K.S. Rangasamy College of Technology

(Autonomous)



CURRICULUM & SYLLABI

of

B.Tech., Food Technology

(For the batch admitted in 2022 – 2023)

R2022

Accredited by NAAC with A++, Approved by AICTE, Affiliated to Anna University, Chennai.

KSR Kalvi Nagar, Tiruchengode – 637 215. Namakkal District, Tamil Nadu, India.

Department of Food Technology

VISION

To be a leading center for learning and sharing knowledge in the field of Food Technology across the nation and beyond.

MISSION

- To develop skilled and ethically responsible Food Technology professionals by providing technical knowledge through quality teaching and learning process
- To create an environment that fosters employability skills in Food Technology through collaborations with industry and academia
- To encourage students to focus on research and entrepreneurship in Food Technology, promoting societal welfare and enhancing the quality of life.

PROGRAM EDUCATIONAL OBJECTIVES (PEOs)

- **PEO1:** Core Competence: Our graduates apply technical knowledge to solve problems in Food safety, quality and sustainability.
- **PEO2:** Employability: Our graduates exhibit technical expertise and professionalism to meet the needs of the Food industry and society.
- **PEO3:** Research and Development: Our graduates promote research and development in Food Technology through lifelong learning, addressing challenges in Food safety, quality and sustainability.

PROGRAMME OUTCOMES (POs)

Engineering Graduates will be able to:

- **PO1:** Engineering knowledge: Apply the knowledge of mathematics, science, engineeringfundamentals, and an engineering specialization to the solution of complex engineering problems.
- **PO2: Problem analysis**: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
- **PO3:** Design /development of solutions: Design solutions for complex engineering problems anddesign system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
- **PO4:** Conduct investigations of complex problems: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
- **PO5: Modern tool usage:** Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modelling to complex engineering activities with an understanding of the limitations
- **PO6:** The engineer and society: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.
- **PO7:** Environment and sustainability: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
- **P08:** Ethics: Apply ethical principles and commit to professional ethics and responsibilities and normsof the engineering practice.
- **PO9:** Individual and team work: Function effectively as an individual, and as a member or leader indiverse teams, and in multidisciplinary settings.
- **PO10:** Communication: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
- **PO11:** Project management and finance: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
- **PO12:** Life-long learning: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.



PROGRAMME SPECIFIC OUTCOMES (PSOs):

Engineering Graduates will be able to:

PSO1: Food Processing Expertise: Graduates will design, develop and optimize Food processing techniques to improve product quality, safety and efficiency.

To improve product quality, salety and eniciency.

PSO2: Food Safety and Quality: Graduates will ensure adherence to high standards of food safety and quality throughout the production process.

PSO3: Sustainability Practices: Graduates will implement environmental friendly and energy- efficient practices in food production.

MAPPING OF PROGRAMME EDUCATIONAL OBJECTIVES (PEOs) WITH PROGRAMME OUTCOMES (POs)

The B.Tech. Food Technology Programme outcomes leading to the achievement of the objectives are summarized in the following Table.

Programme						Program	me Outc	omes				
Educational Objectives	PO1	PO2	PO3	PO4	PO5	PO6	P07	PO8	PO9	PO10	PO11	PO12
PEO 1	3	2	3	3	2	1	1	1	2	2	3	1
PEO 2	3	3	3	3	3	2	1	1	2	2	2	1
PEO 3	3	2	2	2	2	1	1	3	3	2	3	1

Contributions: 1-low, 2-medium, 3-high

MAPPING-UG-FOOD TECHNOLOGY

Year	Sem	Course	PO1	PO2	PO3	PO4	PO5	P06	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
		Professional English I Matrices and	- 3	- 2	-	-	- 2	-	-	2	3	3	2	3	2.4	2.4	2.6
		Calculus Physics for Food	3	2	-	-		-	-	-	-	-	-	-	2	-	-
		Technology Chemistry for Life	3	2	-	-	-	-	-	-	-	2	-	-	-	-	3
		Sciences Engineering	3	2.6	-	-	-	-	-	-	-	-	-	-	2.7	2	-
		Graphics	3	2.8	3	-	3	-	-	3	-	-	-	-	2.75	2.8	-
		Applied Physics and Chemistry Laboratory	3	-	-	-	-	-	-	-	2	-	-	-	2.5	2.5	-
		Fabrication and Reverse Engineering Laboratory	3	2	3	-	-	2	2	-	3	-	-	3	-	3	3
I		Professional English II	-	-	-	-	-	-	-	2	3	3	2	3	2	2	2.8
		Integrals ,Partial Differential Equations and Laplace transform	3	2	-	'	2	'	-	-	-	-	-	-	2	-	-
		Engineering Mechanics	3	2	2	3	-	-	-	-	-	-	-	2	-	-	-



Year	Sem	Course	PO1	PO2	PO3	PO4	PO5	PO6	P07	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
		C Programming	3	3	3		3				2	2		2			2
	II	Basic Electrical and Electronics Engineering	2.6	2.8	1.6	1.6	2	2	2.3	1.5	2	2	2	2.25	3	2	-
		Environmental Studies and Climate Change	2.8	2	2	2	2.33	2.5	2.6	2	-	-	-	2	-	-	-
		Heritage of Tamils / தமிழர் மரபு	2	-	-	-	-	1.5	1	2.4	2	2	-	1.8	-	-	-
		C Programming Laboratory	3	3	3	-	3	-	-	-	2	2	-	2	3	3	-
		Basic Electrical and Electronics Engineering Laboratory	2.6	2.8	1.67	1.67	2	2	2.33	1.5	2	2	2	2.25	3	2	-
		Career Skill Development I	-	-	1	•	•	-	-	2	3	3	2	3	-	-	-
		Fourier Transform and Numerical Methods	3	2	ı	ı	2	1	-	-	-	-	ı	-	2	-	-
		Engineering Properties of Food materials	3	3	2	3	2	-	-	-	-	-	-	-	2	2	3
		Biochemistry for Food Technologist	3	2.4	-	3	-	3	2	1.8	-	3	-	3	3	2	-
		Food Microbiology for Food Technologist	3	1	1	3	1	3	2	1.8	-	3	1	3	3	2	3
		Food Process Calculations	3	3	2.4	3	-	-	-	-	-	-	-	2	2.8	3	2.5
		Food Processing and Preservation	3	-	3	-	-	-	3	2	2	3	-	2	3	2.6	2.8
II	III	Tamils and Technology / தமிழரும் ததெரழில்நுட்பமும்	3	-	-	-	3	2	2.75	3	2.5	2.2	-	3	-	-	-
		Mandatory – II						3	3	3	2.8	3	2	3			
		Food Biochemistry Laboratory	-	-	3	3	1	-	-		3	3	-	3	3	3	-
		Food Microbiology Laboratory	-	-	3	3	-	-	-		3	3	-	3	3	2.4	3
		Career Skill Development II	-	-	-	-	-	-	-	2	3	3	2	3	2	2	2
		Internship	3	3	2	2	-	-	-		1	2	2	3	2	3	3
		Probability and Statistics	3	2	-	-	2	-	-	-	-	-	-	-	2	-	-
	IV	Fluid Mechanics and Mechanical Operation	3	2.2	2.8	2	-	-	-	-	-	-	-	-	3	2	-



Year	Sem	Course	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
		Meat, Fish and Poultry Process Technology	3	3	2.2	-	-	1.4	2.4	3	-	-	-	-	3	3	2
		Food Chemistry and Nutrition	3	3	2.2	1	-	2.4	2.4	3	-	-	-	-	3	2	2
		Food Chemistry and Nutrition Laboratory	3	3	3	-	-	-	3	-	3	3	-	-	2.4	3	3
		Unit Operations Laboratory	3	3	3	-	-	-	3	-	3	3	-	-	2.4	3	3
		Career Skill Development III	2.6	2.6	2.6	2.8		2.4	-	-	-	2	3	3	-	-	-
		Dairy Technology	3	3	3	-	•	ı	2.4	-	-	-	-	-	3	2.6	2
		Food Process Engineering	3	3	3	2	-	2	-	-	-	-	-	-	3	3	2
		Food Safety and Quality Regulation	3	2	3	2	•	1	3	2	2	3	-	2	2	3	3
		Heat and Mass Transfer	3	3	3	2	-	2.4	-	-	-	-	-	-	-	-	2
		Startups and Entrepreneurship	2.8	2.6	3	2.4	2.2	2.5	1.7	1.75	1.33	2	2.2	2.4	-		2
		Dairy Technology Laboratory	3	2.2	2.8	3		2	2	2	2.8	3	-	-	2	3	-
		Food Process Engineering Laboratory	2.6	2.6	2.33	1.75	2.4	2	2.2	2	2.75	2.8	-	2.4	2	3	-
	V	Design Thinking and Innovation Laboratory	3	3	2.8	3	-	-	-	3	3	3	-	3	3	2.8	3
		Career Skill Development IV	2.6	2.6	2.6	2.8	•	2.4	-	-	-	2	3	3	2	-	2
		NCC/NSS/NSO/ YRC/RRC/Fine Arts*	3	2	1	1	3	3	3	3	3	3	-	-	-	•	-
		Engineering Economics and Financial Accounting	2.67	3	2.5	2.75	3	2	2.33	2	-	-	2.75	2.5	2.75	2.6	2.33
III		Baking and Confectionary Technology	3	3	3	1	1	-	2	-	1	-	-	-	2	2.75	2.75
		Food Process plant layout and safety	3	3	3	2.6	ı	2	2.6	-	1	1	-	-	2.67	2	2
	VI	Refrigeration and Cold Chain Management	3	3	2.6	2		-	2.2	-	-	-	-	-	2.33	2	2.67
		Baking And Confectionary Laboratory	1	1	2.6	2.4	-	2.4	2.4	2.8	3	2	-	3	3	3	3
		Computational Laboratory for Food Technology	3	3	3	2	-	2	-	-	2	3	-	-	3	3	-



Year	Sem	Course	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
		Design Thinking and Product Development Laboratory	3	3	2.8	3	-	-	-	3	3	3	-	3	3	2.8	3
		Comprehension Test	3	3	2	2	-	-	-	-	1	2	2	3	2	-	-
		Food Additives, Nutraceutical and Functional Foods	3	3	2	2	-	2	-	-	-	-	-	-	2	3	-
		Food Packaging Technology	3	3	3	3	2	-	2	-	-	-	-	2	2	2	-
	VII	Fermentation Technology	2.8	3	2.6	2.8	-	-	2.4	-	-	-	-	-	2	-	-
		Research Skill Development	2	2	2	2	3	2	2	3	3	3	-	3	-	-	-
IV		Food Packaging Laboratory	3	3	3	3	-	-	3	-	2	-	-	2	2.2	3	2.4
		Project Work Phase – I	3	2	3	3	3	3	-	-	3	-	-	2	2	3	3
	VIII	Project Work Phase – II	3	2	3	3	3	3	-	-	3	-	-	2	2	3	3



K.S. RANGASAMY COLLEGE OF TECHNOLOGY Credit Distribution for B. Tech. Food Technology Programme–2022 –2023 Batch SUMMARY

	_			Cre	dits Per S	emester				Total	Percentage
S.No.	Category	ı	II	III	IV	V	VI	VII	VIII	Credits	%
1.	HS	2	2	-	-	-	3	AB	-	7	2.45
2.	BS	12	4	4	4	-	-	-	-	24	14.72
3.	ES	6	14	-	-	-	-	-	-	20	12.26
4.	PC	-	-	19	14	18	15	14	8	88	55.82
5.	PE	-	-	-	3	3	3	3	3	15	9.20
6.	OE	-	-	-	3	3	3	-	-	9	5.52
7.	EEC	-	-	-	-	-	-	-	-	-	-
8.	MC		MC-I	MC-II	-	MC-III	-	-	-	-	-
9.	GE	-	GE-1	GE-II	-	-	-	-	-	-	-
10.	CG	-	CG-I	CG-II	CG-III	CG-IV	CG-V	CG-VI	CG-VI	-	-
	Total	20	20	23	24	24	24	17	11	163	100



K.S.RANGASAMY COLLEGE OF TECHNOLOGY, TIRUCHENGODE -637215 (An Autonomous Institution affiliated to Anna University)

HUMANITIES AND SOCIAL SCIENCE (HS)

S.No.	Course Code	Course Title	Category	Contact Periods	L	т	Р	С	Prerequisite
1.	60 EN 001	Professional English I	HS	3	1	0	2	2	Basic knowledge of reading and writing in English
2.	60 EN 002	Professional English II	HS	3	1	0	2	2	Professional English I
3.	60 AB 001	National Cadet Corps (Air Wing)	HS	4	2	0	2	3€	NIL
4.	60 AB 002	National Cadet Corps (Army Wing)	HS	4	2	0	2	3€	NIL
5.	60 HS 002	Engineering Economics and Financial Accounting	HS	3	3	0	0	3	NIL

BASIC SCIENCE (BS)

S.No.	Course Code	Course Title	Category	Contact Periods	L	Т	Р	С	Prerequisite
1.	60 MA 001	Matrices and Calculus	BS	5	3	1	0	4	NIL
2.	60 CH 005	Chemistry for Life Sciences	BS	3	3	0	0	3	NIL
3	60 CP 0P3	Applied Physics and Chemistry Laboratory	BS	4	0	0	4	2	NIL
4	60 MA 003	Integrals, Partial Differential Equations and Laplace transform	BS	5	3	1	0	4	NIL
5	60 PH 006	Physics for Food Technology	BS	3	3	0	0	3	NIL
6	60 MA 012	Fourier Transform and Numerical Methods	BS	5	3	1	0	4	NIL
7	60 MA 021	Probability and Statistics	BS	5	3	1	0	4	NIL

ENGINEERING SCIENCES (ES)

		_		(- /					
S.No.	Course Code	Course Title	Category	Contact Periods	L	Т	Р	С	Prerequisite
1.	60 ME 004	Engineering Mechanics	ES	5	3	1	0	4	NIL
2.	60 CS 001	C Programming	ES	3	3	0	0	3	NIL
3	60 CS 0P1	C Programming Laboratory	ES	4	0	0	4	2	NIL



4	60 EE 001	Basic Electrical and Electronics Engineering	ES	3	3	0	0	3	NIL
5	60 ME 002	Engineering Graphics	ES	6	2	0	4	4	NIL
6	60 ME 0P1	Fabrication and Reverse Engineering Laboratory	ES	4	0	0	4	2	NIL
7	60 EE 0P1	Basic Electrical and Electronics Engineering Laboratory	ES	4	0	0	4	2	NIL

CAREER ENHANCEMENT COURSE (CG)

		CAREER	ENHANCEME	NI COURSE	(CG)				
S.No.	Course Code	Course Title	Category	Contact Periods	L	Т	Р	С	Prerequisite
1.	60 CG 0P1	Career Skill Development I	CG	2	0	0	2	1*	Basic knowledge of reading and writing in English
2.	60 CG 0P2	Career Skill Development II	CG	2	0	0	2	1*	Basic knowledge of reading and writing in English
3	60 CG 0P3	Career Skill Development III	CG	2	0	0	2	1*	Basic knowledge of Arithmetic and Logical Reasoning
4	60 CG 0P4	Career Skill Development IV	CG	2	0	0	2	1*	Basic knowledge of Arithmetic and Logical Reasoning
5	60 CG 0P5	Comprehension Test	CG	2	0	0	2	1*	Fundamental knowledge in all core subjects
6	60 FT 8P2	Internship	CG	0	0	0	0	1/2/3	NIL

PROFESSIONAL CORE (PC)

				- ()					
S.No.	Course Code	Course Title	Category	Contact Periods	L	T	Р	C	Prerequisite
1.	60 FT 301	Engineering Properties of Food materials	PC	3	3	0	0	3	NIL
2.	60 FT 302	Biochemistry for Food Technologist	PC	3	3	0	0	3	NIL
3.	60 FT 303	Food Microbiology for FoodTechnologist	PC	3	3	0	0	3	NIL



		T T		1					
4.	60 FT 304	Food Process Calculations	PC	4	2	1	0	3	NIL
5.	60 FT 305	Food Processing and Preservation	PC	3	3	0	0	3	NIL
6.	60 FT 3P1	Food Biochemistry Laboratory	PC	4	0	0	4	2	NIL
7.	60 FT 3P2	Food Microbiology Laboratory	PC	4	0	0	4	2	NIL
8.	60 FT 401	Fluid Mechanics and Mechanical Operation	PC	5	3	1	0	4	NIL
9.	60 FT 402	Meat, Fish and Poultry Process Technology	PC	3	3	0	0	3	NIL
10.	60 FT 403	Food Chemistry and Nutrition	PC	3	3	0	0	3	NIL
11.	60 FT 4P1	Food Chemistry and Nutrition Laboratory	PC	4	0	0	4	2	NIL
12.	60 FT 4P2	Unit Operations Laboratory	PC	4	0	0	4	2	NIL
13.	60 FT 501	Dairy Technology	PC	3	3	0	0	3	NIL
14.	60 FT 502	Food Process Engineering	PC	5	3	1	0	4	NIL
15.	60 FT 503	Food Safety and Quality Regulations	PC	4	2	0	2	3	NIL
16.	60 FT 504	Heat and Mass Transfer	PC	5	3	1	0	4	NIL
17.	60 FT 5P1	Dairy Technology Laboratory	PC	3	0	0	3	1.5	NIL
18.	60 FT 5P2	Food Process Engineering Laboratory	PC	3	0	0	3	1.5	NIL
19.	60 FT 5P3	Design Thinking and Innovation Laboratory	PC	2	0	0	2	1	NIL
20.	60 FT 601	Baking and Confectionary Technology	PC	3	3	0	0	3	NIL
21.	60 FT 602	Food process plant layout and safety	PC	5	3	1	0	4	NIL
22.	60 FT 603	Refrigeration and Cold Chain Management	PC	5	3	1	0	4	NIL
23.	60 FT 6P1	Baking and Confectionary Laboratory	PC	3	0	0	3	1.5	NIL
24.	60 FT 6P2	Computational Laboratory for Food Technology	PC	3	0	0	3	1.5	NIL
25.	60 FT 6P3	Design Thinking and Product Development Laboratory	PC	2	0	0	2	1	NIL
26.	60 FT 701	Food Additives, Nutraceutical and Functional Foods	PC	3	3	0	0	3	NIL
27.	60 FT 702	Food Packaging Technology	PC	5	3	1	0	4	NIL



28.	60 FT 703	Fermentation Technology	PC	3	3	0	0	3	NIL
29.	60 FT 7P1	Food Packaging Laboratory	PC	4	0	0	4	2	NIL
30.	60 FT 7P2	Project Work Phase - I	PC	4	0	0	4	2	NIL
31.	60 FT 8P1	Project Work Phase - II	PC	16	0	0	16	8	NIL

PROFESSIONAL ELECTIVES (PE)/HONOR SEMESTER IV,

ELECTIVE I

S.No.	Course Code	Course Title	Catego ry	Contact Periods	L	Т	Р	С	Prerequisite
1.	60 FT E11	Introduction to Food Biotechnology	PE	3	3	0	0	3	NIL
2.	60 FT E12	Therapeutics and Nutrition	PE	3	3	0	0	3	NIL
3.	60 FT E13	Technology of Fruit and Vegetable Processing	PE	3	3	0	0	3	NIL
4.	60 FT E14	Instrumental Techniques in Food Analysis	PE	3	3	0	0	3	NIL
5.	60 FT E15	Food Safety and Quality Auditing	PE	3	3	0	0	3	NIL
6.	60 FT E16	Flour Chemistry and Rheology	PE	3	3	0	0	3	NIL
7.	60 FT E17	Drying Technology	PE	3	3	0	0	3	NIL

Note: Any of the Elective course can be opted for Honor Degree

SEMESTER V, ELECTIVE II

S.No.	Course Code	Course Title	Category	Contact Periods	L	Т	Р	С	Prerequisite
1.	60 FT E21	Process Control and Instrumentation	PE	3	3	0	0	3	NIL
2.	60 FT E22	Community Nutrition	PE	3	3	0	0	3	NIL
3.	60 FT E23	Fruits and Vegetables as Nutraceuticals	PE	3	3	0	0	3	NIL
4.	60 FT E24	Modelling, Simulation and Soft Tools for Food Technology	PE	3	3	0	0	3	NIL
5.	60 FT E25	Food Storage and Cold Chain Management	PE	3	3	0	0	3	NIL
6.	60 FT E26	Confectionery Products	PE	3	3	0	0	3	NIL
7.	60 FT E27	Flavouring Technology	PE	3	3	0	0	3	NIL

Note: Any of the Elective course can be opted for Honor Degree



SEMESTER VI, ELECTIVE III

S.No.	Course Code	Course Title	Category	Contact Periods	L	Т	Р	С	Prerequisite
1.	60 FT E31	Bioprocess Engineering	PE	4	2	0	2	3	NIL
2.	60 FT E32	Traditional Foods	PE	4	2	0	2	3	NIL
3.	60 FT E33	Advances in Fruit and Vegetable Processing Technologies	PE	4	2	0	2	3	NIL
4.	60 FT E34	Modern Technology in Cereals, Pulses and Spices	PE	4	2	0	2	3	NIL
5.	60 FT E35	Food Industry Waste Management	PE	4	2	0	2	3	NIL
6.	60 FT E36	Industrial Production of Cookies and Biscuits	PE	4	2	0	2	3	NIL
7.	60 FT E37	Technology of Fats and Oils	PE	4	2	0	2	3	NIL

Note: Any of the Elective course can be opted for Honor Degree

SEMESTER VII, ELECTIVE IV

S.No.	Course Code	Course Title	Category	Contact Periods	L	Т	P	С	Prerequisite
1.	60 FT E41	Downstream Processing of Bioproducts	PE	3	3	0	0	3	NIL
2.	60 FT E42	Food Product Development	PE	3	3	0	0	3	NIL
3.	60 FT E43	Fruit and Vegetable Storage	PE	3	3	0	0	3	NIL
4.	60 FT E44	Technology of Snacks and Extruded Products	PE	3	3	0	0	3	NIL
5.	60 FT E45	Food Quality Assurance and Quality Control	PE	3	3	0	0	3	NIL
6.	60 FT E46	Industrial Production of Bun, Bread, Cakes and Pastries	PE	3	3	0	0	3	NIL
7.	60 FT E47	Cane Sugar Technology	PE	3	3	0	0	3	NIL

Note: Any of the Elective course can be opted for Honor Degree

SEMESTER VIII, ELECTIVE V

S.No.	Course Code	Course Title	Category	Contact Periods	L	T	Р	С	Prerequisite
1.	60 FT E51	Food Allergy and Toxicology	PE	3	3	0	0	3	NIL
2.	60 FT E52	Food Processing Equipment Design	PE	3	3	0	0	3	NIL
3.	60 FT E53	Fruit and Vegetable Industry Safety and Laws	PE	3	3	0	0	3	NIL

4.	60 FT E54	Energy Management in Modern Food Process Industries	PE	3	3	0	0	3	NIL
5.	60 FT E55	Food Laws – Indian and International	PE	3	3	0	0	3	NIL
6.	60 FT E56	Packaging of Bakery and Confectionery Products	PE	3	3	0	0	3	NIL
7.	60 FT E57	Waste Management and By-products Development in Food Industries	PE	3	3	0	0	3	NIL

Note: Any of the Elective course can be opted for Honor Degree

MANDATORY COURSES (MC)

S.No.	Course Code	Course Title	Category	Contact Periods	L	T	Р	С	Prerequisite
1.	60 MY 001	Environmental Studies and Climate Change	MC	2	2	0	0	0	NIL
2.	60 MY 002	Universal Human Values	MC	3	3	0	0	3#	NIL
3.	60 MY 003	Startups and Entrepreneurship	MC	2	2	0	0	2 [@]	NIL

OPEN ELECTIVES I/II/III (OE)

S.No.	Course Code	Course Title	Category	Contact Periods	L	Т	Р	С	Prerequisite
1.	60 FT L01	Nutrition and Healthy Life	OE	3	3	0	0	3	NIL
2.	60 FT L02	Livestock, Poultry and Fish Production Management	OE	3	3	0	0	3	NIL
3	60 FT L03	Food Supply Chain Management	OE	3	3	0	0	3	NIL
4	60 FT L04	Basics of Packaging Technology	OE	3	3	0	0	3	NIL

GENERAL ELECTIVE COURSES (GE)

S.No.	Course Code	Course Title	Category	Contact Periods	L	Т	Р	С	Prerequisite
1.	60 GE 001	Heritage of Tamils / தமிழர்மரபு	GE	1	1	0	0	1 [¥]	NIL
2.	60 GE 002	Tamils and Technology / தமிழரும் தொழில்நுட்பமும்	GE	1	1	0	0	1 [¥]	Heritage of Tamils



INTEGRATED COURSE

S.No.	Course Code	Course Title	Category	Contact Periods	L	Т	Р	С	Prerequisite
1.	60 FT 503	Food Safety and Quality Regulations	PC	4	2	0	2	3	NIL
2.	60 FT E31	Bioprocess Engineering	PE	4	2	0	2	3	NIL
3.	60 FT E32	Traditional Foods	PE	4	2	0	2	3	NIL
4.	60 FT E33	Advances in Fruit and Vegetable Processing Technologies	PE	4	2	0	2	3	NIL
5.	60 FT E34	Modern Technology in Cereals, Pulses and Spices	PE	4	2	0	2	3	NIL
6.	60 FT E35	Food Industry Waste Management	PE	4	2	0	2	3	NIL
7.	60 FT E36	Industrial Production of Cookies and Biscuits	PE	4	2	0	2	3	NIL
8.	60 FT E37	Technology of Fats and Oils	PE	4	2	0	2	3	NIL

VERTICALS

	Vertical I Food Biotechnology	Vertical II Food Nutrition and Product Development	Vertical III Fruit and Vegetable Processing Technology	Vertical IV Next Generation Techniques in Food Sectors	Vertical V Food Storage and Management System	Vertical VI Techniques in Baking and Confectionery Manufacturing	Vertical VII Technology in Food Processing
Elective I	Introduction to Food Biotechnology	Therapeutics and Nutrition	Technology of fruit and vegetable processing	Instrumental Techniques in Food Analysis	Food Safety and Quality Auditing	Flour chemistry and rheology	Drying Technology
Elective II	Process Control and Instrumentation	Community Nutrition	Fruits and vegetables as nutraceuticals	Modelling, Simulation and Soft tools for food technology	Food Storage and Cold Chain Management	Confectionery products	Flavouring Technology
Elective III	Bioprocess Engineering	Traditional Foods	Advances in fruit and vegetable processing technologies	Modern Technology in Cereals, Pulses and Spices	Food Industry Waste Management	Industrial production of cookies and biscuits	Technology of Fats and Oils
Elective IV	Down Stream Processing of Bio-products	Food Product Development	Fruit and vegetable storage	Technology of Snacks and Extruded Products	Food Quality Assurance and Quality Control	Industrial production of bun, bread, cakes and pastries	Cane Sugar Technology
Elective V	Food Allergy and Toxicology	Functional Foods	Fruit and vegetable industry safety & laws	Energy Management in modern Food Process industries	Food laws – Indian and International	Packaging of bakery and confectionery products	Waste Management and by- products development in food industries



K.S.RANGASAMY COLLEGE OF TECHNOLOGY, TIRUCHENGODE - 637215 (An Autonomous Institution affiliated to Anna University) COURSES OF STUDY

(For the candidates admitted in 2022-2023)

		SEMESTER	-I						
S.No.	Course Code	Course Title	Category	Contact Periods	L	Т	Р	С	
1.		Induction Programme	-	-	-	-	-	0	
		THEORY							
2.	60 EN 001	Professional English I	HS	3	1	0	2	2	
3.	60 MA 001	Matrices and Calculus	BS	5	3	1	0	4	
4.	60 PH 006	Physics for Food Technology	BS	3	3	0	0	3	
5.	60 CH 005	Chemistry for Life Sciences	BS	3	3	0	0	3	
6.	60 ME 002	Engineering Graphics	ES	6	2	0	4	4	
		PRACTICAL	S						
8.	60 CP 0P3	Applied Physics and Chemistry Laboratory	BS	4	0	0	4	2	
9.	60 ME 0P1	Fabrication and Reverse Engineering Laboratory	ES	4	0	0	4	2	
	Total 28 12 1 14 20								

I to VII Semester

€ NCC - Course can be waived with 3 credits in VII semester or offered as extra credits

€ NSS/NSO/YRC/RRC/Fine Arts - 3 credits is not accounted for CGPA

I to VIII Semester

Internship 3 additional credits not accounted for CGPA is offered based on the Internship duration

		SEMESTER -	II					
S.No.	Course Code	Course Title	Category	Contact Periods	L	т	Р	С
		THEORY			•	•		
1.	60 EN 002	Professional English II	HS	3	1	0	2	2
2.	60 MA 003	Integrals, Partial Differential Equations and Laplace transform	BS	5	3	1	0	4
3.	60 ME 004	Engineering Mechanics	ES	5	3	1	0	4
4.	60 CS 001	C Programming	ES	3	3	0	0	3
5.	60 EE 001	Basic Electrical and Electronics Engineering	ES	3	3	0	0	3
6.	60 MY 001	Environmental Studies and Climate Change	МС	2	2	0	0	0
7.	60 GE 001	Heritage of Tamils / தமிழர் மரபு	HS	1	1	0	0	1¥
		PRACTICALS	3					
8.	60 CS 0P1	C Programming Laboratory	ES	4	0	0	4	2
9.	60 EE 0P1	Basic Electrical and Electronics Engineering Laboratory	ES	4	0	0	4	2
10.	60 CG 0P1	Career Skill Development I	EEC	2	0	0	2	1*
			Total	32	16	2	12	20

^{*}Heritage of Tamils additional 1 credit is offered and not account for CGPA



^{*} Career Skill Development - Extra 1 credit is offered and not accounted for CGPA

^{*} Career Skill Development I additional credit is offered not accounted for CGPA.

	SEMESTER - III								
S. No.	Course Code	Course Title	Category	Contact Periods	L	Т	Р	С	
	THEORY								
1.	60 MA 012	Fourier Transform and Numerical Methods	BS	5	3	1	0	4	
2.	60 FT 301	Engineering Properties of Food Materials	PC	3	3	0	0	3	
3.	60 FT 302	Biochemistry for Food Technologist	PC	3	3	0	0	3	
4.	60 FT 303	Food Microbiology for Food Technologist	PC	3	3	0	0	3	
5.	60 FT 304	Food Process Calculations	PC	4	2	1	0	3	
6.	60 FT 305	Food Processing and Preservation	PC	3	3	0	0	3	
7.	60 GE 002	Tamils and Technology / தமிழரும் தொழில்நுட்பமும்	HS	1	1	0	0	1¥	
8.	60 MY 002	Universal Human Values	MC	3	3	0	0	3#	
		PRACTICAL	LS						
9.	60 FT 3P1	Food Biochemistry Laboratory	PC	4	0	0	4	2	
10.	60 FT 3P2	Food Microbiology Laboratory	PC	4	0	0	4	2	
11.	60 CG 0P2	Career Skill Development II	CG	2	0	0	2	1*	
12.	60 CG 0P6	Internship	CG	-	-	-	-	1/2/3\$	
				35	21	2	10	23	

[¥] Tamils and Technology additional1 credit is offered and not account for CGPA.

^{\$} Internship 1 or 2 or 3 additional credits not accounted for CGPA is offered based on the Internship duration.

		SEMESTE	R – IV					
S. No.	Course Code	Course Title	Category	Contact Periods	L	T	Р	С
		THEO	RY					
1.	60 MA 021	Probability and Statistics	BS	5	3	1	0	4
2.	60 FT 401	Fluid Mechanics and Mechanical Operation	PC	5	3	1	0	4
3.	60 FT 402	Meat, Fish and Poultry Process Technology	PC	3	3	0	0	3
4.	60 FT 403	Food Chemistry and Nutrition	PC	3	3	0	0	3
5.	60 FT E1*	Professional Elective – I	PE	3	3	0	0	3
6.	60 OE L0*	Open Elective – I	OE	3	3	0	0	3
		PRACTIC	CALS					
7.	60 FT 4P1	Food Chemistry and Nutrition Laboratory	PC	4	0	0	4	2
8.	60 FT 4P2	Unit Operations Laboratory	PC	4	0	0	4	2
9.	60 CG 0P3	Career Skill Development III	CG	2	0	0	2	1*
10.	60 CG 0P6	Internship	CG	-	-	-	-	1/2/3\$
	Total 32 18 2 10 24							24

^{*} Career Skill Development III additional credit is offered not accounted for CGPA.



[#] UHV additional 3 credit is offered and not accounted for CGPA

^{*} Career Skill Development II additional credit is offered not accounted for CGPA.

^{\$} Internship 1 or 2 or 3 additional credits not accounted for CGPA is offered based on the Internship duration.

		SEMESTI	ER – V					
S.No.	Course Code	Course Title	Category	Contact Periods	L	Т	Р	С
		THEO	RY					
1.	60 FT 501	Dairy Technology	PC	3	3	0	0	3
2.	60 FT 502	Food Process Engineering	PC	5	3	1	0	4
3.	60 FT 503	Food Safety and Quality Regulation	PC	4	2	0	2	3
4.	60 FT 504	Heat and Mass Transfer	PC	5	3	1	0	4
5.	60 FT E2*	Professional Elective – II	PE	3	3	0	0	3
6.	60 OE L0*	Open Elective – II	OE	3	3	0	0	3
7.	60 MY 003	Startups and Entrepreneurship	MC	2	2	0	0	2@
		PRACTION	CALS			•		
8.	60 FT 5P1	Dairy Technology Laboratory	PC	3	0	0	3	1.5
9.	60 FT 5P2	Food Process Engineering Laboratory	PC	3	0	0	3	1.5
10.	60 FT 5P3	Design Thinking and Innovation Laboratory	PC	2	0	0	2	1
11.	60 CG 0P4	Career Skill Development IV	CG	2	0	0	2	1*
12.	60 CG 0P6	Internship	CG	-	-	-	-	1/2/3\$
				35	19	2	12	24

^{*} Career Skill Development IV additional credit is offered not accounted for CGPA.

^{\$} Internship 1 or 2 or 3 additional credits not accounted for CGPA is offered based on the Internship duration.

	SEMESTER – VI								
S.No.	Course Code	Course Title	Category	Contact Periods	L	Т	Р	С	
		RY							
1.	60 HS 002	Engineering Economics and Financial Accounting	PC	3	3	0	0	3	
2.	60 FT 601	Baking and Confectionery Technology	PC	3	3	0	0	3	
3.	60 FT 602	Food Process Plant Layout and Safety	PC	5	3	1	0	4	
4.	60 FT 603	Refrigeration and Cold Chain Management	PC	5	3	1	0	4	
5.	60 FT E3*	Professional Elective – III	PE	4	2	0	2	3	
6.	60 OE L0*	Open Elective – III	OE	3	3	0	0	3	
		PRACTION	CALS						
7.	60 FT 6P1	Baking and Confectionery Laboratory	PC	3	0	0	3	1.5	
8.	60 FT 6P2	Computational Laboratory for Food Technology	PC	3	0	0	3	1.5	
9.	60 FT 6P3	Design Thinking and Product Development Laboratory	PC	2	0	0	2	1	
10.	60 CG 0P5	Comprehension Test	CG	2	0	0	2	1*	
11.	60 CG 0P6	Internship	CG	-	-	-	-	1/2/3 ^{\$}	
				35	17	2	14	24	

^{*} Comprehension Test one additional credit is offered and not accounted for CGPA calculation.



^{\$} Internship 1 or 2 or 3 additional credits not accounted for CGPA is offered based on the Internship duration.

		SEMESTER	– VII					
S.N o.	Course Code	Course Title	Category	Contact Periods	L	Т	Р	С
		THEOR	Υ	1	I.			
1.	60 FT 701	Food Additives, Nutraceutical and Functional Foods	PC	3	3	0	0	3
2.	60 FT 702	Food Packaging Technology	PC	5	3	1	0	4
3.	60 FT 703	Fermentation Technology	PC	3	3	0	0	3
4.	60 FT E4*	Professional Elective – IV	PE	3	3	0	0	3
5.	60 AC 001	Research Skill Development	AC	1	1	0	0	0
		PRACTICA	ALS					
6.	60 FT 7P1	Food Packaging Laboratory	PC	4	0	0	4	2
7.	60 FT 7P2	Project Work Phase – I	PC	4	0	0	4	2
8.	60 CG 0P6	Internship	CG	-	-	-	-	1/2/3 ^{\$}
9.	60 AB 00*	NCC/NSS/NSO/YRC/RRC/Fine Arts	HS	4	2	0	2	3€
	Total 23 13 1 8 17							

^{\$} Internship 1 or 2 or 3 additional credits not accounted for CGPA is offered based on the Internship duration.

[€] NSS/NSO/YRC/RRC/Fine Arts 3 credits is not accounted for CGPA

	SEMESTER – VIII								
S.No	Course Code	Course Title	Category	gory Contact L T P					
		THEORY	Y						
1.	1. 60 FT E5* Professional Elective – V PE 3 3 0 0 3								
		PRACTICA	LS						
3.	60 FT 8P1	Project Work Phase - II	PC	16	0	0	16	8	
4.	4. 60 CG 0P6 Internship CG 1/2/3\$								
	Total 19 3 0 16 11								

^{\$} Internship 1 or 2 or 3 additional credits not accounted for CGPA is offered based on the Internship duration.

TOTAL NUMBER OF CREDITS TO BE EARNED FOR AWARD OF THE DEGREE = 163

Note: HS- Humanities and Social Sciences including Management Courses, BS- Basic Science Courses, ES-Engineering Science Courses, PE-Professional Core Courses, PE-Professional Elective Courses, GE- General Elective Courses, OE- Open Elective Courses, CG -Career Enhancement Course, MC- Mandatory Courses



[€] NCC Course can be waived with 3 credits in VII semester or offered as extra credits

K.S.RANGASAMY COLLEGE OF TECHNOLOGY, TIRUCHENGODE - 637215

(An Autonomous Institution affiliated to Anna University)
B.E. / B.Tech. Degree Programme
SCHEME OF EXAMINATIONS
(For the candidates admitted in 2022-2023)
FIRST SEMESTER

	Course	Name of the	Duration of	Weightage of Marks			Minimum M Pass in End S Exan	Semester
S.No.	Code	Course	Internal Exam	Continuous Assessment	End Semester Exam	Max. Marks	End Semester Exam	Total
	ı	.	•	THEORY	ı	l	1	
1	60 EN 001	Professional English I	2	40	60	100	45	100
2	60 MA 001	Matrices and Calculus	2	40	60	100	45	100
3	60 PH 006	Physics for Food Technology	2	40	60	100	45	100
4	60 CH 005	Chemistry for Life Sciences	2	40	60	100	45	100
5	60 ME 002	Engineering Graphics	2	40	60	100	45	100
				PRACTICAL				
6	60 CP 0P3	Applied Physics and Chemistry Laboratory	3	60	40	100	45	100
7	60 ME 0P1	Fabrication and Reverse Engineering Laboratory	3	60	40	100	45	100

^{*} CA evaluation pattern will differ from course to course and for different tests. This will have to be declared in advance to students. The department will put a process in place to ensure that the actual test paper follow the declared pattern.



^{**} End Semester Examination will be conducted for maximum marks of 100 and subsequently be reduced to 60 marks for theory End Semester Examination and 40 marks for practical End Semester Examination.

60 EN 001	Professional English I	Category	L	Т	Р	Credit
00 LIV 001	i Tolessional English	HS	1	0	2	2

Objectives

- To help learners improve their vocabulary and to enable them to use words appropriately in different academic and professional contexts.
- To help learners develop strategies that could be adopted while reading texts.
- To help learners acquire the ability to speak effectively in English in real life and career related situations.
- To equip students with effective speaking and listening skills in English.
- To facilitate learners to enhance their writing skills with coherence and appropriate format effectively.

Pre-requisites

Basic knowledge of reading and writing in English

Course Outcomes

On the successful completion of the course, students will be able to

CO1	Compare and interpret complex academic texts	Understand
CO2	Recall the denotative and connotative meanings of technical texts	Remember
CO3	Interpret definitions, descriptions, narrations, and essays on various topics	Understand
CO4	Express fluently and accurately in formal and informal communicative Contexts	Understand
CO5	Summarize their opinions effectively in both oral and written medium of communication	Understand

Mappii	Mapping with Programme Outcomes														
COs		POs											PSOs		
003	1 2 3 4 5 6 7 8 9 10 11 12								12	1	2	3			
CO1	-	-	-	-	-	-	-	2	3	3	2	3	3	2	2
CO2	-	-	-	-	-	-	-	2	3	3	2	3	2	2	2
CO3	-	-	-	-	-	-	-	2	3	3	2	3	3	2	3
CO4	-	-	-	-	-	-	-	2	3	3	2	3	2	3	3
CO5	-	-	-	-	-	-	-	2	3	3	2	3	2	3	3
3- Stro	ng;2-M	edium;1	-Low												

Bloom's	Continuous Ass (Ma	essment Tests arks)	Model Examination (Marks)	End Sem Examination (Marks)		
Category	1	2	(Wai KS)	(ivial K5)		
Remember	10	20	20	20		
Understand	50	80	80	80		
Apply	-	-	-	-		
Analyze	-	-	-	-		
Evaluate	-	-	-	-		
Create	-	-	-	-		
Total	60	100	100	100		

Syllabus

L	Syllabus									
Semester Hours/Week Total Credit Maximum Marks Semester Hours/Week Total Credit Maximum Marks L T P Hours C C CA ES Total 1 0 0 2 45 2 40 0 0 100 Introduction to Fundamentals of Communication Isterinig: General information-specific details-conversation: introduction to classmates – audio / video formal & information; Senting: Self Introduction; Introducting a friend; conversation: politeness strategies, teading: Reading brochures (technical context), telephone messages / social media messages relevant to echnical contexts and emails. Writing: Writing letters – informal and formal – basics and format orientation anguage Focus: Present Tenses; word formation (affixes); synonyms, antonyms and contranyms, and hirasal vehrs; abbreviations & acronyms (as used in technical contexts). Jarration and Summation Isterning: Podeast, anecdotes / stories / event narration; documentaries and interviews with celebrities. Jarration and Summation Jastening: Podeast, anecdotes / stories / events, Interviewing a celebrity; reporting / and ummarizing of documentaries / podeasts/ interviews. Reading: Biographies, travelogues, newspaper reports, excerpts from literature, and travel & technical logs. Writing: Paragraph writing, short report on an event (field trip etc.). anguage Focus: Past tenses and prepositions; One-word substitution. Description of a process / product	K.S.Rangasamy College of Technology – Autonomous R2022									
Semester Hours/Week Total Credit Maximum/Marks L T P Hours C C C C ES Total C C C C C C C C C				B.Tech	n. Food Techn	ology				
L				60 EN 001	- Professiona	l English I				
Introduction to Fundamentals of Communication Introduction to Fundamentals of Communication Istering: General information-specific details-conversation: introduction to classmates – audio / video formal & informal). Speaking: Self Introduction; Introducing a friend: conversation - politeness strategies. [9] Reading brochures (technical context), telephone messages / social media messages relevant to echnical contexts and emails. Writing: Writing letters – informal and formal – basics and format orientation anguage Focus: Present Tenses; word formation (affixes); synonyms, antonyms and contranyms, and hirasal verbs; abbreviations & acronyms (as used in technical contexts). Identify: Writing letters – informal and formal – basics and format orientation anguage Focus: Present Tenses; word formation (affixes); synonyms, antonyms and contranyms, and hirasal verbs; abbreviations & acronyms (as used in technical contexts). Identify: Writing: Podcast, anecdotes / stories / event narration; documentaries and interviews with celebrities. Speaking: Podcast, anecdotes / stories / event narration; documentaries and interviews with celebrities. Speaking: Biographies, travelogues, newspaper reports, excerpts from literature, and travel & technical longs. Writing: Paragraph writing, short report on an event (field trip etc.). anguage Focus: Past tenses and prepositions; One-word substitution. Posscription of a process / product. Isterning: Eleten to a product and process description; advertisements about products or services speaking: Picture description; giving instruction to use the product; presenting a product. Reading: Petition of a process / product and process description. Isterning: Eletina to a product process description and process. Isterning: Teb Talks; scientific lectures; and educational videos. Speaking: Small Talk; Mini presentations Lote-making: Mote-taking: recommendations: Transferring information from non-verbal (chart, graph etc., overbal mode). Isterning: Debates/ discussions, debates & r	Semester		Hours/Week		Total	Credit	Ma	aximum Marks		
Introduction to Fundamentals of Communication Istening: General information-specific details-conversation: introduction to classmates – audio / video formal & informal). Istening: General information-specific details-conversation: introduction to classmates – audio / video formal & informal). Istening: Self Introduction; Introducting a friend: conversation - politeness strategies. Istending: Reading brochures (technical context), telephone messages / social media messages relevant to echnical contexts and emails. Writing: Writing letters – informal and formal – basics and format orientation anguage Focus: Present Tenses; word formation (affixes); synonyms, antonyms and contranyms, and brinsal verbs; abbreviations & acronyms (as used in technical contexts). Istening: Podacst, anecotoes / stories / event narration: documentaries and interviews with celebrities. Interviewing a celebrity; reporting / and ummarizing of documentaries / podcasts / interviews. Istening: Podcast, anecotoes / stories / event narration: documentaries and interviews with celebrities. Interviewing a celebrity; reporting / and ummarizing of documentaries / podcasts/ interviews. Istening: Paragraph writing, short report on an event (field trip etc.). anguage Focus: Past tenses and prepositions; One-word substitution. Poscription of a process / product Istening: Listen to a product and process descriptions; advertisements about products or services speaking: Picture description; giving instruction to use the product; presenting a product. Istening: Definitions; instructions; and product /process description. anguage Focus: Imperatives; comparative adjectives; future tenses. Homonyms; and Homophones, iscourse markers (connectives & sequence words) Istening: TED Talks; scientific lectures; and educational videos. Speaking: Self Talk; Mini presentations Istening: Debates/ discussions; different viewpoints on an issue; and panel discussions. Speaking: Connectives & role plays. Reading: Editorials; and opinion blogs. Writing: Eagl		L	Т	Р	Hours	С	CA	ES	Total	
	ı	1	0	2	45	2	40	60	100	
formal & Informal). Speaking: Self Introduction; Introducing a friend; conversation - politeness strategies. teading: Reading brochures (technical context), telephone messages / social media messages relevant to echnical contexts and emails. Writing: Writing letters – informal and formal – basics and format orientation anguage Focus: Present Tenses, word formation (affixes); synonyms, antonyms and contranyms, and hirstals viersis; abbreviations & acronyms (as used in technical contexts). Jarration and Summation. Jastening: Podoast, anecdotes / stories / event narration; documentaries and interviews with celebrities. Speaking: Narrating personal experiences / events; Interviewing a celebrity; reporting / and ummarizing of documentaries / podcasts/ interviews. Reading: Biographies, travelogues, newspaper reports, excerpts from literature, and travel & technical logs. Writing: Paragraph writing, short report on an event (field trip etc.). anguage Focus: Past tenses and prepositions; One-word substitution. Poscription of a process / product Jatesting: Listen to a product and process descriptions; advertisements about products or services speaking: Picture description; giving instruction to use the product; presenting a product. Reading: Advertisements, gadget reviews and user manuals. Writing: Definitions; instructions; and product / process description. Jassification and Recommendations Jassification and Recommendation	Introduction	to Fundamen	tals of Comm	unication						
echnical contexts and emails. Writing: Writing letters – informal and formal – basics and format orientation anguage Focus: Present Tenses; word formation (affixes); synonyms, antonyms and contranyms, and hrasal verbs: abbreviations & acronyms (as used in technical contexts). Auraration and Summation istening: Podcast, anecdotes / stories / event narration; documentaries and interviews with celebrities. pipeaking: Narrating personal experiences / events; Interviewing a celebrity; reporting / and ummarizing of documentaries / podcasts/ interviews. Reading: Biographies, travelogues, newspaper reports, excerpts from literature, and travel & technical ummarizing of documentaries / podcasts/ interviews. Reading: Biographies, travelogues, newspaper reports, excerpts from literature, and travel & technical logs. Writing: Paragraph writing, short report on an event (field trip etc.). anguage Focus: Past tenses and prepositions; One-word substitution. Description of a process / product istening: Listen to a product and process descriptions; advertisements about products or services speaking: Picture description; giving instruction to use the product; presenting a product. Reading: Definitions; instructions; and product /process description, anguage Focus: Imperatives; comparative adjectives; future tenses. Homonyms; and Homophones, ilscourse markers (connectives & sequence words) Jassification and Recommendations istening: Telo Talks; scientific lectures; and educational videos. Speaking: Small Talk; Mini presentations Reading: Newspaper articles and Journal reports lote-making: Mote-taking: recommendations; Transferring information from non-verbal (chart, graph etc, o verbal mode) anguage Focus: Articles; Pronouns -Possessive & Relative pronouns; subject-verb agreement; collocations. Expression Istening: Debates/ discussions, debates & role plays. Reading: Revisca and Journal reports lote-making: Group discussions, debates & role plays. Reading: Religional plays and plays and plays and plays and plays and	(formal & info Speaking: Se	rmal). elf Introduction	; Introducing a	friend; conve	rsation - polite	ness strategie	es.		[9]	
Narration and Summation Summation Summation Summation Podcast, anecdotes / stories / event narration; documentaries and interviews with celebrities. Speaking: Narrating personal experiences / events; Interviewing a celebrity; reporting / and ummarizing of documentaries / podcasts/ interviews. [9] Reading: Biographies, travelegues, newspaper reports, excerpts from literature, and travel & technical logs Podcasts/ interviews. [9] Norman Podcasts/ interviews. [9] Norman Podcasts/ interviews. [9] Norman Podcasts/ interviews [9] Norman Podcasts/ interviews. [9] Note-taking: recommendations [9] Note-taking: recommendations [9] Note-taking: recommendations Podcasts/ interviews. [9] Podcasts/ intervi	Writing: Writing letters – informal and formal – basics and format orientation Language Focus: Present Tenses; word formation (affixes); synonyms, antonyms and contranyms, and									
Listening: Podcast, anecdotes / stories / event narration; documentaries and interviews with celebrities. bpeaking: Narrating personal experiences / events; interviewing a celebrity; reporting / and unmarizing of documentaries / podcasts/ interviews. Reading: Biographies, travelogues, newspaper reports, excerpts from literature, and travel & technical logs. Writing: Paragraph writing, short report on an event (field trip etc.). Language Focus: Past tenses and prepositions; One-word substitution. Description of a process / product Listening: Listen to a product and process descriptions; advertisements about products or services speaking: Picture description; giving instruction to use the product; presenting a product. Listening: Listen to a product and process descriptions; advertisements about products or services speaking: Corus: Imperatives; comparative adjectives; future tenses. Homonyms; and Homophones, liscourse markers (connectives & sequence words) Alassification and Recommendations Listening: TED Talks; scientific lectures; and educational videos. Speaking: Small Talk; Mini presentations Reading: Newspaper articles and Journal reports lote-making / Note-taking; recommendations; Transferring information from non-verbal (chart, graph etc, o verbal mode) lote-making: Debates/ discussions; different viewpoints on an issue; and panel discussions. Speaking: Group discussions, debates & role plays. Reading: Editorials; and opinion blogs. Writing: Essay Writing (Descriptive or narrative). Language Focus: Punctuation; Compound Nouns; simple, compound & complex sentences. cause & lifect expressions. Total Hours: Total Hours: Total Hours: 45 Fext Book(s): Lighth for Engineers & Technologists' Orient Blackswan Private Ltd. Department of English, Anna University, 20: Norman Lewis, Word Power Made Easy - The Complete Handbook for Building a Superior Vocabulary Book', Penguin Random House India, 2020 Reference(s): Paul Emmerson and Nick Hamilton, Five Minute Activities for Business English', Cambr	•		s & acronyms	(as used in te	echnical conte	xts).				
Description of a process / product Listening: Listen to a product and process descriptions; advertisements about products or services speaking: Picture description; giving instruction to use the product; presenting a product. Reading: Advertisements, gadget reviews and user manuals. Writing: Definitions; instructions; and product /process description. Language Focus: Imperatives; comparative adjectives; future tenses. Homonyms; and Homophones, discourse markers (connectives & sequence words) Classification and Recommendations Listening: TED Talks; scientific lectures; and educational videos. Speaking: Small Talk; Mini presentations Reading: Newspaper articles and Journal reports Iote-making / Note-taking; recommendations; Transferring information from non-verbal (chart, graph etc, o verbal mode) Language Focus: Articles; Pronouns -Possessive & Relative pronouns; subject-verb agreement; collocations. Expression Listening: Debates/ discussions; different viewpoints on an issue; and panel discussions. Speaking: Group discussions, debates & role plays. Reading: Editorials; and opinion blogs. Writing: Essay Writing (Descriptive or narrative). Language Focus: Punctuation; Compound Nouns; simple, compound & complex sentences. cause & defect expressions. Total Hours: Total Hours: Total Hours: 15 English for Engineers & Technologists' Orient Blackswan Private Ltd. Department of English, Anna University, 20: Norman Lewis, 'Word Power Made Easy - The Complete Handbook for Building a Superior Vocabulary Book', Penguin Random House India, 2020 Reference(s): Paul Emmerson and Nick Hamilton, 'Five Minute Activities for Business English', Cambridge University Press, New York, 2005 Arthur Brookes and Peter Grundy, 'Beginning to Write: Writing Activities for Elementary and Intermediate Learners', Cambridge University Press, New York, 2003 Michael McCarthy and Felicity O Dell, 'English Vocabulary in Use: Upper Intermediate', Cambridge University Press, New York, 2012	Listening: Po Speaking: N summarizing of Reading: Bio blogs. Writing: Para	odcast, aneco arrating perso of documental ographies, trav graph writing,	onal experience ries / podcasts velogues, new short report o	ces / events; s/interviews. /spaper report n an event (fie	Interviewing rts, excerpts feld trip etc.).	a celebrity; if	reporting / an	nd	[9]	
Listening: Listen to a product and process descriptions; advertisements about products or services Speaking: Picture description; giving instruction to use the product; presenting a product. Reading: Advertisements, gadget reviews and user manuals. Writing: Definitions; instructions; and product /process description. Language Focus: Imperatives; comparative adjectives; future tenses. Homonyms; and Homophones, discourse markers (connectives & sequence words) Classification and Recommendations Listening: TED Talks; scientific lectures; and educational videos. Speaking: Small Talk; Mini presentations Reading: Newspaper articles and Journal reports lote-making / Note-taking; recommendations; Transferring information from non-verbal (chart, graph etc., overbal mode) Language Focus: Articles; Pronouns -Possessive & Relative pronouns; subject-verb agreement; collocations. Expression Listening: Debates/ discussions, different viewpoints on an issue; and panel discussions. Speaking: Group discussions, debates & role plays. Reading: Editorials; and opinion blogs. Writing: Essay Writing (Descriptive or narrative). Language Focus: Punctuation; Compound Nouns; simple, compound & complex sentences. cause & effect expressions. Total Hours: 19] Writing: Essay Writing (Descriptive or narrative). Language Focus: Punctuation; Compound Nouns; simple, compound & complex sentences cause & effect expressions. Total Hours: 45 Text Book(s): 10] Paul Emmerson and Nick Hamilton, 'Five Minute Activities for Business English', Cambridge University Press, New York, 2005 Arthur Brookes and Peter Grundy,' Beginning to Write: Writing Activities for Elementary and Intermediate Learners', Cambridge University Press, New York, 2005 Michael McCarthy and Felicity O Dell, 'English Vocabulary in Use: Upper Intermediate', Cambridge University Press, New York, 2012 Listening: Particle Science Technical English', Science Publications (Inclin) Part Ltd. 2000				sitions, One-v	word Substitution	Jn.				
Listening: TED Talks; scientific lectures; and educational videos. Speaking: Small Talk; Mini presentations Reading: Newspaper articles and Journal reports lote-making / Note-taking; recommendations; Transferring information from non-verbal (chart, graph etc, o verbal mode) .anguage Focus: Articles; Pronouns -Possessive & Relative pronouns; subject-verb agreement; collocations. Expression .istening: Debates/ discussions; different viewpoints on an issue; and panel discussions. Speaking: Group discussions, debates & role plays. Reading: Editorials; and opinion blogs. Writing: Essay Writing (Descriptive or narrative). .anguage Focus: Punctuation; Compound Nouns; simple, compound & complex sentences. cause & siffect expressions. Total Hours: 45 Fext Book(s): . 'English for Engineers & Technologists' Orient Blackswan Private Ltd. Department of English, Anna University, 20: . Norman Lewis, 'Word Power Made Easy - The Complete Handbook for Building a Superior Vocabulary Book', Penguin Random House India, 2020 Reference(s): . Paul Emmerson and Nick Hamilton, 'Five Minute Activities for Business English', Cambridge University Press, New York, 2005 . Arthur Brookes and Peter Grundy,' Beginning to Write: Writing Activities for Elementary and Intermediate Learners', Cambridge University Press, New York, 2003 Michael McCarthy and Felicity O Dell, 'English Vocabulary in Use: Upper Intermediate', Cambridge University Press, N.York, 2012	Listening: Listen to a product and process descriptions; advertisements about products or services Speaking: Picture description; giving instruction to use the product; presenting a product. Reading: Advertisements, gadget reviews and user manuals. Writing: Definitions; instructions; and product /process description. Language Focus: Imperatives; comparative adjectives; future tenses. Homonyms; and Homophones, discourse markers (connectives & sequence words)									
Listening: Debates/ discussions; different viewpoints on an issue; and panel discussions. Speaking: Group discussions, debates & role plays. Reading: Editorials; and opinion blogs. Writing: Essay Writing (Descriptive or narrative). Language Focus: Punctuation; Compound Nouns; simple, compound & complex sentences. cause & effect expressions. Total Hours: 45 Text Book(s): L. 'English for Engineers & Technologists' Orient Blackswan Private Ltd. Department of English, Anna University, 20: Norman Lewis, 'Word Power Made Easy - The Complete Handbook for Building a Superior Vocabulary Book', Penguin Random House India, 2020 Reference(s): Paul Emmerson and Nick Hamilton, 'Five Minute Activities for Business English', Cambridge University Press, New York, 2005 Arthur Brookes and Peter Grundy,' Beginning to Write: Writing Activities for Elementary and Intermediate Learners', Cambridge University Press, New York, 2003 Michael McCarthy and Felicity O Dell, 'English Vocabulary in Use: Upper Intermediate', Cambridge University Press, N. York, 2012 Lakebrii Narrayanan 'A Course Book on Technical English' Scitoch Bublications (India) But Ltd. 2020	Listening: TE Speaking: Sr Reading: Nev Note-making / to verbal mod Language Fo	ED Talks; scier nall Talk; Mini wspaper article ' Note-taking; le)	ntific lectures; presentations es and Journal recommenda	reports tions; Transfe	erring informat				[9]	
Fext Book(s): 1. 'English for Engineers & Technologists' Orient Blackswan Private Ltd. Department of English, Anna University, 2022. 2. Norman Lewis, 'Word Power Made Easy - The Complete Handbook for Building a Superior Vocabulary Book', Penguin Random House India, 2020. Reference(s): Paul Emmerson and Nick Hamilton, 'Five Minute Activities for Business English', Cambridge University Press, New York, 2005. Arthur Brookes and Peter Grundy,' Beginning to Write: Writing Activities for Elementary and Intermediate Learners', Cambridge University Press, New York, 2003. Michael McCarthy and Felicity O Dell, 'English Vocabulary in Use: Upper Intermediate', Cambridge University Press, N. York, 2012. Lakebri Nervyonen 'A Course Rook on Technical English' Scitch Publications (India) Put Ltd. 2020.	Listening: De Speaking: Gr Reading: Edit Writing: Essa Language Fo	oup discussio torials; and oping Writing (Des Docus: Punctu	ns, debates & inion blogs. scriptive or nar	role plays.				s. cause &	[9]	
 'English for Engineers & Technologists' Orient Blackswan Private Ltd. Department of English, Anna University, 2022. Norman Lewis, 'Word Power Made Easy - The Complete Handbook for Building a Superior Vocabulary Book', Penguin Random House India, 2020. Reference(s): Paul Emmerson and Nick Hamilton, 'Five Minute Activities for Business English', Cambridge University Press, New York, 2005. Arthur Brookes and Peter Grundy,' Beginning to Write: Writing Activities for Elementary and Intermediate Learners', Cambridge University Press, New York, 2003. Michael McCarthy and Felicity O Dell, 'English Vocabulary in Use: Upper Intermediate', Cambridge University Press, N. York, 2012. Lakehmi Nerwapana, 'A Course Book on Technical English' Scitch Publications (India) Put Ltd, 2020. 								Total Hours:	45	
Norman Lewis, 'Word Power Made Easy - The Complete Handbook for Building a Superior Vocabulary Book', Penguin Random House India, 2020 Reference(s): Paul Emmerson and Nick Hamilton, 'Five Minute Activities for Business English', Cambridge University Press, New York, 2005 Arthur Brookes and Peter Grundy,' Beginning to Write: Writing Activities for Elementary and Intermediate Learners', Cambridge University Press, New York, 2003 Michael McCarthy and Felicity O Dell, 'English Vocabulary in Use: Upper Intermediate', Cambridge University Press, N. York, 2012 Lakebri Nervypapa, 'A Course Rook on Tochnical English' Scitceh Bublications (India) Put Ltd. 2020	Text Book(s)	:								
Norman Lewis, 'Word Power Made Easy - The Complete Handbook for Building a Superior Vocabulary Book', Penguin Random House India, 2020 Reference(s): Paul Emmerson and Nick Hamilton, 'Five Minute Activities for Business English', Cambridge University Press, New York, 2005 Arthur Brookes and Peter Grundy,' Beginning to Write: Writing Activities for Elementary and Intermediate Learners', Cambridge University Press, New York, 2003 Michael McCarthy and Felicity O Dell, 'English Vocabulary in Use: Upper Intermediate', Cambridge University Press, N. York, 2012 Lakebri Nervypapa, 'A Course Rook on Tochnical English' Scitceh Bublications (India) Put Ltd. 2020			ers & Technolo	gists' Orient E	Blackswan Priv	/ate Ltd. Depa	artment of Eng	lish, Anna Univ	ersity, 2020	
Paul Emmerson and Nick Hamilton, 'Five Minute Activities for Business English', Cambridge University Press, New York, 2005 Arthur Brookes and Peter Grundy,' Beginning to Write: Writing Activities for Elementary and Intermediate Learners', Cambridge University Press, New York, 2003 Michael McCarthy and Felicity O Dell, 'English Vocabulary in Use: Upper Intermediate', Cambridge University Press, N. York, 2012 Lakebri New York, 2012	2. Norma	an Lewis, <i>'Wol</i> oulary Book', P	rd Power Mad	e Easy - The 0	Complete Han				,, - <u>-</u>	
New York, 2005 Arthur Brookes and Peter Grundy,' Beginning to Write: Writing Activities for Elementary and Intermediate Learners', Cambridge University Press, New York, 2003 Michael McCarthy and Felicity O Dell, 'English Vocabulary in Use: Upper Intermediate', Cambridge University Press, N. York, 2012 Lakebri Nersyspan, 'A Course Rook on Tochnical English' Scitceh Bublications (India) But Ltd. 2020	Reference(s)	:								
Intermediate Learners', Cambridge University Press, New York, 2003 Michael McCarthy and Felicity O Dell, 'English Vocabulary in Use: Upper Intermediate', Cambridge University Press, N. York, 2012 Lakehmi Narayanan, 'A Course Rook on Technical English' Scitted Bublications (India) But Ltd. 2020										
Press, N.York, 2012 Lakehmi Narayanan 'A Course Rook on Tochnical English' Scitoch Publications (India) Put Ltd. 2020	Z. Interm	nediate Learne	ers', Cambridg	e University F	Press, New Yo	ork, 2003				
Lakshmi Narayanan, 'A Course Book on Technical English' Scitech Publications (India) Pvt. Ltd. 2020	3. Press	, N.York, 2012	2					_	ersity	
	4. Laksh	mi Narayanan	i, 'A Course Bo	ook on Techni	ical English' So	citech Publica	tions (India) P	vt. Ltd. 2020		

^{*} SDG- 04- Quality Education



Course C	ontents and Lecture Schedule	
S. No.	Topics	No. of hours
1.0	Introduction to Fundamentals of Communication	
1.1	Listening for general information and Specific details	1
1.2	Self-introduction	1
1.3	Narrating personal experiences	1
1.4	Reading relevant to technical contexts and emails	1
1.5	Writing letters – informal	1
1.6	Writing letters – formal	1
1.7	Present Tenses	1
1.8	synonyms, antonyms and contranyms, and affixes	1
1.9	Phrasal verbs; abbreviations & acronyms	1
2.0	Narration and Summation	
2.1	Listening to podcasts, documentaries and interviews with celebrities	1
2.2	Narrating personal experiences	1
2.3	Summarizing of documentaries	1
2.4	Reading travelogues, and excerpts from literature	1
2.5	Paragraph writing	1
2.6	Short report on an event (field trip etc.).	1
2.7	Past tenses	1
2.8	Prepositions	1
2.9	One-word substitution	1
3.0	Description of a process / product	, <u> </u>
3.1	Listen to a product and process descriptions	1
3.2	Picture description	1
3.3	Giving instruction to use the product	1
3.4	Reading Advertisements, gadget reviews and user manuals	1
3.5	Writing Definitions and instructions	1
3.6	Future Tenses	1
3.7	Homonyms and Homophones	1
3.8	Imperatives	1
3.9	comparative adjectives, and discourse markers	1
4.0	Classification and Recommendations	
4.1	Listening to TED Talks and educational videos	1
4.2	Listening to scientific lectures	1
4.3	Small Talk and mini presentations	1
4.4	Reading newspaper articles and journal reports	1
4.5	Note-making / Note-taking	1
4.6	Recommendations	1
4.7	Transferring information from non-verbal	1
4.8	Articles and Pronouns	1
4.9	Subject-verb agreement and collocations	1
5.0	Expression	<u> </u>
5.1	Listening to debates and panel discussions	1
5.2	Group discussions	2
5.3	Role plays	1
5.4	Reading editorials and opinion blogs	1
5.5	Essay Writing (Descriptive or narrative)	1
5.6	Punctuation and cause & effect expressions.	1
5.7	Compound Nouns	1
5.8	Simple, compound & complex sentences	1

Course Designer(s)

Dr.A.Palaniappan -palaniappan@ksrct.ac.in



60 MA 001	Matrices and Calculus	Category	L	Т	Р	Credit
	Matrices and Galculus	BS	3	1	0	4

Objectives

- To familiarize the basic concepts in Cayley-Hamilton theorem and orthogonal transformation
- To get exposed to the fundamentals of differentiation
- To acquire skills to understand the concepts involved in Jacobians and maxima and minima
- To solve various linear differential equations and method of variation of parameters
- To learn various techniques and methods in solving definite and indefinite integrals

Pre-requisites

Nil

Course Outcomes

On the	successful completion of the course, Students will be able to	
CO1	Apply the concepts of Cayley-hamilton theorem and orthogonal transformation to the matrix	Apply
CO2	Apply the concepts of differentiation in solving various Engineering problems	Apply
CO3	Obtain Jacobians and maxima and minima of functions of two variables	Apply
CO4	Employ various methods in solving differential equations	Apply
CO5	Apply different techniques to evaluate definite and indefinite integrals	Apply

Mapping with Programme Outcomes

Cos	PO1	PO2	PO3	PO4	PO5	PO6	P07	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	-	-	2	-	-	-	-	-	-	-	2	-	-
CO2	3	2	-	-	2	-	-	-	-	-	-	-	2	-	-
CO3	3	2	-	-	2	-	-	-	-	-	-	-	2	-	-
CO4	3	2	-	-	2	-	-	-	-	-	-	-	2	-	-
CO5	3	2	-	-	2	-	-	-	-	-	-	-	2	-	-

3 - Strong; 2 - Medium; 1 - Some

Assessment Pattern

	Continuous Assess	sment Tests (Marks)	Model	End Sem
Bloom's Category	1	2	Examination (Marks)	Examination (Marks)
Remember	10	10	10	10
Understand	10	10	20	20
Apply	40	40	70	70
Analyze	-	-	-	-
Evaluate	-	-	-	-
Create	-	-	-	-
Total	60	60	100	100

Syllabus	V C Dana	anni Calla	as of Taskasla	Autonom	(D2022)			
	K. S. Rang	asamy Colle	ge of Technolo B.Tech. Food		10us (R2022)			
		60 1	MA 001 – Matric		us			
Semester	Hours / Wee	k	Total Hours	Credit		Maximum M	larks	
L	T	Р		С	CA	ES	To	
Matrices	1	0	60	4	40	60	10	10
Matrices					: -(-1		
Characteristic equatio	-	-		=	-			
and Eigen vectors - C			-		-	-	i iorm -	[0]
Reduction of quadration		-	n Ortnogonai tra	nsiormation - i	vature or quad	aratic form		[9]
 Applications: Stretch Hands-on: 	ing or an elastic	membrane						
Matrix Operations - A	Addition Multin	lication Tra	nenoso Invors	o and Pank				
	-adition, waitip	mication, ma	inspose, invers	e and ivanik				
Differentiation			o 5 .	·: D:"		,		
Representation of fun							-	
chain rules) - Succes one variable*	sive differentiat	ion - Leibnit	zs theorem - A	applications: i	waxima and	wiinima of fu	nctions of	[9]
Hands-on:								
Determine the solution	on of evetom of	linear equa	tions					
		ilileai equa						
Functions of Several								
Partial differentiation	-				-			
variables - Applicatio				wo variables	- Constraine	a maxima and	i minima:	[9]
Lagrange's Method	of Undetermine	ea Multiplier	'S [^]					
Hands-on:			a f a Matuia					
Compute the Eigen		en vectors	or a Matrix					
Differential Equations						.,		
inear differential equa	tions of second	and higher o	rder with constar	nt coefficients -	R.H.S is of th	ıe form e ^{αX} , si	nαx,	
os $\alpha x, x^{n}, n > 0$ -	Differential equa	ations with v	ariable coefficie	ents: Cauchy's	and Legend	dre's form of	linear	[9]
equations - Method of	variation of para	meters						
Hands-on:								
Solve the first and	second order of	ordinary diffe	erential equatio	ons				
Integration								
Definite and Indefinite	e integrals - Su	bstitution ru	le - Techniques	of Integration	n: Integration	by parts, Inte	gration of	
rational functions by	oartial fraction, I	ntegration of	f irrational funct	ions - Imprope	r integrals - A	Applications: H	lydrostatic	
force and pressure, m	noments and cer	ntres of mass	3					[9]
Hands-on:								
Compute the Maxima	a and Minima of	a function	of one variable					
				Total Hours: 4	45 + 5 (Hands	s-on) + 10 (Tut	orial)	60
Fext Book(s): 1. Grewal B.S, "Hig	hor Engineering	Mathamatica	" 44IN Edition I	Zhanna Dubliah	oro Dolhi 20	17		
							Name Dallat	0040
2. Kreyszig Erwin, "	Advanced Engir	neering iviatin	ematics , 10" E	aition, John W	liey and Sons	(Asia) Limited	, New Deini,	2016.
Reference(s):								
Dace H K "High	er Engineering N	/athematics"	3 rd (Revised) F	Edition S Chan	nd & Company	I td. New Delh	ni 2014	
1.	•		•					
2. Veerarajan T, "E 2019.								
3. Kandasamy P, T 2017.		,						
4. Bali N P and Mar	•	ext book of E	ngineering Math	ematics",10 th	Edition, Laxm	i Publications	(P) Ltd, 2016	5.

*SDG: 4 – Quality Education



Course Contents and Lecture Schedule

1.2 Eigen values and Eigen vectors of a real matrix 1.3 Properties of Eigen values and Eigen vectors 1.4 Cayley-Hamilton theorem 1.5 Orthogonal transformation of a symmetric matrix to diagonal form 1.6 Nature of quadratic form 1.7 Reduction of quadratic form to canonical form by Orthogonal transformation 1.8 Stretching of an elastic membrane 1.9 Tutorial 1.0 Hands-on 2. Differentiation 2.1 Representation of functions 2.1 Limit of a function and Continuity 2.3 Differentiation rules (sum, product, quotient, chain rules) 2.4 Successive differentiation 2.5 Leibnitz's theorem 2.6 Maxima and minima of functions of one variable 2.7 Tutorial 2.8 Hands-on 3. Functions of Several Variables 3.1 Partial differentiation 3.1 Prostions of Several Variables 3.2 Homogeneous functions and Euler's theorem 3.3 Jacobians 3.4 Taylor's series for functions of two variables 3.5 Maxima and minima of functions of two variables 3.6 Lagrange's Method of Undetermined Multipliers 3.7 Tutorial 3.8 Hands-on 4. Differential equations 4.1 Linear differential equations of second and higher order with constant co-efficient 4.2 R.H.S is of the form e ^{QX} , sin α x, cos α x, x ⁰ , n > 0 4. Differential equations with variable coefficients: Legendre's form of linear equations 4. Differential equations with variable coefficients: Legendre's form of linear equations 4. Differential equations with variable coefficients: Legendre's form of linear equations 4. Differential equations with variable coefficients: Legendre's form of linear equations 4. Hands-on 4. Differential equations with variable coefficients: Legendre's form of linear equations 4. Hands-on 5. Integration 6. Hands-on 6. Hands-on 7. Hands-on 8. Hends-on 8. Hends-on 9. He	S.No.	Topic	No. of Hours
1.2 Eigen values and Eigen vectors of a real matrix 1.3 Properties of Eigen values and Eigen vectors 1.4 Cayley-Hamilton theorem 1.5 Orthogonal transformation of a symmetric matrix to diagonal form 1.6 Nature of quadratic form to canonical form by Orthogonal transformation 1.7 Reduction of quadratic form to canonical form by Orthogonal transformation 1.8 Stretching of an elastic membrane 1.9 Tutorial 1.0 Hands-on 1.10 Hands-on 2. Differentiation 2.1 Representation of functions 2.1 Limit of a function and Continuity 2.3 Differentiation rules (sum, product, quotient, chain rules) 2.4 Successive differentiation 2.5 Leibnitz's theorem 2.6 Maxima and minima of functions of one variable 2.7 Tutorial 2.8 Hands-on 3. Functions of Several Variables 3.1 Partial differentiation 3.1 Protions of Several Variables 3.2 Homogeneous functions and Euler's theorem 3.3 Jacobians 3.4 Taylor's series for functions of two variables 3.5 Maxima and minima of functions of two variables 3.6 Lagrange's Method of Undetermined Multipliers 3.7 Tutorial 3.8 Hands-on 4. Differential equations 4.1 Linear differential equations of second and higher order with constant co-efficient 4.2 R.H.S is of the form e ^{QX} , sin α x, cos α x, x ⁰ , n > 0 4.3 Differential equations with variable coefficients: Legendre's form of linear equations 4.4 Differential equations with variable coefficients: Legendre's form of linear equations 4.5 Method of variation of parameters 4.6 Hands-on 4.7 Hands-on 5. Integration 6.7 Hands-on 6.8 Integration 7. Integration of irrational functions by partial fraction 7. Integration of irrational functions 7. Integration of irrational functions 8. Pressure, moments and centres of mass. 8. Hydrostatic force. 9. Tutorial 9. Hydrostatic force 9. Tutorial 9. Tutorial	1.	Matrices	
1.3 Properties of Eigen values and Eigen vectors 1.4 Cayley-Hamilton theorem 1.5 Orthogonal transformation of a symmetric matrix to diagonal form 1.6 Nature of quadratic form 1.7 Reduction of quadratic form to canonical form by Orthogonal transformation 1.8 Stretching of an elastic membrane 1.9 Tutorial 1.10 Hands-on 2. Differentiation 2.1 Limit of a function and Continuity 2.2. Limit of a function and Continuity 2.3 Differentiation rules (sum, product, quotient, chain rules) 2.4 Successive differentiation 2.5 Leibnitz's theorem 2.6 Maxima and minima of functions of one variable 2.7 Tutorial 2.8 Hands-on 3. Functions of Several Variables 3.1 Partial differentiation 3.2 Homogeneous functions and Euler's theorem 3.3 Jacobians 3.4 Taylor's series for functions of two variables 3.5 Maxima and minima of functions of two variables 3.6 Lagrange's Method of Undetermined Multipliers 3.7 Tutorial 4. Differential Equations 4. Differential equations of second and higher order with constant co-efficient 4. Linear differential equations of second and higher order with constant co-efficient 4. Linear differential equations with variable coefficients: Cauchy's form of linear equations 4. Differential equations with variable coefficients: Cauchy's form of linear equations 4. Differential equations with variable coefficients: Cauchy's form of linear equations 4. Differential equations with variable coefficients: Cauchy's form of linear equations 4. Definite and Indefinite integrals 5. Integration 5. Integration of integration: Integration by parts 6. Integration of rational functions by partial fraction 1. Integration of rational functions 5. Integration of irrational functions 1. Integration of rational functions 1. Integration	1.1	Characteristic equation	1
1.3 Properties of Eigen values and Eigen vectors 1.4 Cayley-Hamilton theorem 1.5 Orthogonal transformation of a symmetric matrix to diagonal form 1.6 Nature of quadratic form 1.7 Reduction of quadratic form to canonical form by Orthogonal transformation 1.8 Stretching of an elastic membrane 1.9 Tutorial 1.10 Hands-on 2. Differentiation 2.1 Limit of a function and Continuity 2.2. Limit of a function and Continuity 2.3 Differentiation rules (sum, product, quotient, chain rules) 2.4 Successive differentiation 2.5 Leibnitz's theorem 2.6 Maxima and minima of functions of one variable 2.7 Tutorial 2.8 Hands-on 3. Functions of Several Variables 3.1 Partial differentiation 3.2 Homogeneous functions and Euler's theorem 3.3 Jacobians 3.4 Taylor's series for functions of two variables 3.5 Maxima and minima of functions of two variables 3.6 Lagrange's Method of Undetermined Multipliers 3.7 Tutorial 4. Differential Equations 4. Differential equations of second and higher order with constant co-efficient 4. Linear differential equations of second and higher order with constant co-efficient 4. Linear differential equations with variable coefficients: Cauchy's form of linear equations 4. Differential equations with variable coefficients: Cauchy's form of linear equations 4. Differential equations with variable coefficients: Cauchy's form of linear equations 4. Differential equations with variable coefficients: Cauchy's form of linear equations 4. Definite and Indefinite integrals 5. Integration 5. Integration of integration: Integration by parts 6. Integration of rational functions by partial fraction 1. Integration of rational functions 5. Integration of irrational functions 1. Integration of rational functions 1. Integration	1.2	Eigen values and Eigen vectors of a real matrix	1
1.5 Orthogonal transformation of a symmetric matrix to diagonal form 1.6 Nature of quadratic form 1.7 Reduction of quadratic form to canonical form by Orthogonal transformation 2.1 Stretching of an elastic membrane 1.9 Tutorial 2.0 Differentiation 2.1 Representation of functions 2.1 Limit of a function and Continuity 2.2 Limit of a function and Continuity 2.3 Differentiation rules (sum, product, quotient, chain rules) 2.4 Successive differentiation 2.5 Leibnitz's theorem 2.6 Maxima and minima of functions of one variable 2.7 Tutorial 2.8 Hands-on 3. Functions of Several Variables 3.1 Partial differentiation 1.1 Partial differentiation 1.2 Homogeneous functions and Euler's theorem 1.3 Jacobians 1.4 Taylor's series for functions of two variables 1.5 Maxima and minima of functions of two variables 1.6 Lagrange's Method of Undetermined Multipliers 1.7 Tutorial 1.8 Hands-on 1.9 Differential Equations 1.1 Linear differential equations with variable coefficients: Cauchy's form of linear equations 1.4 Differential equations with variable coefficients: Legendre's form of linear equations 1.5 Method of variation of parameters 1.6 Method of variation of parameters 1.7 Tutorial 1.8 Substitution rule 1.9 Definite and Indefinite integrals 1.9 Definite and Indefinite integrals 1.0 Linear differential equations with variable coefficients: Legendre's form of linear equations 1.1 Definite and Indefinite integrals 1.2 Substitution rule 1.3 Techniques of Integration: Integration by parts 1.4 Integration of rational functions by partial fraction 1.5 Integration of rational functions by partial fraction 1.6 Improper integrals 1.7 Hydrostatic force. 1.8 Pressure, moments and centres of mass. 1.9 Tutorial 1.0 Linear differential and centres of mass. 1.0 Tutorial 1.1 Linear differential and centres of mass. 1.1 Tutorial 1.2 Linear differential equations and centres of mass. 1.4 Differential equations moments and centres of mass.	1.3	<u> </u>	1
1.6 Nature of quadratic form 1.7 Reduction of quadratic form to canonical form by Orthogonal transformation 1.8 Stretching of an elastic membrane 1.9 Tutorial 1.9 Differentiation 2. Differentiation 2.1 Representation of functions 2.1 Representation and Continuity 2.2 Limit of a function and Continuity 2.3 Differentiation rules (sum, product, quotient, chain rules) 2.4 Successive differentiation 2.5 Leibnitz's theorem 2.6 Maxima and minima of functions of one variable 2.7 Tutorial 2.8 Hands-on 3.1 Partial differentiation 3.2 Homogeneous functions and Euler's theorem 3.3 Jacobians 3.4 Taylor's series for functions of two variables 3.5 Maxima and minima of functions of two variables 3.6 Lagrange's Method of Undetermined Multipliers 3.7 Tutorial 4. Differential Equations 4.1 Linear differential equations with variable coefficients: Cauchy's form of linear equation	1.4	Cayley-Hamilton theorem	1
1.7 Reduction of quadratic form to canonical form by Orthogonal transformation 2 Stretching of an elastic membrane 1.9 Tutorial 2.1.0 Hands-on 2. Differentiation 2.1 Representation of functions 2.1 Limit of a function and Continuity 2.3 Differentiation rules (sum, product, quotient, chain rules) 2.4 Successive differentiation 2.5 Leibnitz's theorem 2.6 Maxima and minima of functions of one variable 2.7 Tutorial 2.8 Hands-on 3. Functions of Several Variables 3.1 Partial differentiation 3.1 Partial differentiation 4.1 Taylor's series for functions of two variables 3.2 Homogeneous functions and Euler's theorem 3.3 Jacobians 3.4 Taylor's series for functions of two variables 3.5 Maxima and minima of functions of two variables 3.6 Lagrange's Method of Undetermined Multipliers 3.7 Tutorial 4. Differential Equations 4.1 Linear differential equations of second and higher order with constant co-efficient 4.1 Linear differential equations of second and higher order with constant co-efficient 4.1 Linear differential equations with variable coefficients: Cauchy's form of linear equations 4. Differential equations with variable coefficients: Legendre's form of linear equations 4. Differential equations with variable coefficients: Legendre's form of linear equations 4. Differential equations with variable coefficients: Legendre's form of linear equations 4. Differential equations with variable coefficients: Legendre's form of linear equations 4. Differential equations with variable positions is Legendre's form of linear equations 5. Integration 5. Integration 5. Integration 5. Integration of integration: Integration by parts 5. Integration of irrational functions by partial fraction 5. Integration of restrictional functions 5. Integration of restrictional functions 5. Integration of irrational functions 5. Integration of irrational functions 5. Integration of microtional functions 5. Integration of irrational functions 5. Integration of irrational functions 5. Integration of irrat	1.5	Orthogonal transformation of a symmetric matrix to diagonal form	1
1.9 Tutorial 2. Differentiation 2.1 Hands-on 3. Differentiation 2.1 Limit of a function and Continuity 3. Differentiation rules (sum, product, quotient, chain rules) 3. Differentiation rules (sum, product, quotient, chain rules) 3. Leibnitz's theorem 4. Successive differentiation 4. Tutorial 5. Leibnitz's theorem 5. Leibnitz's theorem 6. Rama and minima of functions of one variable 7. Tutorial 7. Tutorial 7. Partial differentiation 7. Taylor's series for functions of two variables 7. Tutorial 7. Taylor's series for functions of two variables 7. Tutorial 7. Tutorial 7. Tutorial 7. Tutorial 7. Tutorial 7. Tutorial 7. Partial Equations 7. Tutorial 7. Linear differential equations of second and higher order with constant co-efficient 7. Tutorial 7. Linear differential equations with variable coefficients: Cauchy's form of linear equations 7. Partial equations with variable coefficients: Legendre's form of linear equations 7. Hands-on 7. Hands-on 7. Hands-on 7. Hands-on 7. Integration 7. Integration 7. Hands-on 7. Integration 7. Integration 7. Integration 7. Integration 7. Integration of irrational functions by partial fraction 7. Integration of irrational functions 7. Integration of material and centres of mass.	1.6	Nature of quadratic form	1
1.9 Tutorial 2 1.10 Hands-on 1 2. Differentiation 1 2.1 Representation of functions 1 2.2 Limit of a function and Continuity 1 2.3 Differentiation rules (sum, product, quotient, chain rules) 2 2.4 Successive differentiation 1 2.5 Leibnitz's theorem 2 2.6 Maxima and minima of functions of one variable 2 2.7 Tutorial 2 2.8 Hands-on 1 3. Functions of Several Variables 1 3.1 Partial differentiation 1 3.2 Homogeneous functions and Euler's theorem 1 3.3 Jacobians 2 3.4 Taylor's series for functions of two variables 2 3.5 Maxima and minima of functions of two variables 2 3.5 Maxima and minima of functions of two variables 2 3.6 Lagrange's Method of Undetermined Multipliers 2 3.7 Tutorial 2 4. Differential Equations </td <td>1.7</td> <td>Reduction of quadratic form to canonical form by Orthogonal transformation</td> <td>2</td>	1.7	Reduction of quadratic form to canonical form by Orthogonal transformation	2
1.10 Hands-on 2 Differentiation 2.1 Representation of functions 2.2 Limit of a function and Continuity 2.3 Differentiation rules (sum, product, quotient, chain rules) 2.4 Successive differentiation 2.5 Leibnitz's theorem 2.6 Maxima and minima of functions of one variable 2.7 Tutorial 2.8 Hands-on 3. Functions of Several Variables 3.1 Partial differentiation 3.1 Partial differentiation 3.2 Homogeneous functions and Euler's theorem 3.3 Jacobians 3.4 Taylor's series for functions of two variables 3.5 Maxima and minima of functions of two variables 3.6 Lagrange's Method of Undetermined Multipliers 3.7 Tutorial 3.8 Hands-on 4. Differential Equations 4.1 Linear differential equations of second and higher order with constant co-efficient 4.1 Linear differential equations with variable coefficients: Cauchy's form of linear equations 4.4 Differential equations with variable coefficients: Cauchy's form of linear equations 4.5 Method of variation of parameters 4.6 Tutorial 4.7 Hands-on 5. Integration 5.1 Definite and Indefinite integrals 5.2 Substitution rule 5.3 Techniques of Integration: Integration by parts 5.4 Integration of irrational functions by partal fraction 5.6 Improper integrals 5.7 Hydrostatic force. 5.8 Pressure, moments and centres of mass. 5.9 Tutorial	1.8	Stretching of an elastic membrane	1
2. Differentiation 2.1 Representation of functions 1 2.2 Limit of a function and Continuity 1 2.3 Differentiation rules (sum, product, quotient, chain rules) 2 2.4 Successive differentiation 1 2.5 Leibnitz's theorem 2 2.6 Maxima and minima of functions of one variable 2 2.7 Tutorial 2 2.8 Hands-on 1 3. Functions of Several Variables 3 3.1 Partial differentiation 1 3.2 Homogeneous functions and Euler's theorem 1 3.3 Jacobians 2 3.4 Taylor's series for functions of two variables 2 3.5 Maxima and minima of functions of two variables 2 3.6 Lagrange's Method of Undetermined Multipliers 2 3.7 Tutorial 2 4. Differential Equations 1 4.1 Linear differential equations of second and higher order with constant co-efficient 1 4.2 R.H.S is of the form $e^{\alpha X}$, sin α , $\cos \alpha$, x , n , $n > 0 $	1.9	Tutorial	2
2.1 Representation of functions 2.2 Limit of a function and Continuity 2.3 Differentiation rules (sum, product, quotient, chain rules) 2.4 Successive differentiation 2.5 Leibnitz's theorem 2.6 Maxima and minima of functions of one variable 2.7 Tutorial 2.8 Hands-on 3. Functions of Several Variables 3.1 Partial differentiation 3.1 Homogeneous functions and Euler's theorem 3.2 Homogeneous functions and Euler's theorem 3.3 Jacobians 3.4 Taylor's series for functions of two variables 3.5 Maxima and minima of functions of two variables 3.6 Lagrange's Method of Undetermined Multipliers 3.7 Tutorial 3.8 Hands-on 4. Differential equations 4.1 Linear differential equations of second and higher order with constant co-efficient 4.2 R.H.S is of the form e ^{QX} , sin α x, cos α x, x ^Ω , n > 0 4. Differential equations with variable coefficients: Cauchy's form of linear equations 4.4 Differential equations with variable coefficients: Legendre's form of linear equations 4.5 Method of variation of parameters 4.6 Tutorial 4.7 Hands-on 5.1 Definite and Indefinite integrals 5.2 Substitution rule 5.3 Techniques of Integration: Integration by parts 5.4 Integration of irrational functions by partial fraction 5.5 Integration of irrational functions by partial fraction 5.6 Improper integrals 5.7 Hydrostatic force. 5.8 Pressure, moments and centres of mass. 5.9 Tutorial	1.10	Hands-on	1
2.1 Representation of functions 2.2 Limit of a function and Continuity 2.3 Differentiation rules (sum, product, quotient, chain rules) 2.4 Successive differentiation 2.5 Leibnitz's theorem 2.6 Maxima and minima of functions of one variable 2.7 Tutorial 2.8 Hands-on 3. Functions of Several Variables 3.1 Partial differentiation 3.1 Jacobians 3.2 Honogeneous functions and Euler's theorem 3.3 Jacobians 3.4 Taylor's series for functions of two variables 3.5 Maxima and minima of functions of two variables 3.6 Lagrange's Method of Undetermined Multipliers 3.7 Tutorial 3.8 Hands-on 4. Differential equations 4.1 Linear differential equations of second and higher order with constant co-efficient 4.2 R.H.S is of the form e ^{QX} , sin α x, cos α x, x ⁿ , n > 0 4. Differential equations with variable coefficients: Cauchy's form of linear equations 4.4 Differential equations with variable coefficients: Legendre's form of linear equations 4.5 Method of variation of parameters 4.6 Tutorial 4.7 Hands-on 5.1 Definite and Indefinite integrals 5.2 Substitution rule 5.3 Techniques of Integration: Integration by parts 5.1 Integration of irrational functions by partial fraction 5.1 Pofforciatic force. 5.8 Pressure, moments and centres of mass. 5.9 Tutorial	2.	Differentiation	
2.2 Limit of a function and Continuity 2.3 Differentiation rules (sum, product, quotient, chain rules) 2.4 Successive differentiation 2.5 Leibnitz's theorem 2.6 Maxima and minima of functions of one variable 2.7 Tutorial 2.8 Hands-on 3. Functions of Several Variables 3.1 Partial differentiation 3.2 Homogeneous functions and Euler's theorem 3.1 Partial differentiations and Euler's theorem 3.4 Taylor's series for functions of two variables 3.5 Maxima and minima of functions of two variables 3.6 Lagrange's Method of Undetermined Multipliers 3.7 Tutorial 3.8 Hands-on 4. Differential Equations 4.1 Linear differential equations of second and higher order with constant co-efficient 4.2 R.H.S. is of the form e ^{QX} , sin α x, cos α x, x ⁿ , n > 0 4.3 Differential equations with variable coefficients: Cauchy's form of linear equations 4.4 Differential equations with variable coefficients: Legendre's form of linear equations 4.5 Method of variation of parameters		Representation of functions	1
2.3 Differentiation rules (sum, product, quotient, chain rules) 2.4 Successive differentiation 2.5 Leibnitz's theorem 2.6 Maxima and minima of functions of one variable 2.7 Tutorial 2.8 Hands-on 3. Functions of Several Variables 3.1 Partial differentiation 3.1 Homogeneous functions and Euler's theorem 3.2 Homogeneous functions and Euler's theorem 3.3 Jacobians 3.4 Taylor's series for functions of two variables 3.5 Maxima and minima of functions of two variables 3.6 Lagrange's Method of Undetermined Multipliers 3.7 Tutorial 3.8 Hands-on 4. Differential Equations 4.1 Linear differential equations of second and higher order with constant co-efficient 4.2 R.H.S is of the form e ^{QX} , sin α x, cos α x, x ⁰ , n > 0 4.3 Differential equations with variable coefficients: Cauchy's form of linear equations 4.4 Differential equations with variable coefficients: Legendre's form of linear equations 4.5 Method of variation of parameters 4.6 Tutorial 4.7 Hands-on 5. Integration 5.1 Definite and Indefinite integrals 5.2 Substitution rule 5.3 Techniques of Integration: Integration by parts 5.4 Integration of rational functions by partial fraction 5.5 Integration of rirational functions by partial fraction 5.6 Improper integrals 5.7 Hydrostatic force. 5.8 Pressure, moments and centres of mass.	2.2	·	1
2.4 Successive differentiation 1 2.5 Leibnitz's theorem 2 2.6 Maxima and minima of functions of one variable 2 2.7 Tutorial 2 2.8 Hands-on 1 3. Functions of Several Variables 1 3.1 Partial differentiation 1 3.2 Homogeneous functions and Euler's theorem 1 3.2 Homogeneous functions and Euler's theorem 1 3.2 Homogeneous functions of two variables 2 3.4 Taylor's series for functions of two variables 2 3.5 Maxima and minima of functions of two variables 2 3.6 Lagrange's Method of Undetermined Multipliers 2 3.7 Tutorial 2 4.1 Linear differential Equations 1 4.1 Linear differential Equations 1 4.2 R.H.S is of the form e ^{QX} , sin α x, cos α x, x ^η , n > 0 2 4.3 Differential equations with variable coefficients: Cauchy's form of linear equations 2 4.5		· · · · · · · · · · · · · · · · · · ·	2
2.5 Leibnitz's theorem 2 2.6 Maxima and minima of functions of one variable 2 2.7 Tutorial 2 2.8 Hands-on 1 3. Functions of Several Variables 1 3.1 Partial differentiation 1 3.2 Homogeneous functions and Euler's theorem 1 3.3 Jacobians 2 3.4 Taylor's series for functions of two variables 2 3.5 Maxima and minima of functions of two variables 2 3.6 Lagrange's Method of Undetermined Multipliers 2 3.7 Tutorial 2 3.8 Hands-on 1 4.1 Linear differential equations 1 4.2 R.H.S is of the form e ^{QX} , sin α x, cos α x, x ^η , n > 0 2 4.3 Differential equations with variable coefficients: Cauchy's form of linear equations 2 4.5 Method of variation of parameters 2 4.6 Tutorial 2 4.7 Hands-on 1 5.1			1
2.6 Maxima and minima of functions of one variable 2 2.7 Tutorial 2 2.8 Hands-on 1 3. Functions of Several Variables 1 3.1 Partial differentiation 1 3.2 Homogeneous functions and Euler's theorem 1 3.2 Homogeneous functions and Euler's theorem 1 3.3 Jacobians 2 3.4 Taylor's series for functions of two variables 2 3.5 Maxima and minima of functions of two variables 2 3.6 Lagrange's Method of Undetermined Multipliers 2 3.7 Tutorial 2 4. Differential Equations 1 4.1 Linear differential equations of second and higher order with constant co-efficient 1 4.2 R.H.S is of the form e ^{QX} , sin α x, cos α x, x ⁰ , n > 0 2 4.3 Differential equations with variable coefficients: Cauchy's form of linear equations 2 4.5 Method of variation of parameters 2 4.6 Tutorial 2 <t< td=""><td>2.5</td><td>Leibnitz's theorem</td><td>2</td></t<>	2.5	Leibnitz's theorem	2
2.7 Tutorial 2.8 Hands-on 3. Functions of Several Variables 3.1 Partial differentiation 3.2 Homogeneous functions and Euler's theorem 3.3 Jacobians 3.4 Taylor's series for functions of two variables 3.5 Maxima and minima of functions of two variables 3.6 Lagrange's Method of Undetermined Multipliers 3.7 Tutorial 3.8 Hands-on 4. Differential Equations 4.1 Linear differential equations of second and higher order with constant co-efficient 4.2 R.H.S is of the form e ^{QX} , sin α x, cos α x, x ⁰ , n > 0 2.4 Differential equations with variable coefficients: Cauchy's form of linear equations 4.4 Differential equations with variable coefficients: Legendre's form of linear equations 4.5 Method of variation of parameters 4.6 Tutorial 4.7 Hands-on 5.1 Integration 5.1 Definite and Indefinite integrals 5.2 Substitution rule 5.3 Techniques of Integration: Integration by parts 5.4 Integration of rational functions by partial fraction 5.5 Integration of irrational functions 5.6 Improper integrals 5.7 Hydrostatic force. 5.8 Pressure, moments and centres of mass. 5.9 Tutorial		Maxima and minima of functions of one variable	2
2.8 Hands-on 3. Functions of Several Variables 3.1 Partial differentiation 3.2 Homogeneous functions and Euler's theorem 3.3 Jacobians 3.4 Taylor's series for functions of two variables 3.5 Maxima and minima of functions of two variables 3.6 Lagrange's Method of Undetermined Multipliers 3.7 Tutorial 3.8 Hands-on 4. Differential Equations 4.1 Linear differential equations of second and higher order with constant co-efficient 4.2 R.H.S is of the form e ^{QX} , sin α x, cos α x, x ^η , n > 0 4.3 Differential equations with variable coefficients: Cauchy's form of linear equations 4.4 Differential equations with variable coefficients: Legendre's form of linear equations 4.5 Method of variation of parameters 4.6 Tutorial 4.7 Hands-on 5. Integration 5.1 Definite and Indefinite integrals 5.2 Substitution rule 5.3 Techniques of Integration: Integration by parts 5.4 Integration of rational functions by partial fraction 5.5 Integration of ritograls 5.6 Improper integrals 5.7 Hydrostatic force. 5.8 Pressure, moments and centres of mass. 5.9 Tutorial			2
3. Functions of Several Variables 3.1 Partial differentiation 3.2 Homogeneous functions and Euler's theorem 3.3 Jacobians 3.4 Taylor's series for functions of two variables 3.5 Maxima and minima of functions of two variables 3.6 Lagrange's Method of Undetermined Multipliers 3.7 Tutorial 3.8 Hands-on 4. Differential Equations 4.1 Linear differential equations of second and higher order with constant co-efficient 4.2 R.H.S is of the form e ^{QX} , sin α x, cos α x, x ⁿ , n > 0 4.3 Differential equations with variable coefficients: Cauchy's form of linear equations 4.4 Differential equations with variable coefficients: Legendre's form of linear equations 4.5 Method of variation of parameters 4.6 Tutorial 4.7 Hands-on 5. Integration 5.1 Definite and Indefinite integrals 5.2 Substitution rule 5.3 Techniques of Integration: Integration by parts 5.4 Integration of rational functions by partial fraction 5.5 Integration of rirational functions 5.6 Improper integrals 5.7 Hydrostatic force. 5.8 Pressure, moments and centres of mass. 5.9 Tutorial			1
3.1 Partial differentiation 3.2 Homogeneous functions and Euler's theorem 3.3 Jacobians 3.4 Taylor's series for functions of two variables 3.5 Maxima and minima of functions of two variables 3.6 Lagrange's Method of Undetermined Multipliers 3.7 Tutorial 3.8 Hands-on 4. Differential Equations 4.1 Linear differential equations of second and higher order with constant co-efficient 4.2 R.H.S is of the form e ^{QX} , sin α x, cos α x, x ^η , n > 0 4.3 Differential equations with variable coefficients: Cauchy's form of linear equations 4.5 Method of variation of parameters 4.6 Tutorial 4.7 Hands-on 5. Integration 5.1 Definite and Indefinite integrals 5.2 Substitution rule 5.3 Techniques of Integration: Integration by parts 5.4 Integration of irrational functions by partial fraction 5.5 Integration of irrational functions 5.6 Improper integrals 5.7 Hydrostatic force. 5.8 Pressure, moments and centres of mass. 5.9 Tutorial			
3.2 Homogeneous functions and Euler's theorem 3.3 Jacobians 3.4 Taylor's series for functions of two variables 3.5 Maxima and minima of functions of two variables 3.6 Lagrange's Method of Undetermined Multipliers 3.7 Tutorial 3.8 Hands-on 4. Differential Equations 4.1 Linear differential equations of second and higher order with constant co-efficient 4.2 R.H.S is of the form e ^{αX} , sin α x, cos α x, x ⁿ , n > 0 4.3 Differential equations with variable coefficients: Cauchy's form of linear equations 4.4 Differential equations with variable coefficients: Legendre's form of linear equations 4.5 Method of variation of parameters 4.6 Tutorial 4.7 Hands-on 5. Integration 5.1 Definite and Indefinite integrals 5.2 Substitution rule 5.3 Techniques of Integration: Integration by parts 5.4 Integration of irrational functions by partial fraction 5.5 Integration of irrational functions 5.6 Improper integrals 5.7 Hydrostatic force. 5.8 Pressure, moments and centres of mass. 5.9 Tutorial		Partial differentiation	1
3.3 Jacobians 3.4 Taylor's series for functions of two variables 3.5 Maxima and minima of functions of two variables 3.6 Lagrange's Method of Undetermined Multipliers 3.7 Tutorial 3.8 Hands-on 4. Differential Equations 4.1 Linear differential equations of second and higher order with constant co-efficient 4.2 R.H.S is of the form e ^{αX} , sin α x, cos α x, x ^η , n > 0 4.3 Differential equations with variable coefficients: Cauchy's form of linear equations 4.4 Differential equations with variable coefficients: Legendre's form of linear equations 4.5 Method of variation of parameters 4.6 Tutorial 4.7 Hands-on 5.1 Integration 5.1 Definite and Indefinite integrals 5.2 Substitution rule 5.3 Techniques of Integration: Integration by parts 5.4 Integration of rational functions by partial fraction 5.5 Integration of irrational functions 5.6 Improper integrals 5.7 Hydrostatic force. 5.8 Pressure, moments and centres of mass. 5.9 Tutorial			1
3.4 Taylor's series for functions of two variables 1 3.5 Maxima and minima of functions of two variables 2 3.6 Lagrange's Method of Undetermined Multipliers 2 3.7 Tutorial 2 3.8 Hands-on 1 4. Differential Equations 1 4.1 Linear differential equations of second and higher order with constant co-efficient 1 4.2 R.H.S is of the form e ^{αX} , sin α x, cos α x, x ⁿ , n > 0 2 4.3 Differential equations with variable coefficients: Cauchy's form of linear equations 2 4.4 Differential equations with variable coefficients: Legendre's form of linear equations 2 4.5 Method of variation of parameters 2 4.6 Tutorial 2 4.7 Hands-on 1 5.1 Integration 1 5.2 Substitution rule 1 5.2 Substitution rule 1 5.3 Techniques of Integration: Integration by partial fraction 1 5.5 Integration of irrational functions by partial fraction 1 5.6 Improper integrals	3.3		2
3.5 Maxima and minima of functions of two variables 3.6 Lagrange's Method of Undetermined Multipliers 3.7 Tutorial 3.8 Hands-on 4. Differential Equations 4.1 Linear differential equations of second and higher order with constant co-efficient 4.2 R.H.S is of the form e ^{αX} , sin α x, cos α x, x ⁿ , n > 0 4.3 Differential equations with variable coefficients: Cauchy's form of linear equations 4.4 Differential equations with variable coefficients: Legendre's form of linear equations 4.5 Method of variation of parameters 4.6 Tutorial 4.7 Hands-on 5. Integration 5.1 Definite and Indefinite integrals 5.2 Substitution rule 5.3 Techniques of Integration: Integration by parts 5.4 Integration of rational functions by partial fraction 5.5 Integration of irrational functions 5.6 Improper integrals 5.7 Hydrostatic force. 5.8 Pressure, moments and centres of mass. 5.9 Tutorial			1
3.6 Lagrange's Method of Undetermined Multipliers 3.7 Tutorial 3.8 Hands-on 4. Differential Equations 4.1 Linear differential equations of second and higher order with constant co-efficient 4.2 R.H.S is of the form e ^α X, sin α x, cos α x, x ⁿ , n > 0 4.3 Differential equations with variable coefficients: Cauchy's form of linear equations 4.4 Differential equations with variable coefficients: Legendre's form of linear equations 4.5 Method of variation of parameters 4.6 Tutorial 4.7 Hands-on 5. Integration 5.1 Definite and Indefinite integrals 5.2 Substitution rule 5.3 Techniques of Integration: Integration by parts 5.4 Integration of rational functions by partial fraction 5.5 Integration of irrational functions 5.6 Improper integrals 5.7 Hydrostatic force. 5.8 Pressure, moments and centres of mass. 5.9 Tutorial		•	2
3.7 Tutorial 3.8 Hands-on 4. Differential Equations 4.1 Linear differential equations of second and higher order with constant co-efficient 4.2 R.H.S is of the form e ^{αX} , sin α x, cos α x, x ⁿ , n > 0 4.3 Differential equations with variable coefficients: Cauchy's form of linear equations 4.4 Differential equations with variable coefficients: Legendre's form of linear equations 4.5 Method of variation of parameters 4.6 Tutorial 4.7 Hands-on 5. Integration 5.1 Definite and Indefinite integrals 5.2 Substitution rule 5.3 Techniques of Integration: Integration by parts 5.4 Integration of rational functions by partial fraction 5.5 Integration of irrational functions 5.6 Improper integrals 5.7 Hydrostatic force. 5.8 Pressure, moments and centres of mass. 5.9 Tutorial			2
3.8 Hands-on 4. Differential Equations 4.1 Linear differential equations of second and higher order with constant co-efficient 4.2 R.H.S is of the form e ^{αX} , sin α x, cos α x, x ⁿ , n > 0 4.3 Differential equations with variable coefficients: Cauchy's form of linear equations 4.4 Differential equations with variable coefficients: Legendre's form of linear equations 4.5 Method of variation of parameters 4.6 Tutorial 4.7 Hands-on 5.1 Integration 5.1 Definite and Indefinite integrals 5.2 Substitution rule 5.3 Techniques of Integration: Integration by parts 5.4 Integration of rational functions by partial fraction 5.5 Integration of irrational functions 5.6 Improper integrals 5.7 Hydrostatic force. 5.8 Pressure, moments and centres of mass. 5.9 Tutorial		· · · · · · · · · · · · · · · · · · ·	2
4. Differential Equations 4.1 Linear differential equations of second and higher order with constant co-efficient 4.2 R.H.S is of the form eαX, sin α x, cos α x, x ⁿ , n > 0 4.3 Differential equations with variable coefficients: Cauchy's form of linear equations 4.4 Differential equations with variable coefficients: Legendre's form of linear equations 4.5 Method of variation of parameters 2.6 Tutorial 4.7 Hands-on 5.1 Integration 5.1 Definite and Indefinite integrals 5.2 Substitution rule 5.3 Techniques of Integration: Integration by parts 5.4 Integration of rational functions by partial fraction 5.5 Integration of irrational functions 5.6 Improper integrals 5.7 Hydrostatic force. 5.8 Pressure, moments and centres of mass. 5.9 Tutorial			1
4.1 Linear differential equations of second and higher order with constant co-efficient 4.2 R.H.S is of the form e ^{αX} , sin α x, cos α x, x ⁿ , n > 0 4.3 Differential equations with variable coefficients: Cauchy's form of linear equations 4.4 Differential equations with variable coefficients: Legendre's form of linear equations 4.5 Method of variation of parameters 4.6 Tutorial 4.7 Hands-on 5. Integration 5.1 Definite and Indefinite integrals 5.2 Substitution rule 5.3 Techniques of Integration: Integration by parts 5.4 Integration of rational functions by partial fraction 5.5 Integration of irrational functions 5.6 Improper integrals 5.7 Hydrostatic force. 5.8 Pressure, moments and centres of mass. 5.9 Tutorial			
 R.H.S is of the form e^{αX}, sin α x, cos α x, xⁿ, n > 0 Differential equations with variable coefficients: Cauchy's form of linear equations Differential equations with variable coefficients: Legendre's form of linear equations Method of variation of parameters Tutorial Hands-on Integration Definite and Indefinite integrals Substitution rule Techniques of Integration: Integration by parts Integration of irrational functions by partial fraction Integration of irrational functions Hydrostatic force. Pressure, moments and centres of mass. Tutorial 		•	1
4.3Differential equations with variable coefficients: Cauchy's form of linear equations4.4Differential equations with variable coefficients: Legendre's form of linear equations4.5Method of variation of parameters4.6Tutorial4.7Hands-on5.Integration5.1Definite and Indefinite integrals5.2Substitution rule5.3Techniques of Integration: Integration by parts5.4Integration of rational functions by partial fraction5.5Integration of irrational functions5.6Improper integrals5.7Hydrostatic force.5.8Pressure, moments and centres of mass.5.9Tutorial		R.H.S is of the form $e^{\alpha X}$, $\sin \alpha x$, $\cos \alpha x$, x^n , $n > 0$	2
4.4 Differential equations with variable coefficients: Legendre's form of linear equations 4.5 Method of variation of parameters 4.6 Tutorial 4.7 Hands-on 5. Integration 5.1 Definite and Indefinite integrals 5.2 Substitution rule 5.3 Techniques of Integration: Integration by parts 5.4 Integration of rational functions by partial fraction 5.5 Integration of irrational functions 5.6 Improper integrals 5.7 Hydrostatic force. 5.8 Pressure, moments and centres of mass. 5.9 Tutorial			2
4.5 Method of variation of parameters 4.6 Tutorial 4.7 Hands-on 5. Integration 5.1 Definite and Indefinite integrals 5.2 Substitution rule 5.3 Techniques of Integration: Integration by parts 5.4 Integration of rational functions by partial fraction 5.5 Integration of irrational functions 5.6 Improper integrals 5.7 Hydrostatic force. 5.8 Pressure, moments and centres of mass. 5.9 Tutorial		• • • • • • • • • • • • • • • • • • • •	2
4.6 Tutorial 4.7 Hands-on 5. Integration 5.1 Definite and Indefinite integrals 5.2 Substitution rule 5.3 Techniques of Integration: Integration by parts 5.4 Integration of rational functions by partial fraction 5.5 Integration of irrational functions 5.6 Improper integrals 5.7 Hydrostatic force. 5.8 Pressure, moments and centres of mass. 5.9 Tutorial			2
4.7Hands-on15.Integration25.1Definite and Indefinite integrals25.2Substitution rule15.3Techniques of Integration: Integration by parts15.4Integration of rational functions by partial fraction15.5Integration of irrational functions15.6Improper integrals15.7Hydrostatic force.15.8Pressure, moments and centres of mass.15.9Tutorial2			2
5. Integration 5.1 Definite and Indefinite integrals 2 5.2 Substitution rule 1 5.3 Techniques of Integration: Integration by parts 1 5.4 Integration of rational functions by partial fraction 1 5.5 Integration of irrational functions 1 5.6 Improper integrals 1 5.7 Hydrostatic force. 1 5.8 Pressure, moments and centres of mass. 1 5.9 Tutorial 2			1
5.1 Definite and Indefinite integrals 5.2 Substitution rule 5.3 Techniques of Integration: Integration by parts 5.4 Integration of rational functions by partial fraction 5.5 Integration of irrational functions 5.6 Improper integrals 5.7 Hydrostatic force. 5.8 Pressure, moments and centres of mass. 5.9 Tutorial			<u> </u>
5.2 Substitution rule 5.3 Techniques of Integration: Integration by parts 5.4 Integration of rational functions by partial fraction 5.5 Integration of irrational functions 5.6 Improper integrals 5.7 Hydrostatic force. 5.8 Pressure, moments and centres of mass. 5.9 Tutorial		-	2
5.3 Techniques of Integration: Integration by parts 5.4 Integration of rational functions by partial fraction 5.5 Integration of irrational functions 5.6 Improper integrals 5.7 Hydrostatic force. 5.8 Pressure, moments and centres of mass. 5.9 Tutorial		-	1
5.4Integration of rational functions by partial fraction15.5Integration of irrational functions15.6Improper integrals15.7Hydrostatic force.15.8Pressure, moments and centres of mass.15.9Tutorial2			1
5.5Integration of irrational functions15.6Improper integrals15.7Hydrostatic force.15.8Pressure, moments and centres of mass.15.9Tutorial2			1
5.6 Improper integrals 5.7 Hydrostatic force. 5.8 Pressure, moments and centres of mass. 5.9 Tutorial 5.6 Improper integrals 1 1 2			1
5.7 Hydrostatic force. 5.8 Pressure, moments and centres of mass. 5.9 Tutorial		•	1
5.8 Pressure, moments and centres of mass. 5.9 Tutorial 2			1
5.9 Tutorial 2		·	1
			2
O110			1
	5.10		60

Course Designers

- 1. Dr.C.Chandran cchandran@ksrct.ac.in
- 2. Mr.G.Mohan mohang@ksrct.ac.in



	Physics for Food Tochnology	Category	L	Т	Р	Credit
60 PH 006	Physics for Food Technology	BS	3	0	0	3

Objectives

- To analyze the crystal parameters to investigate crystal structures and to classify the type of the defect present in the crystal
- To enable the students in understanding the importance of quantum physics and its applications.
- To introduce the basics of laser, types and its applications in food processing.
- To study the basic concept of ultrasonic waves, production of ultrasonic waves and its applications
- To obtain fundamental concepts and current knowledge of nanotechnology for engineering applications

Pre-requisites

Nil

Course Outcomes

On the successful completion of the course, students will be able to

CO1	Recognize the basics of crystallography, crystal imperfections and nucleation	Remember
CO2	Acquire the fundamentals of quantum mechanics and apply to one dimensional motion of particles.	Apply
CO3	Realize a strong foundational knowledge in lasers and its applications	Understand
CO4	Comprehend the principle, production, properties and applications of ultrasonic waves	Understand
CO5	Infer the preparation and properties of nano materials for potential applications	Understand

Mappii	Mapping with Programme Outcomes														
		POs										PSOs			
COs	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1	3		-	-	-	-	-	-	-	-	-	-	-	-	-
CO2	3		-	-	-	-	-	-	-	-	-	-	-	-	-
CO3	3		-	-	-	-	-	-	-	-	-	-	-	-	3
CO4	3		-	-	-	-	-	-	-	2	-	-	-	-	3
CO5	3		-	-	-	-	-	-	-	2	-	-	-	-	3
3 - Str	ong;	2 - Me	dium;	1 - Sor	ne										

Assessment Pattern

Bloom's Category	Continuous A Tests(M		Model Examination	End Sem Examination
Dioom o Gatogory	1	2	(Marks)	(Marks)
Remember	10	20	20	20
Understand	40	70	70	70
Apply	10	10	10	10
Analyze	-	-	-	-
Evaluate	-	-	-	-
Create	-	-	-	-
Total	60	100	100	100



		K.S.Rangasan						
	ı		H 006 - Ph	•	od Technolog	,,		
Semeste	er - 	Hours/Week		Total	Credit		ximum Marks	
	L	Т	Р	Hours	С	CA	ES	Tota
l	3	0	0	45	3	40	60	100
attice - cubic lat rector a	tice - Packing	factor for HCF energy- surfa	P – Crystal ce imperfe	l imperfection ections – grain	s- edge and n and twin bo	screw disloc undaries – F	s - d spacing in ations, Burgers Polymorphism –	[9]
ntroduct Fime-dep a box (c	pendent and tim	e independen and three di	t Schroding mensional)	ger equation f	or wave funct	ion- Applicat	Matter waves - ions: Particle in ations- Electron	[9]
Theory o CO2), so *applica	echnology of laser - characte olid-state lasers ation of laser tec wn spectroscopy	(Nd: YAG), Se hnology in foo	miconducto d processir	or laser (Homo ng: Preservati	junction and I	Hetero junctio	on)-	[9]
		,	od analysis					
ntroduct piezoele Applicati	nics and Application-Properties-fectric effect, pictons: Cavitation sion, resonance	etions Production: Mezoelectric ge	agnetostric nerator – DNAR– No	etion effect, Ultrasonic ondestructive	detection- ac testing: Pulse	echo syste	ting- em, through	[9]
Introductoriezoele Applicati Applicati transmis Nanotec Nanoma Techniquelectric	nics and Application-Properties-Fectric effect, pie ons: Cavitation sion, resonance chnology terials: Propertie	es- Top-down plications **N	agnetostricenerator – DNAR– Nocations- **Coccess: Barrethod-	ction effect, Ultrasonic ondestructive Quality assess all Milling met Carbon Nano	detection- ac testing: Pulse sment using ul thod – Bottom o Tube (CNT) industry and	oustical gra e echo syste trasonics in f -up process: : Properties I packaging -	ting- em, through lood industry Sol- Gel , preparation by	
Introduct piezoele Applicati transmis Nanotec Nanoma Techniqu electric packagir	nics and Application-Properties-Fectric effect, pie ons: Cavitation sion, resonance chnology terials: Propertieue, Vapour Phaarc method, Apng, Nano structu	es- Top-down plications **N	agnetostricenerator – DNAR– Nocations- **Coccess: Barrethod-	ction effect, Ultrasonic ondestructive Quality assess all Milling met Carbon Nano	detection- ac testing: Pulse sment using ul thod – Bottom o Tube (CNT) industry and	oustical gra e echo syste trasonics in f -up process: : Properties I packaging -	ting- em, through lood industry Sol- Gel , preparation by	
Introduct piezoele Applicati transmis Nanotec Nanoma Techniquelectric	nics and Application-Properties-Fectric effect, pie ons: Cavitation sion, resonance chnology terials: Propertieue, Vapour Phaarc method, Apng, Nano structu	es- Top-down plications **N	agnetostricenerator – DNAR– Nocations- **Coccess: Barrethod-	ction effect, Ultrasonic ondestructive Quality assess all Milling met Carbon Nano	detection- ac testing: Pulse sment using ul thod – Bottom o Tube (CNT) industry and	oustical gra e echo syste trasonics in f -up process: : Properties I packaging -	ting- em, through food industry Sol- Gel , preparation by Smart lications.	[9]
Introductoriezoele Applicati transmis Nanotec Nanoma Techniquelectric apackagir Text Boo	nics and Application-Properties-Fectric effect, pie ons: Cavitation sion, resonance chnology terials: Propertieue, Vapour Phaarc method, Apng, Nano structuok(s):	es- Top-down plications - **Nored coating, ad	agnetostric nerator – DNAR– No cations- **C process: Ba method- lanotechno dvantages	etion effect, Ultrasonic on Indestructive Quality assess all Milling met Carbon Nand Dlogy in food of nanomater	detection- ac testing: Pulse sment using ul hod – Bottom Tube (CNT) industry and ials in food pa	oustical gra e echo syste trasonics in f -up process: : Properties I packaging - ckaging app	ting- em, through food industry Sol- Gel , preparation by Smart lications.	[9] 45
ntroductoriezoele Applicati Transmis Nanotec Nanoma Techniquelectric a packagir	nics and Application-Properties-Fectric effect, pie ons: Cavitation sion, resonance chnology terials: Propertieue, Vapour Phaarc method, Apng, Nano structuok(s): I. N. Avadhanulu ublications, New	es- Top-down plications **N red coating, ac	agnetostric nerator – DNAR– No cations- **Concess: Ba process: Ba method- lanotechno dvantages of	etion effect, Ultrasonic orndestructive Quality assess all Milling met Carbon Nancology in food of nanomater	detection- ac testing: Pulse sment using ul shod – Bottom o Tube (CNT) industry and ials in food pa	oustical gra e echo syste trasonics in f -up process: : Properties I packaging - ckaging app	sting- em, through dood industry Sol- Gel , preparation by Smart lications. Total Hours:	[9] 45
Introduct piezoele Applicati transmis Nanotec Nanoma Techniquelectric apackagir Text Boo 1. M P 2. H	nics and Application-Properties-Fectric effect, pie ons: Cavitation sion, resonance chnology terials: Propertieue, Vapour Phaarc method, Apng, Nano structuok(s): I. N. Avadhanulu ublications, New	es- Top-down plications **Nored coating, additions **Nored coating, additional **Nored coating	agnetostricenerator – DNAR– No cations- **Concess: Barnethod- Nanotechnodovantages of gar, TVS A	etion effect, Ultrasonic of andestructive Quality assess all Milling met Carbon Nancology in food of nanomater arun Murthy "Assics" McGraw	detection- actesting: Pulsesment using uland by the detection of the detec	oustical gra e echo syste trasonics in f -up process: : Properties packaging - ckaging appi Engineering	sting- em, through cood industry Sol- Gel , preparation by Smart lications. Total Hours: Physics", S Chai	[9] 45
ntroductoriezoele Application Transmis Nanotec Nanoma Techniquelectric apackagir 1. MP 2. H 3. D	nics and Application-Properties-Fictric effect, pictric effect, pictons: Cavitation sion, resonance chnology terials: Propertieue, Vapour Phaarc method, Apng, Nano structurok(s): I. N. Avadhanulu ublications, New . K. Malik, A. K.	es- Top-down plications **Nored coating, additions **Nored coating, additional **Nored coating	agnetostricenerator – DNAR– No cations- **Concess: Barnethod- Nanotechnodovantages of gar, TVS A	etion effect, Ultrasonic of andestructive Quality assess all Milling met Carbon Nancology in food of nanomater arun Murthy "Assics" McGraw	detection- actesting: Pulsesment using uland by the detection of the detec	oustical gra e echo syste trasonics in f -up process: : Properties packaging - ckaging appi Engineering	sting- em, through cood industry Sol- Gel , preparation by Smart lications. Total Hours: Physics", S Chai	[9] 45
ntroductoriezoele: Application ransmis Nanotec Nanoma Fechniquelectric apackagir 1. M P 2. H 3. D Reference	ce(s):	estions Production: Mezoelectric gecleaning, SC system-applications- **Nored coating, actions and polications are dependent of the coating	agnetostricenerator – DNAR– Nocations- **Corocess: Barnethod- Nanotechnodyantages gar, TVS Areering Phys	ction effect, Ultrasonic of andestructive Quality assess all Milling met Carbon Nancology in food of nanomater arun Murthy "Assics" McGraw Hill Education	detection- actesting: Pulsesment using uland by the detection of the detec	e echo systetrasonics in f -up process: : Properties I packaging -ckaging appi Engineering Private Lim d, New Delhi	sting- em, through cood industry Sol- Gel , preparation by Smart lications. Total Hours: Physics", S Chai	[9]
ntroductoriezoelec Application anomal Technique electric coackagir Text Boot 1. Manage Hall Hall Hall Hall Hall Hall Hall Hal	ce(s):	ations Production: Mezoelectric gecleaning, SC system-applications- **Nored coating, actions- **	agnetostrice inerator — DNAR— No cations- **Corocess: Barrendo in method-lanotechnod in anotechnod in a part of the corocess: Barrendo in method in method in anotechnod in a part of the corocess: Barrendo in method i	ction effect, Ultrasonic of Indestructive Quality assess all Milling met Carbon Nanc Dlogy in food of nanomater arun Murthy "A sics" McGraw Hill Education	detection- actesting: Pulsesment using uland bettom Detection of Tube (CNT) industry and ials in food particular action of Tube Limite e International testing: Private Limite e International testing: Pulse e International testing	oustical gra e echo syste trasonics in f -up process: : Properties l packaging - ckaging app Engineering Private Lim d, New Delhi I (P) Limited,	sting- em, through cood industry Sol- Gel , preparation by Smart lications. Total Hours: Physics", S Char ited, New Delhi 2010 New Delhi, 2014	[9]



^{*} SDG:4- Quality Education ** SDG:2 - Achieve food security

irse Co	ntents and Lecture Schedule	T
S. No.	Topic	No. o
1.0	CRYSTALLOGRAPHY	
1.1	Lattice - Unit cell – crystal systems and Bravais lattice	2
1.2	Crystal planes and Miller indices	1
1.3	d spacing in cubic lattice	1
1.4	Packing factor for HCP	1
1.5	Crystal imperfections- edge and screw dislocations, Burgers vector and elastic strain energy	2
1.6	surface imperfections – grain and twin boundaries – Polymorphism	1
1.7	phase changes – nucleation and growth – homogeneous and heterogeneous nucleation.	1
2.0	QUANTUM MECHANICS	
2.1	Introduction to Quantum mechanics	1
2.2	Wave nature of Particles- de-Broglie hypothesis – Matter waves	2
2.3	Time-dependent and time independent Schrodinger equation for wave function	2
2.4	Applications: Particle in a box (one dimensional and three dimensional)	2
2.5	Uncertainty principle and its applications	1
2.6	Electron microscope: Scanning electron microscope.	1
3.0	LASER TECHNOLOGY	
3.1	Theory of laser - characteristics	1
3.2	Einstein's coefficients	1
3.3	Population inversion - Types of lasers: gas lasers (CO2)	1
3.4	Solid-state lasers (Nd: YAG)	1
3.5	Semiconductor laser (Homojunction and Hetero junction)	2
3.6	Application of laser technology in food processing: Preservation and Packaging	2
3.7	Laser-induced breakdown spectroscopy (LIBS) for food analysis	1
4.0	ULTRASONICS AND APPLICATIONS	
4.1	Introduction-Properties	1
4.2	Production: Magnetostriction effect, Magnetostriction generator	1
4.3	piezoelectric effect, piezoelectric generator	1
4.4	Ultrasonic detection- acoustical grating	1
4.5	Applications: Cavitation, cleaning, SONAR	2
4.6	Nondestructive testing: Pulse echo system, through transmission, resonance system	2
4.7	applications- Quality assessment using ultrasonics in food industry	1
5.0	NANOTECHNOLOGY	 '
5.1	Nanomaterials: Properties- Top-down process: Ball Milling method	2
5.2	Bottom-up process: Sol-Gel Technique	1
5.3	Vapour Phase Depositionmethod	2
5.4	Carbon Nano Tube (CNT): Properties, preparation by electric arc method	1
5.5	Applications- Nanotechnology in food industry and packaging	1
5.6	Smart packaging, Nano structured coating, advantages of nanomaterials in food packaging applications	2

Course Designers

- 1. Dr. V. Vasudevan vasudevanv@ksrct.ac.in
- 2. Mr. S. Vanchinathan vanchinathan@ksrct.ac.in
- $3. \ \, \text{Dr. P. Suthanthira Kumar-suthanthirakumar@ksrct.ac.in}$



60 CH 005	Chemistry for Life Sciences	Category	L	Т	Р	Credit
00 011 003	Chemistry for Life Sciences	BS	3	0	0	3

Objectives

- To help the learners to analyse the hardness of water and its removal
- To study the behaviour of solutions based on their properties
- To analyse the factors influencing reaction rates and catalysis
- To study the concepts of electrochemistry and its applications
- To explain the characteristics and application of chemical sensors

Pre-requisites

Nil

Total

Course Outcomes

On the successful completion of the course, students will be able to

60

CO1	Identify the types of hardness of water and its removal	Apply
CO2	Summarize the characteristics of solutions and their applications	Apply
CO3	Illustrate the kinetics of reaction rates and catalysis	Understand
CO4	Interpret the applications of electro chemistry	Apply
CO5	Categorize the types of sensors for various applications	Understand

Mappii	Mapping with Programme Outcomes														
COs		POs											PSOs		
COS	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1	3	2	-	-	-	-	-	-	-	-	-	-	-	2	
CO2	3	3	-	-	-	-	-	-	-	-	-	-	2	-	-
CO3	3	2	-	-	-	-	-	-	-	-	-	-	3	-	-
CO4	3	3	-	-	-	-	-	-	-	-	-	-	-	2	-
CO5	3	3	-	-	-	-	-	-	-	-	-	-	3	-	1
3 - Str	ong; 2	- Mediu	m; 1	- Some											

Assessment Pattern				
Bloom's Category	Continuous Asses (Mar		Model Examination	End Sem Examination
	1	2	(Marks)	(Marks)
Remember	20	20	20	20
Understand	30	30	60	60
Apply	10	10	20	20
Analyze	-	-	-	-
Evaluate	-	-	-	-
Create	-	=	-	-

60

100

100

Syllabus	K	(.S.Rangasa	my College	of Technolo	gy – Autono	mous R202	2	
	-	guou		I. Food Tech			_	
		60			Life Science	S		
Semester	ŀ	Hours/Week		Total	Credit		aximum Marks	3
	L	Т	Р	Hours	С	CA	ES	Total
1/11	3	0	0	45	3	40	60	100
Water Tech	nology*							
by EDTA M Methods) -	 Commercia ethod Interna External Co everse Osmo poration. 	al Conditionin onditioning (ng (Colloidal, Zeolite Prod	Phosphate,	Calgon and	Carbonate	Conditioning	[9]
Buffer So Permeabiliti Osmotic Pr Gas Laws. on Osmotic Number, F Movements	Molarity, Mol lutions - Ty ly - Principle essure, Isotor The General Pressure - E Preparation a s and Tyndall	ypes - App of Diffusion nic, Hypotoni Equation for Biological Imp nd Propertie Effect - Emu	olications - A & Osmosis C & Hypertor Dilute Soluti Portance of Ces of Colloice	Henderson- s - Donon M nic Solutions. ons, The Infl Osmosis - Co ds - Lyophili	Hasselbach Membrane Ed. Relationship uence of Ioni olloids - Defir ic and Lyopl	Equation. quilibrium. [of Osmotic zation & Mo ition and Ty	Membrane Definition of Pressure to lecular Size ypes, Gold	[9]
Rate of Re Period of Fi - Factors Ir	inetics and Caction, Order rst Order Realfluencing Ra	r and Molecu action - Deter	mination of F	Rate Constan	nt of Hydrolys	is of Ester		[9]
Significance Heterogene Intra Molecu	Catalyst - Au e. Catalytic ous Catalysis ular Reaction	ito Catalyst Promoters - s - Reactivity	EnzymeCatalyticCoenzymes	Catalyst - I Poisons s - Proton Tra	Michaelis-Me Active Cente ansfer - Meta	enten Equa er, Homoge Llons -	tion and its eneous and	
Significance Heterogene Intra Molect Catalysts. Electroche Electroche Irreversible Conductom	e. Catalytic ous Catalysis ular Reaction mistry ** Potential - Ner Cells - Types netric and Pot	rnst Equation of Electrode	- Enzyme - Catalytic - Coenzyme: Catalysis - I - Derivation s and its App	Catalyst - I Poisons s - Proton Tra Inclusion Con and Problem	Michaelis—Me Active Cento ansfer - Meta mplexation -	enten Equa er, Homogo I Ions - Industrial A	tion and its eneous and pplication of	[9]
Significance Heterogene Intra Molect Catalysts. Electroche Electrode F Irreversible Conductom Chemical S Sensors - G Sensors - A Biosensors Sensors as	e. Catalytic ous Catalytic ous Catalysis ular Reaction mistry ** Potential - Ner Cells - Types netric and Pot ensors*** Chemical Ser imperometric - Optical Bios Detectors a	rost Equation of Electrode entiometric Tensors - Char Sensors - Sensors: Enzind Indicators	- Enzyme - Catalytic - Coenzymes Catalysis - I - Derivation s and its App Titrations Catalysis - I - Derivation s and its App Titrations Catalysis - I	Catalyst - I Poisons - s - Proton Tra Inclusion Col and Problem lications - Re Elements a ed on Electro s - Bio Affinity	Michaelis—Me Active Centre Active Centre ansfer - Meta mplexation - as - Reversible eference Elector and Character ochemical Me y Sensors - D	enten Equa er, Homogo I Ions - Industrial A e and trodes - pH rization - Po thods - Ele NA Sensors	tion and its eneous and pplication of , , otentiometric ctrochemical s. Chemical	[9]
Significance Heterogene Intra Moleci Catalysts. Electroche Electrode F Irreversible Conductom Chemical S Sensors - A Biosensors Sensors as Nano Techr	e. Catalytic ous Catalytic ous Catalysis ular Reaction: mistry ** Potential - Ner Cells - Types netric and Pot ensors*** Chemical Ser umperometric - Optical Bios Detectors a nology in Che	rost Equation of Electrode entiometric Tensors - Char Sensors - Sensors: Enzind Indicators	- Enzyme - Catalytic - Coenzymes Catalysis - I - Derivation s and its App Titrations Catalysis - I - Derivation s and its App Titrations Catalysis - I	Catalyst - I Poisons - s - Proton Tra Inclusion Col and Problem lications - Re Elements a ed on Electro s - Bio Affinity	Michaelis—Me Active Centre Active Centre ansfer - Meta mplexation - as - Reversible eference Elector and Character ochemical Me y Sensors - D	enten Equa er, Homogo I Ions - Industrial A e and trodes - pH rization - Po thods - Ele NA Sensors - Separatio	tion and its eneous and pplication of , , otentiometric ctrochemical s. Chemical	
Significance Heterogene Intra Moleci Catalysts. Electroche Electrode F Irreversible Conductom Chemical S Sensors - A Biosensors Sensors as Nano Techn	e. Catalytic ous Catalytic ous Catalysis ular Reaction: mistry ** Potential - Ner Cells - Types netric and Pot ensors*** Chemical Ser umperometric - Optical Bios Detectors a nology in Che	rost Equation s of Electrode entiometric T sensors - Char Sensors - S sensors: Enz nd Indicators mical Sensor	- Enzyme - Catalytic - Coenzyme: Catalysis - I - Derivation s and its App citrations Catalysis - I - Derivation s and its App citrations Catalysis - I - Derivation s and its App citrations Catalysis - I - Derivation s and its App citrations Catalysis - I - Derivation s and its App citrations.	Catalyst - I Poisons s - Proton Trainclusion Cor and Problem lications - Re Elements a ed on Electro s - Bio Affinity for Titration	Michaelis—Me Active Central Active C	enten Equa er, Homogo I Ions - Industrial A e and trodes - pH rization - Po thods - Ele NA Sensors - Separatio	tion and its eneous and pplication of , , otentiometric ctrochemical s. Chemical n Methods -	[9]
Significance Heterogene Intra Moleci Catalysts. Electroche Electrode F Irreversible Conductom Chemical S Sensors - A Biosensors Sensors as Nano Techr Text Book(1. O.G.	e. Catalytic ous Catalytic ous Catalysis ular Reaction: mistry ** Potential - Ner Cells - Types netric and Pot ensors*** Chemical Ser amperometric - Optical Bios Detectors a nology in Che s): Palanna, "En	rost Equation s of Electrode entiometric T sensors - Char Sensors - Sensors: Enz nd Indicators mical Sensor	- Enzyme - Catalytic - Coenzyme: Catalysis - I - Derivation s and its App citrations Ensors Base yme Sensors s: Indicators s:	Catalyst - I Poisons s - Proton Trainclusion Col and Problem lications - Re Elements a ed on Electro s - Bio Affinity for Titration	Michaelis—Me Active Centre Active Centre ansfer - Meta mplexation - as - Reversible eference Elect and Characte bechemical Me by Sensors - D Processes	enten Equa er, Homoge I Ions - Industrial A e and trodes - pH rization - Pe thods - Ele NA Sensors - Separatio	tion and its eneous and pplication of pplication of tentiometric ctrochemical s. Chemical n Methods - Total Hours:	[9] 45
Significance Heterogene Intra Moleci Catalysts. Electroche Electrode F Irreversible Conductom Chemical S Sensors - G Sensors - A Biosensors Sensors as Nano Techr Text Book(1. O.G. 2. P.C. 16 th	e. Catalytic ous	rnst Equation s of Electrode entiometric T sensors - Char Sensors - Char Sensors - Enz ind Indicators mical Sensor	- Enzyme - Catalytic - Coenzyme: Catalysis - I - Derivation s and its App citrations Ensors Base yme Sensors s: Indicators s:	Catalyst - I Poisons s - Proton Trainclusion Col and Problem lications - Re Elements a ed on Electro s - Bio Affinity for Titration	Michaelis—Me Active Centre Active Centre ansfer - Meta mplexation - as - Reversible eference Elect and Characte bechemical Me by Sensors - D Processes	enten Equa er, Homoge I Ions - Industrial A e and trodes - pH rization - Pe thods - Ele NA Sensors - Separatio	tion and its eneous and pplication of , , otentiometric ctrochemical s. Chemical n Methods -	[9] 45
Significance Heterogene Intra Moleci Catalysts. Electroche Electroche Irreversible Conductom Chemical S Sensors - G Sensors - G Biosensors Sensors as Nano Techn Text Book(1. O.G. 2. P.C. 16th Reference(s	e. Catalytic ous	rost Equation s of Electrode entiometric T sensors - Char Sensors - Char Sensors - Sensors: Enz mical Sensor gineering Char cica Jain, A Te	- Enzyme - Catalytic - Coenzyme: Catalysis - I - Derivation s and its App itrations Catalysis - I - Derivation s and its App itrations Catalysis - I - Derivation s and its App itrations Catalysis - I - Catalysis -	Catalyst - I Poisons s - Proton Trainclusion Con and Problem lications - Re Elements a ed on Electro s - Bio Affinity for Titration a McGraw-Hi ngineering Ci	Michaelis—Me Active Cente Active Cente ansfer - Meta mplexation - as - Reversible eference Elec and Characte ochemical Me y Sensors - D Processes Il Pub.Co.Ltd hemistry, Dha	enten Equa er, Homogo I Ions - Industrial A e and trodes - pH rization - Po thods - Ele NA Sensors - Separatio New Delhi, anpat Rai pu	tion and its eneous and pplication of pplication of tentiometric ctrochemical s. Chemical n Methods - Total Hours:	[9] 45
Significance Heterogene Intra Molect Catalysts. Electroche Electroche Irreversible Conductom Chemical S Sensors - G Sensors - A Biosensors Sensors as Nano Techn Text Book(1. O.G. 2. P.C. 16 th Reference(1. Pete 2. B. R.	e. Catalytic ous Catalytic ous Catalytic ous Catalysis ular Reaction: emistry ** Potential - Ner Cells - Types netric and Pot ensors*** Chemical Ser emperometric - Optical Bios Detectors a nology in Che s): Palanna, "En Jain and Mon edition, 2015 s): Grundler, "C Puri, L.R. Sh	to Catalyst Promoters	- Enzyme - Catalytic - Coenzyme: Catalysis - I - Derivation s and its App citrations Catalysis - I - Derivation s and its App citrations Catalysis - I - Derivation s and its App citrations Catalysis - I - Catalysi	Catalyst - I Poisons - s - Proton Tra Inclusion Con and Problem lications - Re Elements a ed on Electro s - Bio Affinity for Titration a McGraw-Hi ngineering Cl er Berlin Heic Principles of	Michaelis—Me Active Cente Active Cente ansfer - Meta mplexation - as - Reversible eference Elec and Characte ochemical Me y Sensors - D Processes Il Pub.Co.Ltd hemistry, Dha	enten Equa er, Homoge I Ions - Industrial A e and trodes - pH rization - Pethods - Ele NA Sensors - Separatio New Delhi, anpat Rai pu	tion and its eneous and pplication of pplication of tentiometric ctrochemical s. Chemical n Methods - Total Hours:	[9] 45 w Delhi,
Significance Heterogene Intra Moleci Catalysts. Electroche Electrode F Irreversible Conductom Chemical S Sensors - G Sensors - A Biosensors Sensors as Nano Techr Text Book(1. O.G. 2. P.C. 16 th Reference(1. Pete 2. B. R. Gum	e. Catalytic ous	to Catalyst Promoters	- Enzyme - Catalytic - Coenzyme: Catalysis - I - Derivation s and its App citrations Catalysis - I - Derivation s and its App citrations Catalysis - I - Derivation s and its App citrations Catalysis - I - Catalysi	Catalyst - I Poisons - s - Proton Tra Inclusion Con and Problem lications - Re Elements a ed on Electro s - Bio Affinity for Titration a McGraw-Hi ngineering Cl er Berlin Heic Principles of nar	Michaelis—Me Active Cente Active Cente ansfer - Meta mplexation - as - Reversible eference Elec and Characte ochemical Me y Sensors - D Processes Il Pub.Co.Ltd hemistry, Dha delberg New N Physical Che	enten Equa er, Homoge I Ions - Industrial A e and trodes - pH rization - Pethods - Ele NA Sensors - Separatio New Delhi, anpat Rai pu	tion and its eneous and pplication of pplication of otentiometric ctrochemical s. Chemical n Methods - Total Hours: 2017 Jublications, New and Publishing Contention of the properties of the	[9] 45 w Delhi,
Significance Heterogene Intra Molect Catalysts. Electroche Electrode F Irreversible Conductom Chemical S Sensors - G Sensors - A Biosensors Sensors as Nano Techr Text Book(1. O.G. 2. P.C. 16 th Reference(1. Pete 2. B. R. Gum 3. Upac Hima	e. Catalytic ous Catalytic ous Catalytic ous Catalysis ular Reaction: emistry ** Potential - Ner Cells - Types netric and Pot ensors*** Chemical Ser emperometric - Optical Bios Detectors a nology in Che s): Palanna, "En Jain and Mon edition, 2015 s): Grundler, "C Puri, L.R. Sh	arma, and S. Did Railway R. Rang House, Bo	- Enzyme - Catalytic - Coenzymes - Catalysis - I - Derivation s and its App - Titrations Catalysis - I - Derivation s and its App - Titrations Catalysis - I - Derivation s and its App - Catalysis - I	Catalyst - I Poisons - s - Proton Tra Inclusion Con and Problem lications - Re Elements a ed on Electro s - Bio Affinity for Titration a McGraw-Hi ngineering Cl er Berlin Heic Principles of nar Biophysical co	Michaelis—Me Active Cente Active Cente ansfer - Meta mplexation - as - Reversible eference Elec and Characte ochemical Me y Sensors - D Processes Il Pub.Co.Ltd hemistry, Dha delberg New \ Physical Che chemistry: Pri	enten Equa er, Homoge I Ions - Industrial A e and trodes - pH rization - Pethods - Ele NA Sensors - Separatio New Delhi, anpat Rai pu	tion and its eneous and pplication of pplication of tentiometric ctrochemical s. Chemical n Methods - Total Hours: 2017 Jublications, New and Publishing Company of the pub	[9] 45 w Delhi,

^{*}SDG 6 – Improve Clean Water and Sanitation



^{*} SDG 11 - Sustainable Cities and Communities

^{**} SDG 3 - Good Health and Well-being

^{***}SDG 9– Industry Innovation and Infrastructure

^{***}SDG 8 – Decent Work and Economic Growth

S. No.	Topics	No. of hours
1.0	Water Technology	
1.1	Introduction – Commercial and Industrial uses of Water	1
1.2	Hardness – Types	1
1.3	Estimation of Hardness of Water by EDTA Method	1
1.4	Internal Conditioning (Colloidal, Phosphate, Calgon and Carbonate)	1
1.5	External Conditioning (Zeolite Process)	1
1.6	Demineralization Process	1
1.7	Desalination Methods (Reverse Osmosis)	1
1.8	Electro dialysis	1
1.9	Flash Evaporation	1
2.0	Solutions	
2.1	Normality, Molarity, Molality, Percentage Solution, Mole Fractions (Simple Numerical Problems).	1
2.2	Buffer Solutions – Types - Applications-	1
2.3	Henderson-Hasselbach Equation	1
2.4	Membrane Permeability - Principle of Diffusion & Osmosis - Donon Membrane Equilibrium	1
2.5	Definition of Osmotic Pressure, Isotonic, Hypotonic & Hypertonic Solutions.	1
2.6	Relationship of Osmotic Pressure to Gas Laws.	1
2.7	The General Equation for Dilute Solutions, The Influence of Ionization & Molecular Size on Osmotic Pressure.	1
2.8	Colloids - Definition and Types, Gold Number, Preparation and Properties of Colloids – Lyophilic and Lyophobic Sols.	1
2.9	Brownian Movements and Tyndall Effect - Emulsion & Emulsifying Agents.	1
3.0	Chemical Kinetics and Catalysis	
3.1	Rate of Reaction, Order and Molecularity	1
3.2	Derivation of First Order Rate Equation – Half-Life Period of First Order Reaction	1
3.3	Determination of Rate Constant of Hydrolysis of Ester	1
3.4	Factors Influencing Rate of Reaction. Activation Energy -Arrhenius Equation- Transition State Theory	1
3.5	Catalyst– Auto Catalyst- Enzyme Catalyst – Michaelis–Menten Equation and its Significance	1
3.6	Catalytic Promoters – Catalytic Poisons	1
3.7	Active Center, Homogeneous and Heterogeneous Catalysis	1
3.8	Reactivity – Coenzymes – Proton Transfer – Metal Ions – Intra Molecular Reactions	1
3.9	Covalent Catalysis – Inclusion Complexation - Industrial Application of Catalysts	1
4.0	Electrochemistry	
4.1	Electrode Potential - Nernst Equation - Derivation and Problems	2
4.2	Reversible and Irreversible Cells	1
4.3	Types of Electrodes and its Applications	1
4.4	Reference Electrodes - pH	1
4.5	Conductometric and Potentiometric Titrations	1
4.6	Principles of Electro Plating and Electro Less Plating	2
4.7	Fabrication Process of Printed Circuit Board	1
5.0	Chemical Sensors	
5.1	Sensors – Chemical Sensors - Characteristics	1
5.2	Elements and Characterization	1



5.3	Potentiometric Sensors, Amperometric Sensors	1
5.4	Sensors Based on Electrochemical Methods	1
5.5	Electrochemical Biosensors	1
5.6	Optical Biosensors: Enzyme Sensors – Bio affinity Sensors	1
5.7	DNA Sensors. Chemical Sensors as Detectors and Indicators	1
5.8	Indicators for Titration Processes	1
5.9	Separation Methods. Nano technology in chemical sensors	1

Course Designer(s)

Dr.T.A.Sukantha - sukantha@ksrct.ac.in
 Dr.B.Srividhya - srividhya@ksrct.ac.in
 Dr.S.Meenachi - meenachi@ksrct.ac.in
 Ms.D.Kirthiga - kiruthiga@ksrct.ac.in

60 ME 002	Engineering Graphics	Category	L	Т	Р	Credit
OU WIL OUZ	Linginieering Grapinics	ES	2	0	4	4

Objectives

- To acquire various concepts of dimensioning, conventions and standards.
- To impart the graphic skills for converting pictorial views of solids in to orthographic views.
- To learn the concept in projection of solids.
- To draws the section of solids and to know development of different types of surfaces.
- To learn the concept in isometric projection.

Pre-requisites

NIL

Course Outcomes

On the successful completion of the course, students will be able to

On the	On the successful completion of the course, students will be able to								
CO1	Demonstrate the Impact of computer technologies on graphical Communication	Apply							
CO2	Convert the pictorial views in to orthographic views using drafting software	Apply							
CO3	Draw the projection of simple solids, true shape of sections and development of surfaces	Apply							
CO4	Construct the isometric projections of objects using drafting software.	Apply							
CO5	Interpret a design project illustrating engineering graphical skills	Apply							

Mapping with Programme Outcomes															
COs	POs											PSOs			
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1	3	2	3	-	-	1	-	-	-	-	-	-	3	3	-
CO2	3	3	3	-	-	-	-	-	-	-	-	-	3	3	-
CO3	3	3	3	-	3	-	-	3	-	-	-	-	3	3	-
CO4	3	3	3	-	3	-	-	3	-	-	-	-	3	3	-
CO5	3	3	3	-	-	-	-	-	-	-	-	-	2	2	-
3- Strong; 2-Medium; 1-Some															

Assessment Pattern								
Bloom's Category	Continuous Asse (Ma		Model Examination	End Sem Examination				
	1	2	(Marks)	(Marks)				
Remember	10	10	20	20				
Understand	20	20	30	30				
Apply	30	30	50	50				
Analyze	-	-	-	-				
Evaluate	-	-	-	-				
Create	-	-	-	-				
Total	60	60	100	100				

Syllabus									
K.S.Rangasamy College of Technology – Autonomous R2022									
B.Tech. Food Technology 60 ME 002- Engineering Graphics									
Hours/Week Total Credit Maximum Mark									
Semester					C	CA	ES	Total	
1	2	0	4	90	4	40	60	100	
Introduction to Computer Aided Drafting (CAD) software Theory of CAD software – Menu System, Tool bars (Standard, Object Properties, Draw, Modify and Dimension) – Drawing Area (Background, Crosshairs, Coordinate System) – Dialog boxes and windows - Shortcut menus (Button Bars) – The Command Line and Status Bar – Different methods of zoom – Select and erase objects.							[3+12]		
Theory of projection	phic Projection projection – Ter – Conversion c	minology an of pictorial vi	ews into orth			nd third angl	e	[3+12]	
Projection of Solids and Sections of Solids Projections of simple solids: prism, pyramid, cylinder and cone (Axis parallel to one plane and perpendicular to other, axis inclined to one plane and parallel to other). Sections of simple solids: prism, pyramid, cylinder and cone in simple positions (cutting plane is inclined to one of the principal planes and perpendicular to the other) – True shape of sections. Principle of development-Methods of development: Parallel line development-Cube, Prism and Cylinder. Radial line development – Pyramid and cone						[3+12]			
Isometric Projection Principles of Isometric projection – Isometric scale, Isometric views, Conventions – Isometric views of lines, Planes, Simple and compound Solids – Conversion of Orthographic views in to Isometric view						[3+12]			
Application of Engineering Graphics Geometry and topology of engineered components: Creation of engineering models and their presentation in standard 2D blueprint form, 3D wire-frame and shaded solids – Geometric dimensioning and Tolerance – Use of solid modeling software for creating associative models – Floor plans: windows, doors, and fixtures such as water closet (WC), bath sink, shower, etc. – Applying colour coding according to building drawing practice – Drawing sectional elevation showing foundation to ceiling – Introduction to Building Information Modelling (BIM).						[3+12]			
						7	Total Hours	75	
Text Book(s):									
	att N.D., Engine	ering Drawir	ng, Charotar	Publishing H	ouse Pvt. Ltd	d., 53rd Editio	on, Gujarat, 2	019.	
2. Venugopal K., Engineering Graphicsll, New Age International (P) Limited, 2014.									
Reference	• •								
1. Shah M.B., Rana B.C., and V.K.Jadon., —Engineering Drawing, Pearson Education, 2011.									
2. Na	tarajan K.V., A ⁻	Text Book of	Engineering	Graphics, D	hanalakshm	i Publishers,	Chennai, 201	4.	
•									
4. Na	4. Narayana, K.L. & P Kannaiah, Text book on Engineering Drawing, Scitech Publishers, 2008.								

^{*}SDG 9 – Industry Innovation and Infrastructure

Course (Contents and Lecture Schedule	
S. No.	Topics	No. of hours
1.0	Introduction to Computer Aided Drafting (CAD) software	
1.1	Theory of CAD software	1
1.2	Menu System, Tool bars (Standard, Object Properties, Draw, Modify and Dimension)	2
1.3	Drawing Area (Background, Crosshairs, Coordinate System)	3
1.4	Dialog boxes and windows – Shortcut menus	3
1.5	The Command Line and Status Bar	1
1.6	Different methods of zoom – Select and erase objects.	2
2.0	Orthographic Projection	
2.1	Introduction to orthographic projections	2
2.2	Planes of projection,	2
2.3	Projection of points	1
2.4	Projection of lines inclined to both planes.	2
2.5	Projection of planes	2
2.6	Projection of planes Inclined to both planes	1
2.7	Conversions of pictorial views to orthographic views.	3
2.8	Practice class for pictorial views to orthographic views.	2
2.9	Practice class for pictorial views to orthographic views.	1
3.0	Projection of Solids	
3.1	Projections of simple solids: prism	2
3.2	Projections of simple solids: cylinder	3
3.3	Projections of simple solids: pyramid	2
3.4	Projections of simple solids: Cone	2
3.5	Practice class for Projection of Solids	2
3.6	Axis of solid inclined to both HP and VP	5
3,7	Section of solids for Prism,	2
3,8	Section of solids for Cylinder,	2
3,9	Section of solids for Pyramid,	2
3,10	Section of solids for Cone	2
3,11	Auxiliary Views - Draw the sectional orthographic views of geometrical solids.	3
3.12	Draw the sectional orthographic views of objects from industry.	3
3,13	Development of surfaces of Right solids Prism,	2
3.14	Development of surfaces of Right solids Pyramid	2
3.15	Development of surfaces of Right solids Cylinder and Cone	2
4.0	Isometric Projection and Introduction to AutoCAD	
4.1	Principles of isometric projection	1
4.2	Isometric scale	1
4.3	Isometric projections of simple solids: Prism,	1
4.4	Isometric projections of simple solids: Pyramid,	1
4.5	Isometric projections of simple solids: Cylinder	1
4.6	Isometric projections of simple solids: Cone	1
4.7	Isometric projections of frustum	1
4.8	Isometric projections of truncated solids	2
4.9	Combination of two solid objects in simple vertical positions.	1
5.0	Application of Engineering Graphics	_
5.1	Geometry and topology of engineered components:	2
5.2	Creation of engineering models and their presentation in standard 2D blue print form	3
5.3	3D wire-frame and shaded solids – Geometric dimensioning and Tolerance – Use of solid modeling software for creating associative models	3
5.4	Floor plans: windows, doors, and fixtures such as water closet (WC), bath sink, shower, etc.	1
5.5	Applying colour coding according to building drawing practice	1
5.6	Drawing sectional elevation showing foundation to ceiling	1
5.7	Introduction to Building Information Modelling (BIM).	1

Course Designer(s)

1. Dr.K.Mohan-mohank@ksrct.ac.in



60 CP 0P3	Applied Physics and Chemistry	Category	L	T	Р	Credit
60 CF 0F3	Laboratory	BS	0	0	4	2

- To infer the practical knowledge by applying the experimental methods to correlate with the Physics theory.
- To demonstrate an ability to make physical measurements and understand the limits of precision in measurements
- Test the knowledge of theoretical concepts and develop the experimental skills of the learners.
- To facilitate data interpretation and expose the learners to various industrial and environmental applications
- To enhance the students to handle the instruments.

Pre-requisites

Nil

Course Outcomes

On the successful completion of the course, students will be able to

CO1	Realize the concept of youngs modulus, rigidity modulus and dielectric constant of the given materials	Apply
CO2	Recognize the knowledge of properties of light using laser and ordinary light source	Apply
CO3	Apply the concepts of chemistry and develop analytical skills for applications in engineering.	Apply
CO4	Analyze the pH, electromotive force, conductance by using instrumental methods.	Apply
CO5	Apply the Freundlich's adsorption isotherm and Langmuir's adsorption isotherm using acetic acid on activated charcoal	Analyze

Mappin	Mapping with Programme Outcomes (FT)														
COs	COs POs											PSOs			
COS	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1	3	-	-	-	-	-	-	-	2	-	-	-	-	-	-
CO2	3	-	-	-	-	-	-	-	2	-	-	-	2	-	-
CO3	3	-	-	-	-	-	-	-	2	-	-	-	3	-	-
CO4	3	-	-	-	-	-	-	-	2	-	-	-	-	3	-
CO5	3	-	-	-	-	-	-	-	2	-	-	-	-	2	-
3 - Stror	3 - Strong; 2 - Medium; 1 – Some														

Assessment Pattern

Bloom's Category	Lab Experiment (Ma	s Assessment arks)	Model Examination (Marks)	End Sem Examination (Marks)
	Lab	Activity	(marko)	(Marito)
Remember	10	-	10	10
Understand	30	30	30	30
Apply	40	40	40	40
Analyze	20	30	20	20
Evaluate	-	-	-	-
Create	-	-	-	-
Total	100	100	100	100



K. S. Rangasamy College of Technology – Autonomous R2022											
B.Tech. Food Technology											
	60 CP 0P3- Applied Physics and Chemistry Laboratory										
Semester	I	Hours/Week		Total	Credit	Ma	ximum Mark	s			
L T P Hrs C CA ES Total											
1	0	0 0 4 60 2 60 40 100									

List of Experiments (Physics):

- 1.Determination of Young's modulus of a given material Uniform bending 2.Determination of rigidity modulus of a wire -Torsional pendulum.
- 3. Determination of dielectric constant.
- 4. Determination of wavelength of mercury spectral lines spectrometer grating 5.(a) Laser-Determination of the wave length of the laser using grating.
- (b) Optical fibre -Determination of Numerical Aperture and acceptance angle.
- * SDG: 4- Quality Education

List of Experiments (Chemistry):

- 1. Estimation of hardness of water sample by complexometric method.
- 2. Estimation of HCl by pH meter.
- 3. Estimation of mixture of acids by conductivity meter.
- 4. Determination of ferrous ion by Potentiometric titration.
- 5. Adsorption of acetic acid by Charcoal.
- * SDG 6: Improve Clean Water and Sanitation
- * SDG 9: Industry, Innovation, and Infrastructure
- * SDG 8: Decent Work and Economic Growth

Case studies/Activity report

Prepare a report on hardness of water samples in and around your area and suggest your idea for removal of hardness.

Apply the knowledge of pH determination for health drinks, beverages, soil, effluent and other biological samples and prepare a case study report.

Lab Manual

- 1. "Engineering Physics Lab Manual", Department of Physics, KSRCT.
- 2. "Chemistry Lab Manual Volume I & II", Department of Chemistry, KSRCT.

Course Designer(s) - Physics

- Dr. V. Vasudevan vasudevanv@ksrct.ac.in
- $Mr.\ S.\ Vanchinathan vanchinathan @ ksrct.ac.in$
- Dr. P. Suthanthira Kumar suthanthirakumar@ksrct.ac.in

Course Designer(s) - Physics

Dr.T.A.Sukantha – sukantha@ksrct.ac.in Dr.B.Srividhya - srividyab@ksrct.ac.in Dr.S.Meenachi - meenachi@ksrct.ac.in



60 ME 0P1	Fabrication and Reverse Engineering Laboratory	Category	L	Т	Р	Credit
	Laboratory	ES	0	0	4	2

- To acquire skills in operating hand tools and instruments.
- To provide hands-on training on Carpentry, Sheet metal, Fitting and Welding.
- To provide hands-on training on household wiring and electronic circuits.
- To offer real time activity on plumbing connections in domestic applications.
- To provide hands-on activities on dismantling, and assembling the Home Appliance, Center lathe operations, computer's internal components and peripherals.

Pre-requisites

• NIL

Course Outcomes On the successful completion of the course, students will be able to Perform power tools operations. Apply CO₂ Make a wooden model using carpentry process Apply CO3 Make a model using sheet metal, filing and joining a MS Plate Apply CO4 Repair and Maintenances of water lines for home applications Apply Trouble shoots the electrical and electronic circuits, Electrical CO₅ machines and realizes the reputation of house wiring, home Apply Appliance, computer internal components and peripherals.

Mappii	Mapping with Programme Outcomes														
COs	POs										PSOs				
COS	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1	3	2	3	1	-	2	2	-	3	-	-	3	-	3	3
CO2	3	2	3	-	ı	2	2	-	3	1	-	3	-	3	3
CO3	3	2	3	1	-	2	2	1	3	-	-	3	-	3	3
CO4	3	2	3	-	ı	2	2	-	3	1	-	3	-	3	3
CO5	3	2	3	-	-	2	2	-	3	-	-	3	-	3	3
3 - Str	3 - Strong; 2 - Medium; 1 - Some														

Assessment Pattern				1		
Bloom's Category	Lab Experiments (Mar		Model Examination (Marks)	End Sem Examination (Marks)		
<u> </u>	Lab	Activity	()	(,	
Remember	-	-	-	-	-	
Understand	25	12	50		50	
Apply	25	13	50		50	
Analyze	-	-	-	-	-	
Evaluate	-	-	-	-	-	
Create	-	-	-	-	-	
Total	50	25	100	-	100	

Syllabus

Cyllabus									
	K.S.Rangasamy College of Technology – Autonomous R2022								
	B.Tech. – Food Technology								
	60 ME 0P1 -Fabrication and Reverse Engineering Laboratory								
Semester	ŀ	lours/Week		Total	Credit	Ma	ximum Mar	ks	
Semester	L T P Hrs C CA ES Total								
II	II 0 0 4 60 2 60 40 100								

Performs of Power Tools*

Drilling in different Walls and Materials Fitting of Hand shower mount, Shirt hanger, Towel hanger and Pipe with clamps.

Carpentry Process*

Design and Development of Wooden Model using the Carpentry Process T / Cross Joint / different joints

Sheet Metal and Filling Process*

Design and Development of Metal Model - Make a Tray Components using Sheet Metal Process and Mating of Square joint in MS Plate using the Filling Process

Welding Process*

Fabrication of Models with MS Plate using Arc Welding- Lap Joint, Butt Joint, T Joint

Plumbing Process*

Repair and Maintenances of Pipe Fitting for Home Applications Study of plumbing tools, assembly of G.I. pipes/ PVC and pipe fittings, cutting of threads in G.I. Pipes by thread cutting dies.

Residential house wiring*

Design and Excusion of Residential house wiring with and without UPS- 1 BHK - 2 BHK. Design and fabrication of domestic LED lamps - Circuit designing (calculation of components)

Electronic Circuit wiring*

PCB fabrication – Soldering - Assembling of Audio Amplifiers- Connecting USB/Bluetooth MP3 player board - Connecting Volume controllers - Connecting bass & treble filter boards - Connecting Surround and subwoofer filter board

Assembling and dismantling of Electronics Machines*

Iron box, Induction stove, Water heater, Mixer, Table fan, Ceiling fan

Study Exercises

Demonstration of Centre Lathe Operations Facing, Turning, and drilling and its components. Assemble and dismantle of Vacuum Cleaner / Refrigerator and its components

Computer Hardware Study Exercises

Identify internal components of computer - Assemble and dismantle desktop computer systems

List of Experiments: _

1. Fitting of Wall mounting Parts using Power Tools

- a) Drilling in different Walls and Materials
- b) Fitting of Hand shower mount, Shirt hanger, Towel hanger and Pipe with Clamps.



2. Making of Wooden model using the Carpentry Process

- a) T / Cross Joint
- b) Mortise and Tenon Joint / different joints

3. Making of Metal Model

- a) Making of Components using Sheet Metal Process
- b) Mating of Components using the Filling Process
- 4. Fabrication of Welded model

5. Repair and Maintenance of Pipe Fitting for Home Applications

- a) Assembly of GI pipes/PVC and Pipe Fitting
- b) Cutting of Threads in GI pipes by thread Cutting Dies

6. Assembling and dismantling of

- a) Iron box
- b) Induction stove
- c) Water heater
- d) Mixer
- e) Table fan
- f) Ceiling fan

7. Design and Execution of Residential house wiring

- a) 1 BHK
- b) 2 BHK

8. Design and Execution of Residential house wiring with UPS.

- a) 1 BHK
- b) 2 BHK

9. Design and fabrication of domestic LED lamps

- a) Circuit designing (calculation of components)
- b) PCB fabrication
- c) Soldering

10. Assembling of Audio Amplifiers

- a) Connecting USB/Bluetooth MP3 player board
- b) Connecting Volume controllers
- c) Connecting bass & treble filter boards
- d) Connecting Surround and sub-woofer filter board

Study Exercises

- 1. Demonstration of Centre Lathe and its operations like Facing, Turning, and drilling.
- 2. Dismantle and Assemble of Vacuum Cleaner / Refrigerator.
- 3. Study of components of computer. Dismantle and assemble of desktop computer systems

*SDG 9 - Industry Innovation and Infrastructure

Course Designer(s)

- 1. Mr.S Sakthivel sakthivel_s@ksrct.ac.in
- 2. Dr. D Sri Vidya srividhya@ksrct.ac.in
- 3. Mr. K.Raguvaran raguvaran@ksrct.ac.in



K.S.RANGASAMY COLLEGE OF TECHNOLOGY, TIRUCHENGODE - 637215 (An Autonomous Institution affiliated to Anna University) B.E. / B.Tech. Degree Programme SCHEME OF EXAMINATIONS (For the candidates admitted in 2022-2023) SECOND SEMESTER

		Name of the Course	Duration of	_	ntage of Mark	(S	Minimum Marks for Pass in End Semester Exam		
S.No.	Course Code		Internal Exam	Continuous Assessment	End Semester Exam **	Max. Marks	End Semester Exam	Total	
	•	1	THE	ORY			II II		
1	60 EN 002	Professional English II	2	40	60	100	45	100	
2	60 MA 003	Integrals, Partial Differential Equations and Laplace transform	2	40	60	100	45	100	
3	60 ME 004	Engineering Mechanics	2	40	60	100	45	100	
4	60 CS 001	C Programming	2	40	60	100	45	100	
5	60 EE 001	Basic Electrical and Electronics Engineering	2	40	60	100	45	100	
6	60 MY 001	Environmental Studies and Climate Change	2	100	-	100	-	-	
7	60 GE 001	Heritage of Tamils / தமிழர்மரபு	2	100	-	100	-	100	
			PRAC	TICAL				•	
8	60 CS 0P1	C Programming Laboratory	3	60	40	100	45	100	
9	60 EE 0P1	Basic Electrical and Electronics Engineering Laboratory	3	60	40	100	45	100	
10	60 CG 0P1	Career Skill Development I	3	60	40	100	45	100	

^{*} CA evaluation pattern will differ from course to course and for different tests. This will have to be declared in advance to students. The department will put a process in place to ensure that the actual test paper follow the declared pattern.



^{**} End Semester Examination will be conducted for maximum marks of 100 and subsequently be reduced to 60 marks for theory End Semester Examination and 40 marks for practical End Semester Examination.

60 EN 002	Professional English II	Category	L	Т	Р	Credit
00 211 002	i roicocional Englicit II	HS	1	0	2	2

- To help learners improve their vocabulary and enable them to use words appropriately in different academic and professional contexts.
- To help learners develop strategies that could be adopted while reading texts.
- To help learners acquire the ability to speak and write effectively in English in real life and career related situations.
- Improve listening, observational skills, and problem-solving capabilities
- Develop message generating and delivery skills

Pre-requisites

Basic knowledge of reading and writing in English and should have completed Professional English I.

Course Outcomes

Assessment Pattern

Create

Total

On the successful completion of the course, students will be able to

CO1	Compare and contrast products and ideas in technical texts.	Understand
CO2	Illustrate cause and effects in events, industrial processes through technical texts	Understand
CO3	Infer problems in order to arrive at feasible solutions and communicate them orally and in the written format.	Understand
CO4	Relate events and the processes of technical and industrial nature.	Remember
CO5	Demonstrate their opinions in a planned and logical manner, and draft effective résumés in context of job search.	Understand

Mappi	Mapping with Programme Outcomes														
COs		POs											PSOs		
COS	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1	-	-	-	-	-	-	-	2	3	3	2	3	2	2	2
CO2	-	-	-	-	-	-	-	2	3	3	2	3	2	2	3
CO3	-	-	-	-	-	-	-	2	3	3	2	3	2	2	3
CO4	-	-	-	-	-	-	-	2	3	3	2	3	2	2	3
CO5	-	-	-	-	-	-	-	2	3	3	2	3	2	2	3
3- Stro	ng;2-	Medium;1	-Low												

Bloom's Category	Continuous Assessmo (Marks)	ent Tests	Model Examination (Marks)	End Sem Examination (Marks)		
	1	2	(Marks)	Examination (marks)		
Remember	10	10	20	20		
Understand	50	50	80	80		
Apply	-	-	-	-		
Analyze	-	-	-	-		
Evaluate	-	-	-	-		

60

100

100

60

				Tech. Food						
60 EN 002 - Professional English II										
Semester		Hours/Week		Total	Credit		Maximum Marks			
Jeillestei	L	T	Р	Hours	С	CA	ES	Total		
II	1	0	2	45	2	40	60	100		
	mparisons*									
istening:	Evaluative L	istening: Advert	isements,	Product Desc	riptions, - Au	dio / video; 1	filling a graphic			
organiser (d	choosing a p	product or servic	e by com	parison)						
Speaking:	Marketing a	product, persua:	sive spee	ch techniques.				[9]		
		ertisements, usei						[-]		
_		mails, Email etic		-	-					
_anguage l	Focus: mixe	ed tenses, prepo	sitional ph	rases, same v	vords used in	different co	ntexts and discourse			
<i>Markers</i>										
		lations in Spea								
		longer technical								
		sts – Listening t								
		and discussing th								
		cal texts- cause		ct essays, and	l letters / ema	ails of comp	laint,	[9]		
_	• .	nses to complain								
			e transforr	nations, Infinit	ive and Geru	nds – Word	Formation (Noun-			
	dv), Adverbs	S								
Problem So										
		/ watching movi	e scenes/	documentarie	es depicting a	technical p	roblem and			
uggesting										
		ussion (based or				tegies.		[9]		
_		s, excerpts from I	•	•		_				
_		ditor, Checklists,		•	•	•				
		or correction; If co	onditional	sentences - C	ompound Wo	ords, Senter	nce Completion.			
		nd Research*								
		omprehension b								
nterviewing articles.	g, presenting	g oral reports, Mi	nı presen	tations on sele	ct topics. Rea	ading: New	spaper	[9]		
	oommondat	tiona Trongoodir	a Appida	nt Bonort Bro	oio writing on	d Cummori-	zina			
		tions, Transcodir orted Speech – I					zirig			
		s or Information			use of Frepos	SILIOIIS				
		TED Talks, Pres			torvious (on	alvaia of the	intoniou			
erformance		TED Talks, FIES	entations	, Fulliai jub ili	terviews, (ari	alysis of the	eniterview			
		in role plays, vir	tual inter	viewe makina	nresentations	with vieual	aide			
		terview with prof		news, making	presentations	willi visuai	aius	[9]		
		p application – C		r & Rásumá						
		nerical Adjective			es or No/ and	d Tage: Rale	ative Clauses -			
	ocus. Nun	iericai Aujective	s, questio	ii types. wii/ i	es or No, ari	a rags, rec	alive Clauses			
ninne										
aloms.							Total Hours:	45		
dioms. Text Book(S):						Total Hours:	45		
ext Book(lish for Engil	neers & Technol	ogists'Or	ient Blackswa	n Private Ltd.	Departmer	Total Hours:			
1. 'Eng. 2020 Norm	lish for Engil	Word Power Ma	de Easy -					ersity,		
1. 'Engi 2020 Norm 2. Peng	nan Lewis, 'I guin Randon		de Easy -				nt of English, Anna Unive	ersity,		
1. England 2020 Norm Penger Reference(nan Lewis, 'I guin Randon s):	Word Power Ma n House India, 2	de Easy - 2020	The Complete	e Handbook fo	or Building a	nt of English, Anna Unive	ersity,		
fext Book(1. 'Eng. 2020 2. Norm Peng. Reference(1. Ram 2. Arthu	han Lewis, 'I guin Randon s): an. Meenak ur Brookes a	Word Power Ma n House India, 2 shi, Sharma. Sa	de Easy - 2020 ngeeta, 'F	The Complete Professional Eling to Write: W	Handbook fo	or Building a	nt of English, Anna University of English, Anna University of Superior Vocabulary B	ersity,		

^{*} SDG- 04- Quality Education



Course Co	ontents and Lecture Schedule	
S. No.	Topics	No. of hour s
1.0	Making Comparisons	•
1.1	Evaluative Listening	1
1.2	Product Descriptions and filling a graphic organiser	1
1.3	Marketing a product by using persuasive techniques	2
1.4	Reading advertisements, user manuals and brochures	1
1.5	Writing professional emails	1
1.6	Compare and contrast essay	1
1.7	mixed tenses and prepositional phrases	1
1.8	Same words used in different contexts	1
2.0	Expressing Causal Relations in Speaking and Writing	
2.1	Listening to longer technical talks	1
2.2	Listening to process/event descriptions	1
2.3	Describing and discussing the reasons of accidents or disasters	1
2.4	Reading longer technical texts– cause and effect essays	1
2.5	Writing responses to complaints	1
2.6	Active Passive Voice transformations	2
2.7	Infinitive and Gerunds	1
2.8	Word Formation (Noun-Verb-Adj-Adv), Adverbs.	1
3.0	Problem Solving	
3.1	Listening to documentaries and suggesting solutions	1
3.2	Group Discussion (based on case studies)	2
3.3	Reading Case Studies, excerpts from literary texts and news reports	1
3.4	Letter to the Editor	1
3.5	Checklists	1
3.6	Problem solution and argumentative essays	1
3.7	Error correction and Sentence Completion	1
3.8	If conditional sentences	1
4.0	Reporting of Events and Research	
4.1	Listening Comprehension	1
4.2	Interviewing and presenting oral reports	1
4.3	Mini presentations on select topics	1
4.4	Reading newspaper articles	1
4.5	Recommendations	1
4.6	Transcoding	1
4.7	Precis writing and Summarising	1
4.8	Reported Speech, Modals	1
4.9	Conjunctions	
5.0	The Ability to put Ideas or Information Coherently	
5.1	Listening to Formal job interviews	1
5.2	Role plays	2
5.3	Virtual interviews	1
5.4	Reading Company profiles	1
5.5	Writing Statement of Purpose (SoPs)	1
5.6	Writing Résumé	1
5.7	Numerical Adjectives and Relative Clauses - Idioms	1
5.8	question types: Wh/ Yes or No/ and Tags	1

Course Designer(s)

1 Dr.A.Palaniappan - palaniappan@ksrct.ac.in



60 MA 003	Integrals, Partial Differential Equations	Category	L	Т	Р	Credit
35 1117 (353	and Laplace Transform	BS	3	1	0	4

- To acquire the knowledge about multiple integrals.
- To familiarize the basic concepts of vector calculus.
- To get exposed to the fundamentals of analytic functions.
- To solve various types of partial differential equations.
- To familiarize the concepts of Laplace transform.

Pre-requisites

• NIL

Course Outcomes

On the succ	of the successful completion of the course, students will be able to								
CO1	Interpret the basic concepts of double and triple integrals.	Apply							
CO2	Interpret the basic concepts of vector calculus.	Apply							
CO3	Construct the analytic functions and evaluate complex integrals.	Apply							
CO4	Compute the solution of partial differential equations using different methods.	Apply							
CO5	Apply Laplace transform techniques for solving differential equations.	Apply							

Mappii	Mapping with Programme Outcomes														
COs		POs											PSOs		
003	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1	3	2	-	-	2	-	-	-	-	-	-	-	2	-	-
CO2	3	2	-	-	2	-	-	-	-	-	-	-	2	-	-
CO3	3	2	-	-	2	-	-	-	-	-	-	-	2	-	-
CO4	3	2	-	-	2	-	-	-	-	-	-	-	2	-	-
CO5	3	2	-	-	2	-	-	-	-	-	-	-	2	-	-
3 - Str	ong; 2	- Mediu	m; 1 – S	Some											

Assessment Pattern	Assessment Pattern									
Bloom's Category		Assessment (Marks)	Model Examination	End Sem Examination (Marks)						
	1	2	(Marks)	(wai ks)						
Remember	10	10	10	10						
Understand	10	10	30	30						
Apply	40	40	60	60						
Analyze	•	-	-	-						
Evaluate	ı	-	-	-						
Create		-	-	-						
Total	60	60	100	100						

Syllabu	S									
		K.	S. Rangasam		of Technology		s (R 2022)			
		60 1	ΜΔ 003 –Integ		Tech. Food Tec al Differential E		I anlace Trans	form		
			Hours/Week	rais, raiti		Credit	Lapiace Trails	Maximum Ma	rks	
Se	mester	L	Т	Р	Total hrs	С	CA	ES	То	ıtal
	ll .	3	1	0	60	4	40	60	10	0
Doubl Triple Cylind Hand	integration drical co-ord s - on:	on – Carte in Cartes dinates.	ian co-ordinat	es – Char		- Cartesian t	o polar co-ordii	ea as double integ nates and Cartesia		[9]
Introd Diverg the pla	gence and o ane – Gaus s - on:	radient of curl (excludes s diverger	ding vector ide	entities) – S Stokes' the		rrotational vec		ion of two surface on: Green's theore		[9]
Analytic Functions and Integrals Analytic function – Necessary and Sufficient conditions (statement only)-Properties – Harmonic function – Construction of an analytic function – Cauchy's Integral theorem (statement only) – Cauchy's integral formula – Classification of singularities – Application: Cauchy's residue theorem. Hands - on: Plotting and visualizing functions of single variable, two and three variables.										[9]
Forma differe equat	ential equat ions with co s - on:	tial differer ions of firs onstant coe	ntial equations it order – Lagr	ange's line	ear equations –			ns – Non- Linear pa inear partial differe		[9]
Condi transf theore efficie	orms - Initia em (exclud ents. s - on:	existence - al and fina ing proof)	I value theore - Application	m – Trans : Solution	form of periodic	functions. Inverse functions of the functions. Investigation of the functions of the functi	erse Laplace ti fferential equat	atives and integral ransform – Convoli ions with constant	ution	[9]
						Total Hours:	45 + 5(Hands o	n) + 10(Tutorial)		60
	ook(s):								I.	
1.					s", 44 th Edition, I					
2.	Kreyszig E 2016.	Erwin, "Adv	anced Engine	ering Math	ematics", 10 th I	Edition, John V	/iley and Sons (Asia) Limited,New	Delhi,	
Refere	nce(s):									
1. Dass H.K, "Higher Engineering Mathematics", 3 rd (Revised) Edition, S.Chand& Company Ltd, New Delhi, 2014.										
2.	Veeraraja Delhi, 201		neering Mather	matics", for	Semesters I &	I, 1 st Edition,	Tata McGraw H	ill Publishing Co., N	lew	
3.	Kandasan 2017	ny P, Thila	gavathy K and	Gunavath	y K, "Engineerin	g Mathematics	s - I", S.Chand&	Company Ltd, New	/ Delh	ıi,
4.	Bali N P a	nd Manish	Goyal, A text b	oook of En	gineering Mathe	matics",10 th E	Edition, Laxmi P	ublications(P) Ltd,	2016.	



Course Contents and Lecture Schedule

S.No	Topic	No.of Hours
1	MULTIPLE INTEGRALS	
1.1	Double integration	1
1.2	Cartesian and polar coordinates	1
1.3	Change of order of integration	1
1.4	Area as double integral	1
1.5	Triple integration in Cartesian coordinates	1
1.6	Change of variables	2
1.7	Cartesian to polar coordinates	1
1.8	Cartesian to Cylindrical coordinates	1
1.9	Tutorial	2
1.10	Hands on	1
2	VECTOR CALCULUS	
2.1	Introduction: Gradient of a scalar point function	1
2.2	Directional derivative	1
2.3	Angle of intersection of two surfaces	1
2.4	Divergence and curl (excluding vector identities)	1
2.5	Solenoidal and irrotational vectors	1
2.6	Application: Green's theorem in the plane	1
2.7	Gauss divergence theorem	2
2.8	Stokes' theorem (statement only)	1
2.9	Tutorial	2
2.10	Hands on	1
3	ANALYTIC FUNCTIONS AND INTEGRALS	
3.1	Analytic function	1
3.2	Necessary and Sufficient conditions (statement only)	1
3.3	Properties	1
3.4	Harmonic function	1
3.5	Construction of an analytic function	1
3.6	Cauchy's Integral theorem (statement only), Cauchy's integral formula	2
3.7	Classification of singularities	1
3.8	Applications: Cauchy's residue theorem.	1
3.9	Tutorial	2
3.10	Hands on	1
4	PARTIAL DIFFERENTIAL EQUATIONS	
4.1	Formation of partial differential equations by eliminating arbitrary constants	1
4.2	Formation of partial differential equations by eliminating arbitrary functions	2
4.3	Non- linear partial differential equations of first order	3
4.4	Lagrange's linear equations	1
4.5	Application: Homogeneous Linear partial differential equations with constant coefficients.	2

4.6	Tutorial	2
4.7	Hands on	1
5	LAPLACE TRANSFORM	
5.1	Conditions for existence	1
5.2	Transforms of elementary functions	1
5.3	Basic properties	1
5.5	Derivatives and integrals of transforms, Initial and final value theorem	1
5.6	Transform of periodic functions	1
5.7	Inverse Laplace transform	1
5.8	Convolution theorem (excluding proof)	1
5.9	Application: Solution of second order ordinary differential equation with constant co-efficient.	2
5.10	Tutorial	2
5.11	Hands on	1
	Total	60

Course Designers

- 1. Dr.C.Chandran cchandran@ksrct.ac.in
- $2. Dr. K. Prabakaran ~- \underline{prabakaran@ksrct.ac.in}$

	Engineering Mechanics	Category	L	Т	Р	Credit
60 ME 004		ES	3	1	0	4

- To learn a process for analysis of static objects, concepts of force, moment, and mechanical
 equilibrium in two and three dimensions.
- To learn the equilibrium of rigid bodies such as frames, trusses, beams.
- To identify the properties of surfaces and solids by using different theorem.
- To learn the principle of frictional forces at the contact surfaces and impart basic concept of dynamics of particles.
- To acquire the concept of elements of rigid body dynamics

Pre-requisites

NIL

Course Outcomes

On the 30	accessial completion of the course, students will be able to	
CO1	Use scalar and vector analytical techniques for analyzing forces in statically determinate structures.	Apply
CO2	Apply basic knowledge of scientific concepts to solve real-world problems.	Apply
CO3	Calculate the properties of surfaces and solids using various theorems.	Apply
CO4	Determine the effect of frictional forces and the dynamic forces exerted in the particle	Apply
CO5	Analysis of rigid body dynamics and calculation of member forces in the rigid body	Apply

Mapping wi	Mapping with Programme Outcomes															
COs		POs												PSOs		
003	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	
CO1	3	2	2	3	-	-	-	-	-	-	-	2	-	-	2	
CO2	3	2	2	3	-	-	-	-	-	-	-	2	-	-	2	
CO3	3	2	2	3	-	-	-	-	-	-	-	2	-	-	2	
CO4	3	2	2	3	-	-	-	-	-	-	-	2	-	-	2	
CO5	3	2	2	3	-	-	-	-	-	-	-	2	-	-	2	
3 - Strong; 2	2 - Me	dium	; 1 - S	ome												

Assessment Pattern					
Bloom's		Assessment Tests Marks)	Model Examination	End Sem Examination (Marks)	
Category	1	2	(Marks)	LXaiiiiiatioii (Waiks)	
Remember	10	10	20	20	
Understand	20	20	30	30	
Apply	30	30	50	50	
Analyze	-	-	-	-	
Evaluate	-	-	-	-	
Create	-	-	-	-	
Total	60	60	100	100	

Syllab	us									
		K.S	.Rangasan		of Technolo		mous R20	22		
			61		. Food Tech Engineering					
		н	lours/Week		Total	Credit) 	Maximum Marks		
Se	emester	L	T	P	Hours	C	CA	ES	Total	
	II	3	1	0	60	4	40	60	100	
Introdu Paralle Vector Addition Equilib	Basics and Statics of Particles Introduction -Units and Dimensions-Laws of Mechanics-Principle of transmissibility-Lame's theorem, Parallelogram and triangular Law of forces-Vectors-Vectorial representation of forces and moments. Vector operations Addition, subtraction, dot product, cross product-Coplanar Forces-Resolution and Composition of forces- Equilibrium of a particle-Forces in space-Equilibrium of a particle in space-Equivalent systems of forces- Single equivalent force.									
Free determ	ninacy, Momei	-Types of nts and C	ouples-Mo	ment of a	force abou	t a point a	and about	equilibrium-Static an axis-Vectorial two dimensions.	[12]	
Detern using I axis th	Integration Met	as and Vol hod; T sect	umes-Cent ion, I sectio	n, Angle se	ction, Hollow	section usir	ng standard	gle, circle, triangle I formula) - Parallel It of inertia of thin	[12]	
tension Dynan Displa	nal force–Laws n in belt. nics of Particle	es ty, accelera	ition and the	eir relationsl	hip–Relative	motion -Pro	_	sistance–Ratio of on in horizontal	[12]	
Transl	ents of Rigid B ation and Rota ecting rod mech	tion of Rigic		elocity and a	acceleration-	-General Pla	ne motion:	Crank and	[12]	
							Total	: 45 + 15 (Tutorial)	60	
1.	Ltd., 3 rd Edit	ion, 2017.						s, Vikas Publishing H		
2.	Beer, F.P and 11 th Edition,		r. E.R, "Ved	ctor Mechan	nics for Engir	eers", Statio	s and Dyna	amics, McGraw-Hill Ir	nternational	
Refere	ence(s):									
1.								ew Delhi, 2012		
2.	Hibbeller, R.0	C., "Engined	ering Mecha	nics", Vol. 1	Statics, Vol	. 2 Dynamics	s, Pearson E	Education Asia Pvt. L	td.,	
3.	Bansal R.K,"	Engineering	Mechanics	s" Laxmi Pul	olications (P)	Ltd, 2011.				
4.							rson Educa	tion Asia Pvt. Ltd, 4 th	¹ Edition,	
5.	James M. Ge	ere and Tim	oshenko, "I	Mechanics of	of Materials"	, CBS Publis	her, New D	Delhi, 6 th Edition, 201	12	

Course C	ontents and Lecture Schedule	
S. No.	Topics	No. of hours
1.0	BASICS AND STATICS OF PARTICLES	
1.1	Introduction, Units and Dimensions, Laws of Mechanics	1
1.2	Principle of transmissibility, Lame's theorem,	1
1.3	Parallelogram and triangular Law of forces	1
1.4	Tutorial	2
1.5	Vectors, Vectorial representation of forces and moments	1
1.6	Vector operations, Coplanar Forces–Resolution and Composition of forces	2
1.7	Equilibrium of a particle, Forces in space	1
1.8	Equivalent systems of forces-Single equivalent force.	1
1.9	Tutorial	2
2.0	EQUILIBRIUM OF RIGID BODIES	
2.1	Free body diagram, Types of supports and their reactions	1
2.2	Requirements of stable equilibrium, Static determinacy	1
2.3	Moments and Couples–Moment of a force about a point and about an axis	2
2.4	Vectorial representation of moments and couples	1
2.5	Tutorial	2
2.6	Varignon's theorem	1
2.7	Equilibrium of Rigid bodies in two dimensions	2
2.8	Tutorial	2
3.0	PROPERTIES OF SURFACES AND SOLIDS	
3.1	Determination of Areas and Volumes-Centroid	1
3.2	Moment of Inertia of plane area (Rectangle, circle, triangle using Integration Method)	2
3.3	Tutorial	2
3.4	Moment of Inertia of plane area(T section, I section, Angle section)	1
3.5	Moment of Inertia of plane area(Hollow section)	1
3.6	Parallel axis theorem and perpendicular axis theorem	1
3.7	Polar moment of inertia	1
3.8	Mass moment of inertia of thin rectangular section.	1
3.9	Tutorial	2
4.0	FRICTION &DYNAMICS OF PARTICLES	
4.1	Frictional force, Laws of Coloumb friction, Simple contact friction	1
4.2	Ladder friction	1
4.3	Rolling resistance–Ratio of tension in belt	1
4.4	Tutorial	2
4.5	Displacement, Velocity, acceleration and their relationship, Relative motion	1
4.6	Projectile motion in horizontal plane	1
4.7	Newton's law	1
4.8	Work Energy Equation	1
4.9	Impulse and Momentum	1
4.10	Tutorial	2
5.0	ELEMENTS OF RIGID BODY DYNAMICS	
5.1	Translation and Rotation of Rigid Bodies	1
5.2	Translation and Rotation of Rigid Bodies - Velocity	2
5.3	Translation and Rotation of Rigid Bodies - acceleration	2
5.4	Tutorial	2
5.5	General Plane motion	1
5.6	General Plane motion - Crank and Connecting rod mechanism	2
5.7	Tutorial	2
5.7		

Course Designer(s)

1. Mr.S.Karthick - skarthick@ksrct.ac.in



60 CS 001	C Programming	Category	L	Т	Р	Credit
00 00 001	o i rogrammig	ES	3	0	0	3

- To learn most fundamental element of the C language and to examine the execution of branching, looping statements,
- To examine the concepts of arrays, its characteristics and types and strings.
- To understand the concept of functions, pointers and the techniques of putting them to use
- To apply the knowledge of structures and unions to solve basic problems in C language
- To enhance the knowledge in file handling functions for storage and retrieval of data

Pre-requisites

NIL

Course Outcomes

On the succ	essitui completion oi the course, students will be able to	
CO1	Construct the fundamental building blocks of structured Programming in C	Apply
CO2	Implement the different operations on arrays and strings	Apply
CO3	Develop simple real world applications utilizing functions, recursion and pointers.	Apply
CO4	Demonstrate the concepts of structures ,unions ,user defined data types and preprocessor	Apply
CO5	Interpret the file concepts using proper standard library functions for a given application	Apply

Mappii	Mapping with Programme Outcomes																		
COs	POs											POs PSOs							
003	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3				
CO1	3	3	3	-	3	-	-	-	2	2	-	2	-	-	2				
CO2	3	3	3	-	3	-	-	-	2	2	-	2	-	-	2				
CO3	3	3	3	-	3	-	-	-	2	2	-	2	-	-	2				
CO4	3	3	3	-	3	-	-	-	2	2	-	2	-	-	2				
CO5	3	3	3	-	3	-	-	-	2	2	-	2	-	-	2				
3- Stro	ng;2-N	/lediun	n;1-Lo	W															

Assessment Pattern				
Bloom's Category	Continuous Asses	ssment Tests (Marks)	Model Examination	End Sem Examination
	1	2	(Marks)	(Marks)
Remember	10	10	20	20
Understand	10	10	20	20
Apply	40	40	60	60
Analyze	-	-	-	-
Evaluate	-	-	-	-
Create	-	-	-	-
Total	60	60	100	100

Syllabus										
	P	K.S.Rangasa	my College	of Technolo	ogy – Auton	omous R20	022			
				h. Food Tecl						
				01 – C Prog	ramming					
Semest	er	Hours/Week		Total	Credit		Maximum Marks			
	L	Т	Р	Hours	С	CA	ES	Total		
II	3	0	0	45	3	40	60	100		
	, I/O, Branching a									
	f a C Program – [[8]		
							le I/O - Conditional			
	and Loops-Writing	and evaluation	n or condition	onais and co	insequent br	anching				
Arrays and		. Two Dies	: I A	ana Matrix	Maniaulatiau	- Charast	on annous Chrimana	[7]		
Arrays: One Dimensional Arrays - Two Dimensional Arrays – Matrix Manipulation - Character arrays – Strings: String Manipulation with and without String Handling Functions.										
	and Pointers	oat ouring	a.iaiiig i				<u> </u>			
		n Library E	unationa an	d Hoor dofin	ad funations	Eupotion	Prototypes – Call by			
							n— Recursion and			
	- Passing Arrays to					iaiii iuiiciic	ii— itecursion and	[11]		
аррисаногі	r dooning / mayorto	o i anonono	otorago ola	оо ороошого				[]		
Introduction	to Pointer Variable	s - The Pointe	er Operators	- Pointer Ex	pressions - F	ointers and	Arrays			
- Generating	g a Pointer to an Ar	ray - Indexing	Pointers– F	unction and	pointers - D	ynamic mer	nory			
Structures.	Unions, Enumera	tions. Typed	lef and Pre	processors						
	·				f Structures	· Arravs an	d Structures, Nested	[0]		
							umerations - typedef	[9]		
	cessor and comm				J		in the state of th			
File Handlin										
	•	riting Charac	ters - Readii	na and Writin	Otalia	ile System f	unctions – File			
Manipulation	n-Sequential acces	ss - Random	File: Streams – Reading and Writing Characters - Reading and Writing Strings - File System functions – File Manipulation-Sequential access - Random Access Files – Command Line arguments.							
			Access File	s – Commar	ng Strings - F nd Line argu	ments.		[9]		
Text Book(s	s):		Access File	es – Commar	nd Line argu	ments.	Total Hours:	[9] 45		
, ,										
1. H	erbert Schildt, "The	e Complete R		es – Commar	nd Line argu					
	erbert Schildt, "The yron Gottfried, "Pro	•	eference C"	, Fourth Editi	on, Tata McC	Graw Hill Ed	ition, 2010.			
	yron Gottfried, "Pro	•	eference C"	, Fourth Editi	on, Tata McC	Graw Hill Ed	ition, 2010.			
2. B	yron Gottfried, "Pro s):	gramming wi	eference C", th C", Third	s – Commar , Fourth Editi Edition, McG	on, Tata McC	Graw Hill Ed cation, 2014	ition, 2010.			
2. B Reference(s	yron Gottfried, "Pro s):	ogramming wi	eference C", th C", Third	, Fourth Editi Edition, McG	on, Tata McCiraw Hill Educ	Graw Hill Ed cation, 2014 Graw Hill Ed	ition, 2010. I. ition, New Delhi, 2016.			
2. B Reference(s 1. E.I 2. Bri	yron Gottfried, "Pro s): Balagurusamy, "Pr ian W. Kernighan a	ogramming wi	eference C", th C", Third n ANSI C", S	, Fourth Editi Edition, McG Seventh Edition	on, Tata McCon, Tata McCon, Tata McCon, Tata McCon, Tata McCon, Tata McCong Language	Graw Hill Ed cation, 2014 Graw Hill Ed , Prentice-H	ition, 2010. I. ition, New Delhi, 2016.	45		

S. No.	Topics	No. of hours
1.0	Basics of C, I/O, Branching and Loops	-
1.1	Structure of a C Program, Keywords	1
1.2	Data types, Type Qualifiers	1
1.3	Variables and Constants	1
1.4	Operators—expressions and precedence	1
1.5	Console I/O Unformatted and Formatted Console I/O	1
1.6 1.7	Conditional Branching Iteration and loops	1 2
1.8	Writing and evaluation of conditionals and consequent branching	1
2.0	Arrays and Strings	
2.1	One Dimensional Array	1
2.2	Two-Dimensional Array and Matrix Manipulation	1
2.3	Character arrays and Strings Basics	1
2.4	String Manipulation without String Handling Functions	2
2.5	String Manipulation with String Handling Functions	2
3.0	Functions and Pointers	
3.1	Scope of a Function – Library Functions, User defined functions and Function Prototypes	1
3.2	Function Call by value and Function Call by reference, Function Categorization	2
3.3	Arguments to main function	1
3.4	Recursion and application	1
3.5	Passing Arrays to Functions	1
3.6	Storage class Specifiers	1
3.7	Introduction to Pointer Variables - The Pointer Operators - Pointer Expressions	1
3.8	Pointers and Arrays - Generating a Pointer to an Array – Indexing Pointers	1
3.9	Function and pointers	1
3.10	Dynamic memory allocation	1
4.0	Structures, Unions, Enumerations, Type def and Preprocessors	
4.1	Introduction to Structures and Initialization	1
4.2	Arrays and Structures, Arrays of Structures	1
4.3	Structures within Structures, Passing Structures to Functions	2
4.4	Structure Pointers	1
4.5	Unions and Bit Fields.	1
4.6	Enumerations – type def	1
4.7	Preprocessor commands	2
5.0	File Handling	I
5.1	File Streams –Reading and Writing Characters - Reading and Writing Strings	2
5.2	File System functions and File Manipulation	2
5.3	Sequential access	2
5.4	Random Access Files	2
5.5	Command Line arguments and files	1

Course Designer(s)

1. Dr.P.Kaladevi - kaladevi@ksrct.ac.in



60 EE 001	Basic Electrical and Electronics	Category	L	T	Р	Credit
35 = 551	Engineering	BS	3	0	0	3

- To familiarize the basic concept on electrical circuits and its various parameters
- To facilitate the various types of electrical machines and their uses
- To gain knowledge on Electrical safety
- To provide exposure on the functions of various semiconductor devices
- To familiarize the use of various measuring instruments

Pre-requisite

NIL

Course Outcomes

On the successful completion of the course, students will be able to

On the	successful completion of the course, students will be able to	
CO1	Apply the basic laws of electric circuits to calculate the unknown quantities.	Apply
CO2	Acquire knowledge on different electrical machines and select suitable machines for industrial applications.	Apply
CO3	Express the significance of various components of low voltage electrical installations and create awareness on electrical safety.	Understand
CO4	Demonstrate the operation and characteristics of various semiconductor devices.	Understand
CO5	Interpret the operating principles of measuring instruments and choose suitable instrument for measuring the parameters.	Understand

Mapping with Programme Outcomes

00		РО											PSO		
СО	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1	3	3	-	-	-	-		-	-	-	-	-	-	-	-
CO2	3	3	-	-	-	-	2	-	-	-	-	2	-	2	2
CO3	3	3	-	-	-	2		-	-	-	-	2	-	-	-
CO4	2	2	-	-	-	-	2	-	-	2	-	2	-	2	2
CO5	2	3	-	-	-	-	3	-	3	2	-	2	-	1	1
3- Strong; 2-	Medium	; 1-Low		•	•	•								•	

Assessment Pattern

Bloom's Category	Continuous Asses	ssment Tests (Marks)	Model Examination	End Sem Examination	
Bloom's Category	1 2		(Marks)	(Marks)	
Remember	20	20	20	20	
Understand	20	40	40	40	
Apply	20	-	40	40	
Analyze	-	-	-	-	
Evaluate	-	-	-	-	
Create	-	-	-	-	
Total	60	60	100	100	



Syllabus								
		K.S.Rangasam		Technology – A		R 2022		
				Food Technolog				
				cal and Electro		ring		
Semes		Hours/M		Total hrs	Credit		•	m Marks
	L	T	Р		С	CA	ES	Total
	3	0	0	45	3	40	60	100
problems. Introductior real power,	s: Circuit Compone to AC Circuits and reactive power an olems. Introduction	Parameters: W	aveforms, Av wer, power fa	verage value an	d RMS Value o	of Sinusoida	l Waveform	[9]
Application	n and Working prins. Working Principle Applications of T	of DC motors,	Torque Equa	ation, Types and	Applications.	Construction	n, Working	[9]
Domestic v Breaker-Mo	nstallations* viring, types of wire oulded Case Circuis and First Aid.							[9]
 Bipolar J 	ctronics n to Semiconductor unction Transistor er Supply*.							[9]
Functional Moving Iron	ents and Instrumen Elements of an Inst n meters, Operating SO- Block Diagram-	rument, Standa Principles and	Types of W					[9]
							Total Hours	45
Text Book(•							
E	Kothari DP and I.J N Education, 2020.							
	A.K. Sawhney, Pune and Co, 2015.	et Sawhney 'A (Course in Ele	ctrical & Electror	nic Measureme	ents & Instrur	nentation', Dl	hanpat Rai
Reference((s):							
1. I	Kothari DP and I.J N	lagrath, "Basic	Electrical En	gineering", Fou	rth Edition, Mo	cGraw Hill E	ducation, 20	19.
2.	Albert Malvino, David	d Bates, 'Electro	nic Principles	, McGraw Hill E	ducation; 7th e	dition, 2017.		
3.	Mahmood Nahvi and	d Joseph A. Edr	minister, "Ele	ctric Circuits", So	chaum' Outline	Series, Mc	Graw Hill, 200	02.
4. I	H.S. Kalsi, 'Electroni	c Instrumentation	n', Tata McG	raw-Hill, New De	elhi, 2010.			
	,				· -			

^{*}SDG 9 - Industry Innovation and Infrastructure

Course Contents and Lecture Schedule

S.No	Topic	No. of Hours
1	Electrical Circuits	
1.1	Circuit Components: Resistor, Inductor, Capacitor	1
1.2	Ohm's Law - Kirchhoff's Laws	1
1.3	Ohm's Law - Kirchhoff's Laws - Problems	1
1.4	Introduction to AC Circuits and Parameters: Waveforms, Average value and RMS Value of Sinusoidal Waveform	2
1.5	Real power, reactive power and apparent power, power factor	1
1.6	Steady state analysis of RLC series circuits	1
1.7	RLC series circuits - Problems	1
1.8		1
	Introduction to three phase system Electrical Machines	ı
2		1 4
2.1	Construction and Working principle of DC Generator	1
2.2	Types and Applications of Separately and Self excited DC Generators	1
2.3	EMF equation of DC Generator	1
2.4	Working Principle of DC motors	1
2.5	Torque Equation, Types and Applications	1
2.6	Construction, Working principle and Applications of Transformer	1
2.7	Construction, Working principle and Applications of Three phase Alternator	1
2.8	Construction, Working principle and Applications of Synchronous motor	1
2.9	Construction, Working principle and Applications of Three Phase Induction Motor	1
3	Electrical Installations	
3.1	Domestic wiring, types of wires and cables	1
3.2	Earthing, protective devices	2
3.3	Switch fuse unit- Miniature Circuit Breaker	1
3.4	Molded Case Circuit Breaker- Earth Leakage Circuit Breaker	1
3.5	Batteries and types	2
3.6	UPS	1
3.7		1
4	Safety precautions and First Aid	'
	Analog Electronics	4
4.1	Introduction to Semiconductor Materials	1
4.2	Characteristics and Applications of PN Junction Diodes	2
4.3	Characteristics and Applications of Zener Diode	1
4.4	Bipolar Junction Transistor	1
4.5	Biasing & Configuration (NPN)	2
4.6	Regulated power supply unit	1
4.7	Switched mode power supply	1
5	Measurements and Instrumentation	
5.1	Functional elements of an instrument	1
5.2	Standards and calibration	1
5.3	Moving Coil meters - Operating Principle, types	1
5.4	Moving Iron meters - Operating Principle, types	1
5.5	Operating principles and Types of Wattmeter	1
5.6	Energy Meter	1
5.7	Instrument Transformers – CT & PT	1
5.7	DSO- Block diagram- Data acquisition	2
5.5	Total	

Course Designer(s)

- Mr.S.Srinivasan srinivasan@ksrct.ac.in
 Ms.R.Radhamani radhamani@ksrct.ac.in
 Ms.S.Jaividhya jaividhya@ksrct.ac.in
 Dr.S.Gomathi gomathi@ksrct.ac.in

- 5. Mr.T.Prabhu - prabhut@ksrct.ac.in

60 MY 001	Environmental Studies and	Category	L	Т	Р	Credit
00 1411 001	Climate Change	MC	2	0	0	0

- To understand the impact climate changes in ecosystem and biodiversity.
- To analyze the impacts of pollution, control and legislation.
- To explain the importance of sustainable development practices.
- To explore the significance of organic farming.
- To identify the Geo-spatial tools for resource management.

Pre-requisites

• Nil

Course Outcomes

CO1	Interpret the impacts of pollution on climate change	Understand
CO2	Categorize the wastes and its management.	Analyze
CO3	Identify the different types of sustainable practices	Apply
CO4	Classify the organic farming techniques	Apply
CO5	Categorize the Geo-spatial tools for resource management	Analyze

Маррі	Mapping with Programme Outcomes														
COs	POs												PSO's		
COS	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1	3	2	-	-	-	-	3	-	-	-	-	2	-	-	-
CO2	3	2	-	-		3	3	2	-	-	-	2	-	-	-
CO3	3	2	-	-	•	3	3	2	-	-	-	2	-	-	-
CO4	3	2	-	-	•	2	3	-	-	-	-	2	-	-	-
CO5	3	2	-	-	3	-	2	-	-	-	-	2	-	-	-
3 - Str	ong; 2	- Mediu	m; 1 - So	ome											

Assessment Pattern					
Bloom's Category		ssessment Tests (30 irks)		uiz marks)	Seminar presentation
	Case Study	Activity Report	Quiz 1	Quiz 2	(50 marks)
Remember	10	10	5	5	10
Understand	30	20	10	10	15
Apply	-	30	-	5	15
Analyze	20	-	5	-	10
Evaluate	-	-	-		-
Create	-	-	-		-
Total	60	60	20	20	50

				Food Tech		mous R202		
		60 MY 001			s and Clima	te Change		
		lours/Week		Total	Credit		ximum Marks	<u> </u>
Semes	ter L	T	Р	Hours	C	CA	ES	Total
II	2	0	0	30	0	100	-	100
Pollutio	on and its Impact	on Climate	Change*			1		
Chang Sector Action	ion: Sources and ge - Ozone Layer rs – Agriculture, F n Plan on Climate col, Montreal Proto	Depletion - Forestry and Change. II	Acid Rain. I Ecosystem PCC, UNFC	Carbon Foo – Climate (tprint - Clima	ate Change	on Various	[6]
Vaste Swac Biomed	rated Waste Mana - Types and Clas hh Bharat Abhiya dical Waste - F ls. Waste Water T	sification. P an – Comm RiskManage	ercial Waste ment: Colle	e, Plastic Wa ection, Segr	aste, Domes	stic Waste, I		[6]
Sustai – Eco Hydro	inable Developme inable Developme - Friendly Plastic electric Power. W	ent Goals (S – Alternate	DGs) – Gree Energy: Hy	/drogen – B	Bio-Fuels – S	-	-	[0]
	d Water Recharge	and Rainwa		-	ent,			[6]
Enviro Organ	onment and Agric nic Farming – Bio-F Gardening and Irriq	and Rainwa culture**** Pesticides- C	ter Harvestin	ng. Bio Composi	ting, Vermi- (Green	[6]
Enviro Organ Roof C Auditin Geo-S Data Foreca	onment and Agric nic Farming – Bio-F Gardening and Irriq	e and Rainwa culture**** Pesticides- C gation. Wast I Resource I n Environm mote Sensin	Composting, e Land Recla Managemen ent Informat g and Geogr	Bio Composi amation. Clim t tion- Digital raphical Info	ting, Vermi- (nate Resilien Image Proc	t Agriculture.	ications in	
Enviro Organ Roof C Auditir Geo-S Data Foreca Web (onment and Agric nic Farming – Bio-F Gardening and Irric ng Science in Natural Base Software in asting. GPS - Rer WWW) - Environn	e and Rainwa culture**** Pesticides- C gation. Wast I Resource I n Environm mote Sensin	Composting, e Land Recla Managemen ent Informat g and Geogr	Bio Composi amation. Clim t tion- Digital raphical Info	ting, Vermi- (nate Resilien Image Proc	t Agriculture.	ications in	[6]
Enviro Organ Roof C Auditir Geo-S Data Foreca Web (onment and Agric nic Farming – Bio-F Gardening and Irric ng Science in Natural Base Software in asting. GPS - Rer WWW) - Environn	e and Rainwa culture**** Pesticides- C gation. Wast I Resource I n Environm mote Sensin	Composting, e Land Recla Managemen ent Informat g and Geogr	Bio Composi amation. Clim t tion- Digital raphical Info	ting, Vermi- (nate Resilien Image Proc	t Agriculture.	ications in Vorld Wide	[6]
Corgan Roof Condition Audition Geo-Son Data Foreca Web (onment and Agric nic Farming – Bio-F Gardening and Irric ng Science in Natural Base Software in asting. GPS - Rer WWW) - Environn	e and Rainwa culture**** Pesticides- C gation. Wast I Resource I n Environm note Sensin nental Inform	Composting, e Land Recla Managemen ent Informat g and Geogr nation Syster	Bio Composi amation. Clim t tion- Digital raphical Inform (ENVIS).	ting, Vermi- (nate Resilien Image Proc rmation Syst	t Agriculture. eessing Appl em (GIS) - V	ications in Vorld Wide otal Hours:	[6]
Enviro Organ Roof C Auditin Geo-S Data Foreca Web (onment and Agric nic Farming – Bio-F Gardening and Irric ng Science in Natural Base Software in asting. GPS - Rer WWW) - Environn Dok(s): Anubha Kaushik , publishers;6 th Edince(s):	e and Rainwa culture**** Pesticides- C gation. Wast Resource I n Environm note Sensin nental Inform C P Kaushik ition 2018.	Composting, e Land Recla Managemen ent Informat g and Geogration System . Perspective	Bio Composi amation. Clim t tion- Digital raphical Inform (ENVIS).	ting, Vermi- (nate Resilien Image Proc rmation Syst	t Agriculture. eessing Appl em (GIS) - V T es, New Age	ications in Vorld Wide otal Hours:	[6]
Enviro Organ Roof C Auditin Geo-S Data Foreca Web (conment and Agricular Farming – Bio-Fardening and Irrigung Science in Natural Base Software in asting. GPS - Rer WWW) - Environn Cook(s): Anubha Kaushik, publishers;6 th Edi	e and Rainwa culture**** Pesticides- C gation. Wast Resource I n Environm note Sensin nental Inform C P Kaushik ition 2018.	Composting, e Land Recla Managemen ent Informat g and Geogration System . Perspective	Bio Composi amation. Clim t tion- Digital raphical Inform (ENVIS).	ting, Vermi- (nate Resilien Image Proc rmation Syst	t Agriculture. eessing Appl em (GIS) - V T es, New Age	ications in Vorld Wide otal Hours:	[6]
Corgan Roof Condition Auditing Geo-Solution Forecast Web (1997) Text Both Reference 1. Condition 1. Conditio	onment and Agric nic Farming – Bio-F Gardening and Irric ng Science in Natural Base Software in asting. GPS - Rer WWW) - Environn Dok(s): Anubha Kaushik , publishers;6 th Edince(s):	e and Rainwa culture**** Pesticides- C gation. Wast I Resource I In Environm mote Sensin nental Inform C P Kaushik ition 2018.	Composting, le Land Recla Management Informating and Geographic System Description: Description:	Bio Composi amation. Clim t ion- Digital raphical Inform (ENVIS). es in Environ	ting, Vermi- (nate Resilien Image Procrmation Systemental Studi	t Agriculture. eessing Appl em (GIS) - V T es, New Age	ications in Vorld Wide otal Hours: International	[6]

^{*}SDG: 13 – Climate Action

^{**}SDG: 4 – Clean Water and Sanitation

^{***}SDG: 6 - Affordable and Clean Energy

^{****}SDG: 3 - Good Health and Well-being

S.No	Topic	No. of hours
1.0	Pollution and its impact on climate change	
1.1	Pollution: Sources and impacts of air pollution – greenhouse effect- Global warming- climate change - ozone layer depletion - acid rain	2
1.2	Climate change on various sectors: Agriculture, forestry and ecosystem. – climate change mitigation and adaptation	1
1.3	Action plan on climate change - IPCC, UNFCCC, Kyoto Protocol, Montreal Protocol on Climatic Changes	1
2.0	Integrated Waste Management	
2.1	Waste - Types and classification. Principles of waste management (5R approach) - Swachh Bharat Abhiyan	1
2.2	Commercial waste, plastic waste, domestic waste, e-waste and biomedical waste	1
2.3	Risk management: Collection, segregation, treatment and disposal methods.	1
3.0	Sustainable development practices	
3.1	Sustainable development goals (SDGs) – Green computing- Carbon trading - Green building – Eco- friendly plastic	1
3.2	Alternate energy: Hydrogen – Bio-fuels – Solar energy – Wind – Hydroelectric power	2
3.3	Water scarcity- Watershed management, ground water recharge and rainwater harvesting	1
4.0	Environment and Agriculture	
4.1	Organic farming – bio-pesticides	1
4.2	Composting, bio composting, vermi-composting	1
4.3	Roof gardening and irrigation	1
4.4	Waste land reclamation. Climate resilient agriculture, Green auditing	1
5.0	Geo-science in natural resource management	
5.1	Data base software in environment information, Digital image processing applications in forecasting	2
5.2	GPS, Remote Sensing and Geographical Information System (GIS)	1
5.3	World wide web (www), Environmental information system (ENVIS)	1
	Total	20

Course Designer(s)

- 1. Dr.T.A.Sukantha sukantha@ksrct.ac.in
- 2. Dr.B.Srividhya srividhya@ksrct.ac.in
- 3. Dr.S.Meenachi meenachi@ksrct.ac.in
- 4. Ms.D.Kirthiga kiruthiga@ksrct.ac.in

B.TECH.(FT)-2022-2023

60 GE 001	Heritage of Tamils ^{&}	Category	L	T	Р	Credit
00 GE 001	(Common to all Branches)	GE	1	0	0	1 ^{&}

Objectives

- To learn the extensive literature of classical Tamil.
- To review the fine arts heritage of Tamil culture.
- To realize the contribution of Tamils in Indian freedom struggle

Pre-requisites

• Nil

Course Outcomes

CO1	Recognize the extensive literature of Tamil and its classical nature.	Understand
CO2	Apprehend the heritage of sculpture, painting and musical instruments of ancient people.	Understand
CO3	Review on folk and martial arts of Tamil people.	Understand
CO4	Insight thinai concepts, trade and victory of Chozha dynasty.	Understand
CO5	Realize the contribution of Tamil in Indian freedom struggle, self-esteem movement and siddha medicine.	Understand

	lapping with Programme Outcomes POs										PSOs				
COs	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1	-	-	-	-	-	-	3	3	-	2	-	3	-	-	-
CO2	-	-	-	-	-	-	3	3	-	2	-	3	-	-	-
CO3	-	-	-	-	-	-	3	3	-	2	-	3	-	-	-
CO4	-	-	-	-	-	-	3	3	-	2	-	3	-	-	-
CO5	-	-	-	-	-	-	3	3	-	2	-	3	-	-	-

Assessment Pattern									
Bloom's	Continuous Asses	ssment Tests (Marks)	Model Examination (Marks)						
Category	1	2	Model Examination (Marks)						
Remember	30	30	30						
Understand	30	30	70						
Apply	-	-	-						
Analyse	-	-	-						
Evaluate	-	-	-						
Create	-	-	-						
Total	60	60	100						

Syllab	116							B.TECH.(FT)-	2022-2023	
Cyliab	us	K.	S.Rangasan	ny College o	of Technolog	av – Autono	mous R202	2		
			on turiguour.		Food Tech			_		
					- Heritage of					
			Hours/Week		Total	Credit	M	aximum Mar	ks	
Seme	ster	L	T	Р	Hours	C	CA	ES	Total	
II		1	0	0	15	1*	100	-	100	
Langu	age an	d Literatur	е							
Literate Literate in Tam of Mod	Language Families in India - Dravidian Languages - Tamil as a Classical Language - Classical Literature in Tamil - Secular Nature of Sangam Literature - Distributive Justice in Sangam Literature - Management Principles in Thirukural - Tamil Epics and Impact of Buddhism & Jainism in Tamil Land - Bakthi Literature Azhwars and Nayanmars - Forms of Minor Poetry - Development of Modern Literature in Tamil - Contribution of Bharathiyar and Bharathidhasan. Heritage - Rock Art Paintings to Modern Art - Sculpture									
Hero S Making Making Temple	Stone tog g -Mass g of Mu es in Sc	Modern So sive Terract sical Instru ocial and Ec	ntings to Mocculpture - Brocotta Sculptu ments - Mriconomic Life conomic Life conom	nze Icons - res, Village Ihangam, Pa	Tribes and T Deities, Th	iruvalluvar S	Statue at Ka	anyakumari,	[3]	
Theruk Valari,	coothu, Tiger D	ance - Spo	n, Villu Pattu, orts and Game			am, Leather	Puppetry, S	ilambattam,	[3]	
Flora Literate and Po Contri	Thinai Concept of Tamils Flora and Fauna of Tamils & Aham and Puram Concept From Tholkappiyam and Sangam Literature - Aram Concept of Tamils - Education and Literacy During Sangam Age - Ancient Cities and Ports of Sangam Age - Export And Import During Sangam Age - Overseas conquest of Cholas. Contribution of Tamils to Indian National Movement and Indian Culture Contribution of Tamils to Indian Freedom Struggle - The Cultural Influence of Tamils Over The									
Other	Parts of	f India – Se	lf-Respect Me Manuscripts	ovement - R	ole of Siddha	a Medicine in	Indigenous	Systems of	[3]	
							T	otal Hours:	15	
Text B	Book(s)					/				
1.		வரலாறு - ப ர் கழகம்).	மக்களும் பண்	பாடும் கே. 🤇	ீக . பிள்ளை	(வெளியீடு: த	நமிழ்நாடு ப <u>ா</u>	டநூல் மற்றும்	கல்வியியல்	
2.	கணினி	த் தமிழ் – மு	னைவர் இல. சு	ந்தரம். (விகட	ன் பிரசுரம்).					
3.			க்கரையில் சங்க			லியல் துறை ெ	வளியீடு).			
4.	பொரு	நை - ஆற்றங்க	கரை நாகரீகம்	(தொல்லியல் :	துறை வெளியீ	ீடு).				
5.			ils (Dr.K.K.Pil	• •	-	•	C and RMRL	. – (in print).		
6.	Social							International	Institute of	
7.	Historia	cal Heritage	e of the Ta ute of Tamil S		.Subaraman	ian, Dr.K.D.	Thirunavuk	karasu) (Pub	olished by:	
8.	The Co				ulture (Dr.M.	.Valarmathi)	(Published b	y: Internation	nal Institute	
9.	Keelad	i - 'Sangan	n City Civiliza mil Nadu Tex					shed by: Dep nil Nadu)	artment of	
10.		in the His						llay) (Publish	ed by: The	
11.	Poruna	i Civilizatio	n (Jointly Puces Corporati			of Archaeo	logy & Tam	il Nadu Text	Book and	
12.						Published by	/: RMRL) – F	Reference Bo	ok.	
				<u> </u>						

B.TECH.(FT)-2022-2023

60 GE 001	தமிழர் மரபு	Category	L	Т	Р	Credit
00 GE 001	(அனைத்து துறைகளுக்கும் பொதுவானது)	GE	1	0	0	1 ^{&}

பாடத்தின் நோக்கங்கள்:

- தமிழ் மொழியின் இலக்கணச் செறிவைக் கற்றுணர்தல்.
- தமிழர் பண்பாட்டின் நுண்கலைகள் பற்றிய ஒரு மீள்பார்வை.
- இந்திய சுதந்திரப் போராட்டத்தில் தமிழர்களின் பங்களிப்பை உணருதல்

Pre-requisites

தேவை இல்லை

பாடம்கற்றதின் விளைவுகள்

பாடத்தை வெற்றிகரமாக கற்று முடித்த பின்பு, மாணவர்களால் முடியும் விளைவுகள்

CO1	தமிழ் மொழியின் செந்தண்மை மற்றும் இலக்கியம் குறித்த தெரிதல்.	புரிதல்
CO2	தமிழர்களின் சிற்பக்கலை, ஓவியக்கலை மற்றும் இசைக்கருவிகள் குறித்ததெளிவு.	புரிதல்
CO3	தமிழர்களின் நாட்டுப்புறக்கலைகள் மற்றும் வீரவிளையாட்டுகள் குறித்த தெளிவு.	புரிதல்
CO4	தமிழர்களின் திணைக் கோட்பாடுகள், சங்ககால வணிகம் மற்றும் சோழர்களின் வெற்றிகள் குறித்த தகவல்கள்.	புரிதல்
CO5	இந்திய தேசிய இயக்கம், சுயமரியாதையை இயக்கம் மற்றும் சித்த மருத்துவம் பற்றிய புரிதல்.	புரிதல்

COs	POs	vith Programme Outcomes POs										PSOs			
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1	-	-	-	-	-	-	3	3	-	2	-	3	-	-	
CO2	-	-	-	-	-	-	3	3	-	2	-	3	-	-	-
CO3	-	-	-	-	-	-	3	3	-	2	-	3	-	-	-
CO4	-	-	-	-	-	-	3	3	-	2	-	3	-	-	-
CO5	-	-	-	-	-	-	3	3	-	2	-	3	-	-	-

Assessment Pattern										
Bloom's Catagony	Continuous Assessment Tes	sts (Marks)	Model Everination (Marks)							
Bloom's Category	1	2	Model Examination (Marks)							
Remember	30	30	30							
Understand	30	30	70							
Apply	-	-	-							
Analyse	-	-	-							
Evaluate	-	-	-							
Create	-	-	-							
Total	60	60	100							

Syllabus	K.S.Rangasamy College of Technology – Autonomous R2022								
B. Tech. Food Technology									
60 GE 001- தமிழர் மரபு									
Hours/Week Total Credit Maximum Marl						rks			
Semester	L	Т	Р	Hours	С	CA	ES	Total	
=	1	0	0	15	1*	100	-	100	
இந்திய மொழ சங்க இலக்கிய மேலாண்மைக இலக்கியம், ஆ	1 0 0 15 1* 100 - பொழி மற்றும் இலக்கியம்: இந்திய மொழிக் குடும்பங்கள் – திராவிட மொழிகள் – தமிழ் ஒரு செம்மொழி – தமிழ் செவ்விலக்கியங்கள் - சங்க இலக்கியத்தின் சமயச் சார்பற்ற தன்மை – சங்க இலக்கியத்தில் பகிர்தல் அறம் – திருக்குறளில் மேலாண்மைக் கருத்துக்கள் - தமிழ்க் காப்பியங்கள் - தமிழகத்தில் சமண பௌத்த சமயங்களின் தாக்கம் – பக்தி இலக்கியம், ஆழ்வார்கள் மற்றும் நாயன்மார்கள் - சிற்றிலக்கியங்கள் - தமிழில் நவீன இலக்கியத்தின் வளர்ச்சி – தமிழ் இலக்கிய வளர்ச்சியில் பாரதியார் மற்றும் பாரதிதாசன் ஆகியோரின் பங்களிப்பு.								
மரபு – பாறை	ஓவியங்கள் மு	தல் நவீன ஒவ்	ியங்கள் வரை	−சிற்பக் கலை:				[3]	

Passed in BoS Meeting held on 23.12.22 Approved in Academic Council Meeting held on 07.01.23



B.TECH.(FT)-2022-2023

	B.TECH.(FT)	-2022-2023						
நடுக	ல் முதல் நவீன சிற்பங்கள் வரை – ஐம்பொன் சிலைகள் – பழங்குடியினர் மற்றும் அவர்கள் தயாரிக்கும்							
கைவி	னைப் பொருட்கள், பொம்மைகள் - தேர் செய்யும் கலை – சுடுமண் சிற்பங்கள் – நாட்டுப்புறத்							
தெய்	ນங்கள் — குமரிமுனையில் திருவள்ளுவர் சிலை — இசைக் கருவிகள் — மிருதங்கம், பறை, வீணை, யாழ்,							
நாதள்	வரம் – தமிழர்களின் சமூக பொருளாதார வாழ்வில் கோவில்களின் பங்கு.							
நாட்டு	ப்புறக் கலைகள் மற்றும் வீர விளையாட்டுகள்:							
தெருக	க்கூத்து, கரகாட்டம், வில்லுப்பாட்டு, கணியான் கூத்து, ஒயிலாட்டம், தோல்பாவைக் கூத்து,	[3]						
சிலம்	சிலம்பாட்டம், வளரி, புலியாட்டம், தமிழர்களின் விளையாட்டுகள்.							
தமிழ	ர்களின் த <mark>ிணைக் கோட்பாடுகள்:</mark>							
தமிழ	கத்தின் தாவரங்களும், விலங்குகளும் – தொல்காப்பியம் மற்றும் சங்க இலக்கியத்தில் அகம் மற்றும் புறக்							
கோட்	பாடுகள் - தமிழர்கள் போற்றிய அறக்கோட்பாடு - சங்ககாலத்தில் தமிழகத்தில் எழுத்தறிவும், கல்வியும் -	[3]						
சங்ககால நகரங்களும் துறை முகங்களும் - சங்க காலத்தில் ஏற்றுமதி மற்றும் இறக்குமதி – கடல்கடந்த								
நாடுக	ளில் சோழர்களின் வெற்றி.							
இந்தி	ய தேசிய இயக்கம் மற்றும் இந்திய பண்பாட்டிற்குத் தமிழர்களின் பங்களிப்பு:							
இந்தி	இந்திய விடுதலைப்போரில் தமிழர்களின் பங்கு — இந்தியாவின் பிறப்பகுதிகளில் தமிழ்ப் பண்பாட்டின்							
தாக்கம	ம் - சுயமரியாதை இயக்கம் – இந்திய மருத்துவத்தில், சித்த மருத்துவத்தின் பங்கு – கல்வெட்டுகள்,	[3]						
கைபெ	பழுத்துப்படிகள் - தமிழ்ப் புத்தகங்களின் அச்சு வரலாறு.							
Total	Hours:	15						
Text	Book(s):							
1	தமிழக வரலாறு - மக்களும் பண்பாடும் கே. கே . பிள்ளை (வெளியீடு: தமிழ்நாடு பாடநூல் மற்றும் கல்வியியல்							
1.	பணிகள் கழகம்).							
2.	கணினித்தமிழ் – முனைவர் இல. சுந்தரம். (விகடன் பிரசுரம்).							
3.	கீழடி – வைகை நதிக்கரையில் சங்ககால நகர நாகரீகம் (தொல்லியல் துறை வெளியீடு).							
4.	பொருநை - ஆற்றங்கரை நாகரீகம் (தொல்லியல் துறை வெளியீடு).							
5.	Social Life of Tamils (Dr.K.K.Pillay) A joint publication of TNTB & ESC and RMRL – (in print).							
6.	Social Life of the Tamils - The Classical Period (Dr.S.Singaravelu) (Published by: Internationa	I Institute of						
0.	Tamil Studies.							
7.	Historical Heritage of the Tamils (Dr.S.V.Subaramanian, Dr.K.D. Thirunavukkarasu) (Publishe	d by:						
ļ	International Institute of Tamil Studies).							
8.	The Contributions of the Tamils to Indian Culture (Dr.M.Valarmathi) (Published by: Internation	al Institute						
<u> </u>	of Tamil Studies.)							
9.	Keeladi - 'Sangam City Civilization on the banks of river Vaigai' (Jointly Published by: Departm	nent of						
	Archaeology & Tamil Nadu Text Book and Educational Services Corporation, Tamil Nadu)							
10.	Studies in the History of India with Special Reference to Tamil Nadu (Dr.K.K.Pillay) (Published	i by: The						
	Author). Downsi Civilization (Jointhy Bublished by Donortment of Archaeology & Tamil Nody Toyt Boo	lı and						
11.	Porunai Civilization (Jointly Published by: Department of Archaeology & Tamil Nadu Text Boo	k and						
10	Educational Services Corporation, Tamil Nadu).	nok						
12.	Journey of Civilization Indus to Vaigai (R.Balakrishnan) (Published by: RMRL) - Reference Bo	JUK.						

60 CS 0P1	C Programming	Category	L	T	Р	Credit
00 00 01 1	Laboratory	ES	0	0	4	2

- To enable the students to apply the concepts of C to solve simple problems
- To use selection and iterative statements in C programs
- To apply the knowledge of library functions in C programming
- To implement the concepts of arrays, functions, structures and pointers in C
- To implement the file handling operations through C

Pre-requisites

NIL

Course Outcomes

On the successful completion of the course, students will be able to

On the Succ	cessial completion of the course, students will be able to	
CO1	Implement computational problems using selection and iterative statements	Apply
CO2	Demonstrate C program to manage collection of related data.	Apply
СОЗ	Design and Implement different ways of passing arguments to functions, Recursion and implement pointers concepts.	Apply
CO4	Develop a C program to manage collection of different data using structures, Union, user-defined data types and preprocessor directives.	Apply
CO5	Demonstrate C program to store and retrieve data using file concepts.	Apply

Mappii	ng with	Progr	amme	Outco	mes										
COs						Р	Os							PSO	S
COS	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1	3	3	3	-	3	-	-	-	2	2	-	2	3	3	-
CO2	3	3	3	-	3	-	-	-	2	2	-	2	3	3	-
CO3	3	3	3	-	3	-	-	-	2	2	-	2	3	3	-
CO4	3	3	3	-	3	-	-	-	2	2	-	2	3	3	-
CO5	3	3	3	-	3	-	-	-	2	2	-	2	3	3	-
3 - Stro	ong; 2 -	- Mediu	m; 1 - S	Some											

Assessment Pattern

Bloom's Category	Lab Experiments A		Model Examination (Marks)	End Sem Examination (Marks)
	Lab	Activity	- (marke)	(marko)
Remember	-	-	-	=
Understand	-	12	-	=
Apply	50	13	100	100
Analyze	-	-	-	=
Evaluate	-	-	-	-
Create	-	-	-	=
Total	50	25	100	100

		K.S.Ranga	samy Colle	ege of Techi	nology – Αι	itonomous	R2022					
	B.Tech. Food Technology											
	60 CS 0P1 – C Programming Laboratory											
Semester	Н	ours/Week	(Total	Credit		Maximum	Marks				
Semester	L T P Hrs C CA ES Total											
II	0	0	4	60	2	60	40	100				

List of Experiments:

- 1. Implementation of Simple computational problems using various formulas*.
- 2. Implementation of Problems involving Selection statements*.
- 3. Implementation of Iterative problems e.g., sum of series*.
- 4. Implementation of 1D Array manipulation*.
- 5. Implementation of 2D Array manipulation*.
- 6. Implementation of String operations*.
- 7. Implementation of Simple functions and different ways of passing arguments to functions and Recursive Functions*.
- 8. Implementation of Pointers*
- 9. Implementation of structures and Union*.
- 10. Implementation of Bit Fields, Typedef and Enumeration*.
- 11. Implementation of Preprocessor directives*.
- 12. Implementation of File operations*.

Course Designer(s)

1. Dr.P.Kaladevi - kaladevi@ksrct.ac.in



^{*}SDG 4 - Quality Education

60 EE 0P1	Basic Electrical and Electronics Engineering	Category	L	Т	Р	Credit
	Laboratory	ES	0	0	4	2

- To acquire knowledge in conducting basic electrical laws
- To gain knowledge on three phase power measurement
- To train the students in conducting load tests on electrical machines
- To gain practical experience in characterizing electronic devices
- To gain practical experience in using measuring devices

Pre-requisites

NIL

Course Outcomes

On the successful completion of the course, students will be able to

CO1	Practice experimental methods to verify the Ohm's and Kirchhoff's Laws.	Apply
CO2	Perform the three-phase power measurement.	Apply
CO3	Demonstrate the load characteristics of electrical machines.	Apply
CO4	Describe the characteristics of basic electronic devices.	Understand
CO5	Use the appropriate measuring devices to measure the electrical parameters.	Apply

Mappii	ng wi	th Prog	gramme	e Outco	omes										
COs						F	POs							PSOs	
003	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1	3	2	-	-	-	-	-	3	2	-	-	-	-	-	-
CO2	3	2	-	-	-	-	-	3	2	-	2	-	-	-	-
CO3	3	2	-	-	-	-	-	3	2	-	2	-	-	2	2
CO4	3	2	-	-	-	-	-	3	2	2	2	-	-	2	2
CO5	3	1	-	-	-	-	-	3	2	2	2	-	-	1	1
3- Stro	ng;2-	Mediun	n;1-Low	1											

Assessment Pattern

Bloom's Category	Lab Experiments	Assessment (Marks)	Model Examination (Marks)	End Sem Examination (Marks)
	Lab	Activity	()	()
Remember	-	-	-	-
Understand	25	13	50	50
Apply	25	12	50	50
Analyze	-	-	-	50
Evaluate	-	-	-	-
Create	-	-	-	-
Total	50	25	100	100

	K	.S.Rangasar	ny College o	of Technolog	gy – Autono	mous R2022	2				
	B.Tech. Food Technology										
	60 EE 0P1 - Basic Electrical and Electronics Engineering Laboratory										
Semester	H	lours/Week		Total	Credit	Ma	ximum Mark	s			
Semester	L	Т	Р	Hrs	С	CA	ES	Total			
II	0	0	4	60	2	60	40	100			

List of Experiments:

- 1. Verification of Ohm's and Kirchhoff's Laws.
- 2. Measurement of Three Phase Power.
- 3. Load test on DC Shunt Motor.
- 4. Load test on Self Excited DC Generator.
- 5. Load test on Single phase Transformer.
- 6. Load test on Induction Motor.
- 7. Characteristics of PN and Zener Diodes.
- 8. Characteristics of BJT (CE).
- 9. Calibration of Single-Phase Energy Meter.*
- 10. Mini Project.*

Course Designer(s)

Mr.S.Srinivasan
 Ms.R.Radhamani
 Ms.S.Jaividhya
 Dr.S.Gomathi
 srinivasan@ksrct.ac.in
 radhamani@ksrct.ac.in
 jaividhya@ksrct.ac.in
 gomathi@ksrct.ac.in

5. Mr.T.Prabhu - <u>prabhut@ksrct.ac.in</u>

^{*}SDG 9 - Industry Innovation and Infrastructure

60 CG 0P1	Career Skill Development I	Category	L	Т	Р	Credit
60 CG UP1	Career Skill Development I	CG	0	0	2	1*

- To help learners improve their vocabulary and to enable them to use words appropriately in different academic and professional contexts
- To help learners develop strategies that could be adopted while reading texts
- To help learners acquire the ability to speak effectively in english in real life and career related situations
- To equip students with effective speaking and listening skills in english
- To facilitate learners to enhance their writing skills with coherence and appropriate format effectively

Pre-requisites

Basic knowledge of reading and writing in English

Course Outcomes

CO1	Listen and comprehend complex academic texts	Understand
CO2	Read and infer the denotative and connotative meanings of technical texts	Analyze
CO3	Write definitions, descriptions, narrations, and essays on various topics	Apply
CO4	Speak fluently and accurately in formal and informal communicative contexts	Apply
CO5	Appraise the verbal ability skills in the career development and professional contexts	Analyze

Mappin	g wit	h Prog	ramme	Outco	omes										
COs							POs							PSOs	
003	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1	-	-	-	-	-	-	-	2	3	3	2	3			
CO2	-	-	-	-	-	-	-	2	3	3	2	3			
CO3	-	-	-	-	-	-	-	2	3	3	2	3			
CO4	-	-	-	-	-	-	-	2	3	3	2	3			
CO5	-	-	-	-	-	-	-	2	3	3	2	3			
3 - Stro	ng; 2	- Mediu	ım; 1 - :	Some											

C.,		ь	-	_
Svi	ша		10)	•

					ege of Techno		onomous	6 R2U22		
					ech - Food T					
					1 - Career Ski					
Semester	nester		s/We		Total	Credit	Maximum Mark			
		L	Т	Р	Hours	С	CA	ES	Total	
<u> </u>		0	0	2	30	1*	100	00	100	
Listen to Po	dcasts/ 1	TED Talk	ks/ A	necdote	etails - Audio / s / Stories / I n Celebrities - L	Event		ormal) -	[6]	
Personal Ex _l Documentari	periences ies / Pode esenting	s / Event casts/ In a Produ	s; In	terviewir ews - Pi	onversation - ng a Celebrity; cture Descript Falk; Mini Pre	Reporting ion; Giving	/ And Su Instructio	mmarizing of n to Use the	[6]	
Brochures (Technical - Biograp	Context	i), Šo avelo	ocial Me ogues, N	ng & Scanning dia Messages Jewspaper Re and User	Relevant	to Techni	cal Contexts	[6]	
Writing * Writing Lette										
Paragraph T Instructions;	exting, Sand Prod	Short Replace	port ess	on an E Descripti	 Basics and Event (Field Ton - Note-Makon Note 	rip Etc.) - :ing/Note-T	Definition: aking;		[6]	
Paragraph T Instructions; Recommend Verbal Abilit Reading Cor	exting, S and Prod lations; T ty I * mprehens	Short Re luct /Proc Fransferri	port cess l ing I	on an E Descripti Informati Cloze Te	vent (Field T on - Note-Mak	rip Etc.) - ing / Note-T n-Verbal (C	Definitions Taking; Charts,	S;	[6] [6]	
Paragraph T nstructions; Recommend Verbal Abilit Reading Cor	exting, S and Prod lations; T ty I * mprehens	Short Re luct /Proc Fransferri	port cess l ing I	on an E Descripti Informati Cloze Te	event (Field Ton - Note-Makon From No	rip Etc.) - ing / Note-T n-Verbal (C	Definitions Taking; Charts, Thereof Thereof	S;		
Paragraph T Instructions; Recommend Verbal Abilit Reading Cor and Paraphra	exting, S and Prod lations; T ty I * nprehens ase – Erro	Short Re luct /Proc Fransferri	port cess l ing I	on an E Descripti Informati Cloze Te	event (Field Ton - Note-Makon From No	rip Etc.) - ing / Note-T n-Verbal (C	Definitions Taking; Charts, Thereof Thereof	s; 	[6]	
Paragraph T Instructions; Recommend Verbal Abilit Reading Cor and Paraphra	Texting, S and Prod lations; T ty I * mprehens ase – Erro):	Short Re luct /Proc Fransferri	port cess l ing I	on an E Descripti Informati Cloze Te	event (Field Ton - Note-Makon From No	rip Etc.) - ing / Note-T n-Verbal (C	Definitions Taking; Charts, Thereof Thereof	s; 	[6]	
Paragraph T Instructions; Recommend Verbal Abilit Reading Cor	Texting, S and Prod lations; T ty I * mprehens ase – Erro): 'English i	Short Re luct /Proc Fransferri sion (Mcq or Detect	eers	on an E Descripti Informati Cloze Te - Spelling	event (Field Ton - Note-Mak on From No est - Sequencir g Test – Sente	rip Etc.) - Ling / Note-T n-Verbal (C ng Of Sente nce	Definition: Taking; Charts, Inces – Su	s; 	[6] 30	
Paragraph T Instructions; Recommend Verbal Abilit Reading Cor and Paraphra Text Book(s Reference(s	exting, S and Prod lations; T ty I* mprehens ase – Erro 'English to Anna Un	Short Reluct /Proc Fransferricion (Mcq or Detect for Engin hiversity, Lewis, 'V	eers 2020	on an E Descripti Informati Cloze Te - Spelling & Technol Power N	event (Field Ton - Note-Mak on From No est - Sequencing Test – Sente	rip Etc.) - ring / Note-T n-Verbal (C ng Of Senter nce Blackswan	Definition: Taking; Charts, Inces – Su Private Lto	s; Immarizing Total Hours:	[6] 30 of English,	
Paragraph T Instructions; Recommend Verbal Abilit Reading Cor and Paraphra Text Book(s Reference(s	exting, S and Prod lations; T tyl* mprehens ase – Erro): 'English' Anna Un Norman Vocabula Michael Cambrid	Short Reluct /Proc Fransferricion (Mcq or Detect for Engin hiversity, Lewis, 'V ary Book McCarth Ige Unive	eers 2020 Vord Vord y and persity	on an E Descripti Informati Cloze Te - Spelling & Technol Power M nguin Ra I Felicity Press, N	event (Field Ton - Note-Makon From Notest - Sequencing Test - Sente cologists' Orient Made Easy - Thandom House O Dell, 'Englis J. York, 2012	rip Etc.) - ing / Note-T n-Verbal (C ng Of Senter nce Blackswan ne Complete India, 2020 h Vocabula	Definition: Taking; Charts, Inces – Su Private Lte B Handboorry in Use:	immarizing Total Hours: d. Department	[6] 30 of English, a Superior	

^{*} SDG- 04- Quality Education

Course Contents and Lecture Schedule						
S.No	Торіс	No.of Hours				
1	Listening *					
1.1	Listening for General Information and Specific Details	1				
1.2	Listening to Podcasts, Documentaries and Interviews with Celebrities	1				
1.3	Narrating Personal Experiences	1				
1.4	Reading Relevant to Technical Contexts and Emails	1				
1.5	Listen to a Product and Process Descriptions	1				
2	Speaking					
2.1	Self-Introduction	1				
2.2	Summarizing of Documentaries & Picture Narration	1				
2.3	Small Talk; Mini Presentations	1				
2.4	Group Discussions, Debates & Role Plays.	1				
2.5	Group Discussions	1				
3	Reading					
3.1	Loud Reading Vs Silent Reading, Skimming & Scanning of Passages	1				
3.2	Reading Social Media Messages Relevant to Technical Contexts	1				
3.3	Reading Newspaper Reports and Travel & Technical Blogs	1				
3.4	Reading Advertisements, Gadget Reviews and User Manuals	1				
3.5	Reading Newspaper Articles and Journal Reports	1				
4	Writing					
4.1	Writing Letters – Informal and Formal	1				
4.2	Paragraph Texting	1				
4.3	Definitions and Instructions	1				
4.4	Note-Making / Note-Taking	1				
4.5	Essay Texting	1				
5	Verbal Ability					
5.1	Reading Comprehension (Mcqs) and Cloze Test	1				
5.2	Sequencing of Sentences	1				
5.3	Paraphrasing and Summarizing	1				
5.4	Error Detection and Spelling Test	1				
5.5	Prepositions	1				
		25				

Course Designer

1. Dr.A.Palaniappan - palaniappan@ksrct.ac.in

K.S.RANGASAMY COLLEGE OF TECHNOLOGY, TIRUCHENGODE - 637215 (An Autonomous Institution affiliated to Anna University) B.E. / B.Tech. Degree Programme SCHEME OF EXAMINATIONS

(For the candidates admitted in 2022-2023) THIRD SEMESTER

S.No.	Course Code	Name of the Course	Duration of Internal Exam	Weighta	ge of Marks	Pass in End S	Minimum Marks for Pass in End Semester Exam		
				Continuous Assessment *	End Semester Exam **	Max. Marks	End Semester Exam	Total	
			1	THEORY	I				
1.	60 MA 012	Fourier Transform and Numerical Methods	2	40	60	100	45	100	
2.	60 FT 301	Engineering Properties of Food Materials	2	40	60	100	45	100	
3.	60 FT 302	Biochemistry for Food Technologist	2	40	60	100	45	100	
4.	60 FT 303	Food Microbiology for Food Technologist	2	40	60	100	45	100	
5.	60 FT 304	Food Process Calculations	2	40	60	100	45	100	
6.	60 FT 305	Food Processing and Preservation	2	40	60	100	45	100	
7.	60 GE 002	Tamils and Technology / தமிழரும் ததொழில்நுட்பமும்	2	100	-	100	-	100	
8.	60 MY 002	Universal Human Values	-	100	-	100	-	100	
			PR	RACTICAL					
9.	60 FT 3P1	Food Biochemistry Laboratory	3	60	40	100	45	100	
10.	60 FT 3P2	Food Microbiology Laboratory	3	60	40	100	45	100	
11.	60 CG 0P2	Career Skill Development II	3	60	40	100	45	100	
12.	60 CG 0P6	Internship	-	100	-	100	-	100	

^{*} CA evaluation pattern will differ from course to course and for different tests. This will have to be declared in advance to students. The department will put a process in place to ensure that the actual test paper follow the declared pattern.

Passed in BoS Meeting held on 23.12.22

CHAIRMAN POARD OF STUDIES

^{**} End Semester Examination will be conducted for maximum marks of 100 and subsequently be reduced to 60 marks for theory End Semester Examination and 40 marks for practical End Semester Examination.

60 MA 012	Fourier Transform and	Category	L	T	Р	Credit
00 1112 012	Numerical Methods	BS	3	1	0	4

- To provide exposure and ability to use Fourier series.
- To familiarize the basic concepts of Fourier transform.
- To get exposed to various techniques to solve equations numerically.
- To know the concepts of interpolation and numerical integration.
- To learn the basics concepts of initial value problems.

Pre-requisites

Nil

Course Outcomes

At the en	d of the course, the students will be able to	
CO1	Obtain the Fourier series expansion for the periodic functions.	Apply
CO2	Apply Fourier transform techniques for the continuous functions.	Apply
CO3	Employ various iteration techniques for solving algebraic, transcendental and system of linear equations.	Apply
CO4	Apply different techniques to find the intermediate values and to evaluate single definite integrals.	Apply
CO5	Compute the solution for initial value problems using single and multi- step methods.	Apply

Mappir	Mapping with Programme Outcomes																
COs		POs													PSOs		
003	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3		
CO1	3	2	-	-	2	-	-	-	-	-	-	-	2	-	-		
CO2	3	2	-	-	2	-	-	-	-	-	-	-	2	-	-		
CO3	3	2	-	-	2	-	-	-	-	-	-	-	2	-	-		
CO4	3	2	-	-	2	-	-	-	-	-	-	-	2	-	-		
CO5	3	2	ı	-	2	-	•	-	-	•	-	-	2	-	-		
3 – Str	ong; 2 –	Med	ium;1 -	- Some	•	•	•		•		•		•				

Assessment Pattern				
Bloom's Category		sessment Tests larks)	Model Examination	End Sem Examination
	1	2	(Marks)	(Marks)
Remember	10	10	10	10
Understand	10	10	20	20
Apply	40	40	70	70
Analyze	0	0	0	0
Evaluate	0	0	0	0
Create	0	0	0	0
Total	60	60	100	100

Sylla	bus								
		K	K.S.Rangasa			gy-Autonom	ous (R2022)		
					h. Food Tech				
				2 – Fourier 1		nd Numerical			
Seme	ster		lours/Week		Total hrs	Credit	Maximum N		
		L	T	Р		С	CA	ES	Total
		3	1	0	60	4	40	60	100
Dirichl		ditions - Fou				Half range Fou rmonic analysi			[9]
Fourie	Fourier Transform Fourier transform pair - Fourier transform of simple functions - Fourier sine and cosine transform - [9] Properties - Convolution theorem - Parseval's identity.								
Soluti Algebi elimina	Solution of Equations and Eigen Value Problem Algebraic and Transcendental equations - Newton Raphson method – Horner's method - Gauss Selimination method – Gauss Jordan method – Iterative methods: Gauss Jacobi method – Gauss Seidel method – Eigen value of a matrix by Power method.								
Lagra forwa	inge's a ird and	nd Newton backward i	interpolation	difference i n (equal int	interpolation tervals)* - Tv rule (single in	ns (unequal in wo point and nate of the state of the stat	ntervals) - N three point G	l ewton's Gaussian	[9]
Single - Four	e step me th order	ethods: Tayl Runge-Kutt	a method for	ethod - Eule solving first	er's method -	Modified Euler ons - Multi ste or method.		lilne's	[9]
•				•		Total Hours:	45 + 15 (Tuto	orial)	60
Text E	Book(s):								
1.						lition, Khanna			
2.	Faires	, J D and Bu	ırden R L, "N	umerical Me	thods", Thom	son publicatio	ns, Fourth Ed	ition, New D	elhi,2012.
Refere	ence(s):								
1.		zig E., "Adva Reprint 201		eering Math	ematics", 10	th Edition, Joh	n Wiley & So	ns (Asia) Lir	mited,New
2.	a the second of								Khanna
3.	Comp	any Ltd, Ne	w Delhi, 201	6.	•	ations", 3 rd Ed			•
4.		asamy P, Th Delhi, 2010.	ilagavathy K	and Gunav	athi K, "Num	erical Method	s", 3rd Editior	n, Sultan Ch	and & Sons,

^{**}SDG: 4 – Quality Education

S.No.	Торіс	No. of
1.	Fourier Series	
1.1	Dirichlet's conditions	1
1.2	Fourier series - Even functions	2
1.3	Fourier series - Odd functions	1
1.4	Half range Fourier series	1
1.5	Tutorial	2
1.6	Electronically Injection System: Function, Layout and Working Principle (MPFi, GDI & CRDi)	1
1.7	Parseval's identity	1
1.8	Harmonic analysis	1
1.9	Tutorial	2
2.	Fourier Transform	
2.1	Fourier transform pair	1
2.2	Fourier transform of simple functions	1
2.3	Fourier sine transform	1
2.4	Fourier cosine transform	1
2.5	Tutorial	2
2.6	Properties of Fourier transform	1
2.7	Convolution theorem	2
2.8	Parseval'sidentity	1
2.9	Tutorial	2
3.	Solution of Equations and Eigen Value Problem	
3.1	Newton-Raphson method	1
3.2	Horner's method	1
3.3	Gaussian elimination method	1
3.4	Gauss-Jordan method	1
3.5	Tutorial	2
3.6	Gauss-Jacobi method	1
3.7	Gauss-Seidel method	2
3.8	Eigen value of a matrix by Power method	1
3.9	Tutorial	2
4.	Interpolation and Numerical Integration	
4.1	Lagrange's divided difference interpolation	2
4.2	Newton's divided difference interpolation	1
4.3	Newton's forward and backward interpolations	2
4.4	Tutorial	2
4.5	Two and three point Gaussian quadrature	1
4.6	Trapezoidal and Simpson's 1/3 and 3/8 rules	2
4.7	Tutorial	2
5.	Numerical Solution of Ordinary Differential Equations	1
5.1	Taylor series method	2
5.2	Euler's method	1
5.3	Modified Euler's method	1
5.4	Tutorial	2



5.6	Milne's predictor and corrector method	1
5.7	Adam's predictor and corrector method	1
5.8	Tutorial	2

List of MATLAB Programs:

- 1. Generate the Fourier series of f(x) in $(-\pi, \pi)$ and (-l, l), plot and visualize.
- 2. Compute the Fourier transform of f(x), plot and visualize.
- 3. Determine the solution of Non-linear equations using Iteration methods.
- 4. Illustrate Gauss-Jacobi and Gauss-Seidal method for system of linear equations.
- 5. Compute Newton's forward and backward interpolation method.
- 6. Demonstrate Trapezoidal and Simpson's rule.
- 7. Determine the solution of first order ODE using Fourth order Runge-kutta method.
- 8. Compute the solution of ODE using Milne's and Adam's Predictor and Corrector method.

Course Designer(s)

- 1. Mr.G.Mohan-mohang@ksrct.ac.in
- 2. Ms.K.Geetha- geethak@ksrct.ac.in

60 FT 301	Engineering Properties of	Category	L	Т	Р	Credit
0011301	Food Materials	PC	3	0	0	3

- To understand the physical properties of food material.
- To impart knowledge on the applications in food processing sector.
- To identify the physical, hydro and aerodynamic properties of food materials
- To know the thermal and Rheological Properties of food materials
- To learn basic principles of optical properties of foods.

Pre-requisites

NIL

Course Outcomes

CO1	Apply the various physical properties in food process design	Apply
CO2	Outline the thermal properties of foods and its measurement methods	Understand
CO3	Make use of optical and electromagnetic properties of food materials in food processes	Apply
CO4	Explain various rheological behaviour of solid, liquid and viscoelastic food materials	Understand
CO5	Choose suitable textural and color measurement techniques for food materials	Apply

Mappii	Mapping with Programme Outcomes														
COs	POs												PSOs		
COS	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1	3	3	2	3	-	-	-	-	-	-	-	-	2	2	3
CO2	3	3	-	3	-	-	-	-	-	-	-	-	-	2	3
CO3	3	3	-	3	-	-	-	-	-	-	-	-	2	2	3
CO4	3	3	-	3	-	-	-	-	-	-	-	-	-	2	3
CO5	3	3	2	3	2	-	-	-	-	-	-	-	-	2	3
3- Stro	ng;2-M	edium;	1-Low			•		•				•	•		

Assessment Pattern				
Bloom's Category	Continuous Ass (Ma	essment Tests arks)	Model Examination	End Sem Examination
	1	2	(Marks)	(Marks)
Remember	10	10	10	10
Understand	20	20	30	30
Apply	30	30	60	60
Analyze	0	0	0	0
Evaluate	0	0	0	0
Create	0	0	0	0
Total	60	60	100	100

		.S.Rangasaı			•	mousK202	2	
		CO ET 204		Food Techi		lata viala		
	-		- Engineer	Total	es of Food N		aximum Mark	
Semester	L	Hours/Week	Р	Hours	Credit C	CA	s Total	
III	3	0	0	45	3	40	60	100ai
Physical P		J	-	.0		10	1 00	100
Importance density, po coefficient internal fric	of engineering of engineering of solution of friction, and tion — definition dits application in the solution of the solution	urface area gle of repose on and deter	definitiontypes and	ns and mea lits determin	asurements, ation, rolling	Frictional presistance a	oroperties – and angle of	[9]
coefficient. methods, t	operties: f specific hea Measuremen hermal diffusi nt elevation	t of specific l ivity – Dicke	heat, therma rson's meth	al conductivit nod, Calorific	y – steady s value of fo	tate and un	steady state calorimeter,	[9]
glossimete Electrical p measureme	ndex of food index of food index, color, Transporties- elected to the methods, of the methods,	slucency – I ctrical conduc	Definitions a ctivity and its	and applicati s measureme	ons. Electro ent, dielectric	magnetic Pr properties	operties:	[9]
otner applic	cations.		ото. о, тор с	statute and c	omposition, i	Tilciowave i	leating and	
Rheologica Classification Bingham a Dehaviour- Diagrams, I	cations. Al Properties: On of rheologing Non Bingstress relaxed Rheological mentions.	gy, Stress S gham. Stres ation test, c nodels – Kelv	train behavi s strain rel reep test ai in and Maxv	iour of New lationships i nd dynamic well model. V	tonian and n solids, liq test, stress	Non- Newto uids and v -strain rpes and its	onian fluids- risco elastic	[9]
Rheologica Classification Bingham a behaviour- diagrams, I measureme Textural Pi Types of fo Shear, Pur with light, Munsel col	al Properties: on of rheolog and Non Bing stress relaxa Rheological ment methods -0	gy, Stress S gham. Stres ation test, c nodels – Kelv Capillary, Orif Texture me ration and TF t methods -S E color syste	train behaving strain related test and Maxving assuring instead assuring instead of the complete of the comple	iour of New lationships ind dynamic well model. Vand Rotational truments- Coes of food pometer and	tonian and no solids, liquest, stress /iscosity – Tyal viscometers ompression, nowders. Col	Non- Newtouids and vestrain res and its s. Snap Bendor: Interaction	onian fluids- risco elastic definitions, ling, Cutting on of object	[9]
Rheologica Classification Bingham as behaviour- diagrams, I measureme Fextural Pi Types of for Shear, Pur with light, Munsel col	al Properties: on of rheological Mone Bing stress relaxance Rheological ment methods - Coperties: ood textures, acture, Penetr Measurement or system, CI	gy, Stress S gham. Stres ation test, c nodels – Kelv Capillary, Orif Texture me ration and TF t methods -S E color syste	train behaving strain related test and Maxving assuring instead assuring instead of the complete of the comple	iour of New lationships ind dynamic well model. Vand Rotational truments- Coes of food pometer and	tonian and no solids, liquest, stress /iscosity – Tyal viscometers ompression, nowders. Col	Non- Newtouids and vestrain res and its section. Snap Bendor: Interaction Color order	onian fluids- risco elastic definitions, ling, Cutting on of object	
Rheological Classification Bingham and Dehaviour-diagrams, I measurement Fextural Propers of four Shear, Purwith light, Munsel color space	al Properties: on of rheologiand Non Bing stress relaxa Rheological ment methods - Coperties: ood textures, acture, Penetr Measurement or system, Cl	gy, Stress S gham. Stres ation test, c nodels – Kelv Capillary, Orif Texture me ration and TF t methods -S E color syste	train behaving strain related test and Maxving assuring instead assuring instead of the complete of the comple	iour of New lationships ind dynamic well model. Vand Rotational truments- Coes of food pometer and	tonian and no solids, liquest, stress /iscosity – Tyal viscometers ompression, nowders. Col	Non- Newtouids and vestrain res and its section. Snap Bendor: Interaction Color order	onian fluids- risco elastic definitions, ling, Cutting on of object er systems-	[9]
Rheologica Classification Bingham a behaviour- diagrams, I measureme Textural Pi Types of fo Shear, Pur with light, Munsel col color space	al Properties: on of rheological Mon Bing stress relaxance Rheological ment methods - Coperties: ood textures, acture, Penetr Measurement or system, Clay, Lovibond system; Lovibond system; Clay, Lovibond sy	gy, Stress S gham. Stres ation test, c todels – Kelv Capillary, Orif Texture me ration and TF t methods -5 E color systes stem.	train behaving s strain related test and Maxwice, Falling a sauring instead of the part of	iour of New lationships i nd dynamic vell model. V and Rotationa truments- Co es of food p ometer and lab	tonian and no solids, liquest, stress viscosity – Tyal viscometers compression, nowders. Colorimeter,	Non- Newtouids and vestrain research its second its sec	onian fluids- risco elastic definitions, ling, Cutting on of object er systems-	[9] 45
Rheologica Classification Bingham a behaviour- diagrams, I measureme Textural Pr Types of fr Shear, Pur with light, Munsel col color space Text Book 1. Serr 2012	al Properties: on of rheologiand Non Bingstress relaxarent methods - Coperties: ond textures, acture, Penetr Measurement or system, Clas, Lovibond system; (s): oil Sahin and Section of the Section of Section o	gy, Stress S gham. Stres ation test, c nodels – Kelv Capillary, Orif Texture me ration and Tf t methods - S E color syste stem.	train behaving s strain related test and Maxwice, Falling a sauring instead of the sauring	iour of New lationships ind dynamic well model. V and Rotational truments- Co es of food p ometer and lab	tonian and n solids, liq test, stress /iscosity – Ty al viscometers ompression, nowders. Col Colorimeter, ties of Foods	Non- Newtouids and vestrain repes and its is. Snap Bendor: Interactic Color order	onian fluids- risco elastic definitions, ling, Cutting on of object er systems-	[9] 45 ew York,
Rheologica Classification Bingham a behaviour- diagrams, I measureme Fextural Pi Types of fo Shear, Pur with light, Munsel col color space Fext Book 1. Serp 2012 2. Jam Gen	al Properties: on of rheological Mon Bing stress relaxarent methods - Coperties: ond textures, acture, Penetr Measurement or system, Clay, Lovibond system; Lovibond system; Sil Sahin and Sahin	gy, Stress S gham. Stres gham. Stres ation test, c lodels – Kelv Capillary, Orif Texture me ration and The methods - S E color syste stem. Gervet Gulum n, "Food Processing Servet Street.	train behaving s strain related to strain related to strain and Maxwice, Falling and assuring instead of the strain and the st	iour of New lationships in dynamic well model. Vand Rotational truments- Coes of food pometer and lab	tonian and In solids, liq test, stress /iscosity – Ty Il viscometers ompression, sowders. Colorimeter, ties of Foods	Non- Newtouids and vestrain upes and its section. Snap Bendor: Interaction Color order ", 1st Edition GmbH & Color CombH & Color Color CombH & Color Col	onian fluids- risco elastic definitions, ling, Cutting on of object er systems- otal Hours:	[9] 45 ew York,
Rheologica Classification Bingham a behaviour- diagrams, I measureme Textural Pi Types of for Shear, Pur with light, Munsel col color space Text Book 1. Serr 2012 2. Jam Gerr 3. Rao Frar	al Properties: on of rheologiand Non Bingstress relaxarent methods - Croperties: ood textures, acture, Penetri Measurement or system, CI a, Lovibond system; Lovibond system; CI as G. Brennarmany, 2006. M. A. and Rizicis Gp., CRC	gy, Stress S gham. Stres gham. Stres ation test, c lodels – Kelv Capillary, Orif Texture me ration and The methods - S E color syste stem. Gervet Gulum n, "Food Processing Servet Street.	train behaving s strain related to strain related to strain and Maxwice, Falling and assuring instead of the strain and the st	iour of New lationships in dynamic well model. Vand Rotational truments- Coes of food pometer and lab	tonian and In solids, liq test, stress /iscosity – Ty Il viscometers ompression, sowders. Colorimeter, ties of Foods	Non- Newtouids and vestrain upes and its section. Snap Bendor: Interaction Color order ", 1st Edition GmbH & Color CombH & Color Color CombH & Color Col	onian fluids- risco elastic definitions, ling, Cutting on of object er systems- otal Hours: n, Springer, Ne	[9] 45 ew York,
Classification Bingham as behaviour- diagrams, I measureme Textural Pi Types of for Shear, Pur with light, Munsel color space Text Book 1. Serp 2012 2. Jam Gern 3. Rao Frar Reference	al Properties: on of rheological Mon Bing stress relaxarence Rheological ment methods - Coperties: ood textures, acture, Penetr Measurement or system, Clay, Lovibond system, Clay, Lovibond system, Clay, Lovibond Sp. es G. Brennarmany, 2006. g. M. A. and Rizacis Gp., CRC sp.:	gy, Stress S gham. Stres ation test, c nodels – Kelv Capillary, Orif Texture me ration and TF t methods - S E color syste stem. Servet Gulum n, "Food Proc zvi, S. S. H., A press, 2005	train behaving signification strain relations and Maxwice, Falling and assuring instance of the properties of the proper	iour of New lationships ind dynamic well model. Nand Rotational truments- Codes of food pometer and lab sysical Proper dbook". Wiley ta""Engineer	tonian and n solids, liq test, stress /iscosity – Ty ll viscometers ompression, lowders. Colorimeter, ties of Foods /-VCH Verlag ing Propertie	Non- Newtouids and variation of the vari	onian fluids- risco elastic definitions, ling, Cutting on of object er systems- otal Hours: n, Springer, Ne	[9] 45 ew York, hheim, ylor and

S. No.	Topics	No. of hours
1	Physical Properties	nours
' 1.1	Importance of engineering properties	1
1.2	Physical properties of food materials- size and shape	1
1.3	Physical properties of food materials – volume and density	1
1.4	Physical properties of food materials – volume and density Physical properties of food materials – porosity and surface area	1
1.4	Frictional properties –coefficient of friction, angle of repose – types and its	'
1.5	determination	2
1.6	Rolling resistance and angle of internal friction – definition and determination	1
	Aerodynamic properties Drag coefficient, Terminal Velocity and its	
1.7	application	2
2	Thermal Properties	II
	Definition of specific heat, enthalpy, thermal conductivity, thermal diffusivity,	
2.1	Surface heat transfer coefficient.	2
2.2	Measurement of specific heat	1
2.3	Thermal conductivity – steady state and unsteady state methods	2
2.4	Thermal diffusivity – Dickerson's method	1
2.5	Calorific value of food - Bomb calorimeter	1
2.6	Boiling point elevation - definition, Applications of thermal properties	1
2.7	Freezing point depression - definition, Applications of thermal properties	1
3	Optical Properties	<u>'</u>
3.1	Refractive index of food items	1
3.2	Abbe's refractometer	1
3.3		1
	Optical activity Polarimeter	
3.4	1 11 111	1
3.5	Gloss and glossimeter, color	1
3.6	Translucency – Definitions and applications Electrical properties- electrical conductivity and its measurement	1
3.7		1
3.8	Dielectric properties - measurement methods, effect on moisture,	1
3.9	temperature and composition Microwave heating and other applications	1
4	Rheological Properties	'
4.1	Classification of rheology	1 1
	Stress Strain behaviour of Newtonian	1
4.2		1
4.3	Non- Newtonian fluids- Bingham and Non Bingham	1
4.4	Stress strain relationships in solids, liquids	1
4.5	Visco elastic behaviour- stress relaxation test, creep test and dynamic test,	2
4.6	stress-strain diagrams, Reological models – Kelvin and Maxwell model	1
4.7		1
4.7	Viscosity – Types and its definitions, Viscosity – measurement methods - Capillary, Orifice, Falling and Rotational	1
4.8	viscosity – measurement metrious - Capillary, Office, Falling and Rotational viscometers.	1
5	Textural Properties	
5.1	Types of food textures	1
	Texture measuring instruments- Compression, Snap Bending, Cutting	1
5.2	Shear, Puncture, Penetration and TPA,	2
5.3	Properties of food powders	1
5.4	Color: Interaction of object with light	1
5.5	Measurement methods -Spectrophotometer	1
	Colorimeter	<u> </u>
5.6		1
5.7	Color order systems- Munsel color system, CIE color system, Hunter lab color space, Lovibond system	1

1. Mr. S. Nithishkumar - nithishkumar@ksrct.ac.in



60 FT 302	Biochemistry for Food	Category	L	Т	Р	Credit
0011302	Technologist	PC	3	0	0	3

- To recall the importance and application of bio molecules.
- To examine the classification and properties fats.
- To learn metabolism of carbohydrate and lipid
- To learn structural functions and properties of proteins and nucleic acids.
- To impart classification and nomenclature of enzymes.

Pre-requisites

Nil

Course Outcomes

On the sur	On the Succession completion of the course, students will be able to								
CO1	Understand types and importance of carbohydrates	Understand							
CO2	Categorize the structure, composition and properties of fats	Analyze							
CO3	Illustrate the metabolism of carbohydrate and lipid	Apply							
CO4	Know the structural functions and properties of proteins and nucleic acid.	Understand							
CO5	Describe the nature, function, classification and nomenclature of enzymes	Understand							

Mappii	Mapping with Programme Outcomes														
COs	COs POs										PSOs				
COS	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1	3	2	-	3	-	3	2	1	-	3	-	3	3	2	-
CO2	3	2	-	3	-	3	2	2	-	3	-	3	3	2	-
CO3	3	3	-	3	-	3	2	2	-	3	-	3	3	2	-
CO4	3	2	-	3	-	3	2	2	-	3	-	3	3	2	-
CO5	3	3	-	3	-	3	2	2	-	3	-	3	3	2	-
3 - Stro	ong; 2 ·	- Medium	ı; 1 - :	Some											

Assessment Pattern				
Bloom's Category	Continuous Ass (Ma	essment Tests arks)	Model Examination	End Sem Examination (Marks)
	1	2	(Marks)	(marko)
Remember	10	10	20	20
Understand	20	20	20	20
Apply	20	30	50	50
Analyze	10	-	10	10
Evaluate	-	-	-	-
Create	-	-	-	-
Total	60	60	100	100

		- · · · · · · · · · · · · · · · · · · ·			ogy-Autonon	IOUS INZUZZ		
		00 FT 0		n. Food Tech				
			02-Bioche		ood Technol	_		
Semester	H	ours/Week		Total Hours	Credit		ximum Marks	
	L	T	P		C	CA	ES	Total
	3	0	0	45	3	40	60	100
di (Sucrose properties - in food indu	icasification, fu e, Maltose · Lac - sugar Hygros istries; sensory quivalent, Degr	ctose), oligo copicity and properties-sy	(Raffinose) I solubility, o weetness in	 & polysaccloptical rotation dex, 	narides (Stard on, muta rotat	ch & Cellulos ion, Applicat	se). Sugar - ion of sugar	[9]
lipids: spec rancidity ar	on & nomencla cific properties nd oxidative ra nt, auto-oxidatio	 crystal fo ncidity. Sho 	rmation, portening por	olymorphism wer of fats,	, plasticity, is tenderization,	omerization emulsificati	, hydrolytic on, frying -	[9]
Matabolic p metabolism	ate and Lipid roathways - Typon, energy balan	es and che ice sheet an	nd regulatio					
acid metab	n – modification polism, Beta o bio synthesis o	xidation of	saturated a	d metabolism	i: fatty			[9]
acid metab oxidation – Proteins ar Structure a Tertiary str importance	oolism, Beta o	xidation of soft lipid and colors Is on of amino uaternary stodenaturation	saturated a holesterol. a acids - paracture - and renati	d metabolism and unsatura proteins: prin central doguration – Nuc	n: fatty ated fatty acid mary structure ma, aggregat cleic acids: str	ds, energeti	cs of beta y structure, , structural	[9]
Proteins are Structure as Tertiary structure of Structure of Enzymes Introduction - michaelis enzyme inh	polism, Beta on bio synthesis of and nucleic acid and classification ructure and quand function, of	xidation of soft lipid and color lipid and color lipid and color lipid and color lipid and the color lipid	saturated a holesterol. a acids — particular — and renature in a nomenclar site — en	oroteins: princentral doguration – Nuces and its impature of enzyazyme mode	n: fatty nated fatty acid mary structure ma, aggregat cleic acids: str portance. mes – mecha ls –enzyme a	ds, energeting, Secondar ted proteins ructure of numerical anism of enactivity and	y structure, s, structural ucleic acids, zyme action modifiers –	
acid metable oxidation — Proteins are Structure at Tertiary structure of structure of Enzymes Introduction — michaelis enzyme inhimmobilizat	polism, Beta or bio synthesis of bio syn	xidation of soft lipid and color lipid and color lipid and color lipid and color lipid and the color lipid	saturated a holesterol. a acids — particular — and renature in a nomenclar site — en	oroteins: princentral doguration – Nuces and its impature of enzyazyme mode	n: fatty nated fatty acid mary structure ma, aggregat cleic acids: str portance. mes – mecha ls –enzyme a	e, Secondar red proteins ructure of nu anism of enz activity and mes in food	y structure, s, structural ucleic acids, zyme action modifiers –	[9]
Proteins are Structure as Tertiary structure of Structure of Structure of Enzymes Introduction - michaelis enzyme inhimmobilizat	polism, Beta or bio synthesis of bio synthesis of and nucleic acid and classification ructure and quand function, or DNA, Types of an, function, class-menten hypothibititon, factors tion methods.	xidation of soft lipid and collections of amino uaternary statement of RNA and the sification and the sification and the sification and sific	saturated a holesterol. a acids — paructure — and renature in and renature in a nomencle e site — en enzyme acti	d metabolism and unsatura proteins: print central doguration – Nues and its impacture of enzy azyme mode ivity – applic	n: fatty ated fatty acid mary structure ma, aggregat cleic acids: str portance. mes – mecha ls –enzyme a ation of enzy	ds, energetics, Secondar ted proteins ructure of numerical anism of enactivity and mes in food	y structure, s, structural ucleic acids, zyme action modifiers — I industries, otal Hours:	[9]
Proteins as Structure as Tertiary structure of Enzymes Introduction - michaelis enzyme in immobilizat	polism, Beta or bio synthesis of bio syn	xidation of soft lipid and collists on of amino paternary statementuration of RNA and the sesification and theses; active and affecting education of RNA and the sesification and	saturated a holesterol. a acids — paructure — and renature in and renature in a nomencle e site — en enzyme acti	d metabolism and unsatura proteins: print central doguration – Nues and its impacture of enzy azyme mode ivity – applic	n: fatty ated fatty acid mary structure ma, aggregat cleic acids: str portance. mes – mecha ls –enzyme a ation of enzy	ds, energetics, Secondar ted proteins ructure of numerical anism of enactivity and mes in food	y structure, s, structural ucleic acids, zyme action modifiers — I industries, otal Hours:	[9]
Proteins and Structure and Tertiary structure of Structur	polism, Beta or bio synthesis of his syn	xidation of soft lipid and collists on of amino paternary statement and the sification and the sification and the saffecting education and the sification and the sif	saturated a holesterol. a acids — particular — and renaturated and nomenclar structure — enzyme action — enzyme action — cox. Lehni	d metabolism and unsatura proteins: princentral doguration – Nuces and its impature of enzyazyme mode ivity – application – appl	nary structurema, aggregaticleic acids: structurem portance. mes – mechals –enzyme a ation of enzymes es of Biochem	ds, energetice, Secondarited proteins ructure of number of enactivity and mes in food	y structure, s, structural ucleic acids, zyme action modifiers — I industries, otal Hours:	[9]
Proteins are Structure as Tertiary structure of Structure of Structure of Enzymes Introduction - michaelis enzyme inhimmobilization Text Book 1. Davi Lear 2. "Mur Reference	polism, Beta or bio synthesis of bio syn	xidation of soft lipid and collists on of amino uaternary state denaturation of RNA and the sification and the sification are the sification and t	saturated a holesterol. a acids – particular – and renature in and renature in and nomenclar structure in action in	d metabolism and unsatural proteins: princentral doguration – Nucles and its impature of enzylazyme mode ivity – application – a	n: fatty ated fatty acid mary structure ma, aggregat cleic acids: str portance. mes – mecha ls –enzyme a ation of enzy es of Biochem h Edition. McG	ds, energetics, Secondarized proteins ructure of number of engactivity and mes in food Thistry, 6th Editor of the Graw-Hill, 200	y structure, s, structural ucleic acids, eyme action modifiers — I industries, otal Hours:	[9] [9] 45
Proteins and Structure and Tertiary structure of structure of structure of the structure of	colism, Beta or bio synthesis of his syn	xidation of soft lipid and collists on of amino uaternary state denaturation of RNA and the sification and the sification are the sification and t	saturated a holesterol. a acids – particular – and renature in and renature in and nomenclar structure in action in	d metabolism and unsatural proteins: princentral doguration – Nucles and its impature of enzylazyme mode ivity – application – a	n: fatty ated fatty acid mary structure ma, aggregat cleic acids: str portance. mes – mecha ls –enzyme a ation of enzy es of Biochem h Edition. McG	ds, energetics, Secondarized proteins ructure of number of engactivity and mes in food Thistry, 6th Editor of the Graw-Hill, 200	y structure, s, structural ucleic acids, eyme action modifiers — I industries, otal Hours:	[9] [9] 45
Proteins are Structure as Tertiary structure of Structure	polism, Beta or bio synthesis of bio syn	xidation of soft lipid and collists. Is on of amino paternary standenaturation of RNA and the sification and the sifiation and the s	saturated a holesterol. a acids – paructure – and renature in and renature in and nomencle e site – en enzyme acti	d metabolism and unsatural proteins: print central doguration – Nures and its impature of enzyme mode avity – application – appl	n: fatty ated fatty acid mary structure ma, aggregat cleic acids: str portance. mes – mecha ls –enzyme a ation of enzy es of Biochem h Edition. McG	ds, energetice, Secondaried proteins ructure of number of energetivity and mes in food Table of the control of	y structure, s, structural ucleic acids, eyme action modifiers — I industries, otal Hours:	[9] [9] 45
Proteins are Structure as Tertiary structure of Structure	colism, Beta or bio synthesis of bio syn	xidation of soft lipid and color lipid and the soft lipid and the soft lipid and the soft lipid and lipid lipi	saturated a holesterol. a acids — particular — and renaturated and nomencle e site — energyme activated Biocle. "Biochem	d metabolism and unsatura oroteins: print central doguration – Nures and its important ature of enzy azyme mode in a principle or entral control or entral c	n: fatty ated fatty acid mary structure ma, aggregat cleic acids: str portance. mes – mecha ls –enzyme a ation of enzy es of Biochem h Edition. McG . John Wiley a	ds, energetice, Secondaried proteins ructure of number of energetivity and mes in food Table of the control of	y structure, s, structural ucleic acids, eyme action modifiers — I industries, otal Hours:	[9] [9] 45

ourse C	ontents and Lecture Schedule	N .
S. No.	Topics	No. of hours
1	Carbohydrates	1
1.1	Sources, Classification, function, structure and properties of mono (glucose, Fructose, galactose),	2
1.2	Sources, Classification, function, structure and properties of di (Sucrose, Maltose · Lactose),	1
1.3	Sources, Classification, function, structure and properties of oligo (Raffinose)	1
1.4	Sources, Classification, function, structure and properties of poly saccharides(Starch & Cellulose).	2
1.5	Sugar - properties – sugar Hygroscopicity and solubility, optical rotation, mutarotation,	1
1.6	Application of sugar in food industries; sensory properties-sweetness index, Dextrose Equivalent, Degree of polymerisation	1
1.7	Sugar alcohols – Natural and Artificial Sweetener.	1
2	Lipid	
2.1	Classification & nomenclature of lipids- Types of fatty acids	1
2.2	Physical properties of lipids.	1
2.3	Chemical properties of lipids:	1
2.4	Specific properties - crystal formation, polymorphism, plasticity, isomerization, hydrolytic rancidity and oxidative rancidity.	2
2.5	Shortening power of fats, tenderization, emulsification, frying - smoke point,	2
2.6	auto-oxidation, inter-esterification and polymerization.	1
2.7	Biological role of lipids	1
3	Carbohydrate and Lipid metabolism	
3.1	Metabolic pathways - Types and chemical reactions	1
3.2	Glycolysis: Anaerobic path way of glucose metabolism, energy balance sheet and regulation	1
3.3	citric acid cycle: aerobic pathway of glucose metabolism	1
3.4	modification of citric acid cycle,	1
3.5	lipid metabolism: fatty acid metabolism,	1
3.6	Beta oxidation of saturated fatty acids	1
3.7	unsaturated fatty acids, energetics of beta oxidation	1
3.8	bio synthesis of lipid.	1
3.9	Bio synthesis of cholesterol	1
4	Proteins and nucleic acids	
4.1	Structure and classification of amino acids –	1
4.2	proteins :primary structure, Secondary structure, Tertiary structure and quaternary structure	2
4.3	central dogma, aggregated proteins,	1
4.4	structural importance and function, denaturation and renaturation –	1
4.5	Nucleic acids: structure of nucleic acids,	1
4.6	Structure of DNA,	1
4.7	Types of RNA and their structures and its importance.	2
5	Enzymes	1
5.1	Introduction, function, classification and nomenclature of enzymes –	2
5.2	mechanism of enzyme action - michaelis-menten hypothesis;	1
5.3	active site – enzyme models	1
5.4	enzyme activity and modifiers – enzyme inhibititon,	2
5.5	factors affecting enzyme activity –	1
5.6	application of enzymes in food industries,	1

Dr.K.Prabha - prabhak@ksrct.ac.in



60 FT 303	Food Microbiology For	Category	L	Т	Р	Credit
0011303	Food Technologist	PC	3	0	0	3

- To provide students with a knowledge about Basic knowledge of microorganisms
- To impart detailed knowledge on the Isolation and Identification of Food Pathogens
- To learn staining and Microscopy Techniques.
- To learn about Food spoilage and diseases.
- To provide knowledge about microbial spoilage and detection methods

Pre-requisites

Nil

Course Outcomes

On the suct	Off the successful completion of the course, students will be able to						
CO1	Identify the Basic knowledge of microorganism and its classification	Understand					
CO2	Recall the method of isolation and Identification of microorganism	Analyze					
CO3	Explain the importance of staining and Microscopy techniques	Apply					
CO4	Categorize the food spoilage and Diseases	Apply					
CO5	Describe the types microbial food spoilage and its detection methods	Analyze					

Mappii	Mapping with Programme Outcomes															
COs									POs					PSOs		
003	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	
CO1	3	-	-	3	-	3	2	1	-	3	-	3	3	-	-	
CO2	3	-	-	3	-	3	2	2	-	3	-	3	3	-	-	
CO3	3	-	-	3	-	3	2	2	-	3	-	3	3	-	-	
CO4	3	-	-	3	-	3	2	2	-	3	-	3	3	2	3	
CO5	3	-	-	3	-	3	2	2	-	3	-	3	3	2	3	
3- Stro	ng;2-M	edium;1	-Low													

Assessment Pattern	Assessment Pattern									
Bloom's Category	Continuous Asse (Ma	essment Tests arks)	Model Examination	End Sem Examination						
	1	2	(Marks)	(Marks)						
Remember (Rn)	10	10	20	20						
Understand	30	30	40	40						
Apply	10	20	30	30						
Analyze	10	-	10	10						
Evaluate	-	-	-	-						
Create	-	-	-	-						
Total	60	60	100	100						

K.S.Rangasamy College of Technology – Autonomous R2022										
		gg		Food Techi						
60 FT 303 - Food Microbiology for Food Technologist										
Compostor	ŀ	lours/Week		Total	Credit	,	ximum Marks	;		
Semester	L	T	Р	Hours	С	CA	ES	Total		
III	3	0	0	45	3	40	60	100		
Classificat	ion and Struc	ture of Mic	roorganisms	5		-				
Introduction	to food m	icrobiology,	classificati	ion of mic	roorganism	s - prokar	yotes and	[4]		
	s. Types o	f micro-o	rganisms:	bacteria,	virus, alga	ae, fungi-	structure,	ניז		
reproducti										
	nd Identificat									
	re technique									
	n of pure cultu synthetic, cor							[14]		
	ntinuous cultu					Slowill culv	e – baten	[14]		
	e, pH, osmo					nical Identif	ication and			
•	Characterization	•								
	y and Stainin									
	– Instrumenta			Application -	Types of Micr	roscone-l iah	nt			
	-Simple, con							[0]		
microscope	and phase	contrast and	d Slide prepa	aration. Stain	s - Auxochro	ome, chromo	ophores,	[9]		
	basic dyes. S					aining, acid fa	ast			
staining, er	dospore stain	ing, capsule	e staining and	d flagella stai	ning.					
Microbiolo	gy spoilage a	nd Food Bo	orne Disease	S						
	ooilage of diffe									
	oducts, bake						ed foods.	[9]		
	and Enumera							[~]		
	cci, Yersinia, us, Rotavirus,					ria monocyto	ogenes,			
IVOIWAIK VII	us, Molaviius,	i iepailiis A	virus iroin ic	ou samples.						
_	Techniques		_							
	ection technic							101		
	of bacterial							[9]		
	n, gel diffusio			diagnostic sy	stems - Poly	ymerase Cha	ain Reaction			
(PCR). Mic	ro array diagn	ostic metho	ds.					4=		
Tavt Back	۵۱.					ı	otal Hours:	45		
Text Book		lav ID an	d Klain D A	"Microbiolog	r" 7th Edition	η ΤΔΤΛ Μα	 Graw-Hill Public	cations		
1. 2010).	icy, J.i . aii	u Nicili, D.A.	wholoblolog	y , <i>i</i>	i, iAiAivice	JIAW-I III F UDIII	balloris,		
Osm	Osman Erkmen, T. Faruk Bozoglu. "Food Microbiology: Principles into Practice", John Wiley & Sons, Ltd									
2. 2016		arak bozt			o.pico iiit	.5 1 1451166 ,0	o.m. whoy a o	o.10, Eta		
Reference(s):									
	zar, M.J., Cha	n, E.C.S. an	d Krieg, N.R.	, "Microbiolog	gy", McGraw-	-Hill, New Yo	rk, 2004.			
	J.M. "Modern						•			
			a **Life on le		-,					

SDG - *Good health and well-being, **Life on land

Course	Contents and Lecture Schedule						
S. No.	Topics	No. of hours					
1	Classification and Structure of Microorganisms						
1.1	Introduction to food microbiology, classification of microorganisms	1					
1.2	Types of micro-organisms: bacteria, virus	1					
1.3	Algae, fungi- structure	1					
1.4	Reproduction	1					
2	Isolation, and Identification of Microorganisms	•					
2.1	Pure culture technique – Serial dilution and plating method	2					
2.2	Culture Media – Importance - components of media. synthetic, complex						
2.3	Types of media - natural, selective, differential, enriched media.	1					
2.4	Growth curve – batch culture, continuous culture.	2					
2.5	Physical factors influencing the growth – Temperature, pH, osmotic pressure and salt concentration.						
2.6	Biochemical Identification	2					
2.7	Molecular Characterization of Microorganism,	2					
2.8	Whole Genome Sequencing.	2					
3	Microscopy and Staining Techniques	•					
3.1	Microscope – Instrumentation, Working Principle, Application	1					
3.2	Types of Microscope	2					
3.3	Dark field and light microscope and phase contrast and Slide preparation.						
3.4	Stains – Auxochrome, chromophores, acidic and basic dyes.	1					
3.5	Simple staining, Gram's staining, acid fast staining,	2					
3.6	Endospore staining, capsule staining and flagella staining.	1					
4	Microbiology spoilage and Food Borne Diseases	•					
4.1	Microbial spoilage of different types of foods-fruits and vegetables, meat	1					
4.2	Poultry, sea foods, cereals products, bakery products	1					
4.3	Dairy products, fermented foods and canned foods.	1					
4.4	Detection and Enumeration of microbes in foods	1					
4.5	Detection methods for E. coli, Staphylococci,	1					
4.6	Yersinia, B. cereus,	1					
4.7	C. botulinum and Salmonella,	1					
4.8	Listeria monocytogenes, Norwalk virus,	1					
4.9	Rotavirus, Hepatitis A virus from food samples	1					
5	Diagnostic Techniques in Food Borne Pathogens						
5.1	Rapid detection techniques for food borne pathogens and their toxins, pesticides;	2					
5.3	In-vitro evaluation of bacterial toxins by immunological techniques like slide agglutination,	1					
5.4	Tube agglutination, gel diffusion assay	2					
5.5	Genetic based diagnostic systems - Polymerase Chain Reaction	2					
5.6	Micro array diagnostic methods	2					
5.7	Rapid detection techniques for food borne pathogens and their toxins, pesticides;	2					
Course	Designer(s)						

1. Dr.A.S.Ruby Celsia - rubycelsia@ksrct.ac.in



60 FT 304	Food Process	Category	L	Т	Р	Credit
60 FT 304	Calculations	PC	2	1	0	3

- Know the various kinds of processing operations in food industry
- Familiarize with recycle operation in food industry
- To explore knowledge on material balance
- To learn energy balance calculations
- To learn NHV, GHV of the fuels

Pre-requisites

Nil

Course Outcomes

0										
CO1	Apply different systems of units and dimensions	Understand								
CO2	Learn about the material balance without chemical reaction	Apply								
CO3	Apply material balance for recycle operations	Analyze								
CO4	Perform energy balance calculations	Analyze								
CO5	Know about the combustion of solids, liquid and gas	Analyze								

Mapping	Mapping with Programme Outcomes														
COs		POs											PSOs		
003	1	1 2 3 4 5 6 7 8 9 10 11 12									12	1	2	3	
CO1	3	3	2	3	-	-	-	-	-	-	-	2	2	3	-
CO2	3	3	2	3	-	-	-	-	-	-	-	2	3	3	-
CO3	3	3	3	3	-	-	-	-	-	-	-	2	3	3	2
CO4	3	3	3	3	-	-	-	-	-	-	-	2	3	3	3
CO5	3	3	2	3	-	-	-	-	-	-	-	2	3	3	-
3 - Stror	3 - Strong; 2 - Medium; 1 - Some														

Assessment Pattern					
Bloom's Category	Continuous Asse (Ma		Model Examination	End Sem Examination	
	1	2	(Marks)	(Marks)	
Remember	10	10	20	20	
Understand	20	20	30	30	
Apply	30	10	30	30	
Analyze	-	20	20	20	
Evaluate	-	-	-	-	
Create	-	-	-	-	
Total	60	60	100	100	

Syllabus												
	K.	S.Rangasar		of Technolog . Food Tech	gy–Autonom	nous R2022						
	60 FT 304 - Food Process Calculations											
	Н	ours/Week	1100+10	Total	Credit	_	ximum Mark	 S				
Semester	L	Т	Р	Hours	С	CA ES		Total				
III	2	1	0	45	3	40	60	100				
Units and Dimensions-Fundamental Calculations Basic and derived units, unit conversions, use of model units in calculations, methods of expression, compositions of mixture and solutions. Ideal and real gas laws – gas constant - calculations of pressure, volume and temperature using ideal gas law, Use of partial pressure and pure component volume in gas calculations, applications of real gas relationship in gas calculation.												
Material Balance Stoichiometric principles, material balance without chemical reaction- application of material balance to unit operations like distillation, evaporation, crystallization, drying and extraction.*												
Recycle Operations Recycle stream, block diagram, purging operations, purge ratio, recycle ratio and purge stream. Humidity and Saturation: Calculation of absolute humidity, molal humidity, relative humidity and percentage humidity, wet and dry bulb temperature, dew point - Humidity chart usage.*												
calculations neat of read reaction - Ef	ence city of solids , problems in- ction, heats of fect of pressur systems withou	volving sens formation, re and tempe	sible heat an combustion, erature on he	d latent hea solution, mi	ts, evaluatio xing, calcula	n of enthalpy	y. Standard	[9]				
Value (GH\	n of solids, liqu /). Determina theoretical o	tion of comp	position by				s Heat	[9]				
					Total :45	+15(Tutorial)Hours	60				
Text Book(
1. Gavh	nane K.A., "Inti	roduction to	Process Cald	culations", Fir	st Edition, Ni	rali Prakasha	an Publication	ıs, 2016.				
2. Venk 2011	ataramani V. a	and Anantha	raman N., "P	rocess Calcu	ulations", Sec	ond Edition,	Prentice Hall	of India,				
Reference(s):											
1. Delh	t B.L. and Vora i, 2004.		•									
	yanan K.V. ar Delhi, 2006.	d Lakshmi k	utty B., "Stoi	chiometry an	d Process Ca	alculations",	Prentice Hall	of India,				
3. Himmelblau D.M., "Basic Principles and Calculations in Chemical Engineering, 6th Edition, Prentice Hall of India, New Delhi, 2003.								ntice				
Albe	rt Ibarz, Gusta ervation Tech	vo V. Barbos			ions in Food	Engineering	, Food					

SDG- *Affordable and clean energy

Course C	ontents and Lecture Schedule					
S. No.	Topics	No. of hours				
1	Units and Dimensions-Fundamental Calculations					
1.1	Basic and derived units, unit conversions,	1				
1.2	Use of model units in calculations	1				
1.3	Methods of expression	1				
1.4	Compositions of mixture and solutions.	1				
1.5	Ideal and real gas laws – gas constant	1				
1.6	Calculations of P, V and T using ideal gas law	1				
1.7	Use of partial pressure and pure component volume in gas calculations	1				
1.8	Use of partial pressure and pure component volume in gas calculations	1				
1.9	Applications of real gas relationship in gas calculation	1				
2	Stoichiometric					
2.1	Principles of Stoichiometric	1				
2.2	Material balance without chemical reaction	1				
2.3	Material balance without chemical reaction	1				
2.4	Material balance to Unit operation	1				
2.5	Application of material balance of distillation	1				
2.6	Application of material balance of evaporation	1				
2.7	Application of material balance of crystallization	1				
2.8	Application of material balance of drying	1				
2.9	Application of material balance of extraction	1				
3	Recycle operations					
3.1	Recycle stream with block diagram	1				
3.2	Purging operations with block diagram	1				
3.3	Purge ratio, and purge stream	1				
3.4	Recycle ratio	1				
3.5	Humidity and Saturation concept	1				
3.6	Calculation of absolute humidity, molal humidity	1				
3.7	Calculation of relative humidity and percentage humidity	1				
3.8	Calculation of wet & dry bulb temperature and dew point	1 1				
3.9	Humidity chart usage	1				
3.9 4		ı				
4.1	Energy balance Heat capacity of solids, liquids, gases and solutions	1				
		1 1				
4.2	Use of mean heat capacity in heat calculations Problems involving sensible heat and latent heats, evaluation of enthalpy.	_ 				
4.3	Problems involving sensible heat and latent heats, evaluation of enthalpy. Problems involving sensible heat and latent heats, evaluation of enthalpy.	1				
4.4	Standard heat of reaction of solution and mixing	1				
4.5	-	1				
4.6	Standard heats of formation of solution and mixing	1				
4.7	Standard heat of combustion of solution and mixing	1				
4.8	Calculation of standard heat of reaction - Effect of pressure and temperature On heat of reaction	1				
4.9	Energy balance for systems without chemical reaction.	1				
4.9 5	Combustion	1				
5.1	Combustion Combustion of solids, liquid and gas	1				
5.1	Determination of Net Heat Value (NHV)	2				
5.3	Determination of Net Heat Value (NHV) Determination of Gross Heat Value (GHV)	1				
	Determination of Gross Heat Value (GHV) Determination of composition by Orsat analysis	2				
5.4						
5.5	Calculation of excess air requirement	1				
5.6	Calculation of theoretical oxygen requirement	2				

1. Dr. P. Shanmugam-shanmugam@ksrct.ac.in



60 FT 305	Food Processing and	Category	L	Т	Р	Credit
60 F1 303	Preservation	PC	3	0	0	3

- To understand the basic processing techniques
- To identify the suitable processing techniques for food material
- To know novel and advanced methods of food processing.
- To Understand the Basics of food and their spoilage
- To know the methods of food preservation.

Pre-requisites

• Nil

Course Outcomes

On the successful completion of the course, students will be able to

CO1	Infer the knowledge about food processing technique	Understand
CO2	Recognize the appropriate techniques for food processing	Apply
CO3	Realize the modern and innovative methods of food processing	Apply
CO4	Understand the needs of food and their spoilage	Understand
CO5	Identify the suitable food preservation methods	Apply

Mapping with Programme Outcomes

COs		POs											PSOs		
COS	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1	3	2	2	3	-	-	-	-	-	-	-	2	2	2	2
CO2	3	3	3	3	-	-	-	-	-	-	-	2	3	3	3
CO3	3	3	3	3	-	-	-	-	-	-	-	2	3	3	3
CO4	3	3	2	3	-	-	-	-	-	-	-	2	2	2	2
CO5	3	3	3	3	-	-	-	-	-	-	-	2	3	3	3
3 - Str	3 - Strong; 2 - Medium; 1 - Some														

3 - Strong, 2 - Medium, 1 - Some

Assessment Pattern	Assessment Pattern										
Bloom's Category	Continuous Asses (Mar		End Sem Examination (Marks)								
	1	2	1								
Remember	20	20	30								
Understand	30	30	50								
Apply	10	10	20								
Analyze	-	-	-								
Evaluate	-	-	-								
Create	-	-	-								
Total	60	60	100								

ntroduo ndustri	ter Ho	60 FT		. rood Tech	nology								
III ntrodu ntroduc ndustri	ter L		B.Tech. Food Technology 60 FT 305 - Food Processing and Preservation										
III ntrodu ntroduc ndustri	ter L			Total	Credit		ximum Marks						
ntrodu ntroduc ndustri		T	P	Hours	Credit	CA	ES	Total					
ntrodu ntroduc ndustri		0	0	45	3	40	60	100					
	uction of food proce ction to Food Proce es, type of food pr sing. ** Convenien OVA food classifica	ssing and ocessing ce food – r	primary peady to eat a	rocessing, and heat & se	secondary p erve	rocessing, t	ertiary	[9]					
Therma Pasteui Therma environ	ds of food process al treatment: Boiling rization – Principle, al and other treatme ment packing, and tion, advantages an	, Frying, Ro process flo ent: Chilling Added sub	pasting, Blandow, application, freezing, frostance - Prir	on, advantag eeze drying,	es and disad fermentation	vantages. N	on-	[9]					
Thermaneating Nonthe	Food Processing T al technologies: Ra I, Aseptic processin rmal technologies: sing, Cold plasma s flow, application, a	adio frequi g - Princip High-press treatment	ency heating le, process f sure processi , Ultrasound	low, applicating, Pulsed e I, Irradiation	tion, advantag lectric field	ges and disa	advantages.	[9]					
ntroductions, (cods, cod sport) ood sportinciple	reservation ction to food prese Classification of foo oilage, food safety le of Food preser ration, trends in foo	od, Food S for consu vation, Ne	poilage, cha mers – need eed and sco	racteristics a ds and impo	and types of fatance,	ood spoilage	e, Cause of	[9]					
Chemic oreserv Preserv Preserv	ds of Food Preserved and methods — Chroative-types, uses vation by low tervation by drying an vantages of process	nemical pr s, FSSAI mperature, d Preserva	standards a Preservation	and recomion by high	mendation**, temperature	, Physical ı ə,	methods -	[9]					
						T	otal Hours:	45					
	ook(s):												
	Sivasankar, B. Food		-										
2.	Vikas Nanda and Sa & Solutions P. LTD.	vita sharm New Delh	a, Novel Foo ni.: 2017.	d Processing	g Technologie:	s. NIPA Gen	x Electronic R	esource					
	Khetarpaul and Nee	elam. "Food	d Processing	and Preserv	ation." Daya F	Publications,	2005						
	nce(s):	"											
	Rahman, M. Shafiur Zeuthen, Peter and												

^{*}SDG 9 - Industry Innovation and Infrastructure

^{**}SDG 3 - Good Health and Well Being

Course (Course Contents and Lecture Schedule									
S. No.	Topics	No. of hours								
1.0	Introduction of food processing	T								
1.1	Introduction to Food processing	1								
1.2	Scope and importance of food processing sectors	1								
1.3	Indian trends in food processing industries	1								
1.4	Type of food processing – primary processing, secondary processing	1								
1.5	Tertiary processing.	1								
1.6	Convenience food – ready to eat and heat & serve food.	1								
1.7	NOVA food classification,	1								
1.8	Degree of food processing,	1								
1.9	Different type of food processing sectors	1								
2.0	Methods of Food Preservation									
2.1	Boiling, Frying	1								
2.2	Roasting, Blanching	1								
2.3	Autoclave, Smoking,	1								
2.4	Canning	1								
2.5	Pasteurization	1								
2.6	Chilling,	1								
2.7	Freezing, freeze drying	1								
2.8	Fermentation	1								
2.9	Adjusted environment packing, and Added substance	1								
3.0	Food Processing	 								
3.1	Radio frequency heating	1								
3.2	Microwave heating	1								
3.3	Ohmic heating, Infrared heating	1								
3.4	Aseptic processing	1								
3.5	High-pressure processing	1								
3.6	Pulsed electric field processing	1								
3.7	Cold plasma treatment	1								
3.8	Ultrasound, Irradiation	1								
3.9	UV and pulsed light	1								
4.0	Methods of food processing technologies	'								
4.1	Introduction to food preservation, type of foods	1								
4.2	Classification of food	1								
4.3	Food Spoilage	1								
4.4	Characteristics and types of food spoilage	1								
4.5	Cause of food spoilage	1								
4.6	Food safety for consumers – needs and importance,	1								
4.7	Principle of Food preservation, Need and scope of Food preservation,	1								
4.8	Importance of food preservation, Need and scope of Food preservation,	1								
4.9	Trends in food processing	1								
5.0	Novel Food Processing Technologies	'								
5.1	Chemical preservation	1								
5.2	water activity (aw) and pH control	1								
5.3	Chemical preservative- types, uses	1								
5.4	FSSAI standards and recommendation	1								
5.5	Preservation by low temperature	1								
5.6	Preservation by low temperature Preservation by high temperature	1								
5.7	Preservation by high temperature Preservation by drying	1								
	Preservation by drying Preservation by irradiation									
5.8	Biological methods – Fermentation	1								
5.9	Diological methods — Lemichtation	1								

1. Mr. P. Kalai Rajan-kalairajan@ksrct.ac.in



60 GE 002	Tamils and Technology	Category	L	T	Р	Credit
00 GE 002	(Common to all Branches)	GE	1	0	0	1\$

- To learn weaving, ceramic and construction technology of Tamils.
- To understand the agriculture, irrigation and manufacturing technology of Tamils.
- To realize the development of scientific Tamil and Tamil computing

Pre-requisites

Nil

Course Outcomes

CO1	Understand the weaving and ceramic technology of ancient Tamil people nature.	Understand
CO2	Comprehend the construction technology, building materials in sangam period and case studies.	Understand
CO3	Infer the metal process, coin and beads manufacturing with relevant archeological evidence.	Understand
CO4	Realize the agriculture methods, irrigation technology and pearl diving.	Understand
CO5	Apply the knowledge of scientific Tamil and Tamil computing.	Apply

Mappi	Mapping with Programme Outcomes														
COs	POs										PSOs				
COS	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1	-	-	-	-	-	-	3	3	-	2	-	3	-	-	-
CO2	-	-	-	-	-	-	3	3	-	2	-	3	-	-	-
CO3	-	-	-	-	-	-	3	3	-	2	-	3	-	-	-
CO4	-	-	-	-	-	-	3	3	-	2	-	3	-	-	-
CO5	-	-	-	-	-	-	3	3	-	2	-	3	-	-	-
3 - Str	3 - Strong; 2 - Medium; 1 - Some											•			

Bloom's	Continuous Asses	sment Test (Marks)	Model Examination (Marks)		
Category	1	2			
Remember	20	20	40		
Understand	40	40	40		
Apply	-	-	20		
Analyse	-	-	-		
Evaluate	-	-	-		
Create	-	-	-		
Total	60	60	100		

Syllabus	Syllabus									
K.S.Rangasamy College of Technology – Autonomous R2022										
B. Tech. Food Technology										
60 GE 002- Tamils and Technology										
Semester	Hours/Week	Total	Credit	Maximum Marks						



							B.TECH.(FT)-2	2022-2023	
	L	Т	Р	Hours	С	CA	ES	Total	
	II 1	0	0	15	1*	100	00	100	
Weav	ring and Ceramic Tring Industry During /) – Graffiti on Potte	g Sangam Ag	ge – Ceram	ic Technolog	y – Black a	and Red Wa	re Potteries	[3]	
Designation Age - Silapp Wors Thirum Britisl Manu Art of coins	gn and Construction gning and Structura Building Materials Dathikaram – Sculpt hip Places – Tem malai Nayakar Mah n Period. Ifacturing Technol Ship Building – Met As Source of the Receptor	Il Constructions and Hero Stures and Tentingles of Nayal – Chetti National – Chetti National – Chetti National – Minting	n House & Stones Of S Inples of Mar Iraka Period Iraka Houses Iron Of Coins	angam Age nallapuram – - Type Stu , Indo – Sara Industry – Iro Beads Makin	Details of Great Templady (Maduricenic Architens of Smelting of Great Templade), and the matter of the matter	f Stage Consoles of Chola ai Meenakshecture at Ma	structions in s and Other ni Temple)- dras During er and Gold ads – Glass	[3]	
Type:	s – Terracotta Bea s Described In Silap culture and Irrigation	pathikaram. on Technolo	gy*					[0]	
Wells Pearl	Dam, Tank, Ponds, Sluice, Significance of Kumizhi Thoompu of Chola Period, Animal Husbandry – Wells Designed for Cattle Use – Agriculture and Agro Processing – Knowledge of Sea- Fisheries – Pearl – Conche Diving -Ancient Knowledge of Ocean – Knowledge Specific Society.								
Deve of Ta	ntific Tamil and Ta lopment of Scientifi mil Software – Ta uvai Project.	c Tamil – Tar	nil Computir			ine Tamil Di	ctionaries –	[3]	
						T	otal Hours:	15	
1.	Book(s): தமிழக வரலாறு - பணிகள் கழகம்).				(வெளியீடு: ှ	தமிழ்நாடு பாம	_நூல் மற்றும்	கல்வியியல்	
2.	கணினித்தமிழ் – மு	•	• • • • • • • • • • • • • • • • • • • •	•	<u> </u>	2 2 2 2			
3.	கீழடி – வைகை நதி					வளாய்டு).			
4.	பொருநை - ஆற்றங்					O and DMD!	(in maint)		
5. 6.	Social Life of Tam Social Life of the Tamil Studies.	Tamils - The	Classical Pe	riod (Dr.S.Sir	ngaravelu) (I	Published by:	International		
7.	Historical Heritag International Instit	ute of Tamil S	Studies).					·	
8.	The Contributions of Tamil Studies.)								
9.	Keeladi - 'Sangar Archaeology & Ta	ımil Nadu Tex	t Book and I	Educational S	Services Cor	poration, Tan	nil Nadu)		
10.	Studies in the His Author).	•				`	• • • • • • • • • • • • • • • • • • • •		
11.	Porunai Civilization	ces Corporati	on, Tamil Ña	adu).					
12.	Journey of Civiliza		Vaigai (R.Ba	alakrishnan) (Published b	y: RMRL) – F	Reference Boo	ok.	

^{*}SDG 4 – Quality Education

60 GE 002	தமிழரும் தொழில்நுட்பமும்	Category	L	T	Р	Credit
80 GE 002	(அனைத்து துறைகளுக்கும் பொதுவானது)	GE	1	0	0	1\$

பாடத்தின் நோக்கங்கள்:

- தமிழர்களின் சங்ககால நெசவு, பனை வனைதல் மற்றும் கட்டிட தொழில் நுட்பம் குறித்து அறிதல்.
- தமிழர்களின் சங்ககால வேளாண்மை, நீர்ப்பாசனம் மற்றும் உற்பத்தி முறைகள் குறித்த கற்றல்.
- நவீன அறிவியல் தமிழ் மற்றும் கணித்தமிழ் குறித்த புரிதல்.

முன்கூட்டிய துறைசார் அறிவு:

• தேவை இல்லை

Course Outcomes

பாடத்தை வெற்றிகரமாக கற்று முடித்த பின்பு, மாணவர்களால் முடியும் விளைவுகள்

B.TECH.(FT)-2022-2023

CO1	சங்ககாலத் தமிழர்களின் நெசவு மற்றும் பானை வனைதல் தொழில்நுட்பம் குறித்த கற்றுணர்தல்	புரிதல்
CO2	சங்ககாலத் தமிழர்களின் கட்டிட தொழில்நுட்பம் கட்டுமானப் பொருட்கள் மற்றும் அவற்றை விளக்கும் தளங்கள் குறித்த அறிவு.	புரிதல்
CO3	சங்ககாலத் தமிழர்களின் உலோகத் தொழில், நாணயங்கள் மற்றும் மணிகள் சார்ந்த தொல்லியல் சான்றுகள் பற்றிய அறிவு.	புரிதல்
CO4	சங்ககாலத் தமிழர்களின் வேளாண்மை, நீர்ப்பாசன முறைகள் மற்றும் முத்து குளித்தல் குறித்த தெளிவு.	புரிதல்
CO5	நவீன அறிவியல் தமிழ் மற்றும் கணித்தமிழ் குறித்த புரிந்துகொள்ளலும் மற்றும் பயன்படுக்குகலும்.	பகுப்பாய்வு

Mappi	Mapping with Programme Outcomes														
COs		POs										PSOs			
S	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1	-	-	-	-	-	-	3	3	-	2	-	3	-	-	-
CO2	-	-	-	-	-	-	3	3	-	2	-	3	-	-	-
CO3	-	-	-	-	-	-	3	3	-	2	-	3	-	-	-
CO4	-	-	-	-	-	-	3	3	-	2	-	3	-	-	-
CO5	-	-	-	-	-	-	3	3	-	2	-	3	-	-	-
3 - Str	ong; 2	- Medi	um; 1	- Some											

Assessment Patte	Assessment Pattern											
Bloom's	Continuous Asses	ssment Test (Marks)	End Som Examination (Marks)									
Category	1	2	End Sem Examination (Marks)									
Remember	20	20	40									
Understand	40	40	40									
Apply	-	-	20									
Analyse	-	-	-									
Evaluate	-	-	-									
Create	-	-	-									
Total	60	60	100									

- y.iui	bus								
	Duo	K	(.S.Rangas	amv Collec	e of Technolo	av – Autono	mous R202	2	
					ch. Food Tech			<u>-</u>	
					2 – தமிழரும் தெ				
•			Hours/We		Total	Credit	M	aximum Mar	ks
Sem	ester	L	Т	Р	Hours	С	CA	ES	Total
	II	1	0	0	15	1*	100	00	100
நெசவு	ு மற்றும்	பானைத் தெ	நாழில்நுட்பம்	:					
			•		நி <mark>ல்நுட்பம்-</mark> கருப்ப	பு சிவப்புபான்	ாடங்கள் - ப	ாண்டங்களில்	[3]
	 குறியீடுச		. 0		0				
வடிவ	மைப்பு ப	<u>மற்றும் கட்டி</u>	டத் தொழில்ந	நட்பம்:					
					ள் & சங்க காலத்த	ில்வீட்டுப் பெ	ாருட்களில் வ	படிவமைப்பு -	
சங்க	காலத்தி	ல் கட்டுமா	னப் பொருப்	களும் நடுக	ல்லும் - சிலப்ப	பதிகாரத்தில் 🤇	மேடை அமை	மப்பு பற்றிய	
விவரா	ங்கள் —	மாமல்லபுரச்	ச் சிற்பங்களு <i>ம</i>	ம், கோவில்க	ளும் - சோழர் க	ாலத்துப் பெரு	ங்கோயில்கள்	் மற்றும் பிற	[3]
வழிப	ாட்டுத் த	லங்கல் - நா	யக்கர் காலக்	கோயில்கள்	– மாதிரி கட்டன	மைப்புகள் பற்றி	ி அறிதல், மது	ழரை மீனாட்சி	ارحا
அம்ம	ன் ஆல	யம் மற்றும்	திருமலை	நாயக்கர் ம	ஹால் - செட்டி	நாட்டு வீடுக	ள் - பிரிட்டி	ஷ் காலத்தில்	
சென்	னையில்	இந்தோ -சா	ரோசெனிக் க	ட்டிடக் கலை	υ.				
உற்ப	த்தித்தெ	ாழில்நுட்பம்:							
கப்பவ்	ம் கட்டுப	் கலை — உ	.லோகவியல்	- இரும்புத்	தொழிற்சாலை -(இரும்பை உரு	க்குதல்,எஃகு	- வரலாற்றுச்	
சான்று	தளாக	செம்பு ம	ற்றும் தங்க	க நாணயங்	கள்- நாணயங்க	ள் அச்சடித்த	5ல்- மணி	உருவாக்கும்	[3]
தொழி	ிற்சாலை	கள் - கல்மன	னிகள் ,கண்ன	னாடிமணிகள்	- சுடுமண் மணிச	ள் - சங்கு மன	ரிகள் - எலும்	புத் துண்டுகள்	ری
- தொ	வ்லியல்	சான்றுகள் –	சிலப்பதிகாற	ரத்தில் மணிக	ளின் வகைகள்.				
வேள	ாண்மை	மற்றும் நீர்ப	ாசனத் தொழி	ில் நுட்பம்:					
அனை	ன, ஏரி,	குளங்கள்,	மதகு - சோ	ரழர்காலக் கு	முழித் தூம்பின்	முக்கியத்துவட	ம்-கால்நடை	பராமரிப்பு -	
கால்ந	டைகளு	க்கான வடி	வமைக்கப்பட	ட்ட கிணறு	கள் – வேளா	ண்மை மற்று	ம் வேளாண்	ாமை சார்ந்த	[3]
செயல்	ப் பாடுகள்	ர் - கடல்சா	ர் அறிவு -மி	ீன்வளம் -	முத்து மற்றும் ம	முத்துக்குளித்த ்	ல் - பெருங்	கடல் குறித்த	
		வு - அறிவுசா	T. T. T. T. T. L.						
arwo -									
		ிழ் மற்றும் க	ணித்தமிழ்						
அறிவி	ரியல் தம	ிழ் மற்றும் க பிழின் வளர	ணித்தமிழ் ர்ச்சி - கணி		ரர்ச்சி - தமிழ் ,				101
அறிவீ மென்	ரியல் தட பொருட்	ிழ் மற்றும் க பிழின் வளர கள் உருவாக்	ணித்தமிழ் ர்ச்சி - கணி கம் - தமிழ்		ார்ச்சி - தமிழ் , ல்விக்கழகம் - த				[3]
அறிவீ மென்	ரியல் தட பொருட்	ிழ் மற்றும் க பிழின் வளர	ணித்தமிழ் ர்ச்சி - கணி கம் - தமிழ்				கம் - இணை	யத்தில் தமிழ்	
அறிவீ மென் அகரா	ியல் தம பொருட் திகள் - (ிழ் மற்றும் க மிழின் வளர கள் உருவாக் சொற்குவைத்	ணித்தமிழ் ர்ச்சி - கணி கம் - தமிழ்				கம் - இணை		[3] 15
அறிவி மென் அகரா	பியல் தம பொருட் திகள் - சே Book(s	வ ழ் மற்றும் க மிழின் வளர கள் உருவாக் சொற்குவைத்):	ணித்தமிழ் ர்ச்சி - கணி கம் - தமிழ் திட்டம்.	இணையக் க	ல்விக்கழகம் ⁻ த	மிழ் மின் நூல	கம் - இணை T	யத்தில் தமிழ் otal Hours:	15
அறிவி மென் அகரா	ியல் தம பொருட் இகள் - செ Book(s தமிழக	வ ழ் மற்றும் க மிழின் வளர கள் உருவாக் சொற்குவைத்): வரலாறு-ம	ணித்தமிழ் ர்ச்சி - கணி கம் - தமிழ் திட்டம்.	இணையக் க		மிழ் மின் நூல	கம் - இணை T	யத்தில் தமிழ் otal Hours:	15
அறிவி மென் அகரா Text I 1.	ியல் தம பொருட் இகள் - இ Book(s தமிழக பணிக	வ ழ் மற்றும் க மிழின் வளர கள் உருவாச் சொற்குவைத்): வரலாறு-ம ள் கழகம்).	ணித்தமிழ் ர்ச்சி - கணி கம் - தமிழ் திட்டம். கக்களும் பன்	இணையக் க ன்பாடும் கே.	ல்விக்கழகம் - த கே .பிள்ளை (மிழ் மின் நூல	கம் - இணை T	யத்தில் தமிழ் otal Hours:	15
அறிவ் மென் அகரா Text I 1.	ியல் தம் பொருட் திகள் - இ Book(s தமிழக பணிக கணின்	வ ழ் மற்றும் க மிழின் வளர கள் உருவாச் சொற்குவைத்): வரலாறு-ம ள் கழகம்). பித்தமிழ் – மு	ணித்தமிழ் ர்ச்சி - கணி கம் - தமிழ் திட்டம். கக்களும் பண்	இணையக் க ன்பாடும் கே. . சுந்தரம். (வீ	ல்விக்கழகம் - த கே .பிள்ளை (கேடன் பிரசுரம்).	மிழ் மின் நூல வெளியீடு: த	கம் - இணை T மிழ்நாடு பாம	யத்தில் தமிழ் otal Hours:	15
அறிவி மென் அகரா <mark>Text</mark> I 1.	ியல் தம் பொருட் திகள் - இ Book(s தமிழக பணிக கணின்	வ ழ் மற்றும் க மிழின் வளர கள் உருவாச் சொற்குவைத்): வரலாறு-ம ள் கழகம்). பித்தமிழ் – மு	ணித்தமிழ் ர்ச்சி - கணி கம் - தமிழ் திட்டம். கக்களும் பண்	இணையக் க ன்பாடும் கே. . சுந்தரம். (வீ	ல்விக்கழகம் - த கே .பிள்ளை (மிழ் மின் நூல வெளியீடு: த	கம் - இணை T மிழ்நாடு பாம	யத்தில் தமிழ் otal Hours:	15
அறிவ் மென் அகரா Text I 1.	பெயல் தம பொருட் திகள் - இ தமிழக பணிக கணின் கீழடி -	வ ழ் மற்றும் க பிழின் வளர கள் உருவாக் சொற்குவைத்): : வரலாறு-ம ள் கழகம்). சித்தமிழ் – மு - வைகை ந <u>த</u>	ணித்தமிழ் ர்ச்சி - கணி கம் - தமிழ் திட்டம். அக்களும் பண் அனைவர் இல இக்கரையில் ச	இணையக் க னபாடும் கே. . சுந்தரம். (வி ங்ககால நகர	ல்விக்கழகம் - த கே .பிள்ளை (கேடன் பிரசுரம்).	மிழ் மின் நூல வெளியீடு: த வெயல் துறை ெ	கம் - இணை T மிழ்நாடு பாம	யத்தில் தமிழ் otal Hours:	15
அறிவ் மென் அகரா 1. 2. 3. 4.	பெரம் தம் கெள் - செ இகள் - செ இத்தை - செ இத்தை கணின் கணின் கீழடி - போரு Social	பிழ் மற்றும் க பிழின் வளர கள் உருவாக் சொற்குவைத்): வரலாறு-ம ள் கழகம்). சித்தமிழ் – மு - வைகை ந <u>த</u> நை - ஆற்றங் Life of Tan	ணித்தமிழ் ர்ச்சி - கணி கம் - தமிழ் திட்டம். அக்களும் பண் அனைவர் இல இக்கரையில் ச ம்கரை நாகரீக	இணையக் க ன்பாடும் கே. . சுந்தரம். (வீ ங்ககால நகர ம் (தொல்லிய Pillay) A joir	ல்விக்கழகம் - த கே .பிள்ளை (நாகரீகம் (தொல் பல் துறை வெளிய nt publication of	மிழ் மின் நூல வெளியீடு: த லியல் துறை ெ சீடு).	கம் - இணை T மிழ்நாடு பாம் வளியீடு).	யத்தில் தமிழ் otal Hours: _நூல் மற்றும் - (in print).	15 கல்வியிய
அறிவ் மென் அகரா 1. 2. 3. 4.	பெரமுட் இகள் - மே இகள் - மே இகள் - மே இது இது இது இது இது இது இது இது இது இது	லிழ் மற்றும் க மிழின் வளர கள் உருவாக் சொற்குவைத்): வரலாறு-ம ள் கழகம்). சித்தமிழ் – மு ஹை - ஆற்றங் Life of Tan	ணித்தமிழ் ர்ச்சி - கணி கம் - தமிழ் திட்டம். அக்களும் பண் அனைவர் இல இக்கரையில் ச ம்கரை நாகரீக	இணையக் க ன்பாடும் கே. . சுந்தரம். (வீ ங்ககால நகர ம் (தொல்லிய Pillay) A joir	ல்விக்கழகம் - த கே .பிள்ளை (ரகடன் பிரசுரம்). நாகரீகம் (தொல் பல் துறை வெளிய	மிழ் மின் நூல வெளியீடு: த லியல் துறை ெ சீடு).	கம் - இணை T மிழ்நாடு பாம் வளியீடு).	யத்தில் தமிழ் otal Hours: _நூல் மற்றும் - (in print).	15 கல்வியிய
அறிவ் மென் அகரா 1. 2. 3. 4.	பெரமுட் இகள் - மே இகள் - மே இகள் - மே இது இது இது இது இது இது இது இது இது இது இது இது இது	வழ் மற்றும் க மிழின் வளர கள் உருவாக் சொற்குவைத்): வரலாறு-ம ள் கழகம்). சித்தமிழ் – மு ஹந - ஆற்றங் Life of Tan Life of the Studies.	ணித்தமிழ் ர்ச்சி - கணி க்கம் - தமிழ் திட்டம். கக்களும் பண் கைவர் இல திக்கரையில் ச ப்கரை நாகரீக nils (Dr.K.K. Tamils - Th	இணையக் க எபாடும் கே. . சுந்தரம். (வி ங்ககால நகர ம் (தொல்லிய Pillay) A joir e Classical	க்விக்கழகம் - த கே .பிள்ளை (நகடன் பிரசுரம்). நாகரீகம் (தொல் பல் துறை வெளிய nt publication of Period (Dr.S.Si	மிழ் மின் நூல வெளியீடு: த. லியல் துறை ெ சீடு). TNTB & ESC ngaravelu) (F	கம் - இணை T மிழ்நாடு பாம் வளியீடு). C and RMRL Published by	யத்தில் தமிழ் otal Hours: _நூல் மற்றும் _ – (in print). : International	15 கல்வியிய Institute
அறிவ் மென் அகரா 1. 2. 3. 4.	ியல் து பொருட் திகள் - செ தமிழக பணிக் கணின் கீழடி - பொரு Social Social Tamil Histor	பிழ் மற்றும் க மிழின் வளர கள் உருவாக் சொற்குவைத்): வரலாறு-ம ள் கழகம்). சித்தமிழ் – மு - வைகை நத நை - ஆற்றங் Life of the Studies. ical Heritag	ணித்தமிழ் ரச்சி - கணி கம் - தமிழ் திட்டம். கக்களும் பண் கைவர் இல கெக்கரையில் ச பகரை நாகரீக nils (Dr.K.K. Tamils - Th	இணையக் க கபாடும் கே. . சுந்தரம். (வீ ங்ககால நகர ம் (தொல்லிய Pillay) A joir e Classical	ல்விக்கழகம் - த கே .பிள்ளை (நாகரீகம் (தொல் பல் துறை வெளிய nt publication of	மிழ் மின் நூல வெளியீடு: த. லியல் துறை ெ சீடு). TNTB & ESC ngaravelu) (F	கம் - இணை T மிழ்நாடு பாம் வளியீடு). C and RMRL Published by	யத்தில் தமிழ் otal Hours: _நூல் மற்றும் _ – (in print). : International	15 கல்வியிய Institute
அறிவ் மென் அகரா 1. 2. 3. 4. 5.	ியல் தம பொருட் இகள் - (இகள் - (இகள் - (இதமிழக பணிக கணின் கழுடி - போரு Social Social Tamil Histor Interna	பிழ் மற்றும் க மிழின் வளர கள் உருவாக் சொற்குவைத்): வரலாறு-ம ள் கழகம்). சித்தமிழ் – மு - வைகை நதி நை - ஆற்றங் Life of the Studies. ical Heritag	ணித்தமிழ் ர்ச்சி - கணி கம் - தமிழ் திட்டம். கைகளும் பண் கைகையில் ச ப்கரை நாகரீக nils (Dr.K.K. Tamils - Th	இணையக் க ன்பாடும் கே. . சுந்தரம். (வீ ங்க்கால நகர ம் (தொல்லிய Pillay) A joir e Classical Tamils (Dr. il Studies).	க்விக்கழகம் - த கே .பிள்ளை (நாகரீகம் (தொல் பல் துறை வெளிய nt publication of Period (Dr.S.Si S.V.Subaramar	மிழ் மின் நூல வெளியீடு: த வியல் துறை ெ ரீடு). TNTB & ESC ngaravelu) (F	கம் - இணை T மிழ்நாடு பாம வளியீடு). C and RMRL Published by Thirunavuk	யத்தில் தமிழ் otal Hours: _நூல் மற்றும் - (in print). : International	15 ສລໍລາພາແ Institute
அறிவ் மென் அகரா 1. 2. 3. 4. 5.	ியல் தர பொருட் திகள் - (ச திகள் - (ச தமிழக பணிக கணின் கீழடி - பொரு Social Tamil Histor Interna	லிழ் மற்றும் க மிழின் வளர கள் உருவாக் சொற்குவைத்): வரலாறு-ம ள் கழகம்). சித்தமிழ் – மு - வைகை நத நை - ஆற்றங் Life of the Studies. ical Heritaç ational Insti	ன் த்தமிழ் ர்ச்சி - கணி கம் - தமிழ் திட்டம். கைகளும் பண் கைகை நாகரீக nils (Dr.K.K. Tamils - Th	இணையக் க ன்பாடும் கே. . சுந்தரம். (வீ ங்க்கால நகர ம் (தொல்லிய Pillay) A joir e Classical Tamils (Dr. il Studies).	க்விக்கழகம் - த கே .பிள்ளை (நகடன் பிரசுரம்). நாகரீகம் (தொல் பல் துறை வெளிய nt publication of Period (Dr.S.Si	மிழ் மின் நூல வெளியீடு: த வியல் துறை ெ ரீடு). TNTB & ESC ngaravelu) (F	கம் - இணை T மிழ்நாடு பாம வளியீடு). C and RMRL Published by Thirunavuk	யத்தில் தமிழ் otal Hours: _நூல் மற்றும் - (in print). : International	15 ສລໍລາພາແ Institute
அறிவி மென்! அகரா 1. 2. 3. 4. 5. 6. 7.	ியல் தர பொருட் திகள் - செ தமிழக பணிக கணின் கீழடி - பொரு Social Tamil Histor Interna The Co	வழ் மற்றும் க மிழின் வளர கள் உருவாக் சொற்குவைத்): வரலாறு-ம ள் கழகம்). சித்தமிழ் – மு - வைகை நதி நை - ஆற்றங் Life of the Studies. ical Heritagational Insti	ன் த்தமிழ் ர்ச்சி - கணி கம் - தமிழ் திட்டம். கைக்களும் பண் கைவர் இல கிக்கரையில் ச ப்கரை நாகரீக nils (Dr.K.K. Tamils - Th ge of the tute of Tami	இணையக் க கபாடும் கே. . சுந்தரம். (வீ சங்ககால நகர ம் (தொல்லிய Pillay) A joir e Classical Tamils (Dr. il Studies). nils to India	ல்விக்கழகம் - த கே .பிள்ளை (நாகரீகம் (தொல் பல் துறை வெளிய nt publication of Period (Dr.S.Si S.V.Subaramar n Culture (Dr.M	மிழ் மின் நூல வெளியீடு: த லியல் துறை ெ பீடு). TNTB & ESC ngaravelu) (F nian, Dr.K.D.	கம் - இணை T மிழ்நாடு பாம் வளியீடு). C and RMRL Published by Thirunavul	யத்தில் தமிழ் otal Hours: _நூல் மற்றும் _ — (in print). : International kkarasu) (Pub	15 ສລໍລາພາມ Institute Dished b
அறிவ் மென் அகரா 1. 2. 3. 4. 5. 6.	ியல் து பொருட் திகள் - (ச திகள் - (ச தமிழக பணிக கணின் கீழடி - பொரு Social Tamil Histor Intern The C of Tan Keela	லிழ் மற்றும் க மிழின் வளர கள் உருவாக் சொற்குவைத் பிர்களைத் கு வரலாறு-ம ள் கழகம்). சித்தமிழ் – மு - வைகை நதி நை - ஆற்றங் Life of Tan Life of the Studies. ical Heritagational Insti- contributions nil Studies.) di - 'Sanga	னித்தமிழ் ர்ச்சி - கணி கம் - தமிழ் திட்டம். கைவர் இல கிக்கரையில் ச ம்கரை நாகரீக nils (Dr.K.K. Tamils - Th ge of the tute of Tami s of the Tan	இணையக் க கபாடும் கே. . சுந்தரம். (வி சங்ககால நகர ம் (தொல்லிய Pillay) A join e Classical Tamils (Dr. il Studies). nils to Indial	ல்விக்கழகம் - த கே .பிள்ளை (நாகரீகம் (தொல் மல் துறை வெளிய nt publication of Period (Dr.S.Si S.V.Subaramar n Culture (Dr.M	மிழ் மின் நூல வெளியீடு: த லியல் துறை ெ ரீடு). TNTB & ESC ngaravelu) (F nian, Dr.K.D.	கம் - இணை T மிழ்நாடு பாம் வளியீடு). C and RMRL Published by Thirunavul (Published I	யத்தில் தமிழ் otal Hours: _நூல் மற்றும் _ — (in print). : International kkarasu) (Pub	15 ສລໍລາພາມ Institute Dished b
அறிவி மென்! அகரா 1. 2. 3. 4. 5. 6. 7.	ியல் து பொருட் திகள் - (ச திகள் - (ச தமிழக பணிக கணின் கீழடி - போரு Social Tamil Histor Intern: The C of Tan Keela Archa	வழ் மற்றும் க மிழின் வளர கள் உருவாக் சொற்குவைத் நின் கழகம்). சித்தமிழ் – மு - வைகை நதி நை - ஆற்றங் Life of the Studies. ical Heritagational Insti- contributions nil Studies.) di - 'Sanga eology & Ta	ன்த்தமிழ் ர்ச்சி - கணி கம் - தமிழ் திட்டம். கைவர் இல கிக்கரையில் ச வகரை நாகரீக nils (Dr.K.K. Tamils - Th ge of the tute of Tami s of the Tan m City Civi	இணையக் க கபாடும் கே. . சுந்தரம். (வி சங்ககால நகர ம் (தொல்லிய Pillay) A joir e Classical Tamils (Dr. il Studies). nils to Indial	ல்விக்கழகம் - த கே .பிள்ளை (நாகரீகம் (தொல் மல் துறை வெளிய nt publication of Period (Dr.S.Si S.V.Subaramar n Culture (Dr.M the banks of ri	மிழ் மின் நூல வெளியீடு: த லியல் துறை ெ ரீடு). TNTB & ESC ngaravelu) (F nian, Dr.K.D. I.Valarmathi) ver Vaigai' (Services Corp	கம் - இணை T மிழ்நாடு பாம் வளியீடு). C and RMRL Published by Thirunavul (Published I	யத்தில் தமிழ் otal Hours: _நூல் மற்றும் _ — (in print). : International kkarasu) (Puk by: Internatior shed by: Dep mil Nadu)	15 ສລໍລາພາພ Institute plished b
அறிவி மென்! அகரா 1. 2. 3. 4. 5. 6. 7.	ியல் தம் பொருட் இகள் - (இ தமிழக பணிக கணின் கீழடி - போரு Social Tamil Histor Interna The C of Tan Keela Archa Studie	வழ் மற்றும் க மிழின் வளர கள் உருவாச் சொற்குவைத் ப் கள் கழகம்). சித்தமிழ் — மு வைகை நதி நை - ஆற்றங் Life of Tan Life of Tan Life of The Studies. ical Heritagational Insti contributions nil Studies.) di - 'Sanga eology & Ta	ன்த்தமிழ் ர்ச்சி - கணி கம் - தமிழ் திட்டம். கைவர் இல கிக்கரையில் ச வகரை நாகரீக nils (Dr.K.K. Tamils - Th ge of the tute of Tami s of the Tan m City Civi	இணையக் க கபாடும் கே. . சுந்தரம். (வி சங்ககால நகர ம் (தொல்லிய Pillay) A joir e Classical Tamils (Dr. il Studies). nils to Indial	ல்விக்கழகம் - த கே .பிள்ளை (நாகரீகம் (தொல் மல் துறை வெளிய nt publication of Period (Dr.S.Si S.V.Subaramar n Culture (Dr.M	மிழ் மின் நூல வெளியீடு: த லியல் துறை ெ ரீடு). TNTB & ESC ngaravelu) (F nian, Dr.K.D. I.Valarmathi) ver Vaigai' (Services Corp	கம் - இணை T மிழ்நாடு பாம் வளியீடு). C and RMRL Published by Thirunavul (Published I	யத்தில் தமிழ் otal Hours: _நூல் மற்றும் _ — (in print). : International kkarasu) (Puk by: Internatior shed by: Dep mil Nadu)	15 ສລໍລາພາພ Institute plished b
அறிவி மென்! அகரா! 1. 2. 3. 4. 5. 6. 7. 8.	ியல் தம் பொருட் திகள் - (ச திகள் - (ச திகள் - (ச தமிழக பணிக கணின் கீழடி - போரு Social Tamil Histor Interna The C of Tan Keela Archa Studie Autho	லிழ் மற்றும் க மிழின் வளர கள் உருவாச் சொற்குவைத்): வரலாறு-ம ள் கழகம்). சித்தமிழ் — மு வகை நத நை - ஆற்றங் Life of Tan Life of the Studies. ical Heritagational Instite contributions nil Studies.) di - 'Sanga eology & Tass es in the Histor).	ன் த்தமிழ் ர்ச்சி - கணி கம் - தமிழ் திட்டம். கக்களும் பண் கைவர் இல கக்கரையில் ச ம்கரை நாகரீக nils (Dr.K.K. Tamils - Th ge of the tute of Tami s of the Tan m City Civi amil Nadu T	இணையக் க கபாடும் கே. . சுந்தரம். (வி கங்ககால நகர ம் (தொல்லிய Pillay) A join e Classical Tamils (Dr. il Studies). nils to Indian lization on ext Book an ia with Special	ல்விக்கழகம் - த கே .பிள்ளை (கடன் பிரசுரம்). நாகரீகம் (தொல் பல் துறை வெளிய nt publication of Period (Dr.S.Si S.V.Subaramar n Culture (Dr.M the banks of ri d Educational Scial Reference	மிழ் மின் நூல வெளியீடு: த லியல் துறை ெ ரீடு). TTNTB & ESC ngaravelu) (F nian, Dr.K.D. I.Valarmathi) ver Vaigai' (Services Corp to Tamil Nad	கம் - இணை T மிழ்நாடு பாம் வளியீடு). C and RMRL Published by Thirunavul (Published I (Published I Jointly Publi poration, Tar lu (Dr.K.K.P	யத்தில் தமிழ் otal Hours: _நூல் மற்றும் _ — (in print). : International kkarasu) (Pub by: Internatior shed by: Dep mil Nadu) illay) (Publish	15 கல்வியிய Institute plished b nal Institu partment ed by: Th
அறிவி மென்! அகரா 1. 2. 3. 4. 5. 6. 7.	ியல் தம் பொருட் இகள் - மி இகள் - மி இகள் - மி தமிழக பணிக கணின் கீழடி - போரு Social Tamil Histor Interna The C of Tan Keela Archa Studie Autho	வழ் மற்றும் க மிழின் வளர கள் உருவாக் சொற்குவைத் பித்தமிழ் — மு வைகை நதி நை - ஆற்றங் Life of Tan Life of Tan Life of Heritagational Institicontributions nil Studies.) di - 'Sanga eology & Tassi in the Histor). ai Civilizati	ன்த்தமிழ் ர்ச்சி - கணி கம் - தமிழ் திட்டம். கக்களும் பன் கைவர் இல கக்கரையில் ச மகரை நாகரீக nils (Dr.K.K. Tamils - Th ge of the tute of Tami s of the Tan m City Civi amil Nadu T story of Indi	இணையக் க கபாடும் கே. . சுந்தரம். (வீ ங்ககால நகர ம் (தொல்லிய Pillay) A joir e Classical Tamils (Dr. il Studies). nils to India lization on fext Book an ia with Spec	்விக்கழகம் - த கே .பிள்ளை (கடன் பிரசுரம்). நாகரீகம் (தொல் பல் துறை வெளிய nt publication of Period (Dr.S.Si S.V.Subaramar n Culture (Dr.M the banks of ri d Educational Scial Reference	மிழ் மின் நூல வெளியீடு: த லியல் துறை ெ ரீடு). TTNTB & ESC ngaravelu) (F nian, Dr.K.D. I.Valarmathi) ver Vaigai' (Services Corp to Tamil Nad	கம் - இணை T மிழ்நாடு பாம் வளியீடு). C and RMRL Published by Thirunavul (Published I (Published I Jointly Publi poration, Tar lu (Dr.K.K.P	யத்தில் தமிழ் otal Hours: _நூல் மற்றும் _ — (in print). : International kkarasu) (Pub by: Internatior shed by: Dep mil Nadu) illay) (Publish	15 கல்வியிய Institute plished b nal Institu partment ed by: Th
அறிவி மென் அகரா 1. 2. 3. 4. 5. 6. 7. 8.	ியல் தம் பொருட் இகள் - மி இகள் - மி இகள் - மி இது - மி இது - பணிக கணின் கீழடி - போரு Social Tamil Histor Interna The C of Tan Keela Archa Studie Autho Porun Educa	வழ் மற்றும் க மிழின் வளர கள் உருவாக் சொற்குவைத் பித்தமிழ் — மு வைகை நதி நை - ஆற்றங் Life of Tan Life of Tan Life of Heritagational Institicontributions nil Studies.) di - 'Sanga eology & Tas es in the Histry). ai Civilizatiational Servi	ன்த்தமிழ் ர்ச்சி - கணி கம் - தமிழ் திட்டம். கக்களும் பன் கைவர் இல கக்கரையில் ச மகரை நாகரீக nils (Dr.K.K. Tamils - Th ge of the tute of Tami s of the Tan m City Civi amil Nadu T story of Indi	இணையக் க கபாடும் கே. . சுந்தரம். (வி கங்ககால நகர ம் (தொல்லிய Pillay) A join e Classical Tamils (Dr. il Studies). nils to Indian lization on in fext Book and ia with Special	்விக்கழகம் - த கே .பிள்ளை (கடன் பிரசுரம்). நாகரீகம் (தொல் பல் துறை வெளிய nt publication of Period (Dr.S.Si S.V.Subaramar n Culture (Dr.M the banks of ri d Educational Scial Reference	மிழ் மின் நூல வெளியீடு: த லியல் துறை ெ ரீடு). TNTB & ESC ngaravelu) (F nian, Dr.K.D. I.Valarmathi) ver Vaigai' (, Services Corp to Tamil Nad	கம் - இணை T மிழ்நாடு பாம் வளியீடு). C and RMRL Published by Thirunavul (Published I Jointly Publi poration, Tar u (Dr.K.K.P	யத்தில் தமிழ் otal Hours: _நூல் மற்றும் _ – (in print). : International kkarasu) (Pub by: Internatior shed by: Dep mil Nadu) illay) (Publish iil Nadu Text	15 கல்வியிய Institute plished b mal Institute partment ed by: Ti

60 MY 002	Universal Human	Category	L	T	Р	Credit
00 101 1 002	Values	MC	3	0	0	3#

- To identify the essential complementarily between 'values' and 'skills'
- To ensure core aspirations of all human beings.
- To acquire ethical human conduct, trustful and mutually fulfilling human behaviour
- To enrich interaction with Nature
- To achieve holistic perspective towards life and profession

Pre-requisites

Nil

Course Outcomes

On the suc	On the successful completion of the course, students will be able to										
CO1	Understand the significance of value inputs in formal education and start applying them in their life and profession	Understand									
CO2	Evaluate coexistence of the "I" with the body.	Analyze									
CO3	Identify and evaluate the role of harmony in family, society and universal order.	Analyze									
CO4	Classify and associate the holistic perception of harmony at all levels of existence and Nature	Analyze									
CO5	Develop appropriate human conduct and management patterns to create harmony in professional and personal lives.	Create									

Mapping with Programme Outcomes

COs						F	POs							PSOs	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1	-	-	-	-	-	-	-	3	2	-	2	3	-	-	-
CO2	-	-	-	-	-	3	-	3	3	-	-	3	-	-	-
CO3	-	-	-	-	-	3	3	3	3	-	-	3	-	-	-
CO4	-	-	-	-	-	3	3	3	3	-	-	3	-	-	-
CO5	-	-	-	-	-	3	3	3	3	3	-	3	-	-	-
3 - Stro	ong; 2 ·	- Mediu	m; 1 - :	Some											

Assessment	Dattern

Bloom's Category	Continuous Asses (Mar		End Sem Examination (Marks)
	1	2	
Remember	10	10	
Understand	10	10	
Apply	20	20	No End Semester Examination
Analyze	20	20	
Evaluate	0	0	
Total	60	60	

- J	bus	V 0 D) - II T		A 1	- D0000			
		K. S. R	angasamy (echnology - . Food Tech	- Autonomou	IS R2022			
			6			ıman Values				
		ŀ	lours/Week	01111 002 0	Total	Credit	Ma	ximum Marks	<u> </u>	
Seme	ester		T	Р	Hours	C	CA	FS	Total	
I	III	3	0	0	45	3#	100	0	100	
Unde Conti relatio	erstandir inuous l onship a	- Happiness a	ucation*-Self nd prosperity facility –hap	-the basic h	uman aspira	cess for valu tions-right und current scenar	derstanding-	-	[9]	
Unde the n undei	erstandir needs o rstandir	f the self a	eing as the C	the body a	s an instrur	nd the Body-D nent of the s e body – prog	elf-		[9]	
Harm relatio undei	nony in t onship - rstandir	-'Trust' the fo	he basic unit oundation va n the society	lue in relatio	nship –'Res	ues in human pect'- as the r human order	ight evaluat		[9]	
Unde fulfilln	erstandir ment an	ng harmony nong the fou	in the N	ature – reali		ss, self-regul ce as co-exist			[9]	
Natur huma profe	ral Acce anistic e ssional	eptance of h ducation, hu ethics*** –	manistic cons holistic tech	s- definitiver stitution and inologies, pi	universal hu roduction sy	an conduct**- man order- co stems and m ase life and p	mpetence ir nanagement	ì	[9]	
							-	Total Hours:		
Text E	Book(s)	:							45	
	A Fou	Indation Cou	rea in Huma	n Values and	d Profession	al Ethias Car	ır R R Asth	ana R. Ragari	45	
1.	Revis	ea Edition, E	xcel Books,	New Delhi, 2	2019. ISBN 9	78-93-87034-	47-1	ana IX, bagan		
1. 2.		R R, Asthana	xcel Books,	New Delhi, 2	2019. ISBN 9	78-93-87034-	47-1	es and Profess	a G P, 2 ^r	
2.	Gaur	R R, Asthana	xcel Books,	New Delhi, 2	2019. ISBN 9	78-93-87034-	47-1		a G P, 2	
2.	Gaur Ethics rence(s) Jeeva	R R, Asthana 3. : in Vidya: Ek	excel Books, la R, Teachers	New Delhi, 2 s' Manual for agaraj A, Jee	2019. ISBN 9 r A Foundatio	78-93-87034-	47-1 Iuman Value narkantak, 19	es and Profess	a G P, 2	

SDG - * Quality education, ** Gender equality, ***Reduced inequalities

0.11	T	No. of
S. No.	Topics	hours
1	Introduction to Value Education	
1.1	Discussion on Present Education System and Skill Based Education	1
1.2	Understanding Value Education	1
1.3	Self-exploration as the process for value education	1
1.4	Basic Human Aspirations – Continuous Happiness and Prosperity	1
1.5	Basic requirements to 44ulfil Human Aspirations – Right understanding, Relationship and Physical facility	1
1.6	Transformation from Animal Consciousness to Human Consciousness	1
1.7	Sources of Happiness and Prosperity – Harmony and Disharmony	1
1.8	Current Scenario and Role of Education	1
1.9	Outcome of Human Education and Method to 44ulfil the basic human aspirations	1
2	Harmony in the Human Being	
2.1	Understanding Human being – As Co-Existence of the self and the Body – The Needs of the Self and the Body	1
2.2	Understanding Human being – As Co-Existence of the self and the Body – The Activities and Response of the Self and the Body	2
2.3	The body as an instrument of the self	1
2.4	Understanding harmony in the self	1
2.5	Harmony of the self with the body	2
2.6	Programme to ensure self-regulation and health	1
2.7	My Participation (Value) regarding Self and my Body – Correct Appraisal of our Physical needs	1
3	Harmony in the Family and Society	
3.1	Harmony in the Family – Understanding Values in Human Relationships	1
3.2	Family as the basic Unit of Human Interaction	1
3.3	Values in human Relationships	1
3.4	Trust – the foundation value in relationship	1
3.5	Respect as the right evaluation, the Basis for Respect, Assumed Bases for Respect today	1
3.6	Harmony from Family to World Family: Undivided Society	1
3.7	Extending Relationship from family to society, Identification of the Comprehensive Human Goal	1
3.8	Programs needed to achieve the Comprehensive Human Goal: The Five Dimensions of Human Endeavour	1
3.9	Harmony from Family Order to World Family Order – Universal Human Order	1
4	Harmony in the Nature / Existence	
4.1	The Four Orders in Nature	1
4.2	Participation of Human Being in Entire Nature	1
4.3	Natural Characteristics – Tendency of Human Living with Animal Consciousness / The Holistic Perception of Harmony in Existence	1
4.4	Present day Problems	1
4.5	Recyclability and self-regulation in Nature	1
4.6	Relationship of Mutual Fulfilment	1
4.7	An Introduction to space, Co-existence of Units in Space	1
4.8	Harmony in Existence – Understanding Existence as Co- Existence	1
4.9	Natural Characteristic of Human Living with Human Consciousness	1
5	Implications of the Holistic Understanding	



5.1	Natural Acceptance of human values	1
5.2	Definitiveness of Ethical Human Conduct – Development of Human Consciousness	1
5.3	Identification of Comprehensive Human Goal	1
5.4	Basis for Humanistic Education and Humanistic Constitution	1
5.5	Ensuring Competence in professional Ethics	1
5.6	Issues in Professional Ethics-The Current Scenario	1
5.7	Holistic Technologies and Production Systems and management models – Typical Case Studies	2
5.8	Strategies for transition towards value based life and profession	1

1. Dr.G.Vennila - vennila@ksrct.ac.in
2. Dr.K.Raja - rajak@ksrct.ac.in

60 FT 3P1	Food Biochemistry	Category	L	Т	Р	Credit
0011311	Laboratory	PC	0	0	4	2

- To remember the basics of qualitative analysis.
- To examine the quantitative estimation of carbohydrates.
- To study about determination of protein by appropriate methods.
- To learn the methods for lipids determination.
- To infer suitable methods to identify enzymes in food materials.

Pre-requisites

NIL

Course Outcomes

On the succ	On the successful completion of the course, students will be able to									
CO1	Recall the process of calibration of glass wares and preparation of regents.	Understand								
CO2	Analyze the types of carbohydrate in food materials.	Analyze								
CO3	Estimate the protein and lipids in food samples.	Apply								
CO4	Determine the iodine, saponification number and minerals content present in the food sample	Apply								
CO5	Apply suitable method to analyse the enzyme in the food sources and their effects.	Analyze								

Mappir	Mapping with Programme Outcomes														
Cos						P	os							PSOs	
003	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1	-	-	3	3	-	-	-	-	3	3	-	3	3	3	-
CO2	-	-	3	3	-	-	-	-	3	3	-	3	3	3	-
CO3	-	-	3	3	-	-	-	-	3	3	-	3	3	3	-
CO4	-	-	3	3	-	-	-	-	3	3	-	3	3	3	-
CO5	-	-	3	3	-	-	-	-	3	3	-	3	3	3	-
3-Stron	ıg;2-Me	edium;1	-Low												

Assessment	Pattern	

Bloom's Category	Lab Experiments	Assessment (Marks)	Model Examination (Marks)	End Sem Examination (Marks)
	Lab Activity			
Remember	-	-	-	-
Understand	20	10	50	50
Apply	20	10	30	30
Analyze	10	5	20	20
Evaluate	-	-	-	-
Create	-	-	-	-
Total	50	25	100	100

K.S.Rangasamy College of Technology – Autonomous R2022											
B.Tech. Food Technology											
60 FT 3P1 – Food Biochemistry Laboratory											
Semester	ŀ	lours/Week		Total	Credit	Ma	ximum Mark	s			
Semester	L	Т	Р	Hrs	С	CA	ES	Total			
III	0	0	4	60	2	60	40	100			

List of Experiments:

- 1. Calibration of glass wares- pipettes, burettes and volumetric flasks (demonstration) and Preparation of solutions: 1)percentage solutions, 2) molar solutions, 3) normal solutions
- 2. Qualitative tests for monosaccharide, disaccharide and polysaccharide.
- 3. Estimation of reducing sugar (Dinitrosalicylic method). *
- 4. Estimation of Total Carbohydrates in cereals by anthrone method. *
- 5. Isolation of Protein from milk and egg.*
- 6. Estimation of Protein by Lowry's method.
- 7. Estimation of Lipid by Folch's method. *
- 8. Estimation of cholesterol by Zak's method. *
- 9. Determination of Iodine number.
- 10. Determination of Saponification number.
- 11. Estimation of ash and acid insoluble ash.
- 12. Estimation of minerals present in food samples by flame photometry.*
- 13. Determine the dependence of catalase activity on temperature.
- 14. Identification of enzymes in different sources

Lab Manual

- 1. Wilson, Keith and John Walker "Principles and Techniques of Biochemistry and Molecular Biology", 6th Edition. Cambridge University Press, 2006.
- 2. Sadasivam, S., and Manickam, A, Biochemical Methods ", 3rd Edition, New Age International, Delhi, 1996.

SDG - *Good health and well-being

Course Designer(s)

Dr. K. Prabha - prabhak@ksrct.ac.in



60 FT 3P2	Food Microbiology	Category	L	Т	Р	Credit
0011312	Laboratory	PC	0	0	4	2

- The students will be familiarize with procedures of isolation of bacteria culturing
- To learn aseptic technique, identification of organisms
- To explore conditions necessary for microbial growth as well as microbial control.
- The students should be able to analyse explicitly the concepts, develop their skills in the preparation
- To identify and quantify microorganisms.

Pre-requisites

NIL

Course Outcomes

CO1	Demonstrate the types of sterilization techniques ,cultivation and plating techniques of microorganism	Understand
CO2	Interpret the different types of staining techniques and biochemical analysis of bacteria	Analyze
CO3	Illustrate the biochemical analysis of microorganisms and microbial growth kinetics	Apply
CO4	Examine the load of coliform bacteria, antimicrobial activity and production of alcoholic beverage	Apply
CO5	Illustrate the effect of pH , temperature and UV on microbial growth and	Analyze

Mappii	Mapping with Programme Outcomes														
Cos	Pos												PSOs		
COS	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1	-	-	3	3	-	-	-	-	3	3	-	3	3	2	-
CO2	-	-	3	3	-	-	-	-	3	3	-	3	3	2	-
CO3	-	-	3	3	-	-	-	-	3	3	-	3	3	3	-
CO4	-	-	3	3	-	-	-	-	3	3	-	3	3	2	-
CO5	-	-	3	3	-	-	-	-	3	3	-	3	3	3	3
3-Stron	ng;2-Me	dium;1	-Low												

Assessment Pattern	Assessment Pattern											
Bloom's Category	Lab Experiment	s Assessment (Marks)	Model Examination (Marks)	End Sem Examination (Marks)								
	Lab	Activity										
Remember	-	-	-	-								
Understand	20	10	50	50								
Apply	20	10	30	30								
Analyze	10	5	20	20								
Evaluate	-	-	-	-								
Create	-	-	-	-								
Total	50	25	100	100								

100

Syllabus											
K.S.Rangasamy College of Technology – Autonomous R2022											
B.Tech. Food Technology											
60 FT 3P2 – Food Microbiology Laboratory											
Samester	I	lours/Week		Total	Credit	Ma	ximum Mark	(S			
Semester	L	Т	Р	Hrs	С	CA	ES	Total			

60

2

60

40

List of Experiments:

Ш

- Sterilization techniques, equipment and preparation of culture media –complex, synthetic and selective media.**
- 2. Isolation of bacteria from rotten food sample

0

3. Cultivation of microorganisms – agar slant, streak plate and spread plate.

4

- 4. Quantitative analysis of food sample by standard plate counting methods.*
- 5. Simple, Gram and Fungal staining methods.
- 6. Methylene Blue reduction test for Milk.*

0

- 7. Biochemical Analysis of Bacteria Imvic method.
- 8. Isolation of probiotic bacteria from food sample using anaerobic chamber.*
- 9. Microbial Growth Kinetics in Fermentation process.
- 10. Effect of different sterilization methods on Bacteria.*
- 11. Antimicrobial activity of Antibiotics and Natural antimicrobial agent.
- 12. Production and evaluation of Fermented food.*
 - 13. Effect of pH, temperature and UV on microbial growth.

Lab I	Manual
1.	"Food Microbiology Lab Manual", Department of Food Technology, KSRCT.
2.	Microbiology, Pelczar, Michael J. Chan and E.C.N Krieg Noel R. McGraw Hill Education; 5th edition, New Delhi, 2001.

SDG - *Good health and well-being, **Clean water and sanitation

Course Designer(s)

1. Dr.A.S.Ruby Celsia - rubycelsia@ksrct.ac.in



60 CG 0P2	Career Skill	Category	L	Т	Р	Credit
00 CG 0F 2	Development II	CG	0	0	2	1*

- To help learners improve their vocabulary and enable them to use words appropriately in different academic and professional contexts.
- To help learners develop strategies that could be adopted while reading texts.
- To help learners acquire the ability to speak and write effectively in English in real life and career related situations.
- Improve listening, observational skills, and problem-solving capabilities
- Develop message generating and delivery skills

Pre-requisites

Basic knowledge of reading and writing in English

Course Outcomes

CO1	Compare and contrast products and ideas in technical texts.	Analyze
CO2	Identify cause and effects in events, industrial processes through technical texts	Analyze
CO3	Analyze problems in order to arrive at feasible solutions and communicate them orally and in the written format.	Analyze
CO4	Report events and the processes of technical and industrial nature.	Apply
CO5	Articulate their opinions in a planned and logical manner, and draft effective resumes in context of job search.	Apply

Mappir	Mapping with Programme Outcomes															
COs	POs													PSOs		
COS	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	
CO1	-	-	-	-	-	-	-	2	3	3	2	3	-	-	-	
CO2	-	-	-	-	-	-	-	2	3	3	2	3	2	2	-	
CO3	-	-	-	-	-	-	-	2	3	3	2	3	-	2	2	
CO4	-	-	-	-	-	-	-	2	3	3	2	3	-	-	-	
CO5	-	-	-	-	-	-	-	2	3	3	2	3	2	2	-	
3- Stro	ng;2-M	edium;	1-Some		•			•	•	•	•					

Syllab	bus								
K.S.Rangasamy College of Technology – Autonomous R2022									
B.Tech. Food Technolgy									
60 CG 0P2 - Career Skill Development II Hours/Week Total Credit Maximum Marks									
Seme	ester		T T	P	Hours	Credit	CA	Total	
I	II	0	0	2	30	1*	100	ES 00	100
Listening Evaluative Listening: Advertisements, Product Descriptions - Audio / video; filling a graphic organiser (choosing a product or service by comparison) - Listening to longer technical talks and completing– gap filling exercises. Listening technical information from podcasts – Listening to process/event descriptions to identify cause & effects, documentaries depicting a technical problem and suggesting solutions - Listening to TED Talks								[6]	
Speaking Marketing a product, persuasive speech techniques - Describing and discussing the reasons of accidents or disasters based on news reports, Group Discussion (based on case studies),presenting oral reports, Mini presentations on select topics with visual aids, participating in role plays, virtual interviews							[6]		
Reading Reading advertisements, user manuals and brochures - longer technical texts— cause and effect essays, and letters / emails of complaint - Case Studies, excerpts from literary texts,news reports etc Company profiles, Statement of Purpose (SoPs)								[6]	
Writing Professional emails, Email etiquette - compare and contrast essay - Writing responses to complaints Precis writing, Summarizing and Plagiarism- Job / Internship application - Cover letter & Résumé						[6]			
	al Abilit	y II							
Reading Comprehension (Inferential fillups) – Spotting Errors – Verbal Analogies – Theme Detection – Change of Voice – Change of Speech – One word substitution							Detection –	[6]	
							Т	otal Hours:	30
Refer	ence(s	,						"- -	
1.	<i>'English for Engineers & Technologists'</i> Orient Blackswan Private Ltd. Department of English, Anna University, 2020.								
2.	Norman Lewis, 'Word Power Made Easy - The Complete Handbook for Building a Superior Vocabulary Book', Penguin Random House India, 2020								
3.	Raman. Meenakshi, Sharma. Sangeeta, 'Professional English'. Oxford University Press. New Delhi. 2019								
4.	Arthur Brookes and Peter Grundy,' Beginning to Write: Writing Activities for Elementary and Intermediate Learners', Cambridge University Press, New York, 2003								

^{*} SDG- 04- Quality Education

Course Contents and Lecture Schedule						
S. No.	Topics					
1.0	Listening	•				
1.1	Evaluative Listening: Advertisements, Product Descriptions	1				
1.2	Listening to longer technical talks and completing- gap filling exercises.	1				
1.3	Listening technical information from podcasts					
1.4	Listening to process/event descriptions to identify cause & effects and documentaries depicting a technical problem and suggesting solutions					
1.5	Listening to TED Talks	2				
2	Speaking					
2.1	Marketing a product, persuasive speech techniques	1				
2.2	Describing and discussing the reasons of accidents or disasters based on news reports,					
2.3	Group Discussion (based on case studies)	1				
2.4	Presenting oral reports, Mini presentations on select topics with visual aids	1				
2.5	participating in role plays and virtual interviews	2				
3	Reading	ı				
3.1	Reading advertisements, user manuals and brochures	1				
3.2	Reading - longer technical texts- cause and effect essays, and letters / emails of complaint	1				
3.3	Case Studies, excerpts from literary texts, news reports etc.	1				
3.4	Company profiles	1				
3.5	Statement of Purpose (SoPs)	2				
4	Writing					
4.1	Professional emails, Email etiquette	1				
4.2	Compare and contrast essay	1				
4.3	Writing responses to complaints	1				
4.4	Precis writing, Summarizing and Plagiarism	1				
4.5	Job / Internship application – Cover letter & Résumé	2				
5	Verbal Ability II	1				
5.1	Reading Comprehension (Inferential fillups) and Theme Detection	1				
5.2	Spotting Errors	1				
5.3	Verbal Analogies	1				
5.4	Change of Voice and Change of Speech	1				
5.5	One word substitution	2				
		1				

1. Dr.A.Palaniappan - palaniappan@ksrct.ac.in

K.S.RANGASAMY COLLEGE OF TECHNOLOGY, TIRUCHENGODE 637215 (An Autonomous Institution affiliated to Anna University) B.E. / B.Tech. Degree ProgrammeSCHEME

OF EXAMINATIONS (For the candidates admitted in 2022-2023) FOURTH SEMESTER

		Name of the Course	Duration of Internal Exam	Weightage of Marks			Minimum Marks for Pass in End Semester Exam			
S.No.	Course Code			Continuous Assessment	End Semester Exam **	Max. Marks	End Semester Exam	Total		
THEORY										
1	60 MA 021	Probability and Statistics	2	40	60	100	45	100		
2	60 FT 401	Fluid Mechanics and Mechanical Operation	2	40	60	100	45	100		
3	60 FT 402	Meat, Fish and Poultry Process Technology	2	40	60	100	45	100		
4	60 FT 403	Food Chemistry and Nutrition	2	40	60	100	45	100		
5	60 FT E1*	Professional Elective – I	2	40	60	100	45	100		
6	60 OE L0*	Open Elective – I	2	40	60	100	45	100		
			•	PRACTICAL			•			
7	60 FT 4P1	Food Chemistry and Nutrition Laboratory	3	60	40	100	45	100		
8	60 FT 4P2	Unit Operations Laboratory	3	60	40	100	45	100		
9	60 CG 0P3	Career Skill Development III	3	60	40	100	45	100		
10	60 CG 0P6	Internship	-	-	-	100	-	100		

^{*} CA evaluation pattern will differ from course to course and for different tests. This will have to be declared in advance to students. The department will put a process in place to ensure that the actual test paper follow the declared pattern.



^{**} End Semester Examination will be conducted for maximum marks of 100 and subsequently be reduced to 60 marks for theory End Semester Examination and 40 marks for practical End Semester Examination.

60 MA 021	Probability and	Category	L	T	Р	Credit
60 MA 021	Statistics	BS	3	1	0	4

- To get exposed to the basic concepts of probability.
- To familiarize the concepts of correlation and regression.
- To familiarize various methods in hypothesis testing.
- To get exposed to the fundamentals of analysis of variance.
- To learn basics of descriptive statistics and control charts.

Pre-requisites

Nil

Course Outcomes

Off the 3de	en the saccessial completion of the coarse, stadents will be able to							
CO1	Understand the basic concepts of probability.	Apply						
CO2	Calculate coefficient of correlation and regression.	Apply						
CO3	Apply Student's t test, F test and Chi-square test for testing the statistical hypothesis.	Apply						
CO4	Apply the concepts of ANOVA to test the equality of means for more than two populations.	Apply						
CO5	Compute measures of central tendency and measures of dispersion, and apply the concepts of control charts for decision making.	Apply						

Mapping with Programme Outcomes	Mapping	with	Programme	Outcomes
---------------------------------	----------------	------	------------------	----------

COs		POs											PSOs		
003	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1	3	2	-	-	2	-	-	-	-	-	-	-	2	-	-
CO2	3	2	-	-	2	-	-	-	-	-	-	-	2	-	-
CO3	3	2	-	-	2	-	-	-	-	-	-	-	2	-	-
CO4	3	2	-	-	2	-	-	-	-	-	-	-	2	-	-
CO5	3	2	-	-	2	-	-	-	-	-	-	-	2	-	-
3 – Str	ong; 2	– Medi	um; 1 –	Some											

Assessinent Fattern				
Bloom's Category		sessment Tests arks)	Model Examination	End Sem Examination (Marks)
	1	2	(Marks)	(Marks)
Remember	10	10	20	20
Understand	10	10	20	20
Apply	40	40	60	60
Analyze	-	-	-	-
Evaluate	-	-	-	-
Create	-	-	-	-
Total	60	60	100	100

B.Tech. Food Technology 60 MA 021 - Probability and Statistics									
Semesie	L	Т	Р	Hours	С	CA	ES	Total	
IV	3	1	0	60	4	40	60	100	
Probabili Random	ity and Randon ty - Axioms of pr variable - Discre - Probability dens	obability - To	ariable - Pro	bability mass	s function - C			[9]	
Joint dist	nensional Rand ribution - Margin on - Rank Correl	al distributio	n - Condition	nal distributio	n - Covarian	ce -		[9]	
Type I ar	of Hypothesis nd Type II errors Difference of me S.							[9]	
Analysis	of Experiments of variance - On ation* - Randon	•				ign - Twow a	ay	[9]	
classification* - Randomized block design - Latin square design. Statistics and Quality Control Measures of Central tendency*: Mean, Median, Mode - Measures of Dispersion: Quartile deviation - Standard deviation - Coefficient of variation - Control charts: Mean \[\overline{X} \] chart and Range (R) chart - nP chart - C chart.									
Measure d <u>e</u> viation	es of Central ter - Standard dev	ontrol ndency*: Me iation - Coeff	an, Median, ficient of vari	Mode - Mea ation - Contr	sures of Disp		artile	[9]	
Measure d <u>e</u> viatior □ <i>X</i> □ char	es of Central ter – Standard dev t and Range (R)	ontrol ndency*: Me iation - Coeff	an, Median, ficient of vari	Mode - Mea ation - Contr	sures of Disp ol charts: Me			[9]	
Measure deviation □X char Text Boo	es of Central ter - Standard dev t and Range (R) ok(s):	ontrol ndency*: Me iation - Coefl chart - nP cl	an, Median, ficient of vari nart - C chart	Mode - Mea ation - Contr	sures of Dispol charts: Me	an urs: 45 + 15	(Tutorial)		
Measure deviation X char Text Bool 1. G C	es of Central ter - Standard dev t and Range (R) bk(s): upta S.C and Ka hand & Sons, Ne	ontrol ndency*: Me iation - Coeff chart - nP cl apoor V.K., "F ew Delhi, 202	an, Median, ficient of vari nart - C chart fundamental 20.	Mode - Mea ation - Contr :. s of Mathem	sures of Dispol charts: Me Total Horatical Statisti	urs: 45 + 15 cs", 12 th Ed	(Tutorial) ition, Sultan		
Measure deviation X char Text Bool 1. G C 2 R	es of Central ter - Standard dev t and Range (R) ok(s): upta S.C and Ka	ontrol ndency*: Me iation - Coeff chart - nP cl spoor V.K., "F ew Delhi, 202 n, "Miller & F	an, Median, ficient of varinart - C charter of charter	Mode - Mea ation - Contr :. s of Mathem	sures of Dispol charts: Me Total Horatical Statisti	urs: 45 + 15 cs", 12 th Ed	(Tutorial) ition, Sultan		
Measure deviation X char Text Boo 1. G C 2. R Po Reference	es of Central ter — Standard dev t and Range (R) pk(s): upta S.C and Ka hand & Sons, Ne chard A Johnson earson Education ce(s):	ontrol ndency*: Me iation - Coeff chart - nP cl spoor V.K., "F ew Delhi, 202 n, "Miller & F n Limited, Ne	an, Median, ficient of vari hart - C chart fundamental 20. reund's Probew Delhi, 20	Mode - Mea ation - Contr i. s of Mathem pability and S	sures of Dispol charts: Me Total Ho atical Statisti	urs: 45 + 15 cs", 12 th Ed Engineers", 9	ition, Sultan		
Measured deviation X char Text Boo C C C Reference 1 S	es of Central ter - Standard dev t and Range (R) bk(s): upta S.C and Ka hand & Sons, Ne chard A Johnson earson Education	ontrol ndency*: Me iation - Coeff chart - nP cl spoor V.K., "F ew Delhi, 202 n, "Miller & F n Limited, Ne	an, Median, ficient of vari hart - C chart fundamental 20. reund's Probew Delhi, 20	Mode - Mea ation - Contr i. s of Mathem pability and S	sures of Dispol charts: Me Total Ho atical Statisti	urs: 45 + 15 cs", 12 th Ed Engineers", 9	ition, Sultan		
Measure deviation X char Text Boo 1. G C 2. R Perendent 1. Si 2. R 2. R	es of Central ter - Standard dev t and Range (R) - Dk(s): - upta S.C and Ka - hand & Sons, Ne - chard A Johnson - earson Education - ce(s): - neldon Ross, "A	ontrol ndency*: Me iation - Coeff chart - nP cl poor V.K., "F ew Delhi, 202 n, "Miller & F n Limited, Ne first course in	an, Median, ficient of varinart - C charter of charter	Mode - Mea ation - Contribution - Co	sures of Dispol charts: Me Total Honatical Statistic statistics for E n, Pearson E rs and Keyin	cs", 12 th Ed Engineers", 9	ition, Sultan th Edition, ew Delhi,	60	
Measure deviation	es of Central ter - Standard dev t and Range (R) Dk(s): upta S.C and Ka hand & Sons, Ne chard A Johnson earson Education ce(s): neldon Ross, "A 119. onald E. Walpole	ontrol ndency*: Me iation - Coeff chart - nP cl poor V.K., "F ew Delhi, 202 n, "Miller & F n Limited, Ne first course in e, Raymond I ientists", 9th obability, Sta any Ltd, New	an, Median, ficient of varinart - C charter of charter	Mode - Mea ation - Contribution - Co	sures of Dispol charts: Me Total Hotal Additional Statistic for E In, Pearson E Ins and Keyin on, New Delless", 3 rd Edi	cs", 12 th Ed Engineers", 9 Education, No	ition, Sultan th Edition, ew Delhi, ability andState	60	

*SDG: 4 - Quality Education

1. Probability and Random Variable	Course Contents and Lecture Schedule							
1.1.1 Axioms of probability 1 1.2.2 Total probability 1 1.3.3 Conditional probability 1 1.4.4 Bayes theorem 2 1.5.5 Tutorial 2 1.6. Discrete random variable - Probability mass function 2 1.7. Continuous random variable - Probability density function 1 1.8. Moment generating function 1 1.9. Tutorial 2 2. Two Dimensional Random Variables 2.1. Joint distribution 1 2.2. Marginal distribution 1 2.3. Conditional distribution 1 2.4. Covariance 1 2.5. Tutorial 2 2.6. Correlation 2 2.7. Rank Correlation 2 2.8. Regression 1 2.9. Tutorial 2 3. Testing of Hypothesis 3.1. Student's 't 'test – Single mean 1 3.2. Student's 't 'test – Difference of means 2 3.3. F. test 2 3.4. Tutorial 2 3.5. Chi-square test -Goodness of fit 1 4. Design of Experiments 4.1. Analysis of variance - One way classification 2 4.2. Analysis of variance - Two way classification 2 4.3	S. No.	Topics	No. of hours					
1.2 Total probability 1 1.3 Conditional probability 1 1.4 Bayes theorem 2 1.5 Tutorial 2 1.6 Discrete random variable - Probability density function 1 1.7 Continuous random variable - Probability density function 1 1.8 Moment generating function 1 1.9 Tutorial 2 2. Two Dimensional Random Variables 2.1 Joint distribution 1 2.2 Marginal distribution 1 2.3 Conditional distribution 1 2.4 Covariance 1 2.5 Tutorial 2 2.6 Correlation 2 2.7 Rank Correlation 1 2.8 Regression 1 2.9 Tutorial 2 3. Testing of Hypothesis 3.1 Student's 't test - Single mean 1 3.2 Student's 't test - Single mean 1 3.2 Student's 't test - Single mean 1 3.1 Student's 't test - Single mean 1 3.2 Student's 't test - Single mean 1 3.1 Tutorial 2 <td< td=""><td>1.</td><td></td><td></td></td<>	1.							
1.3 Conditional probability 1 1.4 Bayes theorem 2 1.5 Tutorial 2 1.6 Discrete random variable - Probability mass function 2 1.7 Continuous random variable - Probability density function 1 1.8 Moment generating function 1 1.9 Tutorial 2 2. Two Dimensional Random Variables 2.1 Joint distribution 1 2.2 Marginal distribution 1 2.3 Conditional distribution 1 2.4 Covariance 1 2.5 Tutorial 2 2.6 Correlation 2 2.7 Rank Correlation 1 2.8 Regression 1 2.9 Tutorial 2 2.9 Tutorial 2 2.1 Tutorial 2 2.1 Tutorial 2 2.1 Student's 'I' test - Single mean 1 3.1 Student's 'I' test - Difference of means 2 3.1 Tutorial 2 3.3 F- test 1 3.4 Tutorial 2 3.5 Chi-square test -Goodness of fit 1 4. Design of Experiments 2 4. Design of Experiments 1 4. Analysis of variance - One way classification 2 4.5 Analysis of variance - Two way classification 2 4.5 Analysis of variance - Two way classification 2 4.5 Analysis of variance - Two way classification 2 4.5 Analysis of variance - Two way classification 2 4.5 Analysis of variance - Two way classification 2 4.5 Analysis of variance - Two way classification 2 4.5 Analysis of variance - Two way classification 2 4.5 Analysis of variance - Two way classification 2 4.6 Analysis of variance - Two way classification 2 4.7 Tutorial 2 4.8 Coefficient of variation 1 5.1 Mean, Median, Mode 2 5.2 Quartile deviation 1 5.3 Standard deviation 1 5.4 Coefficient of variation 1 5.5 Tutorial 1 5.6 Mean UXU chart and Range (R) chart 1 5.7 n P chart 1 5.8 C Chart 1	1.1	·						
1.4 Bayes theorem 2 1.5 Tutorial 2 1.6 Discrete random variable - Probability mass function 2 1.7 Continuous random variable - Probability density function 1 1.8 Moment generating function 1 1.9 Tutorial 2 2. Two Dimensional Random Variables 2.1 Joint distribution 1 2.2 Marginal distribution 1 2.3 Conditional distribution 1 2.4 Covariance 1 2.5 Tutorial 2 2.5 Tutorial 2 2.6 Correlation 2 2.7 Rank Correlation 1 2.8 Regression 1 2.9 Tutorial 2 3.1 Student's 't test - Single mean 1 3.1 Student's 't test - Single mean 2 3.2 Student's 't test - Uniference of means 2 3.2 Student's 't test - Uniference of means	1.2		1					
1.5 Tutorial 2 1.6 Discrete random variable - Probability mass function 2 1.7 Continuous random variable - Probability density function 1 1.8 Moment generating function 1 1.9 Tutorial 2 2. Two Dimensional Random Variables 2.1 Joint distribution 1 2.2 Marginal distribution 1 2.3 Conditional distribution 1 2.4 Covariance 1 2.4 Covariance 1 2.5 Tutorial 2 2.6 Correlation 2 2.7 Rank Correlation 1 2.8 Regression 1 2.9 Tutorial 2 3. Testing of Hypothesis 3.1 Student's 't'est - Single mean 1 3.2 Student's 't'est - Difference of means 2 3.2 Student's 't est - Difference of means 2 3.4 Tutorial 2	1.3		1					
1.6 Discrete random variable - Probability mass function 1.7 Continuous random variable - Probability density function 1.8 Moment generating function 1.9 Tutorial 2. Tutorial 2. Two Dimensional Random Variables 2.1 Joint distribution 1.1 2.2 Marginal distribution 1.2.2 Marginal distribution 1.1 2.3 Conditional distribution 2.3 Conditional distribution 2.4 Covariance 2.5 Tutorial 2.6 Correlation 2.7 Rank Correlation 2.8 Regression 2.9 Tutorial 2.8 Regression 3.1 Student's 't test - Single mean 3.2 Student's 't test - Single mean 3.2 Student's 't test - Difference of means 3.3 F - test 3.3 F - test 3.4 Tutorial 3.5 Chi-square test - Independence of attributes 3.7 Tutorial 3.6 Chi-square test - Independence of attributes 3.7 Tutorial 3.8 Caption	1.4	Bayes theorem	2					
1.7 Continuous random variable - Probability density function 1 1.8 Moment generating function 1 1.9 Tutorial 2 2. Two Dimensional Random Variables 2.1 Joint distribution 1 2.2 Marginal distribution 1 2.3 Conditional distribution 1 2.4 Covariance 1 2.5 Tutorial 2 2.6 Correlation 2 2.7 Rank Correlation 1 2.8 Regression 1 2.9 Tutorial 2 3.1 Student's "test - Single mean 1 3.2 Student's "test - Single mean 1 3.2 Student's "test - Difference of means 2 3.3 F- test 2 3.4 Tutorial 2 3.5 Chi-square test - Goodness of fit 1 4. Design of Experiments 2 4.1 Analysis of variance - Come way classification 2 <td>1.5</td> <td>Tutorial</td> <td>2</td>	1.5	Tutorial	2					
1.8 Moment generating function 1 1.9 Tutorial 2 2. Two Dimensional Random Variables 2.1 Joint distribution 1 2.2 Marginal distribution 1 2.3 Conditional distribution 1 2.4 Covariance 1 2.5 Tutorial 2 2.6 Correlation 2 2.7 Rank Correlation 1 2.8 Regression 1 2.9 Tutorial 2 2.9 Tutorial 2 3.1 Student's 't' test - Single mean 1 3.1 Student's 't' test - Difference of means 2 3.2 Student's 't' test - Difference of means 2 3.3 F- test 2 3.4 Tutorial 2 3.5 Chi-square test-Oodness of fit 1 3.6 Chi-square test-Goodness of fit 1 3.6 Chi-square test-Independence of attributes 2 3.7 Tutorial 2 4.1 Analysis of v	1.6		2					
1.9 Tutorial 2 2. Two Dimensional Random Variables 2.1 Joint distribution 1 2.2 Marginal distribution 1 2.3 Conditional distribution 1 2.4 Covariance 1 2.5 Tutorial 2 2.6 Correlation 2 2.7 Rank Correlation 1 2.8 Regression 1 2.9 Tutorial 2 3. Testing of Hypothesis 3.1 Student's 't' test - Single mean 3.1 Student's 't' test - Single mean 3.2 Student's 't' test - Difference of means 2 3.2 Student's 't' test - Difference of means 2 3.3 F- test 2 3.4 Tutorial 2 3.5 Chi-square test - Ondenso of fit 1 3.6 Chi-square test - Goodness of fit 1 3.6 Chi-square test - Goodness of fit 1 4.0 Design of Experime	1.7	, ,	1					
2. Two Dimensional Random Variables 2.1 Joint distribution 1 2.2 Marginal distribution 1 2.3 Conditional distribution 1 2.4 Covariance 1 2.5 Tutorial 2 2.6 Correlation 1 2.7 Rank Correlation 1 2.8 Regression 1 2.9 Tutorial 2 3. Testing of Hypothesis 3.1 Student's 't test - Single mean 1 3.2 Student's 't test - Difference of means 2 3.2 Student's 't test - Difference of means 2 3.4 Tutorial 2 3.5 Chi-square test - Goodness of fit 1 3.6 Chi-square test - Independence of attributes 2 3.7 Tutorial 2 4. Design of Experiments 4.1 Analysis of variance - One way classification 2 4.2 Analysis of variance - Two way classification 2	1.8	Moment generating function	1					
2.1 Joint distribution 1 2.2 Marginal distribution 1 2.3 Conditional distribution 1 2.4 Covariance 1 2.5 Tutorial 2 2.6 Correlation 2 2.7 Rank Correlation 1 2.8 Regression 1 2.9 Tutorial 2 3. Testing of Hypothesis 3.1 Student's "test - Single mean 3.2 Student's "test - Difference of means 2 3.4 Tutorial 2 4. Design of Experiments </td <td>1.9</td> <td>Tutorial</td> <td>2</td>	1.9	Tutorial	2					
2.2 Marginal distribution 1 2.3 Conditional distribution 1 2.4 Covariance 1 2.5 Tutorial 2 2.6 Correlation 2 2.7 Rank Correlation 1 2.8 Regression 1 2.9 Tutorial 2 3.1 Student's 't' test - Single mean 1 3.2 Student's 't' test - Difference of means 2 3.3 F- test 2 3.4 Tutorial 2 3.5 Chi-square test - Goodness of fit 1 3.6 Chi-square test - Independence of attributes 2 3.7 Tutorial 2 4. Design of Experiments 4.1 Analysis of variance - One way classification 2 4.2 Analysis of variance - One way classification 2 4.2 Analysis of variance - Two way classification 2 4.3 Analysis of variance - Randomized block design 1 4.5 Analysis of variance - Randomized block design 1 4.6	2.	Two Dimensional Random Variables						
2.3 Conditional distribution 1 2.4 Covariance 1 2.5 Tutorial 2 2.6 Correlation 2 2.7 Rank Correlation 1 2.8 Regression 1 2.9 Tutorial 2 3. Testing of Hypothesis 3.1 Student's 't' test - Single mean 1 3.2 Student's 't' test - Difference of means 2 3.2 Student's 't' test - Difference of means 2 3.4 Tutorial 2 3.5 Chi-square test - Goodness of fit 1 3.6 Chi-square test - Independence of attributes 2 3.7 Tutorial 2 4. Design of Experiments 4.1 Analysis of variance - One way classification 2 4.2 Analysis of variance - One way classification 2 4.2 Analysis of variance - Two way classification 2 4.3 Analysis of variance - Randomized block design 1 4.4 Tutorial 2 5. Statistics and Qua	2.1	Joint distribution	1					
2.4 Covariance 1 2.5 Tutorial 2 2.6 Correlation 2 2.7 Rank Correlation 1 2.8 Regression 1 2.9 Tutorial 2 3. Testing of Hypothesis 3 3.1 Student's 't' test - Single mean 1 3.2 Student's 't' test - Difference of means 2 3.3 F- test 2 3.4 Tutorial 2 3.5 Chi-square test - Goodness of fit 1 3.6 Chi-square test - Independence of attributes 2 3.7 Tutorial 2 4.1 Analysis of variance - One way classification 2 4.2 Analysis of variance - One way classification 2 4.2 Analysis of variance - Two way classification 2 4.3 Analysis of variance - Two way classification 2 4.4 Tutorial 2 4.5 Analysis of variance - Randomized block design 1 4.6 Analysis of variance - Latin square 2 <td< td=""><td>2.2</td><td>Marginal distribution</td><td>1</td></td<>	2.2	Marginal distribution	1					
2.5 Tutorial 2 2.6 Correlation 2 2.7 Rank Correlation 1 2.8 Regression 1 2.9 Tutorial 2 3. Testing of Hypothesis 3.1 Student's 't' test - Single mean 1 3.2 Student's 't' test - Difference of means 2 3.3 F- test 2 3.4 Tutorial 2 3.5 Chi-square test - Goodness of fit 1 3.6 Chi-square test - Independence of attributes 2 3.7 Tutorial 2 4. Design of Experiments 4.1 Analysis of variance - One way classification 2 4.2 Analysis of variance - One way classification 2 4.2 Analysis of variance - Two way classification 2 4.4 Tutorial 2 4.5 Analysis of variance - Randomized block design 1 4.6 Analysis of variance - Latin square 2 4.7 Tutorial 2 5. Statistics and Quality Control </td <td>2.3</td> <td>Conditional distribution</td> <td>1</td>	2.3	Conditional distribution	1					
2.6 Correlation 2 2.7 Rank Correlation 1 2.8 Regression 1 2.9 Tutorial 2 3. Testing of Hypothesis 3.1 Student's 't' test - Single mean 1 3.2 Student's 't' test - Difference of means 2 3.3 F- test 2 3.4 Tutorial 2 3.5 Chi-square test - Goodness of fit 1 3.6 Chi-square test - Independence of attributes 2 3.7 Tutorial 2 4. Design of Experiments 4.1 Analysis of variance - One way classification 2 4.2 Analysis of variance - One way classification 2 4.2 Analysis of variance - Two way classification 2 4.3 Analysis of variance - Two way classification 2 4.4 Tutorial 2 4.5 Analysis of variance - Randomized block design 1 4.6 Analysis of variance - Latin square 2 4.7 Tutorial 2 5.1 Mean	2.4	Covariance	1					
2.7 Rank Correlation 1 2.8 Regression 1 2.9 Tutorial 2 3. Testing of Hypothesis 3.1 Student's 't' test - Single mean 1 3.2 Student's 't' test - Difference of means 2 3.3 F- test 2 3.4 Tutorial 2 3.5 Chi-square test -Goodness of fit 1 3.6 Chi-square test - Independence of attributes 2 3.7 Tutorial 2 4. Design of Experiments 4.1 Analysis of variance - One way classification 2 4.2 Analysis of variance - Completely randomized design 1 4.3 Analysis of variance - Two way classification 2 4.4 Tutorial 2 4.5 Analysis of variance - Randomized block design 1 4.6 Analysis of variance - Latin square 2 4.7 Tutorial 2 5. Statistics and Quality Control 2 5.1 Mean, Median, Mode 2 5.2 Quartile deviation 1 5.3 Standard deviation 1 5.4 Coefficient of variation 1 5.5 Tutorial 2 5.7 nP chart 1 5.8 C chart 1	2.5	Tutorial	2					
2.8 Regression 1 2.9 Tutorial 2 3. Testing of Hypothesis 3.1 Student's 't' test - Single mean 1 3.2 Student's 't' test - Difference of means 2 3.3 F- test 2 3.4 Tutorial 2 3.5 Chi-square test - Goodness of fit 1 3.6 Chi-square test - Independence of attributes 2 3.7 Tutorial 2 4. Design of Experiments 4.1 Analysis of variance - One way classification 2 4.2 Analysis of variance - Completely randomized design 1 4.3 Analysis of variance - Two way classification 2 4.4 Tutorial 2 4.5 Analysis of variance - Randomized block design 1 4.6 Analysis of variance - Latin square 2 4.7 Tutorial 2 5. Statistics and Quality Control 5.1 Mean, Median, Mode 2 5.2 Quartile deviation 1 5.4 Coefficient of variati	2.6	Correlation	2					
2.9 Tutorial 2 3. Testing of Hypothesis 3.1 Student's 't' test - Single mean 1 3.2 Student's 't' test - Difference of means 2 3.3 F- test 2 3.4 Tutorial 2 3.5 Chi-square test - Goodness of fit 1 3.6 Chi-square test - Independence of attributes 2 3.7 Tutorial 2 4. Design of Experiments 4.1 Analysis of variance - One way classification 2 4.2 Analysis of variance - Completely randomized design 1 4.3 Analysis of variance - Two way classification 2 4.4 Tutorial 2 4.5 Analysis of variance - Randomized block design 1 4.6 Analysis of variance - Latin square 2 4.7 Tutorial 2 5. Statistics and Quality Control 5.1 Mean, Median, Mode 2 5.2 Quartile deviation 1 5.4 Coefficient of variation 1 5.5 Tutorial	2.7	Rank Correlation	1					
3. Testing of Hypothesis 3.1 Student's 't' test - Single mean 1 3.2 Student's 't' test - Difference of means 2 3.3 F- test 2 3.4 Tutorial 2 3.5 Chi-square test - Goodness of fit 1 3.6 Chi-square test - Independence of attributes 2 3.7 Tutorial 2 4. Design of Experiments 2 4.1 Analysis of variance - One way classification 2 4.2 Analysis of variance - Completely randomized design 1 4.3 Analysis of variance - Two way classification 2 4.4 Tutorial 2 4.5 Analysis of variance - Randomized block design 1 4.6 Analysis of variance - Latin square 2 4.7 Tutorial 2 5. Statistics and Quality Control 5.1 Mean, Median, Mode 2 5.2 Quartile deviation 1 5.3 Standard deviation 1 5.5 Tutorial 2 5.6 Mean □X□ chart and Range (R) chart 1 5.7 nP chart 1 5.8 C chart 1	2.8	Regression	1					
3.1 Student's 't' test - Single mean 1 3.2 Student's 't' test - Difference of means 2 3.3 F- test 2 3.4 Tutorial 2 3.5 Chi-square test - Goodness of fit 1 3.6 Chi-square test - Independence of attributes 2 3.7 Tutorial 2 4. Design of Experiments 4.1 Analysis of variance - One way classification 2 4.2 Analysis of variance - Completely randomized design 1 4.3 Analysis of variance - Two way classification 2 4.4 Tutorial 2 4.5 Analysis of variance - Randomized block design 1 4.6 Analysis of variance - Latin square 2 4.7 Tutorial 2 5. Statistics and Quality Control 5.1 Mean, Median, Mode 2 5.2 Quartile deviation 1 5.3 Standard deviation 1 5.5 Tutorial 2 5.6 Mean □X □ chart and Range (R) chart 1 5	2.9	Tutorial	2					
3.1 Student's 't' test - Single mean 1 3.2 Student's 't' test - Difference of means 2 3.3 F- test 2 3.4 Tutorial 2 3.5 Chi-square test - Goodness of fit 1 3.6 Chi-square test - Independence of attributes 2 3.7 Tutorial 2 4. Design of Experiments 4.1 Analysis of variance - One way classification 2 4.2 Analysis of variance - Completely randomized design 1 4.3 Analysis of variance - Two way classification 2 4.4 Tutorial 2 4.5 Analysis of variance - Randomized block design 1 4.6 Analysis of variance - Latin square 2 4.7 Tutorial 2 5. Statistics and Quality Control 5.1 Mean, Median, Mode 2 5.2 Quartile deviation 1 5.3 Standard deviation 1 5.5 Tutorial 2 5.6 Mean □X □ chart and Range (R) chart 1 5	3.	Testing of Hypothesis	•					
3.3 F- test 2 3.4 Tutorial 2 3.5 Chi-square test - Goodness of fit 1 3.6 Chi-square test - Independence of attributes 2 3.7 Tutorial 2 4. Design of Experiments 2 4.1 Analysis of variance - One way classification 2 4.2 Analysis of variance - Completely randomized design 1 4.3 Analysis of variance - Two way classification 2 4.4 Tutorial 2 4.5 Analysis of variance - Randomized block design 1 4.6 Analysis of variance - Latin square 2 4.7 Tutorial 2 5. Statistics and Quality Control 5.1 Mean, Median, Mode 2 5.2 Quartile deviation 1 5.3 Standard deviation 1 5.4 Coefficient of variation 1 5.5 Tutorial 2 5.6 Mean □X□ chart and Range (R) chart 1 5.7 nP chart 1 5.8 C char	3.1		1					
3.3 F- test 2 3.4 Tutorial 2 3.5 Chi-square test - Goodness of fit 1 3.6 Chi-square test - Independence of attributes 2 3.7 Tutorial 2 4. Design of Experiments 2 4.1 Analysis of variance - One way classification 2 4.2 Analysis of variance - Completely randomized design 1 4.3 Analysis of variance - Two way classification 2 4.4 Tutorial 2 4.5 Analysis of variance - Randomized block design 1 4.6 Analysis of variance - Latin square 2 4.7 Tutorial 2 5. Statistics and Quality Control 5.1 Mean, Median, Mode 2 5.2 Quartile deviation 1 5.3 Standard deviation 1 5.4 Coefficient of variation 1 5.5 Tutorial 2 5.6 Mean □X□ chart and Range (R) chart 1 5.7 nP chart 1 5.8 C char	3.2	Student's 't' test - Difference of means	2					
3.5 Chi-square test - Goodness of fit 1 3.6 Chi-square test - Independence of attributes 2 3.7 Tutorial 2 4. Design of Experiments 4.1 Analysis of variance - One way classification 2 4.2 Analysis of variance - Completely randomized design 1 4.3 Analysis of variance - Two way classification 2 4.4 Tutorial 2 4.5 Analysis of variance - Randomized block design 1 4.6 Analysis of variance - Latin square 2 4.7 Tutorial 2 5. Statistics and Quality Control 5.1 Mean, Median, Mode 2 5.2 Quartile deviation 1 5.3 Standard deviation 1 5.4 Coefficient of variation 1 5.5 Tutorial 2 5.6 Mean □X□ chart and Range (R) chart 1 5.7 nP chart 1 5.8 C chart 1	3.3	F- test	2					
3.6 Chi-square test - Independence of attributes 2 3.7 Tutorial 2 4. Design of Experiments 4.1 Analysis of variance - One way classification 2 4.2 Analysis of variance - Completely randomized design 1 4.3 Analysis of variance - Two way classification 2 4.4 Tutorial 2 4.5 Analysis of variance - Randomized block design 1 4.6 Analysis of variance - Latin square 2 4.7 Tutorial 2 5. Statistics and Quality Control 5.1 Mean, Median, Mode 2 5.2 Quartile deviation 1 5.3 Standard deviation 1 5.4 Coefficient of variation 1 5.5 Tutorial 2 5.6 Mean □X□ chart and Range (R) chart 1 5.7 nP chart 1 5.8 C chart 1	3.4	Tutorial	2					
3.7 Tutorial 2 4. Design of Experiments 4.1 Analysis of variance - One way classification 2 4.2 Analysis of variance - Completely randomized design 1 4.3 Analysis of variance - Two way classification 2 4.4 Tutorial 2 4.5 Analysis of variance - Randomized block design 1 4.6 Analysis of variance - Latin square 2 4.7 Tutorial 2 5. Statistics and Quality Control 5.1 Mean, Median, Mode 2 5.2 Quartile deviation 1 5.3 Standard deviation 1 5.4 Coefficient of variation 1 5.5 Tutorial 2 5.6 Mean □X □ chart and Range (R) chart 1 5.7 nP chart 1 5.8 C chart 1	3.5	Chi-square test -Goodness of fit	1					
4. Design of Experiments 4.1 Analysis of variance - One way classification 2 4.2 Analysis of variance - Completely randomized design 1 4.3 Analysis of variance - Two way classification 2 4.4 Tutorial 2 4.5 Analysis of variance - Randomized block design 1 4.6 Analysis of variance - Latin square 2 4.7 Tutorial 2 5. Statistics and Quality Control 5.1 Mean, Median, Mode 2 5.2 Quartile deviation 1 5.3 Standard deviation 1 5.4 Coefficient of variation 1 5.5 Tutorial 2 5.6 Mean □X□ chart and Range (R) chart 1 5.7 nP chart 1 5.8 C chart 1	3.6	Chi-square test - Independence of attributes	2					
4.1 Analysis of variance - One way classification 2 4.2 Analysis of variance - Completely randomized design 1 4.3 Analysis of variance - Two way classification 2 4.4 Tutorial 2 4.5 Analysis of variance - Randomized block design 1 4.6 Analysis of variance - Latin square 2 4.7 Tutorial 2 5. Statistics and Quality Control 5.1 Mean, Median, Mode 2 5.2 Quartile deviation 1 5.3 Standard deviation 1 5.4 Coefficient of variation 1 5.5 Tutorial 2 5.6 Mean □X□ chart and Range (R) chart 1 5.7 nP chart 1 5.8 C chart 1	3.7	Tutorial	2					
4.2 Analysis of variance - Completely randomized design 1 4.3 Analysis of variance - Two way classification 2 4.4 Tutorial 2 4.5 Analysis of variance - Randomized block design 1 4.6 Analysis of variance - Latin square 2 4.7 Tutorial 2 5. Statistics and Quality Control 5.1 Mean, Median, Mode 2 5.2 Quartile deviation 1 5.3 Standard deviation 1 5.4 Coefficient of variation 1 5.5 Tutorial 2 5.6 Mean □X□ chart and Range (R) chart 1 5.7 nP chart 1 5.8 C chart 1	4.	Design of Experiments	·					
4.3 Analysis of variance - Two way classification 2 4.4 Tutorial 2 4.5 Analysis of variance - Randomized block design 1 4.6 Analysis of variance - Latin square 2 4.7 Tutorial 2 5. Statistics and Quality Control 5.1 Mean, Median, Mode 2 5.2 Quartile deviation 1 5.3 Standard deviation 1 5.4 Coefficient of variation 1 5.5 Tutorial 2 5.6 Mean □X□ chart and Range (R) chart 1 5.7 nP chart 1 5.8 C chart 1	4.1	Analysis of variance - One way classification	2					
4.4 Tutorial 2 4.5 Analysis of variance - Randomized block design 1 4.6 Analysis of variance - Latin square 2 4.7 Tutorial 2 5. Statistics and Quality Control 5.1 Mean, Median, Mode 2 5.2 Quartile deviation 1 5.3 Standard deviation 1 5.4 Coefficient of variation 1 5.5 Tutorial 2 5.6 Mean □X□ chart and Range (R) chart 1 5.7 nP chart 1 5.8 C chart 1	4.2	Analysis of variance - Completely randomized design	1					
4.5 Analysis of variance - Randomized block design 1 4.6 Analysis of variance - Latin square 2 4.7 Tutorial 2 5. Statistics and Quality Control 5.1 Mean, Median, Mode 2 5.2 Quartile deviation 1 5.3 Standard deviation 1 5.4 Coefficient of variation 1 5.5 Tutorial 2 5.6 Mean □X□ chart and Range (R) chart 1 5.7 nP chart 1 5.8 C chart 1	4.3	Analysis of variance - Two way classification	2					
4.6 Analysis of variance - Latin square 2 4.7 Tutorial 2 5. Statistics and Quality Control 5.1 Mean, Median, Mode 2 5.2 Quartile deviation 1 5.3 Standard deviation 1 5.4 Coefficient of variation 1 5.5 Tutorial 2 5.6 Mean □X□ chart and Range (R) chart 1 5.7 nP chart 1 5.8 C chart 1	4.4	Tutorial	2					
4.7 Tutorial 2 5. Statistics and Quality Control 5.1 Mean, Median, Mode 2 5.2 Quartile deviation 1 5.3 Standard deviation 1 5.4 Coefficient of variation 1 5.5 Tutorial 2 5.6 Mean □X□ chart and Range (R) chart 1 5.7 nP chart 1 5.8 C chart 1	4.5	Analysis of variance - Randomized block design	1					
4.7 Tutorial 2 5. Statistics and Quality Control 5.1 Mean, Median, Mode 2 5.2 Quartile deviation 1 5.3 Standard deviation 1 5.4 Coefficient of variation 1 5.5 Tutorial 2 5.6 Mean □X□ chart and Range (R) chart 1 5.7 nP chart 1 5.8 C chart 1	4.6	Analysis of variance - Latin square	2					
5. Statistics and Quality Control 5.1 Mean, Median, Mode 2 5.2 Quartile deviation 1 5.3 Standard deviation 1 5.4 Coefficient of variation 1 5.5 Tutorial 2 5.6 Mean □X□ chart and Range (R) chart 1 5.7 nP chart 1 5.8 C chart 1			2					
5.2 Quartile deviation 1 5.3 Standard deviation 1 5.4 Coefficient of variation 1 5.5 Tutorial 2 5.6 Mean □X□ chart and Range (R) chart 1 5.7 nP chart 1 5.8 C chart 1	5.	Statistics and Quality Control	•					
5.2 Quartile deviation 1 5.3 Standard deviation 1 5.4 Coefficient of variation 1 5.5 Tutorial 2 5.6 Mean □X□ chart and Range (R) chart 1 5.7 nP chart 1 5.8 C chart 1	5.1	Mean, Median, Mode	2					
5.3 Standard deviation 1 5.4 Coefficient of variation 1 5.5 Tutorial 2 5.6 Mean □X□ chart and Range (R) chart 1 5.7 nP chart 1 5.8 C chart 1								
5.4 Coefficient of variation 1 5.5 Tutorial 2 5.6 Mean □X□ chart and Range (R) chart 1 5.7 nP chart 1 5.8 C chart 1		Standard deviation	1					
5.5 Tutorial 2 5.6 Mean □X□ chart and Range (R) chart 1 5.7 nP chart 1 5.8 C chart 1		Coefficient of variation	1					
5.6 Mean □X□ chart and Range (R) chart 1 5.7 nP chart 1 5.8 C chart 1		Tutorial						
5.7 nP chart 1 5.8 C chart 1		Mean □X□ chart and Range (R) chart						
5.8 C chart 1		nP chart						

List of MATLAB Programs:

- 1. Calculating the probability for one dimensional random variable
 - 2. Computing Coefficient of Correlation
 - 3. Plotting Lines of regression
 - 4. Visualizing data and performing Testing of hypothesis
 - 5. Visualizing data and performing Chi-square test
 - 6. Visualizing data and performing Analysis of Variance
 - 7. Computing Mean, Median and Mode
 - 8. Plotting and visualizing control charts

Course Designer(s)

- 1. Mr.G.Mohan mohang@ksrct.ac.in
- 2. Ms.K.Geetha geethak@ksrct.ac.in

Passed in BoS Meeting held on 12/05/2023 Approved in Academic Council Meeting held on 03/06/2023



60 FT 401	Fluid Mechanics and Mechanical	Category	L	Т	Р	Credit
0011101	Operation	PC	3	1	0	4

- To imply the application of fluid statics and to know the basic dimensional analysis
- To impart concept of the nature of fluids with its properties and types
- To identity and understand the fluid transport through various methods.
- To comprehend the laws of size reduction in equipment such as sieve analysis
- To learn basic principles in mechanical operations in filtration, sedimentation and mixing.

Pre-requisites

NIL

Course Outcomes

On the successful completion of the course, students will be able to

011 1110 0000	becords completion of the codrec, students will be able to	
CO1	Know about the nature of fluids and dimensional analysis	Apply
CO2	Learn about the fluid flow correction and application in pump work	Apply
CO3	Asses the performance of fluid moving machinery and it related concepts	Analyze
CO4	Comprehend the laws of size reduction in equipment	Apply
CO5	Describe the filtration process and sedimentation along with the concept of mixing patterns	Understand

Mapping with Programme Outcomes

COs		POs											PSOs		
003	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1	3	3	2	2	-	-	-	-	-	-	-	-	3	-	-
CO2	3	3	3	2	-	-	-	-	-	-	-	-	3	2	-
CO3	3	3	3	2	-	-	-	-	-	-	-	-	3	2	-
CO4	3	1	3	2	-	-	-	-	-	-	-	-	3	2	-
CO5	3	1	3	2	-	-	-	-	-	-	-	-	3	2	-
3-Stror	ng;2-Me	edium;1	-Low												

Assessment Pattern						
Bloom's Category	Continuous Ass (Ma	essment Tests arks)	Model Examination (Marks)	End Sem Examination (Marks)		
oategory	1	2				
Remember	10	10	20	20		
Understand	30	20	30	30		
Apply	20	20	30	30		
Analyze	-	10	20	20		
Evaluate	-	-	-	-		
Create	-	-	-	-		
Total	60	60	100	100		

		K	.S.Rangasa	my College	of Technolo	gy- Autono	mous R202	2	
					. Food Tech				
			60 FT 401	- Fluid Mech	nanics and N	lechanical (Operation		
Seme	ctor	l	Hours/Week	[Total	Credit	Ma	aximum Mark	s
Seme	stei	L	Т	Р	Hours	С	CA ES		Total
I۷	/	3	1	0	60	4	40	60	100
Nature Compr equilib	e of flui ressible orium. <i>F</i>	ds, Properti e and incom Application o	npressible. V of fluid statics	lysis Types of flu elocity profile manometer hod and Bucl	es. Fluid stat rs, continuou	tic: Hydrosta s gravity dec	tic		[9]
Berno equati hroug	ulli equion for phononical in the close the cl	pump work. ed conduits.	rection of B Shear stress Friction factor	sernoulli eques and skin fried for smoothers in fittings, varied for the series of the	ction in pipes and rough	s. Laminar ar	nd turbulent	flow of fluids	[9]
/ariab Calibra selecti orincip	ole hear ation or ion and ole and	nd meter: O f flow meter d specificat	rs. Valves – tion. Positive n. Fans, blo	Venturimete Types, appli displacement owers and o	cations. Fluient, centrifuç	d moving ma gal pump –	achinery.Pe	rformance –	[9]
			piloutiono.						
Classi cumula scree	ative si	ion n, laws of sieve analysictiveness*:	size reductions; Problems storage of	on, equipments in power resolids-bins, assifier, cycle	equirement silo and hop	of size redu pper. Separa	ction equip	ments and	[9]
Classicumula screer specific Filtrat Conce princip mixers	ification lative si n effect ic propertion, see ept of fi ole of s	ion n, laws of sieve analysictiveness*: erties: gravi edimentation ltration- Facesedimentationstruction	size reductions; Problems storage of sty settling, claim and Mixing ctors affecting on. Agitatio	on, equipments in power resolids-bins, assifier, cycle	equirement silo and hop one, jigging a ation-Types on one of liquid	of size reduction of filtration eds.: Concept	ction equiption of solid tation.	concept and	[9]
Classicumula screer specifi Filtrat Conce orincip mixers	ification lative si n effect ic propertion, se ept of fi ole of s	ion n, laws of sieve analysictiveness*: erties: gravi edimentation ltration- Facesedimentationstruction	size reductions; Problems storage of sty settling, claim and Mixing ctors affecting on. Agitatio	on, equipments in power responds to bins, assifier, cycle	equirement silo and hop one, jigging a ation-Types on one of liquid	of size reduce per. Separa and froth float of filtration eds*: Conceptes of impe	ction equip tion of solid tation. juipments. (t of mixing llers, Flow	concept and	
Classicumula screen specifi Filtrat Conce princip mixers agitate	ification lative si n effect ic propertion, se ept of fi ole of s	ion n, laws of sieve analysictiveness*: erties: gravi edimentation ltration- Facesedimentationstruction isel.	size reductions; Problems storage of sty settling, claim and Mixing ctors affecting on. Agitatio	on, equipments in power responds to bins, assifier, cycle	equirement silo and hop one, jigging a ation-Types on one of liquid	of size reduce per. Separa and froth float of filtration eds*: Conceptes of impe	ction equip tion of solid tation. juipments. (t of mixing llers, Flow	Concept and J- Types of pattern in	[9]
Classicumula screen specifi Filtrat Conce princip mixera agitate	ification ative sin effection, seept of sible of size-consed ves	ion n, laws of sieve analysictiveness*: erties: gravi edimentatio ltration- Facisedimentatio astruction astruction sel.): be W.L., Sm	size reductions; Problems storage of sty settling, class on and Mixing ctors affecting on. Agitationand flow page 1	on, equipments in power resolids-bins, assifier, cycloggrate of filtrand mixing attern of important process.	equirement silo and hop one, jigging a ation-Types on one of liquid one liquid	of size reduce pper. Separa and froth float of filtration eds.*: Conceptes of impe	ction equiption of solid tation. quipments. (a of mixing liers, Flow ours: 45 + 1	Concept and J- Types of pattern in	[9]
Classicumulisscreeispecifii Filtrat Conceprincipmixers agitate	ification ative sin effection, seept of sible of seept of seed ves Book(seept of seed ves Gavha	ion n, laws of sieve analysictiveness*: erties: gravi edimentatio ltration- Facedimentatio estruction instruction be W.L., Sm n, McGraw I ane K.A., "U	size reductions; Problems storage of sty settling, class on and Mixing the storage of sty settling, class of the storage of sty settling, class of the storage of styles of the storage of the styles	on, equipments in power resolids-bins, assifier, cycloggrate of filtrand mixing attern of important process.	equirement silo and hop one, jigging a ation-Types on one of liquid onellers-Typ Unit Operation	of size reduce pper. Separa and froth float of filtration eds.*: Conceptes of impe	ction equiption of solid tation. quipments. (a of mixing llers, Flow purs: 45 + 1	Concept and J. Types of pattern in 5 (Tutorial)	[9]
Classicumuliscreels specificate Conception of the Conception of th	ification ative sin effection, seept of sible of seept of seed ves Book(seept of seed ves Gavha	ion n, laws of sieve analysictiveness*: erties: graviveness*: edimentation ltration- Face sedimentation astruction assel.): be W.L., Sm n, McGraw I ane K.A., "U Prakashan I	size reductions; Problems storage of sty settling, class on and Mixing the storage of sty settling, class of the storage of sty settling, class of the storage of styles of the storage of the styles	on, equipments in power resolids-bins, assifier, cycles grate of filtran and mixing attern of important in the power of th	equirement silo and hop one, jigging a ation-Types on one of liquid onellers-Typ Unit Operation	of size reduce pper. Separa and froth float of filtration eds.*: Conceptes of impe	ction equiption of solid tation. quipments. (a of mixing llers, Flow purs: 45 + 1	Concept and J. Types of pattern in 5 (Tutorial)	[9]
Classicumuli screel specifi sp	ification lative si n effectic proposition, see ept of ficible of si eed ves McCa Edition Gavha Nirali ence(s	ion n, laws of sieve analysictiveness*: erties: gravivenesis: edimentation ltration- Factsedimentation struction astruction n, McGraw I ane K.A., "U Prakashan I): el, Yunus an	size reductions; Problems storage of sty settling, class and Mixing the stors affecting on. Agitation and flow partial of the storage of storage of the stor	on, equipments in power resolids-bins, assifier, cyclong grate of filtrand mixing attern of immunity attern of immunity, 2021.	equirement silo and hopone, jigging a stion-Types on a fliquid npellers-Type silow and Mecond Mechanics	of size reduce pper. Separa and froth float of filtration eds.*: Conceptives of imperiors of Chemical Oper. Fundamenta	ction equiption of solid tation. quipments. (at of mixing lilers, Flow purs: 45 + 1 al Engineerications)", 8th	Concept and J. Types of pattern in 5 (Tutorial)	[9]
Classicumula screen specific s	ification ative sin effection, seept of sible of sissed vession McCa Edition Gavha Nirali ence(seept of sible of sissed vession McCa Edition Noel of sissed vession need to sissed vess	ion n, laws of sieve analysictiveness*: erties: gravi edimentation Itration- Facesedimentation struction astruction is be W.L., Smn, McGraw II ane K.A., "U Prakashan II): el, Yunus and n, Tata McG de Nevers, "	size reductions; Problems storage of sty settling, class and Mixing the storage and flow particles. Agitation and flow particles and flow particle	on, equipments in power resolids-bins, assifier, cyclong grate of filtranand mixing attern of immunity attention in the immunity	equirement silo and hopone, jigging a stion-Types on a fliquid npellers-Type silow and Mecong of Mechanics pany, New Decomposition of the standard silow and	of size reduce pper. Separa and froth float of filtration eds.*: Conceptives of imperiors of Chemical Oper. Fundamenta elhi, 2006.	ction equiption of solid tation. quipments. Of of mixing lilers, Flow ours: 45 + 1 rations)", 8th	Concept and J- Types of pattern in Edition, Cations", 2nd	[9]
Classicumuliscreeispecifi Filtrat Conceprincipmixer agitate 1. Referen 1.	ification ative sin effection, seept of fible of seept of fibre of seept of seept of fibre of seept of fibre of seept of fibre of seept of seept of seept of fibre of seept of	ion n, laws of sieve analysictiveness*: erties: gravi edimentation Itration- Face sedimentation estruction assel.): be W.L., Smn, McGraw I ane K.A., "U Prakashan I): el, Yunus an n, Tata McG de Nevers, " 2020. elblau D.M.,	size reductions; Problems storage of sty settling, class of and Mixing ctors affecting on. Agitation and flow particular in the J.C. and Hill, New Yornit Operations, and Cimbala Journal of Cimbala O	on, equipments in power resolids-bins, assifier, cycle of grate of filtran and mixing attern of important attern of important ending the pune, 2011. The pune, 2011. The pune, 2011. The pune of the power of the po	equirement silo and hopone, jigging a stion-Types on a fiquid apellers-Type silow and Mechanics bany, New Denical Engineer	of size reduce pper. Separa and froth float and froth float of filtration eds*: Conceptes of imperior of Chemical Operations of Chemical	ction equiption of solid tation. quipments. On the following of the follo	Concept and J. Types of pattern in Edition, cations", 2nd	[9]

SDG 7 - *Affordable and clean energy

ourse c	ontents and Lecture Schedule	No. of
S. No.	Topics	hours
1	Fluid Statics and Dimensional Analysis	
1.1	Introduction and Nature of fluids	1
1.2	Properties of Fluids	1
1.3	Types of fluids – Newtonian and Non – Newtonian fluids	1
1.4	Compressible and incompressible fluids	1
1.5	Fluid static: Hydrostatic equilibrium	1
1.6	Application of fluid statics: manometers	1
1.7	Application of fluid statics: continuous gravity decanter.	1
1.8	Basics of dimensional analysis: Rayleigh's method	1
1.9	Basics of dimensional analysis: Buckingham's method	1
2	Basic Equations of Fluid Flow	<u> </u>
2.1	Bernoulli equation	1
2.2	Correction of Bernoulli equation for fluid friction.	1
2.3	Application of Bernoulli equation for pump work	1
2.4	Shear stress in pipes	1
2.5	Skin friction in pipes.	1
2.6	Laminar and turbulent flow of fluids through closed conduits	1
2.7	Friction factor for smooth and rough pipes	1
	Friction loss due to sudden enlargement, contraction	
2.8	· · · · · · · · · · · · · · · · · · ·	1
2.9	Friction loss in fittings, valves and coils	1
3	Metering and Transportation of Fluids	
3.1	Variable head meter: Orifice meter	1
3.2	Variable head meter: Venturimeter, Pitot tube	1
3.3	Variable area meter: Rota meter. Calibration of flow meters.	1
3.4	Valves – Types, applications	1
3.5	Fluid moving machinery	1
3.6	Performance – selection and specification	1
3.7	Positive displacement - working principle and application.	1
3.8	Centrifugal pump – characteristics-working principle and application.	1
3.9	Fans, blowers and compressors –Selection, types and applications	1
4	Size Reduction	
4.1	Front Axle - Wheel Geometry - Wheel Alignment and Balancing	1
4.2	laws of size reduction	1
4.3	sieve analysis- screening and differential sieve analysis	1
4.4	sieve analysis- cumulative sieve analysis;	1
4.5	Problems in power requirement of size reduction equipments and screen	1
4.0	effectiveness: storage of solids- bins, silo and hopper.	'
4.6	Separation of solids based on specific properties: gravity settling,	1
4.7	Separation of solids based on specific properties: classifier	1
4.8	Separation of solids based on specific properties: jigging	1
4.9	Separation of solids based on specific properties: froth floatation.	1
5	Filtration, sedimentation and Mixing	•
5.1	Concept of filtration	1
5.2	Factors affecting rate of filtration	1
5.3	Types of filtration equipments	1
5.4	Filtration process	1
5.5	Concept and principle of sedimentation	1
5.6	Agitation and mixing of liquids: Concept of mixing	1
5.7	Types of mixers-construction and flow pattern of impellers	1
5.8	Types of impellers	1
5.8	Flow pattern in agitated vessel	1

1. Dr. P. Shanmugam - shanmugam@ksrct.ac.in



60 FT 402	Meat, Fish and Poultry	Category	L	Т	Р	Credit
0011 402	Process Technology	PC	3	0	0	3

- Differentiate the types of meat available based on its composition and its structure.
- Students will be able to pronounce carious meat, fish and poultry processing techniques
- Preservation techniques and the post mortem changes that happen in them.
- Study the techniques involved in processing of fishes
- Understand the properties of egg and processing of egg and poultry

Pre-requisites

□ Nil

Course Outcomes

CO1	Recognize the types of meat available with its structure and composition and illustrate the various steps in processing of meat products.	Apply
CO2	Assess the post-mortem changes of meat and the factors affecting the changes and design modern abattoirs/slaughter house by taking various features into account.	Understand
CO3	Implement various preservation methods for meat for improving shelf life and pronounce and produce different meat products with higher quality.	Understand
CO4	Differentiate different types of fish along with its structure and composition and identify recent trends in fish preservation such as freezing and canning.	Analyze
CO5	Understand the nutritional and functional properties of egg and illustrate different methods of egg processing and preservation	Apply

COs	POs												PSOs		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1	3	3	3	-	-	1	3	-	-	-	-	-	3	•	
CO2	3	3	2	-	-	1	3	3	-	-	-	-	3	•	
CO3	3	3	2	-	-	1	2	-	-	-	-	-	3	3	:
CO4	3	3	2	-	-	2	2	3	-	-	-	-	3	3	:
CO5	3	3	2	-	-	2	2	-	-	-	-	-	3	3	

Assessment Pattern	1					
Bloom's Category	Continuous Asse (Ma	essment Tests rks)	Model Examination	End Sem Examination		
outogory	1	2	(Marks)	(Marks)		
Remember	20	10	20	20		
Understand	30	30	40	40		
Apply	10	10	20	20		
Analyze	-	10	20	20		
Evaluate	-	•	-	-		
Create	-	-	-	-		
Total	60	60	100	100		



			B. Tech. Fo	od Technol	oav			
		60 FT 402	2 - Meat, Fish			echnology		
C	_ Н	ours/Weel		Total	Credit		ximum Marks	
Semeste	L	Т	Р	Hours	С	CA	ES	Total
IV	3	0	0	45	3	40	60	100
meat and slaughter	rends in meat prod d meat products care -stunning, , inspection and g	Introduct methods	ion to Halal of stunning -	. Ante mor	tem handling	g, Slaughte	ring-pre	[9]
	meat tem changes of meat tenderization a							[9]
Meat pre processin irradiation	servation servation-Methods ng-dehydration- cu n. Meat products nd standardization	ring and s – Ham ar	smoking-pres	ervation usi	ng antibiotics			[9]
Fish prod	cessing							
Handling a	fish, composition and transportation g, salting, smoking	of fish. Pres	servation meth	ods –Freezir	g and Individ	ual Quick Fr	eezing(IQF)	[9]
Structure eggs, Far methods Dressing- scalding-	poultry processing to composition, nuctor affecting egg pasteurization, lagrading-slaughte Mechanical defication of poultry managements.	tritive value quality an iquid egg, ring- eathering	d measures of frozen egg, of	of egg qualit	y. Preservati n-Egg powde	on of egg ber processin	y different	[9]
						To	otal Hours:	45
Text Boo	- · ·				4 . = 00	\/'' 5		
1 1	Panada P.C., —Te House Pvt. Ltd., Ne			itry Technolo	ogy, 1st Editio	on, Vikas Pul	biishing	
۷.	Gunter Heinz and F 2007.	Peter Hautz	zinger, —Mea	t Processing	Technology,	1st Edition,	RapPublication	n, Montep
Referenc							-	
1.	onnis S. Boziaris,	—Seafood	Handbook: T	echnology, (Quality and Sa	afety, Wil <mark>ey I</mark>	Blackwell,UK, 2	014.
''								

^{*}SDG 9 - Industry Innovation and Infrastructure

^{**}SDG 3 – Good Health and Well Being ***SDG 7 – Affordable and Clean Energy

Course Contents and Lecture Schedule									
S. No.	Topics	No. of hours							
1.0	Meat								
1.1	Recent trends in meat processing.	1							
1.2	Types of Meat and its sources, composition, structure, of meat and meat								
1.2	products.	2							
1.3	Introduction to Halal.	1							
1.4	Ante mortem handling,	1							
1.5	Slaughtering-pre slaughter care –stunning, methods of stunning– bleeding-								
	skinning of animals,	2							
1.6	Mechanical deboning, inspection and grading of meat.	2							
2.0	Aging of meat	1							
2.1	Post-mortem changes of meat.	2							
2.2	Factors affecting post-mortem changes,	1							
2.3	Properties and shelf-life of meat.	1							
2.4	Meat tenderization and Meat quality evaluation	1							
2.5	Modern abattoirs.	1							
2.6	Slaughter house and its features	1							
3.0	Meat preservation								
3.1	Meat preservation-Methods of preservation-low temperature, chilling andfreezing	2							
3.2	Thermal processing-dehydration	1							
3.3	Curing and smoking	1							
3.4	preservation using antibiotics	1							
3.5	Preservation by irradiation.	1							
3.6	Meat products – Ham and Beckon, sausage, quality control and	3							
	standardization of meat.								
4.0	Fish processing	1							
4.1	Types of fish, composition, structure, and spoilage factors of fish.	2							
4.2	Post-mortem changes in fish.	1							
4.3	Handling and transportation of fish.	1							
4.4	Preservation methods –Freezing and Individual Quick Freezing(IQF)	1							
4.5	Canning	1							
4.6	salting, smoking,	1							
4.7	drying of fish, pickling.	2							
4.8	On board preservation – RSW, CSW.	1							
5.0	Egg and poultry processing	L.							
	Structure, composition, nutritive value, calculation of nutritive value and								
5.1	functional properties of eggs	2							
5.2	Factor affecting egg quality and measures of egg quality.	1							
	Preservation of egg by different methods – pasteurization, liquid egg, frozenegg,								
5.3	desugarisation	2							
5.4	Egg powder processing	1							
5.5	Poultry-Dressing –grading-slaughtering-scalding	1							
5.6	Mechanical defeathering eviscerating-preservation	2							
5.7	Quality control and standardization of poultry meat	1							

1. Dr. J. Philip Robinson -philip@ksrct.ac.in



60 FT 403	Food Chemistry and	Category	L	Т	Р	Credit
0011 403	Nutrition	PC	3	0	0	3

_					
m	h	10	ct	11/	20
v	u	ıc	υL	ıv	es

- ☐ To understand the composition of food and importance of water
- □ To recognize the sources, functions and deficiency of minerals and vitamins
- To realize the importance of aroma and phytochemical's in food.
- To get an overview about nutrition.
- To learn basic metabolism, energy, and composition foods and weigh control.

Pre-requisites

Nil

Course Outcomes

On the day	if the saccessial completion of the course, stadents will be able to									
CO1	Know about the composition of food and importance of water.	Understand								
CO2	Learn about the sources, functions and deficiency of minerals and vitamins along with its properties and types.	Understand								
CO3	Understand the function of colorants and toxic substance in foods.	Understand								
CO4	Comprehend the basics of nutrition and its planning.	Understand								
CO5	Describe the metabolic pathway, energy balance and composition of food for health.	Analyze								

Mappi	Mapping with Programme Outcomes																
COs	POs													PSOs			
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3		
CO1	3	3	3	-	-	3	3	-	-	-	-	-	3	2	-		
CO2	3	3	2	-	-	3	3	3	-	-	-	-	3	2	-		
CO3	3	3	2	-	-	2	2	-	-	-	-	-	3	2	2		
CO4	3	3	2	-	-	2	2	3	-	-	-	-	3	2	-		
CO5	3	3	2	-	-	2	2	-	-	-	-	-	3	2	2		
3-Stroi	ng; <mark>2-N</mark>	/ledium	n; 1-Lov	N		•	•		•						•		

Assessment Patteri	n				
Bloom's Category		sessment Tests irks)	Model Examination (Marks)	End Sem Examination (Marks)	
	1	2	(Waiks)	(Walks)	
Remember	20	20	20	20	
Understand	40	40	40	40	
Apply	-	-	30	30	
Analyze	-	-	10	10	
Evaluate	-	-	-	-	
Create	-	-	-	-	
Total	60	60	100	100	

			amy College B. Tech f	Food Techno				
		60	FT 403 – Foo			on		
		Hours/Weel		Total	Credit		ximum Marks	<u> </u>
Semester	L	Т	Р	Hours	С	CA	ES	Total
IV	3	0	0	45	3	40	60	100
Proximate can nutrient, fu	unction, sour	of food, waterces, require	R** er activity in fement, structuen bonding, E	ire, water ba	lance – effec	ct of		[9]
Mineral & vit sources, Bio sodium, pot deficiency d	o-availability tassium. Vita iseases caus	t of foods- st , and deficie amins – Cla sed by follow	ability & degreency of followassification, vitamins:	wing mineral units of me a. Fats solu	s – calcium, asurement, s ble	, Iron, Iodin sources, fur	e, Fluorine,	[9]
Naturally oc Colours, en coffee, tea, of Threshold va	curring colou zymatic bro cocoa, fruits, alues, off fla	urs/pigments wning of fo vegetables vours & food	EMICALS IN in food and od, flavour & fermented it taints. Natur , bioactive co	impact on ar & aroma con products; ar rally occurring	mponents pr ld Naturally s g	esent in hei similar /artific	rbs, spices, cial flavours,	[9]
Definition, s status, nutri dietary reco	tional require	nutrients, c	alculating end		rom food, us		, nutritional	
hysiology (ange lists, pe of the diges	ersonal diet a tive tract,	diet planning analysis; Dige	g: Diet plann stion, Absor		, dietary guid	populations, delines; food	[9]
physiology mechanical	ange lists, pe of the diges and chemica	ersonal diet a tive tract, al digestion, a	diet planning analysis; Dige absorption of	g: Diet plann stion, Absor nutrients.	ing principles ption and Ti	, dietary guid	populations, delines; food	[9]
physiology of mechanical METABOLIS Review of cocalorific value of footomposition development	ange lists, per of the diges and chemica sm, ENERG atabolic and ue of foods tion of foods; Energy; health imput; hunger, sa	ersonal diet a tive tract, al digestion, a Y BALANCI d anabolic p – bomb cal s, energy b Balance and olications; ol atiety and sa	diet planning analysis; Dige	g: Diet plann stion, Absor nutrients. Y COMPOSI glucose, fats ergy required and indire cosition: Ene and BMI caters of weigh	rion and Ti rion* and amino ments – bas ct calorimetr rgy balance; alculations; W t loss; how to	, dietary guid ransport: Ar acids; Defir al metabolis y, physiolog body weigh Veight Conti o identify un	populations, delines; food natomy and nition, units, sm, specific gical energy and body rol: Fat cell	[9]
ohysiology of mechanical METABOLIS Review of cocalorific valuely namic actual actual composition developments	ange lists, per of the diges and chemica sm, ENERG atabolic and ue of foods tion of foods; Energy; health imput; hunger, sa	ersonal diet a tive tract, al digestion, a Y BALANCI d anabolic p – bomb cal s, energy b Balance and olications; ol atiety and sa	diet planning analysis; Dige absorption of E AND BOD athways of glorimeter; enalance, direct di Body Compbesity, BMR atiation; dange	g: Diet plann stion, Absor nutrients. Y COMPOSI glucose, fats ergy required and indire cosition: Ene and BMI caters of weigh	rion and Ti rion* and amino ments – bas ct calorimetr rgy balance; alculations; W t loss; how to	acids; Defir acids; Defir al metabolis y, physiolog body weigh Veight Conti o identify un	populations, delines; food natomy and nition, units, sm, specific gical energy and body rol: Fat cell	
ohysiology of mechanical METABOLIS Review of cocalorific value of footomposition development oss scheme	ange lists, per of the diges and chemica SM, ENERG attabolic and ue of foods tion of foods; Energy; health imput; hunger, satisfy treatment	ersonal diet a tive tract, al digestion, a Y BALANCI d anabolic p – bomb cal s, energy b Balance and olications; ol atiety and sa	diet planning analysis; Dige absorption of E AND BOD athways of glorimeter; enalance, direct di Body Compbesity, BMR atiation; dange	g: Diet plann stion, Absor nutrients. Y COMPOSI glucose, fats ergy required and indire cosition: Ene and BMI caters of weigh	rion and Ti rion* and amino ments – bas ct calorimetr rgy balance; alculations; W t loss; how to	acids; Defir acids; Defir al metabolis y, physiolog body weigh Veight Conti o identify un	nition, units, sm, specific gical energy and body rol: Fat cell isafe weight	[9]
METABOLIS Review of cocalorific value of foo composition developmen oss scheme	ange lists, per of the diges and chemica SM, ENERG catabolic and ue of foods tion of foods; Energy; health imput; hunger, sales; treatment spi:	ersonal diet a tive tract, al digestion, a Y BALANCI d anabolic p – bomb cal s, energy b Balance and blications; of atiety and sa of obesity;a	diet planning analysis; Dige absorption of E AND BOD athways of gorimeter; enalance, direct d Body Composity, BMR attation; dang ttitudes and be analysis of the composity of th	g: Diet plann stion, Absor nutrients. Y COMPOSI glucose, fats ergy required and indire cosition: Ene and BMI caters of weigh pehaviors tow	rion and Transition and Transition and Amino ments – bas ct calorimetry balance; alculations; Walculations; Ward weight constant of the consta	acids; Defiral metabolis, physiolog body weight Control control.	nition, units, sm, specific gical energy and body rol: Fat cell isafe weight	[9]
METABOLIS Review of cocalorific value of footomposition development oss scheme Text Book(structure) Metabolistic value of footomposition development oss scheme Metabolistic value of footomposition development oss	sange lists, per of the diges and chemical sand chemical s	ersonal diet a tive tract, al digestion, a Y BALANCI d anabolic p – bomb cal s, energy b Balance and blications; ol atiety and sa of obesity;a	diet planning analysis; Dige absorption of E AND BOD athways of gorimeter; enalance, direct d Body Composity, BMR attation; dang ttitudes and be analysis of the composity of th	g: Diet plann stion, Absor nutrients. Y COMPOSI glucose, fats ergy require than indire cosition: Ene and BMI caters of weight behaviors town ood Chemist	ry, 4th Edition	, dietary guid ransport: Ar acids; Defir al metabolis y, physiolog body weigh Veight Contro o identify un control.	populations, delines; food natomy and natomy and nition, units, sm, specific gical energy and body rol: Fat cell safe weight otal Hours:	[9]
METABOLIS Review of cocalorific value of footomposition development oss scheme Text Book(s 1. Belitz 2. Manr Universition of the composition of	sange lists, per of the diges and chemical sand chemical s	ersonal diet a ative tract, al digestion, a	diet planning analysis; Dige absorption of E AND BOD athways of glorimeter; end alance, direct displayed Body Complesity, BMR atiation; dangettitudes and be hieberle P. Fell "Essentials"	g: Diet plann stion, Absor nutrients. Y COMPOSI' glucose, fats ergy require to and indire cosition: Ene and BMI caters of weigh pehaviors toward ood Chemists of Human N	ry, 4th Edition	acids; Defiral metabolis y, physiolog body weigh Veight Control control.	populations, delines; food natomy and natomy and nition, units, sm, specific gical energy and body rol: Fat cell safe weight otal Hours:	[9]
METABOLIS Review of cocalorific value of footomposition development oss scheme Text Book(s 1. Belitz 2. Manr University Scheme (s) Reference (s)	sange lists, per of the diges and chemical sand chemical s	ersonal diet a tive tract, al digestion, al digestion beautient and sa of obesity; and sa of obesity; al ch W and Scient Trusw 2007.	diet planning analysis; Dige absorption of E AND BOD athways of glorimeter; enalance, direct display Body Composity, BMR atiation; dang ttitudes and be also b	g: Diet plann stion, Absor nutrients. Y COMPOSI' glucose, fats ergy required and indire cosition: Ene and BMI caters of weigh behaviors town ood Chemist is of Human Nestry''. 3rd Edition, Absorbed to the plant of	ry, 4th Edition and Sutton, Springe	acids; Defirial metabolis y, physiolog body weight Control control. Ton, Springer-VI Edition. Oxfor, 1999.	populations, delines; food natomy and natomy and nition, units, sm, specific gical energy nt and body rol: Fat cell safe weight otal Hours: Verlag, 2009. ford	[9]
METABOLIS Review of cocalorific value of foo composition development oss scheme Text Book(s 1. Belitz 2. Manrulnive Reference(s 1. John 2. Chop	sange lists, per of the diges and chemica send chemica se	ersonal diet a ative tract, al digestion, al digestion of bomb cal s, energy be Balance and olications; ol atiety and sa of obesity; a ch W and Sc ewart Trusw 2007. Principles of P.S. Panesa	diet planning analysis; Dige absorption of E AND BOD athways of glorimeter; enalance, direct di Body Complesity, BMR atiation; dang ttitudes and be a believed by the best of	g: Diet plann stion, Absor nutrients. Y COMPOSI glucose, fats ergy required and indired position: Ene and BMI caters of weigh pehaviors town ood Chemist is of Human in stry". 3rd Ediemistry". Alph	ry, 4th Edition Nutrition, Springe as Science Information and Triples, ption and Triples, ption and aminoments — bas ct calorimetr rgy balance; alculations; We to loss; how to vard weight constitution.	acids; Defiral metabolis y, physiolog body weigh Veight Control control. To n, Springer-Veight Coxlar, 1999. ternational L	populations, delines; food natomy and policial energy national energy nation	[9]
METABOLIS Review of cocalorific value of foo composition development oss scheme Text Book(state	sange lists, per of the diges and chemica sand chemica sa	ersonal diet a tive tract, al digestion, a d	diet planning analysis; Dige absorption of E AND BOD athways of glorimeter; enalance, direct display Body Composity, BMR atiation; dang ttitudes and be also b	g: Diet plann stion, Absor nutrients. Y COMPOSI glucose, fats ergy required the and indirect and indirect and BMI caters of weigh behaviors town ood Chemists of Human Nutriti	FION* and aminoments – baset calorimetry balance; alculations; Ward weight covard weight covard with the covard weight covard we	acids; Defiral metabolis, physiolog body weight Control identify uncontrol. To Springer-Veight Coxton identify uncontrol.	populations, delines; food natomy and natomy and natomy and nition, units, sm, specific pical energy and body rol: Fat cell safe weight notal Hours: Verlag, 2009. ford Limited, 2010 all, 2009.	[9]

^{*}SDG2- Zero hunger



^{**}SDG3- Good health and well-being
***SDG12- Responsible consumption and production

Course Contents and Lecture Schedule										
S. No.	Topics	No. of hours								
1	FOOD COMPOSITION AND WATER	1								
1.1	Proximate composition of food	1								
1.2	water activity in food, water quality for food processing	2								
1.3	Water as a nutrient, function, sources, requirement	1								
1.4	structure, water balance – effect of deficiency	1								
1.5	Moisture in food: Hydrogen bonding	1								
1.6	Bound water, Free water	1								
1.7	Water activity and Food stability	1								
2	MINERALS AND VITAMINS									
2.1	Mineral & vitamin content of foods	1								
2.2	Stability & degradation during food processing	1								
2.3	Mineral functions, sources, Bio-availability	1								
2.4	deficiency of following minerals – calcium, Iron, lodine	1								
2.5	Fluorine, sodium, potassium	1								
2.6	Vitamins – Classification, units of measurement, sources	1								
2.7	functions and deficiency diseases caused by vitamins	1								
2.8	Fats soluble vitamins – Vitamin A, D, E and K	1								
2.9	Water soluble vitamins – Vitamin C and B-complex	1								
3.0	Transmission Systems									
3.1	Naturally occurring colours/pigments in food and impact on antioxidant level	1								
3.2	Synthetic food grade Colours, enzymatic browning of food, flavor	2								
3.3	3.3 aroma components present in herbs, spices, coffee, tea, cocoa									
3.4	aroma components present in fruits, vegetables	1								
3.5	aroma components present in fermented products	1								
3.6	Naturally similar /artificial flavours, Threshold values, off flavours & food taints	1								
3.7	Naturally occurring toxic substances, protease inhibitors	1								
3.8	bioactive components phytates, polyphenols, saponins	1								
4	AN OVERVIEW OF NUTRITION									
4.1	Definition, six classes of nutrients	1								
4.2	calculating energy values from food, using the RDA	1								
4.0	Nutritional status, nutritional requirement, malnutrition, nutritional	1								
4.3	assessment of individuals and populations	'								
4.4	Dietary recommendations, Balanced diet planning	2								
4.5	Diet planning principles, dietary guidelines; food groups, exchange lists	1								
4.6	Personal diet analysis; Digestion, Absorption and Transport	1								
4.7	Anatomy and physiology of the digestive tract	1								
4.8	mechanical and chemical digestion, absorption of nutrients	1								
5	METABOLISM, ENERGY BALANCE AND BODY COMPOSITION	T								
5.1	Review of catabolic and anabolic pathways of glucose, fats and amino acids	1								
5.2	Definition, units, calorific value of foods – bomb calorimeter; energy requirements – basal metabolism	1								
5.3	specific dynamic action of foods, energy balance, direct and indirect calorimetry	1								
5.4	physiological energy value of foods	1								
5.5	Energy Balance and Body Composition: Energy balance; body weight and body composition	1								
5.6	health implications; obesity, BMR and BMI calculations	1								
5.7	Weight Control: Fat cell development; hunger, satiety and satiation; dangers of weight loss	1								
5.8	how to identify unsafe weight loss schemes	1								
5.9	Treatment of obesity; attitudes and behaviours toward weight control	1								

1. Dr.K.Prabha - prabhak@ksrct.ac.in



60 FT 4P1	Food Chemistry and	Category	L	T	Р	Credit
0011411	Nutrition Laboratory	PC	0	0	4	2

- To understand the extraction techniques of food samples.
- To analyze the important vitamins and food spoilage.
- To investigate and comprehend the physical and chemical aspects of foods.
- To become acquainted with the nutritious composition of foods
- To gain knowledge in quantitative methods in assessing nutritional status of individuals andgroups.

Pre-requisites

NIL

Course Outcomes

On the successful completion of the course, students will be able to

CO1	components in the food sample.						
CO2	Identify the vitamins and rancidity in the samples.	Analyze					
CO3	Better understanding the physical and chemical properties of food.	Analyze					
CO4	Recognizing the various food groups, food components, and energy from food.	Understand					
CO5	Exposing to dietary allowances, food components, and nutritional assessments.	Analyze					

Mapping with Programme Outcomes

COs		POs												PSOs		
COS	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	
CO1	3	3	3	-	-	-	3	-	3	3	-	-	2	3	-	
CO2	3	3	3	-	-	-	3	-	3	3	-	-	2	3	-	
CO3	3	3	3	-	-	-	3	-	3	3	-	-	3	3	3	
CO4	3	3	3	-	-	-	3	-	3	3	-	-	3	3	3	
CO5	3	3	3	-	-	-	3	-	3	3	-	-	2	3	-	
3-Stroi	ng;2-M	edium;1	1-Low													

Assessment Pattern

Bloom's Category	Lab Experiment (Ma	s Assessment arks)	Model Examination (Marks)	End Sem Examination (Marks)	
	Lab	Lab Activity			
Remember	-	-	-	-	
Understand	-	-	-	-	
Apply	25	12	50	50	
Analyze	25	13	50	50	
Evaluate	-	-	-	-	
Create	-	-	-	-	
Total	50	25	100	100	

K.S.Rangasamy College of Technology – Autonomous R2022											
B.Tech. Food Technology											
60 FT 4P1 - Food Chemistry and Nutrition Laboratory											
Semester	ŀ	lours/Week		Total	Credit	Ma	ximum Mark	(S			
Semester	L	Т	Р	Hrs	С	CA	ES	Total			
IV	0	0 0 4 60 2 60 40 100									

List of Experiments:

- 1. Estimation of moisture content and crude fiber in the given food sample.
- 2. Extraction and estimation of chlorophyll for different green leafy vegetables
- 3. Extraction and Estimation of carotenoid and lycopene in the given sample.
 - 4. Determination of vitamin C in the given food sample.
- 5. Determination of Solubility, Refractive index and Oxidative rancidity of given fats and oils.
 - 6. Estimation of total polyphenol present in the given food sample.
- 7. Determination of Total soluble solid, titrable acidity and refractive index of various fruit juice.
 - 8. Iso-electric precipitation of casein, Effect of rennin on milk proteins.
 - 9. Detection of Saccharine in beverages.
 - 10. Determination of α-amylase activity in the given sample by falling number test.
 - 11. Calculation of energy balance of individuals based on 3 day dietary recall.
- 12. Dietary survey of a group of individuals/community.

Activity

Hospital visit and slide presentation on several nutritional deficiencies problems

Lab Manual

1. "Food Chemistry and Nutrition Lab Manual", Department of Food Technology, KSRCT.

Course Designer(s)

1. Dr.K.Prabha - prabhak@ksrct.ac.in



60 FT 4P2	Unit Operations	Category	L	Т	Р	Credit
00114F2	Laboratory	PC	0	0	4	2

- To provide students with practical knowledge and hands on training in chemical engineering equipment.
- To illustrate principles of viscosity measurement and co-efficient of friction.
- To explore the knowledge on size reduction equipment
- To learn single effect evaporator and diffusivity measurements
- To learn various extraction process

Pre-requisites

NIL

Course Outcomes

On the successful completion of the course, students will be able to

On the successful completion of the course, students will be able to								
CO1	Analyse Co-efficient of discharge of venture meter and orifice meter.	Apply						
CO2	Analyze							
CO3	Determination of Jaw/Roll Crusher and Stefan Boltzmann Constant.	Analyze						
CO4	Estimate the heat transfer coefficients of the single effect evaporatorand principle behind diffusivity measurements.	Understand						
CO5	Review the principle of ternary equilibrium in liquid-liquid extraction and leaching process.	Analyze						

Mappi	Mapping with Programme Outcomes														
COs	POs											PSOs			
003	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1	3	3	3	-	-	-	3	-	3	3	-	-	2	3	-
CO2	3	3	3	-	-	-	3	-	3	3	-	-	2	3	-
CO3	3	3	3	-	-	-	3	-	3	3	-	-	3	3	3
CO4	3	3	3	-	-	-	3	-	3	3	-	-	3	3	3
CO5	3	3	3	-	-	-	3	-	3	3	-	-	2	3	-
3-Stror	ng;2-M	edium;1	1-Low												

Assessment Pattern

Bloom's Category	Lab Experimen	its Assessment (Marks)	Model Examination	End Sem Examination (Marks)
	Lab	Activity	(Marks)	, ,
Remember	-	-	-	-
Understand	-	-	-	-
Apply	25	12	50	50
Analyze	25	13	50	50
Evaluate	-	-	-	-
Create	-	-	-	-
Total	50	25	100	100

	K.S.Rangasamy College of Technology – Autonomous R2022										
	B.Tech. Food Technology										
		60	FT 4P2 – Ur	nit Operation	ns Laborato	ry					
Semester	I	Hours/Week		Total	Credit	Ma	Maximum Marks				
Ocilicatei	L	Т	Р	Hrs	С	CA	ES	Total			
11.7	^	Λ	1	60	2	60	40	100			

List of Experiments:

- 1. Determination of Coefficient of Discharge in Venturimeter
- 2. Determination of Coefficient of Discharge in Orifice meter
- 3. Estimate the Viscosity measurement for Non Newtonian fluids
 - 4. Determination of Coefficient of friction in Straight pipes
- 5. Determination of average particle size of the products from Ball mill
- 6. Determination of average particle size of the products from Hammer mill
- 7. Determination of Stefan Boltzmann Constant using radiation methods
- 8. Determination of heat transfer coefficient using Single effect evaporator
 - 9. Determination of Heat transfer using natural convection
 - 10. Estimate the diffusivity coefficient between the heat transfer objects.
 - 11. Estimate the Ternary equilibrium in liquid liquid extraction

Activity

Demonstrate the ether-oil and water-oil separation in the decantor.

Lab Manual

- 1. McCab W. L. Smith J. C., Unit Operations of Chemical Engineering, Seventh editon, Mc Graw Hill Publications, New York, 2005.
- 2. Perry Robert- Perry Chemical Engineering Hand Book eight Edition, Mc Graw Hill Publications, New York, 2007.

Course Designer(s)

1.Dr. P. Shanmugam-<u>shanmugam@ksrct.ac.in</u>



60 CG 0P3	Career Skill	Category	L	T	Р	Credit
00 00 01 3	Development III	CG	0	0	2	1*

- To help learners improve their logical reasoning skills at different academic and professional contexts.
- To help learners relate basic quantitative problems and solve them.
- To help learners Infer critically the statements with optimal conclusions and assumptions.
- To Solve the quantitative problems pertaining to calculations of averages, ratio and proportions, and profit and loss effectively
- To compute quantitative problems related to time and work, speed and distance, and simple and compound interest

Pre-requisites

Basic knowledge of Arithmetic and Logical Reasoning

Course Outcomes

On the successful completion of the course, students will be able to

CO1	Deduce the topics in logical reasoning at the preliminary and intermediate level.	Analyze
CO2	Relate basic quantitative problems and solve them effectively at the preliminary level	Apply
CO3	Infer critically the statements with optimal conclusions and assumptions with the data and information given.	Analyze
CO4	Solve the quantitative problems pertaining to calculations of averages,ratio and proportions, and profit and loss effectively at the pre-intermediate level.	Apply
CO5	Compute quantitative problems related to time and work, speed and distance, and simple and compound interest at intermediate level.	Apply

Mapping with Programme Outcomes

COs						P	Os							PSOs	
003	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1	2	2	2	3	-	3	-	-	-	2	3	3	-	-	-
CO2	3	3	3	3	-	2	-	-	-	2	3	3	-	-	-
CO3	2	2	2	2	-	3	-	-	-	2	3	3	-	-	-
CO4	3	3	3	3	-	2	-	-	-	2	3	3	-	-	-
CO5	3	3	3	3	-	2	-	-	-	2	3	3	-	-	-
3 - Str	ong; 2 -	- Mediu	m; 1 - S	Some											

	K.S	o.Kanyasan	ny College o	of Technolog	gy – Autonoi	mous R2022	2	
			B.Tech.	Food Techr	nology			
		60	CG 0P3 - Ca	reer Skill De	evelopment	III		
Semeste	_ H	lours/Week		Total	Credit	Max	kimum Marks	;
Semeste	' L	Т	Р	Hours	С	CA	ES	Total
IV	0	0	2	30	1*	100	00	100
Logical F	Reasoning							
Analogies	s - Alpha and nu	umeric serie	s - Number S	Series - Cod	ing and Deco	oding - Blood	dRelations -	[6]
Coded Re	elations - Order	and Ranking	- odd man d	out - Direction	n and distand	e		
Quantita	tive Aptitude –	Part 1						
Number s	ystem - Squares	& cubes - [Divisibility - U	nit digits - Re	emainder The	orem - HCF8	&LCM -	[6]
Geometri	c and Arithmetic	progression	ı - Surds & ir	ndices				
Critical R	Reasoning							
Syllogism	- Statements ar	nd Conclusion	ns, Cause ar	d Effect, Sta	tements and	Assumptions		[6]
- identifyi	ng Strong Argui	ments and V	Veak Argum	ents – Caus	e and Action	-Data		
sufficienc	У							
Quantita	tive Aptitude –	Part 2						
	- Ratio and pro	oportion – A	.ges – Partr	nership- Per	centage - P	rofit & loss	-Discount -	[6]
Mixture a	nd Allegation							
	tive Aptitude –	Part 3						
T	ork - Pipes and							
				distance - T	rains - Boats	and Streams	S	[6]
	nterest and Con			distance - T	rains - Boats			[6]
- Simple i				distance - T	rains - Boats		otal Hours:	[6]
- Simple i	e(s):	npound inter	est			To	otal Hours:	30
Reference		npound inter Modern App	roach to Ver	bal and Non-		To	otal Hours:	30
Reference 1. Ag 20	e (s): Igarwal, R.S. 'A	Modern App	roach to Verly Delhi. 2009	bal and Non-	verbal Reaso	To oning', Revis	otal Hours:	30
Reference 1. Ag 20 2. Ab	e (s): Igarwal, R.S. 'A 09, S.Chand & (Modern App Co Ltd., New	roach to Verl Delhi. 2009 tude', McGra	bal and Non- · aw Hill Educa	verbal Reaso	To oning', Revis	ed Edition200	30 8, Reprir

S. No.	Topics	No. of hours
1	Logical Reasoning	<u> </u>
1.1	Analogies - Alpha and numeric series	1
1.2	Number Series - Coding and Decoding	1
1.3	Blood Relations - Coded Relations	1
1.4	Order and Ranking – odd man out	1
1.5	Direction and distance	2
2	Quantitative Aptitude – Part 1	-
2.1	Number system	1
2.2	Squares & cubes - Divisibility	1
2.3	Unit digits - Remainder Theorem	1
2.4	HCF & LCM- Geometric and Arithmetic progression	1
2.5	Surds & indices	2
3	Critical Reasoning	•
3.1	Syllogism	1
3.2	Statements and Conclusions, Cause and Effect	1
3.3	Statements and Assumptions	1
3.4	identifying Strong Arguments and Weak Arguments	1
3.5	Cause and Action -Data sufficiency	2
4	Quantitative Aptitude – Part 2	•
4.1	Average - Ratio and proportion	1
4.2	Ages – Partnership	1
4.3	Percentage	1
4.4	Profit & loss	1
4.5	Discount - Mixture and Allegation	2
5	Quantitative Aptitude – Part 3	
5.1	Time & Work	1
5.2	Pipes and cistern	1
5.3	Time, Speed & distance - Trains	1
5.4	Boats and Streams	1
5.5	Simple interest and Compound interest	2

1. R. Poovarasan - poovarasan@ksrct.ac.in

K.S.RANGASAMY COLLEGE OF TECHNOLOGY, TIRUCHENGODE - 637215 (An Autonomous Institution affiliated to Anna University) B.E. / B.Tech. Degree Programme SCHEME OF EXAMINATIONS

(For the candidates admitted in 2022-2023) FIFTH SEMESTER

C No	Course	Name of the	Duration of	Weighta	ge of Marks		Minimum M Pass in End S Exan	Semester
S.No.	Code	Course	Internal Exam	Continuous Assessment *	End Semester Exam	Max. Marks	End Semester Exam	Total
				THEORY				
1.	60 FT 501	Dairy Technology	2	40	60	100	45	100
2.	60 FT 502	Food Process Engineering	2	40	60	100	45	100
3.	60 FT 503	Food Safety and Quality Regulation	2	50	50	100	45	100
4.	60 FT 504	Heat and Mass Transfer	2	40	60	100	45	100
5.	60 FT E2*	Professional Elective – II	2	40	60	100	45	100
6.	60 OE L0*	Open Elective – II	2	40	60	100	45	100
7.	60 MY 003	Startups and Entrepreneurship	2	100	-	100	-	100
			PF	RACTICAL				
8.	60 FT 5P1	Dairy Technology Laboratory	3	60	40	100	45	100
9.	60 FT 5P2	Food Process Engineering Laboratory	3	60	40	100	45	100
10.	60 FT 5P3	Design Thinking and Innovation Laboratory	3	60	40	100	45	100
11.	60 CG 0P4	Career Skill Development IV	3	100	-	100	-	100
12.	60 CG 0P6	Internship	-	100	-	100	-	100

^{*} CA evaluation pattern will differ from course to course and for different tests. This will have to be declared in advance to students. The department will put a process in place to ensure that the actual test paper follow the declared pattern.





^{**} End Semester Examination will be conducted for maximum marks of 100 and subsequently be reduced to 60 marks for theory End Semester Examination, 50 marks for theory cum practical End Semester Examination and 40 marks for practical End Semester Examination.

B.TECH.(FT)-2022-2023
PC 3 0 0 3

Objectives

- To provide knowledge about the various types of milk processing techniques
- To understand about milk, milk processing methodologies
- To provide technical knowledge about the production of milk products
- To provide knowledge on packing equipment in milk processing
- To identify fermented and non-fermented milk products

Pre-requisites

Nil

Course Outcomes

On the succ	cessiul completion of the course, students will be able to	
CO1	Learn the milk processing equipment's and methods.	Understand
CO2	How to maintain and ensure the quality and safety of dairy products, including hygiene standards and food safety regulations.	Apply
CO3	Knowledge of creating new dairy products and improving existing ones through research and development.	Analyze
CO4	Identify the production process of various fermented and non-fermented milk products	Apply
CO5	Analyse the safety and quality factors that determine the acceptability of the	Analyze

Mappii	Mapping with Programme Outcomes														
COs	POs												PSOs		
003	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1	3	3	3	-	-	-	3	-	-	-	1	-	3	2	2
CO2	3	3	3	-	-	-	3	-	-	-	-	-	3	2	2
CO3	3	3	3	-	-	-	2	-	-	-	-	-	3	3	2
CO4	3	3	3	-	-	-	2	-	-	-	-	-	3	3	2
CO5	3	3	3	-	-	-	2	-	-	-	-	-	3	3	2
3 - Stro	ong; 2 -	Mediur	n; 1 - S	ome											

Bloom's Category	Continuous Asse (Ma		End Sem Examination (Marks)
Category	1	2	
Remember	10	0	20
Understand	40	10	30
Apply	10	40	30
Analyze	-	10	20
Evaluate	-	-	-
Create	-	-	-
Total	60	60	100

			B. Tech.	Food Techno	ology			
				1 - Dairy Tec				
	Н	ours/Week		Total	Credit	Ma	aximum Marks	3
Semeste	r L	Т	Р	Hours	С	CA	ES	Total
V	3	0	0	45	3	40	60	100
the indus	ion of dairy industry try. Milk - Definition f milk pricing, Nu	on, types o	f market mill	k, Compositio	n and factors	affecting qu		[9]
Raw milk Platform Fat, Solid test and <i>i</i>	n and inspection collection - Co tests of milk, Sm ds-Not-Fat, Dye Adulteration test.	oling and nell, Appea Reduction Microbial ir	Transportati trance, Temportati Test: MBRT Inspection of	perature, Sec test, Resaz	diment, Acidit	y, Lactomet	er Reading,	[9]
Milk proc	cessing and Equessing equipmen			D4	tion UTST	_ T T _		
Cream se	essing equipment anks - Cream sep eparation – princip es of milk powder	parating Ce ole, theory	ntrifuges - H and separati	omogenizationg efficiency	on – theory ar of cream sep	nd working p arators. Pro	rinciple.	[9]
Packagir Storage a liquid mill machines affecting	anks - Cream sep eparation – princi	parating Ce ole, theory - types. Ad sanitation of f milk. Prind capping ing of milk	ntrifuges - H and separati vanced nove of dairy indunciples and values and values, p	omogenization gefficiency el equipment in stries** working of difficult ouch filling management processing the processing of the processin	on – theory ar of cream sep in dairy proce fferent packa nachine, asep working, ma	nd working p arators. Pro ssing. ging types f tic packagin	rinciple. cessing or solid and ag and filling	[9]
Packagir Storage a liquid mill machines affecting system. Manufac Production	anks - Cream seperation — principles of milk powder and, storage and seperation of the control	corating Ce cole, theory types. Ad constation of find capping ing of mill cons. CIP corrects coducts* am, butter, Yoghurt, da	ntrifuges - H and separati vanced nove of dairy indunciples and wanchine, poor products. eleaning and ghee, ice-clahi, shrikhan	omogenization gefficiency el equipment in stries** working of difficult ouch filling many designing of designing of designing of the stries ouch filling many designing filling many designing ouch filling many designing filling many de	on – theory ar of cream sep in dairy proce fferent packa nachine, asep working, ma f	nd working p arators. Pro ssing. ging types f tic packagin intenance	rinciple. cessing or solid and ag and filling and factors	
Packagir Storage a liquid mill machines affecting system. Manufac Production	anks - Cream seperation — principles of milk powder and, storage and seperation of the control	corating Ce cole, theory types. Ad constation of find capping ing of mill cons. CIP corrects coducts* am, butter, Yoghurt, da	ntrifuges - H and separati vanced nove of dairy indunciples and wanchine, poor products. eleaning and ghee, ice-clahi, shrikhan	omogenization gefficiency el equipment in stries** working of difficult ouch filling many designing of designing of designing of the stries ouch filling many designing filling many designing ouch filling many designing filling many de	on – theory ar of cream sep in dairy proce fferent packa nachine, asep working, ma f	nd working parators. Prossing. ging types for the packaging intenance and an ana, Foaneer -qual	rinciple. cessing or solid and ag and filling and factors	[9]
Packagir Storage a liquid mill machines affecting system. Manufac Production	anks - Cream seperation — principles of milk powder and stribution of k - bottle filters as for bulk handli washing operation of turing of milk process of Cread milk products by advance	corating Ce cole, theory types. Ad constation of find capping ing of mill cons. CIP corrects coducts* am, butter, Yoghurt, da	ntrifuges - H and separati vanced nove of dairy indunciples and wanchine, poor products. eleaning and ghee, ice-clahi, shrikhan	omogenization gefficiency el equipment in stries** working of difficult ouch filling many designing of designing of designing of the stries ouch filling many designing filling many designing ouch filling many designing filling many de	on – theory ar of cream sep in dairy proce fferent packa nachine, asep working, ma f	nd working parators. Prossing. ging types for the packaging intenance and an ana, Foaneer -qual	or solid and and ag and factors Rabri, Kulfi. ity aspects	[9]
Packagir Storage a liquid mill machines affecting system. Manufac Productio Fermente of milk pr	anks - Cream seperation — principles of milk powder and stribution of k - bottle filters as for bulk handli washing operation of turing of milk process of Cread milk products by advance	carating Ce cole, theory types. Ad sanitation of fi milk. Prind capping ing of milk cons. CIP cons. CIP cons. coducts* am, butter, Yoghurt, da ced technol	ntrifuges - H and separati vanced nove of dairy indu- nciples and variables, por y machine, por c products. eleaning and ghee, ice-cuahi, shrikhan logies.	omogenization gefficiency el equipment in stries** working of difficult ouch filling management pescription, designing of the	on – theory ar of cream sep in dairy proce fferent packa nachine, asep working, ma f	nd working p arators. Pro ssing. ging types f tic packagin intenance a, chaana, F paneer -qual	rinciple. cessing or solid and ag and filling and factors Rabri, Kulfi. ity aspects	[9] [9]
Packagir Storage a liquid mill machines affecting system. Manufac Productio Fermente of milk pr Text Boo 1.	anks - Cream seperation — principles of milk powder and stribution of a control of the process of Cream separation — principles of milk products of milk products by advance (k(s):	carating Ce cole, theory types. Ad canitation of milk. Prind capping ing of milk cons. CIP co coducts* am, butter, Yoghurt, da ced technol y Plant Eng	ntrifuges - H and separati vanced nove of dairy indu nciples and v machine, p r products. eleaning and ghee, ice-cl ahi, shrikhan ogies.	omogenization gefficiency el equipment in stries** working of difficult ouch filling management designing of the stries ouch filling management designing ouch filling management designing ouch filling management designing desi	on – theory ar of cream sep in dairy proce fferent packa nachine, asep working, ma f milk food, kho ermilk, kefir, p	nd working parators. Prossing. ging types for the packaging intenance and an analyst packaging intenance and an analyst paneer -qual	or solid and ag and filling and factors Rabri, Kulfi. ity aspects Fotal Hours:	[9] [9]
Packagir Storage a liquid mill machines affecting system. Manufac Productio Fermente of milk pr Text Boo 1. Tu 2. Su Reference	anks - Cream seperation — principles of milk powder and seperation — principles of milk powder and distribution of a country of both process of Cream and milk products by advance with the pr	carating Cecole, theory types. Ad canitation of milk. Prind capping ing of milk ons. CIP cons.	ntrifuges - H and separati vanced nove of dairy indu nciples and v machine, p r products. leaning and ghee, ice-cr ahi, shrikhan ogies. gineering and	omogenization gefficiency el equipment in stries** working of difficult ouch filling management designing of the stries of the stries ouch filling management designing ouch filling management designing ouch filling management designing ouch filling management designing desi	on – theory ar of cream sep in dairy proce fferent packa nachine, asep working, ma f nilk food, kho ermilk, kefir, p	nd working parators. Prossing. ging types for the packaging intenance and an analyst packaging intenance and analyst packaging intenance analyst packaging intenance and analyst packaging intenance and analyst packaging intenance analyst packaging intenance analyst packaging i	or solid and ag and filling and factors Rabri, Kulfi. ity aspects Fotal Hours: S, New Delhi, 2	[9] [9] 45
Packagir Storage a liquid mill machines affecting system. Manufac Productic Fermente of milk pr Text Boo 1. Tu 2. Su Reference	anks - Cream seperation — principles of milk powder and separation — principles of milk powder and distribution of k - bottle filters as for bulk handli washing operation process of Cread milk products by advance (k(s): Ifail Ahmad, "Dair ukumar De, Outling of milk products of the products by advance (k(s):	carating Cecole, theory types. Ad canitation of milk. Prind capping ing of milk ons. CIP cons.	ntrifuges - H and separati vanced nove of dairy indu nciples and v machine, p r products. leaning and ghee, ice-cr ahi, shrikhan ogies. gineering and	omogenization gefficiency el equipment in stries** working of difficult ouch filling management designing of the stries of the stries ouch filling management designing ouch filling management designing ouch filling management designing ouch filling management designing desi	on – theory ar of cream sep in dairy proce fferent packa nachine, asep working, ma f nilk food, kho ermilk, kefir, p	nd working parators. Prossing. ging types for the packaging intenance and an analyst packaging intenance and analyst packaging intenance analyst packaging intenance and analyst packaging intenance and analyst packaging intenance analyst packaging intenance analyst packaging i	or solid and ag and filling and factors Rabri, Kulfi. ity aspects Fotal Hours: S, New Delhi, 2	[9] [9] 45

^{*}SDG 9 – Industry Innovation and Infrastructure **SDG 3 – Good Health and Well Being

Course Co	ontents and Lecture Schedule	
S. No.	Topics	No. of hours
1.0	Introduction	
1.1	Overview of dairy industry.	1
1.2	Historical development of dairy processing.	1
1.3	Role of dairy engineers in the industry.	1
1.4	Milk – Definition.	1
1.5	Types of market milk.	1
1.6	Composition and factors affecting composition of milk.	1
1.7	System of pricing of milk.	1
1.8	Nutritive value of milk.	1
1.9	Physico -chemical properties of milk.	1
2.0	Collection and inspection of fresh milk	
2.1	Raw milk collection - Cooling and Transportation.	1
2.2	Inspection and Quality control of Raw milk.	2
2.3	Platform tests of milk: Smell, Appearance, Temperature, Sediment,	1
2.4	Platform tests of milk: Acidity, Lactometer Reading, Fat, Solids-Not-Fat,	1
2.5	Dye Reduction Test: MBRT test,	1
2.6	Resazurian tests.	1
2.7	Mastitis test,	1
2.8	Neutralizer test.	1
3.0	Dairy Processing and Equipment's	
3.1	Milk processing equipment	1
3.2	filtration/clarification	1
3.3	Pasteurization – HTST – LTLT - UHT methods	1
3.4	storage tanks - Cream separating Centrifuges	1
3.5	Homogenization – theory - working principle of homogenizers – homogenization efficiency	2
3.6	cream separation – principles, gravity and centrifugal separation	1
3.7	Centrifugal separator – parts – construction and working principle – separation efficiency.	2
4.0	Manufacturing of milk products	
4.1	Production process of Cream, butter, ghee	1
4.2	Production process of ice-cream	1
4.3	Production process of infant milk food	1
4.4	Production process of khoa	1
4.5	Production process of chaana	1
4.6	Production process of Rabri	<u>·</u> 1
4.7	Production process of Kulfi.	1
4.8	Fermented milk products-Yoghurt, dahi, shrikhand, lassi, buttermilk, kefir, paneer	2
5.0	Storage and sanitation of dairy equipment	
5.1	Storage and distribution of milk.	1
5.2	Principles and working of different types of bottle filters and capping machine,	2
5.3	Pouch filling machine for bulk handling of milk products.	1
5.4	Aseptic packaging for bulk handling of milk products.	1
5.5	Filling machines for bulk handling of milk products.	1
5.6	Description, working and maintenance of can washers, bottle washers.	1
5.7	Factors affecting washing operations. CIP cleaning and designing of system.	2

1. Mr.S. Nithishkumar – <u>nithishkumar@ksrct.ac.in</u>



60 FT 502	Food Process	Category	L	Т	Р	Credit
0011302	Engineering	PC	3	1	0	4

- To learn about various food processing operations
- To understand about drying of food samples and the equipment
- To impart the applications of size reduction operations
- To familiarize on mechanical separation in food samples
- To brief on crystallization process performed at food processing industries.

Pre-requisites

Nil

Course Outcomes

On the suct	cessial completion of the coarse, stadents will be able to	
CO1	Analyse the principles and working of equipment used in size reduction of food	Understand
CO2	Elaborate on the concept of sedimentation process, centrifugation, filtration and sieving	Apply
CO3	Adapt specific pre-processing operations of food materials	Analyze
CO4	Analyze the concept and mechanisms of dryers used in food industries	Apply
CO5	Recall the concept and types of equipment employed in crystallization process.	Analyze

Mappii	Mapping with Programme Outcomes															
COs		POs												PSOs		
003	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	
CO1	3	3	3	2	-	2	-	-	-	-	-	-	3	3	2	
CO2	3	3	3	2	-	2	-	-	-	-	-	-	3	3	2	
CO3	3	3	3	2	-	2	-	-	-	-	-	-	3	3	2	
CO4	3	3	3	2	-	2	-	-	-	-	-	-	3	3	2	
CO5	3	3	3	2	-	2	-	-	-	-	-	-	3	3	2	
3 - Stro	3 - Strong; 2 - Medium; 1 - Some															

Assessment Pattern			
Bloom's Category	Continuous Ass (Ma	essment Tests arks)	End Sem Examination (Marks)
	1	2	
Remember	10	-	10
Understand	40	10	30
Apply	10	40	40
Analyze	0	10	20
Evaluate	-	-	-
Create	-	-	-
Total	60	60	100

	11.	uyuot	amy College	Food Techno				
		-	B. Tech F 30 FT 502 - Fc			•		
		ours/Week		Total	Credit		ximum Marks	
Semester		T	P	Hours	C	CA	ES	Total
V	3	<u>'</u> 1	0	60	4	40	60	100ai
	tion in Food p			00	1 4	40	00	100
Size reduction of dry food mills, Ball Emulsification	ion of Fibrous F ls: Crushers - mills, Plate mill ion and homog omogenizers, L	ood: Cutte Jaw, gyrate s and Roll enization,	rs - Slicers, D ory and crusl er mills. Size Colloidal mill,	hing rolls, G reduction ir , Hydro shea	rinders - Har n liquids:	mmer mills, F	Fixed head	[9]
Sedimenta gas. Floata Constant r	Il Separation* ation - Gravitation ation. Centrifug ate and Consta Milling, shreddir s.	al separati int pressur	on - Velocity e filtration, S	of particles, sieving effect	Radius of r	neutral zone.	Filtration -	[9]
Types of Deaners, Grading an content – formethods, reffect. Wa	g Operations* processing operations Air Screen Cland Sorting - Priving ee moisture, benodels, Importater activity and tics of materials	eaners. Pe nciples, typound and unce and hy d its impo	eling - Flash bes and equi unbound mois steresis	n steam, Ab pment. Cuttii sture. Equilibi	rasion, Causing and chop rium moisture	stic and Flam ping, Grinding e content - de	ne peeling. g, Moisture termination	[9]
Spray Dry	uipment* and deep bed o er, Fluidized Bo eze Drying, Hea	ed Dryer, S	Spouted bed	dryer, Pneu	matic Dryer,	Rotary Drye		[9]
Crystalliza	ion Equilibrium ion - Rate of on, Evaporative	crystal g	growth. Stage	e equilibriun	n crystallizat	tion. Cooling rystallization -	Principle	[9]
					Total Hou	ırs: 45 + 15 (T	utorial)	60
Text Book			-	<u> </u>	15	LE DA MA		
'. Lim	ows P.J. Food F ted, New Delhi	2009.						
	ay K.M. and Sir se Pvt. Ltd., Ne			ions of Agricu	ultural Proces	sing, 2nd Edi	tion, Vikas Pu	ublishing
Reference	(s):							
1. Ear	e R.L., Unit Ope	rations in F	ood Process	ing, Web Edit	ion, Pergamo	n Press, U.K.	., 2004.	
2. Pau 201	I Singh R. and [4.	Dennis R., I	ntroduction to	Food Proce	ss Engineerir	ng, 5th Edition	n, Academic P	ress, US
	nis R. Heldmar	and R. Pa	ul Singh, Intro	oduction to fo	od engineeri	ng, Fourth ed	lition, CRC Pr	ess, 200
1								

^{*}SDG 9 – Industry, Innovation And Infrastructure

6. No.	Topics	No. of hours
1.0	Size reduction	
1.1	Size reduction of Fibrous Food, Cutters, Slicers, Dicers	1
1.2	Pulper, Shredder and Flaker, Size reduction of dry foods	1
1.3	Crushers - Jaw, gyratory and crushing rolls	1
1.4	Grinders - Hammer mills, Fixed head mills, Ball mills	1
1.5	Plate mills and Roller mills	1
1.6	Size reduction in liquids, Emulsification and homogenization	1
1.7	Colloidal mill, Hydro shear homogenizers	1
2.0	Mechanical Separation	•
2.1	Gravitational sedimentation, Sedimentation in liquids	1
2.2	Sedimentation of particles in gas.	1
2.3	Floatation	1
2.4	Centrifugal separation	1
2.5	Velocity of particles, Radius of neutral zone	1
2.6	Filtration – Constant rate and Constant pressure filtration	1
2.7	Sieving effectiveness and Applications	1
2.8	Extrusion, Crushing-principle, uses and application	1
2.9	Milling, shredding and Decantation principle, uses and applications	1
3.0	Processing Operations	
3.1	Cleaning - Wet and Dry-cleaning merits and demerits	1
3.2	Screen Cleaners, Air Screen Cleaners	1
3.3	Peeling - Flash steam, Abrasion, Caustic and Flame peeling	1
3.4	Grading and Sorting - Principles, types and equipment	1
3.5	Cutting and chopping, Grinding	1
3.6	Moisture content – free moisture, Bound and unbound moisture, Equilibrium moisture content	1
3.7	Determination methods, models, Importance and hysteresis effect	1
3.8	Water activity and its importance.	1
3.9	Theory and mechanism of drying, Drying characteristics of materials	1
4.0	Drying Equipments	
4.1	Thin layer and deep bed drying	1
4.2	Tunnel Dryer, Belt Dryer	1
4.3	Drum Dryer	1
4.4	Spray Dryer	1
4.5	Fluidized Bed Dryer, Spouted bed dryer	1
4.6	Pneumatic Dryer, Rotary Dryer	1
4.7	Vacuum Drying, Freeze Drying	1
4.8	Heat Pump drying	1
4.9	Di-electric drying and Microwave drying	1
5.0	Crystallization	<u> </u>
5.1	Crystallization Equilibrium	1
5.2	Nucleation	1
5.3	Meta stable region	1
5.4	Seed Crystals	1
	Heat of Crystallization	
5.5 5.6	Rate of crystal growth	1 1
	Stage equilibrium crystallization	1
5.7	Cooling crystallization, Evaporative crystallization	1
5.8	* * *	1
5.9	Batch crystallization, Continuous crystallization esigner(s)	1

1. P. Aarthi – aarthi@ksrct.ac.in



60 FT 503	Food Safety and Quality	Category	L	Т	Р	Credit
0011303	Regulation	PC	2	0	2	3

- To understand the basic concept of food safety and quality.
- To familiarize students with national and international regulatory agencies.
- To educate students about relevant food safety laws and regulations, including their scope, key provisions, and enforcement mechanisms.
- To equip students with the skills to detect, analyse, and prevent food adulteration, ensuring the integrity
 and safety of food products.
- To provide students with an understanding of labelling and packaging regulations.

Pre-requisites

Nil

Course Outcomes

CO1	Infer the knowledge about food safety and quality.	Understand
CO2	Understand the national and international regulatory agencies in Food sector.	Understand
CO3	Facilitate the importance of food safety laws and regulations.	Analyze
CO4	Acquire skills in detecting food adulteration, understanding common adulterants, and implementing strategies to prevent adulteration, and ensuring the integrity of Food products.	Apply
CO5	Equip the ability to interpret food labelling and packaging regulations.	Apply

Mappii	Mapping with Programme Outcomes																	
COs		POs													PSOs			
COS	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3			
CO1	3	2	3	2	-	-	3	2	2	3	-	2	2	3	3			
CO2	3	2	3	2	-	-	3	2	2	3	-	2	2	3	3			
CO3	3	2	3	2	-	-	3	2	2	3	-	2	2	3	3			
CO4	3	2	3	2	-	-	3	2	2	3	-	2	2	3	3			
CO5	3	2	3	2	-	-	3	2	2	3	-	2	2	3	3			
3 - Stro	3 - Strong; 2 - Medium; 1 - Some																	

Assessment Patter	Assessment Pattern										
Bloom's	Contin	uous Asse (Ma	essment Te rks)	sts	Model Examination	End Sem Examination (Marks)					
Category	Tes	st 1	Tes	st 2	(Marks)						
	Theory	Lab	Theory	Lab	Lab	Theory	Lab				
Remember	20	-	10	-	-	20	-				
Understand	40	-	30	-	-	40	-				
Apply	-	50	10	50	50	20	50				
Analyze	-	50	10	50	50	20	50				
Evaluate	-	-	-	-	-	-	-				
Create	-	-	-	-	-	-	-				
Total	60	100	60	100	100	100	100				

Common Adulterants: Identification of common substances used for food adulteration, Health Risks: foodborne illnesses - allergic reactions - long-term health effects, Methods of Detection and Analysis, Regulatory Measures to Combat Food Adulteration. Food Labeling and Packaging Regulations Labelling Requirements: Nutritional Information and Allergen Declaration, Nutrition Labelling and Allergen Labelling, Health and Nutritient Claims, Packaging Standards: Materials -Safety – Preservation, Claims and Declarations: Organic - Non-GMO - Gluten- Free, Regulatory Compliance and Consumer Protection. Practical: 1. Collection of food samples from different sources and perform microbial testing using agar plates. 2. Design a survey or conduct interviews to gather data on consumer attitudes towards food safety and quality. 3. Experiment on Measurement of the pH of various food items using a pH meter. Discuss how pH levels affect microbial growth and food stability. 4. Analyze food labels of various products and identify any discrepancies or violations of labelling requirements. 5. Experiment on qualitative tests for food samples to detect the presence of food additives. 6. Execute simple chemical tests to detect adulterants dairy products. Discuss the health risks associated with food adulteration. 7. Implement simple chemical tests to detect adulterants Spices products. Discuss the health risks associated with food adulteration. 8. Perform simple chemical tests to detect adulterants fruit and vegetable products. Discuss the health risks associated with food adulteration. 9. Expose food samples to different packaging materials (plastic, glass, metal) and assess their impact on food quality over time. 10. Design and evaluate food labels for compliance with regulatory standards. 11. Analyze food labels of different products to identify nutritional information, allergen declaration, and health claims. Total Hours: (Lecture - 30; Practical - 30) 60 Text Book(s): 1. Sivasankar B. Food processing and preservat		ŀ	K.S.Rangasamy				nous R2022		
Hours / Week									
Semester L T P Hours C CA ES Total				3 - Food S					
The content of the	Semester	F							
Introduction to Food Safety and Quality Overview of Food Safety and Quality Assurance, Quality Assurance vs. Quality Control, Importance of Food Safety in Public Health, Consumer Protection, Historical Development of Food Regulation and Roble of Government Agencies in Food Regulation. Regulatory Farmeworks and Standards National Regulatory Agencies: Functions and Responsibilities, International Organizations: Codex Alimentarius Commission — WHO - FAO, Comparison of Regulatory Frameworks in Different Countries, Harmonization of Food Standards and Regulations, Role of Non-Governmental Organizations (NGOs). Food Safety Laws and Regulations* Food Safety Laws and Regulations* Food Safety Laws and Regulations* Food Safety - Labeling - Additives - Contaminants, Food Safety and Standards (FSS) Regulations (2011). Enforcement Mechanisms and Penalties for Non-Compliance. Food Adulteration* Food Labeling and Packaging Regulations Labeling Requirements: Nutritional Information and Allergen Declaration, Nutrition Labelling and Allergen and Packaging Regulations Labeling Requirements: Nutritional Information and Allergen Declaration, Nutrition Labelling and Allergen and Packaging Regulations Labeling Requirements: Nutritional Information and Allergen Declaration, Nutrition Labeling and Allergen and Packaging Regulations Labeling Requirements: Nutritional Information and Allergen Declaration, Nutrition Labeling and Allergen and Packaging Regulations Labeling and Pa		L				_			
Develvew of Food Safety and Quality Assurance, Quality Assurance vs. Quality Control, Importance of Food Safety in Public Health. Consumer Protection, Historical Development of Food Regulation and Role of Government Agencies in Food Regulation. Regulatory Frameworks and Standards Vational Regulatory Agencies. Functions and Responsibilities, International Organizations: Codex Alimentarius Commission – WHO - FAO, Comparison of Regulatory Frameworks in Different Organizations (NGOs). Food Safety Laws and Regulations* Food Adulteration of Common Adultions (PSS) (Eg) Food Adulteration of Common Adultions (PSS) Regulations (2011), Enforcement Mechanisms and Penalties for Non-Compliance. Food Adulteration of Common Substances used for food adulteration, Health Risks: foodborne illnesses - allergic reactions - long-term health effects, Methods of Detection and Analysis, Regulatory Measures to Combat Food Adulteration, Nutrition Labelling and Packaging Regulations Sabelling Regulations (2011), Enforcement Mechanisms and Penalties for Non-Compliance and Consumer Protection. Food Labeling and Packaging Regulations and Allergen Declaration, Nutrition Labelling and Allergen Labelling, Health and Nutrient Claims, Packaging Standards: Materials -Safety — Preservation, Claims and Declarations: Organic - Non-GMO - Gluten- Free, Regulatory Measurements of Measurement			Ţ.		60	3	50	50	100
of Food Safety in Public Health, Consumer Protection, Historical Development of Food Regulation and Role of Government Agencies in Food Regulation. Regulatory Frameworks and Standards National Regulatory Agencies: Functions and Responsibilities, International Organizations: Codex (Alimentarius Commission – WHO - FAO, Comparison of Regulatory Frameworks in Different Countries, Harmonization of Food Standards and Regulations, Role of Non-Governmental Organizations (NGOs). Food Safety Laws and Regulations* Food Safety Laws and Regulations* Food Safety Authority (EFSA) - Food Standards Agency (FSA), Key Provisions: Food Safety - Labeling - Additives – Contaminants, Food Safety and Standards (FSS) Regulations (2011), Enforcement Mechanisms and Penalties for Non-Compliance. Food Adulteration* Food Adulteration* Food Labeling - Additives – Contaminants, Food: Chemical – Biological – Physical, Common Adulterants: Identification of common substances used for food adulteration, Health Risks: foodborne illnesses - allergic reactions - long-term health effects, Methods of Detection and Analysis, Regulatory Measures to Combat Food Adulteration, Pood Labeling and Packaging Regulations Labelling Requirements: Nutritional Information and Allergen Declaration, Nutrition Labelling and Allergen Labelling, Health and Nutrient Claims, Packaging Standards: Materials-Safety – Food Labeling and Packaging Regulations Labelling Requirements: Nutritional Information and Allergen Declarations of Labelling and Packaging Standards: Materials Safety – Food Labels of Claims and Declarations: Organic - Non-GMO - Gluten- Free, Regulatory Compliance and Consumer Protection. Food Labels of Claims and Declarations of Information and Packaging Standards: Materials Safety – Food Labels of Organic - Non-GMO - Gluten- Free, Regulatory Compliance and Consumer Protection. Food Labels of Organical Protection Prot					Juglity Assur	onos va Ouo	lity Control I	mportonoo	
and Role of Government Agencies in Food Regulation. Regulatory Frameworks and Standards National Regulatory Agencies: Functions and Responsibilities, International Organizations: Codex Allmentanius Commission – WHO - FAO, Comparison of Regulatory Frameworks in Different Countries, Harmonization of Food Standards and Regulations, Role of Non- Governmental Organizations (NGOs). Food Safety Laws and Regulations* Food Safety Laws and Regulations* Food Safety Authority (EFSA) - Food Standards Agency (FSA), Key Provisions: Food Safety — Labeling – Additives – Contaminants, Food Safety and Standards (FSS) Regulations (2011), Enforcement Mechanisms and Penalties for Non-Compliance. Food Adulteration** Definition and Types of Food Adulteration, Adulterants in Food: Chemical – Biological – Physical, Common Adulteration* Definition and Types of Food Adulteration, Adulterants in Food: Chemical – Biological – Physical, Common Adulteration, Health Risks: foodborne illnesses – allergic reactions - long-term health effects, Methods of Detection and Analysis, Regulatory Measures to Combat Food Adulteration. Food Labeling and Packaging Regulations Labelling Requirements: Nutritional Information and Allergen Declaration, Nutrition Labelling and Allergen Labeling, Health and Nutrient Claims, Packaging Standards: Materials -Safety – Preservation, Claims and Declarations: Organic - Non-GMO - Gluten- Free, Regulatory Compliance and Consumer Protection. Practical: 1. Collection of food samples from different sources and perform microbial testing using agar plates. 2. Design a survey or conduct interviews to gather data on consumer attitudes towards food safety and quality. 3. Experiment on Measurement of the pH of various food items using a pH meter. Discuss how pH levels affect microbial growth and food stability. 4. Analyze food labels of various products and identify any discrepancies or violations of labelling requirements. 5. Experiment on qualitative tests to detect adulterants fruit and vegetable products. Disc									[6]
Regulatory Frameworks and Standards National Regulatory Agencies: Functions and Responsibilities. International Organizations: Codex Alimentarius Commission — WHO - FAO, Comparison of Regulatory Frameworks in Different Countries, Harmonization of Food Slandards and Regulations, Role of Non- Governmental Organizations (NGOs). Food Safety Laws and Regulations* Food Safety Labeling — Additives — Contaminants, Food Safety and Standards (FSS) Regulations (2011), Enforcement Mechanisms and Penalties for Non-Compliance. Food Adulteration* Food Adulteration* Food Adulteration* Food Adulteration* Food Labeling and Packaging Regulations Labelling Requirements: Nutritional Information and Allergen Labelling and Packaging Regulations Labelling Requirements: Nutritional Information and Allergen Declaration, Nutrition Labelling and Packaging Regulations Labelling Requirements: Nutritional Information and Allergen Declaration, Nutrition Labelling and Packaging Regulations Labelling Requirements: Nutritional Information and Allergen Declaration, Nutrition Labelling and Perservation, Claims and Declarations: Organic - Non-GMO - Glutten- Free, Regulatory Compliance and Consumer Protection. Food Labeling and Packaging Regulations Labelling Requirements: Nutritional Information and Allergen Declaration, Nutrition Labelling and Packaging Regulations Labelling Requirements: Nutritional Information and Allergen Declaration, Claims and Declarations or Grandards and Packaging Regulations 1. Collection of food samples from different sources and perform microbial testing using again plates. 2. Experience of alabels of various products and identify any d						ai Developine	111 01 1 000 1	egulation	
National Regulatory Agencies: Functions and Responsibilities, International Organizations: Codex Alimentarius Commission — WHO - FAO, Comparison of Regulatory Frameworks in Different Countries, Harmonization of Food Standards and Regulations, Role of Non-Governmental Organizations (ROSa). Food Safety Laws and Regulations* Food Safety Laws and Regulations* Food Safety Authority (EFSA) - Food Standards Agency (FSA), Key Provisions: Food Safety - Labeling — Additives — Contaminants, Food Safety and Standards (FSS) Regulations (2011), Enforcement Mechanisms and Penalties for Non-Compliance. Food Adulteration* Definition and Types of Food Adulteration, Adulterants in Food: Chemical — Biological — Physical, Common Adulterants: Identification of common substances used for food adulteration, Health Risks: foodborne illnesses - allergic reactions - long-term health effects, Methods of Detection and Analysis, Regulatory Measures to Combat Food Adulteration. Food Labeling and Packaging Regulations Labeling Requirements: Nutritional Information and Allergen Declaration, Nutrition Labelling and Allergen Labeling, Health and Nutrient Claims, Packaging Standards: Materials -Safety — Preservation, Claims and Declarations: Organic - Non-GMO - Gluten- Free, Regulatory Compliance and Consumer Protection. Practical: 1. Collection of food samples from different sources and perform microbial testing using agar plates. 2. Design a survey or conduct interviews to gather data on consumer attitudes towards food safety and quality. 3. Experiment on Measurement of the pH of various food items using a pH meter. Discuss how pH levels affect microbial growth and food stability. 4. Analyze food labels of various products and identify any discrepancies or violations of labelling requirements. 5. Experiment on qualitative tests for food samples to detect the presence of food additives. 6. Execute simple chemical tests to detect adulterants fruit and vegetable products. Discuss the health risks associated with food adulteration. 9. Ex					-				
Countries, Harmonization of Food Standards and Regulations, Role of Non-Governmental Organizations (NGOs). Food Safety Laws and Regulations* Food Safety Laws and Regulations* Food Safety and Standards Act, 2006 (India), Regulatory Authorities: Food and Drug Administration (FDA) - European Food Safety Authority (EFSA) - Food Standards Agency (FSA), Key Provisions: Food Safety - Labeling - Additives - Contaminants, Food Safety and Standards (FSS) Regulations (2011), Enforcement Mechanisms and Penalties for Non-Compliance. Pood Adulteration* Definition and Types of Food Adulteration, Adulterants in Food: Chemical - Biological - Physical, Common Adulterants: Identification of common substances used for food adulteration, Health Risks: foodborne illnesses - allergic reactions - long-term health effects, Methods of Detection and Analysis, Regulatory Measures to Combat Food Adulteration. Food Labeling and Packaging Regulations Labelling Requirements: Nutritional Information and Allergen Declaration, Nutrition Labelling and Allergen Labelling, Health and Nutrient Claims, Packaging Standards: Materials -Safety - Freservation, Claims and Declarations: Organic - Non-GMO - Gluten- Free, Regulatory Compliance and Consumer Protection. Practical: 1. Collection of food samples from different sources and perform microbial testing using agar plates. 2. Design a survey or conduct interviews to gather data on consumer attitudes towards food safety and quality. 3. Experiment on Measurement of the pH of various food items using a pH meter. Discuss how pH levels affect microbial growth and food stability. 4. Analyze food labels of various products and identify any discrepancies or violations of labelling requirements. 5. Experiment on qualitative tests for food samples to detect the presence of food additives. 6. Execute simple chemical tests to detect adulterants fruit and vegetable products. Discuss the health risks associated with food adulteration. 9. Expose food samples to different products to identify nutritional in					sponsibilities	, Internationa	l Organization	ons: Codex	
Organizations (NGOs). Food Safety Laws and Regulations* Food Safety and Standards Act, 2006 (India), Regulatory Authorities: Food and Drug Administration (FDA). European Food Safety Authority (EFSA) - Food Safety And Standards Agency (FSA), Key Provisions: Food Safety - Labeling - Additives - Contaminants, Food Safety and Standards (FSS) Regulations (2011). Enforcement Mechanisms and Penalties for Non-Compliance. Food Adulteration** Definition and Types of Food Adulteration, Adulterants in Food: Chemical - Biological - Physical, Common Adulteration: Identification of common substances used for food adulteration, Health (Fisks: foodborne illnesses - allergic reactions - long-term health effects, Methods of Detection and Analysis, Regulatory Measures to Combat Food Adulteration. Food Labeling and Packaging Regulations Labelling Requirements: Nutritional Information and Allergen Declaration, Nutrition Labelling and Allergen Labelling, Health and Nutrient Claims, Packaging Standards: Materials - Safety - Preservation, Claims and Declarations: Organic - Non-GMO - Gluten - Free, Regulatory Compliance and Consumer Protection. Practical: 1. Collection of food samples from different sources and perform microbial testing using agar plates. 2. Design a survey or conduct interviews to gather data on consumer attitudes towards food safety and quality. 3. Experiment on Measurement of the pH of various food items using a pH meter. Discuss how pH levels affect microbial growth and food stability, 4. Analyze food labels of various products and identify any discrepancies or violations of labelling requirements. 5. Experiment on qualitative tests for food samples to detect the presence of food additives. 6. Execute simple chemical tests to detect adulterants fruit and vegetable products. Discuss the health risks associated with food adulteration. 7. Implement simple chemical tests to detect adulterants fruit and vegetable products. Discuss the health risks associated with food adulteration. 8. Perform simple chemical tests to									[6]
Food Safety Laws and Regulations* Food Safety and Standards Act, 2006 (India), Regulatory Authorities: Food and Drug Administration (FDA) - European Food Safety Authority (EFSA) - Food Standards Agency (FSA), Key Provisions: Food Safety - Labeling - Additives - Contaminants, Food Safety and Standards (FSS) Regulations (2011), Enforcement Mechanisms and Penalties for Non-Compliance. Food Adulteration** Definition and Types of Food Adulteration, Adulterants in Food: Chemical - Biological - Physical, Common Adulterants: Identification of common substances used for food adulteration, Health Risks: foodborne illnesses - allergic reactions - long-term health effects, Methods of Detection and Analysis, Regulatory Measures to Combat Food Adulteration. Food Labeling and Packaging Regulations Labelling Requirements: Nutritional Information and Allergen Declaration, Nutrition Labelling and Allergen Labelling, Health and Nutrient Claims, Packaging Standards: Materials -Safety - Preservation, Claims and Declarations: Organic - Non-GMO - Gluten- Free, Regulatory Compliance and Consumer Protection. Practical: 1. Collection of food samples from different sources and perform microbial testing using agar plates. 2. Design a survey or conduct interviews to gather data on consumer attitudes towards food safety and quality. 3. Experiment on Measurement of the pH of various food items using a pH meter. Discuss how pH levels affect microbial growth and food stability. 4. Analyze food labels of various products and identify any discrepancies or violations of labelling requirements. 5. Experiment on qualitative tests for food samples to detect the presence of food additives. 6. Execute simple chemical tests to detect adulterants fruit and vegetable products. Discuss the health risks associated with food adulteration. 9. Expose food samples to different packaging materials (plastic, glass, metal) and assess their impact on food quality over time. 10. Design and evaluate food labels for compliance with regulatory standards.			on of Food Sta	andards a	and Regulat	ions, Role o	of Non- Gov	vernmental	
Food Safety and Standards Act, 2006 (India), Regulatory Authorities: Food and Drug Administration (FDA) - European Food Safety Authority (EFSA) - Food Standards Agency (FSA), Key Provisions: Food Safety — Labeling — Additives — Contaminants, Food Safety and Standards (FSS) Regulations (2011), Enforcement Mechanisms and Penalties for Non-Compliance. Food Adulteration** Definition and Types of Food Adulteration, Adulterants in Food: Chemical — Biological — Physical, Common Adulteratis: Identification of common substances used for food adulteration, Health Risks: foodborne illnesses - allergic reactions - long-term health effects, Methods of Detection and Analysis, Regulatory Measures to Combat Food Adulteration. Food Labeling and Packaging Regulations Labelling Requirements: Nutritional Information and Allergen Declaration, Nutrition Labelling and Allergen Labelling, Health and Nutrient Claims, Packaging Standards: Materials - Safety — Preservation, Claims and Declarations: Organic - Non-GMO - Gluten- Free, Regulatory Compliance and Consumer Protection. Practical: 1. Collection of food samples from different sources and perform microbial testing using agar plates. 2. Design a survey or conduct interviews to gather data on consumer attitudes towards food safety and quality. 3. Experiment on Measurement of the pH of various food items using a pH meter. Discuss how pH levels affect microbial growth and food stability. 4. Analyze food labels of various products and identify any discrepancies or violations of labelling requirements. 5. Experiment on qualitative tests for food samples to detect the presence of food additives. 6. Execute simple chemical tests to detect adulterants fruit and vegetable products. Discuss the health risks associated with food adulteration. 8. Perform simple chemical tests to detect adulterants fruit and vegetable products. Discuss the health risks associated with food adulteration. 9. Expose food samples to different packaging materials (plastic, glass, metal) and assess their i									
(FDA) - European Food Safety Authority (EFSA) - Food Standards Agency (FSA), key Provisions: Food Safety - Labeling - Additives - Contaminants, Food Safety and Standards (FSS) Regulations (2011). Enforcement Mechanisms and Penalties for Non-Compliance. Food Adulteration** Definition and Types of Food Adulteration, Adulterants in Food: Chemical - Biological - Physical, Common Adulterants: Identification of common substances used for food adulteration, Health Risks: foodborne illnesses - allergic reactions - long-term health effects, Methods of Detection and Analysis, Regulatory Measures to Combat Food Adulteration. Food Labeling and Packaging Regulations Labelling Requirements: Nutritional Information and Allergen Declaration, Nutrition Labelling and Allergen Labelling, Health and Nutrient Claims, Packaging Standards: Materials - Safety - Preservation, Claims and Declarations: Organic - Non-GMO - Gluten- Free, Regulatory Compliance and Consumer Protection. Practical: 1. Collection of food samples from different sources and perform microbial testing using agar plates. 2. Design a survey or conduct interviews to gather data on consumer attitudes towards food safety and quality. 3. Experiment on Measurement of the pH of various food items using a pH meter. Discuss how pH leevels affect microbial growth and food stability. 4. Analyze food labels of various products and identify any discrepancies or violations of labelling requirements. 5. Experiment on qualitative tests for food samples to detect the presence of food additives. 6. Execute simple chemical tests to detect adulterants fruit and vegetable products. Discuss the health risks associated with food adulteration. 7. Implement simple chemical tests to detect adulterants fruit and vegetable products. Discuss the health risks associated with food adulteration. 8. Experiment on qualitative tests for food samples to different packaging materials (plastic, glass, metal) and assess their impact on food quality over time. 9. Expose food samples to differ				dia) Dam	Jatami Avitha	witing. Fand a			
Regulations (2011), Enforcement Mechanisms and Penalties for Non-Compliance. Food Adulteration** Definition and Types of Food Adulteration, Adulterants in Food: Chemical — Biological — Physical, Common Adulterants: Identification of common substances used for food adulteration, Health Risks: foodborne illnesses - allergic reactions - long-term health effects, Methods of Detection and Analysis, Regulatory Measures to Combat Food Adulteration. Food Labeling and Packaging Regulations Labelling Requirements: Nutritional Information and Allergen Declaration, Nutrition Labelling and Allergen Labelling, Health and Nutrient Claims, Packaging Standards: Materials -Safety — [6] Preservation, Claims and Declarations: Organic - Non-GMO - Gluten- Free, Regulatory Compliance and Consumer Protection. Practical: 1. Collection of food samples from different sources and perform microbial testing using agar plates. 2. Design a survey or conduct interviews to gather data on consumer attitudes towards food safety and quality. 3. Experiment on Measurement of the pH of various food items using a pH meter. Discuss how pH levels affect microbial growth and food stability. 4. Analyze food labels of various products and identify any discrepancies or violations of labelling requirements. 5. Experiment on qualitative tests for food samples to detect the presence of food additives. 6. Execute simple chemical tests to detect adulterants dairy products. Discuss the health risks associated with food adulteration. 7. Implement simple chemical tests to detect adulterants fruit and vegetable products. Discuss the health risks associated with food adulteration. 8. Expose food samples to different packaging materials (plastic, glass, metal) and assess their impact on food quality over time. 9. Expose food samples to different packaging materials (plastic, glass, metal) and assess their impact on food quality over time. 10. Design and evaluate food labels for compliance with regulatory standards. 11. Analyze food labels of different									
Regulations (2011), Enforcement Mechanisms and Penalties for Non-Compliance. Food Adulteration** Definition and Types of Food Adulteration, Adulterants in Food: Chemical – Biological – Physical, Common Adulterants: Identification of common substances used for food adulteration, Health Risks: foodborne illnesses - allergic reactions - long-term health effects, Methods of Detection and Analysis, Regulatory Measures to Combat Food Adulteration. Food Labeling and Packaging Regulations Labelling Requirements: Nutritional Information and Allergen Declaration, Nutrition Labelling and Allergen Labelling, Health and Nutrient Claims, Packaging Standards: Materials -Safety – Preservation, Claims and Declarations: Organic - Non-GMO - Gluten- Free, Regulatory Compliance and Consumer Protection. Practical: 1. Collection of food samples from different sources and perform microbial testing using agar plates. 2. Design a survey or conduct interviews to gather data on consumer attitudes towards food safety and quality. 3. Experiment on Measurement of the pH of various food items using a pH meter. Discuss how pH levels affect microbial growth and food stability. 4. Analyze food labels of various products and identify any discrepancies or violations of labelling requirements. 5. Experiment on qualitative tests for food samples to detect the presence of food additives. 6. Execute simple chemical tests to detect adulterants Aginy products. Discuss the health risks associated with food adulteration. 7. Implement simple chemical tests to detect adulterants fruit and vegetable products. Discuss the health risks associated with food adulteration. 8. Perform simple chemical tests to detect adulterants fruit and vegetable products. Discuss the health risks associated with food adulteration associated with food adulteration. 9. Expose food samples to different packaging materials (plastic, glass, metal) and assess their impact on food quality over time. 10. Design and evaluate food labels for compliance with regulatory stand									[6]
Definition and Types of Food Adulteration, Adulterants in Food: Chemical – Biological – Physical, Common Adulterants: Identification of common substances used for food adulteration, Helalth Risks: foodborne illnesses - allergic reactions - long-term health effects, Methods of Detection and Analysis, Regulatory Measures to Combat Food Adulteration. Food Labeling and Packaging Regulations Labelling Requirements: Nutritional Information and Allergen Declaration, Nutrition Labelling and Allergen Labelling, Health and Nutrient Claims, Packaging Standards: Materials -Safety – Preservation, Claims and Declarations: Organic - Non-GMO - Gluten- Free, Regulatory Compliance and Consumer Protection. Practical: 1. Collection of food samples from different sources and perform microbial testing using agar plates. 2. Design a survey or conduct interviews to gather data on consumer attitudes towards food safety and quality. 3. Experiment on Measurement of the pH of various food items using a pH meter. Discuss how pH levels affect microbial growth and food stability. 4. Analyze food labels of various products and identify any discrepancies or violations of labelling requirements. 5. Experiment on qualitative tests for food samples to detect the presence of food additives. 6. Execute simple chemical tests to detect adulterants dairy products. Discuss the health risks associated with food adulteration. 8. Perform simple chemical tests to detect adulterants Spices products. Discuss the health risks associated with food adulteration. 8. Perform simple chemical tests to detect adulterants fruit and vegetable products. Discuss the health risks associated with food adulteration. 9. Expose food samples to different packaging materials (plastic, glass, metal) and assess their impact on food quality over time. 10. Design and evaluate food labels for compliance with regulatory standards. 11. Analyze food labels of different packaging materials (plastic, glass, metal) and assess their impact on food quality over time. 12. Siva								(*)	
Risks: Tooldoorne linesses - allergic reactions - olog-term neatin errects, Methods of Detection and Analysis, Regulatory Measures to Combat Food Adulteration. Food Labeling and Packaging Regulations Labelling Requirements: Nutritional Information and Allergen Declaration, Nutrition Labelling and Allergen Labelling, Health and Nutrient Claims, Packaging Standards: Materials -Safety – [6] Preservation, Claims and Declarations: Organic - Non-GMO - Gluten- Free, Regulatory Compliance and Consumer Protection. Practical: 1. Collection of food samples from different sources and perform microbial testing using agar plates. 2. Design a survey or conduct interviews to gather data on consumer attitudes towards food safety and quality. 3. Experiment on Measurement of the pH of various food items using a pH meter. Discuss how pH levels affect microbial growth and food stability. 4. Analyze food labels of various products and identify any discrepancies or violations of labelling requirements. 5. Experiment on qualitative tests for food samples to detect the presence of food additives. 6. Execute simple chemical tests to detect adulterants dairy products. Discuss the health risks associated with food adulteration. 7. Implement simple chemical tests to detect adulterants Spices products. Discuss the health risks associated with food adulteration. 8. Perform simple chemical tests to detect adulterants fruit and vegetable products. Discuss the health risks associated with food adulteration. 9. Expose food samples to different packaging materials (plastic, glass, metal) and assess their impact on food quality over time. 10. Design and evaluate food labels for compliance with regulatory standards. 11. Analyze food labels of different products to identify nutritional information, allergen declaration, and health claims. Total Hours: (Lecture - 30; Practical - 30) 60 Text Book(s): 1. Sivasankar B. Food processing and preservation. PHI Learning Pvt. Ltd.; 2002. Vikas Nanda and Savita sharma. Novel Food Processing	Food Adulte	eration**					•		
Risks: foodborne illnesses - allergic reactions - long-term health effects, Methods of Detection and Analysis, Regulatory Measures to Combat Food Adulteration. Food Labeling and Packaging Regulations Labelling Requirements: Nutritional Information and Allergen Declaration, Nutrition Labelling and Allergen Labelling, Health and Nutrient Claims, Packaging Standards: Materials -Safety - Preservation, Claims and Declarations: Organic - Non-GMO - Gluten- Free, Regulatory Compliance and Consumer Protection. Practical: 1. Collection of food samples from different sources and perform microbial testing using agar plates. 2. Design a survey or conduct interviews to gather data on consumer attitudes towards food safety and quality. 3. Experiment on Measurement of the pH of various food items using a pH meter. Discuss how pH levels affect microbial growth and food stability. 4. Analyze food labels of various products and identify any discrepancies or violations of labelling requirements. 5. Experiment on qualitative tests for food samples to detect the presence of food additives. 6. Execute simple chemical tests to detect adulterants dairy products. Discuss the health risks associated with food adulteration. 7. Implement simple chemical tests to detect adulterants Spices products. Discuss the health risks associated with food adulteration. 8. Perform simple chemical tests to detect adulterants fruit and vegetable products. Discuss the health risks associated with food adulteration. 9. Expose food samples to different packaging materials (plastic, glass, metal) and assess their impact on food quality over time. 10. Design and evaluate food labels for compliance with regulatory standards. 11. Analyze food labels of different products to identify nutritional information, allergen declaration, and health claims. Total Hours: (Lecture - 30; Practical - 30) 60 Text Book(s): 1. Sivasankar B. Food processing and preservation. PHI Learning Pvt. Ltd.; 2002. Vikas Nanda and Savita sharma. Novel Food Processing Tech									
Risks: Tooldoorne linesses - allergic reactions - olog-term neatin errects, Methods of Detection and Analysis, Regulatory Measures to Combat Food Adulteration. Food Labeling and Packaging Regulations Labelling Requirements: Nutritional Information and Allergen Declaration, Nutrition Labelling and Allergen Labelling, Health and Nutrient Claims, Packaging Standards: Materials -Safety – [6] Preservation, Claims and Declarations: Organic - Non-GMO - Gluten- Free, Regulatory Compliance and Consumer Protection. Practical: 1. Collection of food samples from different sources and perform microbial testing using agar plates. 2. Design a survey or conduct interviews to gather data on consumer attitudes towards food safety and quality. 3. Experiment on Measurement of the pH of various food items using a pH meter. Discuss how pH levels affect microbial growth and food stability. 4. Analyze food labels of various products and identify any discrepancies or violations of labelling requirements. 5. Experiment on qualitative tests for food samples to detect the presence of food additives. 6. Execute simple chemical tests to detect adulterants dairy products. Discuss the health risks associated with food adulteration. 7. Implement simple chemical tests to detect adulterants Spices products. Discuss the health risks associated with food adulteration. 8. Perform simple chemical tests to detect adulterants fruit and vegetable products. Discuss the health risks associated with food adulteration. 9. Expose food samples to different packaging materials (plastic, glass, metal) and assess their impact on food quality over time. 10. Design and evaluate food labels for compliance with regulatory standards. 11. Analyze food labels of different products to identify nutritional information, allergen declaration, and health claims. Total Hours: (Lecture - 30; Practical - 30) 60 Text Book(s): 1. Sivasankar B. Food processing and preservation. PHI Learning Pvt. Ltd.; 2002. Vikas Nanda and Savita sharma. Novel Food Processing									[6]
Labelling and Packaging Regulations Labelling Requirements: Nutritional Information and Allergen Declaration, Nutrition Labelling and Allergen Labelling, Realth and Nutritiont Claims, Packaging Standards: Materials -Safety — Preservation, Claims and Declarations: Organic - Non-GMO - Gluten- Free, Regulatory Compliance and Consumer Protection. Practical: 1. Collection of food samples from different sources and perform microbial testing using agar plates. 2. Design a survey or conduct interviews to gather data on consumer attitudes towards food safety and quality. 3. Experiment on Measurement of the pH of various food items using a pH meter. Discuss how pH levels affect microbial growth and food stability. 4. Analyze food labels of various products and identify any discrepancies or violations of labelling requirements. 5. Experiment on qualitative tests for food samples to detect the presence of food additives. 6. Execute simple chemical tests to detect adulterants dairy products. Discuss the health risks associated with food adulteration. 7. Implement simple chemical tests to detect adulterants Spices products. Discuss the health risks associated with food adulteration. 8. Perform simple chemical tests to detect adulterants fruit and vegetable products. Discuss the health risks associated with food adulteration. 9. Expose food samples to different packaging materials (plastic, glass, metal) and assess their impact on food quality over time. 10. Design and evaluate food labels for compliance with regulatory standards. 11. Analyze food labels of different products to identify nutritional information, allergen declaration, and health claims. Total Hours: (Lecture - 30; Practical - 30) 60 Text Book(s): 1. Sivasankar B. Food processing and preservation. PHI Learning Pvt. Ltd; 2002. 2. Vikas Nanda and Savita sharma. Novel Food Processing Technologies. NIPA Genx Electronic Resource and Solutions P. LTD. New Delhi:: 2017 3. Khetarpaul, Neelam. "Food Processing and Preservation". Marcel & Dekker, 2006.							Methods of	Detection	[-]
Labelling Requirements: Nutritional Information and Allergen Declaration, Nutrition Labelling and Allergen Labelling, Health and Nutrient Claims, Packaging Standards: Materials -Safety — [6] Preservation, Claims and Declarations: Organic - Non-GMO - Gluten- Free, Regulatory Compliance and Consumer Protection. Practical: 1. Collection of food samples from different sources and perform microbial testing using agar plates. 2. Design a survey or conduct interviews to gather data on consumer attitudes towards food safety and quality. 3. Experiment on Measurement of the pH of various food items using a pH meter. Discuss how pH levels affect microbial growth and food stability. 4. Analyze food labels of various products and identify any discrepancies or violations of labelling requirements. 5. Experiment on qualitative tests for food samples to detect the presence of food additives. 6. Execute simple chemical tests to detect adulterants dairy products. Discuss the health risks associated with food adulteration. 7. Implement simple chemical tests to detect adulterants Spices products. Discuss the health risks associated with food adulteration. 8. Perform simple chemical tests to detect adulterants fruit and vegetable products. Discuss the health risks associated with food adulteration. 9. Expose food samples to different packaging materials (plastic, glass, metal) and assess their impact on food quality over time. 10. Design and evaluate food labels for compliance with regulatory standards. 11. Analyze food labels of different products to identify nutritional information, allergen declaration, and health claims. Total Hours: (Lecture - 30; Practical - 30) Text Book(s): 1. Sivasankar B. Food processing and preservation. PHI Lenning Pvt. Ltd.; 2002. Vikas Nanda and Savita sharma. Novel Food Processing Technologies. NIPA Genx Electronic Resource and Solutions P. LTD. New Delhi: 2017 3. Khetarpaul, Neelam. "Food Processing and Preservation." Daya Publications, 2005 Reference(s): 1. Rahman, M. Shafiur. "H					o Additeration)[].			
Allergen Labelling, Health and Nutrient Claims, Packaging Standards: Materials -Safety — Preservation, Claims and Declarations: Organic - Non-GMO - Gluten- Free, Regulatory Compliance and Consumer Protection. Practical: 1. Collection of food samples from different sources and perform microbial testing using agar plates. 2. Design a survey or conduct interviews to gather data on consumer attitudes towards food safety and quality. 3. Experiment on Measurement of the pH of various food items using a pH meter. Discuss how pH levels affect microbial growth and food stability. 4. Analyze food labels of various products and identify any discrepancies or violations of labelling requirements. 5. Experiment on qualitative tests for food samples to detect the presence of food additives. 6. Execute simple chemical tests to detect adulterants dairy products. Discuss the health risks associated with food adulteration. 7. Implement simple chemical tests to detect adulterants Spices products. Discuss the health risks associated with food adulteration. 8. Perform simple chemical tests to detect adulterants fruit and vegetable products. Discuss the health risks associated with food adulteration. 9. Expose food samples to different packaging materials (plastic, glass, metal) and assess their impact on food quality over time. 10. Design and evaluate food labels for compliance with regulatory standards. 11. Analyze food labels of different products to identify nutritional information, allergen declaration, and health claims. Total Hours: (Lecture - 30; Practical - 30) Text Book(s): 1. Sivasankar B. Food processing and preservation. PHI Learning Pvt. Ltd.; 2002. Vikas Nanda and Savita sharma. Novel Food Processing Technologies. NIPA Genx Electronic Resource and Solutions P. LTD. New Delhi:: 2017 3. Khetarpaul, Neelam. "Food Processing and Preservation." Daya Publications, 2005 Reference(s): 1. Rahman, M. Shafiur. "Handbook of Food Preservation". Marcel & Dekker, 2006.					and Allergen	Declaration	Nutrition La	helling and	
Preservation, Claims and Declarations: Organic - Non-GMO - Gluten- Free, Regulatory Compliance and Consumer Protection. 1. Collection of food samples from different sources and perform microbial testing using agar plates. 2. Design a survey or conduct interviews to gather data on consumer attitudes towards food safety and quality. 3. Experiment on Measurement of the pH of various food items using a pH meter. Discuss how pH levels affect microbial growth and food stability. 4. Analyze food labels of various products and identify any discrepancies or violations of labelling requirements. 5. Experiment on qualitative tests for food samples to detect the presence of food additives. 6. Execute simple chemical tests to detect adulterants dairy products. Discuss the health risks associated with food adulteration. 7. Implement simple chemical tests to detect adulterants Spices products. Discuss the health risks associated with food adulteration. 8. Perform simple chemical tests to detect adulterants fruit and vegetable products. Discuss the health risks associated with food adulteration. 9. Expose food samples to different packaging materials (plastic, glass, metal) and assess their impact on food quality over time. 10. Design and evaluate food labels for compliance with regulatory standards. 11. Analyze food labels of different products to identify nutritional information, allergen declaration, and health claims. Total Hours: (Lecture - 30; Practical - 30) 60 Text Book(s): 1. Sivasankar B. Food processing and preservation. PHI Learning Pvt. Ltd.; 2002. Vikas Nanda and Savita sharma. Novel Food Processing Technologies. NIPA Genx Electronic Resource and Solutions P. LTD. New Delhi.: 2017 3. Khetarpaul, Neelam. "Food Processing and Preservation." Daya Publications, 2005 Reference(s): 1. Rahman, M. Shafiur. "Handbook of Food Preservation". Marcel & Dekker, 2006.									[6]
Practical: 1. Collection of food samples from different sources and perform microbial testing using agar plates. 2. Design a survey or conduct interviews to gather data on consumer attitudes towards food safety and quality. 3. Experiment on Measurement of the pH of various food items using a pH meter. Discuss how pH levels affect microbial growth and food stability. 4. Analyze food labels of various products and identify any discrepancies or violations of labelling requirements. 5. Experiment on qualitative tests for food samples to detect the presence of food additives. 6. Execute simple chemical tests to detect adulterants dairy products. Discuss the health risks associated with food adulteration. 7. Implement simple chemical tests to detect adulterants Spices products. Discuss the health risks associated with food adulteration. 8. Perform simple chemical tests to detect adulterants fruit and vegetable products. Discuss the health risks associated with food adulteration. 9. Expose food samples to different packaging materials (plastic, glass, metal) and assess their impact on food quality over time. 10. Design and evaluate food labels for compliance with regulatory standards. 11. Analyze food labels of different products to identify nutritional information, allergen declaration, and health claims. Total Hours: (Lecture - 30; Practical - 30) 60 Text Book(s): 1. Sivasankar B. Food processing and preservation. PHI Learning Pvt. Ltd.; 2002. Vikas Nanda and Savita sharma. Novel Food Processing Technologies. NIPA Genx Electronic Resource and Solutions P. LTD. New Delhi.: 2017 3. Khetarpaul, Neelam. "Food Processing and Preservation." Daya Publications, 2005 Reference(s): 1. Rahman, M. Shafiur. "Handbook of Food Preservation". Marcel & Dekker, 2006. 2. Zeuthen, Peter and Bogh-Sarensen, Leif. "Food Preservation Techniques". CRC / Wood Head Publishin									[0]
1. Collection of food samples from different sources and perform microbial testing using agar plates. 2. Design a survey or conduct interviews to gather data on consumer attitudes towards food safety and quality. 3. Experiment on Measurement of the pH of various food items using a pH meter. Discuss how pH levels affect microbial growth and food stability. 4. Analyze food labels of various products and identify any discrepancies or violations of labelling requirements. 5. Experiment on qualitative tests for food samples to detect the presence of food additives. 6. Execute simple chemical tests to detect adulterants dairy products. Discuss the health risks associated with food adulteration. 7. Implement simple chemical tests to detect adulterants Spices products. Discuss the health risks associated with food adulteration. 8. Perform simple chemical tests to detect adulterants fruit and vegetable products. Discuss the health risks associated with food adulteration. 9. Expose food samples to different packaging materials (plastic, glass, metal) and assess their impact on food quality over time. 10. Design and evaluate food labels for compliance with regulatory standards. 11. Analyze food labels of different products to identify nutritional information, allergen declaration, and health claims. Total Hours: (Lecture - 30; Practical - 30) 60 Text Book(s): 1. Sivasankar B. Food processing and preservation. PHI Learning Pvt. Ltd.; 2002. Vikas Nanda and Savita sharma. Novel Food Processing Technologies. NIPA Genx Electronic Resource and Solutions P. LTD. New Delhi.: 2017 3. Khetarpaul, Neelam. "Food Processing and Preservation." Daya Publications, 2005 Reference(s): 1. Rahman, M. Shafiur. "Handbook of Food Preservation". Marcel & Dekker, 2006. 2. Zeuthen, Peter and Bogh-Sarensen, Leif. "Food Preservation Techniques". CRC / Wood Head Publishir	and Consum	ner Protection	า.					-	
plates. 2. Design a survey or conduct interviews to gather data on consumer attitudes towards food safety and quality. 3. Experiment on Measurement of the pH of various food items using a pH meter. Discuss how pH levels affect microbial growth and food stability. 4. Analyze food labels of various products and identify any discrepancies or violations of labelling requirements. 5. Experiment on qualitative tests for food samples to detect the presence of food additives. 6. Execute simple chemical tests to detect adulterants dairy products. Discuss the health risks associated with food adulteration. 7. Implement simple chemical tests to detect adulterants Spices products. Discuss the health risks associated with food adulteration. 8. Perform simple chemical tests to detect adulterants fruit and vegetable products. Discuss the health risks associated with food adulteration. 9. Expose food samples to different packaging materials (plastic, glass, metal) and assess their impact on food quality over time. 10. Design and evaluate food labels for compliance with regulatory standards. 11. Analyze food labels of different products to identify nutritional information, allergen declaration, and health claims. Total Hours: (Lecture - 30; Practical - 30) 60 Text Book(s): 1. Sivasankar B. Food processing and preservation. PHI Learning Pvt. Ltd.; 2002. Vikas Nanda and Savita sharma. Novel Food Processing Technologies. NIPA Genx Electronic Resource and Solutions P. LTD. New Delhi.: 2017 3. Khetarpaul, Neelam. "Food Processing and Preservation." Daya Publications, 2005 Reference(s): 1. Rahman, M. Shafiur. "Handbook of Food Preservation". Marcel & Dekker, 2006. 2. Zeuthen, Peter and Bogh-Sarensen, Leif. "Food Preservation Techniques". CRC / Wood Head Publishin	Practical:								
 Design a survey or conduct interviews to gather data on consumer attitudes towards food safety and quality. Experiment on Measurement of the pH of various food items using a pH meter. Discuss how pH levels affect microbial growth and food stability. Analyze food labels of various products and identify any discrepancies or violations of labelling requirements. Experiment on qualitative tests for food samples to detect the presence of food additives. Execute simple chemical tests to detect adulterants dairy products. Discuss the health risks associated with food adulteration. Implement simple chemical tests to detect adulterants Spices products. Discuss the health risks associated with food adulteration. Perform simple chemical tests to detect adulterants fruit and vegetable products. Discuss the health risks associated with food adulteration. Expose food samples to different packaging materials (plastic, glass, metal) and assess their impact on food quality over time. Design and evaluate food labels for compliance with regulatory standards. Analyze food labels of different products to identify nutritional information, allergen declaration, and health claims. Total Hours: (Lecture - 30; Practical - 30) Text Book(s): Sivasankar B. Food processing and preservation. PHI Learning Pvt. Ltd.; 2002. Vikas Nanda and Savita sharma. Novel Food Processing Technologies. NIPA Genx Electronic Resource and Solutions P. LTD. New Delhi.: 2017 Khetarpaul, Neelam. "Food Processing and Preservation." Daya Publications, 2005 Reference(s): Rahman, M. Shafiur. "Handbook of Food Preservation". Marcel & Dekker, 2006. Zeuthen, Peter and Bogh-Sarensen, Leif. "Food Preservation Techniques". CRC / Wood Head Publishin 		n of food sa	mples from diff	ferent sou	irces and pe	erform microl	oial testing u	using agar	
and quality. 3. Experiment on Measurement of the pH of various food items using a pH meter. Discuss how pH levels affect microbial growth and food stability. 4. Analyze food labels of various products and identify any discrepancies or violations of labelling requirements. 5. Experiment on qualitative tests for food samples to detect the presence of food additives. 6. Execute simple chemical tests to detect adulterants dairy products. Discuss the health risks associated with food adulteration. 7. Implement simple chemical tests to detect adulterants Spices products. Discuss the health risks associated with food adulteration. 8. Perform simple chemical tests to detect adulterants fruit and vegetable products. Discuss the health risks associated with food adulteration. 9. Expose food samples to different packaging materials (plastic, glass, metal) and assess their impact on food quality over time. 10. Design and evaluate food labels for compliance with regulatory standards. 11. Analyze food labels of different products to identify nutritional information, allergen declaration, and health claims. Total Hours: (Lecture - 30; Practical - 30) Text Book(s): 1. Sivasankar B. Food processing and preservation. PHI Learning Pvt. Ltd.; 2002. Vikas Nanda and Savita sharma. Novel Food Processing Technologies. NIPA Genx Electronic Resource and Solutions P. LTD. New Delhi.: 2017 3. Khetarpaul, Neelam. "Food Processing and Preservation." Daya Publications, 2005 Reference(s): 1. Rahman, M. Shafiur. "Handbook of Food Preservation". Marcel & Dekker, 2006. 2. Zeuthen, Peter and Bogh-Sarensen, Leif. "Food Preservation Techniques". CRC / Wood Head Publishing and Pu	•								
3. Experiment on Measurement of the pH of various food items using a pH meter. Discuss how pH levels affect microbial growth and food stability. 4. Analyze food labels of various products and identify any discrepancies or violations of labelling requirements. 5. Experiment on qualitative tests for food samples to detect the presence of food additives. 6. Execute simple chemical tests to detect adulterants dairy products. Discuss the health risks associated with food adulteration. 7. Implement simple chemical tests to detect adulterants Spices products. Discuss the health risks associated with food adulteration. 8. Perform simple chemical tests to detect adulterants fruit and vegetable products. Discuss the health risks associated with food adulteration. 9. Expose food samples to different packaging materials (plastic, glass, metal) and assess their impact on food quality over time. 10. Design and evaluate food labels for compliance with regulatory standards. 11. Analyze food labels of different products to identify nutritional information, allergen declaration, and health claims. Total Hours: (Lecture - 30; Practical - 30) 60 Text Book(s): 1. Sivasankar B. Food processing and preservation. PHI Learning Pvt. Ltd.; 2002. Vikas Nanda and Savita sharma. Novel Food Processing Technologies. NIPA Genx Electronic Resource and Solutions P. LTD. New Delhi.: 2017 3. Ikhetarpaul, Neelam. "Food Processing and Preservation." Daya Publications, 2005 Reference(s): 1. Rahman, M. Shafiur. "Handbook of Food Preservation". Marcel & Dekker, 2006. 2. Zeuthen, Peter and Bogh-Sarensen, Leif. "Food Preservation Techniques". CRC / Wood Head Publishir			nduct interviews	s to gatner	data on cor	isumer attitud	es towards f	ood safety	
levels affect microbial growth and food stability. 4. Analyze food labels of various products and identify any discrepancies or violations of labelling requirements. 5. Experiment on qualitative tests for food samples to detect the presence of food additives. 6. Execute simple chemical tests to detect adulterants dairy products. Discuss the health risks associated with food adulteration. 7. Implement simple chemical tests to detect adulterants Spices products. Discuss the health risks associated with food adulteration. 8. Perform simple chemical tests to detect adulterants fruit and vegetable products. Discuss the health risk associated with food adulteration. 9. Expose food samples to different packaging materials (plastic, glass, metal) and assess their impact on food quality over time. 10. Design and evaluate food labels for compliance with regulatory standards. 11. Analyze food labels of different products to identify nutritional information, allergen declaration, and health claims. Total Hours: (Lecture - 30; Practical - 30) Text Book(s): 1. Sivasankar B. Food processing and preservation. PHI Learning Pvt. Ltd.; 2002. 2. Vikas Nanda and Savita sharma. Novel Food Processing Technologies. NIPA Genx Electronic Resource and Solutions P. LTD. New Delhi.: 2017 3. Khetarpaul, Neelam. "Food Processing and Preservation." Daya Publications, 2005 Reference(s): 1. Rahman, M. Shafiur. "Handbook of Food Preservation". Marcel & Dekker, 2006. 2. Zeuthen, Peter and Bogh-Sarensen, Leif. "Food Preservation Techniques". CRC / Wood Head Publishir	•	•	rement of the n	H of variou	us food items	s using a nH r	meter Discu	es how nH	
4. Analyze food labels of various products and identify any discrepancies or violations of labelling requirements. 5. Experiment on qualitative tests for food samples to detect the presence of food additives. 6. Execute simple chemical tests to detect adulterants dairy products. Discuss the health risks associated with food adulteration. 7. Implement simple chemical tests to detect adulterants Spices products. Discuss the health risks associated with food adulteration. 8. Perform simple chemical tests to detect adulterants fruit and vegetable products. Discuss the health risks associated with food adulteration. 9. Expose food samples to different packaging materials (plastic, glass, metal) and assess their impact on food quality over time. 10. Design and evaluate food labels for compliance with regulatory standards. 11. Analyze food labels of different products to identify nutritional information, allergen declaration, and health claims. Total Hours: (Lecture - 30; Practical - 30) Text Book(s): 1. Sivasankar B. Food processing and preservation. PHI Learning Pvt. Ltd.; 2002. Vikas Nanda and Savita sharma. Novel Food Processing Technologies. NIPA Genx Electronic Resource and Solutions P. LTD. New Delhi.: 2017 3. Khetarpaul, Neelam. "Food Processing and Preservation." Daya Publications, 2005 Reference(s): 1. Rahman, M. Shafiur. "Handbook of Food Preservation". Marcel & Dekker, 2006. 2. Zeuthen, Peter and Bogh-Sarensen, Leif. "Food Preservation Techniques". CRC / Wood Head Publishir	levels aff	ect microbial	arowth and foo	d stability.	as lood items	s using a piri	neter. Discu	ss now pri	
requirements. 5. Experiment on qualitative tests for food samples to detect the presence of food additives. 6. Execute simple chemical tests to detect adulterants dairy products. Discuss the health risks associated with food adulteration. 7. Implement simple chemical tests to detect adulterants Spices products. Discuss the health risks associated with food adulteration. 8. Perform simple chemical tests to detect adulterants fruit and vegetable products. Discuss the health risks associated with food adulteration. 9. Expose food samples to different packaging materials (plastic, glass, metal) and assess their impact on food quality over time. 10. Design and evaluate food labels for compliance with regulatory standards. 11. Analyze food labels of different products to identify nutritional information, allergen declaration, and health claims. Total Hours: (Lecture - 30; Practical - 30) 60 Text Book(s): 1. Sivasankar B. Food processing and preservation. PHI Learning Pvt. Ltd.; 2002. 2. Vikas Nanda and Savita sharma. Novel Food Processing Technologies. NIPA Genx Electronic Resource and Solutions P. LTD. New Delhi.: 2017 3. Khetarpaul, Neelam. "Food Processing and Preservation." Daya Publications, 2005 Reference(s): 1. Rahman, M. Shafiur. "Handbook of Food Preservation". Marcel & Dekker, 2006. 2. Zeuthen, Peter and Bogh-Sarensen, Leif. "Food Preservation Techniques". CRC / Wood Head Publishir			•	,		crepancies or	violations of	labelling	
6. Execute simple chemical tests to detect adulterants dairy products. Discuss the health risks associated with food adulteration. 7. Implement simple chemical tests to detect adulterants Spices products. Discuss the health risks associated with food adulteration. 8. Perform simple chemical tests to detect adulterants fruit and vegetable products. Discuss the health risks associated with food adulteration. 9. Expose food samples to different packaging materials (plastic, glass, metal) and assess their impact on food quality over time. 10. Design and evaluate food labels for compliance with regulatory standards. 11. Analyze food labels of different products to identify nutritional information, allergen declaration, and health claims. Total Hours: (Lecture - 30; Practical - 30) 60 Text Book(s): 1. Sivasankar B. Food processing and preservation. PHI Learning Pvt. Ltd.; 2002. Vikas Nanda and Savita sharma. Novel Food Processing Technologies. NIPA Genx Electronic Resource and Solutions P. LTD. New Delhi.: 2017 3. Khetarpaul, Neelam. "Food Processing and Preservation." Daya Publications, 2005 Reference(s): 1. Rahman, M. Shafiur. "Handbook of Food Preservation". Marcel & Dekker, 2006. 2. Zeuthen, Peter and Bogh-Sarensen, Leif. "Food Preservation Techniques". CRC / Wood Head Publishin					,,				
associated with food adulteration. 7. Implement simple chemical tests to detect adulterants Spices products. Discuss the health risks associated with food adulteration. 8. Perform simple chemical tests to detect adulterants fruit and vegetable products. Discuss the health risks associated with food adulteration. 9. Expose food samples to different packaging materials (plastic, glass, metal) and assess their impact on food quality over time. 10. Design and evaluate food labels for compliance with regulatory standards. 11. Analyze food labels of different products to identify nutritional information, allergen declaration, and health claims. Total Hours: (Lecture - 30; Practical - 30) 60 Text Book(s): 1. Sivasankar B. Food processing and preservation. PHI Learning Pvt. Ltd.; 2002. Vikas Nanda and Savita sharma. Novel Food Processing Technologies. NIPA Genx Electronic Resource and Solutions P. LTD. New Delhi.: 2017 3. Khetarpaul, Neelam. "Food Processing and Preservation." Daya Publications, 2005 Reference(s): 1. Rahman, M. Shafiur. "Handbook of Food Preservation". Marcel & Dekker, 2006. 2. Zeuthen, Peter and Bogh-Sarensen, Leif. "Food Preservation Techniques". CRC / Wood Head Publishing.	5. Experime	nt on qualitat	ive tests for food	samples t	o detect the	oresence of fo	od additives.		
7. Implement simple chemical tests to detect adulterants Spices products. Discuss the health risks associated with food adulteration. 8. Perform simple chemical tests to detect adulterants fruit and vegetable products. Discuss the health risks associated with food adulteration. 9. Expose food samples to different packaging materials (plastic, glass, metal) and assess their impact on food quality over time. 10. Design and evaluate food labels for compliance with regulatory standards. 11. Analyze food labels of different products to identify nutritional information, allergen declaration, and health claims. Total Hours: (Lecture - 30; Practical - 30) 60 Text Book(s): 1. Sivasankar B. Food processing and preservation. PHI Learning Pvt. Ltd.; 2002. Vikas Nanda and Savita sharma. Novel Food Processing Technologies. NIPA Genx Electronic Resource and Solutions P. LTD. New Delhi.: 2017 3. Khetarpaul, Neelam. "Food Processing and Preservation." Daya Publications, 2005 Reference(s): 1. Rahman, M. Shafiur. "Handbook of Food Preservation". Marcel & Dekker, 2006. 2. Zeuthen, Peter and Bogh-Sarensen, Leif. "Food Preservation Techniques". CRC / Wood Head Publishin	6. Execute	simple chem	nical tests to de	etect adult	erants dairy	products. Di	scuss the h	ealth risks	[0.0]
associated with food adulteration. 8. Perform simple chemical tests to detect adulterants fruit and vegetable products. Discuss the health risks associated with food adulteration. 9. Expose food samples to different packaging materials (plastic, glass, metal) and assess their impact on food quality over time. 10. Design and evaluate food labels for compliance with regulatory standards. 11. Analyze food labels of different products to identify nutritional information, allergen declaration, and health claims. Total Hours: (Lecture - 30; Practical - 30) 60 Text Book(s): 1. Sivasankar B. Food processing and preservation. PHI Learning Pvt. Ltd.; 2002. Vikas Nanda and Savita sharma. Novel Food Processing Technologies. NIPA Genx Electronic Resource and Solutions P. LTD. New Delhi.: 2017 3. Khetarpaul, Neelam. "Food Processing and Preservation." Daya Publications, 2005 Reference(s): 1. Rahman, M. Shafiur. "Handbook of Food Preservation". Marcel & Dekker, 2006. 2. Zeuthen, Peter and Bogh-Sarensen, Leif. "Food Preservation Techniques". CRC / Wood Head Publishing	associate	ed with food a	adulteration.						[30]
8. Perform simple chemical tests to detect adulterants fruit and vegetable products. Discuss the health risks associated with food adulteration. 9. Expose food samples to different packaging materials (plastic, glass, metal) and assess their impact on food quality over time. 10. Design and evaluate food labels for compliance with regulatory standards. 11. Analyze food labels of different products to identify nutritional information, allergen declaration, and health claims. Total Hours: (Lecture - 30; Practical - 30) 60 Text Book(s): 1. Sivasankar B. Food processing and preservation. PHI Learning Pvt. Ltd.; 2002. Vikas Nanda and Savita sharma. Novel Food Processing Technologies. NIPA Genx Electronic Resource and Solutions P. LTD. New Delhi.: 2017 3. Khetarpaul, Neelam. "Food Processing and Preservation." Daya Publications, 2005 Reference(s): 1. Rahman, M. Shafiur. "Handbook of Food Preservation". Marcel & Dekker, 2006. 2. Zeuthen, Peter and Bogh-Sarensen, Leif. "Food Preservation Techniques". CRC / Wood Head Publishing				etect adult	erants Spice	es products. D	Discuss the h	nealth risks	
the health risks associated with food adulteration. 9. Expose food samples to different packaging materials (plastic, glass, metal) and assess their impact on food quality over time. 10. Design and evaluate food labels for compliance with regulatory standards. 11. Analyze food labels of different products to identify nutritional information, allergen declaration, and health claims. Total Hours: (Lecture - 30; Practical - 30) 60 Text Book(s): 1. Sivasankar B. Food processing and preservation. PHI Learning Pvt. Ltd.; 2002. Vikas Nanda and Savita sharma. Novel Food Processing Technologies. NIPA Genx Electronic Resource and Solutions P. LTD. New Delhi.: 2017 3. Khetarpaul, Neelam. "Food Processing and Preservation." Daya Publications, 2005 Reference(s): 1. Rahman, M. Shafiur. "Handbook of Food Preservation". Marcel & Dekker, 2006. Zeuthen, Peter and Bogh-Sarensen, Leif. "Food Preservation Techniques". CRC / Wood Head Publishing							5:		
9. Expose food samples to different packaging materials (plastic, glass, metal) and assess their impact on food quality over time. 10. Design and evaluate food labels for compliance with regulatory standards. 11. Analyze food labels of different products to identify nutritional information, allergen declaration, and health claims. Total Hours: (Lecture - 30; Practical - 30) 60 Text Book(s): 1. Sivasankar B. Food processing and preservation. PHI Learning Pvt. Ltd.; 2002. Vikas Nanda and Savita sharma. Novel Food Processing Technologies. NIPA Genx Electronic Resource and Solutions P. LTD. New Delhi.: 2017 3 .Khetarpaul, Neelam. "Food Processing and Preservation." Daya Publications, 2005 Reference(s): 1. Rahman, M. Shafiur. "Handbook of Food Preservation". Marcel & Dekker, 2006. 2. Zeuthen, Peter and Bogh-Sarensen, Leif. "Food Preservation Techniques". CRC / Wood Head Publishing						i vegetable pi	oducts. Disc	uss	
impact on food quality over time. 10. Design and evaluate food labels for compliance with regulatory standards. 11. Analyze food labels of different products to identify nutritional information, allergen declaration, and health claims. Total Hours: (Lecture - 30; Practical - 30) 60 Text Book(s): 1. Sivasankar B. Food processing and preservation. PHI Learning Pvt. Ltd.; 2002. Vikas Nanda and Savita sharma. Novel Food Processing Technologies. NIPA Genx Electronic Resource and Solutions P. LTD. New Delhi.: 2017 3. Khetarpaul, Neelam. "Food Processing and Preservation." Daya Publications, 2005 Reference(s): 1. Rahman, M. Shafiur. "Handbook of Food Preservation". Marcel & Dekker, 2006. 2. Zeuthen, Peter and Bogh-Sarensen, Leif. "Food Preservation Techniques". CRC / Wood Head Publishing						ic alaes mot	al) and asse	ee their	
 10. Design and evaluate food labels for compliance with regulatory standards. 11. Analyze food labels of different products to identify nutritional information, allergen declaration, and health claims. Total Hours: (Lecture - 30; Practical - 30) Ext Book(s): Sivasankar B. Food processing and preservation. PHI Learning Pvt. Ltd.; 2002. Vikas Nanda and Savita sharma. Novel Food Processing Technologies. NIPA Genx Electronic Resource and Solutions P. LTD. New Delhi.: 2017 I. Khetarpaul, Neelam. "Food Processing and Preservation." Daya Publications, 2005 Reference(s): Rahman, M. Shafiur. "Handbook of Food Preservation". Marcel & Dekker, 2006. Zeuthen, Peter and Bogh-Sarensen, Leif. "Food Preservation Techniques". CRC / Wood Head Publishing 				kagirig ilia	iteriais (piasi	ic, glass, mei	ai) ailu asse	33 111011	
11. Analyze food labels of different products to identify nutritional information, allergen declaration, and health claims. Total Hours: (Lecture - 30; Practical - 30) 60 Text Book(s): 1. Sivasankar B. Food processing and preservation. PHI Learning Pvt. Ltd.; 2002. Vikas Nanda and Savita sharma. Novel Food Processing Technologies. NIPA Genx Electronic Resource and Solutions P. LTD. New Delhi.: 2017 3. Khetarpaul, Neelam. "Food Processing and Preservation." Daya Publications, 2005 Reference(s): 1. Rahman, M. Shafiur. "Handbook of Food Preservation". Marcel & Dekker, 2006. Zeuthen, Peter and Bogh-Sarensen, Leif. "Food Preservation Techniques". CRC / Wood Head Publishing				ompliance	with regulato	ory standards.			
declaration, and health claims. Total Hours: (Lecture - 30; Practical - 30) 60 Text Book(s): 1. Sivasankar B. Food processing and preservation. PHI Learning Pvt. Ltd.; 2002. Vikas Nanda and Savita sharma. Novel Food Processing Technologies. NIPA Genx Electronic Resource and Solutions P. LTD. New Delhi.: 2017 3. Khetarpaul, Neelam. "Food Processing and Preservation." Daya Publications, 2005 Reference(s): 1. Rahman, M. Shafiur. "Handbook of Food Preservation". Marcel & Dekker, 2006. Zeuthen, Peter and Bogh-Sarensen, Leif. "Food Preservation Techniques". CRC / Wood Head Publishing								allergen	
Total Hours: (Lecture - 30; Practical - 30) 60 Text Book(s): 1. Sivasankar B. Food processing and preservation. PHI Learning Pvt. Ltd.; 2002. 2. Vikas Nanda and Savita sharma. Novel Food Processing Technologies. NIPA Genx Electronic Resource and Solutions P. LTD. New Delhi.: 2017 3. Khetarpaul, Neelam. "Food Processing and Preservation." Daya Publications, 2005 Reference(s): 1. Rahman, M. Shafiur. "Handbook of Food Preservation". Marcel & Dekker, 2006. 2. Zeuthen, Peter and Bogh-Sarensen, Leif. "Food Preservation Techniques". CRC / Wood Head Publishing	-				•		•	-	
Text Book(s): 1. Sivasankar B. Food processing and preservation. PHI Learning Pvt. Ltd.; 2002. 2. Vikas Nanda and Savita sharma. Novel Food Processing Technologies. NIPA Genx Electronic Resource and Solutions P. LTD. New Delhi.: 2017 3. Khetarpaul, Neelam. "Food Processing and Preservation." Daya Publications, 2005 Reference(s): 1. Rahman, M. Shafiur. "Handbook of Food Preservation". Marcel & Dekker, 2006. 2. Zeuthen, Peter and Bogh-Sarensen, Leif. "Food Preservation Techniques". CRC / Wood Head Publishing					Total Hour	s: (Lecture -	30; Practica	I - 30)	60
Vikas Nanda and Savita sharma. Novel Food Processing Technologies. NIPA Genx Electronic Resource and Solutions P. LTD. New Delhi.: 2017 Khetarpaul, Neelam. "Food Processing and Preservation." Daya Publications, 2005 Reference(s): Rahman, M. Shafiur. "Handbook of Food Preservation". Marcel & Dekker, 2006. Zeuthen, Peter and Bogh-Sarensen, Leif. "Food Preservation Techniques". CRC / Wood Head Publishing.									
 and Solutions P. LTD. New Delhi.: 2017 .Khetarpaul, Neelam. "Food Processing and Preservation." Daya Publications, 2005 Reference(s): Rahman, M. Shafiur. "Handbook of Food Preservation". Marcel & Dekker, 2006. Zeuthen, Peter and Bogh-Sarensen, Leif. "Food Preservation Techniques". CRC / Wood Head Publishin 									
3 .Khetarpaul, Neelam. "Food Processing and Preservation." Daya Publications, 2005 Reference(s): 1. Rahman, M. Shafiur. "Handbook of Food Preservation". Marcel & Dekker, 2006. 2 Zeuthen, Peter and Bogh-Sarensen, Leif. "Food Preservation Techniques". CRC / Wood Head Publishing.					d Processing	Technologie	s. NIPA Gen	x = E	esource
Reference(s): 1. Rahman, M. Shafiur. "Handbook of Food Preservation". Marcel & Dekker, 2006. Zeuthen, Peter and Bogh-Sarensen, Leif. "Food Preservation Techniques". CRC / Wood Head Publishin	and C				Dropor otics	" Dove Dublis	otiona 2005		
 Rahman, M. Shafiur. "Handbook of Food Preservation". Marcel & Dekker, 2006. Zeuthen, Peter and Bogh-Sarensen, Leif. "Food Preservation Techniques". CRC / Wood Head Publishin 			III. FUUU PIOCES	ssing and I	rieservation	. Daya Public	aliui 15, 2005		
Zeuthen, Peter and Bogh-Sarensen, Leif. "Food Preservation Techniques". CRC / Wood Head Publishin			ır "Handbook o	f Food Pro	servation" N	larcel & Dekk	er 2006		
	Zeuth							Wood Head D	uhlishin
			. Dogii Galerise	, <u>L</u> OII. I	554 1 10361V	anon rooming	200 . 0110/	Jour Idau I	4511011111

^{*}SDG 12 – Responsible Consumption and Production **SDG 3 – Good Health and Well Being



Course Co	ntents and Lecture Schedule	I INO. OT HOURS
1	Introduction to Food Safety and Quality	140. 01 110010
1.1	Overview of Food Safety and Quality Assurance	1
1.2	Quality Assurance vs. Quality Control	1
1.3	Importance of Food Safety in Public Health	1
1.4	Consumer Protection	1
1.5	Historical Development of Food Regulation	1
1.6	Role of Government Agencies in Food Regulation	1
2	Regulatory Frameworks and Standards	ı
2.1	National Regulatory Agencies: Functions and Responsibilities	1
2.2	International Organizations: Codex Alimentarius Commission – WHO – FAO	2
2.3	Comparison of Regulatory Frameworks in Different Countries	1
2.3	Harmonization of Food Standards and Regulations	1
	Role of Non-Governmental Organizations (NGOs)	1
2.5 3	Food Safety Laws and Regulations	<u> </u>
3.1		1 4
3.1	Food Safety and Standards Act, 2006 (India)	1
3.2	Regulatory Authorities: Food and Drug Administration (FDA) - European Food Safety Authority (EFSA) - Food Standards Agency (FSA)	2
3.3	Key Provisions: Food Safety – Labeling – Additives – Contaminants	1
3.4	Food Safety and Standards (FSS) Regulations(2011)	1
3.5	Enforcement Mechanisms and Penalties for Non-Compliance	1
4	Food Adulteration	•
4.1	Definition and Types of Food Adulteration	1
4.2	Adulterants in Food: Chemical – Biological – Physical	1
4.3	Common Adulterants: Identification of common substances used for food Adulteration	1
4.4	Health Risks: foodborne illnesses - allergic reactions - long-term health effects	1
4.5	Methods of Detection and Analysis	1
4.6	Regulatory Measures to Combat Food Adulteration	1
5	Food Labeling and Packaging Regulations	<u>'</u>
5.1	Labelling Requirements: Nutritional Information and Allergen Declaration	1
5.2	Nutrition Labelling and Allergen Labelling	1
5.3	Health and Nutrient Claims	1
5.4	Packaging Standards: Materials -Safety – Preservation	1
5.5	Claims and Declarations: Organic - Non-GMO - Gluten-Free	1
	<u>~</u>	
5.6 Practical:	Regulatory Compliance and Consumer Protection	1
Practical:	Collection of food complete from different courses and nonform rejeach in testing	1
1.	Collection of food samples from different sources and perform microbial testing using agar plates	2
2.	Design a survey or conduct interviews to gather data on consumer attitudes towards food safety and quality	4
3.	Experiment on Measurement of the pH of various food items using a pH meter. Discuss how pH levels affect microbial growth and food stability	4
4.	Analyze food labels of various products and identify any discrepancies or violations of labelling requirements	2
5.	Experiment on qualitative tests for food samples to detect the presence of food additives	2
6.	Perform simple chemical tests to detect adulterants dairy products. Discuss the health risks associated with food adulteration	3
7.	Perform simple chemical tests to detect adulterants Spices products. Discuss	4
8.	the health risks associated with food adulteration Perform simple chemical tests to detect adulterants fruit and vegetable products. Discuss the health risks associated with food adulteration.	2
9.	products. Discuss the health risks associated with food adulteration Expose food samples to different packaging materials (plastic, glass, metal)	3
	and assess their impact on food quality over time.	
10.	Design and evaluate food labels for compliance with regulatory standards.	2
11.	Analyze food labels of different products to identify nutritional information, allergen declaration, and health claims.	2

1. Mr. S. Nithishkumar-<u>nithishkumar@ksrct.ac.in</u>



60 FT 504	Heat and Mass Transfer	Category	L	Т	Р	Credit
0011304	Tieat and Mass Transler	PC	3	1	0	4

- To familiarize conduction heat transfer mechanisms
- •To demonstrate the phase change heat transfer and determine the performance of heat exchanging devices
- To know principal of mass transfer concepts and its applications
- Choose evaporators and infer its performance.
- To infer diffusion and convective mass transfer

Pre-requisites

Nil

Course Outcomes

On the succ	cessful completion of the course, students will be able to	
CO1	Apply the heat conduction equation to compute the rate of heat transfer and determine the heat transfer rate in free and forced convection	Understand
CO2	Make use of equations for calculating convective heat transfer coefficients and to determine the performance of the equipments	Analyze
CO3	Execute mass transfer rate in diffusion mass transfer applications	Apply
CO4	Evaluate convective mass transfer process and apply mass transfer principles in food and bioprocessing	Apply
CO5	Illustrate the principle and operation of leaching equipment's and make use of leaching calculations	Analyze

Mappir	ng with	Progra	amme C	Outcom	es										
COs						P	Os							PSOs	
003	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1	3	3	3	-	-	3	-	-	-	-	-	-	-	-	2
CO2	3	3	3	-	-	3	-	-	-	-	-	-	-	-	2
CO3	3	3	3	-	-	3	-	-	-	-	-	-	-	-	2
CO4	3	3	3	2	-	2	-	-	-	-	-	-	-	-	2
CO5	3	3	3	2	-	1	-	-	-	-	-	-	-	-	2
3 - Stro	ong; 2 -	Mediur	n; 1 - S	ome											

Assessment Pattern			
Bloom's Category	Continuous Asse (Mar		End Sem Examination (Marks)
outogot y	1	2	
Remember	10	10	20
Understand	10	30	20
Apply	20	20	40
Analyze	20	-	20
Evaluate	-	-	-
Create	-	-	-
Total	60	60	100

	-	K.S.Rangasar		Food Techr				
				Heat and Ma				
		Hours/Week		Total	Credit	Ma	ximum Marks	<u> </u>
Semester	L	Т	Р	Hours	С	CA	ES	Total
V	3	1	0	60	4	40	60	100
	er Operation							
processing convection– convection coefficients	operations. Application under lamina and its relation mann's law,	ansfer Opera Conduction: of dimension ar, transition a onship. Black emissivity and	Fourier's al analysis tand turbuler body conce	law of hea for convection at conditions. ot - Radiation	t conduction n - Equation Individual a n Properties–	n. Natural is for forced and overall h	and forced and natural eat transfer	[9]
ransfer unit principles ar plate heat e evaporators Open pan	I counter flow - use of count application exchangers. , multiple of evaporator,	w heat excha rrection factor ns: Single pas Types of eva effect evapor horizontal to e evaporator	charts - Fo s, multi pass aporators – rators -Fee ube	ouling factor. s heat exchar working prin ed forward	Types of heagers, shell a ciple and apand feed	eat exchange nd tube heat oplications: S backward	er*- working exchanger, Single effect operations,	[9]
ntroduction operations i diffusion in g solids. Introd over all mas	to Mass Tr n food proce gases and liqued duction to uns s transfer co		tions: Introd on: Ficks la ment and pr	w of diffusion of diffusion	n. Steady st	ate molecula	ar and eddy	[9]
Humidification Measurem Crystallizer	ent of humic	allization: Adi dity - Cooling Applications	towers and	d Spray Cha	ambers*. Pri	nciples of cr	ystallization.	[9]
Single stag Extractors - perforated single stage Leaching e	working pri plate towers leaching - m quipment's -	g: I- Multi stagonciple and aps-rotating disulti stage cro I- working prinnedy Extract	oplications: sc contacto ss-current a nciple and a	mixer settler ors - pulsed and counter applications:	s- packed t column*. So -current lead Bollman extra	owers -spra lid- liquid equ ching opera	ay towers- uilibrium - tions**.	[9]
					Total Hour	s: 45 + 15 (T	utorial)	45
Text Book(s	s):					•		
1. Gavh	ane K.A., "He	eat Transfer SI	Units", 13th	Edition, Nirali	Prakashan P	ublications, F	Pune, 2012.	
		., Meera She Delhi, 2011.	riffa Begam	K.M., "Mas	s Transfer T	heory and F	ractice", 1st E	Edition, I
Reference(s		, ביווו, ביווו, בייוו, בייוו						
₁ Earle	-		ood Proces	sing", 2nd Ed	dition, The Ne	ew Zealand I	nstitute of Foo	d Scien
2 Dutta	Binay K., "H		Principles a	nd Applicatio	ns", 1st Editi	on, Prentice	Hall of India, N	lew Dell
2013		T (^)	-0	I \/- C2.	10	
		ss Transfer O						
	ı P(¬ "Intr∩(DUCTION TO HOO	a Process Er	iuineerina". 2	na Ealtion. Si	pringer, New	YOFK. 2011.	

^{*}SDG 9 – Industry Innovation and Infrastructure **SDG 7 – Affordable and Clean Energy



Course Co	ontents and Lecture Schedule	
S. No.	Topics	No. of hours
1.0	Heat Transfer Operations	
1.1	Introduction, Modes of Heat Transfer, role in food processing operations	1
1.2	Conduction: Fourier's law of heat conduction	1
1.3	Natural and forced convection	1
1.4	Application of dimensional analysis for convection	1
1.5	Equations for forced and natural convection under laminar, transition and	1
	turbulent conditions	
1.6	Individual and overall heat transfer coefficients and its relationship	1
1.7	Black body concept	1
1.8	Radiation Properties–Stefan Boltzmann's law, emissivity and absorptivity	1
1.9	Concept of grey body – radiation between non-black surfaces	1
2.0	Heat Exchangers	
2.1	Parallel and counter flow heat exchangers - LMTD - Heat exchangers effectiveness	1
2.2	number of transfer unit – use of correction factor charts - Fouling factor	1
2.3	Types of heat exchanger- working principles and applications: Single pass,	1
	multi pass heat exchangers	
2.4	Shell and tube heat exchanger, plate heat exchangers	1
2.5	Types of evaporators – working principle and applications: Single effect	1
2.0	evaporators, multiple effect evaporators	1
2.6	Feed forward and feed backward operations	1
2.7	Open pan evaporator, horizontal tube evaporator	1
2.8	vertical tube evaporator, long tube evaporator	1
2.9	Forced circulation evaporator	1
3.0	Mass Transfer Operations and Diffusion	
3.1	Introduction to Mass Transfer Operations	1
3.2	Classification and role of mass transfer operations in food processing	1
3.3	Classification and role of mass transfer operations in food processing	1
3.4	Diffusion: Ficks law of diffusion	1
3.5	Steady state molecular and eddy diffusion in gases and liquids	1
3.6	Measurement and prediction of diffusivity of gas and liquids	1
3.7	Diffusion in solids	1
3.8	Introduction to unsteady state diffusion	1
3.9	Individual and over all mass transfer coefficients.	1
4.0	Humidification and Crystallization	
4.1	Humidification and Crystallization	1
4.2	Adiabatic saturation process and theory of wet bulb temperature	1
4.3	Measurement of humidity	1
4.4	Cooling towers and Spray Chambers	1
4.5	Principles of crystallization	1
4.6	Crystallizers - Types – Applications	1
4.7	Equilibrium in ternary systems	1
4.8	Solvent selection criteria	1
4.9	Equilibrium stage wise contact.	1
5.0	Extraction and Leaching	
5.1	Single stage extraction	1
5.2	Multi stage cross current and counter current operations	1
5.3	Extractors - working principle and applications	1
5.4	Mixer settlers- packed towers -spray towers- perforated plate towers- rotating disc	1
	contactors - pulsed columns	
5.5	Solid-liquid equilibrium - single stage leaching	1
5.6	Multi stage cross current and countercurrent leaching operations	1
5.7	Leaching equipment's – working principle and applications	1
5.8	Bollman extractor- Rotocel extractor- Hildebrand Extractor	1
5.9	Kennedy Extractor - Pachuca tank - Dorr agitator	1

1. Dr. J. Balachandra Mohan-<u>balachandramohan@ksrct.ac.in</u>



60 MY 003	Startups and	Category	L	Т	Р	Credit
00 1111 003	Entrepreneurship	MY	2	0	0	2@

- To Learn basic concepts in entrepreneurship, develop mind-set and skills necessary to explore entrepreneurship
- To provide practical proven tools for transforming an idea into a product or service that creates value for others.
- To Comprehend the process of opportunity identification through design thinking, identify market potential
 and customers while developing a compelling value proposition solution and prototypes
- To create business plan, conduct financial analysis and feasibility analysis to assess the financial viability of a venture ideas & solutions built with domain expertise
- To Prepare and present an investible pitch deck of their practice venture to attract stakeholders

Pre-requisites

• Basic knowledge of reading and writing in English

Course Outcomes

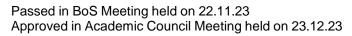
CO1	Develop an entrepreneurial mindset and appreciate the concepts of design thinking, entrepreneurship and innovation	Understand
CO2	Apply process of problem -opportunity identification and validation through human centred approach to design thinking in building solutions	Apply
CO3	Understand market types, conduct market estimation, identify customers, create customer persona, develop the skills to create a compelling value proposition and build a Minimum Viable Product	Apply
CO4	Create business plan, conduct financial analysis and feasibility analysis to assess the financial viability of a venture	Apply
CO5	Prepare and deliver an investible pitch deck of their practice venture to attract stakeholders	Create

COs	POs									PSOs					
COS	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1	3	3	3	3	1	3	1	2	1	-	2	2	3	3	3
CO2	2	3	3	2	2	-	2	2	2	-	2	2	2	3	3
CO3	3	2	3	1	2	-	-	-	1	3	1	3	3	2	3
CO4	3	3	3	3	3	2	2	1	1	1	3	3	3	3	3
CO5	3	2	3	3	3	-	-	2	1	-	3	2	3	2	3
3 - Str	ong; 2	- Mediu	m; 1 - S	ome											

Assessment Pattern			
Bloom's	Continuous Assess	sment Tests (Marks)	Pitch Deck final submission & Via
Category	Milestone 1 (25 Marks)	Milestone 2 & 3 (25 Marks)	voce
Remember	10	-	
Understand	05	10	
Apply	10	10	
Analyze	-	-	50
Evaluate	-	-	
Create	-	5	
Total	25	25	

		l l	K.S.Rangasa	my College	of Technolog	av – Autono	mous R2022)	
		<u> </u>	yasa		. Food Techi			-	
			60 N		tups and En		hip		
Seme	otor		Hours/Week		Total	Credit	Ma	ximum Mark	S
Seme	ster	L	Т	Р	Hours	С	CA	ES	Total
\	/	2	0	0	30	2@	100	-	100
Meani Entrep Entrep skills i Role	ing and preneur preneur required models	d concept of rship, role rship Managd to be an el	urship & Entre Entrepreneu of Entrepgement and I ntrepreneur, and Supportenario	irship, the his preneurship Future of En the entreprer	in Econo trepreneursh neurial decisi	mic Develonip. The Entron on process,	opment, Aç epreneur: M	gencies in leaning, the	[6]
Under valida and co Propo Blue o	rstandir te prob onsume sition, ' ocean s	ng the Proble lem. Explori er, Custome Value Propo strategy, Cor	ntification, Co em and oppo ng market typ or segmentation sition Canvace mpetitive pos e selling poin	rtunity, define bes and estin on and creat s, Developine itioning	e problem us nating the ma ing customer	ing Design tharket size, kn personas. Ir	ninking princi owing your nportance of	customer Value	[6]
Introd assun	uction nptions	to Busines	model and s models. F						[6]
	g a a	ive validati	on, MVP Itera		nce of Build	- Measure –			
Busine Prepa financ	ess Pla ess pla ring a b	n, Financial inning: compousiness plar	on, MVP Itera feasibility and conents of Bu n. Financial P rstanding ba performance	ation-Importa I Managing grainess plan- lanning: Type	rowth Sales plan, Fes of costs, pr	People plan a	Learn approand financial nancial plan	plan,	[6]
Prepa financ Growt Go To Introd Chann busine	ess Pla ess pla ring a b sial tem th and t Marke uction nel, cre ess org	n, Financial nning: compousiness plar plate, unde he financial t Strategies to Go to meating digita anization sp	feasibility and conents of Bu n. Financial P rstanding ba	I Managing grainess plan- lanning: Type sics of Unit lies, start-up building cus venture, ider	rowth Sales plan, Fes of costs, preconomics a branding artomer acquistifying sourc	People plan a reparing the frand analyzing and its elements sition strateges of funds: I	Learn appro- and financial nancial plan g hts, Selectin ly. Choosing	plan, using g the Right g a form of	[6]
Busing Prepa finance Growt Go To Introd Chann busing	ess Pla ess pla ring a b sial tem th and t Marke uction nel, cre ess org	n, Financial nning: compousiness plar plate, unde he financial t Strategies to Go to meating digita anization sp	feasibility and conents of Bu n. Financial P rstanding ba performance and Funding arket strateg Il presence, ecific to your	I Managing grainess plan- lanning: Type sics of Unit lies, start-up building cus venture, ider	rowth Sales plan, Fes of costs, preconomics a branding artomer acquistifying sourc	People plan a reparing the frand analyzing and its elements sition strateges of funds: I	Learn appro-	plan, using g the Right g a form of	
Busing Prepa financ Growt Go To Introd Chang busing & Equ	ess Pla ess pla ring a b cial tem th and t Marke uction nel, cre ess org ity, Map	n, Financial noting: compousiness plar plate, unde he financial t Strategies to Go to meating digita anization spothe Start-up	feasibility and conents of Bu n. Financial P rstanding ba performance and Funding arket strateg al presence, ecific to your o Lifecycle to	I Managing grainess plan- lanning: Type sics of Unit lies, start-up building cus venture, ider Funding Option	rowth Sales plan, Fes of costs, preconomics a branding artomer acquistifying sourcons, Build an	People plan a reparing the fand analyzing and its elemensition strateges of funds: Investor reactions	Learn appro- and financial nancial plan d hts, Selectin ly, Choosing Debt ly pitch deck.	plan, using g the Right g a form of	[6]
Busine Prepa financ Growt Go To Introd Chanr busine & Equ	ess Pla ess pla ring a b cial tem th and t o Marke uction nel, cre ess org ity, Mar Steph	n, Financial noting: compousiness plar plate, unde he financial t Strategies to Go to meating digita anization spothe Start-up to the Start-up to the Key, "On	feasibility and conents of Bu n. Financial P rstanding ba performance and Funding arket strateg al presence, ecific to your o Lifecycle to	I Managing grainess plan- lanning: Type sics of Unit lies, start-up building cus venture, ider Funding Option	rowth Sales plan, Fes of costs, preconomics a branding artomer acquistifying sourcons, Build an	People plan a reparing the fand analyzing and its elemensition strateges of funds: Investor reactions.	Learn appro- and financial nancial plan by the selecting Choosing Debt ly pitch deck. T	plan, using g the Right g a form of	[6]
Busing Prepa finance Growt Go To Introd Chang busing & Equ	ess Pla ess pla ring a b cial tem th and t o Marke uction nel, cre ess org iity, Map Steph Profita	n, Financial nning: compousiness plare plate, unde he financial t Strategies to Go to meating digita anization spothe Start-up. 1: en Key, "Onable Compares Bamford"	feasibility and conents of Bun. Financial Prestanding bath performance and Funding arket strategal presence, ecific to your oblifecycle to estimpt 1 Editionand Garry Editionand Garry Editionand Funding and Garry Editionand Funding Strategies 1 Editionand Funding Strategies 1 Editional	I Managing grisiness plan- lanning: Type sics of Unit lies, start-up building cus venture, ider Funding Option a for Startups n, Tata Mc Gruton, "Entre	rowth Sales plan, I es of costs, pr economics a branding ar tomer acquis ntifying sourc ons, Build an and Entrepre	People plan a reparing the frand analyzing and its elements of funds: I lovestor reactions. Live beany, New Door. The Art, S	Learn appro- and financial nancial plan the plan state of the plan state of the plan The plan state of the plan state of the plan The plan state of the plan state of the plan The plan state of the plan state of the plan The plan state of the plan state of the plan The plan state of the plan state of the plan The plan state of the plan state of the plan The plan state of t	plan, using g the Right g a form of	[6] 30 Your Own
Busing Preparation of Control Change & Equation 1.	ess Pla ess pla ring a b cial tem th and t Marke uction nel, cre ess org ity, Map Steph Profita Charle 2nd E	n, Financial nning: compousiness plar plate, unde he financial t Strategies to Go to meating digita anization spot he Start-up: en Key, "On able Compares Bamford Edition, Tata	feasibility and conents of Bun. Financial Presending bath performance and Funding arket strategal presence, ecific to your of Lifecycle to be Simple Ideatiny" 1st Edition	I Managing grisiness plan- lanning: Type sics of Unit lies, start-up building cus venture, ider Funding Option a for Startups n, Tata Mc Gruton, "Entre	rowth Sales plan, I es of costs, pr economics a branding ar tomer acquis ntifying sourc ons, Build an and Entrepre	People plan a reparing the frand analyzing and its elements of funds: I lovestor reactions. Live beany, New Door. The Art, S	Learn appro- and financial nancial plan the plan state of the plan state of the plan The plan state of the plan state of the plan The plan state of the plan state of the plan The plan state of the plan state of the plan The plan state of the plan state of the plan The plan state of the plan state of the plan The plan state of the plan state of the plan The plan state of t	plan, using g the Right g a form of otal Hours: s and Create	[6] 30 Your Own
Busing Preparation of Control Change & Equation 1.	ess Pla ess pla aring a b cial tem th and t Marke uction nel, cre ess org ity, Map Steph Profita Charle 2nd E ence(s)	n, Financial inning: compousiness plar plate, unde he financial t Strategies to Go to meating digital anization spoothe Start-up to the Start-	feasibility and conents of Bun. Financial Prestanding ban performance and Funding arket strategal presence, ecific to your becific to your becific to general Esimple Ideany" 1st Editionand Garry Endoctory E	I Managing grainess plan- lanning: Type sics of Unit lies, start-up building cus venture, ider Funding Option a for Startups n, Tata Mc Gruton, "Entre Company, N	branding ar tomer acquisitifying sourcons, Build an and Entrepresentation of the presentation of the prese	People plan a reparing the frand analyzing and its element its ele	Learn appro- and financial nancial plan by this, Selectin ly, Choosing bebt ly pitch deck. T Your Dreams elhi, 2013. cience, and	plan, using g the Right g a form of otal Hours: s and Create	[6] 30 Your Own Success",
Busing Preparation of Control Change & Equal Text E 1.	ess Pla ess pla aring a b cial tem th and t Marke uction nel, cre ess org ity, Map Steph Profita Charle 2nd E ence(s) Philip Oxford Janet	n, Financial nning: compousiness plar plate, unde he financial t Strategies to Go to meating digita anization spot he Start-up en Key, "Onable Compares Bamford Edition, Tata compound to the Start-up en Key	feasibility and conents of Bu n. Financial Prstanding ba performance and Funding arket strateg al presence, ecific to your of Lifecycle to esimple Ideany" 1st Edition and Garry Editionand Garry	ation-Importal I Managing grainess plandanning: Type sics of Unit lies, start-up building cus venture, ider Funding Option a for Startups n, Tata Mc Gruton, "Entre Company, National Prosperity: In Smith Richard."	branding ar tomer acquistifying source ons, Build an and Entrepreservable. and Entrepreservable, 20 How Entrepreservable.	People plan a reparing the fand analyzing and its elemensition strateges of funds: Investor reactions. The Art, Seneurs Are Tientrepreneurs.	Learn appro- and financial nancial plan by Choosing Debt ly pitch deck. T Your Dreams elhi, 2013. cience, and	plan, using g the Right g a form of Total Hours: s and Create Y Process for	[6] 30 Your Own Success",
Busing Preparation of Control Change & Equation 1.	ess Pla ess pla ring a b sial tem th and t Marke uction nel, cre ess org iity, Map Steph Profita Charle 2nd E ence(s) Philip Oxford Janet Deal S Edwal	n, Financial nning: compousiness plar plate, unde he financial t Strategies to Go to meating digita anization spot the Start-up of the Start-up es Bamford dition, Tata in the start-up of the Start-up es Bamford dition, Tata in the start-up of the Start-up es Bamford dition, Tata in the start-up of the start-up es Bamford dition, Tata in the start-up of the start-up es Bamford dition, Tata in the start-up es Bamford dition	feasibility and conents of Bun. Financial Prestanding bath performance and Funding arket strategal presence, ecific to your builded by a simple Idea by and Garry Education and Garry Educ	I Managing grainess plan- lanning: Type sics of Unit lies, start-up building cus venture, ider Funding Option a for Startups n, Tata Mc Gruton, "Entre Company, N Prosperity: Headings and Fire Smith Richard Comics and Fire I start of the comics and Fire I start of the comics and Fire I start of the company	branding ar tomer acquistifying sourcons, Build an and Entrepresentation of the Delhi, 20. How Entrepresentation.	People plan a reparing the frand analyzing and its elemensition strategies of funds: Investor reactions, New Door: The Art, Seneurs Are Transcriptions.	Learn appro- and financial nancial plan by choosing bebt ly pitch deck. T Your Dreams elhi, 2013. cience, and cransforming to	plan, using g the Right g a form of Total Hours: s and Create Process for the Global Eco	[6] 30 Your Own Success", onomy",

S. No.	Topics	No. of hours					
1.0	Introduction to Entrepreneurship & Entrepreneur						
1.1	Meaning and concept of Entrepreneurship and the history of Entrepreneurship Development	1					
1.2	The Entrepreneur: Meaning, the skills required to be an entrepreneur, the entrepreneurial decision process,	1					
1.3	Myths of Entrepreneurship, How to Become a Successful Entrepreneur - Dr Romesh Wadhwani (Platform on boarding)	1					
1.4	Role models, Mentors and Support system- Masterclass on My Story - Joshua Salins						
1.5	Role of Entrepreneurship in Economic Development, Agencies in Entrepreneurship Management and Future of Entrepreneurship						
1.6	Innovation and Creativity, types of innovations, Innovations in current scenario, Concepts of Entrepreneurial Thinking, General Enterprising tendency test	1					
2.0	Problem-Opportunity Identification, Customers Discovery and competitive advantage						
2.1	Understanding the Problem and opportunity, define problem using Design thinking principles and validate problem. Case study and Fireside chat – Desi Hangover	1					
2.2	Identifying a problem for practice venture and filling Problem statement canvas (Handout week 1 - class activity)	1					
2.3	Customer and markets discovery , knowing your customer and consumer, Customer segmentation and Exploring market types and estimating the market size. Case study and Fireside chat – Verloop						
2.4	Creating customer personas & Market estimation (Handout week 2 - class activity)						
2.5	Importance of Value Proposition, Introduce Value Proposition Canvas, Developing Problem-solution fit. Case study and Fireside chat – Honey Twigs						
2.6	Competition analysis, Blue ocean strategy, Competitive positioning and understanding unique selling points. Case study and Fireside chat on Inzpira Fill Value Proposition Canvas (Handout week 3 - class activity) and Competition analysis framework (Handout week 5 - class activity) Briefing on Assignment 1 - Milestone 1						
3.0	Business model and Build your MVP						
3.1	Introduction to Business model and types. Case study and Fireside chat - NUOS	1					
3.2	Lean approach, 9 block lean canvas model, riskiest assumptions to Business models	1					
3.3	Class Activity- Fill Lean canvas for you idea and understand revenue model (Handout week 6)	1					
3.4	Prototyping, Meaning of MLP, Difference between MLP and MVP, How to build an MLP? Different types MLP that you can build. Case study and Fireside chat – KNORISH	1					
3.5	Hypothesis testing and MVP Validation, MVP Iteration-Importance of Build - Measure – Learn approach	1					
3.6	Class Activity- Fill MVP framework (Handout week 7) and learn validation	1					
4.0	Business Plan, Financial feasibility and Managing growth						
4.1	Business planning: components of Business plan- Sales plan, People plan and financial plan, Preparing a business plan. Case study and Fireside chat – Bodh Gems	1					
4.2	Financial Planning: Types of costs, preparing the financial plan using financial template (Handout week 9)	1					
4.3	Class activity - starting up costs, COGS, Sales plan and people plan template.	1					
4.4	Class activity - One year P&L projection, Breakeven Analysis, Five year projection	1					





B.TECH.(FT)-2022-2023

		B.TECH.(FT)-202
4.5	Understanding basics of Unit economics and analyzing Growth and the financial performance	1
4.6	Class activity - Financial template - Unit economics (Handout week 12)	1
5.0 Go To Market Strategies and Funding		
5.1	Introduction to Go to market strategies, start-up branding and its elements, Selecting the Right Channel	1
5.2	Creating digital presence, building customer acquisition strategy.	1
5.3	Class activity: Handout week 10 - create your GTM strategy	1
5.4	Choosing a form of business organization specific to your venture	1
5.5	Identifying sources of funds: Debt & Equity, Map the Start-up Lifecycle to Funding Options	1
5.6	Class activity - Visit relevant GOI websites, other sites to help students explore funding opportunities and briefing on final submission of the pitch deck Build an Investor ready pitch deck, What Should You Cover in Your Pitch Deck? Art of pitching and storytelling	1

Course Designer(s)

1. Dr.N.Tiruvenkadam - tiruvenkadam@ksrct.ac.in

60 FT 5P1	Dairy Technology	Category	L	T	Р	Credit
00113F1	Laboratory	PC	0	0	3	1.5

- The students will be able to analyze the milk sample and its grading.
- Production process of various types of butter and milk products.
- To provide knowledge on packing equipment in milk processing.
- To impart knowledge on Resazurian testing
- To identify fermented and non-fermented milk products

Pre-requisites

Nil

_		-			
Cou		Λ.	-4-		
L.OII	rse	C 71	ITC	ОΠ	168

On the successful completion of the course, students will be able to

Off the 3uc	cessial completion of the coarse, stadents will be able to	
CO1	Analyze the physico-chemical properties of milk	Apply
CO2	Apply platform tests for assessing milk quality	Analyze
CO3	Estimate the efficiency of dairy processing equipment	Analyze
CO4	Analyse the process of resazurian testing of milk	Understand
CO5	Estimating the separating efficiency of cream.	Analyze

Mappii	Mapping with Programme Outcomes														
COs		POs											PSOs		
003	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1	3	2	2	3	-	2	2	2	3	3	-	-	2	3	-
CO2	3	3	3	3	-	2	2	2	2	3	-	-	2	3	-
CO3	3	2	3	3	-	2	2	2	3	3	-	-	2	3	-
CO4	3	2	3	3	-	2	2	2	3	3	-	-	2	3	-
CO5	3	2	3	3	-	2	2	2	3	3	-	-	2	3	-
3 - Stro	3 - Strong; 2 - Medium; 1 - Some														

Assessment Pattern

Bloom's Category	Lab Experiments (Mar		Model Examination (Marks)	End Sem Examination (Marks)
	Lab Activity			(marrio)
Remember	-	-	-	-
Understand	-	-	-	-
Apply	25	12	50	50
Analyze	25	13	50	50
Evaluate	-	-	-	-
Create	-			-
Total	50 25		100	100

K.S.Rangasamy College of Technology – Autonomous R2022										
B.Tech. – Food Technology										
	60 FT 5P1 - Dairy Technology Laboratory									
Semester	I	Hours/Week		Total	Credit	Ma	ximum Mark	(S		
Semester	L	Т	Р	Hrs	С	CA	ES	Total		
V	0	0	3	45	1.5	60	40	100		

List of Experiments:

- 1. Studies on Milk sampling, judging and grading of milk
- 2. Experiment of clot on Boiling test and Alcohol index of milk
- 3. Detection of adulterants in milk
- 4. Determination of Fat, SNF and total solids of milk
- 5. Studies on the regeneration efficiency process of milk.
- 6. Methylene blue reduction (MBR) test for milk
- 7. Resazurian test of milk
- 8. Development of flavored and fortified milk**
- 9. Development of paneer**
- 10. Determine the separating efficiency of the cream separator*
- 11. Determination of churning efficiency of butter churner *
- 12. Studies on the efficiency of spray dryer

Lab Manual

1. "Dairy Technology Lab Manual", Department of Food Technology, KSRCT.

Course Designer(s)

1. Mr. S. Nithishkumar- nithishkumar@ksrct.ac.in

^{*}SDG 9 – Industry Innovation and Infrastructure

^{**}SDG 3 - Good Health and Well Being

60 FT 5P2	Food Process	Category	L	Т	Р	Credit
0011312	Engineering Laboratory	PC	0	0	3	1.5

- To analyse and determine various physical properties of grains
- To analyze efficiency of desheller, dryer and grinders
- To familiarize on mechanical separation in food samples
- To brief on crystallization process performed at food processing industries.
- To impart knowledge on minimal processing of food samples.

Pre-requisites

Thermal Engineering

Course Outcomes

On the successful completion of the course, students will be able to

CO1	Estimate engineering properties of agricultural produce	Apply
CO2	Evaluate the performance of agro-processing equipment's	Analyze
CO3	Assess the effectiveness of size reduction equipment's	Analyze
CO4	Formulate the and determine the shelling efficiency	Understand
CO5	Analyse the minimal processing of fruits and vegetables	Analyze

Mappir	Mapping with Programme Outcomes														
COs	POs												PSOs		
003	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1	2	3	2	-	2	2	2	2	3	3	-	2	2	3	-
CO2	3	2	2	2	3	1	2	2	-	3	-	2	2	3	-
CO3	3	3	3	1	2	2	3	-	2	2	-	2	2	3	-
CO4	3	2	-	2	2	3	2	2	3	3	-	3	2	3	-
CO5	2	3	-	2	3	2	2	2	3	3	-	3	2	3	-
3 - Stro	3 - Strong; 2 - Medium; 1 - Some														

Assessment Pattern

Bloom's Category	Lab Experiments (Mar		Model Examination (Marks)	End Sem Examination (Marks)
	Lab	Activity		()
Remember	-	-	-	-
Understand	-	-	-	-
Apply	25	12	50	50
Analyze	25	13	50	50
Evaluate	-	-	-	-
Create			-	-
Total	50	25	100	100

K.S.Rangasamy College of Technology – Autonomous R2022											
	B.Tech. – Food Technology										
60 FT 5P2 - Food Process Engineering Laboratory											
Semester		Hours/Week		Total	Credit	Ма	ximum Mark	S			
Semester	L	Т	Р	Hrs	С	CA	ES	Total			
V	0	0	3	45	1.5	60	40	100			

List of Experiments:

- 1. Determination of size, roundness, and sphericity of food products.
- 2. Determination of bulk density, true density, and porosity of food products.
- 3. Determination of angle of repose and coefficient of friction of food products.
- 4. Performance evaluation of twin-screw extruder using Design of Experiments.
- 5. Experiment on drying of various food samples by fluidized bed dryer*
- 6. Experiment on drying of various food samples by microwave dryer*
- 7. Experiments on freezing point determination of given food sample
- 8. Experiments on dehydration and rehydration characteristics of food samples.
- 9. Determination of Shelling efficiency of Paddy Dehusker *
- 10. Determination of fineness module using Hammer and ball mill*

Activity Experiment

Experiment on Minimal processing of fruit and vegetables.

Lab Manual

1. "Food Process Engineering", Department of Food Technology, KSRCT.

Course Designer(s)

1. P. Aarthi - aarthi@ksrct.ac.in

^{*}SDG 9 – Industry Innovation and Infrastructure

60 FT 5P3	Design Thinking and	Category	L	Т	Р	Credit
00 F1 3F3	Innovation Laboratory	PC	0	0	2	1

- Understand the principles of design thinking and their application in engineering innovation
- Identify real-world engineering problems through brainstorming and mind mapping
- Explore problem space using secondary research methods, including the 5Ws and 1H Matrix, and user participant mapping
- · Conduct primary research from multiple perspectives to ensure a user-centered approach
- Define and analyze problem areas to develop clear and well-structured problem statements

Pre-requisites

-Nil-

Course C	Outcomes	
On the su	ccessful completion of the course, students will be able to	
CO1	Apply design thinking principles to promote innovation.	Apply
CO2	Identify and articulate real-world engineering problems through brainstorming and mind map techniques.	Apply
CO3	Perform secondary research using tools 5Ws and 1H Matrix and user participant mapping to explore problem spaces.	Apply
CO4	Conduct primary research to gather insights from diverse perspectives, ensuring a user- centered approach in problem-solving.	Apply
CO5	Define and analyze problem areas to create precise and actionable problem statements.	Analyse

Mappi	Mapping with Programme Outcomes														
COs	POs											PSOs			
COS	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1	3	3	-	-	-	-	-	3	3	3	-	-	-	2	3
CO2	3	-	-	-	-	3	3	3	3	3	-	-	-	2	3
CO3	3	-	-	-	-	-	-	3	3	3	-	-	-	2	3
CO4	3	-	-	-	-	-	-	3	3	3	-	-	-	2	3
CO5	3	3	-	-	-	-	-	3	3	3	-	-	-	2	3
3 - Str	ong; 2	- Mediu	m; 1 - S	Some									•		

Assessment Pa	attern									
_	view I CO1)		(C	Review II O2,CO3,CO4)		Reviev (CO:		Total (R1+R2+ R3)	
Identification of Existing Problems and Solutions	Apply design thinking principles	renort	of Problem	RACASTON ON	Presentation	Analysis of Problem Space	OIOR	Presentation	Total	Internal
10	10	10	10	30	10	5	10	5	100	60

	Report and Presentation (CO1, CO2, CO3, CO4 & CO		External
Report	Presentation	Total	
50	50	100	40

		K.	S.Rangasar		of Technolog		mous R202	2		
					- Food Tech					
60 FT 5P3 – Design Thinking and Innovation Laboratory Hours/Week – Credit Maximum Mar										
Sem	ester	<u> </u>			Total Hrs					
L .	V	0	T 0	P 2	30	C 1	60	ES 40	Total 100	
Design Thinking and Innovation Process Introduction to Design Thinking and Innovation - Design, Design Thinking, Innovation - Stages of Design Thinking Process - Case Study: Analysis of Existing Problems and Solutions.										
Identi	ification	Problem and Selection g- affinity-Lir		m to Solve,	Tools - Brair	n-storming-	Sorting & aff	inity- Links,	[4]	
Inforn	nation (Sathering: fro		existing - S	econdary Re able - User F			Why, who,	[6]	
Unde	rstandir	ig your Us		ment - Prir	mary resear extual Inquiry		rvation, Cor	nversations,	[6]	
Identi	ify, Cla		pare, Priori		relate inforr R) - Redefinir				[6]	
							Te	otal Hours:	30	
Refer	rence							•		
1.	•	Bombay. http https://dsourc NPTEL: Des Bombay. http	os://onlineco ce.in/dti .ign, Technol os://onlineco ovation by D	urses.swaya logy and Inno urses.nptel.ac Design by Pr	m2.ac.in/aic2 ovation by Pr c.in/noc20_de of. B. K. Ch	23_ge17/prevof. B. K. Chae03/previewakravarthy,	view, *	School of De	Design, IIT	

^{*}SDG 9 – Industry Innovation and Infrastructure

Guwahati & NID, Bengaluru.

Course Designer(s)

1. Dr.K.Raja - raja@ksrct.ac.in

60 CG 0P4	Career Skill	Category	L	T	Р	Credit
00 00 01 4	Development IV	CG	0	0	2	1*

- To help learners improve their vocabulary and enable them to use words appropriately in different academic and professional contexts.
- To help learners develop strategies that could be adopted while reading texts.
- To help learners acquire the ability to speak and write effectively in English in real life and career related situations.
- Improve listening, observational skills, and problem-solving capabilities
- Develop message generating and delivery skills

Pre-requisites

Basic knowledge of Arithmetic and Logical Reasoning

Course Outcomes

On the successful completion of the course, students will be able to

CO1	Compare and contrast products and ideas in technical texts.	Analyze
CO2	Identify cause and effects in events, industrial processes through technical texts	Analyze
CO3	Analyze problems in order to arrive at feasible solutions and communicate them orally and in the written format.	Analyze
CO4	Report events and the processes of technical and industrial nature.	Apply
CO5	Articulate their opinions in a planned and logical manner, and draft effective résumés in context of job search.	Apply

Mappir	ng with	Progra	amme (Outcom	es										
COs	POs									PSOs					
COS	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1	2	2	2	3	-	3	-	-	-	2	3	3	2	-	2
CO2	3	3	3	3	-	2	-	-	-	2	3	3	2	-	2
CO3	2	2	2	2	-	3	-	-	-	2	3	3	2	-	2
CO4	3	3	3	3	-	2	-	-	-	2	3	3	2	-	2
CO5	3	3	3	3	-	2	-	-	-	2	3	3	2	-	2
3 - Stro	ong; 2 -	Mediur	n; 1 - S	ome											

		K.S	.kangasa			gy – Autonor	nous R2022	2	
					. Food Techi				
			60	CG 0P4 - Ca	reer Skill De	evelopment l	V		
Seme	ester	Но	urs/Week		Total	Credit	Ма	ximum Marks	;
00	30101	L	T	Р	Hours	С	CA	ES	Total
'	V	0	0	2	30	1*	100	00	100
Seati nequ	ng Arrar ıality – E	alytical Reaso ngements – Ar Eligibility Test	nalytical Re	easoning (PL	JZZELS) – M	achin input ar	nd output - C	Coded	[6]
Perm		Aptitude - Par and Combinati		ability - Quad	ratic equation	n - Geometry	– Clock – C	Calendar –	[6]
		Reasoning							
		oletion of Figun Polete Figure –							[6]
Quan Quan Mens Recta	e – Com		Paper Curt – 5 The and Sure of the sure of	itting and Fol	ding – Mirror	images and Shapes – 2l	Water Image D Shapes –	es	[6]
Quan Mens Recta etc. Data	e – Con ntitative suration angle, To Interpre	Aptitude - Par of Area, Volur	rt – 5 me and Su etc 3D s malysis n text - Da	urface area in Shapes – Cu	ding – Mirror n 2D and 3D be, Cuboid ,	Shapes – 2l Sphere , Con	Water Image D Shapes – le,	Square,	
Quan Mens Recta etc. Data	e – Con ntitative suration angle, To Interpre	Aptitude - Par of Area, Volur riangle, Circle, etation and An	rt – 5 me and Su etc 3D s malysis n text - Da	urface area in Shapes – Cu	ding – Mirror n 2D and 3D be, Cuboid ,	Shapes – 2l Sphere , Con	Water Image D Shapes – ie , Pie chart , E	Square,	[6]
Quan Mens Recta etc. Data Data And L	e – Com ntitative suration angle, To Interpre interpre Line gra	Aptitude - Par of Area, Volur riangle, Circle, etation and An etation Based on ph – Venn Dia	rt – 5 ne and Su etc 3D S alysis n text - Da gram - Da	urface area ir Shapes – Cu ta interpretat	ding – Mirror 2D and 3D be, Cuboid ,	Shapes – 2l Sphere , Con	Water Image D Shapes – ie , Pie chart , E	Square, Bar graph, Total Hours:	[6]
Quan Mens Recta etc. Data Data And L	e – Com stitative suration angle, To Interpre interpre interpre interpre interpre interpre Aggar	Aptitude - Par of Area, Volur riangle, Circle, etation and An tation Based o ph – Venn Dia	rt - 5 me and Su etc 3D S allysis n text - Da gram - Da	urface area ir Shapes – Cu ta interpretat ta sufficiency	ding – Mirror 2D and 3D be, Cuboid ,	Shapes – 2l Sphere , Con	Water Image D Shapes – ie , Pie chart , E	Square, Bar graph, Total Hours:	[6]
Quan Mens Recta etc. Data Data And L	e – Com atitative suration angle, To Interpre interpre ine gra rence(s) Aggar 2009,	Aptitude - Par of Area, Volur riangle, Circle, etation and An tation Based o ph – Venn Diagon	rt - 5 me and Suetc 3D Sealysis n text - Dagram - Da	urface area ir Shapes – Cu ta interpretat sufficiency	n 2D and 3D be, Cuboid , ion Based or	Shapes – 2l Sphere , Con n Tabulation ,	Water Image D Shapes – le , Pie chart , E	Square, Bar graph, Total Hours:	[6]
Quan Mens Recta etc. Data Data And L Refer	e – Com atitative suration angle, To Interpre interpre ine gra rence(s) Aggar 2009,	Aptitude - Par of Area, Volur riangle, Circle, etation and Antation Based of ph – Venn Diar wal, R.S. 'A M S.Chand & Co Guha, 'Quantif h Khattar, 'Qua	rt - 5 me and Suetc 3D S allysis n text - Da gram - Da dodern App Ltd., New	urface area ir Shapes – Cu ta interpretat ta sufficiency proach to Ver Delhi.	ding – Mirror 2D and 3D be, Cuboid, ion Based or rbal and Non v Hill Education	Shapes – 2l Sphere , Con n Tabulation , -verbal Reaso on, 6 th edition	D Shapes – ne , Pie chart , E poning', Revis	Square, Bar graph, otal Hours:	[6]

SDG 4 – Quality Education SDG 8 – Decent work and Economic growth SDG 9 – Industry, innovation and Infrastructure

Course C	ontents and Lecture Schedule	
S. No.	Topics	No. of hours
1.0	Verbal & Analytical Reasoning	•
1.1	Seating Arrangements	1
1.2	Analytical Reasoning (PUZZELS)	1
1.3	Machin input and output	1
1.4	Coded Inequality	1
1.5	Eligibility Test	2
2.0	Quantitative Aptitude - Part – 4	·
2.1	Permutation and Combination	1
2.2	Probability	1
2.3	Quadratic equation - Geometry	1
2.4	Clock – Calendar	1
2.5	Logarithmic	2
3.0	Non-Verbal Reasoning	
3.1	Series Completion of Figures – Classification	1
3.2	Courting of figure – Figure matrix	1
3.3	Embedded Figure – Complete Figure	1
3.4	Paper Cutting and Folding	1
3.5	Mirror images and Water Images	2
4.0	Quantitative Aptitude - Part – 5	·
4.1	Mensuration of Area, Volume	1
4.2	Mensuration of Volume	1
4.3	Surface area in 2D and 3D Shapes	1
4.4	2D Shapes – Square, Rectangle, Triangle, Circle, etc.	1
4.5	3D Shapes – Cube, Cuboid , Sphere , Cone , etc.	2
5.0	Data Interpretation and Analysis	·
5.1	Data interpretation Based on text	1
5.2	Data interpretation Based on Tabulation, Pie chart	1
5.3	Bar graph, And Line graph	1
5.4	Venn Diagram	1
5.5	Data sufficiency	2

1. R. Poovarasan - poovarasan@ksrct.ac.in

K.S.RANGASAMY COLLEGE OF TECHNOLOGY, TIRUCHENGODE - 637215

(An Autonomous Institution affiliated to Anna University)

B.E. / B.Tech. Degree Programme

SCHEME OF EXAMINATIONS

(For the candidates admitted in 2022-2023) SIXTH SEMESTER

S.No.	Course	Name of the Course	Duration of	W	eightage of Ma	rks	Minimum M Pass in End Exar	Semester
3.NO.	Code	Name of the Course	Exam	Contin uous Assess ment *	End Semester Exam **	Max. Marks	End Semester Exam	Total
		ı	THE	ORY				
1.	60 HS 002	Engineering Economics And Financial Accounting	2	40	60	100	45	100
2.	60 FT 601	Baking and Confectionery Technology	2	40	60	100	45	100
3.	60 FT 602	Food Process plant layout and safety	2	40	60	100	45	100
4.	60 FT 603	Refrigeration and Cold Chain Management	2	40	60	100	45	100
5.	60 FT E3*	Professional Elective – III	2	50	50	100	45	100
6.	60 OE L0*	Open Elective – III	2	40	60	100	45	100
			PRAC	TICAL		•		
7.	60 FT 6P1	Baking and Confectionery Laboratory	3	60	40	100	45	100
8.	60 FT 6P2	Computational Laboratory for Food Technology	3	60	40	100	45	100
9.	60 FT 6P3	Design Thinking and Product Development Laboratory	3	60	40	100	45	100
10.	60 CG 0P5	Comprehension Test	-	100	-	100	-	100
11.	60 CG 0P6	Internship	-	100	-	100	-	100

^{*} CA evaluation pattern will differ from course to course and for different tests. This will have to be declared in advance to students. The department will put a process in place to ensure that the actual test paper follow the declared pattern.

^{**} End Semester Examination will be conducted for maximum marks of 100 and subsequently be reduced to 60 marks for theory End Semester Examination, 50 marks for theory cum practical End Semester Examination and 40 marks for practical End Semester Examination.

60 HS 002	Engineering Economics and	Category	L	T	Р	Credit
00110 002	Financial Accounting	HS	3	0	0	3

- To know about the economic principles underlying demand, supply, and market structure
- To understand the concept related to types of business organization and types of banking
- To know about concepts in financial accounting and capital budgeting
- To understand the different methods of pricing and appraisal of projects
- To know the application of break-even analysis in engineering projects

Pre-requisites

NIL

Course Outcomes

On the successful completion of the course, students will be able to

On the such	of the successful completion of the course, students will be able to								
CO1	Understand the basic concepts of economics, demand, supply, and market structure	Understand							
CO2	Understand the forms of business organization and functions of commercial and central bank	Understand							
CO3	Understand the basis of financial accounting and capital budgeting techniques	Understand							
CO4	Apply different types of pricing strategies and comprehensive project feasibility in diverse business	Apply							
CO5	Apply break even analysis in engineering projects and business	Apply							

Mappi	Mapping with Programme Outcomes														
COs	POs												PSOs		
003	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1	3	3	-	2	3	-	3	-	-	-	3	2	3	3	3
CO2	-	-	-	-	-	2	2	-	-	-	3	3	-	3	-
CO3	-	-	2	3	-	-	-	-	-	-	3	-	2	2	-
CO4	2	-	-	3	-	2	-	-	-	-	-	3	3	3	2
CO5	3	3	3	3	-	-	2	2	-	-	2	2	3	2	2
3 - Stro	ong; 2 -	Mediu	m; 1	- Some											

Assessment Pattern			
Bloom's Category	Continuous Ass (Ma		End Sem Examination (Marks)
Dicom o catogory	1	2	, ,
Remember	30	25	35
Understand	30	25	45
Apply	-	10	20
Analyze	-	-	-
Evaluate	-	-	-
Create	-	-	-
Total	60	60	100

Sylla	bus											
		K	.S.Rangasa			gy – Autono	mous R2022	2				
	B.Tech. Food Technology 60 HS 002 – Engineering Economics and Financial Accounting											
			HS 002 – E Hours/Week		conomics a	Credit		g ıximum Marks	<u> </u>			
Seme	ester	<u>'</u>	T	Р	Hours	C	CA	ES	Total			
VI		3	0	0	45	3	40	60	100			
Defin of Pro Affect Affect	oductio ting De ting Sup ct Cor	Economics - n - Definition mand, Elast oply, Elastici	n of Deman- icity of Dem ty of Supply	d – Law of land, Demar – Market Str	Demand, Ex nd Forecasti ucture –	asic Concept ception to L ng – Definition	aw of Dema on of Suppl	and, Factors y – Factors	[9]			
Formore Organ of Co	s of E nization mmerci s – Typ	, State Enter al Banks and	Sole Propri prise - Mixed d Central Bai ng - Short T	etorship, Pa I Economy - nk – Definitio erm Borrowir	Money and B on of Monetar	loint Stock canking – Kind y Policy and m Borrowing	ds of Banking its	g, Functions	[9]			
Financial Accounting and Capital Budgeting The Balance Sheet and Related Concepts – The Profit and Loss Statement and Related Concepts Financial Ratio Analysis – Definition of Working Capital – Types, Factors – Definition of Capital Budgeting - Techniques – Average Rate of Return, Payback Period, Net Present Value, Profitability Index Method and Internal Rate of Return.								n of Capital	[9]			
Types Cost Pract a Rat Bene	Margice – Fileof Refit Analge	sting – Trad ginal Cost – ull Cost Prici turn – Projec	Cost Outpung – Margina et Appraisal - pility Reports	t Relationsh al Cost Pricir Appraisal pr a — Technic	ip in the Sh ng – Going R ocess, - Cos al Feasibility	ased Costing ort Run and ate Pricing – t , Economic F	in Long Ru Bid Pricing	ın – Pricing – Pricing for	[9]			
Basic Even	Assun Chart,		idence – Ma	nagerial Use		ak-Even Cha Even Analysis			[9]			
		, and the second					Т	otal Hours:	45			
	Book(s				th _							
1.						on , McGraw						
2.	2018.		Varshney R.	_,, "Manageri	al economic	s", 22 nd Editi	on, S Chand	and Co., New	Delhi,			
Refer	rence(s											
1.							•	ns, New Delhi				
2.	Barth 2021.		dustrial Ecor	omics - An II	ntroductory",	4 th Edition, I	New Age Pub	olications, New	/ Delhi,			
3.		acharyya S. I d Publication		rdon, "Accou	nting for Mar	agement Tex	xt and Cases	", 3 rd Edition,	S			

^{*}SDG 9 - Increase Industry Innovation and Infrastructure

S. No.	Topics	No. of
		hours
1 1.1	Basic Economics Definition of connemies and connect connemies	1
1.1	Definition of economics – nature and scope of economics	1
	Basic concepts of economics, factors of production Definition of demand – law of demand	
1.3		1
1.4	Exception to law of demand	1
1.5	Factors affecting demand, elasticity of demand Demand forecasting	1
1.6		1
1.7	Definition of supply – factors affecting supply,	1
1.8	Elasticity of supply Market structure and feet composition important composition	1
1.9	Market structure – perfect competition, imperfect competition	1
2	Organization and Business Financing	
2.1	Forms of business – sole proprietorship, partnership	1
2.2	Joint stock company, cooperative organization, state enterprise	1
2.3	Mixed economy - Money and banking	1
2.4	Kinds of banking	1
2.5	Functions of commercial banks and central bank	1
2.6	Definition of monetary policy and its types	1
2.7	Types of financing	1
2.8	Short term borrowing, long term borrowing	1
2.9	Internal generation of funds	1
3	Financial Accounting and Capital Budgeting	
3.1	The balance Sheet and related concepts	1
3.2	The profit and loss statement and related concepts	1
3.3	Financial ratio analysis	1
3.4	Definition of Working capital – types	1
3.5	Factors	1
3.6	Definition of Capital budgeting - Techniques	1
3.7	Average rate of return, Payback period	1
3.8	Net present value, Profitability index method	1
3.9	Internal rate of return	1
4	Cost Analysis	
4.1	Types of costing - Traditional costing approach - activity based costing	1
4.2	Fixed Cost – variable cost – marginal cost	
4.3	Cost output relationship in the short run and in long run Prining practice full goet prining	1
4.4	Pricing practice – full cost pricing Magginal cost pricing, going rate pricing	1
4.5	Marginal cost pricing, going rate pricing	1
4.6	Bid pricing – pricing for a rate of return	1
4.7	Project appraisal - appraisal process - Cost benefit analysis	1
4.8	Feasibility reports — technical feasibility, economic feasibility	1
4.9 5	Financial feasibility, managerial feasibility, operational feasibility	
	Break Even Analysis	
5.1	Basic assumptions – break-even chart	2
5.2	Profit zone in break-even chart, Loss zone in break-even chart	2
5.3	Angle of incidence	2
5.4	Managerial uses of break-even analysis	2
5.5	Applications of break-even analysis in engineering projects	1

- 1. Mr.V.S.Vijayachander vijayachander@ksrct.ac.in
- 2. Dr.E.kalaivani kalaivanie@ksrct.ac.in



60 FT 601	Baking and Confectionery Technology	Category	L	Т	Р	Credit
3011301	Confectionery recrinology	PC	3	0	0	3

- To give knowledge in Bakery and confectionary technology.
- To provide knowledge on entrepreneurship and development of bakery product.
- To learn production process of cookies, biscuits, cakes and wafers.
- To know about production process of various confectionery products.
- To impart knowledge on quality parameters in a baking industry

Pre-requisites

Nil

Course Outcomes

On the successful completion of the course, students will be able to

On the back	On the successful completion of the course, students will be able to								
CO1	Recognize the role of ingredients, current status and classification of bakery products	Understand							
CO2	Illustrate the types of equipment used in bakery industry.	Apply							
CO3	Classify the types of bread making process and chemistry, defects of bread formation	Analyze							
CO4	Describe the production process of cookies, biscuits, cakes, wafers and pastry	Apply							
CO5	Explicate the current status, ingredients and production process of various confectionery products and their quality parameters	Analyze							

Mappi	Mapping with Programme Outcomes														
COs	POs												PSOs		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1	3	3	3	-	-	-	2	-	-	ı	ı	ı	2		-
CO2	3	3	3	-	-	-	2	-	-	-	-	-	2	3	3
CO3	3	3	3	-	-	-	2	-	-	-	-	-	-	3	2
CO4	3	3	3	-	-	-	2	-	-	-	-	-	2	3	3
CO5	3	3	3	-	-	-	2	-	-	-	-	-	-	2	3
3 - Stro	ong; 2 -	Mediur	m; 1 - S	ome											

Assessment Pattern	Assessment Pattern									
Bloom's Category	Continuous Asse (Ma	essment Tests rks)	End Sem Examination (Marks)							
	1	2								
Remember	10	10	10							
Understand	40	30	30							
Apply	10	10	30							
Analyze	-	10	20							
Evaluate	-	-	10							
Create	-	-	-							
Total	60	60	100							

Syllabus	1							
	K	.S.Rangasa				mous R2022		
				ood Techno				
	-)1 - Bakery a	and Confect			ssimas sua Maulsa	
Semeste	r	Hours/Week	Р	Total Hours	Credit C	CA	ximum Marks ES	Total
VI	3	0	0	45	3	40	60	100
Current its function Coloring	tion to Baking a status of bakery ons – flour, suga agents, flavoring bakery product	r, Classification, fat, salt, year agents, emu	on of bakery ast and bakir ulsifiers, antic	ng powder; e	mulsifiers- eg	gg, other ingr	redients -	[9]
Types of Spiral ar Types o	equipment and equipment used Planetary mix for Ovens and Sph Farinograph, graph.	d in baking p er, Dividing, l licers. Cooki	rocess; Bulk rounding, sh es wire cut	eeting, and la and droppi	aminating- F	ermentation	enclosures,	[9]
Bread making process Bread making methods - Straight dough/bulk fermentation, Sponge and dough, Activated dough development, Chorleywood bread process, No time process. Chemistry of Dough Development. Characteristics of good bread- Internal and external characteristics. Bread defects/faults and remedies. Microbial spoilage of bread - Causes, detection and prevention, Role of Enzyme in bread making process.								
Production short do of the do	oroducts** on of cookies/bis ugh 's, semi-swe ugh. Production s, Egg less cake,	et and enzyn process of C	ne modified o ake making:	dough and ba	atters- import	ance of the	consistency	[9]
Importan used in o stickines Fudge; A Manufac	onery products ce of sugar rhe confectionery, Ma s of sugar. Type erated confectio turing process- ers, faults and co	eology proper anufacture m s, Formulation onery-Method Chemistry o	ethods of high n, Processing s of aeration f Hydrocollo	gh boiled swe ig of confection i- oids -pre-trea	eets: Prevent onery produc tment Proce	ion of recrys sts: Caramel, esses-produc	tallized and Toffee and	[9]
						Т	otal Hours:	45
Text Bo								
1. S	amuel A. Matz, "I	Bakery Techr	ology and E	ngineering", 3	3rd Edition, C	hapman and	Hall, London,	2005.
2. E	dwards W.P. "Sc	ience of bake	ry products,	Published by	The Royal So	ociety of Che	mistry, UK,200)7.
Referen	ce(s):							
	eoff Talbot, Scie oducts, Wood h			robed and fille	ed chocolate	, confectione	ry and bakery	
	erenc A. Mohos, ackwell, UK, 20		ry and Choco	olate Enginee	ring: Principl	es and Applic	cations", Wiley	1
3. E	J. Pyler and L.A osland Publishin	. Gorton. Bak g Company,	ing Science Kansas City,	& Technology MO, USA, 2	y, Vol. II: Fori 009.	mulation & P	roduction, 4th	Ed.

^{*}SDG 9 - Industry Innovation and Infrastructure

^{**}SDG 3 - Good Health and Well Being

Course C	Course Contents and Lecture Schedule									
S. No.	Topic s	No. of hours								
1.0	Introduction to Baking and its ingredients	<u>I</u>								
1.1	Current status of bakery,	1								
1.2	Classification of bakery products Ingredients used in baking.	1								
1.3	Types and its functions – flour, sugar, fat, salt.	1								
1.4	Types and its functions-yeast and baking powder	1								
1.5	Emulsifiers- egg, other ingredients - Coloring agents	1								
1.6	Flavoring agents, emulsifiers, antioxidants	1								
1.7	Conditioners, CBE and CBS	1								
1.8	Leaving agents in bakery products.	1								
1.9	FSSAI guidelines	1								
2.0	Bakery Equipment and Rheology of dough									
2.1	Types of equipment used in baking process	1								
2.2	Bulk handling of ingredients	1								
2.3	Types of Dough mixers Spiral and Planetary mixer	1								
2.4	Dividing, rounding, sheeting	1								
2.5	Laminating- Fermentation enclosures	1								
2.6	Types of Ovens and Slicers	1								
2.7	Cookies wire cut and dropping machine	1								
2.8	Rheology of dough- Viscograph Farinograph	1								
2.9	Amylograph, Alveograph and Extensiograph	1								
3.0	Making process	I.								
3.1	Bread making methods - Straight dough/bulk fermentation	1								
3.2	Sponge and dough, Activated dough development	1								
3.3	Chorleywood bread process, No time process	1								
3.4	Chemistry of Dough Development	1								
3.5	Characteristics of good bread- Internal and external characteristics	1								
3.6	Bread defects/faults and remedies	1								
3.7	Microbial spoilage of bread- Causes, detection and prevention	2								
3.8	Role of Enzyme in bread making process	1								
4.0	Bakery products	I.								
4.1	Production of cookies/biscuits: ingredients and its functions	2								
4.2	Types of dough - Developed dough, short dough 's	1								
4.3	Semi-sweet and enzyme modified dough and batters	1								
4.4	Importance of the consistency of the dough	1								
4.5	Production process of Cake making	1								
4.6	Ingredients and its function: Icing and decoration for cakes	1								
4.7	Egg less cake, Wafers, puff pastry	2								
5.0	Confectionery products									
5.1	Importance of sugar rheology properties, types of sugar glucose and confectionery	1								
5.2	Ingredients used in confectionery	1								
5.3	Manufacture methods of high boiled sweets	1								
5.4	Prevention of recrystallized and stickiness of sugar	1								
5.5	Types, Formulation Processing of confectionery products- Caramel, Toffee and Fudge	1								
5.6	Aerated confectionery, Methods of aeration- Manufacturing process	1								
5.7	Chemistry of Hydrocolloids -pre-treatment Processes, Product quality parameters	1								
5.8	Faults and corrective measures	1								
5.9	Spoilage of confectionery products.	1								

1. P. Aarthi – aarthi@ksrct.ac.in

60 FT 602	Food Process Plant	Category	L	Т	Р	Credit
	Layout and Safety	PC	3	1	0	4

- To facilitate the student to understand the importance of location and plant selection.
- Identify and discuss food processing plant utilities
- To enable the student to understand various food process layout.
- To assist the student to understand about industrial accidents.
- Recognise the students to know about health hazards and industrial safety

Pre-requisites

Nil

Course Outcomes

On the successful completion of the course, students will be able to

011 1110 0000	bessial completion of the coarse, stadents will be able to	
CO1	Illustrate the types and characteristic features of location and plant selection.	Understand
CO2	Infer the different types of food plant utilities and symbols used for plant design	Apply
CO3	Analyse the different food factory production layout.	Analyze
CO4	Elucidate the occurrence of industrial accidents and fire accidents in food processing unit.	Apply
CO5	Elaborate the occupational hazards for food handlers, industrial safety and legal aspects.	Analyze

Mappii	Mapping with Programme Outcomes														
COs	POs											PSOs			
003	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1	3	3	3	3	-	2	2	-	-	-	-	-	3	-	-
CO2	3	3	3	3	-	2	3	-	-	-	-	-	-	2	2
CO3	3	3	3	3	-	2	3	-	-	-	-	-	-	-	-
CO4	3	3	3	2	-	2	3	-	-	-	-	-	2	-	2
CO5	3	3	3	2	-	2	2	-	-	-	-	-	3	-	-
3 - Stro	ong; 2 -	Mediur	n; 1 - S	ome											

Assessment Pattern											
Bloom's Category	Continuous Ass	sessment Tests (Marks)	End Sem Examination (Marks)								
Category	1	2									
Remember	10	10	10								
Understand	40	30	30								
Apply	10	10	30								
Analyze	-	10	20								
Evaluate	-	-	10								
Create	-	-	0								
Total	60	60	100								

	- L	C Danga	camy Call	age of Tochnology	- Autonom	oue P2022				
	<u>r</u>	\.S.Kanga		ege of Technology ech. Food Techno		ous R2022				
60 FT 602- Food Process Plant Layout and Safety										
	He	ours/Week			Credit		laximum Mark	S		
Semester	L	T	Р	Total Hours	С	CA ES		Total		
VI	3	1	0	60	4	40	60	100		
factors and Techniques Basics type	of site, process d other factors s involved in s es of plant layor	affecting site selection ut – importa	investmen on: Subject ant and flow	nent regulations and t and production of tive, Qualitative and w pattern, Layout ce determination,	costs. Flow	chart for p	plant design,	[9]		
Hygienic fo Basic outlir Criteria for	ne on FSMS. CI CIP' able Proce	sign – Princ P Sanitary ess Equipm	ciples of Sa Process de ent Design	nd Layout anitary design - equ esign: CIP system co –Application of CIP leaning Protocols a	omponents –	CIP progra		[9]		
Food buildi fruit and vo milk produc and air con equipment	egetables proc cts processing ditioning plant,	ayout designessing-size plant Meat boiler, pack	gn, prepara e reduction processing kaging plan	ation of machinery la machinery, evapo g machinery layout, at and ancillary ant-types, Oil extra	ration plant, Heat excha	drying pla inger plant,	ant. Milk and refrigeration	[9]		
Manufactui maintenand		rect productions	ction costs supplies,	(including raw mate power and other uplant.				[9]		
Health haz Classification Social. Sat procedure, personal pro	cards, Industria on of occupation fe handling and proper selection	al safety, IS onal hazard od operatio on and rep nent. ISO o	SO and Leg ds for food n of mach placement of industrial		praisal, step ent,	os to imple	ement safety	[9]		
					Total Hours	s: 45 + 15 (Tutorial)	60		
T D								- 00		
	rwol C K "Dlor							- 00		
				handling", Jain bro						
1. Aga				handling", Jain bro arbosa-Canovas, "F			C, London, 200			
1. Aga	onio Lopez-Gon						C, London, 200			
1. Aga 2. Anto	onio Lopez-Gon (s):	nez and Gu	ıstavo V. B		Food Plant De	esign", CR(05.		

^{*}SDG 9 – Industry Innovation and Infrastructure
**SDG 12 – Responsible Consumption and Production

Course Contents and Lecture Schedule								
S. No.	Topics	No. of hours						
1.0	Plant layout							
1.1	Selection of site, process and product	1						
1.2	Government regulations and other legal restrictions	1						
1.3	Community factors and other factors affecting investment and production costs	2						
1.4	Flow chart for plant design	1						
1.5	Techniques involved in site selection: Subjective, Qualitative and Semi- Quantitative Techniques	1						
1.6	Basics types of plant layout – important and flow pattern, Layout design procedure	2						
1.7	Layout of equipment and space determination.	1						
2.0	Overview of Sanitary and Hygienic Design and Layout							
2.1	Hygienic food process design	1						
2.2	Principles of Sanitary design equipment design and specifications Basic outline on FSMS.	2						
2.3	CIP Sanitary Process design	1						
2.4	CIP system components, CIP program control	1						
2.5	Criteria for CIP' able Process Equipment Design	1						
2.6	Application of CIP for Liquid and Solid Food Processes	2						
2.7	Typical Cleaning Protocols and Procedures.	1						
3.0	Various food processing plant layouts							
3.1	Food building plans and layout design,	1						
3.2	Preparation of machinery layout for various processing sectors:	1						
3.3	Fruit and vegetables processing-size reduction machinery, evaporation plant, drying plant	1						
3.4	Milk and milk products processing plant Meat processing machinery layout, Heat exchanger plant, refrigeration and air conditioning plant, boiler, packaging plant, and ancillary equipment plant	2						
3.5	Baking oven plant-types	1						
3.6	Frying plant-types	1						
3.7	Oil extraction, cereal, pulses, and spices processing plant layout	2						
4.0	Product Cost and Plant Overheads							
4.1	Manufacturing costs	2						
4.2	Direct production costs	1						
4.3	Direct production costs (including raw materials, human resources maintenance and repair)	2						
4.4	Direct production cost (operating supplies, power and other utilities, royalties, etc.).	2						
4.5	Process Profitability	 1						
4.6	Application to a Food Processing plant	<u>·</u> 1						
5.0	Health hazards, Industrial safety and Legal Aspects	•						
5.1	Classification of occupational hazards for food handlers: Physical, Chemical, Biological, Mechanical, Social	2						
5.2	Safe handling and operation of machineries	1						
5.3	Safety Appraisal, steps to implement safety procedure	<u>·</u> 1						
5.4	Proper selection and replacement of handling equipment	2						
5.5	Personal protective equipment	1						
5.6	Legal Aspects – factories act	1						
5.7	ESI Act, Workmen Compensation Act	<u>'</u> 1						
J. <i>1</i>	Lorrich, Wolfdfield Compensation Not	<u> </u>						

 $1. \ Mr. S. Nithishkumar - \underline{nithishkumar@ksrct.ac.in}$

60 FT 603	Refrigeration and Cold	Category	L	T	Р	Credit
0011 000	Chain Management	PC	3	1	0	4

- To impart basic knowledge of refrigeration process.
- To impart knowledge on equipment for refrigeration.
- To analyse refrigeration process, their application in processing.
- To know the refrigeration techniques for increasing shelf life of food.
- To learn cold chain design and storage.

Pre-requisites

Nil

Course Outcomes

On the suc	cessful completion of the course, students will be able to	
CO1	Analyse the basic concept of refrigeration based on the laws of thermodynamics, carnot systems	Analyze
CO2	Evaluate the application of vapour compression and vapour absorption cycle with P-H and T-S diagrams	Apply
CO3	Recall the types of evaporator and condenser and their applications in food industries.	Analyze
CO4	Design and construct cold storage units with proper precooling, insulation and operation by load calculation.	Apply
CO5	Comprehend the role of cold chain such as refrigeration, distribution and transport.	Analyze

Mappii	Mapping with Programme Outcomes														
COs	POs											PSOs			
003	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1	3	3	2	-	-	-	3	-	-	-	-	-	3	-	3
CO2	3	3	2	2	-	-	2	-	-	-	-	-	-	-	-
CO3	3	3	3	2	-	-	2	-	-	-	-	-	2	2	2
CO4	3	3	3	2	-	-	2	-	-	-	-	-	2	-	-
CO5	3	3	3	-	-	-	2	-	-	-	-	-	-	-	3
3 - Stro	ong; 2 -	Mediur	n; 1 - S	ome											

Assessment Pattern										
Bloom's Category	Continuous Asses (Mar		End Sem Examination (Marks)							
	1	2	7							
Remember	10	10	20							
Understand	20	20	30							
Apply	20	20	40							
Analyze	10	10	10							
Evaluate	-	-	-							
Create	-	-	-							
Total	60	60	100							

		K.S.Ranga	samy Colle	ge of Technology	– Autonom	ous R2022				
		T.O.I.Cariga		ch. – Food Techn		OUS INDUZ				
60 FT 603- Refrigeration and Cold Chain Management										
Semester	ŀ	lours/Week		Total Hours	Credit		aximum Marl	(S		
Semester	L	T	Р	Total nours	С	CA	ES	Total		
VI	3	1	0	60	4	40	60	100		
Introduction Introduction to refrigeration, unit of refrigeration capacity. Review of Second law of thermodynamics and interpretation. Production of low temperatures - principles and process. Refrigerants - classification and thermodynamic properties. Ozone depletion potential. Reversed Carnot cycle. Limitations of reversed Carnot systems.										
COP, Energe effect of op	n cycle – sir gy ratios and perating cond	Power cor ditions. Air	nsumption or efrigeration	on, vapour absor of a refrigerating r on system – rever cycle, Temperatu	nachine. Sta sed Brayton	ındard ratir	ng cycle and	[9]		
Components of A Refrigeration System* Evaporator- dry and flooded type, liquid cooling evaporator. Condenser- water cooled, air cooled and evaporative condenser. Compressor - Reciprocating type compressors. Expansion valve - thermostatic expansion valve.										
Expansion v				cating type comp	ressors.			[9]		
Low Tempe Pre-cooling unit*. Calcu coolers. Fro	rature Stora systems, Co lation of refrig	estatic expar ge Systems ld storage- of geration load , Cryogenic	nsion valve. construction, d in cold store s – Linde a	, insulation and op e. Prefabricated sy and Claude syste	eration. Des stems, walk-	-in-	•	[9]		
Low Tempe Pre-cooling unit*. Calcu coolers. Fro air, Modified Cold Chain Introduction, retail, Traces food product	rature Stora systems, Co lation of refrigizen storage I Planck's lav Components ability Application - candy r	ge Systems Id storage- of geration load , Cryogenic v for calcular s of cold cha attion of RFID nanufacture,	nsion valve. construction, d in cold store s — Linde a tion of freezi in. Refrigera D and role of beverage p	, insulation and op e. Prefabricated sy and Claude syste	eration. Des /stems, walk- m for liquefa	rin- action of a vstems, Col n in	ir, freezing in			
Low Tempe Pre-cooling unit*. Calcu coolers. Fro air, Modified Cold Chain Introduction, retail, Traces food product	rature Stora systems, Co lation of refrigizen storage I Planck's lav Components ability Application - candy r	ge Systems Id storage- of geration load , Cryogenic v for calcular s of cold cha attion of RFID nanufacture,	nsion valve. construction, d in cold store s — Linde a tion of freezi in. Refrigera D and role of beverage p	, insulation and op e. Prefabricated sy and Claude syste ing time tted distribution an packaging. Role of rocessing, bakery	eration. Des /stems, walk- m for liquefa	rin- action of a rstems, Col n in at products	ir, freezing in d chain in	[9]		
Low Tempe Pre-cooling unit*. Calcu coolers. Fro air, Modified Cold Chain Introduction, retail, Trace; food product products, fis	rature Stora systems, Co lation of refrigozen storage I Planck's law Components ability Application - candy richery product	ge Systems Id storage- of geration load , Cryogenic v for calcular s of cold cha attion of RFID nanufacture,	nsion valve. construction, d in cold store s — Linde a tion of freezi in. Refrigera D and role of beverage p	, insulation and op e. Prefabricated sy and Claude syste ing time tted distribution an packaging. Role of rocessing, bakery	eration. Des stems, walk- m for liquefa d transport sy f refrigeratio products, me	rin- action of a rstems, Col n in at products	ir, freezing in d chain in	[9]		
Low Tempe Pre-cooling unit*. Calcu coolers. Fro air, Modified Cold Chain Introduction, retail, Trace food product products, fis	rature Stora systems, Co lation of refrig ozen storage I Planck's law Components ability Application - candy rehery product	ge Systems Id storage- of geration load , Cryogenic v for calcular s of cold cha ation of RFIE nanufacture, s, fruit /vege	nsion valve. construction, d in cold store s — Linde a tion of freezi in. Refrigera D and role of beverage p etables and	, insulation and op e. Prefabricated sy and Claude syste ing time tted distribution an packaging. Role of rocessing, bakery	peration. Des ystems, walk- m for liquefa d transport sy of refrigeratio products, me	vstems, Col n in eat products	d chain in s, poultry	[9]		
Low Tempe Pre-cooling unit*. Calcu coolers. Fro air, Modified Cold Chain Introduction, retail, Traces food product products, fis Text Book(s 1. Rajpu 2. Dellir	rature Stora systems, Co lation of refrigozen storage I Planck's law Components ability Applica- tion - candy rehery product shery product	ge Systems Id storage- of geration load , Cryogenic v for calculat s of cold cha ation of RFID nanufacture, s, fruit /vege	sconstruction, d in cold store s — Linde a tion of freezi in. Refrigera D and role of beverage p etables and of d Air-condition	, insulation and op e. Prefabricated sy and Claude syste ing time ated distribution an packaging. Role of rocessing, bakery dairy products.	eration. Des /stems, walk m for liquefa d transport sy of refrigeratio products, me Total Hours	vstems, Col n in eat products s: 45 + 15 (*	ir, freezing in d chain in s, poultry Tutorial) (Publishers), I	[9]		
Low Tempe Pre-cooling unit*. Calcu coolers. Fro air, Modified Cold Chain Introduction, retail, Tracea food product products, fis Text Book(s 1. Rajpu 2. Dellir Reference(s	rature Stora systems, Co lation of refrigozen storage I Planck's law Components ability Application - candy rehery product sh: ut R.K., "Refrigo C.V.J., "Co	ge Systems Id storage- of geration load , Cryogenic v for calcular s of cold cha action of RFIE manufacture, s, fruit /vege	nsion valve. construction, d in cold store s — Linde a tion of freezi in. Refrigera D and role of beverage p etables and of d Air-condition	, insulation and ope. Prefabricated syand Claude systeing time Inted distribution an packaging. Role or rocessing, bakery dairy products. Onling", 3rd Edition echnology", 2nd E	eration. Des ystems, walk- m for liquefa d transport sy f refrigeratio products, me Total Hours , S.K. Kataria dition, Spring	estems, Col n in eat products s: 45 + 15 (a and Sons er, US, 201	ir, freezing in d chain in s, poultry Futorial) (Publishers), I	[9] [9] 60 Delhi, 201		
Low Tempe Pre-cooling unit*. Calcu coolers. Fro air, Modified Cold Chain Introduction, retail, Trace- food products products, fis Text Book(s 1. Rajpu 2. Dellir Reference(s	rature Stora systems, Co lation of refrigozen storage I Planck's law Components ability Application - candy rehery product sh: ut R.K., "Refrigo C.V.J., "Co	ge Systems Id storage- of geration load , Cryogenic v for calcular s of cold cha action of RFIE manufacture, s, fruit /vege	nsion valve. construction, d in cold store s — Linde a tion of freezi in. Refrigera D and role of beverage p etables and of d Air-condition	, insulation and op e. Prefabricated sy and Claude syste ing time tted distribution an packaging. Role of rocessing, bakery dairy products.	eration. Des ystems, walk- m for liquefa d transport sy f refrigeratio products, me Total Hours , S.K. Kataria dition, Spring	estems, Col n in eat products s: 45 + 15 (a and Sons er, US, 201	ir, freezing in d chain in s, poultry Futorial) (Publishers), I	[9] [9] 60 Delhi, 201		
Low Tempe Pre-cooling unit*. Calcu coolers. Fro air, Modified Cold Chain Introduction, retail, Trace: food product products, fis Text Book(s 1. Rajpu 2. Dellir Reference(s 1. Arora Delhi	rature Stora systems, Co lation of refrig ozen storage I Planck's lav Components ability Application - candy r shery product at R.K., "Refrig o C.V.J., "Co s): a C.P., "Refrig , 2008.	ge Systems Id storage- of geration load , Cryogenic v for calcular s of cold cha action of RFIE hanufacture, s, fruit /vege igeration And lid and Chille geration and	nsion valve. construction, d in cold stores	, insulation and ope. Prefabricated syand Claude systeing time Inted distribution an packaging. Role or rocessing, bakery dairy products. Onling", 3rd Edition echnology", 2nd E	eration. Des systems, walk- m for liquefa d transport sy of refrigeratio products, me Total Hours , S.K. Kataria dition, Spring	vstems, Col n in eat products s: 45 + 15 (a and Sons er, US, 201 v-Hill Publis	d chain in s, poultry Tutorial) (Publishers), I	[9] [9] 60 Delhi, 20		

^{*}SDG 9 - Industry Innovation and Infrastructure

Course Contents and Lecture Schedule								
S. No.	Topics	No. of hours						
1.0	Introduction							
1.1	Introduction to refrigeration	1						
1.2	Unit of refrigeration capacity	1						
1.3	Review of Second law of thermodynamics and interpretation	1						
1.4	Production of low temperatures - principles and process	1						
1.5	Production of low temperatures	1						
1.6	Refrigerants - classification and thermodynamic properties	1						
1.7	Ozone depletion potential	1						
1.8	Reversed Carnot cycle	1						
1.9	Limitations of reversed Carnot systems	1						
2.0	Refrigeration Systems							
2.1	Refrigeration cycle – simple vapour compression	1						
2.2	Vapour absorption cycle	1						
2.3	P-H and T-S diagrams and COP	2						
2.4	Energy ratios and Power consumption of a refrigerating machine	1						
2.5	Standard rating cycle and effect of operating conditions	1						
2.6	Air refrigeration system – reversed Brayton cycle	1						
2.7	Effect of super heating and sub cooling on vapour compression cycle	1						
2.8	Temperature sensors	1						
3.0	Components of A Refrigeration System	- L						
3.1	Evaporator- dry and flooded type	2						
3.2	Liquid cooling evaporator	1						
3.3	Condenser- water cooled, air cooled and evaporative condenser	2						
3.4	Compressor - Reciprocating type compressors	2						
3.5	Expansion valve - thermostatic expansion valve	2						
4.0	Low Temperature Storage Systems	1						
4.1	Pre-cooling systems	1						
4.2	Cold storage- construction, insulation and operation	1						
4.3	Design of cold storage unit	1						
4.4	Calculation of refrigeration load in cold store	2						
4.5	Prefabricated systems, walk-in-coolers	1						
4.6	Cryogenics – Linde and Claude system for liquefaction of air	1						
4.7	Freezing in air, Frozen storage	1						
4.8	Modified Planck's law for calculation of freezing time	1						
5.0	Cold Chain							
5.1	Introduction, Components of cold chain	1						
5.2	Refrigerated distribution and transport systems	2						
5.3	Cold chain in retail	1						
5.4	Traceability Application of RFID in cold chain.	1						
5.5	Role of refrigeration in food production - candy manufacture and beverage processing	1						
5.6	Role of refrigeration in food production - bakery products and meat products	1						
5.7	Role of refrigeration in food production - poultry products and fishery products	1						
5.8	Role of refrigeration in food production - fruit /vegetables and dairy products.	1						
0.0		1						

Dr. P. Shanmugam – shanmugam@ksrct.ac.in



60 FT 6P1	Baking and Confectionery	Category	L	Т	Р	Credit
	Laboratory	PC	0	0	3	1.5

- The students will be able to work in a bakery oven
- To impart various baking equipment in detail.
- The production process of various kinds of bakery products is highlighted.
- To learn the production process of cookies, biscuits, cakes, wafers
- To know about the production process of various confectionery products and their quality parameters

Pre-requisites

NIL

Course O	utcomes	
On the suc	ccessful completion of the course, students will be able to	
CO1	Analyze the quality of ingredients used in bakery products	Analyze
CO2	Develop different bakery products	Apply
CO3	Formulate various confectioneries	Analyze
CO4	Analyze various dough characteristics using a farinograph	Analyze
CO5	Develop new dough-based formulations	Apply

Mappii	Mapping with Programme Outcomes														
COs		POs											PSOs		
003	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1	1	1	2	3	-	3	3	3	3	2	-	3	3	-	3
CO2	1	1	3	2	-	2	2	3	3	2	-	3	3	-	-
CO3	1	1	3	2	-	2	2	2	3	2	-	3	3	-	-
CO4	1	1	2	3	-	3	3	3	3	2	-	3	3	3	-
CO5	1	1	3	2	-	2	2	3	3	2	-	3	3	-	3
3 - Stro	ong; 2 -	Mediur	n; 1 - S	ome											

Assessment Pattern

Bloom's Category	Lab Experiments (Ma	s Assessment irks)	Model Examination (Marks)	End Sem Examination (Marks)
	Lab	Activity		(,
Remember	-	-	-	-
Understand	-	-	-	-
Apply	25	12	50	50
Analyze	25	13	50	50
Evaluate	-	-	-	-
Create	-	-	-	-
Total	50	25	100	100

K.S.Rangasamy College of Technology – Autonomous R2022								
B. Tech Food Technology								
60 FT 6P1 - Baking and Confectionery Laboratory								
Somostor	I	Hours/Week		Total	Credit	Ma	ximum Mark	s
Semester	L	Т	Р	Hrs	С	CA	ES	Total
VI	0	0	3	45	1.5	60	40	100

List of Experiments:

- 1. Study of ingredients (major and minor): characteristics of flour, yeast, shortening, sugar, egg, and salts.
- Experiment with the leaving action of baking powder, sodium bicarbonate, and ammonium-bicarbonate, and yeast
- 3. Preparation of cakes by all-in-one method.*
- 4. Estimation of gluten content (Atta, and Maida)
- 5. Estimation of water absorption powder (Atta, and Maida)
- 6. Preparation of hard-boiled candies
- 7. Preparation of pasta and efficiency of rehydration.
- 8. Production of Marshmallows*
- 9. Preparation of hard and soft dough biscuits*
- 10. Preparation of bread-different types *
- 11. Studies on nutritional allergens of infant babies, Children and adults.

Lab Manual

1. Yogambal Ashok Kumar, 'Textbook of Bakery and Confectionery", 2nd Edition, PHI Learning Pvt. Ltd., 2012.

Course Designer(s)

1. Ms. P. Aarthi - aarthi@ksrct.ac.in

^{*}SDG 3 - Good Health and Well Being

60 FT 6P2	Computational Laboratory for Food	Category	L	Т	Р	Credit
0011012	Technology	PC	0	0	3	1.5

- To provide students with practical knowledge and hands on training in chemical engineering equipment.
- To illustrate principles of viscosity measurement and co-efficient of friction.
- To explore the knowledge on size reduction equipment
- To learn single effect evaporator and diffusivity measurements
- To learn various extraction process

Pre-requisites

NIL

Course Outcomes

On the successful completion of the course, students will be able to

On the suc	cessiui completion of the course, students will be able to	
CO1	Estimate the molecular weight, density, enthalpy of the reaction and cell potential using spread sheets	Apply
CO2	Predict the concentration of species and solubility of solute in aqueous solutions using Newton Raphson method	Analyze
CO3	Determine the free energy changes and equilibrium constant for a given reaction	Analyze
CO4	Study the kinetics and rate of a reaction; Estimate heat transfer area using composite curve	Understand
CO5	Apply MATLAB/ C program for design of shell and tube/ double pipe heat	Analyze

Mappii	Mapping with Programme Outcomes														
COs		POs											PSOs		
003	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1	3	3	3	2	-	2	-	-	2	3	-	-	3	3	-
CO2	3	3	3	2	-	2	-	-	2	3	-	-	3	3	-
CO3	3	3	3	2	-	2	-	-	2	3	-	-	3	-	-
CO4	3	3	3	2	-	2	-	-	2	3	-	-	3	3	-
CO5	3	3	3	2	-	2	-	-	2	3	-	-	3	3	-
3 - Stro	3 - Strong; 2 - Medium; 1 - Some														

Assessment Pattern

Bloom's Category	Lab Experiment (Ma	s Assessment arks)	Model Examination (Marks)	End Sem Examination (Marks)
	Lab	Activity		(marko)
Remember	-	-	-	-
Understand	-	-	-	-
Apply	25	12	50	50
Analyze	25	13	50	50
Evaluate	-	-	-	-
Create	-	-	-	-
Total	50	25	100	100

K.S.Rangasamy College of Technology – Autonomous R2022								
B. Tech. Food Technology								
60 FT 6P2 – Computational Laboratory for Food Technology								
Semester	I	Hours/Week		Total	Credit	Ma	Maximum Marks	
Semester	L	Т	Р	Hrs	С	CA	ES	Total
VI	0	0	3	45	1.5	60	40	100

List of Experiments:

- 1. Estimation of the following by using spread sheet
- (a) Molecular weight, density, enthalpy of the reaction
- (b) Volume of a Van der Waals gas as a function of pressure and temperature
- (c)Behavior of ideal gas volume based on temperature and pressure changes
- 2. Estimation of the following by using spread sheet
- (a) Cell potential
- (b) H + ion for a given acid by successive approximation
- 3. Computing the following by using Newton-Raphson technique
- (a) Concentrations of all species
- (b) Solubility of solute in aqueous solution
- 4. Computing the free energy changes and equilibrium constant for the given reaction
- 5. Error calculation for given graphical representation using spread sheet
- 6. Linearization of given graphical data using spread sheet chart
- 7. Identification of the kinetics and rate of the given reaction
- 8. Identification of the total heat transfer area by using composite curve
- 9. Drawing of PFD and PID using CAD / MS office (Visio)
- 10. Design of Shell and Tube heat exchanger using MATLAB / C program
- 11. Design of Double pipe heat exchanger using MATLAB / C program
- 12. Design of Condenser using MATLAB / C program
- 13. Design of Single effect evaporator using MATLAB / C program
- 14. Estimation of WBT and DBT
- 15. Mass transfer studies using breakthrough curve

Activity

Demonstrate and sketch the Process Flow Diagram and Process Instrumentation diagram in plant design.

Lab Manual

1. Computational techniques for process simulations and analysis using MATLAB, N. S. Kaisare, CRC Press, 2018.

Course Designer(s)

Dr. P. Shanmugam - shanmugamp@ksrct.ac.in

	Design Thinking and	Category	L	T	Р	Credit
60 FT 6P3	Product Development Laboratory	PC	0	0	2	1

- Ideate and develop innovative solutions for the given problem statement
- Develop soft prototype and visualize user scenarios for early-stage product validation
- Develop medium and hard prototype, integrating technical, ergonomic, and aesthetic considerations
- Conduct testing, gather user feedback, and apply iterative design processes
- Document, publish and present their solution

Pre-requisites

Design Thinking and Innovation Laboratory

Course	Outcomes

On the suc	On the successful completion of the course, students will be able to								
CO1	Generate innovative solutions to address specific problem statements.	Apply							
CO2	Create and evaluate soft prototype, including paper prototypes and storyboards, to test initial design concepts.	Create							
CO3	Create medium and hard prototype using 3D modelling and printing, incorporating human factors and system design.	Create							
CO4	Perform usability studies, analyze user feedback, and iterate their designs to finalize user-centered solutions.	Analyse							
CO5	Prepare professional documentation, and deliver a comprehensive project report and presentation.	Apply							

Mappi	Mapping with Programme Outcomes																
COs		POs													PSOs		
COS	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3		
CO1	3	3	3	-	2	3	3	3	3	3	1	3	3	2	3		
CO2	3	3	3	-	-	-	-	3	3	3	-	-	3	2	3		
CO3	3	3	3	3	3	-	-	3	3	3	-	-	3	2	3		
CO4	3	3	3	3	3	3	3	3	3	3	-	3	3	2	3		
CO5	3	-	-	-	-	-	-	3	3	3	3	-	3	-	-		
3 - Str	3 - Strong; 2 - Medium; 1 - Some																

Assessment Pattern

Re	view I (CO	1)	Rev	iew II (CO2	2,CO3)	Rev	view III (CO4)	(R1+R2+R3)	
Generatin g Creative ideas	Concept Maps and Evaluatio n	Presenta tion	Soft Prototypin g	Hi-fidelity prototypin g	Demonstrati on	User Studies & Feedbac k	е	Presentati on	Total	Interna I Marks
10	10	10	10	20	10	10	10	10	100	60

Report and Presentation (CO1, CO2, CO3,CO4 & CO5)								
Report	Report Presentation Demonstration Total							
50	30	20	100	40				

K.S.Rangasamy College of Technology – Autonomous R 2022										
B. Tech. – Food Technology 60 FT 6P3 – Design Thinking and Product Development Laboratory										
	60 F	Γ 6P3 – Desi	ign Thinking	and Produc	ct Developm	ent Laborat	ory			
Semester		Hours/Week	(Total Hrs	Credit	Ma	S			
Semester	L	T	Р	Totalilis	С	CA ES		Total		
VI	0	0	2	30	1	60	40	100		
Ideation Generating Creative ideas - Idea Sketching, Brainstorming for Ideas, SCAMPER, Creativity and Lateral thinking- Concept Maps and Evaluation										
Soft Prototyping Soft Prototyping - Paper Prototype (low-fidelity), Scenarios and Storyboarding, MVP (minimum Viable product).										
Final Prototyping Medium Prototyping - Proof of Concept (PoC), Info Architecture, Experience Design- Human Factors / Ergonomics - Systems Mapping – high prototyping - 3D Modelling & Printing.										
Usability Studies Solution.		on – Conver	sations - Thi	nk-aloud pro	tocol – Feed	back – Iterat	e - Finalise	[8]		
		al Publication	& Intellectua	al Property Ri	ights–Prepar	e project rep	ort and	[4]		
						To	otal Hours:	30		
Reference(s):									
NPTEL: Design Thinking and Innovation by Prof. Ravi Poovaiah, IDC School of Design, IIT Bombay. https://onlinecourses.swayam2.ac.in/aic23_ge17/preview , https://onlinecourses.swayam2.ac.in/aic19_de02/preview. NPTEL: Innovation by Design by Prof. B. K. Chakravarthy, IDC School of Design, IIT Bombay, https://onlinecourses.swayam2.ac.in/aic19_de02/preview.										
3 www.dsource.in , The Resource for Design by e-Kalpa Design Team,IDC, IIT Bombay, DoD, IIT Guwahati & NID, Bengaluru										

SDG 9 - Industry Innovation and Infrastructure

Course Designer(s)

1. Dr.K.Raja – raja@ksrct.ac.in

60 CG 0P5	Comprehension Test*	Category	L	Т	Р	Credit
	Comprehension rest	CG	0	0	2	1*

- To evaluate the knowledge gained in core courses relevant to the programme of study.
- To assess the technical skill in solving complex engineering problems.

Pre-requisites

Fundamental knowledge in all core subjects.

Course Outcomes

On the successful completion of the course, students will be able to

CO1	Infer knowledge in their respective programme domain.	Apply
CO2	Attend interviews for career progression	Apply
CO3	Exhibit professional standards to solve engineering problems	Apply
CO4	Promote holistic approach to problem solving	Apply
CO5	Examine the competency of graduates in specific programme domain	Apply

Mappi	Mapping with Programme Outcomes																
COs		POs													PSOs		
003	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3		
CO1	3	3	2	2	-	-	-	-	1	2	2	3	2	-	-		
CO2	3	3	2	2	-	-	-	-	1	2	2	3	2	-	-		
CO3	3	3	2	2	-	-	-	-	1	2	2	3	2	-	-		
CO4	3	3	2	2	-	-	-	-	1	2	2	3	2	-	-		
CO5	3	3	2	2	-	-	-	-	1	2	2	3	2	-	-		
3 - Str	3 - Strong; 2 - Medium; 1 - Some																

Assessment Pattern

The overall knowledge of the candidate in various courses he/she studied shall be evaluated with multiple choice questions.

*SDG:4- Quality Education

K.S.RANGASAMY COLLEGE OF TECHNOLOGY, TIRUCHENGODE - 637215

(An Autonomous Institution affiliated to Anna University) B.E. / B.Tech. Degree Programme SCHEME OF EXAMINATIONS

(For the candidates admitted in 2022-2023) SEVENTH SEMESTER

S.No.	Course	Name of the	Duration of	Weighta	ge of Marks	Pass in End	Minimum Marks for Pass in End Semester Exam		
	Code	Course	Internal Exam	Continuous Assessment *	End Semester Exam **	Max. Marks	End Semester Exam	Total	
	1	1	1	THEORY			•		
1.	60 FT 701	Food Additives, Nutraceutical and Functional Foods	2	40	60	100	45	100	
2.	60 FT 702	Food Packaging Technology	2	40	60	100	45	100	
3.	60 FT 703	Fermentation Technology	2	40	60	100	45	100	
4.	60 FT E4*	Professional Elective – IV	2	40	60	100	45	100	
5.	60 AC 001	Research Skill Development	2	100	-	100	-	100	
	•		PR	RACTICAL					
6.	60 FT 7P1	Food Packaging Laboratory	3	60	40	100	45	100	
7.	60 FT 7P2	Project Work Phase – I	3	100	-	100	-	100	
8.	60 CG 0P6	Internship	-	100	-	100	-	100	
9.	60 AB 00*	NCC/NSS/NSO/ YRC/RRC/Fine Arts*	-	50	50	100	-	100	

^{*} CA evaluation pattern will differ from course to course and for different tests. This will have to be declared in advance to students. The department will put a process in place to ensure that the actual test paper follow the declared pattern.



^{**} End Semester Examination will be conducted for maximum marks of 100 and subsequently be reduced to 60 marks for theory End Semester Examination, 50 marks for theory cum practical End Semester Examination and 40 marks for practical End Semester Examination.

60 FT 701	Food Additives, Neutraceuticals and	Category	L	Т	Р	Credit
0011701	Functional Foods	PC	3	0	0	3

- To enable the students to understand types of food additives
- To understand the applications of Food Colors, Emulsifiers and Stabilizers in Food Industry
- To gain knowledge about the basic concept of Neutraceuticals
- Impart knowledge on Functional Foods and Dietary supplements
- Familiarize with Safety and Quality Standards

Pre-requisites

Thermal Engineering

Course Outcomes

On the successful completion of the course, students will be able to

Off the 3det	bessial completion of the coarse, stadents will be able to	
CO1	Overview on food additives and study about role and function of different additives	Understand
CO2	Demonstrate about food colors and emulsifiers and identify different food additives used in food product	Understand
CO3	Study about importance and health benefits of Neutraceuticals and reveal about the technologies to recover Neutraceuticals	Understand
CO4	Illustrate different types of functional foods and identify the need and different forms of dietary supplement	Apply
CO5	Recognise the safety limits and regulation of food additives and explore method of determining toxicity	Apply

Mappi	Mapping with Programme Outcomes															
COs		POs												PSOs		
COS	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	
CO1	3	3	2	2	-	2	-	-	-	-	-	-	2	3	-	
CO2	3	3	2	2	-	2	-	-	-	-	-	-	2	3	-	
CO3	3	3	2	2	-	2	-	-	-	-	-	-	2	3	-	
CO4	3	3	2	2	-	2	-	-	-	-	-	-	2	3	-	
CO5	3	3	2	2	-	2	-	-	-	-	-	-	2	3	-	
3 - Stro	3 - Strong; 2 - Medium; 1 - Some															

Assessment Pattern	Assessment Pattern										
Bloom's Category	Continuous Ass (Ma	essment Tests arks)	End Sem Examination (Marks)								
	1	2									
Remember	20	10	20								
Understand	40	30	50								
Apply	-	20	30								
Analyze	-	-	-								
Evaluate	-	-	-								
Create	-	-	-								
Total	60	60	100								

Syllabus	.								
K.S.Rangasamy College of Technology – Autonomous R2022									
				Food Techn					
		60 FT 701 Food	d Additives,						
Semest	er	Hours/Week	_	Total	Credit		ximum Marks		
	L	T	Р	Hours	С	CA	ES	Total	
VII	3	0	0	45	3	40	60	100	
Food Additives * Overview — Types of food additives-As a preservative-Natural and chemical preservatives; preservatives; Antibiotics-Antioxidants; natural and chemical antioxidants; mechanism of antioxidant function nutritional supplements- Vitamins, Amino acids, minerals									
Natural a identical products polyols in	plors, Flavours, and synthetic co flavors; artificial ; polyols– physi n foods. Function ng agent, anti-ca	olors; certified f I flavors. Emuls cal and chemic nal properties a	ood dyes. Considers of the considers of the considers of the consideration of the considers of the consideration of the cons	oncept of Flactors of permits of polyols, a Sweeteners,	ted emulsifie application in	ers and stabili	zers in food	[9]	
Types, E phytoche Technolo dense ca processe Function Introducts products	nce and health b extraction and Astemicals, phytostogies to recover arbon-di-oxide tres and chemical nal foods** tion to dietary so, Chitosan ,Ech	ssessment of verols, prebiotics Nutraceuticals of eatment, encapil based proces upplements an inacea, Garlic,	arious nutrac s, probiotics a compounds: l osulation of r sses, nano e d functional Ginger, Gin	ceuticals- ant and synbiotic Distillation, ul nutraceuticals encapsulation food & beve kgo biloba, C	ioxidants, Or s of Nutraced trahydrostati s – materials rages; Agnu Ginseng, Gua	mega-3 Fatty uticals. c pressure tre s, mechanica scastus, Aloe arana, Kelp,	Acids, eatment, I e vera, Bee Milk thistle,	[9]	
for dietar	metto, Spirulina, ry supplements, nd Quality Star mits and regula	supplements fo	orms- tablets,	, capsules, po	owders, soft	gels, gel cap	s, liquids.		
exposure antioxida	e, toxicity types, ant, stabilizers, c sues of nutrace	Method of det colors and flavo	ermining tox rs. Health cla	icity - LD50.	FSSAI regu			[9]	
Total Hours:								45	
Text Boo	• •			100 11 "		<u> </u>	/ 1 5 "	0004	
1.	Belitz, H. D., Gro								
John Shi, Chi-Tang Ho and FereidoonShahidi— "Asian Functional Foods", First Edition, CRC Press, 2005.									
Referen	ce(s):								
1.	Wildman, Rober York, 2001 M. Ha edition, Blackwe	asler ,Regulatio	n of Function					rst	
	Lockwood, Brian Pharmaceutical		isa, —Nutrac	euticals: A G	uide for Healt	hcare Profes	sionals,		
3.	Food safety and	standards (foo	d products st	andards and	food additive	es) regulation	s, 2011.		
*CDC 2	Caad Haalth a	•	•			-			

^{*}SDG 3 - Good Health and Well Being

^{**}SDG 12 – Responsible Construction & Production

S. No.	Topics	No. of hours
1.0	Food additives	1.100.10
1.1	Overview – types of food additives	1
1.2	As a preservative-natural and chemical preservatives	1
1.3	Preservatives; antibiotics-antioxidants	1
.4	Natural and chemical antioxidants	2
1.5	Mechanism of antioxidant function nutritional supplements	1
1.6	Vitamins	1
1.7	Amino acids	1
1.8	Minerals	1
2.0	Food colors, flavours, emulsifiers and stabilizers	•
2.1	Natural and synthetic colors; certified food dyes	1
2.2	Concept of flavoring agent	1
2.3	Natural flavors; nature identical flavors; artificial flavors	1
2.4	Emulsifiers-functions of permitted emulsifiers and stabilizers in food products	1
2.5	Polyols– physical and chemical properties of polyols	1
2.6	Application in food industry, permitted polyols in foods	1
2.7	Functional properties and types of: sweeteners, leavening agent	1
2.8	Anti-caking agent, clarifying agent, gases and propellants	2
3.0	Nutraceuticals	1
3.1	Importance and health benefits of nutraceuticals	1
3.2	Plant animal and microbial based nutraceuticals	1
3.3	Types, extraction and assessment of various nutraceuticals	1
3.4	Antioxidants, omega-3 fatty acids, phytochemicals, phytosterols, prebiotics, Probiotics and synbiotics of nutraceuticals	1
3.5	Technologies to recover nutraceuticals compounds	1
3.6	Distillation, ultra-hydrostatic pressure treatment	1
3.7	Dense carbon-di-oxide treatment, encapsulation of nutraceuticals	1
3.8	Materials, mechanical processes and chemical based processes	1
3.9	Nano encapsulation	1
4.0	Functional foods	
4.1	Introduction to dietary supplements and functional food & beverages	1
4.2	Agnuscastus, aloe vera, bee products	1
4.3	Chitosan ,echinacea, garlic, ginger	1
4.4	Ginkgo biloba, ginseng, guaran	1
4.5	Kelp, milk thistle, saw palmetto	1
4.6	Spirulina, chlorella, hypericumperforatum, tea extracts	1
4.7	Dietary supplements – need for dietary supplements	1
4.8	Supplements forms- tablets, capsules, powders, soft gels, gel caps, liquids	2
5.0	Safety and quality standards	
5.1	Safety limits and regulation of food additives	1
5.2	Risk assessment and risk benefit indices of human exposure	1
5.3	Toxicity types	1
5.4	Method of determining toxicity – ld50	1
5.5	FSSAI regulations for preservative, antioxidant, stabilizers	2
5.6	FSSAI regulations for colors and flavors.	1
5.7	Health claims, regulation and safety issues of nutraceuticals foods	1
5.8	Health claims, regulation and safety issues of functional foods	1

1. Dr. K. Prabha –prabhak@ksrct.ac.in

60 FT 702	Food Packaging	Category	L	T	Р	Credit
0011702	Technology	PC	3	1	0	4

- To understand and acquiring the knowledge of packaging technology principles towards protection, communication, and transportation.
- Understand the properties of food packaging materials and their suitability in extending shelf life of food products.
- Impart knowledge on rationale in selecting packaging material for processed food products
- To make the students equipped with understanding of criteria required for designing a successful packaging system for any food product
- To acquire updated knowledge about the new technologies that are developing in packaging industries

Pre-requisites

Nil

Course Outcomes

On the successful completion of the course, students will be able to

CO1	Infer basic concepts in food packaging	Understand
CO2	Select suitable packaging materials for the extension of shelf life of food products	Analyze
CO3	Select and adapt recent trends in food packaging	Apply
CO4	Analyse the testing and labelling regulatory requirements with respect to food packaging industry	Analyze
CO5	Apply the new innovation in developing advanced food packaging material	Apply

Mappir	Mapping with Programme Outcomes														
COs	POs												PSOs		
003	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1	3	3	3	3	-	-	2	-	-	-	-	2	-	-	-
CO2	3	3	3	3	-	-	2	-	-	-	-	2	2	2	-
CO3	3	3	3	3	-	-	2	-	-	-	-	2	2	2	-
CO4	3	3	3	3	2	-	2	-	-	-	-	2	2	2	-
CO5	3	3	3	3	2	-	2	-	-	-	-	2	2	2	-
3 - Stro	3 - Strong; 2 - Medium; 1 - Some														

Bloom's Category	Continuous Asse (Ma		End Sem Examination (Marks)				
,	1	2	7				
Remember	10	10	20				
Understand	20	20	40				
Apply	10	10	20				
Analyze	20	20	20				
Evaluate	-	-	-				
Create	-	-	-				
Total	60	60	100				

Syllabus		C Bangasan	ny Callaga	of Toobnolo	av Autono	maus B202	2	
K.S.Rangasamy College of Technology – Autonomous R2022 B.Tech Food Technology								
60 FT 702 - Food Packaging Technology								
Semeste	.	Hours/Week		Total	Credit		laximum Marl	(\$
Jenneste	L	T	Р	Hours	C	CA	ES	Total
VII	3	1	0	60	4	40	60	100
	ood Packagin						1 30	
History of food packaging technology and methods. Packaging: Concepts and Significance Developments in packaging industry. Classification of packaging: primary and secondary. Packaging types Primary packaging materials- paper, paper-based, plastic, aluminum foil, tin plate and TFS glass; Secondary packaging materials- folding carton, corrugated fibre board boxes, wooden boxes Ancillary packaging materials - printing inks, varnishes, lacquers and varnishes.								
Bottling, ca packaging, PET, Prefo need, adva packaging Packaging Active pack	systems and anning, cappin retort packagir rm, tetrapack. antages, proce and materials Technologies; aging, Intellige	ng, labelling, ng, CAP, MAF Flash 18 process, comparis used in asept MAP, CAP, ent Packaging,	P, active pac cess. Biodeg on of conve ic packaging	kaging, shrin gradable and entional & a g machineries	k packaging edible pack septic pack s used in pa	, lined cartor aging, asept aging. systen acking foods	nning system. tic packaging- em of aseptic	[9]
Food packaging materials** Package materials: classification packages, paper as package material its manufacture, types, advantages, corrugated and paper board boxes etc. Glass as package material, manufacture, advantages, disadvantages, metal as package material-manufacture, advantages, disadvantages, aluminum as package material, its advantages and disadvantages, plastic as package material, classification of polymers, properties, uses and chemistry of each plastic such as polyethylene, polypropylene, polystyrene, polycarbonate, PVC, PVDC, cellulose acetate, nylon etc.							[9]	
Testing an Testing of containers; packaging; rate and ga of packagir cob tester-	d labelling of packaging ma Sealing equipous Secondary and secondary and secondary and secondary and secondary and secondary and traceability.	packaging materials (PM) ment; Labeling d transport p rate through sing – UTM M torque teste	in food indug and symbol ackaging. P given flexible ullen Burstir er tear teste	ols used in parinciples of refilm, OUR ong strength tering strength terings analy	ackaging promeasuring was from food are ster-drop to zer-cushioni	oducts; Asep /ater vapour nd OTR from ester- Pouch	tic and shrink transmission film. Testing burst tester	[9]
Advancement in packaging technology* Difference between packing and packaging, Manufacturing of nano packaging, Degradation of plastic materials, Alternate for plastic/glass material, Eco friendly packaging material. Mechanical strength of different packaging materials; Printing of packages; Barcodes & other marking; Interactions between packaging material and foods; Environmental and cost consideration in selecting packaging materials.							[9]	
- ·					Total	Hours: 45	+ 15 (Tutorial)	60
Text Book	•	ak MaD"	Mark 1 12:	"F! D	a also ades es Ti	ala ala ³³ D	la aloua!!	
Pub	ard Coles, Der ishers, 2003.							
2. Gordon L. Robertson, Food Packaging: Principles and Practice, Second Edition (Food Science and Technology), Taylor & Francis, CRC Press, 2005.								nd
Reference(
	ertson G.L Foo 439862414	d Packaging:	Principles a	nd Practice, ⁻	Third Edition	, CRC Press	s, 2012, ISBN:	
₂ Yam	K.L. and Lee I						Practice, A volu	ıme in
₂ Yam	K.L. and Lee I	D.S., Emergin	g Food Pack	aging Techn	ologies, Prin	ciples and F		
Rich	me in Woodhea ard Coles and							Wiley &
	kwell, 2011.					37 , -		



^{*}SDG 9 – Industry Innovation and Infrastructure
*SDG 12 – Responsible Consumption and Production

Course C	ontents and Lecture Schedule	
S. No.	Topics	No. of hours
1.0	Basics of Food Packaging	
1.1	History of food packaging technology and methods.	1
1.2	Packaging: Concepts and Significance.	1
1.3	Developments in packaging industry.	1
1.4	Classification of packaging: primary and secondary. Packaging types	1
1.5	Primary packaging materials- paper, paper-based, plastic, aluminum	1
1.6	Primary packaging materials- foil, tin plate and TFS, glass;	1
1.7	Secondary packaging materials-folding carton, corrugated fibre board boxes,	1
1.8	Secondary packaging materials- wooden boxes;	1
1.9	Ancillary packaging materials - printing inks, varnishes, lacquers and varnishes.	1
2.0	Packaging systems and methods	
2.1	Bottling, canning, capping, labelling, form-fill-seal and cartonning machineries;	1
2.2	Vacuum and gas packaging, retort packaging, CAP, MAP, active packaging, shrink packaging, lined cartonning system.	1
2.3	PET, Preform, tetrapack. Flash 18 process.	1
2.4	Biodegradable and edible packaging,	1
2.5	Aseptic packaging-need, advantages, process,	1
2.6	Comparison of conventional & aseptic packaging.	1
2.7	System of aseptic packaging and materials used in aseptic packaging machineries used in packing foods	1
2.8	Advances in Packaging Technologies; MAP, CAP, Active packaging	1
2.9	Advances in Packaging Technologies; Intelligent Packaging, Nano- Packaging, Irradiated food Packaging	1
3.0	Food packaging materials	
3.1	Package materials: classification packages, paper as package material	1
3.2	its manufacture, types, advantages, corrugated and paper board boxes etc.	1
3.3	Glass as package material, manufacture, advantages, disadvantages,	1
3.4	metal as package material-manufacture, advantages, disadvantages,	1
3.5	aluminum as package material, its advantages and disadvantages,	1
3.6	plastic as package material,	1
3.7	classification of polymers, properties, uses	1
3.8	chemistry of each plastic such as polyethylene, polypropylene	1
3.9	polystyrene, polycarbonate, PVC, PVDC, cellulose acetate, nylon etc.	1
4.0	Testing and labelling of packaging materials	
4.1	Testing of packaging materials (PM) in food industries; Rigid and semi rigid containers;	1
4.2	Flexible containers; Sealing equipment; Labeling and symbols used in packaging products;	1
4.3	Aseptic and shrink packaging; Secondary and transport packaging.	1
4.4	Principles of measuring water vapour transmission rate and gas permeability rate through given flexible film	1
4.5	OUR from food and OTR from film.	1



4.6	Testing of packaging materials using – UTM Mullen Bursting strength tester- drop tester-	1
4.7	Pouch burst tester- cob tester- gauge tester- torque tester tear tester	1
4.8	Gas analyzer-cushioning materials.	1
4.9	Labeling, regulation and traceability. Global migration testing and design aspects.	1
5.0	Advancement in packaging technology	
5.1	Difference between packing and packaging,	1
5.2	Manufacturing of nano packaging	1
5.3	Degradation of plastic materials	1
5.4	Alternate for plastic/glass material	1
5.5	Eco friendly packaging material.	1
5.6	Mechanical strength of different packaging materials	1
5.7	Printing of packages; Barcodes & other marking;	1
5.8	Interactions between packaging material and foods;	1
5.9	Environmental and cost consideration in selecting packaging materials.	1

Course Designer(s)

 $1.\ Dr.\ J. Balachandra\ Mohan - bal\underline{a} chandramohan @ksrct.ac. in$

60 FT 703	Fermentation	Category	L	Т	Р	Credit
0011703	Technology	PC	3	0	0	3

- To analyse the basic concept of food fermentation
- To learn the process and product obtained through fermentation process
- To impart the knowledge of soy based fermented product.
- To familiarize with different fermentor types and method
- To analyse the concept in production of secondary metabolites

Pre-requisites

Nil

Course Outcomes

CO1	Recall the importance of food fermentation process and fermentative microbes	Understand
CO2	Identify the basics of fermentation techniques	Understand
CO3	Illustrate the production process of dairy, alcoholic and soy based fermented product.	Analyze
CO4	Assess the fermentation process of cereal, vegetables and sausage.	Apply
CO5	Analyse the basic concept in production of secondary metabolites	Analyze

Mappii	ng with	Progra	amme (Outcom	nes										
COs					•	P	Os	•						PSOs	<u>-</u>
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1	3	3	3	3	-	-	3	-	-	-	-	-	2	-	-
CO2	2	3	3	2	-	-	2	-	-	-	-	-	2	-	-
CO3	3	3	3	3	-	-	3	-	-	-	-	-	2	-	-
CO4	3	3	2	3	-	-	2	-	-	-	-	-	2	-	-
CO5	3	3	2	3	-	-	2	-	-	-	-	-	2	-	-
3 - Stro	ong; 2 -	Mediur	m; 1 - S	ome											

Assessment Pattern			
Bloom's Category	Continuous Ass (Ma	essment Tests ırks)	End Sem Examination (Marks)
	1	2	
Remember	30	10	20
Understand	30	20	30
Apply	-	20	30
Analyze	-	10	20
Evaluate	-	-	-
Create	-	-	-
Total	60	60	100

60 FT 703 - Fermentation Technology Semester Hours/Week Total Hours Credit Maximum Marks L T P Total Hours C CA ES							
Semester Hours/Week Total Hours Credit Maximum Marks C CA ES							
Semester L T P Total Hours C CA ES							
L T P C CA ES							
	Total						
VII 3 0 0 45 3 40 60 10)0						
Introduction to Fermentation process Fermentation —Basic, Types, Benefits, Importance. —. Media for industrial fermentation - characteristics of an ideal raw material — industrial sterilization of media and fermentor. Basic function of fermentor - Fermentor design*, parts —types. Recovery and purifications of food products.	[9]						
Fermentated Food Products –I** Dairy fermentations - Alcoholic beverages- Vegetable fermentation- Leafy vegetable fermentation - Mould fermentations – soy based fermented foods – miso, tempeh, soy sauces. Lactic acid bacteria - Brewers and Bakers yeasts - Moulds used in food fermentations	[9]						
Fermented food products II** Bread Making-Idli batter- processes. Fermented meat products. Preservation of marine products using fermentation process. Manufacture of different types of sausages. Storage and shelf life of fermented foods. Medicinal and nutritional supplement production using fermentation.	[9]						
Other products from fermentation Fermentation production of acids – citric acid, acetic acid; Production of flavours, colours using microbes. Enzymes – amylase, proteases. Amino acids – Lysine, glutamic acid, Vitamins – C, B12, SCP – bacterial, fungal, Actinomycetes, algal protein. Antibiotics – penicillin, Streptomycin.	[9]						
Non-Food Applications of Fermentation Bioremediation - fermentation can be used to clean up oil spills - Bacterial bioremediation of hazardous substances - Energy Production- Biofuels - Industrial Fermentation- Primary tool in bioproduction of a variety of substances. Industry food waste utilization, Toxicology of fermented food products.	[9]						
Total Hours:	45						
Text Book(s):							
	-						
Ray, Ramesh C., and Didier Montet. Fermented Foods. CRC Press, 2021.							
Ray, Ramesh C., and Didier Montet. Fermented Foods. CRC Press, 2021.							
 Ray, Ramesh C., and Didier Montet. Fermented Foods. CRC Press, 2021. Hutkin Robert W. Microbiology and Technology of Fermented Foods. Wiley Blackwell, 2019. 	2019						

^{*}SDG 9 – Industry Innovation and Infrastructure **SDG 3 – Good Health and Well Being

Course Co	ntents and Lecture Schedule	
S. No.	Topics	No. of hours
1.0	Introduction to Fermentation Process	•
1.1	Fermentation –Basic Types, Benetifits, Importance	2
1.2	Media for industrial fermentation	2
1.3	Characteristics of an ideal raw material	1
1.4	Industrial sterilization of media and fermentor.	1
1.5	Basic function of fermentor - Fermentor design, parts -types	1
1.6	Recovery and purifications of food products.	2
2.0	Fermentated Food Products –I	
2.1	Dairy fermentations	1
2.2	Alcoholic beverages	1
2.3	Vegetable fermentation	1
2.4	Leafy vegetable fermentation	1
2.5	Mould fermentations – soy based fermented foods – miso, tempeh, soy sauces.	2
2.6	Lactic acid bacteria	1
2.7	Brewers and Bakers yeasts	1
2.8	Moulds used in food fermentations	1
3.0	Fermented food products II	
3.1	Bread Making-Idli batter- processes.	1
3.2	Fermented meat products.	2
3.3	Preservation of marine products using fermentation process.	1
3.4	Manufacture of different types of sausages.	2
3.5	Storage and shelf life of fermented foods.	1
3.6	Medicinal and nutritional supplement production using fermentation	2
4.0	Other products from fermentation	
4.1	Fermentation production of acids – citric acid, acetic acid;	1
4.2	Production of flavours, colours using microbes.	1
4.3	Enzymes – amylase, proteases	1
4.4	Amino acids – Lysine, glutamic acid,	1
4.5	Vitamins – C, B12,	1
4.6	SCP – bacterial, fungal, Actinomycetes, algal protein.	2
4.7	Antibiotics – penicillin, Streptomycin.	2
5.0	Non-Food Applications of Fermentation	
5.1	Bioremediation - fermentation can be used to clean up oil spills	1
5.2	Bacterial bioremediation of hazardous substances	1
5.3	Energy Production	1
5.4	Biofuels	1
5.5	Industrial Fermentation	1
5.6	Primary tool in bio-production of a variety of substances	1
5.7	Industry food waste utilization	1
5.8	Toxicology of fermented food products.	2

Course Designer(s)
Dr.A.S.Ruby Celsia – rubycelsia@ksrct.ac.in



Ī	60 AC 001	Research Skill Development	Category	L	Т	Р	Credit
	00 AC 001	Research okin bevelopment	AC	1	0	0	0

- To identify research problems, formulate hypotheses, collect data and test hypotheses
- To prepare and submit quality manuscripts and understand peer review process
- To utilize software tools for effective manuscript preparation and visualization of research data
- To familiarize different journal metrics and author-level quality indicators
- To protect creative works, inventions, and branding elements using IPR

Pre-requisites

Nil

Course Outcomes

On the successful completion of the course, students will be able to

CO1	Develop structured scientific approach to plan and execute research work	Apply
CO2	Understand the journal requirements to publish research findings effectively	Understand
CO3	Apply various software tools during the manuscript preparation	Apply
CO4	Select suitable journals to publish the work using different publication metrics	Analyze
CO5	Apply the appropriate form of IP protection to a specific invention or creation	Apply

Mapping with Programme Outcomes

COs						ı	POs						Р	SOs	
003	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1	2	2	2	2	-	2	2	3	3	3	-	3	-	-	-
CO2	-	-	-	-	-	-	-	3	3	3	-	3	-	-	-
CO3	-	-	-	-	3	-	-	3	3	3	-	3	-	-	-
CO4	-	-	-	-	-	-	-	3	3	-	-	3	-	-	-
CO5	-	-	2	2	-	-	-	3	3	3	-	3	-	-	-

3 - Strong; 2 - Medium; 1 – Some

Assessment Pattern	
One review at end of the semester	
Parameters	Weightage (Marks)
Research Problem Identification (Research gap, SDG, Objectives)	10
Literature Review preparation (Clarity, Number and quality of sources)	20
Patent Draft/ Manuscript Preparation (Structure, Content)	20
Use of software tools (Plagiarism, Reference Management, etc.,)	10
Journal Identification (Aim & scope of the journal, journal metrics)	10
Presentation & Viva voce	30
Total	100

Syllabus								
	K	.S.Rangasa	my College	of Technolog	gy – Autono	mous R2022		
				. Food Techr				
		60	AC 001 – Re	esearch Skill	Developme	nt		
Semester	ŀ	Hours/Week		Total	Credit	Ма	ximum Marks	
Ocilicatei	L	Т	Р	Hours	С	CA	ES	Total
VII	1	0	0	15	0	100	-	100
Types of	• • • • • • • • • • • • • • • • • • • •	entification a		•		•	vsis - the hypothesis -	[3]
Structure of	t Preparation ^a f a manuscript deference style	t - Types of m	•	•	•	•	ure Review -	[3]
		•	ent - Literatu	re review - Ro	eference mar	nagement - [Data analysis and	[3]
Journal Inc	Publication M ex: Scopus - W ality Indicators:	Veb of Science			ournal; Journa	al Metrics: Im	pact Factor, Cite	[3]
	I Property Rig ndustrial Desi		ight - Trade	marks - Geo	ographical In	dications - T	rade Secrets	[3]
							Total Hours:	15
Reference	(s):							
	nari, C.R. and ornational Publi		, "Research	Methodology	: Methods ar	nd Technique	s", New Age	
	wla H S., "Intro ted, 2019	oduction to li	ntellectual P	roperty Rights	s", CBS Publ	ishers and D	Distributors Private	Э

^{*}SDG 9 - Industry Innovation and Infrastructure

S. No.	Contents and Lecture Schedule Topics	No. of hours
1	Research - Scientific Approach	l
1.1	Types of Research - Identification and Clarification of the problem – Problem analysis - Formulating hypothesis	2
1.2	Selection of sample and tools of data collection - Testing the hypothesis - Conclusion	1
2	Manuscript Preparation	•
2.1	Structure of a manuscript - Types of manuscript - Graphical abstract - Highlights	1
2.2	Literature Review	1
2.3	Citation - Reference style – Plagiarism, Journal selection - Peer review process	1
3	Research Toolkit	•
3.1	Software Tools for Writing enhancement	1
3.2	Literature review, Reference management	1
3.3	Data analysis and visualization – Drawing, Plagiarism	1
4	Research Publication Metrics	•
4.1	Journal Index: Scopus - Web of Science - SCI - UGC Care - Q Journal;	1
4.2	Journal Metrics: Impact Factor, Cite	1
4.3	Score Quality Indicators: h-index - i-10 index - citations	1
5	Intellectual Property Rights	
5.1	Patents	1
5.2	Industrial Designs - Copyright	1
5.3	Trademarks - Geographical Indications - Trade Secrets	1
	Total	15

Course Designer

Dr.M.Kathirselvam - mkathirselvam@ksrct.ac.in

60 FT 7P1	Food Packaging	Category	L	Т	Р	Credit
0011711	Laboratory	PC	0	0	4	2

- To understand and acquiring the knowledge of packaging technology principles towards protection, communication, and transportation
- Understand the properties of food packaging materials and their suitability in extending shelf life of food products
- Impart practical knowledge and skills related to food packaging technology
- Understanding of flexible packaging materials for food packaging technology
- To analyse and interpret the technical requirements for food packaging

Pre-requisites

NIL

Course Outcomes

On the successful completion of the course, students will be able to

On the suc	cessial completion of the course, students will be able to	
CO1	Understand the basic knowledge on packaging materials properties in terms of technical requirements for food packaging	Understand
CO2	Analysis and experimentation of packaging materials for water absorption, tearing, bursting, and compression properties	Analyze
CO3	Assess the concept of drop testing of food packages.	Analyze
CO4	Review the advancements in packaging technologies	Analyze
CO5	Outline of the food packaging materials using different equipment's.	Analyze

Mappii	Mapping with Programme Outcomes															
COs		POs											PSOs			
COS	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	
CO1	3	3	3	3	-	-	3	-	2	-	-	2	2	-	2	
CO2	3	3	3	3	-	-	3	-	2	-	-	2	2	-	2	
CO3	3	3	3	3	-	-	3	-	2	-	-	2	2	-	2	
CO4	3	3	3	3	-	-	3	-	2	-	-	2	2	-	3	
CO5	3	3	3	3	-	-	3	-	2	-	-	2	3	3	3	
3 - Stro	ong; 2 -	Mediur	n; 1 - S	ome		•		•		•				•		

Assessment Pattern

Bloom's Category	Lab Experiments	Assessment (Marks)	Model Examination (Marks)	End Sem Examination (Marks)
	Lab	Activity	()	()
Remember	-	-	-	-
Understand	-	-	-	-
Apply	25	12	50	50
Analyze	25	13	50	50
Evaluate	-	-	=	-
Create	-	-	=	-
Total	50	25	100	100

Syllabus													
	K.S.Rangasamy College of Technology – Autonomous R2022												
	B.Tech. Food Technology												
	60 FT 7P1- Food Packaging Laboratory												
Semester	ı	Hours/Week		Total	Credit	Ма	ximum Mark	(S					
Semester	L T P Hrs C CA ES Total												
VII	0	0	4	60	2	60	40	100					

List of Experiments:

- 1. Estimation of water absorption capacity of paper based packaging materials using cobb tester.
- 2. Determination of tear resistance of packaging materials.
- 3. Determination compressive strength of carton boxes.
- 4. Estimation of bursting strength of packaging materials.
- 5. Estimation of water vapour permeability of different packaging materials
- 6. Measuring thickness of various types of paper based packaging materials.
- 7. Measuring GSM of various paper and flexible film based packaging materials.*
- 8. Determination drop strength of packaged food material using drop tester.
- 9. Experiment on bottling of foods samples using crown corking machine and sealing of packaging materials using hand operated sealing machine.**
- 10. Testing of Thermal Shock resistance of glass materials
- 11. Vacuum packaging of foods and shelf life studies
- 12. Determination of greeze resistance of papers used in food industry butter paper and toffee wrap.
- 13. Determination of adhesiveness test of tapes

Lab Manual

Yam K.L. and Lee D.S., "Emerging Food Packaging Technologies, Principles and Practice, A volume in Wood head Publishing series in Food Science, Technology and Nutrition", 2012.

Course Designer(s)

1. Dr. J.Balachandra Mohan-<u>balachandramohan@ksrct.ac.in</u>

^{*}SDG 7 – Affordable and Clean Energy

^{**} SDG 9 - Industrial Innovation and Infrastructure

60 FT 7P2		Category	L	Т	Р	Credit
00 F1 7F2	Project Work Phase – I	PC	0	0	4	2

- To prepare the students to adapt to the research environment
- To understand how projects are executed in a research laboratory
- To learn practical aspects of research on their domain
- To train students in the art of data interpretation
- To practice the students to analyze the results and thesis writing

Pre-requisites

NIL

Course Outcomes

On the successful completion of the course, students will be able to

CO1	Identify the problem and select a topic of the research.	Apply
CO2	Competence in research design and planning.	Apply
CO3	Create, analyse and critically evaluate different technical solutions.	Apply
CO4	Interpret the obtained research data and conclude the experiment.	Analyze
CO5	Develop skills of project management, report writing, problem solving, communication and interpersonal.	Apply

Mappi	ng with Pr	ogra	amme C	Outcom	es											
COs		POs											PSOs			
COS	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	
CO1	3	2	3	3	3	3	-	-	3	-	-	2	2	3	3	
CO2	3	2	3	3	3	3	-	-	3	-	-	2	2	3	3	
CO3	3	2	3	3	3	-	-	-	3	-	-	2	2	3	3	
CO4	3	2	3	3	3	3	-	-	3	-	-	2	2	3	3	
CO5	3	2	3	3	3	3	-	-	3	-	-	2	2	3	3	
3 - Stro	ona: 2 - Me	ediun	n: 1 - So	ome												

Assessment Pattern

	Review I (R1)			/ II (R2)		Review III (R3)	Total (R1+R2+R3)	Internal	
Literature Survey	Topic Identification & Justification		Approach	Conclusion	Demo- Existing System	Presentation	Report	Total	
10	10	10	20	20	10	10	10	100	100

Syllabus												
K.S.Rangasamy College of Technology – Autonomous R2022												
B. Tech. Food Technology												
60 FT 7P2 - Project Work Phase - I												
Samastar		Hours/Week	(Total	Credit	Maxi	mum Mark	(S				
Semester	Semester L T P Hrs C CA ES Total											
VII	0	0	4	60	2	100	00	100				

Methodology:

Three reviews have to be conducted by the committee that constitutes minimum of three members one of which should be guide.

Research problem should be selected.

Students have to collect and bound about 50 research papers related to their work. Objectives and title of the work has to be finalized at the end of the Project Work - Phase I. Preliminary Implementation can be done if possible.

Report has to be prepared as per the format and submitted by the students Internal evaluation has to be done for 100 marks

CO CC ODC	luta un abia	Category	L	T	Р	Credit
60 CG 0P6	Internship	CG	0	0	0	1\2\3\$

- To promote hands on experience to students in food research institute and food processing industries.
- Students has to undergo practical training in any Food industries or food research institute with the approval from the institution.
- Students will have options while undergoing training either one slot (four weeks) of training in a single industry or else two slot (two weeks in individual industry) of training in two different industries of same discipline.
- At the end of the training student need to submit a report as per the prescribed format to the department.

Pre-requisites

Nil

Course Outcomes

On the successful completion of the course, students will be able to

CO1	Identify the underlying causes and approach to problem-solving	Understand
CO2	Develop the experiment based on a review of the literature.	Create
CO3	Implement and debug using a pilot study	Apply
CO4	Evaluate the calculated and unprocessed data to solve the problem	Apply
CO5	Compiling the reports and recording the information for print	Apply

Mappi	Mapping with Programme Outcomes														
COs	POs													PSOs	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1	3	3	2	2	-	-	-	-	1	2	2	3	2	3	3
CO2	3 3 2 2 1 2 2 3										3	2	3	3	
CO3	3	3	2	2	-	1	-	1	1	2	2	3	2	3	3
CO4	3	3	2	2	-	-	-	-	1	2	2	3	2	3	3
CO5	3	3	2	2	-	-	-	-	1	2	2	3	2	3	3
	3 - Strong; 2 - Medium; 1 - Some														

Assessment process

- This course is mandatory and the student has to pass the course to become eligible for the award of degree.
- Students are allowed to undergone internship from IV to VII semester
- The student performance will be assessed by the Industry mentor through Student intern performance review/employer assessment intern form.
- The student need to make a presentation before a committee constituted by the department which will assess the student based on the report submitted and the presentation made.
- Marks will be awarded out of 100 and appropriate grades assigned as per the regulations.



60 AB 001	National Cadet Corps - Air Wing	Category	L	Т	Р	Credit
00 AD 001	Mational Cadet Corps - All Wing	HS	2	0	2	₃ €

- To design
- · d especially for NCC Cadets
- To develop character, camaraderie, discipline, secular outlook
- To inculcate spirit of adventure, sportsman spirit
- To teach selfless service amongst cadets by working in teams
- To learning military subjects including weapon training and motivate them to join in tri-services

Pre-requisites

• Nil

Course Outcomes

On the successful completion of the course, students will be able to

CO1	Display sense of patriotism, secular values and shall be transformed into motivated youth who will carry out nation building through national unity and social cohesion.	Remember
CO2	Demonstrate the sense of discipline with smartness and have basic knowledge of weapons and their use and handling.	Remember
CO3	Illustrate various forces and moments acting on aircraft.	Understand
CO4	Outline the concepts of aircraft engine and rocket propulsion.	Understand
CO5	Design, build and fly chuck gliders/model airplanes and display static models.	Create

Mappi	Mapping with Programme Outcomes														
COs	POs											F	PSOs		
COS	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1	-	-	-	-	-	3	3	3	3	3	-	-	-	-	-
CO2	-	-	-	-	3	-	-	-	-	-	-	-	-	-	-
CO3	3	2	1	1	-	-	-	-	-	-	-	-	-	-	-
CO4	3	2	1	1	-	-	-	-	-	-	-	-	-	-	-
CO5	3	2	1	1	-	-	-	-	-	-	-	-	-	-	-
3 - Str	ong; 2	- Mediu	im; 1	- Some	•	•	•	•	•	•	•	•	•	•	•

Sylla	bus											
		K.	S.Rangasam		f Technolog		nous R2022					
	B.Tech. Food Technology 60 AB 001- National Cadet Corps - Air Wing											
Hours/Week Total Credit Maximum Marks												
Seme	ester –		T T	Р	Hours	Credit	CA	ES	Total			
	/II	2	0	2	60	3€	50	50	100			
NCC NCC Promand IAF- Contr Integ	Organisa Organisa Organisa ortion of N Awards - Indo-Pa ribution of ration.	ation and Nation – H NCC cadets - Incentive ak War-19 youth in na	National Integralistory of N s – Aim and a s for NCC of the Note of the Nation building-	gration * ICC- NCC advantages of cadets by color ion Safed	Organization of NCC Traini entral and sta Sagar. Natio	I- NCC Tra ng- NCC bac ate govt. Hist onal Integrat	ining- NCC dges of Ran ory and Orga ion- Unity ii	Uniform – k- Honors anization of n diversity-	[12]			
Basic and G Salut Pace	physica Cleanline ing- Mare forward	ss. Drill- V ching- Turr	 Various e Vords of comming on the rear- Marking 	nmands- Pos narch and w	fitness (wirsition and cowheeling-Sal	mmands- Si uting on the	zing and forr march- Side	ming- pace,	[12]			
Laws		n- Forces a	acting on airc		ılli's theorem-	Stalling-Prin	nary control s	surfaces-	[12]			
Aero Introd	Engines duction of	*	e- Types of en	<u> </u>	engine- Jet en	gines- Turbop	orop engines-	Basic Flight	[12]			
Aero Modeling *									[12]			
Total Hours:												
	Text Book(s):											
Text	Book(s):											
Text	"Nation		orps- A Con	cise handbo	ok of NCC C	Cadets", Ram	nesh Publishi					
1.	"Nation New De rence(s):	al Cadet C elhi, 2014.						ing House,				
1.	"Nation New De rence(s): "Cadets	al Cadet Celhi, 2014. s Handbool	k – Common	Subjects SE	D/SW", publis	hed by DG N	ICC, New De	ing House,				
1. Refe	"Nation New De rence(s): "Cadets	al Cadet C elhi, 2014. s Handbook s Handbook	k – Common	Subjects SE Subjects SE	D/SW", publis	hed by DG N	ICC, New De	ing House,				

^{*}SDG 4 – Quality Education

Course Designer(s)

1. Flt Lt V.R.SADASIVAM - sadasivam@ksrct.ac.in

60 AB 002	National Cadet Corps - Army Wing	Category	L	Т	Р	Credit
00 AB 002	National Cadet Corps - Army Wing	HS	2	0	2	ર€

- Develop character, camaraderie
- Inculcate discipline, secular outlook
- Enrich the spirit of adventure, sportsman spirit
- Ideals of selfless service amongst cadets by working in teams
- Improve qualities such as self-discipline, self-confidence, self-reliance and dignity of labour in the cadets

Pre-requisites

• NIL

Course Outcomes

On the successful completion of the course, students will be able to

Off the 3uct	cessial completion of the course, students will be able to	
CO1	Display sense of patriotism, secular values and shall be transformed into motivated youth who will carry out nation building through national unity and social cohesion.	Understand
CO2	Demonstrate Health Exercises, the sense of discipline, improve bearing, smartness, turn out, develop the quality of immediate and implicit obedience of orders.	Apply
CO3	Basic knowledge of weapons and their use and handling.	Understand
CO4	Aware about social evils and shall inculcate sense of whistle blowing against such evils and ways to eradicate such evils	Analyze
CO5	Acquaint, expose & provide knowledge about Army/Navy/ Air force and to acquire information about expansion of Armed Forces, service subjects and important battles	Apply

Mapping	Mapping with Programme Outcomes													
COs	POs											PS	PSOs	
COS	1	2	3	4	5	6	7	8	9	10	11	12	1	2
CO1	-	-	-	-	-	3	3	3	3	3	-	-	-	-
CO2	-	-	-	-	3	-	-	-	-	-	-	-	-	-
CO3	3	2	1	1	-	-	-	-	-	-	-	-	-	-
CO4	3	2	1	1	-	-	-	-	-	-	-	-	-	-
CO5	3	2	1	1	-	-	-	-	-	-	-	-	-	-
3 - Stro	ng; 2 -	Mediur	m; 1 - So	ome										

	cch. Food Tech ational Cadet Co Total Hours 60 ganization- NCC CC Training- N ntral and State ontribution of N ational Integration r Fitness (with I tion and Comma g- Saluting on th Arms- Ceremo of .22 Rifle- Loa ure- MPI and El ESSION) - cs of 7.62mm S	nology orps - Army N Credit C 3€ Training- NC CC Badges govt. Youth in Nation. Demonstration ands- Sizing ne March- Sic onial Drill- Gro	Wing CA 50 CC Uniform — of Rank- Hotion Building n) -Food — Hand Forming de Pace, Pacuard Mounting alloading — Paup and Snap	Promotion onors' and g- National ygiene and g- Saluting-ce Forward ng.(WITH	Total 100 [12]
Semester Hours/Week	r Fitness (with I ational Command Com	Credit C Gredit C G G G G G G G G G G G G G G G G G G	CA SO	Promotion onors' and g- National ygiene and g- Saluting-ce Forward ng.(WITH	Total 100 [12]
Semester L T P	Total Hours 60 ganization- NCC CC Training- N ntral and State ontribution of N ational Integration r Fitness (with I tion and Comma g- Saluting on th Arms- Ceremo of .22 Rifle- Loa ure- MPI and El ESSION) - cs of 7.62mm S	Credit C 3€ Training- NC ICC Badges govt. Youth in Nation. Demonstration ands- Sizing ne March- Sic onial Drill- Grounding and Unitervation- Grounding Control ELR- LMG- C	CA SO	Promotion onors' and g- National ygiene and g- Saluting-ce Forward ng.(WITH	Total 100 [12]
NCC Organization & National Integration* NCC Organization — History of NCC- NCC Orgonization — Unity in Diversity- Continuity in Diversity- Continuity- Diversity- Continuity- Diversity- Continuity- Diversity- Continuity- Diversity- Continuity- Diversity- Continuity- Diversity-	Hours 60 ganization- NCC CC Training- N ntral and State ontribution of N ational Integration r Fitness (with I tion and Comma g- Saluting on th Arms- Ceremo of .22 Rifle- Loa ure- MPI and El ESSION) - cs of 7.62mm S	C 3€ Training- NC ICC Badges govt. Youth in Nation. Demonstration ands- Sizing ne March- Sic onial Drill- Gro adding and Un levation- Gro SLR- LMG- C	CA 50 CC Uniform – of Rank- Ho tion Building n) -Food – H and Forming de Pace, Pac uard Mounti	Promotion onors' and g- National ygiene and g- Saluting-ce Forward ng.(WITH	Total 100 [12]
NCC Organization & National Integration* NCC Organization – History of NCC- NCC Organization – Unity in Diversity- Contegration Council- Images and Slogans on Note of National Integration – Unity in Diversity- Contegration Council- Images and Slogans on Note of National Integration – Various Exercises for Cleanliness Drill- Words of Commands- Posi Marching- Turning on the March and Wheelin and to the Rear- Marking Time- Drill with DEMONSTRATION) Weapon Training Main Parts of a Rifle Characteristics of .303 Rifle- Characteristics Holding, Safety Precautions – Range Proced Long/Short Range Firing (WITH PRACTICE SI Characteristics of 5.56mm Rifle- Characterist Pistol. Social Awareness and Community Developm Aims of Social Service-Various Means and Walds- Cancer its Cause and Preventive Means and P	ganization- NCC CC Training- N ntral and State ontribution of National Integration of Stational Integration and Command Comman	3€ C Training- NC ICC Badges govt. Youth in Nation. Demonstration ands- Sizing ne March- Siconial Drill- Grading and Undevation- Groundstration- Groundstrati	50 CC Uniform – of Rank- Ho tion Building n) -Food – H and Forming de Pace, Pac uard Mounti	Promotion onors' and g- National ygiene and g- Saluting-ce Forward ng.(WITH	[12]
NCC Organization & National Integration* NCC Organization – History of NCC- NCC Orgonization – History of NCC- NCC Orgonization – History of NCC- NCC Orgonization – History of NCC Cadets by Cellow Awards – Incentives for NCC Cadets by Cellow National Integration - Unity in Diversity- Contegration Council- Images and Slogans on Nintegration College Proceed Cleanliness Drill- Words of Commands- Position Marching- Turning on the March and Wheelin and to the Rear- Marking Time- Drill with DEMONSTRATION) Weapon Training Main Parts of a Rifle Characteristics of .303 Rifle- Characteristics Holding, Safety Precautions – Range Proced Long/Short Range Firing (WITH PRACTICE SIC Characteristics of 5.56mm Rifle- Characterist Pistol. Social Awareness and Community Developm Aims of Social Service-Various Means and Wilder Alder Social Service-Various Means and Wilder Cancer its Cause and Preventive Means	ganization- NCC CC Training- N ntral and State ontribution of N ational Integration r Fitness (with I tion and Comma g- Saluting on th Arms- Ceremo of .22 Rifle- Loa ure- MPI and El ESSION) - cs of 7.62mm S	Training- NC ICC Badges govt. Youth in Nation. Demonstration ands- Sizing ne March- Sic onial Drill- Gonial Drill- Gonial Drill- Gonial Drill-	CC Uniform – of Rank- Ho tion Building n) -Food – H and Forming de Pace, Pac uard Mounti	Promotion onors' and g- National ygiene and g- Saluting-ce Forward ng.(WITH	[12]
NCC Organization – History of NCC- NCC Orgon of NCC cadets – Aim and Advantages of Nawards – Incentives for NCC Cadets by Centrol National Integration – Unity in Diversity- Contegration Council- Images and Slogans on Nasc Physical Training & Drill Basic Physical Training & Drill Basic Physical Training — Various Exercises for Cleanliness .Drill- Words of Commands- Posi Marching- Turning on the March and Wheelin and to the Rear- Marking Time- Drill with DEMONSTRATION) Weapon Training Main Parts of a Rifle Characteristics of .303 Rifle- Characteristics Holding, Safety Precautions – Range Proced Long/Short Range Firing (WITH PRACTICE SI Characteristics of 5.56mm Rifle- Characterist Pistol. Social Awareness and Community Developm Aims of Social Service-Various Means and Walds- Cancer its Cause and Preventive Merural Development Program - MGNREGA-STerrorism- Corruption – Female Foeticide - Driving Children from Sexual Offences Act- Civic Sens	CC Training- Nortral and State contribution of North ational Integration of State on the Integration of State on the Integration and Commander Saluting on the Integration of State of State of State of State of T.62mm State	govt. Youth in Nation. Demonstration ands- Sizing the March- Siconial Drill- Grading and Undevation- Groundstration- Groundst	of Rank- Hotion Building n) -Food – Hand Forming de Pace, Pace uard Mounti nloading – Pour and Snap	ygiene and ygiene and g- Saluting-ce Forward ng.(WITH	[12]
Basic Physical Training – Various Exercises for Cleanliness .Drill- Words of Commands- Posis Marching- Turning on the March and Wheelin and to the Rear- Marking Time- Drill with DEMONSTRATION) Weapon Training Main Parts of a Rifle Characteristics of .303 Rifle- Characteristics Holding, Safety Precautions – Range Proced Long/Short Range Firing(WITH PRACTICE SI Characteristics of 5.56mm Rifle- Characterist Pistol. Social Awareness and Community Developm Aims of Social Service-Various Means and WAIDS- Cancer its Cause and Preventive Merural Development Program - MGNREGA-STerrorism- Corruption – Female Foeticide - De Children from Sexual Offences Act- Civic Sens	tion and Commag-Saluting on the Arms-Ceremon of .22 Rifle-Loaure-MPI and Elession) - cs of 7.62mm S	ands- Sizing ne March- Sic onial Drill- Go ading and Un levation- Grou	and Forming de Pace, Pac uard Mounti nloading – Pound up and Snap	g- Saluting- ce Forward ng.(WITH osition and o Shooting-	
Characteristics of .303 Rifle- Characteristics Holding, Safety Precautions – Range Proced Long/Short Range Firing(WITH PRACTICE SI Characteristics of 5.56mm Rifle- Characterist Pistol. Social Awareness and Community Developm Aims of Social Service-Various Means and WAIDS- Cancer its Cause and Preventive Merural Development Program - MGNREGA-STerrorism- Corruption – Female Foeticide - De Children from Sexual Offences Act- Civic Sens	ure- MPI and EI ESSION) - cs of 7.62mm S	levation- Grou	up and Snap	Shooting-	[12]
Aims of Social Service-Various Means and W AIDS- Cancer its Cause and Preventive Me Rural Development Program - MGNREGA-S Terrorism- Corruption – Female Foeticide -Do Children from Sexual Offences Act- Civic Sens	ent				
Specialized Subject (Army)	ays of Social S asures- NGO an GSYJGSY-NSA owry –Child Abu	nd their Activ NP- PMGSY-Tuse-RTI Act-	vities- Drug Terrorism ar	Trafficking- nd Counter	[12]
specialized Subject (Army)					
Basic Structure of Armed Forces- Military Hi	story – War He	roes- Battles	of Indo-Pal	k War-	[12]
Param Vir Chakra- Career in The Defence For	es- Service Tes	sts and Intervi			
			T	otal Hours	60
Text Book(s):					
1. "National Cadet Corps- A Concise had 2014.	idbook of NCC (Cadets", Ram	nesh Publish	ing House, Ne	ew Delhi,
Reference(s):					
"Cadets Handbook – Common Subject		ished by DG	NCC, New D	elhi.	
"Cadets Handbook- Specialized Subjet	ts SD/SW". publ				
"NCC OTA Precise", published by DG		olished by DG	NCC. New D	Delhi.	

^{*}SDG 9 - Industry Innovation and Infrastructure

Course Cor	tents and Lecture Schedule	.H.(FT)-2022-202
S. No.	Topics	No. of hours
1.0	NCC Organization & National Integration	1
1.1	NCC Organization	1
1.2	History of NCC and NCC Organization	1
1.3	NCC Training and NCC Uniform	1
1.4	Promotion of NCC cadet, Aim and Advantages of NCC Training	1
1.5	NCC badges of Rank, Honors' and Awards, Incentives for NCC Cadets by Central and State govt	1
1.6	National Integration, Unity in Diversity	1
1.7	Contribution of Youth in Nation Building	1
1.8	National Integration Council	1
1.9	Images and Slogans on National Integration	1
2.0	Basic Physical Training & Drill	
2.1	Basic Physical Training – Various Exercises for Fitness (with Demonstration)	1
2.2	Drill- Words of Commands.	1
2.3	Position and Commands- Sizing and Forming-	1
2.4	Saluting- Marching- Turning on the March and Wheeling-	2
2.5	Saluting on the March- Side Pace, Pace Forward and to The Rear- Marking Time-	2
2.6	Drill with Arms- Ceremonial Drill- Guard Mounting.(WITH DEMONSTRATION)	2
3.0	Weapon Training Main Parts of Rifle	
3.1	Characteristics of .303 Rifle	1
3.2	Characteristics of .22 Rifle	1
3.3	Loading and Unloading, Position and Holding Safety Precautions	2
3.4	Range Procedure, MPI and Elevation-	1
3.5	Group and Snap Shooting Long/Short Range Firing (WITH PRACTICE SESSION)	2
3.6	Characteristics of 5.56 Mm Rifle	1
3.7	Characteristics of 7.62mm	1
4.0	Social Awareness and Community Development	
4.1	Aims of Social Service, Various Means and Ways of Social Services	1
4.2	Family Planning , HIV and AIDS	1
4.3	Cancer its Cause and Preventive Measures	1
4.4	NGO and their Activities, Drug Trafficking	1
4.5	Rural Development Programmes MGNREGA, SGSY, JGSY, NSAP, PMGSY	1
4.6	Terrorism and Counter Terrorism, Corruption	1
4.7	Female Foeticide, Dowry, Child Abuse, RTI Act, RTE Act	1
4.8	Protection of Children from Sexual Offences Act	1
4.9	Civic Sense and Responsibility	1
5.0	Specialized Subject (Army)	
5.1	Basic Structure of Armed Forces	1
5.2	Military History, War Heroes	1
5.3	Battles of Indo - Pak War	1
5.4	Param Vir Chakra,	1
5.5	Career in The Defence Forces	2
5.6	Service Tests and Interviews.	2

Course Designer(s)

1. Lt.E.Chandra Kumar

- chandrakumar@ksrct.ac.in



K.S.RANGASAMY COLLEGE OF TECHNOLOGY, TIRUCHENGODE - 637215 (An Autonomous Institution affiliated to Anna University) B.E./B.Tech. Degree Programme SCHEME OF EXAMINATIONS

(For the candidates admitted in 2022-2023) EIGHTH SEMESTER

	Course	Name of the	Duration of	Weightag	ge of Marks		Minimum M Pass in End S Exan	Semester
S.No.	Code	Course	Internal Exam	Continuous Assessment *	End Semester Exam **	Max. Marks	End Semester Exam	Total
	•		7	THEORY	ı		•	
1	60 FT E5*	Professional Elective – V	2	40	60	100	45	100
		PRACTICAL						
2	60 FT 8P1	Project Work Phase – II	3	60	40	100	45	100
3	60 CG 0P6	Internship	-	100	-	100	-	100

^{*} CA evaluation pattern will differ from course to course and for different tests. This will have to be declared in advance to students. The department will put a process in place to ensure that the actual test paper follow the declared pattern.

^{**} End Semester Examination will be conducted for maximum marks of 100 and subsequently be reduced to 60 marks for theory End Semester Examination and 40 marks for project End Semester Examination.

B.TECH.(FT)-2022-2023

60 FT 8P1	Project Work Phase - II	Category	L	Т	Р	Credit
3011311	1 Toject Work I hase	PC	0	0	16	8

Objectives

- To prepare the students to adapt to the research environment
- To understand how projects are executed in a research laboratory
- To learn practical aspects of research on their domain
- To train students in the art of data interpretation
- To practice the students to analyze the results and thesis writing

Pre-requisites

NIL

Course Outcomes

On the successful completion of the course, students will be able to

CO1	Identify the problem and select a topic of the research.	Apply
CO2	Competence in research design and planning.	Apply
CO3	Create, analyse and critically evaluate different technical solutions.	Apply
CO4	Interpret the obtained research data and conclude the experiment.	Analyze
CO5	Develop skills of project management, report writing, problem solving, communication and interpersonal.	Apply

Mapping with Programme Outcomes

wappi	mapping with rogiannie Outcomes															
COs		POs												PSOs		
COS	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	
CO1	3	2	3	3	3	3	-	-	3	-	-	2	2	3	3	
CO2	3	2	3	3	3	3	-	-	3	-	-	2	2	3	3	
CO3	3	2	3	3	3	-	-	-	3	-	-	2	2	3	3	
CO4	3	2	3	3	3	3	-	-	3	-	-	2	2	3	3	
CO5	3	2	3	3	3	3	-	-	3	-	-	2	2	3	3	
3 - Stro	3 - Strong; 2 - Medium; 1 - Some															

Assessment process

Internal Assessment: 60 Mark + End Semester Examination: 40 Mark

	End Semester (40)							
Items	Items Review 1 Review 2 Review 3 Publication*							
Marks	5	10	15	30	40			
iviaiks		Total internal	mark 60		40			

Syllabus

Syllabus	zynazus											
K.S.Rangasamy College of Technology – Autonomous R2022												
B. Tech. Food Technology												
	60 FT 8P1 - Project Work Phase - II											
Semester	F	lours/Week		Total	Credit	Ma	aximum Marks	3				
L T P Hrs C CA ES Total												
VIII	0 0 16 240 8 60 40 100											

Methodology:

Three reviews have to be conducted by the committee that constitutes minimum of three members one of which should be guide.

Research problem should be selected.

Students have to collect and bound about 50 research papers related to their work. Objectives and title of the work has to be finalized at the end of the Project Work - Phase I. Preliminary Implementation can be done if possible.

Report has to be prepared as per the format and submitted by the students Internal evaluation has to be done for 100 marks

60 CG 0P6	Internship	Category	L	Т	Р	Credit
60 CG 0F6	internship	CG	0	0	0	1\2\3\$

- To promote hands on experience to students in food research institute and food processing industries.
- Students has to undergo practical training in any Food industries or food research institute with the approval from the institution.
- Students will have options while undergoing training either one slot (four weeks) of training in a single industry or else two slot (two weeks in individual industry) of training in two different industries of same discipline.
- At the end of the training student need to submit a report as per the prescribed format to the department.

Pre-requisites

Nil

Course Outcomes

On the successful completion of the course, students will be able to

CO1	Identify the underlying causes and approach to problem-solving	Understand
CO2	Develop the experiment based on a review of the literature.	Create
CO3	Implement and debug using a pilot study	Apply
CO4	Evaluate the calculated and unprocessed data to solve the problem	Apply
CO5	Compiling the reports and recording the information for print	Apply

Mapping with Programme Outcomes

600	POs										PSOs				
COs	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1	3	3	2	2	-	-	-	-	1	2	2	3	2	3	3
CO2	3	3	2	2	-	-	-	-	1	2	2	3	2	3	3
CO3	3	3	2	2	-	-	-	-	1	2	2	3	2	3	3
CO4	3	3	2	2	-	-	-	-	1	2	2	3	2	3	3
CO5	3	3	2	2	-	•	-	-	1	2	2	3	2	3	3

^{3 -} Strong; 2 - Medium; 1 - Some

Assessment process

- This course is mandatory and the student has to pass the course to become eligible for the award of degree.
- Students are allowed to undergone internship from IV to VII semester
- The student performance will be assessed by the Industry mentor through Student intern performance review/employer assessment intern form.
- The student need to make a presentation before a committee constituted by the department which will assess the student based on the report submitted and the presentation made.
- Marks will be awarded out of 100 and appropriate grades assigned as per the regulations.



PROFESSIONAL ELECTIVE | I

60 FT E11	Introduction to Food	Category	L	Т	Р	Credit
0011211	Biotechnology	PE	3	0	0	3

Objectives

- Comprehend the various basic concepts of biotechnology in Food.
- Understand the various genetically modified foods and its regulations.
- Identify the techniques used for fortification of foods
- Relate the various food quality regulations related to commercial food products.
- Explore the various applications of food biotechnology

Pre-requisites

Nil

Course Outcomes

On the successful completion of the course, students will be able to

CO1	Summarize the applications of food biotechnology and integrate the various microbiological analysis for food and water	Apply
CO2	Define the different types of GM Foods along with its ethical issues and correlate the respective regulation and rules for GM Foods	Analyze
CO3	Select the various techniques used for food fortification and compare the various biological barriers for its application	Understand
CO4	Examine various food quality regulations and link the regulations with the international standards	Analyze
CO5	Deduce the applications of food biotechnology in packaging and validate the application of biosensors in food	Analyze

Mappii	Mapping with Programme Outcomes														
COs	POs										PSOs				
COS	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1	3	3	3	-	-	3	3	-	-	-	-	-	2	3	-
CO2	3	3	2	-	-	3	3	3	-	-	-	-	3	3	2
CO3	3	3	2	-	-	2	2	-	-	-	-	-	3	3	2
CO4	3	3	2	-	-	2	2	3	-	-	-	-	3	3	2
CO5	3	3	2	-	-	2	2	-	-	-	-	-	3	3	2
3 - Stro	3 - Strong; 2 - Medium; 1 - Some														

Assessment Pattern	l			
Bloom's Category	Continuous Asse (Mai		Model Examination	End Sem Examination
	1	2	(Marks)	(Marks)
Remember	10	20	20	20
Understand	10	10	40	40
Apply	20	20	10	10
Analyze	20	10	30	30
Evaluate	-	-	-	-
Create	-	-	-	-
Total	60	60	100	100

Syllabu	S									
	ŀ	K.S.Rangasar			gy – Autonor	nous R2022	2			
			B. Tech. I	Food Techno	ology					
		60 FT I	E11 - Introdi	uction to Fo	od Biotechno	ology				
Semest	er	Hours/Week		Total	Credit	Ma	ximum Marks	3		
	L	Т	Р	Hours	С	CA	ES	Total		
IV	3									
	ction to Food Bi	•								
	iotechnology: Inti							[9]		
	nd foods; Control al cultures for foo						id diseases;	[0]		
IVIICIODIA	al cultures for 1000		i, iiieii iiiaiii	teriarice, suc	airi developine	511L				
Genetic	ally Modified Fo	od								
Introduc	tion and controve	ersies related								
	labelling and t							[9]		
	ement. Public pero food commodities				004. New pro	ducts and p	rocesses in	1		
products		s including pla	ani anu anin	ıaı						
	u nctionalization* nal food. Nutra		iverv svste	ms-Nano-sc	ale delivery	svetems:	Overcoming			
	al barriers; Lipos							[9]		
	ners, Polymeric n									
Food Q	uality Regulatior	IS***								
	of food, major in									
	al safety of food e and herbicide o							[9]		
FSSAI.	e and herbicide c	Ontamination	, roou salet	y Stariuarus.	WHO, FFO,	IVIIVIFO, NA	CCP, GIVIP,			
Applies	tions of Food Bi	otochnology								
	cultures, design			micro encar	sulation and	L packaging				
	oment and form							[9]		
	, significance an									
science	& Technology.									
						1	Total Hours:	45		
Text Bo	• • •									
	Srilakshmi B., Foo									
	ee, B. H. Fundam	entals of Foo	d Biotechnol	logy. VCH. 20	JU6					
Referer	.opez G.F.G. & Ca	200V00 C \/ D	Enad Caia	noo and Faa	d Diotophasis	av (2002) (PC Dross			
1. F	lopez G.F.G. & Ca Florida, USA	anovas G.V.E	., rood Scie	TICE AND FOO	u Divieciiii010	yy (2003), (ING FIESS,			
ر ا	ames M. Jay, Mo	dern Food Mi	cro-Biology.	(2000), 6th e	dition, An Asr	pen publicat	on, Maryland.			
	JSA.		377			•	,			

^{*}SDG 9 – Industry Innovation and Infrastructure

^{**}SDG 3 – Good Health and Well Being
***SDG 12 – Responsible Consumption and Production

Course Contents and Lecture Schedule No. of S. No. **Topics** hours 1.0 Introduction 1.1 Food Biotechnology: Introduction & Applications 1 1.2 Methods for the microbiological examination of water and foods 2 1.3 Control of Microbiological quality and safety 2 Food borne illnesses and diseases 1.4 1 Microbial cultures for food fermentation 1.5 1 Culture maintenance 1 1.6 1.7 Strain development 1 2.0 **Genetically Modified Foods** 2.1 Introduction and controversies related to GMOs 2 2.2 Ethical issues concerning GM foods 1 Testing for GMOs and its labelling, traceability 1 2.3 Trade related aspects 1 2.4 Biosafety; risk assessment and risk management 2.5 Public perception of GM foods 1 2.6 2.7 IPR. GMO Act-2004 1 New products and processes in various food commodities including plant and animal 2.8 products 3.0 **Food Functionalization** 3.1 Functional food 1 1 Nutraceutical 3.2 3.3 Delivery systems 1 1 Nano-scale delivery systems 3.4 Overcoming biological barriers 1 3.5 Liposomes, Nano-cochleates 1 3.6 Hydrogels-based nanoparticles, Micellar systems, Dendrimers 2 3.7 Polymeric nanoparticles, Nano emulsions 1 3.8 **Food Quality Regulations** 4.0 Analysis of food 1 4.1 Major ingredients present in different product 1 4.2 2 Food additives color, flavor, vitamins 4.3 Microbial safety of food products 1 4.4 2 Chemical safety of food products 4.5 Heavy metal, fungal toxins, pesticide and herbicide contamination 1 4.6 Food safety standards: WHO, FPO, MMPO, HACCP, GMP, FSSAI 1 4.7 5.0 Applications of Food Biotechnology 2 Starter cultures designing and development 5.1 5.2 Micro encapsulation and packaging 1 2 Development and formulation of novel products such as probiotic foods 5.3 Nutrigenomics, working, significance and relevance 2 5.4

Course Designer(s)

5.5

1. Mr. G. Bharath-bharathg@ksrct.ac.in



2

Biosensors and novel tools and their application

60 FT E12	Therapeutics and	Category	L	Т	Р	Credit
0011 212	Nutrition	PE	3	0	0	3

- To understand causative factors and metabolic changes in various disease/disorders
- To gain knowledge of the principles of diet therapy
- To understand the fundamentals of therapeutic diet and their formulation
- To understand the necessity of Dietary management in CVD
- To highlight about dietary counselling and medical nutrition therapy

Pre-requisites

Nil

Course Outcomes

On the successful completion of the course, students will be able to

CO1	Recall the fundamentals of Nutritional Assessment and Diet Nutrient and Drug Interaction.	Understand
CO2	Infer the Dietary management in critically ill patients.	Understand
CO3	Identify the Medical Nutrition Therapy, dietary counselling of Weight management & diabetes management.	Apply
CO4	Recall the concept of diagnosis, complications and dietary counselling of cardiovascular disorders and GI tract disorders.	Apply
CO5	Review the dietary management of degenerative disorders and surgery.	Understand

Mappii	ng with	Progra	amme C	Outcom	es										
COs		POs PSOs													
003	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1	3	3	3	-	-	3	3	-	-	-	-	-	2	3	3
CO2	3	3	2	-	-	3	3	3	-	-	-	-	2	3	3
CO3	3	3	2	-	-	2	2	-	-	-	-	-	2	3	3
CO4	3	3	2	-	-	2	2	3	-	-	-	-	2	3	3
CO5	3	3	2	-	-	2	2	-	-	-	-	-	2	3	3
3 - Stro	ong; 2 -	Mediur	n; 1 - S	ome											

Assessment Pattern				
	Continuous Ass	essment Tests (Marks)	Model	End Sem
Bloom's Category			Examination	Examination
	1	2	(Marks)	(Marks)
Remember	30	20	20	20
Understand	30	40	40	40
Apply	-	10	10	10
Analyze	-	30	30	30
Evaluate	-	-	-	-
Create	-	-	-	-
Total	60	100	100	100

		H	ƙ.S.Rangasa	my College	of Technolog	gy – Autonom	10us R2022	2	
					Food Techno				
						and Nutrition			
Seme	ester		Hours/Week		Total	Credit	Ма	ximum Mark	S
		L	Т	Р	Hours	С	CA	ES	Total
ľ	V	3	0	0	45	3	40	60	100
Introd intake Dieta asses	duction e and fo ry Allow ssment	to Therapeu ood habits. (vances (RDA of patients –	Good nutritio (A) for all age (c) out patient (, Major food n - a multidi groups. BMI & hospitalized	sciplinary eff R and BMI c d. Nutrition ca	assification, F fort - Balancer alculations. N are plan and i apeutic diets.	d diets, Red utritional so	commended reening and	[9]
Dieta Abso Rece	ry Cour rption, a ent adva tion. Die	nselling, Diet and metaboli nces in tech	sm of nutrien niques and fe	I Drug Interactits. Nutritional eeding substr	l status asse: rates. Entera	of drugs on ing ssment of the Il Nutrition sup s, Hypertensio	critically ill port and Pa	oatients. arenteral	[9]
Etiop Nutrit	athophy tion The	vsiology, me erapy, Dieta	ary treatmen	_		sis, complication			[9]
		isorders in: diabetes.	Overweight	and Underw	•	etes Mellitus -		•	[-]
Gesta Card Etiop Nutrit hyper Gastr	ational of iovascuatho phetion Thereion rointesti	diabetes. Ilar disorder ysiology, meterapy, dieta , hyperlipide	rs & GI tract etabolic & clir ary counsel emia, metabo orders – Gas	disorders* nical aberrationing, and repolic syndrom	eight, Diabe ons, diagnos cent advan e, periphera	•	ons, treatmo ovascular ovascular o	Fype 2, and ent, Medical Diseases – disease and	[9]
Gesta Cardi Etiop Nutrit hyper Gastr intole Over Canc treatr disea	ational control of the control of th	diabetes. Ilar disorder ysiology, me erapy, diete n, hyperlipide nal tract Dis celiac diseas some dege ny and its ce nd manage /-AIDS. Diet	rs & GI tract etabolic & clin ary counsel emia, metabo orders – Gas se. nerative disc omplications ment to ca tary manage	disorders* nical aberration, and resolic syndrom stroesophage orders and single Chemothe neer patient	ons, diagnos ecent advan e, periphera eal reflux disc urgery erapy, Radiat s. Alzheime gery- Nutritio	sis, complications in Cardio I and cerebro ease, peptic union therapy are ion in wound I	ons, treatmovascular of vascular of licer, diarrhound Surgery, and Parkins	ent, Medical Diseases – disease and oea, lactose Dietary son's	
Cardi Etiop Nutrit hyper Gastri intole Over Canc treatr disea Conv	ational ciovascu atho ph tion Th rtension rointesti erance, ci view of eer thera ment an ise, HIV ralescer	diabetes. Ilar disorder ysiology, me erapy, dieta , hyperlipide nal tract Dis celiac diseas some dege apy and its ce nd manage /-AIDS. Dietary i	rs & GI tract etabolic & clin ary counsel emia, metabo orders – Gas se. nerative disc omplications ment to ca tary manage	disorders* nical aberration, and repolic syndrom stroesophage orders and so - Chemothe neer patient ment in Sur	ons, diagnos ecent advan e, periphera eal reflux disc urgery erapy, Radiat s. Alzheime gery- Nutritio	sis, complications in Cardio I and cerebro ease, peptic union therapy are ion in wound I	ons, treatmonds, t	ent, Medical Diseases – disease and oea, lactose Dietary son's	[9]
Cardi Etiop Nutrit hyper Gastri intole Over Canc treatr disea Conv	ational ciovascu iovascu atho ph tion Th rtension rointesti erance, ci view of ter thera ment an alse, HIV ralescer	diabetes. Ilar disorder ysiology, me erapy, dieta i, hyperlipide nal tract Dis celiac diseas some dege py and its co nd manage /-AIDS. Dietary if ice, Dietary if):	rs & GI tract etabolic & clir ary counsel emia, metabolic derivation orders — Gas etabolic derivations merative discomplications ment to ca etary manage management	disorders* nical aberration, and repolic syndrom stroesophage orders and solution - Chemothe neer patient in Surt for pre- and	eight, Diabe	sis, complication ce in Cardio I and cerebro ease, peptic union therapy arer's disease on in wound I al diets.	ons, treatmon ovascular of vascular of licer, diarrhon and Surgery, and Parkins healing, Sta	ent, Medical Diseases — disease and oea, lactose Dietary son's age of	[9] [9] 45
Cardi Etiop Nutrit hyper Gastri intole Over Canc treatr disea Conv	ational control of the control of th	diabetes. Ilar disorder ysiology, me erapy, diete nal tract Dis celiac diseas some dege ny and its co nd manage /-AIDS. Diet nce, Dietary I M.E., Shike, ed. Lipincott,	rs & GI tract etabolic & clin ary counsel emia, metabo orders – Gas se. nerative disc omplications ment to ca tary manage management M, Ross, A.0 William and	disorders* nical aberrativing, and repolic syndrom stroesophage orders and stroesophage rders and stroesophage chemothencer patient ment in Surter for pre- and stroesophage C., Caballero Wilkins. 2008	eight, Diabe	sis, complications in Cardion	ons, treatments, treatments, treatments ovascular of vascular of vascular of surgery, and Surgery, and Parkins, healing, State of Nutrition in	ent, Medical Diseases — disease and oea, lactose Dietary son's age of Total Hours:	[9] [9] 45 Disease.
Gesta Card Etiop Nutrit hypei Gastr intole Over Canc treatr disea Conv	ational control of the control of th	diabetes. Ilar disorder ysiology, me erapy, diete nal tract Dis celiac diseas some dege ny and its co nd manage /-AIDS. Diet nce, Dietary I M.E., Shike, ed. Lipincott,	rs & GI tract etabolic & clin ary counsel emia, metabo orders – Gas se. nerative disc omplications ment to ca tary manage management M, Ross, A.0 William and	disorders* nical aberrativing, and repolic syndrom stroesophage orders and stroesophage rders and stroesophage chemothencer patient ment in Surter for pre- and stroesophage C., Caballero Wilkins. 2008	eight, Diabe	sis, complication ce in Cardio I and cerebro ease, peptic union therapy arer's disease on in wound I al diets.	ons, treatments, treatments, treatments ovascular of vascular of vascular of surgery, and Surgery, and Parkins, healing, State of Nutrition in	ent, Medical Diseases — disease and oea, lactose Dietary son's age of	[9] [9] 45 Disease.
Gesta Cardi Etiop Nutrit hypei Gastr intole Over Canc treatr disea Conv Text 1.	ational ciovascuatho phiton Thrension rointesti prance, cioview of the there ament an alescen Book(s Shils, 10th eta Maha	diabetes. Ilar disorder ysiology, me erapy, dieta , hyperlipide nal tract Dis celiac diseas some dege py and its cent nd manage /-AIDS. Dieta ice, Dietary i M.E., Shike, ed. Lipincott, n, L. K. and I):	rs & GI tract etabolic & clir ary counsel emia, metabo orders – Gas se. nerative disc omplications ment to ca tary manage management M, Ross, A.6 William and	disorders* nical aberration, and repolic syndrom stroesophage orders and solution - Chemothe near patient ment in Sure for pre- and C., Caballero Wilkins. 2008	eight, Diabe	sis, complications of the sis, complication of the sis, complication of the sis, complication of the sis, complete	ons, treatmonds, t	ent, Medical Diseases – disease and oea, lactose Dietary son's age of Total Hours: In Health and I	[9] [9] 45 Disease. vier, 2008
Gesta Cardi Etiop Nutrit hypei Gastr intole Over Canc treatr disea Conv Text 1.	ational ciovascuatho phiton Thrension rointesti prance, cioview of the there ament an alescen Book(s Shils, 10th eta Maha	diabetes. Ilar disorder ysiology, me erapy, dieta , hyperlipide nal tract Dis celiac diseas some dege py and its cent nd manage /-AIDS. Dieta ice, Dietary i M.E., Shike, ed. Lipincott, n, L. K. and I):	rs & GI tract etabolic & clir ary counsel emia, metabo orders – Gas se. nerative disc omplications ment to ca tary manage management M, Ross, A.6 William and	disorders* nical aberration, and repolic syndrom stroesophage orders and solution - Chemothe near patient ment in Sure for pre- and C., Caballero Wilkins. 2008	eight, Diabe	sis, complications in Cardion	ons, treatmonds, t	ent, Medical Diseases – disease and oea, lactose Dietary son's age of Total Hours: In Health and I	[9] [9] 45 Disease. vier, 2008
Gesta Cardi Etiop Nutrit hyper Gastr intole Over Canc treatr disea Conv Text 1. 2. Refer	ational ciovascu atho phiton Three sion Three sion rointesti erance, ciview of the three sinent and the see there are the see	diabetes. Ilar disorder ysiology, me erapy, dieta n, hyperlipide nal tract Dis celiac diseas some degen ny and its cond manage /-AIDS. Dieta nce, Dietary I M.E., Shike, ed. Lipincott, n, L. K. and I T. K. and Phi T. L.K., Sylvia	rs & GI tract etabolic & clin ary counsel emia, metabolic descriptions orders – Gasse. nerative discomplications ment to call dary management M, Ross, A. William and Escott Stump	disorders* nical aberrativing, and repolic syndrom stroesophage orders and significant control of the control o	eight, Diabe	sis, complications of the sis, complication of the sis, complication of the sis, complication of the sis, complete	ons, treatmony association of Surgery. and Parkins healing, Start 12th ed. Sart Publishing (ent, Medical Diseases — disease and oea, lactose Dietary son's age of Total Hours: n Health and I aunders- Else	[9] [9] 45 Disease.
Gesta Cardi Etiop Nutrit hypei Gastr intole Over Canc treatr disea Conv Text 1. 2. Refer 1.	ational control of iovasculation and control of iovasculation The rension of the	diabetes. Ilar disorder ysiology, me erapy, diete nal tract Dis celiac diseas some dege py and its co nd manage /-AIDS. Diet nce, Dietary I M.E., Shike, ed. Lipincott, n, L. K. and I): F.P. And Phi Caunders Co	rs & GI tract etabolic & clin ary counsel emia, metabolic descriptions orders – Gasse. nerative disconplications ment to call tary management M, Ross, A.6 William and Escott Stump liip Abraham, Escott-Stump mpany Lond	disorders* nical aberrativing, and repolic syndrom stroesophage orders and significant control of the control o	eight, Diabe ons, diagnos ocent advan e, periphera eal reflux disc urgery erapy, Radiat s. Alzheime gery- Nutritic post- surgica B and Cousi 5. s Food & Nut ition and Die	sis, complications, complications, complications, cardinal and cerebro ease, peptic union therapy aren's disease on in wound land diets. Ins RJ, Modern trition Therapy tetics, Oxford and Diet Therapy	ons, treatmony association of Surgery. and Parkins healing, Start 12th ed. Sart Publishing (ent, Medical Diseases — disease and oea, lactose Dietary son's age of Total Hours: n Health and I aunders- Else	[9] [9] 45 Disease.

^{*}SDG 3 - Good Health and Well Being



Course Contents and Lecture Schedule

S. No.	Topics	No. of hours
1.0	Nutritional Assessment and Care of Patients	-
1.1	Introduction to Therapeutic and Nutrition	1
1.2	Major food groups - classification, Factors influencing food intake and food habits	1
1.3	Good nutrition - a multidisciplinary effort - Balanced diets,	1
1.4	Recommended Dietary Allowances (RDA) for all age groups.	1
1.5	BMR and BMI calculations	1
1.6	Nutritional screening and assessment of patients – out patient & hospitalized	1
1.7	Nutrition care plan and implementation	1
1.8	Dietary Counselling, Importance and modification of normal diet to therapeutic diets	2
2.0	Dietary management in critically ill patients	
2.1	Dietary Counselling, Diet Nutrient and Drug Interaction	1
2.2	Effect of drugs on ingestion, Digestion, Absorption, and metabolism of nutrients	2
2.3	Nutritional status assessment of the critically ill patients	1
2.4	Recent advances in techniques and feeding substrates	1
2.5	Enteral Nutrition support and Parenteral Nutrition	1
2.6	Dietary treatment for - Typhoid, Malaria	1
2.7	Dietary treatment for - Tuberculosis, Hypertension and Cardiovascular disease	2
3.0	Weight management & diabetes management	
3.1	Etiopathophysiology, metabolic & clinical aberrations	1
3.2	diagnosis, complications, treatment, Medical Nutrition Therapy	2
3.3	Dietary treatment and dietary counseling	1
3.4	Recent advance for Weight imbalance disorders in: Overweight	1
3.5	Recent advance for Weight imbalance disorders in: Underweight	1
3.6	Diabetes Mellitus – Type 1, Type 2, and Gestational diabetes	1
3.7	Diabetes Mellitus –Type 2, and Gestational diabetes	1
3.8	Diabetes Mellitus –Gestational diabetes	1
4.0	Cardiovascular disorders & GI tract disorders	
4.1	Etiopathophysiology, metabolic & clinical aberrations	1
4.2	diagnosis, complications, treatment	1
4.3	Medical Nutrition Therapy, dietary counseling	1
4.4	Recent advance in Cardiovascular Diseases – hypertension, hyperlipidemia, metabolic syndrome	2
4.5	Peripheral and cerebro vascular disease	1
4.6	Gastrointestinal tract Disorders – Gastroesophageal reflux disease, peptic ulcer	2
4.7	Diarrhoea, lactose intolerance, celiac disease.	1
5.0	Overview of some degenerative disorders and surgery	
5.1	Cancer therapy and its complications	1
5.2	Chemotherapy, Radiation therapy and Surgery.	2
5.3	Dietary treatment and management to cancer patients.	1
5.4	Alzheimer's disease and Parkinson's disease	1
5.5	HIV-AIDS. Dietary management in Surgery	1
5.6	Nutrition in wound healing, Stage of Convalescence, Dietary management for pre - surgical diets	2
5.7	Dietary management for post- surgical diets	1

Course Designer(s)

1. Dr. K.Prabha - prabhak@ksrct.ac.in

60 FT E13	Technology of Fruit and	Category	L	Т	Р	Credit
0011213	Vegetable Processing	PE	3	0	0	3

- Apply tailored methods for soil prep, planting, irrigation, and fertilization in crops.
- Apply proper sorting, grading, and cleaning techniques to prepare fruits and vegetables
 efficiently.
- Utilize freezing technologies to maintain quality, flavor, and nutrition of surplus produce.
- Apply pasteurization and sterilization methods to enhance fruit and vegetable product safety.
- Design and implement production processes for jams, sauces, pickles, and value-added products.

Pre-requisites

• Nil

Course Outcomes

On the successful completion of the course, students will be able to

On the out	become completion of the course, stauchte will be able to	
CO1	Analyze the fundamental agricultural practices related to fruits and vegetables.	Analyze
CO2	Demonstrate the techniques used in the processing of fruits and vegetables.	Apply
CO3	Implement freezing and dehydration technologies to preserve surplus produce.	Apply
CO4	Utilize thermal processing methods in the technology of fruits and vegetables.	Apply
CO5	Execute the production processes for manufacturing fruit and vegetable products.	Apply

Mappir	ng with	Progra	ımme C	Outcom	es										
COs						P	Os							PSOs	
003	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1	3	-	3	3	-	-	-	-	-	-	-	2	3	3	3
CO2	3	-	3	3	-	-	-	-	-	-	-	2	3	3	3
CO3	3	-	3	3	-	-	-	-	-	-	-	2	3	3	3
CO4	3		3	3	-	-	-	-	-	-	-	2	3	2	2
CO5	3	-	3	3	-	-	-	-	-	-	-	2	3	2	3
					3 - 9	Strong	; 2 - Me	dium; 1	1 - Som	е					

Assessment Pattern				
Bloom's Category	Continuous Ass (Ma	essment Tests arks)	Model Examination	End Sem Examination
	1	2	(Marks)	(Marks)
Remember	20	20	20	20
Understand	20	40	40	40
Apply	10	10	10	10
Analyze	10	30	30	30
Evaluate	-	-	-	-
Create	-	-	-	-
Total	60	100	100	100



		s.Rangasa		of Technolog		mous R202		
		60 ET E13 -		 Food Tech of Fruit and 		Drocesing		
		Hours/Week		Total	Credit		aximum Marks	
Semester	L	T	Р	Hours	C	CA	ES	Total
IV	3	0	0	45	3	40	60	100
Ability to ide Indian langu vegetable Industry in	lages, impor dia and World	nmercially in tant regions d. Scope of F nt status, co	nportant fruit s, season, P ruit and Vege	s and veget roduction an etable Preser	ables with t id processin vation	g scenario	in important of fruits and ost- harvest	[9]
Physical, Temethods of important	Maturity dete fruits and veo ulations, meth	acteristics, s erminations r getables. Fru	naturity indicuit ripening- c	es for select chemical	ed fruits and	d vegetables		[9]
Preservation ermentation processed f General pre	by fermer , equipments ruits and veg processing, c s and vegetal ducts.	ntation- Def s; Fruit wine getables, so drying and fr	finition, Adve. Irradiation living probler ezing of frui	antages, dis applications ms with resp its and vegeta	for fruits a pect to natu ables* - prob	ind Vegetab ral resistanci olems associ	le. Minimally e of fruit, ated with	[9]
Canning- Ge exhausting, Nectar/Drink ndian Food processing, clarification,	processing or s, concentral Regulation different pac methods	ocessing, spe onditions; Indites – Genera and Quality king includin	dian Food Re al and specif assurance ' ng aseptic. To	egulation and ic processing Vegetable P echnology fo	I Quality ass g, different p urees/pastes r juice press	urance Fruit eacking includes - General sing, juice ex	- Blanching, Juice / pulp/ ding aseptic. and specific traction and paration and	[9]
Ready to ea Chutneys, F General and Dried Garlid	VEGETABLI t fruit and ve ruit Bar, Sou specific pro , Powder, O Dried vegetab	getable produp powders, cessing, diff	ducts, Jams/N Candied Fr erent packin Vafer; starch	uits, Natural g including a , Papad, Ca	colors, Fru aseptic, Drie arrot Preserv	it and Vegeted Onion, Pove, candy, I	table Fibres- wder. Garlic Pickle, Jam.	[9]
Text Book(s							Total Hours	45
	vs P I "Food							
I •				•			Noodhead, 200	9.
1.	ankar, B. "Foo			•			Woodhead, 200	09.

^{*}SDG 9 – Industry Innovation and Infrastructure



^{***}SDG 7 – Affordable ad Clean Energy

S. No.	Contents and Lecture Schedule Topics	No. of hours
1.0	Basic Agricultural Aspects of Vegetables and Fruits	Hours
1.1	Ability to identify all commercially important fruits with their names	1
1.2	Fruit Names in important Indian languages, important regions, season,	1
1.3	Ability to identify all commercially important vegetables with their names	1
1.4	Vegetable Names in important Indian languages, important regions, season,	1
1.5	Production and processing scenario of fruits and vegetable India and World	2
1.6	Scope of Fruit and Vegetable Preservation Industry in India	1
1.7	Present status, constraints and prospectus	1
1.8	Problem solving in post-harvest quality of fruits and vegetables	1
2.0	Fresh Fruits and Vegetables	
2.1	Physical, Textural characteristics, structure and composition	1
2.2	Maturity standards; Importance, methods of Maturity determinations maturity indices for selected fruits	2
2.3	Maturity standards; Importance, methods of Maturity determinations maturity indices for selected vegetables	2
2.4	Harvesting of important fruits and vegetables	1
2.5	Fruit ripening- chemical changes, regulations, methods	1
2.6	Calculation of respiration rates	1
2.7	Spoilage of fruits, vegetable and their processed products.	1
3.0	PRESERVATION OF FRUITS AND VEGETABLES	
3.1	Preservation by fermentation- Definition, Advantages, disadvantages	2
3.2	Types of fermentation, equipment; Fruit wine	1
3.3	Irradiation applications for fruits and Vegetable. Minimally processed fruits and vegetables	2
3.4	solving problems with respect to natural resistance of fruit	1
3.5	General pre-processing, drying and freezing of fruits and vegetables	1
3.6	problems associated with specific fruits and vegetables	1
3.7	problem solving in Post- cutting treatments to extend the shelf-life of fresh-cut products.	1
4.0	Canning, Purees and Juices	
4.1	Canning- General pre-processing	1
4.2	specific or salient points in fruits and vegetables like -Blanching, exhausting, processing conditions	1
4.3	Indian Food Regulation and Quality assurance Fruit Juice / pulp/ Nectar/Drinks, concentrates	1
4.4	General and specific processing, different packing including aseptic.	1
4.5	Indian Food Regulation and Quality assurance Vegetable Purees/pastes	1
4.6	General and specific processing, different packing including aseptic	1
4.7	Technology for juice pressing, juice extraction and clarification, methods of bottling, enzymatic clarification and debittering of juices, fruit juice powders	2
4.8	preparation and packaging	1
5.0	Fruit and Vegetable Products	
5.1	Ready to eat fruit and vegetable products, Jams/Marmalades, Squashes / cordials, Ketchup /sauces	2
5.2	Chutneys, Fruit Bar, Soup powders, Candied Fruits, Natural colors, Fruit and Vegetable Fibres	2
5.3	General and specific processing, different packing including aseptic	1
5.4	Dried Onion, Powder, Garlic Dried Garlic, Powder, Oil	1
5.5	Potato Wafer; starch, Papad,	1
5.6	Carrot Preserve, candy, Pickle, Jam.	1
5.7	Vegetable-Dried vegetable, Sauerkraut, Pickle Leafy vegetables; Dried Leafy Vegetables.	1

Course Designer(s)
Dr. J. Philip Robinson - philip@ksrct.ac.in



CHAIRMAN

20 == = 1.1	Instrumental Techniques in	Category	L	T	Р	Credit
60 FT E14	Food Analysis	PE	3	0	0	3

- To learnt about the various instruments based on electromagnetic radiation.
- To learn about advanced analytical methods used in the analysis of food.
- To impart knowledge on food quality.
- To evaluate the principles of chromatographic techniques.
- To learn characterization techniques

Pre-requisites

Nil

Course Outcomes

On the succ	cessful completion of the course, students will be able to	
CO1	Analyze different food materials using spectrometry techniques	Understand
CO2	Analyze the components and morphology of food products using various instrumental methods.	Understand
CO3	Discriminate the physical basis of electrophoresis and its development.	Remember
CO4	Evaluate the principle, types and applications of different chromatographic techniques for separation.	Understand
CO5	Acquire knowledge about charecterization techniques.	Apply

Mappii	ng with	Progra	amme C	Outcom	es										
COs						P	Os							PSOs	
003	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1	3	3	3	3	-	-	-	-	-	-	-	3	-	-	2
CO2	3	3	3	3	-	-	-	-	-	-	-	3	-	-	2
CO3	3	3	3	3	-	-	-	-	-	-	-	3	-	-	2
CO4	3	3	3	3	-	-	-	-	-	-	-	3	-	-	2
CO5	3	3	3	3	-	-	-	-	-	-	-	3	-	-	2
3 - Stro	ong; 2 -	Mediur	n; 1 - S	ome											

Assessment Pattern				
Bloom's Category	Continuous Asse	essment Tests (Marks)	Model Examination	End Sem Examination
	1	2	(Marks)	(Marks)
Remember	20	20	20	20
Understand	40	40	40	40
Apply	-	10	10	10
Analyze	-	30	30	30
Evaluate	-	-	-	-
Create	-	-	-	-
Total	60	100	100	100

				R Toch F	ood Techno	gy – Autono			
			60 ET E1	4 – Instrumen			Analysis		
		_	lours/Weel		Total	Credit		ximum Marks	
Seme	ester	L İ	T	<u>`</u> Р	Hours	C	CA	ES	Total
1	V	3	0	0	45	3	40	60	100
The I transr spect – The	mittance rometry eory ins	magnetic spe e – classificat and calorin strumentation	ion of instrunetry- netry- Theo and appli	nteraction of purpose of purpose of properties of properti	ds, Derivatio station and a ed spectrosc	n from Beer's application.	s law, – Visibl Ultra violet s	e spectroscopy	[9]
X- Ra and I Differ applic	ay diffra Refractr ential. 1	rometry – P Thermal analy Morphology	y's law- ins rinciple and ysis, Differe	strumentation d instrumenta ential scanning SEM, TEM, e	ntion – Anal g calorimetry	ysis of suga	ar. Thermog	ravimetry –	[9]
	luctome	etry and Pote	ential Meas	urement					
disad electr	uctance vantage ophores	e measuremes. Potential rasis, application	ents - app measureme on of paper,	lications. Cor ent - pH, pO2, , starch gel, ag s and its advar	pCO2, pHCC garose, nativ	D3, determin			[9]
disad electr denat Chroi Class Perfo of det	uctance vantage ophores turing P matogra sification rmance tectors)	e measuremes. Potential risis, application AGE. 2D electronal risis application of chromate Liquid Chro	ents - app measureme on of paper, ctrophoresis ds* ographic m matography MS, LC-MS	lications. Corent - pH, pO2, starch gel, ag and its advaranthods: Coluy (HPLC), (Pris and GC-FTI	pCO2, pHCO garose, nativi ntages. mn, Thin La inciple, mode	D3, determine and e and ayer, Paper, e of separati	ation. Basic Gas; High on technique	Principle of	[9]
disad electr denat Chroi Class Perfo of det Techr AAS, Atomi Reso	uctance vantage rophores turing P. matogra ification rmance tectors) niques - NMR S ic Absor nance:	e measuremes. Potential risis, application AGE. 2D electroscopy rption Spectroscopy rption Spectroscopy application in the section of the sec	ents - app measureme on of paper, ctrophoresis ds* ographic m matography MS, LC-MS iniques, e-t photomete to NMR; Pr	lications. Corent - pH, pO2, starch gel, ag and its advaranthods: Coluy (HPLC), (Pris and GC-FTI	pCO2, pHCO garose, nativ ntages. mn, Thin La inciple, mode R. Solid – ph estrumentation strumentation	D3, determine and ayer, Paper, e of separations extractions and applican (proton NN)	Gas; High on technique on System. Fations. Nucle	e and types eccent Rapid ar Magnetic mical shift -	
disad electr denat Chroi Class Perfo of det Techr AAS, Atomi Resol	uctance vantage rophores turing P. matogrisification rmance tectors) niques - NMR S ic Absor nance: cations.	e measuremes. Potential risis, application AGE. 2D electrons application of chromatic Liquid Chromatic HPTLC, GC-e-nose technological protion Spectroscopy (Introduction Mass spectroscop)	ents - app measureme on of paper, ctrophoresis ds* ographic m matography MS, LC-MS iniques, e-t photomete to NMR; Pr	lications. Corent - pH, pO2, starch gel, ag and its advarenthods: Coluy (HPLC), (Pri and GC-FTI) ongue.	pCO2, pHCO garose, nativ ntages. mn, Thin La inciple, mode R. Solid – ph estrumentation strumentation	D3, determine and ayer, Paper, e of separations extractions and applican (proton NN)	Gas; High on technique on System. Fations. Nucle MR only) che ation- applica	e and types eccent Rapid ar Magnetic mical shift -	[9]
disad electr denat Chroi Class Perfo of det Techr AAS, Atomi Reson applic	uctance vantage rophores turing P. matogris sification rmance tectors) niques - NMR S ic Absol nance: cations.	e measurements. Potential resis, application AGE. 2D elector applic Methor of chromate Liquid Chromate HPTLC, GC-e-nose tech application Spectroscopy rotion Spectroscopy rotion Spectroscopy rotion spectroscopy mass spectroscopy (Mass spectroscop):	ents - app measureme on of paper, ctrophoresis ds* ographic n matography MS, LC-MS iniques, e-t /* ophotomete to NMR; Proscopy – Ti	lications. Corent - pH, pO2, starch gel, ag and its advarenthods: Coluy (HPLC), (Pri and GC-FTI) ongue.	pCO2, pHCO garose, native ntages. mn, Thin La inciple, mode R. Solid – ph estrumentatio strumentatio nentations – I	D3, determing a yer, Paper, e of separation asse extraction and applican (proton NM lon fragment	Gas; High on technique on System. Fations. Nucle MR only) che ation- applica	e and types ecent Rapid ar Magnetic mical shift - ations.	[9]
disad electridenat Chroi Class Perfo of det Techri AAS, Atomi Reso applic	uctance vantage rophores turing P. matogra ification rmance tectors) niques - NMR S ic Absol nance: cations. Book(s)	e measuremes. Potential risis, application AGE. 2D electrons applic Methon of chromate Liquid Chromate Liquid Chromate HPTLC, GC-e-enose technique Spectroscopy rption Spectro Mass spectro Mass spectro in Ötles. Hand	ents - app measurement on of paper, ctrophoresis ds* ographic m matography MS, LC-MS iniques, e-t r* ophotometer to NMR; Proscopy – Tr	lications. Corent - pH, pO2, starch gel, ags and its advarance thods: Coluy (HPLC), (Pris and GC-FTII ongue. er: Principle, in inciple and inheory, instrument od Analysis Instructions.	pCO2, pHCC garose, nativitages. mn, Thin La inciple, mode R. Solid – phestrumentation strumentation entations – I	D3, determine and ayer, Paper, e of separations extraction ase extraction (proton NM lon fragment RC Press, Bo	Gas; High on technique on System. Fations. Nucle MR only) che ation- applica	e and types ecent Rapid ar Magnetic mical shift - ations.	[9]
disaddisaddisaddisaddisaddisaddisaddisa	wctance vantage ophores turing P. matogra iffication rmance tectors) niques - NMR S ic Absol nance: cations. Book(s) Semih	e measurements. Potential resis, application AGE. 2D electrons application of chromate Liquid Chromate Liquid Chromate Liquid Chromate Capectroscopy reption Spectroscopy application of Mass spectrons. Mass spectrons of Ottles. Hand the Nieisen. 2	ents - app measurement on of paper, ctrophoresis ds* ographic m matography MS, LC-MS iniques, e-t r* ophotometer to NMR; Proscopy – Tr	lications. Corent - pH, pO2, starch gel, ag sand its advarge the thods: Coluy (HPLC), (Pri Sand GC-FTI ongue. er: Principle, in inciple and inheory, instrum	pCO2, pHCC garose, nativitages. mn, Thin La inciple, mode R. Solid – phestrumentation strumentation entations – I	D3, determine and ayer, Paper, e of separations extraction ase extraction (proton NM lon fragment RC Press, Bo	Gas; High on technique on System. Fations. Nucle MR only) che ation- applica	e and types ecent Rapid ar Magnetic mical shift - ations.	[9]
disadelectridenate Chroi Class Perfo of det Techro AAS, Atomi Resonapplic Text I 1. 2.	matogratification rmance tectors) niques - NMR S ic Absolution scations. Book(s) Semin	e measurements. Potential resis, application AGE. 2D electrons application of chromate Liquid Chromate Liquid Chromate Liquid Chromate Capectroscopy reption Spectroscopy application of Mass spectrons. Mass spectrons of the Capectroscopy of the Capectroscopy reption Spectronscopy of the Capectroscopy of	ents - app measurement on of paper, ctrophoresis ds* ographic matography MS, LC-MS, iniques, e-to photometer to NMR; Proscopy – To book of Food	lications. Corent - pH, pO2, starch gel, age and its advarance thods: Coluy (HPLC), (Pris and GC-FTII ongue. er: Principle, in inciple and inheory, instrument and Analysis Labo	pCO2, pHCO garose, nativitages. mn, Thin La inciple, mode R. Solid – ph estrumentation strumentation entations – I struments. CI	D3, determine and ayer, Paper, e of separations extraction and applican (proton NN Ion fragment RC Press, Botal, 2nd Ed. Span, 2nd Ed. Ed. Span, 2nd Ed. Ed. Span, 2nd Ed. Ed. Span, 2nd Ed. Ed. Ed. Ed. Ed. Ed. Ed. Ed. Ed. Ed	Gas; High on technique on System. Fations. Nucle MR only) che ation- application- application- application- pringer, NY, Uninger, NY, U	e and types ecent Rapid ar Magnetic mical shift - ations.	[9] [9]
disadelectric denated Chroi Class Perform of det Techro AAS, Atomia Resonant Denated Text I 1. 2. Refer	uctance vantage ophores turing P. matogrisification rmance tectors) niques - NMR S ic Absol nance: cations. Book(s) Semihar Suzan rence(s) Chatwa Public Liptak	e measurements. Potential resis, application AGE. 2D electroscopy application Spectroscopy (Introduction Mass spectroscopy): n Ötles. Hand anne Nieisen. 2 ival, Gurdeep cations, Bomb	ents - app measurement on of paper, ctrophoresis ds* ographic m matography MS, LC-MS iniques, e-t photomete to NMR; Proscopy – To book of Foot 2010. Food R and Anar pay, 2003.	lications. Corent - pH, pO2, starch gel, age and its advarance thods: Coluy (HPLC), (Pris and GC-FTII ongue. er: Principle, in inciple and inheory, instrument and Analysis Labo	pCO2, pHCO garose, native ntages. mn, Thin La inciple, mode R. Solid – ph estrumentation strumentation strumentation entations – I estruments. CI ratory Manual	D3, determine and ayer, Paper, e of separations extraction and applican (proton NM lon fragment RC Press, Both al, 2nd Ed. Spring for Methods	Gas; High on technique on System. Fations. Nucle MR only) che ation- application- application- application or Ration, Floringer, NY, Union Chemical A	e and types ecent Rapid ar Magnetic mical shift - ations. Total Hours: ., USA, 2009. JSA. 2010.	[9] [9]
disadelectredenate Chroic Class Perfo of det Techroni Resonapplic 1. 2. Refer 1.	wctance vantage ophores turing P. matogratication rmance tectors) niques - NMR S ic Absol nance: cations. Book(s) Semilar Suzan rence(s) Chatwa Public Liptak Penns	e measurements. Potential resis, application AGE. 2D electroscopy retron Spectroscopy retron Spectroscopy rotton rott	ents - app measurement on of paper, ctrophoresis ds* ographic matography MS, LC-MS, iniques, e-t photometer to NMR; Proscopy – To book of Food 2010. Food R and Anar pay, 2003.	lications. Corent - pH, pO2, starch gel, age and its advaruethods: Coluy (HPLC), (Pris and GC-FTI) ongue. er: Principle, in inciple and inheory, instrumed Analysis Labord, Sham K., "I	pCO2, pHCO garose, native ntages. mn, Thin La inciple, mode R. Solid – ph estrumentation strumentation nentations – I ratory Manual nstrumentation lysis", Chiltor	D3, determine and ayer, Paper, e of separations as extraction and applican (proton NN Ion fragment RC Press, Both Ion Methods in Book Comp	Gas; High on technique on System. For the ations. Nuclee MR only) che ation-application-application or application of Chemical Many, Radnor pany, Ra	e and types ecent Rapid ar Magnetic mical shift - ations. Fotal Hours: JSA, 2009. JSA, 2010. Analysis", Hima	[9] [9]

^{*}SDG 9 - Industry Innovation and Infrastructure



Course Contents and Lecture Schedule

S. No.	Topics	No. of hours
1.0	Spectrometry	
1.1	The Electromagnetic spectrum – Interaction of photons with matter	1
1.2	Absorbance and transmittance	1
1.3	classification of instrumental methods,	1
1.4	Derivation from Beer's law, – Visible spectrometry - Theory, instrumentation and application	1
1.5	Calorimetry - Theory, instrumentation and application.	1
1.6	Ultra violet spectroscopy – Theory instrumentation and application	2
1.7	Infrared spectroscopy: Theory Fundamental vibrations – Instrumentation – application – Finger print region	2
2.0	X-Ray and thermal studies	
2.1	X- Ray diffraction, mosley's law	1
2.2	Instrumentation and applications.	1
2.3	Flame photometer, Polarimetry principle and instrumentation.	1
2.4	Refractrometry – Principle and instrumentation – Analysis of sugar	1
2.5	Thermogravimetry – Differential. Thermal analysis	1
2.6	Differential scanning calorimetry applications	1
2.7	Morphology analysis – SEM	1
2.8	Morphology analysis - TEM	1
2.9	Epifluorescence microscopy and Laser diffraction for particle analysis.	1
3.0	Conductometry and Potential Measurement	'
3.1	Conductance measurements - applications.	1
3.2	Conductometry titrations Types, advantages, and disadvantages.	1
3.3	Potential measurement - pH, pO2, pCO2, pHCO3, determination.	2
3.4	Basic Principle of electrophoresis,	1
3.5	Application of paper, starch gel, agarose, and 2D electrophoresis.	2
3.6	Native and denaturing PAGE.	1
3.7	2D electrophoresis and its advantages	1
4.0	Chromatographic Methods	
4.1	Classification of chromatographic methods	1
4.2	Column, Thin Layer chromatography	1
4.3	Paper, Gas chromatography	1
4.4	High Performance Liquid Chromatography (HPLC), (Principle, mode of separation technique and types of detectors)	1
4.5	HPLC	1
4.6	GC-MS	1
4.7	LC-MS and GC-FTIR.	1
4.8	Solid – phase extraction System	1
4.9	Recent Rapid Techniques – e-nose techniques, e-tongue	1
5.0	AAS, NMR Spectroscopy	-
5.1	Atomic Absorption Spectrophotometer: Principle, instrumentation and applications	2
5.2	Nuclear Magnetic Resonance: Introduction to NMR	1
5.3	Principle and instrumentation (proton NMR only)	2
5.4	Chemical shift - applications	1
5.5	Mass spectroscopy – Theory, instrumentations	1
5.6	Ion fragmentation- applications	2
<u> </u>	1	

Course Designer(s)

1. Dr.K.Prabha-<u>prabhak@ksrct.ac.in</u>



60 FT E15	Food Safety and Quality	Category	┙	Т	Р	Credit
0011213	Auditing	PE	3	0	0	3

- To study the Standard Operating Procedures.
- To prepare HACCP based SOP.
- To understand the GMP, Sanitation and Hygiene practice.
- To implement HACCP program to any food industry.
- To conduct quality auditing in the food industries

Pre-requisites

Nil

Course Outcomes

On the successful completion of the course, students will be able to

On the suc	cessial completion of the coarse, stadents will be able to	
CO1	Understand the basic techniques of Standard Operating Procedures used in food processing industries	Understand
CO2	Define the needs of HACCP and SOP during the food audits	Remember
CO3	Examine the Good Manufacturing Practice along with Sanitation and Hygiene practice used in the food industries	Understand
CO4	Summarize the whole process of HACCP in the food processing sectors.	Analyze
CO5	Deduce the improvements of HACCP while undergoing the food auditing	Analyze

Mappii	ng with	Progra	amme C	Outcom	es										
COs						Р	Os							PSOs	
003	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1	3	3	3	-	-	3	3	-	-	-	-	-	-	-	2
CO2	3	3	2	-	-	3	3	3	-	-	-	-	-	-	2
CO3	3	3	2	-	-	2	2	-	-	-	-	-	-	-	2
CO4	3	3	2	-	-	2	2	3	-	-	-	-	-	-	2
CO5	3	3	2	-	-	2	2	-	-	-	-	-	-	-	2
3 - Stro	ong; 2 -	Mediur	n; 1 - S	ome											

Assessment Pattern				
Bloom's Category	Continuous As	sessment Tests (Marks)	Model Examination	End Sem Examination
	1	2	(Marks)	(Marks)
Remember	30	20	20	20
Understand	30	40	40	40
Apply	-	10	10	10
Analyze	-	30	30	30
Evaluate	-	-	-	-
Create	-	-	-	-
Total	60	100	100	100

	3							
	K	K.S.Rangasa	my College o	`		nous R2022	!	
		60 E		Food Techno		lln a		
		Hours/Week	E15 - Food	Total	Credit	•	ximum Marks	
Semeste	er '	T	Р	Hours	Credit	CA	ES	Total
IV	3	0	0	45	3	40	60	100
Preparin operatin purchasi	d Operating Prog scope, quality progedure — progedure — prograw material reheating, perso	policy and quurpose-Forn s, receiving	nat - develop raw materia	oing and impl ls, storage,	lementing, et cleaning, ho	fective writir Iding, coolin	ng. SOP for lig, freezing,	[9]
Preparation	neck List tion of HACCP b ding, refrigerator, g, utensils and e	freezer and	milk cooler, f	ood storage	and dry stora	ge, cleaning	and	[9]
Good Mapecification exterior	uisite Program anufacturing Pra ation, Food Plan r of the building- procedures, trail	t Sanitation interior of the	Managemen	t - Plant fac	cilities constr	uction and r		[9]
Conduct monitori	principle* a hazard analys ng procedures, es on and validatior		tification est					
verificati			ective actions	procedures,				[9]
Impleme HACCP	entation of HACO for jam, biscuit, be eting in auditing,	CP and concoread, dairy,	ective actions ng the HACC lucting audit meat, fish an	procedures, P Program * d egg industi	establish pro	cedures for	MACCP meeting and	[9]
Impleme HACCP close me	for jam, biscuit, t eeting in auditing,	CP and concoread, dairy,	ective actions ng the HACC lucting audit meat, fish an	procedures, P Program * d egg industi	establish pro	cedures for ing of open audit exerci	MACCP meeting and	
Impleme HACCP close me	for jam, biscuit, beting in auditing, ok(s):	n, documenting the concurrence of the concurrence o	ective actions ng the HACC lucting audit meat, fish an of audit report	procedures, P Program * d egg indust s for different	establish pro ries. Conduct t department-	ing of open audit exerci	meeting and se	[9]
Impleme HACCP close me	for jam, biscuit, t eeting in auditing,	CP and concoread, dairy, preparation of los J. Quality	ective actions and the HACC lucting audit meat, fish an of audit report	procedures, P Program * d egg indust s for different	establish pro ries. Conduct t department-	ing of open audit exerci	meeting and se	[9]
Implement HACCP close medians Text Books 1. A C	for jam, biscuit, beting in auditing, ok(s): ndres Vasconcel	CP and concoread, dairy, preparation of los J. Quality on, UK. 2005	ective actions and the HACC lucting audit meat, fish an of audit report	procedures, P Program * d egg industr s for different or the Food in	ries. Conduct department-	ing of open audit exerci	meeting and se otal Hours:	[9]
Implement HACCP close medians and the second	for jam, biscuit, keeting in auditing, ok(s): ndres Vasconcel RC press, Londo nteaz Alli., Food q	CP and concoread, dairy, preparation of the concoread of the concoreaction of the concoreacti	ective actions and the HACC lucting audit meat, fish an of audit report Assurance for	procedures, P Program * d egg indust s for different or the Food in	ries. Conduct department- ndustry - A pr	ing of open audit exerci	meeting and se Total Hours: Dach.	[9]
Implement HACCP close medians and the second	for jam, biscuit, keeting in auditing, ok(s): ndres Vasconcel RC press, Londo nteaz Alli., Food q	CP and concoread, dairy, preparation of los J. Quality on, UK. 2005 quality assurand Carol Wall	ective actions and the HACC lucting audit meat, fish an of audit report Assurance for	procedures, P Program * d egg indust s for different or the Food in	ries. Conduct department- ndustry - A pr	ing of open audit exerci	meeting and se Total Hours: Dach.	[9]

^{*}SDG 12 - Responsible Consumption and Production



Course Contents and Lecture Schedule

S. No.	Topics	No. of hours
1.0	Standard Operating Procedures	
1.1	Preparing scope	1
1.2	quality policy and quality objectives of food processing company	1
1.3	Defining Standard operating procedure – purpose	1
1.4	Format - developing and implementing, effective writing	1
1.5	SOP for purchasing raw materials, receiving raw materials, storage	1
1.6	cleaning, holding, cooling, freezing	1
1.7	thawing, reheating, personal hygiene	1
1.8	facility and equipment	1
1.9	Systems in laboratory accreditation	1
2.0	Audit Check List	
2.1	Preparation of HACCP based SOP checklist	1
2.2	Personal hygiene, food preparation	1
2.3	Hot holding, cold holding	1
2.4	Refrigerator, freezer and milk cooler	1
2.5	Food storage and dry storage	1
2.6	Cleaning and sanitizing	1
2.7	Utensils and equipments, large equipments	1
2.8	garbage storage and disposal and pest control	2
3.0	Pre-requisite Program	
3.1	Good Manufacturing Practices	1
3.2	Personal hygiene.	1
3.3	occupational health and safety specification	1
3.4	Food Plant Sanitation Management - Plant facilities construction and Maintenance	1
3.5	Food Plant Sanitation Management - exterior of the building- interior of the Building	2
3.6	Food Plant Sanitation Management - equipments. Storage, transportation	2
3.7	Food Plant Sanitation Management - traceability, recalling procedures, training	1
4.0	HACCP principle	
4.1	Conduct a hazard analysis	1
4.2	CCP identification	2
4.3	Establish critical limits for each CCP	1
4.4	Establish CCP monitoring procedures	1
4.5	Establish corrective actions procedures	1
4.6	Establish procedures for HACCP verification and validation,	2
4.7	Documenting the HACCP Program.	1
5.0	Implementation of HACCP and conducting audit	
5.1	HACCP for jam, biscuit, bread	2
5.2	HACCP for dairy	1
5.3	HACCP for meat, fish and egg industries	2
5.4	Conducting of open meeting and close meeting in auditing	2
5.5	preparation of audit reports for different department- audit exercise	2

Course Designer(s)

1. Mr. P. Kalai Rajan-kalairajan@ksrct.ac.in



	Flour Chemistry and	Category	L	Т	Р	Credit
60 FT E16	Rheology	PE	3	0	0	3

- Understand the composition and role of gluten in bread making and baking.
- Learn the dry milling process of wheat and the characteristics of flour produced.
- Learn how to test for gluten quantity and dough raising capacity.
- Study the effects of bakery ingredients (e.g., water, yeast, sugar) on dough rheology.
- Learn the effects of mechanical work, mixing time, and temperature on dough properties.

Pre-requisites

Nil

Course Outcomes

Off the 3de	cessial completion of the course, students will be able to	
CO1	Demonstrate knowledge of gluten's function in bread and baked products.	Understand
CO2	Analyse the chemistry of wheat proteins and their effects on flour quality.	Analyze
CO3	Assess gluten quantity and quality using appropriate testing methods.	Apply
CO4	Assess how different ingredients affect dough's rheological properties and gas retention during bread making.	Apply
CO5	Perform rheological tests to measure dough extensibility and mixing tolerance.	Apply

Mappii	ng with	Progra	amme C	Outcom	es										
COs						P	Os							PSOs	
COS	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1	3	3	3	2	-	-	-	-	-	-	-	-	2	2	2
CO2	3	3	3	3	-	-	-	-	-	-	-	-	3	3	3
CO3	3	3	3	3	-	-	-	-	-	-	-	-	3	3	3
CO4	3	3	3	3	-	-	-	-	-	-	-	-	3	3	3
CO5	3	3	3	3	3	-	-	-	-	-	-	-	3	3	3
3 - Stro	ong; 2 -	Mediur	n; 1 - S	ome											

Assessment Pattern				
Bloom's Category	Continuous Asso	essment Tests (Marks)	Model Examination	End Sem Examination
	1	2	(Marks)	(Marks)
Remember	10	20	20	20
Understand	30	40	40	40
Apply	10	10	10	10
Analyze	10	30	30	30
Evaluate	-	-	-	-
Create	-	-	-	-
Total	60	100	100	100



			B.Tech	. Food Techi	nology			
		60	FT E16 - Flou	ur Chemistry	and Rheolo	gy		
Semester	ŀ	lours/Week		Total	Credit	Ma	ximum Marks	
Semester	L	Т	Р	Hours	С	CA	ES	Total
IV	3	0	0	45	3	40	60	100
tests for flou	ed, compositi or quality, colo ypes of baked	our, gluten a	nd water abs	orption. Blen				[9]
characteristi	DUR n structure a cs, optimizati ysaccharides	on, chemisti	y & biochem	istry – wheat	proteins, ad	verse reaction	ns to wheat	[9]
Principles a starch dama Principles a	emical TES nd methods age content, ind methods ugh raising ca	of estimational of estimation	on of moistur ie, flour color on of gluten	re, protein, a ur grade valu quantity, S	e and flour	particle size	distribution.	[9]
Dough structure oscillatory magnetic structure oscillatory mag	ROACHES T cture and ba neasurements neasurements and dough and thiol grou	asics of rhe s. Empirical ugh and glu rheology:	eology. Cree and fundame ten viscoelas Effects of v	ental testing. sticity in gas water, yeast	Rheological retention and , oxidation	behavior of bread maki and compo	dough and ng. Bakery ounds with	[9]
starch and e temperature	CAL TESTS tuents, proce nzymes on rh on dough rhe of visco-am	eological pro eology. Dete	perties of dou rmination of	ugh. Effects o Extensio-gra	f mechanical	work, mixing	time and	[9]
						Т	otal Hours:	45
Text Book(s	•							
	'.H Bakery p							
	- Bakery prod	lucts, Scienc	e and Techno	ology, Secon	d edition, 201	4		
Reference(s	,							
1. Matz	, Samuel A., -	–Bakery Ted	chnology and	Engineering	1992, 3rd Ed	dition, Chapn	nan & Hall, Lor	ndon
2. Edwa	ards W.P. — S	oionac of b	lon, product	o Dec III/ (2007			
∠. ⊏ UW∂	11US VV.P. — S	cience oi ba	werk broadct	5, NOU, UN, 2	1007			

^{*}SDG 9 – Industry Innovation and Infrastructure

Course Contents and Lecture Schedule								
S. No.	Topics	No. of hours						
1.0	Flour							
1.1	Types of Flour	1						
1.2	Composition of flour	1						
1.3	Nature of gluten and its functions	1						
1.4	Functions in bread making and baking	1						
1.5	Simple tests for flour quality	1						
1.6	Colour, gluten and water absorption	2						
1.7	Blended flours and their suitability for use in different types of baked products	1						
1.8	Flour improvers	1						
2.0	Wheat flour							
2.1	Wheat grain structure and composition	2						
2.2	Classification and grading	2						
2.3	Dry milling of wheat	1						
2.4	Flour characteristics, optimization, chemistry & biochemistry – wheat proteins	1						
2.5	Adverse reactions to wheat proteins, polysaccharides	1						
2.6	Interaction within components and interaction with other components	2						
3.0	Physiochemical tests & functional tests							
3.1	Principles and methods of estimation of moisture, protein, ash	1						
3.2	Principles and methods of estimation of minerals, fats	1						
3.3	Principles and methods of estimation of diastatic activity	1						
3.4	starch damage content, maltose value	1						
3.5	flour colour grade value and flour particle size distribution	1						
3.6	Principles and methods of estimation of gluten quantity	1						
3.7	SDS -Sedimentation volume, falling number	1						
3.8	dough raising capacity	1						
3.9	alkaline water retention test	1						
4.0	Basic approaches to dough rheology							
4.1	Dough structure and basics of rheology	1						
4.2	Creep and recovery, viscometry	1						
4.3	stress relaxation, oscillatory measurements	1						
4.4	Empirical and fundamental testing.	1						
4.5	Rheological behavior of dough and gluten.	1						
4.6	Importance of dough and gluten viscoelasticity in gas retention and bread making.	1						
4.7	Bakery ingredients and dough rheology: Effects of water, yeast, oxidation and compounds with disulfide and thiol groups,	1						
4.8	Bakery ingredients and dough rheology: Effects of water, yeast, oxidation and compounds with disulfide and thiol groups,	1						
4.9	sugar and emulsifiers on rheological properties of dough.	1						
5.0	Rheological Tests	•						
5.1	Flour constituents, processing parameters	1						
5.2	dough rheology: Influence of proteins, gluten,	2						
5.3	dough rheology: starch and enzymes on rheological properties of dough.	2						
5.4	Effects of mechanical work, mixing time and temperature on dough rheology.	1						
5.5	Determination of Extensio-graph characteristics of the dough	1						
5.6	Application of visco-amylograph in dough testing	2						

1. Mr. S. Nithishkumar - nithishkumar@ksrct.ac.in

Passed in BoS Meeting held on 12.05.23 Approved in Academic Council Meeting held on 03.06.23



		Category	L	Т	Р	Credit
60 FT E17	Drying Technology	PE	3	0	0	3

- Infer the mechanism and quality changes during drying.
- Select suitable dryers for food products based on requirement.
- Identify appropriate low cost drying methods.
- Choose suitable dryers for solid food materials.
- Recommend appropriate dryers for liquid food materials.

Pre-requisites

• Nil

Course Outcomes

On the succ	cessial completion of the coarse, students will be able to	
CO1	Study and understand the knowledge of the basic mechanism of drying and the changes occurs during drying of food material.	Understand
CO2	Define the different types of drying technologies with its principle, procedure and application in food sectors	Apply
CO3	Examine the different types of low-cost methods used in drying with its ethical values and applications	Analyze
CO4	Elucidate the technologies and methodologies used in drying of solids materials with its limitations	Analyze
CO5	Deduce the various techniques which were used to dry the liquid and slurry food products along with its advantages and disadvantages	Understand

Mappir	ng with	Progra	amme C	Outcom	es										
COs						P	Os							PSOs	
COS	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1	3	3	3	-	-	3	3	-	-	-	-	-	-	-	2
CO2	3	3	2	-	-	3	3	3	-	-	-	-	-	-	2
CO3	3	3	2	-	-	2	2	-	-	-	-	-	-	-	2
CO4	3	3	2	-	-	2	2	3	-	-	-	-	-	-	2
CO5	3	3	2	-	-	2	2	-	-	-	-	-	-	-	2
3 - Stro	ong; 2 -	Mediur	n; 1 – S	ome											

Assessment Pattern				
Bloom's Category	Continuous Asse (Mai		Model Examination (Marks)	End Sem Examination (Marks)
	1	2		
Remember	20	20	20	20
Understand	20	40	40	40
Apply	20	10	10	10
Analyze	-	30	30	30
Evaluate	-	-	-	-
Create	-	-	-	-
Total	60	100	100	100

					gy – Autono		1	
				Food Tech				
		ours/Week	OUFI EI7	Total	Credit	Ma	ximum Marks	
Semeste	er i	T	Р	Hours	C	CA	ES	Total
IV	3	0	0	45	3	40	60	100
Drying a periods · drying pi	nentals of Drying* and dehydration – -constant and falli roblems. Effect of uality changes in fordration.	Basics and ng rate period drying on W	ods. Drying a ater activity, l	nd Food Qua EMC, Sorptic	ality – Post- on isotherms	drying proble . Moisture dif	ms and In-	[9]
Classific convecti environn	f Dryers* iation of dryers – E on and radiation. nental factors. Cor les. Tray dryer – p	Based on fe	ed properties ersus innovat	s. Selection of tive drying	of dryers - en			[9]
Solar dry Osmotic	st Drying method ying. Types of sola dehydration – Pri stivity. Osmo conv	ar dryers – D ncipal. Osm	otic agents,	Factors affect	cting osmotic	dehydration.		[9]
	of Solids***							
Freezing Principle	lryer – Principle, T g, Primary and Se es of fluidization, T ism, Applications.	condary dry	ing stage. Flυ	uidized bed o	drying -			[9]
Freezing Principle mechani Drying o Drum dr system. dryer. Sp Atomize	g, Primary and Secses of fluidization, Toism, Applications. of Liquids and Sluying – principle. To Foam mat drying pray drying – Principle starting to the starting of the st	condary dry ypes of fluid urries ypes of drun – Principles ciple. Comp	ing stage. Flui lized bed drye n driers – Sin , Foaming ag onents of spr	uidized bed of cers. Pneumangle and douling gle and douling gents, Foaming dryer -	drying - tic drying – P ble drum drie ing Properties	rs. Types of I	king -eeding s foam mat	[9]
Freezing Principle mechani Drying o Drum dr system. dryer. Sp Atomize	g, Primary and Secses of fluidization, Toism, Applications. of Liquids and Sluying – principle. To Foam mat drying pray drying – Principle starting to the starting of the st	condary dry ypes of fluid urries ypes of drun – Principles ciple. Comp	ing stage. Flui lized bed drye n driers – Sin , Foaming ag onents of spr	uidized bed of cers. Pneumangle and douling gle and douling gents, Foaming dryer -	drying - tic drying – P ble drum drie ing Properties	rs. Types of I s, Continuous	king -eeding s foam mat	
Freezing Principle mechani Drying o Drum dry system. dryer. Sp Atomize limitation	g, Primary and Sees of fluidization, T ism, Applications. of Liquids and Sluying – principle. Ty Foam mat drying pray drying – Principle stans. ok(s):	condary dry ypes of fluid urries ypes of drun – Principles ciple. Comp ge and doub	ing stage. Flui lized bed drye n driers – Sin , Foaming ag onents of spr ole stage spra	uidized bed of cers. Pneumangle and douling gents, Foaming dryer - by dryer. Des	drying - tic drying – P ble drum drie ing Properties ign aspects.	rs. Types of I s, Continuous	Feeding s foam mat and	[9]
Freezing Principle mechani Drying of Drum dr system. dryer. Sp Atomize limitation Text Bo 1. N 2	g, Primary and Sector of fluidization, To ism, Applications. of Liquids and Sluying – principle. Ty Foam mat drying pray drying – Principle stans. ok(s): dujumdar A.S., —H	condary dry ypes of fluid urries ypes of drun – Principles ciple. Comp ge and doub andbook of I	ing stage. Fluized bed drye n driers – Sin , Foaming ag onents of spr ole stage spra	gle and doul gents, Foami ay dryer - ny dryer. Des	drying - tic drying - P ble drum drie ng Properties ign aspects. A	rs. Types of I s, Continuous Advantages a	Feeding s foam mat and Fotal Hours	[9]
Freezing Principle mechani Drying of Drum dr system. dryer. Si Atomize limitation Text Bo 1.	g, Primary and Sees of fluidization, T ism, Applications. of Liquids and Sluying – principle. Ty Foam mat drying pray drying – Principle stans. ok(s): dujumdar A.S., —H	condary dry ypes of fluid urries ypes of drun – Principles ciple. Comp ge and doub andbook of I	ing stage. Fluized bed drye n driers – Sin , Foaming ag onents of spr ole stage spra	gle and doul gents, Foami ay dryer - ny dryer. Des	drying - tic drying - P ble drum drie ng Properties ign aspects. A	rs. Types of I s, Continuous Advantages a	Feeding s foam mat and Fotal Hours	[9]
Principle mechanic principle mec	g, Primary and Sees of fluidization, T ism, Applications. of Liquids and Sluying – principle. Ty Foam mat drying pray drying – Principle stans. ok(s): dujumdar A.S., —H 007. iiao Dong Chen and lackwel, 2008. ce(s):	urries ypes of drun Principles ciple. Comp ge and doub andbook of I	ing stage. Fluilized bed drye in driers – Sin , Foaming agonents of sproble stage spra	gle and doul gents, Foami gents, Foami ay dryer - ay dryer. Des	drying - tic drying - P ble drum drie ing Properties ign aspects. A on, CRC press gies in Food F	rs. Types of I s, Continuous Advantages a s, Taylor and F	Feeding s foam mat and Fotal Hours Francis group, st Edition, Wil	[9] 45 UK,
Freezing Principle mechani Drying of Drying of Drying of System. dryer. Sp Atomize limitation Text Bo 1.	g, Primary and Sector of fluidization, Trism, Applications. of Liquids and Sluying – principle. Ty Foam mat drying pray drying – Principle stans. ok(s): dujumdar A.S., —H 007. iiao Dong Chen and lackwel, 2008.	condary dry ypes of fluid urries ypes of drun – Principles ciple. Comp ge and doub andbook of I	ing stage. Fluilized bed drye in driers – Sin , Foaming agonents of sproble stage spra	gle and doul gents, Foami gents, Foami ay dryer - ay dryer. Des	drying - tic drying - P ble drum drie ing Properties ign aspects. A on, CRC press gies in Food F	rs. Types of I s, Continuous Advantages a s, Taylor and F	Feeding s foam mat and Fotal Hours Francis group, st Edition, Wil	[9] 45 UK,
Freezing Principle Principle Mechani Prying of Drying of	a, Primary and Sector of fluidization, To ism, Applications. In Liquids and Sluying – principle. The Foam mat drying pray drying – Principle stands. In Liquids and Sluying – Principle stands. In Liquid and Sluying – Principle stands. In	urries ypes of drun Principles ciple. Comp ge and doub andbook of I d Mujumdan 2010. V., Sze Phelectronic Ve	ing stage. Fluized bed drye in driers – Sin , Foaming ag onents of spr ole stage spra industrial dryin r A.S, —Dryin and Mujumda eng Ong and rsion, 2012.	gle and doul gents, Foami ay dryer - ny dryer. Des gll, 3rd Edition g Technolog r A.S., —Dry	ble drum drie ing Properties ign aspects. And the conference of th	rs. Types of Is, Continuous Advantages a Traylor and F Processing, 1 Vegetables a	Feeding so foam mat and Fotal Hours Francis group, st Edition, Will and Fruits, Vo	[9] 45 UK, ey-

^{*}SDG 9 - Industry Innovation and Infrastructure

^{**}SDG 3 – Good Health and Well Being

^{***}SDG 7 - Affordable and Clean Energy

S. No.	Topics	No. of hours
1.0	Fundamentals of Drying	•
1.1	Drying and dehydration – Basics and principles	1
1.2	Mechanism of drying – Drying curves, Drying rate periods - constant and falling rate periods	2
1.3	Drying and Food Quality – Post-drying problems and In-drying problems	1
1.4	Effect of drying on Water activity, EMC, Sorption isotherms	1
1.5	Moisture diffusivities in food	1
1.6	Quality changes in food - Browning, color loss	1
1.7	Quality changes in food - shrinkage, solubility	1
1.8	Quality changes in food - texture and rehydration	1
2.0	Types of Dryers	•
2.1	Classification of dryers – Based on mode of operation	1
2.2	Mode of heat transfer – conduction, convection and radiation	1
2.3	Based on feed properties	1
2.4	Selection of dryers - energy costs, safety, and environmental factors	2
2.5	Conventional versus innovative drying techniques	2
2.6	Tray dryer – principle operational aspects and design	2
3.0	Low Cost Drying methods	•
3.1	Solar drying	1
3.2	Types of solar dryers – Direct, Indirect and mixed mode	2
3.3	Green house solar dryers	1
3.4	Osmotic dehydration – Principal. Osmotic agents	1
3.5	Factors affecting osmotic dehydration	1
3.6	Effect of water activity	1
3.7	Osmo convective drying. Applications, Advantages and Limitations	2
4.0	Drying of Solids	
4.1	Rotary dryer – Principle, Types, Applications	2
4.2	Freeze drying – Phase diagram of water	1
4.3	Principle – Freezing	1
4.4	Primary and Secondary drying stage	1
4.5	Fluidized bed drying - Principles of fluidization	1
4.6	Types of fluidized bed dryers	1
4.7	Pneumatic drying – Principle, Working mechanism, Applications	2
5.0	Drying of Liquids and Slurries	•
5.1	Drum drying – principle	1
5.2	Types of drum driers – Single and double drum driers	1
5.3	Types of Feeding system	1
5.4	Foam mat drying – Principles, Foaming agents, Foaming Properties Continuous foam mat dryer	2
5.5	Spray drying – Principle, Components of spray dryer – Atomizer types	2
5.6	Single stage and double stage spray dryer. Design aspects. Advantages and limitations	2

1. Mr. S. Nithishkumar – <u>nithishkumar@ksrct.ac.in</u>



PROFESSIONAL ELECTIVE - II

60 FT E21	Process Control and	Category	L	Т	Р	Credit
0011 221	Instrumentation	PE	3	0	0	3

Objectives

- Make use of Laplace transformation for first order systems.
- Apply Laplace Transformation for second order systems and determine its dynamic behavior,
- Interpret the concepts of feedback controller and determine its dynamic response and stability.
- Summarize the concept of computer-based controls in automation.
- Select temperature, pressure and level measuring instruments

Pre-requisites

Nil

Course Outcomes

On the successful completion of the course, students will be able to

CO1	Make use of Laplace transformation for first order systems	Understand
CO2	Apply Laplace Transformation for second order systems and determine its dynamic behaviour.	Analyze
CO3	Interpret the concepts of feedback controller and determine its dynamic response and stability.	Apply
CO4	Summarize the concept of computer-based controls in automation.	Apply
CO5	Select temperature, pressure and level measuring instruments	Analyze

Mappii	ng with	Progra	amme C	Outcom	es											
COs						PO	Os						PSOs			
003	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	
CO1	3	3	3	-	-	-	-	-	-	-	-	-	-	-	2	
CO2	3	3	3	-	-	-	-	-	-	-	-	-	-	-	2	
CO3	3	3	3	-	-	-	-	-	-	-	-	-	-	-	2	
CO4	3	3	2	-	-	-	-	-	-	-	-	-	-	-	2	
CO5	3	3	2	-	-	-	-	-	-	-	-	-	-	-	2	
3 - Stro	ong; 2 -	Mediur	n; 1 - S	ome												

Assessment Pattern

Bloom's Category	Continuous Asse	ssment Tests (Marks)	End Sem Examination (Marks)
Dicom c dulogory	1 2		
Remember	10	10	20
Understand	10	20	30
Apply	20	20	30
Analyze	10	-	20
Evaluate	-	-	-
Create	-	-	-
Total	60	60	100

Syllabus									
	ŀ	K.S.Rangasa				mous R2022			
				. Food Techi					
	1		21 - Proces	s Control an					
Semester		Hours/Week		Total Hours	Credit		ximum Marks	_	
V	3	T 0	P 0	45	C 3	CA 40	60	Total 100	
•		-	,	45	3	40	60	100	
Laplace Transform and First Order System Laplace transformation, application. Open-loop systems, first order systems and their transient response for standard input functions, Linearization and its application in process control.									
oscillator, d	der systems ynamic respo	- Interacting case of secon ack control sy	d order syst	em, Closed I	oop control s			[9]	
Controllers, Dynamic Response and its Stability Controllers - Proportional, Proportional Integral, Proportional Derivative and Proportional Integral Derivative (PID). Dynamic behavior of feedback-controlled processes. Effect of proportional, Integral, Derivative and composite control actions on the response of controlled processes. Stability for linear systems, Routh stability criterion and its limitations. Introduction to control system design by frequency, Bode diagram.									
	ponents of S	CADA, worki ation and adv					omparison	[9]	
Process Instruments* Principles of measurements - Static and dynamic response of instruments, Temperature measurements - Expansion Thermometer, filled system thermometers, thermocouple, optical pyrometers, radiation pyrometers. Pressure measurements - Manometers, bourdon gauge and bellows gauge, pressure measurement by vacuum Mccleod gauge, Pirani Gauge. Level measurement - sight glass level indicator, float and tape liquid level gauge.								[9]	
						Т	otal Hours:	45	
Text Book(
		ss Control and	d Instrument	ation", 8th Ed	ition, Dennet	& Co, India,	2015.		
Reference(
1. Step Pren	Stephanopoulos, S.G., "Chemical Process Control: An Introduction to Theory and Practice.", 1st Edition								
		anowr and Stopany Ltd., Ne			s Systems Ar	nalysis and C	Control", 3rd Ed	dition, Tata	

^{*}SDG 9 – Industry Innovation and Infrastructure

Course Contents and Lecture Schedule										
S. No.	Topics	No. of hours								
1.0	Laplace Transform and First Order System									
1.1	Laplace transformation	1								
1.2	application	1								
1.3	Open-loop systems	2								
1.4	first order systems	1								
1.5	their transient response for standard input functions	2								
1.6	Linearization and its application in process control.	2								
2.0	Second Order System									
2.1	Second order systems	1								
2.2	Interacting system and non-interacting system	2								
2.3	manometer, damped oscillator	1								
2.4	dynamic response of second order system	1								
2.5	Closed loop control systems	1								
2.6	development of block diagram for feed-back control systems	2								
2.7	servo and regulator problems	1								
3.0	Controllers, Dynamic Response and its Stability									
3.1	Controllers - Proportional, Proportional Integral,	2								
3.2	Proportional Derivative and Proportional Integral Derivative (PID)	2								
3.3	Dynamic behavior of feedback-controlled processes	1								
3.4	Effect of proportional, Integral, Derivative	1								
3.5	Effect of composite control actions on the response of controlled processes	1								
3.6	Stability for linear systems, Routh stability criterion and its limitations	1								
3.7	Introduction to control system design by frequency, Bode diagram	1								
4.0	Automation									
4.1	Control components of SCADA	2								
4.2	working of SCADA	1								
4.3	comparison of SCADA with DCS	2								
4.4	comparison of PLC with RTU	1								
4.5	Application and advantages of SCADA	2								
4.6	Sensors and its classification	1								
5.0	Process Instruments	-								
5.1	Principles of measurements	1								
5.2	Static and dynamic response of instruments	1								
5.3	Temperature measurements, Expansion Thermometer, filled system thermometers	1								
5.4	thermocouple, optical pyrometers, radiation pyrometers. Pressure measurements	2								
5.5	Manometers, bourdon gauge and bellows gauge, pressure measurement by vacuum	1								
5.6	Mccleod gauge, Pirani Gauge	1								
5.7	Level measurement – sight glass level indicator	1								
5.8	float and tape liquid level gauge	1								

Dr. P. Shanmugam - shanmugamp@ksrct.ac.in



CO FT F00		Category	L	Т	Р	Credit
60 FT E22	Community Nutrition	PE	3	0	0	3

- To provide knowledge on components of health and fitness.
- To impart knowledge on importance of nutrients and its assimilation,
- Determination of Energy Balance in human nutrition and nutrition during life cycle.
- Develop and prepare different types of visual aids suitable to community nutrition programs.

Pre-requisites

Nil

Course Outcomes

On the succ	cessful completion of the course, students will be able to	
CO1	To understand the basic concepts of nutrition, different nutritional demands and dietary requirements	Understand
CO2	Gain practical experience in imparting the knowledge of nutrition to the community	Analyze
CO3	To enhance societal awareness in improving the nutritional and functional properties of food.	Apply
CO4	Understand the importance and roles of energy levels in the regulation of human metabolism and nutrition.	Apply
CO5	Comprehend the physiological changes during pregnancy and lactation and the importance of nutrition during these stages.	Analyze

Mappii	ng with	Progra	amme (Outcom	es										
COs		POs											PSOs		
003	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1	3	3	2	-	-	-	3	-	-	-	-	-	3	3	2
CO2	3	3	2	-	-	-	3	-	-	-	-	-	3	3	2
CO3	3	3	2	-	-	-	3	-	-	-	-	-	3	3	2
CO4	3	3	2	-	-	-	3	-	-	-	-	-	3	3	2
CO5	3	3	2	-	-	-	3	-	-	-	-	-	3	3	2
3 - Stro	ong; 2 -	Mediur	n; 1 - S	ome											

Assessment Pattern			
Bloom's Category	Continuous Ass	sessment Tests (Marks)	End Sem Examination (Marks)
Catogory	1	2	
Remember	10	10	20
Understand	30	30	40
Apply	10	20	20
Analyze	10	-	20
Evaluate	-	-	-
Create	-	-	-
Total	60	60	100

Semester Hours/Week Total Credit Maximum Marks			10118 B2022	IV - Autonor	of Technolog	my College	S Rangaea	L.	Syllabus
Semester			IOUS NZUZZ				.o.Nanyasa		
Hours/Week									
V 3 0 0 0 45 3 40 60 Introduction to Food and Nutrition Definition, six classes of nutrients, RDA-General Principles of Deriving RDA, Reference Body Weights of Indians, Reference Person, Recommended Dietary Allowances for Indians, Uses and limitations of RDA. Nutritional status and its assessment, Malnutrition – over nutrition and under nutrition, deficiency disease. Functions of food, Functions of Nutrients, Balanced diet Nutrition during life cycle* Factors to be considered in meal/menu planning. Pregnancy -Nutritional requirements and modification of existing diet and supplementation, Lactation - nutritional requirements, breast feeding, infant formula, Infancy - nutritional requirements. Introduction of supplementary foods. Nutritional needs of toddlers, preschool, school going children- and adolescents - Dietary management. Geriatic Nutrition - Factors affecting food intake and nutrients use, nutrient needs. Health and functional foods* Concept of the functional foods, types of functional foods, development of functional foods, infant and baby foods, adolescent/ teen age foods, foods for pregnant ladies and nursing mothers, geriatric foods. Social, Economic and psychological aspects of ageing, Food selection patterns, Nutrition and drug interactions Energy in Human nutrition Energy and its unit, Energy Balance, Assessment of Energy Requirements—deficiency and excess, Determination of Energy in food, BMR. and its regulation, specific dynamic action of foods, Obesity and BMI calculations, Preparation of balance diets, evaluation of energy value and technoe conomic feasibility. Common nutritional problems, prevalence, etiology, management and implications. Undernutrition – PEM, underweight, stunting, wasting, SAM. Overnutrition – Childhood obesity Maternal and Child Nutrition Intergenerational cycle of malnutrition. Growth and development in adolescent girls. Preconceptual and Peri-conceptual Nutrition Pregnancy and Lactation: Pregnancy, Nutritional requirements, Lactation: Physiology of lactation, N		ximum Marks	Ma				lours/Week	F	Camaatan
Introduction to Food and Nutrition Definition, six classes of nutrients, RDA-General Principles of Deriving RDA, Reference Body Weights of Indians, Reference Person, Recommended Dietary Allowances for Indians, Uses and limitations of RDA. Nutritional status and its assessment, Malnutrition – over nutrition and under nutrition, deficiency disease. Functions of food, Functions of Nutrients, Balanced diet Nutrition during life cycle* Factors to be considered in meal/menu planning. Pregnancy -Nutritional requirements and modification of existing diet and supplementation, Lactation - nutritional requirements, breast feeding, infant formula, Infancy - nutritional requirements. Introduction of supplementary foods. Nutritional needs of toddlers, preschool, school going children- and adolescents – Dietary management. Geriatic Nutrition - Factors affecting food intake and nutrients use, nutrient needs. Health and functional foods* Concept of the functional foods, types of functional foods, development of functional foods, infant and baby foods, adolescent/ teen age foods, foods for pregnant ladies and nursing mothers, geriatric foods. Social, Economic and psychological aspects of ageing, Food selection patterns, Nutrition and drug interactions Energy in Human nutrition Energy and its unit, Energy Balance, Assessment of Energy Requirements—deficiency and excess, Determination of Energy in food, BMR. and its regulation, specific dynamic action of foods, Obesity and BMI calculations, Preparation of balance diets, evaluation of energy value and techno economic feasibility, Common nutritional problems, prevalence, etiology, management and implications. Undernutrition — PEM, underweight, stunting, wasting, SAM. Overnutrition — Childhood obesity Maternal and Child Nutrition Intergenerational cycle of malnutrition. Growth and development in adolescent girls. Pre- conceptual and Peri-conceptual Nutrition. Pregnancy and Lactation: Pregnancy, Nutritional requirements, Structural and functional differentiation during fetal perio	Total	ES	CA	С	Hours	Р	Τ	L	Semester
Definition, six classes of nutrients, RDA-General Principles of Deriving RDA, Reference Body Weights of Indians, Reference Person, Recommended Dietary Allowances for Indians, Uses and limitations of RDA. Nutritional status and its assessment, Malnutrition over nutrition and under nutrition, deficiency disease. Functions of food, Functions of Nutrients, Balanced diet Nutrition during life cycle* Factors to be considered in meal/menu planning. Pregnancy -Nutritional requirements and modification of existing diet and supplementation, Lactation - nutritional requirements, breast feeding, infant formula, Infancy - nutritional requirements. Introduction of supplementary foods. Nutritional needs of toddlers, preschool, school going children- and adolescents – Dietary management. Geriatic Nutrition - Factors affecting food intake and nutrients use, nutrient needs. Health and functional foods* Concept of the functional foods, types of functional foods, development of functional foods, infant and baby foods, adolescent/ teen age foods, foods for pregnant ladies and nursing mothers, geriatric foods. Social, Economic and psychological aspects of ageing, Food selection patterns, Nutrition and drug interactions Energy in Human nutrition Energy and its unit, Energy Balance, Assessment of Energy Requirements—deficiency and excess, Determination of Energy in food, BMR. and its regulation, specific dynamic action of foods, Obesity and BMI calculations, Preparation of balance diets, evaluation of energy value and techno economic feasibility, Common nutritional problems, prevalence, etiology, management and implications. Undernutrition – PEM, underweight, stunting, wasting, SAM. Overnutrition – Childhood obesity Maternal and Child Nutrition Intergenerational cycle of malnutrition. Growth and development in adolescent girls. Pre- conceptual and Peri-conceptual Nutrition. Pregnancy and Lactation: Pregnancy, Nutritional requirements, Lactation: Physiology of lactation, Nutritional requirements, Lactation management. Total Hou	100	60	40	3	45	0	0	3	V
Factors to be considered in meal/menu planning. Pregnancy -Nutritional requirements and modification of existing diet and supplementation, Lactation - nutritional requirements, breast feeding, infant formula, Infancy - nutritional requirements. Introduction of supplementary foods. Nutritional needs of toddlers, preschool, school going children- and adolescents — Dietary management. Geriatic Nutrition - Factors affecting food intake and nutrients use, nutrient needs. Health and functional foods* Concept of the functional foods, types of functional foods, development of functional foods, infant and baby foods, adolescent/ teen age foods, foods for pregnant ladies and nursing mothers, geriatric foods. Social, Economic and psychological aspects of ageing, Food selection patterns, Nutrition and drug interactions Energy in Human nutrition Energy and its unit, Energy Balance, Assessment of Energy Requirements—deficiency and excess, Determination of Energy in food, BMR. and its regulation, specific dynamic action of foods, Obesity and BMI calculations, Preparation of balance diets, evaluation of energy value and techno economic feasibility, Common nutritional problems, prevalence, etiology, management and implications. Undernutrition — PEM, underweight, stunting, wasting, SAM. Overnutrition — Childhood obesity Maternal and Child Nutrition Intergenerational cycle of malnutrition. Growth and development in adolescent girls. Preconceptual and Peri-conceptual Nutrition. Pregnancy and Lactation: Pregnancy, Nutritional requirements, Structural and functional differentiation during fetal period. Metabolism and use of nutrients, Lactation: Physiology of lactation, Nutritional requirements, Lactation management. Total Hours: Text Book(s): 1. Swaminathan,M. "Handbook of Food and Nutrition", 1st Edition, The Bangalore Press, 2018 2. Mike Lean and E.Combet, Barasi's Human Nutrition — A Health Perspective, Second Edition CRC London, 2015 Reference(s): 1. Swaminathan,M. "Handbook of Food and Nutrition", 1st Edition and D	[9]	s, Uses and d under	es for Indian nutrition an	ary Allowance trition – over	nended Dieta sment, Malnu	on, Recomn	nutrients, RD erence Perso onal status a	x classes of r Indians, Refe RDA. Nutrition	Definition, size Weights of I limitations of
Concept of the functional foods, types of functional foods, development of functional foods, infant and baby foods, adolescent/ teen age foods, foods for pregnant ladies and nursing mothers, geriatric foods. Social, Economic and psychological aspects of ageing, Food selection patterns, Nutrition and drug interactions Energy in Human nutrition Energy and its unit, Energy Balance, Assessment of Energy Requirements—deficiency and excess, Determination of Energy in food, BMR. and its regulation, specific dynamic action of foods, Obesity and BMI calculations, Preparation of balance diets, evaluation of energy value and techno economic feasibility, Common nutritional problems, prevalence, etiology, management and implications. Undernutrition – PEM, underweight, stunting, wasting, SAM. Overnutrition – Childhood obesity Maternal and Child Nutrition Intergenerational cycle of malnutrition. Growth and development in adolescent girls. Preconceptual and Peri-conceptual Nutrition. Pregnancy and Lactation: Pregnancy, Nutritional requirements, Structural and functional differentiation during fetal period. Metabolism and use of nutrients, Lactation: Physiology of lactation, Nutritional requirements, Lactation management. Total Hours: Text Book(s): 1. Swaminathan,M. "Handbook of Food and Nutrition", 1st Edition, The Bangalore Press, 2018 London, 2015 Reference(s): Sumanti R. Mudambi, Rajagopal, M.V., "Fundamentals of Food, Nutrition and Diet Therapy", 6th In New Age International Publishers, New Delhi, 2018	[9]	ents, breast htary foods.	l requireme supplemer	n - nutritiona atroduction of and	on, Lactatior uirements. Ir ing children-	ipplementati itritional req ol, school go	ed in meal, diet and su Infancy - nu ers, preschoo	be considered of existing ant formula, leeds of toddled Dietary ma	Factors to modification feeding, infa Nutritional ne adolescents
Energy and its unit, Energy Balance, Assessment of Energy Requirements—deficiency and excess, Determination of Energy in food, BMR. and its regulation, specific dynamic action of foods, Obesity and BMI calculations, Preparation of balance diets, evaluation of energy value and techno economic feasibility, Common nutritional problems, prevalence, etiology, management and implications. Undernutrition — PEM, underweight, stunting, wasting, SAM. Overnutrition — Childhood obesity Maternal and Child Nutrition Intergenerational cycle of malnutrition. Growth and development in adolescent girls. Preconceptual and Peri-conceptual Nutrition. Pregnancy and Lactation: Pregnancy, Nutritional requirements, Structural and functional differentiation during fetal period. Metabolism and use of nutrients, Lactation: Physiology of lactation, Nutritional requirements, Lactation management. Total Hours: Text Book(s): 1. Swaminathan,M. "Handbook of Food and Nutrition", 1st Edition, The Bangalore Press, 2018 2. Mike Lean and E.Combet, Barasi's Human Nutrition — A Health Perspective, Second Edition CRC London, 2015 Reference(s): Sumanti R. Mudambi, Rajagopal, M.V., "Fundamentals of Food, Nutrition and Diet Therapy", 6th In New Age International Publishers, New Delhi, 2018	[9]	rs, geriatric	rsing mothe	adies and nu	or pregnant la	ods, foods fo	foods, types teen age foo	ne functional f adolescent/ f l, Economic	Concept of the code, foods. Social
Intergenerational cycle of malnutrition. Growth and development in adolescent girls. Preconceptual and Peri-conceptual Nutrition. Pregnancy and Lactation: Pregnancy, Nutritional requirements, Structural and functional differentiation during fetal period. Metabolism and use of nutrients, Lactation: Physiology of lactation, Nutritional requirements, Lactation management. Total Hours: Text Book(s): 1. Swaminathan,M. "Handbook of Food and Nutrition", 1st Edition, The Bangalore Press, 2018 2. Mike Lean and E.Combet, Barasi's Human Nutrition – A Health Perspective, Second Edition CRC London, 2015 Reference(s): 1. Sumanti R. Mudambi, Rajagopal, M.V., "Fundamentals of Food, Nutrition and Diet Therapy", 6th Enterpretational Publishers, New Delhi, 2018	[9]	ls, Obesity o economic tions.	ction of food le and techno and implica	fic dynamic a of energy valu nanagement	ulation, speci , evaluation o ce, etiology, r	. and its reg alance diets as, prevalend	y Balance, A n food, BMR paration of b onal problen	ts unit, Energy In of Energy i Culations, Pre Ommon nutriti	Energy and it Determination and BMI cald feasibility, Co
Text Book(s): 1. Swaminathan,M. "Handbook of Food and Nutrition", 1st Edition, The Bangalore Press, 2018 2. Mike Lean and E.Combet, Barasi's Human Nutrition – A Health Perspective, Second Edition CRC London, 2015 Reference(s): 1. Sumanti R. Mudambi, Rajagopal, M.V., "Fundamentals of Food, Nutrition and Diet Therapy", 6th In New Age International Publishers, New Delhi, 2018	[9]	Nutritional and use of	Pregnancy, Metabolism	Lactation: etal period.	gnancy and ation during	utrition. Pre al differentia	of malnutrit nceptual Nu and function	onal cycle and Peri-co s, Structural	Intergenerati conceptual requirements
 Swaminathan, M. "Handbook of Food and Nutrition", 1st Edition, The Bangalore Press, 2018 Mike Lean and E.Combet, Barasi's Human Nutrition – A Health Perspective, Second Edition CRC London, 2015 Reference(s): Sumanti R. Mudambi, Rajagopal, M.V., "Fundamentals of Food, Nutrition and Diet Therapy", 6th In New Age International Publishers, New Delhi, 2018 	45	otal Hours:	Т						
Mike Lean and E.Combet, Barasi's Human Nutrition – A Health Perspective, Second Edition CRC London, 2015 Reference(s): Sumanti R. Mudambi, Rajagopal, M.V., "Fundamentals of Food, Nutrition and Diet Therapy", 6th In New Age International Publishers, New Delhi, 2018):	Text Book(s
London, 2015 Reference(s): Sumanti R. Mudambi, Rajagopal, M.V., "Fundamentals of Food, Nutrition and Diet Therapy", 6th In New Age International Publishers, New Delhi, 2018	•								
Sumanti R. Mudambi, Rajagopal, M.V., "Fundamentals of Food, Nutrition and Diet Therapy", 6th I New Age International Publishers, New Delhi, 2018	Press,	d Edition CRC	ctive, Secon	lealth Perspe	Nutrition – \overline{A}	si's Human l	ombet, Bara		
1. Sumanti R. Mudambi, Rajagopal, M.V., "Fundamentals of Food, Nutrition and Diet Therapy", 6th I New Age International Publishers, New Delhi, 2018):	Reference(s
	Edition,	Therapy", 6th F	on and Diet	Food, Nutriti				nti R. Mudam	₄ Suma
2. Srilakshmi B., "Nutrition Science", 6th Edition, New Age International Publishers, New Del	ni,2018	ers, New Del	nal Publish	Age Internation				•	Srilak
3. Sarah H. (1981). Maternal, Infant and Child Nutrition. Health Sciences Consortium, the Univ	ersity of	tium, the Univ	nces Conso	Health Scien	ild Nutrition.	ant and Ch	Maternal, Inf		

^{*}SDG 3 - Good Health and Well Being



B.TECH.(FT)-2022-2023 **Course Contents and Lecture Schedule** No. of S. No. **Topics** hours 1.0 Introduction to Food and Nutrition 1.1 Definition, six classes of nutrients RDA-General Principles of Deriving RDA 1.2 1 1.3 Reference Body Weights of Indians, Reference person 1 Recommended Dietary Allowances for Indians 1.4 1 1.5 Uses and limitations of RDA 1 1.6 Nutritional status and its assessment 1 Malnutrition - over nutrition and under nutrition 1.7 Deficiency disease. Functions of food 1.8 1 Functions of Nutrients, Balanced diet 1.9 1 2.0 **Nutrition during life cycle** 2.1 Factors to be considered in meal/menu planning Pregnancy -Nutritional requirements and modification of existing diet and 1 2.2 supplementation 2.3 Lactation - nutritional requirements 1 2.4 Breast feeding, infant formula 1 2.5 Infancy - nutritional requirements 1 Introduction of supplementary foods 2.6 1 Nutritional needs of toddlers, preschool, school going children- and adolescents 2.7 2.8 Dietary management. Geriatric Nutrition 1 2.9 Factors affecting food intake and nutrients use, nutrient needs 1 3.0 Health and functional foods 3.1 Concept of the functional foods Types of functional foods 3.2 Development of functional foods 3.3 1 3.4 Infant and baby foods, adolescent/ teen age foods 1 foods for pregnant ladies and nursing mothers 3.5 1 3.6 Geriatric foods 3.7 Social, Economic and psychological aspects of ageing 1 Food selection patterns 1 3.8 1 3.9 Nutrition and drug interactions 4.0 **Energy in Human nutrition** 4.1 Energy and its unit, Energy Balance Assessment of Energy Requirements—deficiency and excess 4.2 1 4.3 Determination of Energy in food 1 4.4 BMR and its regulation 1 4.5 Specific dynamic action of foods Obesity and BMI calculations 4.6 1 Preparation of balance diets, evaluation of energy value and techno economic feasibility 4.7 1 4.8 Common nutritional problems, prevalence, etiology, management and implications 1 Undernutrition – PEM, underweight, stunting, wasting, SAM. Overnutrition – Childhood 1 4.9 obesity 5.0 **Maternal and Child Nutrition** Intergenerational cycle of malnutrition 1 5.1 Growth and development in adolescent girls 5.2 1 Pre-conceptual and Peri-conceptual Nutrition 5.3 1 Pregnancy and Lactation: Pregnancy, Nutritional requirements 1 5.4

Course Designer(s)

5.5

5.6

5.7

5.8 5.9

1. Dr. J.Balachandra Mohan-balachandramohan@ksrct.ac.in Passed in BoS Meeting held on 22.11.23

Metabolism and use of nutrients

Nutritional requirements

Lactation management

Lactation: Physiology of lactation

Structural and functional differentiation during fetal period

Approved in Academic Council Meeting held on 23.12.23



1

1

1

1

1

60 FT E23	Fruits and Vegetables as	Category	L	Т	Р	Credit
00 F1 E23	Nutraceuticals	PE	3	0	0	3

- Design and implement production processes for jams, sauces, pickles, and value-added products.
- Identify and describe the major physiological processes in fruits and vegetables.
- Define nutraceuticals and distinguish them from pharmaceuticals and functional foods.
- Compare and contrast different methods used for the extraction and isolation of nutraceuticals.
- Assess the role of nutraceuticals and functional foods in preventing specific diseases.

Pre-requisites

Nil

Course Outcomes

On the succe	On the successful completion of the course, students will be able to									
CO1	Comprehend the physiological characteristics of fruits and vegetables.	Understand								
CO2	Explain the foundational concepts of nutraceuticals and their impact on health and disease.	Understand								
CO3	Analyze the chemical properties of nutraceuticals and the techniques used for their extraction.	Analyze								
CO4	Assess the significance of nutraceuticals and functional foods in promoting health and preventing disease.	Analyze								
CO5	Analyze the role of nutraceuticals and functional foods in preventing specific diseases.	Analyze								

Mapping	Mapping with Programme Outcomes														
COs	POs												PSOs		
COS	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1	3	3	3	3	-		-	-	-	-	-	2	3	3	3
CO2	3	3	3	3	-		-	-	-	-	-	2	3	3	3
CO3	3	3	3	3	-		-	-	-	-	-	2	3	3	3
CO4	3	3	3	3	-		-	-	-	-	-	2	3	2	2
CO5	3	3	3	3	-		-	-	-	-	-	2	3	2	3
3 - Stror	ng; 2 - Me	edium;	1 - Soi	me											

Assessment Pattern										
Bloom's Category	Continuous Ass (M	essment Tests arks)	End Sem Examination (Marks)							
	1	2	7							
Remember	30	20	30							
Understand	30	20	30							
Apply	-	10	20							
Analyze	-	10	20							
Evaluate	-	-	-							
Create	-	-	-							
Total	60	60	100							



		1/									
		K.	S.Rangasa				nomous R2022				
B.Tech. – Food Technology 60 FT E23 - Fruits and Vegetables as Nutraceuticals Hours/Week Credit Maximum Marks											
		-						mum Marks			
Se	mester				Total				Tot		
		L	Т	Р	Hours	С	CA	ES	al		
	V	3	0	0	45	3	40	60	100		
Bioactive Compounds in Fruits and Vegetables Introduction to major class of bioactives in fruits and vegetables, present scenario of nutraceutical market, food and nutrient intake behavior in Indians, classification of plant derived bioactives, interaction of functional food with medicine, Vitamins and Minerals of fruits and Vegetables, Flavonoid, Isoflavone, and Carotenoid Contents in Raw fruits and Vegetables, Fibre — dietary fibre, plant tissue and type of cell walls, cell wall polysaccharide, effects of cooking or processing on cell wall composition, health benefits											
Pha vege ther in p	rmacologic etable cons apy; Nutrac prostate he	al properties sumption in ceuticals as	s of fruits a adults; dia therapeutic tidants in f	betes, diabe agent for in	es; nutritiona tic complica flammation	al indicators ation and fla – flavonoids	ivonoids; curcur s, anthocyanin; o	ects of fruits and nin – epigenetic diet and nutrition ant response to	9		
Role food etc. ergo and	e of fruit ands, phytoste Sports for ogenic aids special ne	nd vegetablerol, phytoe ods – ingr in sports nu eeds of infal	e nutrients strogens, cedients, cotrition. Formats, current	glucosinolate omponents i nulations for r	and immunes, organosun sports for meeting nor fant foods,	e system er ilphur comp oods, sports mal	ounds, flavonoi	ion in functional ds, carotenoids, consideration,	9		
Con and Preb tech	cept of new consumer biotic subst	w health foo response; ances from	economic fruits and	analysis and	from fruits d costing c and their util	of novel foo lization in fu	ds from fruits	arketing strategy and vegetables, symbiotic foods,	9		
Nutrand from	raceutical d chemistry, n residues d	lelivery vehice mechanism of fruit and versions.	cles, Role of of action -	case studies	from fruit an , recovery o ustry, stabili	of valuable b ty and bioac	ioactives	and vegetables	9		
Tota	al Hours:								45		
Tex	t Book(s):						-	-			
1.	Anumala, Vegetable	V., Phuraila es as Nutrac	atpam, A., S eutical: Na	Sarma, P., Ar ture's Medici	numala, V., ne. United S	Phurailatpar States: Taylo	m, A., Sarma, P. or & Francis.	(2021). Fr uits ar	nd		
2.								Germany: Wiley.			
Refe	erence(s):										
1.	Li, T. S. C	C., Li, T. S. C ates: CRC F	,	egetables a	and Fruits: N	Nutritional a	nd Th	nerapeutic Va	alues.		
2.	Nutritional Elsevier S	•	n and Antio	xidant Prope	rties of Fruit	s and Veget	ables. (2020). No	etherlands:			

^{**}SDG 3 - Good Health and Well Being



^{***}SDG 7 – Affordable and Clean Energy

Course Contents and Lecture Schedule

S. No.	Topics	No. of hours
1.0	Bioactive Compounds in Fruits and Vegetables	
1.1	Introduction to major class of bioactives in fruits and vegetables	1
1.2	present scenario of nutraceutical market, food and nutrient intake behavior in Indians	2
1.3	classification of plant derived bioactives, interaction of functional food with medicine	2
1.4	Vitamins and Minerals of fruits and Vegetables, Flavonoid	1
1.5	Isoflavone, and Carotenoid Contents in Raw fruits and Vegetables	1
1.6	Fibre – dietary fibre, plant tissue and type of cell walls, cell wall polysaccharide	1
1.7	effects of cooking or processing on cell wall composition, health benefits	1
2.0	Pharmacological and Nutritional Properties of Fruits and Vegetables	
2.1	Pharmacological properties of fruits and vegetables	1
2.2	nutritional indicators and health aspects of fruits and vegetable consumption in adults	2
2.3	diabetes, diabetic complication and flavonoids;	1
2.4	curcumin – epigenetic therapy	1
2.5	Nutraceuticals as therapeutic agent for inflammation – flavonoids, anthocyanin	1
2.6	diet and nutrition in prostate health	1
2.7	Antioxidants in fruits & vegetables	1
2.8	factors that affect antioxidant response to ingestion of fruit - health properties	1
3.0	Nutrients in Fruits and Vegetables for Health and Specialized Foods	
3.1	Role of fruit and vegetable nutrients in Cancer and immune system enhancer	1
3.2	utilization in functional foods, phytosterol, phytoestrogens	1
3.3	glucosinolates, organosulphur compounds, flavonoids, carotenoids, etc.	1
3.4	Sports foods – ingredients, components in sports foods,	1
3.5	sports drinks, design consideration, ergogenic aids in sports nutrition.	1
3.6	Formulations for meeting normal and special needs of infants,	1
3.7	current status of infant foods, additives for infant foods.	1
3.8	Foods for aged persons, design consideration, ingredients for geriatric foods	2
4.0	Development of Health Foods from Fruits and Vegetables	
4.1	Concept of new health food product development from fruits	1
4.2	Concept of new health food product development from vegetables	<u>·</u> 1
4.3	Safety; marketing strategy and consumer response;	2
4.4	economic analysis and costing of novel foods from fruits	<u></u>
4.5	economic analysis and costing of novel foods from vegetables	<u>·</u> 1
4.6	Prebiotic substances from fruits and vegetables and their utilization in functional foods,	1
4.7	symbiotic foods, technological aspects and recent development in probiotics, prebiotics and symbiotic	2
5.0	Nutraceuticals and Bioactive Compound Utilization	
5.1	Nutraceutical delivery vehicles	2
5.2	Role of bioactives from fruit and vegetables for human health	2
5.3	plant parts and chemistry, mechanism of action	1
5.4	case studies, recovery of valuable bioactives from residues of fruit and vegetable processing industry,	2
5.5	stability and bioaccessibility of fruit and vegetables bioactives in food	1
5.6	food component interaction and matrix effect.	1

Course Designer(s)

Dr. J. Balachandramohan-balachandramohan@ksrct.ac.in

Passed in BoS Meeting held on 22.11.23 Approved in Academic Council Meeting held on 23.12.23



B.TECH.(FT)-2022-2023

60 FT E24	Modelling, Simulation and Soft Tools for Food	Category	L	Т	Р	Credit
	Technology	PE	3	0	0	3

Objectives

- Understand the importance for computerization and usage of SCADA in food industries.
- Relate the concept of macros and its applications in spreadsheets.
- Equip knowledge on the usage of MATLAB in food industries.
- Identify the various applications of CFD in beverage industries.
- Facilitate the learners on the usage of LabVIEW software.

Pre-requisites

Nil

Course Ou	tcomes	
On the suc	cessful completion of the course, students will be able to	
CO1	Describe the computerization in food industries and discuss about the SCADA and its functions in industrial process control.	Understand
CO2	Recall the concept of implementing of macros in spreadsheets and infer the various multimedia tools and online process control systems	Understand
CO3	Illustrate the basics of MATLAB programming and compare the various plotting techniques	Analyze
CO4	Deduce the boundary conditions used in CFD and evaluate the discretization and application of CFD in beverage industries	Analyze
CO5	Correlate the basics of LabVIEW software interface and asses the data flow programming and debugging techniques	Analyze

Mappii	Mapping with Programme Outcomes															
COs		POs												PSOs		
003	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	
CO1	3	3	-	3	3	-	-	-	-	-	-	-	3	2	2	
CO2	3	3	3	-	3	-	-	-	-	-	-	-	3	3	-	
CO3	3	3	-	3	3	-	-	-	-	-	-	-	3	3	3	
CO4	3	-	-	3	3	-	-	-	-	-	-	-	3	3	3	
CO5	3	3	-	3	3	-	-	-	-	-	-	-	3	3	3	
3 - Stro	ong; 2 -	Mediur	n; 1 - So	ome												

Assessment Pattern			
Bloom's Category	Continuous Asse	essment Tests (Marks)	End Sem Examination (Marks)
	1	2	
Remember	30	-	10
Understand	30	20	30
Apply	-	20	30
Analyze	-	20	30
Evaluate	-	-	-
Create	-	-	-
Total	60	60	100

Syllabu	S								
		K	K.S.Rangasa		of Technolog		mous R2022		
					Food Techno				
				ling, Simula	tion and Sof				
Semest	er		Hours/Week		Total Hours	Credit		ximum Marks	
		L	T	P		C	CA	ES	Total
<u>V</u>		3	0	0	45	3	40	60	100
various	nce of co types of hardw	of food i	ndustries. S	upervisory o	erating environments on trol and on trol and on trocols, landle	data acquisi	tion (SCAD	A); SCADA	[9]
Spreads macros and web	sheet ap to solve page de	engineer esign; file	: Data interpoing problems	s, use of add-	solving proble ins, use of so on-line food p	olver; Web ho	osting		[9]
using M	MATLAE IATLAB; in MATI	debugg _AB, X-Y	ing MATLAE	programs,	n MATLAB, ι applications ts and overla	to simulation	ns; Plotting	and model	[9]
Introduc derivativ	tion to e, diver	gence of	ftware, GAN velocity, con	tinuity, mome	LUENT soft entum and ei ood and beve	nergy equation	ons; Physica		[9]
simulate	N – Lab ed data a nents of	acquisitio	n, sound card	d, front panel	nto computer, /block diagra g a VI, data	m, toolbar/to	ols palette;	,	[9]
							Т	otal Hours:	45
Text Bo	ok(s):								
'. a	nd Proc	ess Analy	ysis. Academ	ic Press, Lor	ndon. 2014.			n Graphical, S	
	Villiam J JSA. 201		. Introduction	to MATLAB	for Engineers	s, 3rd Ed. Mc	Graw-Hill Co	mpanies, Inc.,	NY,
Referen	ce(s):								
, C		Sun Cor	nputational F	luid Dynamic	s in Food Pro	ocessing. CR	C Press, Boo	ca Raton, FL, I	JSA.
2. N	lational	nstrumer	nts Corporation	on Introduct	ion to LabVIE	EW: 3-Hour H	lands-On. NI	, Austin, Texas	s. 2005.
0000			:						

^{*}SDG 9 - Industry Innovation and Infrastructure



Course Contents and Lecture Schedule

S. No.	Topics	No. of hours
1.0	Introduction	
1.1	Importance of computerization in food industry.	2
1.2	Operating environments and information systems for various types of food industries.	1
1.3	Supervisory control and data acquisition (SCADA)	1
1.4	SCADA systems hardware	1
1.5	SCADA systems software and protocols	1
1.6	SCADA system firmware	1
1.7	Landlines, local area network systems, modems.	2
2.0	Spread sheets and Macros	
2.1	Spreadsheet applications: Data interpretation and solving problems	1
2.2	preparation of charts, use of macros	1
2.3	solve engineering problems, use of add-ins, use of solver	1
2.4	Web hosting and webpage design;	2
2.5	File transfer protocol (FTP)	2
2.6	On-line food process control from centralized server system in processing plant.	2
3.0	MATLAB	
3.1	Use of MATLAB in food industry	1
3.2	Computing with MATLAB	1
3.3	User defined functions, programming using MATLAB	2
3.4	Debugging MATLAB programs, applications to simulations	2
3.5	Plotting and model building in MATLAB	1
3.6	X-Y plotting functions, subplots and overlay plots, special plot types, interactive plotting in MATLAB.	2
4.0	Computational Fluid Dynamics	
4.1	Introduction to CFD software	1
4.2	GAMBIT and FLUENT software	2
4.3	Models of flow, substantial derivative, divergence of velocity, continuity, momentum and energy equations	3
4.4	Physical boundary conditions, discretization	2
4.5	Applications of CFD in food and beverage industry.	1
5.0	LabVIEW	
5.1	LabVIEW – LabVIEW environment: Getting data into computer, data acquisition devices	2
5.2	NI-DAQ, simulated data acquisition, sound card	2
5.3	Front panel/block diagram, toolbar/tools palette	2
5.4	Components of a LabVIEW application: Creating a VI, data Flow execution, debugging techniques.	3

Course Designer(s)

G. Bharath - bharathg@ksrct.ac.in



60 FT E25	Food Storage and Cold	Category	L	T	Р	Credit
0011 223	Chain Management	PE	3	0	0	3

- Understand the basics of food storage concepts and measurement.
- Equip knowledge on cold storage units and its functioning.
- Describe the requirements for cold storage and cold chain.
- Comprehend various control points in the cold chain system.
- Correlate the cold chain traceability concepts with risk management techniques.

Pre-requisites

Nil

Course Outcomes

On the successful completion of the course, students will be able to

Of the successful completion of the course, students will be able to							
CO1	List the various dimensions used for the measurements of foods and discuss the various psychometric tests and the FSSAI standards for food storage.	Understand					
CO2	Identify the various equipment used in a cold storage unit and explain the designing and instrumentation for a cold storage unit	Apply					
CO3	Define the scope and importance of cold chain along with its components and describe the temperature and humidity requirement for cold chain products.	Understand					
CO4	Indicate the various control points in cold storage systems with temperature recording devices and choose the flexible systems of transportation for retail and supermarkets.	Apply					
CO5	Prepare mitigation strategies for the challenges in cold chain management along with the role of packaging in cold chain and outline the various risk mitigation strategies and cost benefit studies	Analyze					

Mappii	Mapping with Programme Outcomes														
COs	POs										PSOs				
003	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1	3	3	2	2	-	-	-	-	-	3	-	-	3	3	2
CO2	3	3	2	2	-	-	-	-	-	3	-	-	3	3	2
CO3	3	3	2	2	-	-	-	-	-	2	-	-	2	3	3
CO4	2	2	2	2	-	-	-	-	-	3	-	-	3	3	3
CO5	2	2	2	2	-	-	-	-	-	3	-	-	3	3	3
3 - Stro	ong; 2 -	Mediur	n; 1 - S	ome											

Assessment Pattern

Bloom's Category	Continuous As: (Ma	sessment Tests irks)	End Sem Examination (Marks)
	1	2	
Remember	10	20	30
Understand	40	30	30
Apply	10	10	30
Analyze	0	0	10
Evaluate	0	0	0
Create	0	0	0
Total	60	60	100

CHAIRMAN BOARD OF STUDIES

Syllabus									
	К	.S.Rangasa			gy – Autonor	nous R2022			
B. Tech Food Technology									
60 FT E25 - Food Storage and Cold Chain Management									
Semester	-	lours/Week		Total Hours			ximum Marks		
1.7	L	T	P		С	ES	Total		
V	3	0	0	45	3	40	60	100	
Psychrome	ensions, bulk o try: humidity, psychrometric	relative hun	nidity, humid	heat, deteri	oration index			[9]	
Cold storage conditioning towers, Diff vapor insula	t for Cold Food ge - Moist air g systems, Everent types of reation materials ation and clima	and applie aporators, refrigerants, a, Design of	Compressors Transmissior small capacit	s, Condense n and distribu	rs, Expansion tion system o	n devices, C		[9]	
Scope and of cold chai	requirements importance on and integration its, packaging	f cold chair on. Products	going in cold	d chain, their	temperature a			[9]	
Stages and functions in	ge control points of contour cold storages on in land and	trol in cold st s, pallet layo	ut and stack	ing options, f	lexibility stora	age systems		[9]	
Challenges manageme	gement in Colin in implementing and problem cold chain tra	ng and man m diagnosis	, Risk Mitiga	tion strategie	es and docur			[9]	
						Т	otal Hours:	45	
Text Book	(s):								
	, Chandra Gop rolled atmosph								
2. Burg	g, Stanley. "Hy _l N-10: 0124199	pobaric stora 623, ISBN-1	ge in food ind 3: 978-0124	dustry: advar 199620, 201	ces in applica 4.	ation and the	ory", Academio	Press,	
Reference									
1. Ahv	enainen, Raija	, "Novel food	packaging to	echniques", 1	st edition, Wo	odhead Pub	lishing,2003.		
2. Rob	ertson G.L., "F	ood packagii	ng: Principles	and practice	", Taylor & Fra	ancis/CRC P	ress,2006.		
	-lt lt								

^{*}SDG 9 – Industry Innovation and Infrastructure



Course Contents and Lecture Schedule No. of S. No. **Topics** hours **Introduction to Food Storage** 1.0 1.1 Grain dimensions 1 1.2 Bulk density, true density, porosity 1 Coefficient of friction 1.3 1 Thermal conductivity and aerodynamic properties 1.4 Psychrometry: humidity, relative humidity 1.5 1 Humid heat 1.6 1 Deterioration index, Wet bulb temperature test 1.7 Use of psychrometric charts 1.8 FSSAI standard in food storage. 1.9 1 2.0 **Equipment for Cold Storage** Cold storage Moist air and applied psychrometry 2.1 1 Air conditioning systems 2.2 Evaporators, Compressors, Condensers. 2.3 1 Expansion devices, Cooling towers. 2 2.4 Different types of refrigerants 2.5 1 Transmission and distribution system of cool air 2.6 1 Thermal and vapor insulation materials 2.7 1 Design of small capacity cold storage, Instrumentation and climate control 2.8 1 3.0 Cold chain requirements Scope and importance of cold chain 3.1 1 Cold chain in food processing industry and retail chain 2 3.2 Components of cold chain and integration 3.3 1 Products going in cold chain 3.4 1 Temperature and Humidity requirements 3.5 **Packaging Needs** 3.6 1 Compatibility in cold chain. 2 3.7 Cold storage control points 4.0 Stages and points of control in cold storages and structures 4.1 1 Temperature recording devices and its functions in cold storages 2 4.2 Pallet layout and stacking options 4.3 2 Flexibility storage systems 4.4 1 Cold chain transportation in land and export 2 4.5 Retail & supermarket cold chain 4.6 1 4.7 Display systems 1 5.0 Risk management in Cold Chain 5.1 Challenges in implementing and managing Cold storage 1 Role of packaging in food cold chain 5.2 2 5.3 Risk management and problem diagnosis Risk Mitigation strategies and documentations 2 5.4 Cost benefit analysis for cold chain transport 2 5.5 Loading and unloading, storage duration 5.6

Course Designer(s)

1. Mr. G. Bharath - bharathg@ksrct.ac.in



60 FT E26	Confectionery Products	Category	L	Т	Р	Credit
0011 220	Connectionery r roducts	PE	3	0	0	3

- To Understand the types and importance of sugar confectionery
- To Learn the formulations and processing for tablets and lozenges
- To Apply the formulation and processing of hard candy
- To impact the manufacturing processes for fondants and creams
- To recall the ingredients and processing techniques for caramel and toffee

Pre-requisites

• Nil

Course Outcomes								
On the suc	On the successful completion of the course, students will be able to							
CO1	Learn the ingredient optimization and spoilage prevention methods	Understand						
CO2	Apply troubleshooting methods for production problems effectively	Apply						
CO3	Analyze chemical changes and stability in hard candy	Analyze						
CO4	Apply solutions to common issues in fondant production	Apply						
CO5	Analyze emulsification and cooking methods for confectionery	Analyze						

Mappi	Mapping with Programme Outcomes														
COs		POs											PSOs		
003	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1	3	3	3	2	-	-	-	-	-	-	-	-	2	2	2
CO2	3	3	3	3	-	-	-	-	-	-	-	-	2	2	3
CO3	3	3	3	2	-	-	-	-	-	-	-	-	3	3	3
CO4	3	3	3	2	-	-	-	-	-	-	-	-	3	3	3
CO5	3	3	3	2	-	-	-	-	-	-	-	-	3	3	3
3 - Stro	ong; 2 -	Mediur	n; 1 - S	ome											

Assessment Pattern								
Bloom's Category	Continuous Asse (Mar		End Sem Examination (Marks)					
	1	2	1					
Remember	20	10	20					
Understand	30	30	40					
Apply	10	10	20					
Analyze	-	10	20					
Evaluate	-	-	-					
Create	-	-	-					
Total	60	60	100					

	K.	S.Rangasaı	my College	of Technolo	gy – Autonoi	mous R2022				
	B.Tech. Food Technology									
60 FT E26 - Confectionery Products										
Semester	H	ours/Week		Total	Credit	Ма	ximum Marks	s		
Semester	L	T	Р	Hours	С	CA	ES	Total		
IV	3	0	0	45	3	40	60	100		
CONFECTIONERY Definition, importance of sugar confectionery. Types of confectioneries-classification-basic technical consideration of confectionery-TSS-pH-Acidity-Raw materials-types of sugar-role of sugar-alternative bulk sweetners –syrup production-enzymes used, additives used. quality parameters, faults and corrective measures. Spoilage of confectionery products. Optimization of ingredients for different types of bread, toffees and sugar boiled confectionary.										
Introduction colors, action colors action colors action colors.	SSED TABLETS on, formulations tives. Processin hooting. Role ental Factors on	and ingredi g – Lozeng of Particle	ents – Base es / wafers Size and	, tablets. Pro Granulation	oduct charac	teristics, Pro	blems and	[9]		
HARD CANDY Introduction, formulations and ingredients, processing – typical process steps, other hard candy technologies. Product characteristics – chemical changes, microstructure, stability / shelf life. Hard Candy Packaging Technology for Shelf Life Enhancement. Challenges in Sugar-Free Hard Candy Production***								[9]		
Introduction Product of Texture M	rs AND CREAM on, formulation a haracteristics, p odification. Alter Flavor and Texto	and ingredie otential pro native Swee	blems and eteners in Fo	trouble show	ting. Role o			[9]		
Introduction hydrocollo	L, FUDGE AND on, formulations olds, salts, flavor ond forming. Prod	and ingre s, colors. P	rocessing -	Mixing & E	mulsification,	Cooking an	d browning,	[9]		
						•	Total Hours	45		
Text Bool	` '									
	nifie , "Chocolate,			-						
2. We 20	eller, "Confectione 10.	ery and Choo	colate Engin	eering: Princ	ples and App	lications", Fir	st edition,			
Reference	• •									
	ckett, "Industrial (
	wards, "The Scie									
3. Jac	kson, "Sugar Co	nfectionery a		te Manufactu	re", Third edit	ion, 2021.				
				gy", First edi						

^{*}SDG 9 – Industry Innovation and Infrastructure

^{**}SDG 12 – Responsible Consumption and Production
*** SDG3- Good Health and well-being

Course Contents and Lecture Schedule								
S. No.	Topics	No. of hours						
1.0	Confectionery							
1.1	Definition, importance of sugar confectionery	1						
1.2	Types of confectioneries-classification	1						
1.3	basic technical consideration of confectionery-TSS-pH-Acidity	1						
1.4	Raw materials-types of sugar-role of sugar-alternative bulk sweetners	1						
1.5	syrup production-enzymes used, additives used	1						
1.6	quality parameters, faults and corrective measures	1						
1.7	Spoilage of confectionery products	1						
1.8	Optimization of ingredients for different types of bread, toffees and sugar boiled confectionary	2						
2.0	Compressed Tablets and Lozenges							
2.1	Introduction, formulations and ingredients	1						
2.2	Base, binder, lubricant	1						
2.3	disintegrant, acids,	1						
2.4	flavours, colors, actives	1						
2.5	Processing – Lozenges / wafers, tablets.	1						
2.6	Product characteristics, Problems and trouble shooting	1						
2.7	Role of Particle Size and Granulation in Tablet Formation	1						
2.8	Impact of Environmental Factors on Tablet and Lozenge Stability	2						
3.0	Hard Candy							
3.1	Introduction, formulations and ingredients, processing	2						
3.2	Typical process steps, other hard candy technologies	2						
3.3	Product characteristics	1						
3.4	chemical changes, microstructure, stability / shelf life.	1						
3.5	Hard Candy Packaging Technology for Shelf Life Enhancement.	2						
3.6	Challenges in Sugar-Free Hard Candy Production	1						
4.0	Fondants and Creams							
4.1	Introduction, formulation and ingredients, manufacturing	2						
4.2	fondant, powdered fondant, creams	2						
4.3	Product characteristics	1						
4.4	potential problems and trouble shooting	1						
4.5	Role of Enzymes in Fondant Texture Modification	1						
4.6	Alternative Sweeteners in Fondants and Creams	1						
4.7	Innovative Flavor and Texture Combinations in Fondants	1						
5.0	Caramel, Fudge and Toffee							
5.1	Introduction, formulations and ingredients	1						
5.2	sweeteners, dairy ingredients, fats	1						
5.3	emulsifiers, hydrocolloids, salts, flavors, colors	2						
5.4	Processing – Mixing & Emulsification	2						
5.5	Cooking and browning, Cooling and forming	2						
5.6	Product characteristics, Trouble shooting	1						

1. Mr.T.G.N. Nagarjun - nagarjun@ksrct.ac.in



60 FT E27	Flavouring Technology	Category	L	Т	Р	Credit
0011 227	riavouring recimology	PE	3	0	0	3

- Facilitate the learners on the classification and types of falvours.
- Relate the various techniques for production of flavours.
- Equip the analysis techniques used for detecting flavours.
- Identify the quality control procedures with the limits of falvour usage.
- Demonstrate the applications of flavours in various food products and industries.

Pre-requisites

• Nil

Course 0	Outcomes	
On the su	accessful completion of the course, students will be able to	
CO1	Describe the classification of falvours and its forms and discuss the artificial flavours and compounds.	Understand
CO2	Recall the techniques used for producing flavours and infer the various extraction methods of the flavours produced	Understand
CO3	Illustrate the sample preparation techniques for flavour isolation and compare the various analysis results.	Analyze
CO4	Deduce the chemical properties, structure and stability of flavours and evaluate the falvours based on FSSAI standards.	Analyze
CO5	Correlate the application of falvours in culinary products and asses the role of falvours in dairy and baking industry.	Analyze

Mappir	Mapping with Programme Outcomes														
COs	POs												PSOs		
COS	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1	3	3	-	3	-	3	-	-	-	-	-	-	2	2	2
CO2	3	3	3	-	3	-	-	-	-	-	-	-	2	3	3
CO3	3	3	2	3	3	-	-	-	-	-	-	-	2	3	3
CO4	3	2	2	3	3	-	-	-	-	-	-	-	2	3	3
CO5	3	3	2	3	3	-	-	-	-	-	-	-	2	3	3
3 - Str	ong; 2	- Mediu	m; 1 - \$	Some											

Assessment Pattern									
Bloom's Category	Continuous Asse (Ma		End Sem Examination (Marks)						
	1	2	1						
Remember	30	20	20						
Understand	30	20	30						
Apply	-	10	20						
Analyze	-	10	30						
Evaluate	-	-	-						
Create	-	-	-						
Total	60	60	100						



		(S Rangasa	my College	of Technolog	gy – Autonor	nous R2022)	
	•	o.nangasa		Food Techno	• •	IIOUS INZUZZ	•	
				Flavouring 1				
Semester		Hours/Week		Total	Credit	Ma	aximum Marks	
Semester	L	Т	Р	Hours	С	CA	ES	Total
V	3	0	0	45	3	40	60	100
oil soluble	ours n Classification liquid flavours, Diacetyl, Ethyl	emulsion-ba	ased flavours	, dispersed fl	lavours, spray	dried flavo	ours. Artificial	[9]
Classificat roasting, c critical flui	roduction tech ion - Alliaceou ooking frying o d extraction. S duction - Stalir	s flavours - on flavour dev olvent Extrac	velopments - ction, Sorptiv	Essential oil e Extraction,	s and oleores Distillation N	sins - Extrac ⁄lethods, Lic	tion - Super quid and dry	[9]
Introductio	of flavours* n, Aroma Com	npounds - Sa	amnle Select	tion/Properct	ion Dringinla			
	Sorptive Exti e Concentration	raction, Vola	atility, Metho	ods of Aron	na Isolation	- Static F		[9]
Quality con Definitions Influence Commercia		raction, Volan Methods (D	atility, Metho dynamic Head ucture, Stab e of Action FI FSSAI flavour	ods of Aron dspace), Con ility, Sensory lavour, Poten r standards -	na Isolation centration for Properties- itiators in Foo	- Static F Analysis. Influence cods, Toxicity	n Taste,	[9]
Quality co Definitions Influence of Commerci limits, solv Flavour te Flavours in of flavours	ntrol of flavou , Chemical Pron Aroma. Synal and Other P	raction, Volan Methods (Dars operties, Streegism, Mode otentiators. Filluents used lications ucts - Soups oducts, Snac	ucture, Stabe of Action Fl SSAI flavourin flavorings. and Stocks,	ods of Arondspace), Condispace), Condispace), Condispace, Condispace, Seasonfectionery	na Isolation centration for Properties- tiators in Foolist of permitted asonings, and Products, Da	- Static F Analysis. Influence cods, Toxicity ed synthetic	on Taste, c flavour and . Application	
Quality co Definitions Influence of Commerci limits, solv Flavour te Flavours in of flavours	ntrol of flavour, Chemical Pron Aroma. Synal and Other Pents, carrier, dechnology appin culinary Prodes in Bakery Pro	raction, Volan Methods (Dars operties, Streegism, Mode otentiators. Filluents used lications ucts - Soups oducts, Snac	ucture, Stabe of Action Fl SSAI flavourin flavorings. and Stocks,	ods of Arondspace), Condispace), Condispace), Condispace, Condispace, Seasonfectionery	na Isolation centration for Properties- tiators in Foolist of permitted asonings, and Products, Da	- Static H Analysis. Influence c ds, Toxicity ed synthetic d Marinades iry Products Beverages	on Taste, c flavour and . Application	[9]
Quality co Definitions Influence of Commerci limits, solv Flavour te Flavours in of flavours Milks, Flav	ntrol of flavour, Chemical Pron Aroma. Synal and Other Pents, carrier, dechnology apply a culinary Production Bakery Proceed Yogurts,	raction, Volan Methods (Dars operties, Stractions, Mode otentiators. Filluents used in the color of the color	ucture, Stable of Action Fl FSSAI flavourings. and Stocks, sk Foods, Cory Desserts.	ods of Arondspace), Condispace), Condispace), Condition, Sensory, lavour, Potentr standards - Sauces, Seatonfectionery Soft Drinks -	na Isolation centration for Properties- tiators in Foc list of permitt asonings, and Products, Da Carbonated	- Static H Analysis. Influence cods, Toxicity ed synthetic Marinades iry Products Beverages	on Taste, filavour and Application for Flavored Total Hours	[9]
Quality conditions Influence of Commercial Imits, solver the Flavour te Flavours in of flavours Milks, Flavours Milks, Flavours Influence of Influen	ntrol of flavour, Chemical Pron Aroma. Synal and Other Pents, carrier, denoted by the collinary Production Bakery Proceed Yogurts, (s):	raction, Volan Methods (Dars operties, Stractions, Mode otentiators, Filuents used in the control of the contro	ucture, Stable of Action Fl FSSAI flavourings. and Stocks, sk Foods, Cory Desserts. Linforth, "Foo	ods of Arondspace), Condispace), Condispace), Condispace, Condispace, Potentr standards - Sauces, Seatonfectionery Soft Drinks -	na Isolation centration for Properties- tiators in Foc list of permitt asonings, and Products, Da Carbonated Technology".	- Static F Analysis. Influence cods, Toxicity ed synthetic Marinades iry Products Beverages	on Taste, filavour and Application for Flavored Total Hours	[9] [9]
Quality conditions Influence of Commercial limits, solver the Flavours in of flavours Milks, Milks, Flavours Milks, Milk	ntrol of flavour, Chemical Pron Aroma. Synal and Other Pents, carrier, dechnology apply a culinary Production Bakery Proceed Yogurts,	raction, Volan Methods (Dinarcon Methods (Dinarcon Methods (Dinarcon Methods (Dinarcon Methods) rs operties, Strieries, Modeotentiators. Filluents used in the control of	ucture, Stable of Action Flavorings. and Stocks, sk Foods, Cory Desserts. Linforth, "Foods Methyen, "Flavorings"	ods of Arondspace), Condispace), Condispace), Condispace, Condispace, Potentr standards - Sauces, Seatonfectionery Soft Drinks -	na Isolation centration for Properties- tiators in Foc list of permitt asonings, and Products, Da Carbonated Technology".	- Static F Analysis. Influence cods, Toxicity ed synthetic Marinades iry Products Beverages	on Taste, filavour and Application for Flavored Total Hours	[9] [9]
Quality condenses of the commercial strains	ntrol of flavour, Chemical Pron Aroma. Synal and Other Pents, carrier, denotogy apportunity of the culinary Production Bakery Proceed Yogurts, frew J. Taylor, Flavour Proceds, Woodenstein Bakery Proceds of the culinary Production of the culinary Proceds of the culinary Proceds of the cultinary Proceed Yogurts, frew J. Taylor, Flavour J. K., Elmor Proceds of the cultinary Process of the cultina	raction, Volan Methods (Dirscoperties, Striergism, Mode otentiators. Filluents used in the control of the contr	atility, Methodynamic Head dynamic Head ucture, Stable of Action FI FSSAI flavour in flavorings. and Stocks, ck Foods, Co ry Desserts.	ods of Arondspace), Condispace), Condispace), Condispace, Condispace, Seasonfectionery Soft Drinks -	na Isolation centration for centration for Properties- tiators in Foolist of permitted asonings, and Products, Da Carbonated Technology".	- Static H Analysis. Influence cods, Toxicity ed synthetic d Marinades iry Products Beverages Wiley, 2010 rsis and Pero	en Taste, favour and Application Flavored Total Hours ception in Food	[9] [9]
Quality condenses of the commercial property of	ntrol of flavour, Chemical Pron Aroma. Syntal and Other Pents, carrier, denotogy apply a culinary Production Bakery Proposed Yogurts, (s): drew J. Taylor, Flavor, Elmory rerages", Wood	raction, Volan Methods (Director) Irs Operties, Striergism, Mode of the office of the	atility, Methodynamic Head ucture, Stable of Action Fl FSSAI flavour in flavorings. and Stocks, ck Foods, Co ry Desserts. Linforth, "Food Methyen, "Fl hing, 2015.	ods of Arondspace), Condispace), Condispace), Condispace, Condispace, Seasonfectionery Soft Drinks -	na Isolation centration for centration for Properties- tiators in Foolist of permitted asonings, and Products, Da Carbonated Technology".	- Static H Analysis. Influence cods, Toxicity ed synthetic d Marinades iry Products Beverages Wiley, 2010 rsis and Pero	en Taste, favour and Application Flavored Total Hours ception in Food	[9] [9]

^{*}SDG 9 - Industry Innovation and Infrastructure

Course Contents and Lecture Schedule

S. No.	Topics	No. of hours
1.0	Food flavours	
1.1	Introduction and Classification - Natural and artificial flavors	2
1.2	Flavor forms: water soluble liquid flavours	1
1.3	Flavor forms: oil soluble liquid flavours	1
1.4	Flavor forms: emulsion-based flavours	1
1.5	Flavor forms: dispersed flavours, spray dried flavours	1
1.6	Artificial flavours - Diacetyl, Ethyl decadienoate, Ethyl maltol	1
1.7	Artificial flavours - Ethyl propionate, Ethylvanillin, Eucalyptol	2
2.0	Flavour production technology	
2.1	Classification of flavours - Bittering agents, Coffee and Cocoa	1
2.2	Fruit flavours	1
2.3	Effect of roasting, cooking frying on flavour development	1
2.4	Essential oils and oleoresins	1
2.5	Extraction - Super critical fluid extraction	1
2.6	Solvent Extraction, Sorptive Extraction	1
2.7	Extraction - Distillation Methods	1
2.8	Liquid and dry flavour production - Staling of flavours	1
2.9	Microbial and cell suspensions in the synthesis of flavour	1
3.0	Analysis of flavours	
3.1	Introduction to Aroma Compounds – Volatility	1
3.2	Sample Selection/Preparation, Principles of Aroma Isolation	1
3.3	Solubility, Sorptive Extraction	2
3.4	Aroma Isolation - Static Headspace	2
3.5	Aroma Isolation - Headspace Concentration Methods (Dynamic Headspace)	2
3.6	Methods of Concentration for Analysis.	1
4.0	Quality control of flavours	
4.1	Definitions, Chemical Properties, Structure and Stability	1
4.2	Sensory Properties - Influence on Taste	2
4.3	Sensory Properties - Influence on Aroma	1
4.4	Synergism, Mode of Action Flavour	1
4.5	Potentiators in Foods, toxicity	1
4.6	Commercial and Other Potentiators	1
4.7	FSSAI flavour standards - list of permitted synthetic flavour and limits	1
4.8	FSSAI flavour standards - solvents, carrier, diluents used in flavorings	1
5.0	Flavour technology applications	
5.1	Flavours in culinary Products - Soups and Stocks, Sauces, Seasonings, and Marinades,	2
5.2	Application of flavours in Bakery Products, Snack Foods, Confectionery Products	2
5.3	Dairy Products - Flavored Milks, Flavored Yogurts, Flavored Dairy Desserts	2
5.4	Soft Drinks - Carbonated Beverages	3

Course Designer(s)

1. G. Bharath - bharathq@ksrct.ac.in



PROFESSIONAL ELECTIVE - III

60 FT E31	Bioprocess Engineering	Category	L	Т	Р	Credit
0011 231	Dioprocess Engineering	PE	2	0	2	3

Objectives

- To learn the historical development in bioprocess technology of production and recovery process.
- To design a bioreactors and the strategy of scale up reactor for commercial prospects.
- To develop and predict the construction of ancillaries for fermentor system.
- To enable the knowledge of fluid behavior and analyze the biodynamic property.
- To understand the important concepts of software's in monitoring and validation of Bioprocess Technology

Pre-requisites

Nil

Course Outcomes

	3000141 00111-011011 01111 011111 011111 011111 011111 011111 011111 01111	
CO1	Enumerate the historical development, types of fermentation process and bio product recovery	Understand
CO2	Design a kinetic parameters of cell growth of structured and unstructured model	Analyze
CO3	Illustrate the concept of design and construction of reactor with its controlling strategies	Apply
CO4	Determine the scale up of the bioreactors with respect to mixing and power consumption	Analyze
CO5	Simulate and validate the protocol of bioprocess technology through soft wares.	Apply

Mappir	ng with	Progra	amme C	Outcom	es										
COs	POs											PSOs			
COS	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1	3	2	3	3	-	-	-	-	2	-	-	-	3	3	2
CO2	3	2	3	3	-	-	-	-	2	-	-	-	3	3	2
CO3	3	2	3	3	-	-	-	-	2	-	-	-	2	3	3
CO4	3	2	3	3	-	-	-	-	2	-	-	-	3	3	3
CO5	3	2	3	3	3	-	-	-	2	-	-	-	3	3	3
3 - Stro	ong; 2 -	Mediur	n; 1 – S	ome											

Assessment Pattern											
Bloom's Category	Contir	nuous Asse	ssment Te	sts (Marks)	Model Examination	End Sem Examination					
Diodin's Category	Tes	st 1	Tes	st 2	(Marks)	(Marks)					
	Theory	Lab	Theory	Lab	Lab	Theory	Lab				
Remember	20	-	20	-	-	20	-				
Understand	30	-	20	-	-	30	-				
Apply	10	50	10	50	50	30	50				
Analyze	-	50	10	50	50	20	50				
Evaluate	-	-	-	-	-	-	-				
Create	-	-	-	-	-	-	-				
Total	60	100	60	100	100	100	100				

		K.S.Rangasar		Food Techr				
			0 FT E31 - E	Bioprocess E	Ingineering			
Semester	Н	lours / Week		Total	Credit	Ма	ximum Mark	S
Demester	L	Т	Р	Hours	С	CA	ES	Tota
VI	2	0	2	60	3	50	50	100
		ess Technolo				_		
		sing: Historic						[6]
		of fermentation			of media for	termentatio	n	
		erobic fermer	itation proce	55.				
	n Processes					"		
		fermentation						[6]
ubstrate co	ncentration. i	Monod mode	i. Determinin	ig cell kirietic	parameters	nom batch c	iaia.	
Process De	sian And Co	ntrol of Biore	actors*					
		nstruction - F		neering in pe	rspective. Ty	nes of Read	ctors (Batch.	[0]
		ous). Design						[6]
nimal cell r		200). 200.g	· · · · · · · · · · · · · · · · · · ·	aapaa.	o. 2.op.ooo	o a.co.gc		
		of Fermentat	ion					
	-	tonian fluids, l		le on oxygena	ation, mixing,	sterilization	, nutrient	[6]
		cale-up criteri					,	
imulation a	and Validation	on in Bioproc	ess Techno	ology				
imulation t	echniques (S	Software): Re	actor design	n (Autocad,	ANSYS Flue	nt,) and eva	luation of	[6]
esign of ex	periments (D	OCE), Dynami	ic simulation	of the biorea	actor.			
ractical:								
		eactor system						
		I model of a fl						
	•	alysis to ident	ify key opera	iting paramet	ers affecting	reactor		
	using CFD	norimont unit	a a fraction	al factorial da	aian ar athan	DOE appro	aab	
		periment usir cant factors i					acn	
		ice of each fa						
	statistical tes		otor asiriq ar			<i>i</i> () () () () ()		
		IS.	J	laryolo or var	iano (711 10 1	,		
			_	-	•	·	the	
	tors and the l	τs. face plots or θ bioprocess οι	contour plots	-	•	·	the	
elected fac . Design ar	n experiment	face plots or bioprocess ou to investigate	contour plots utput.	s to visualize	the relationshioreactor usi	nip between	AN.	
elected fac . Design ar hoose a sp	n experiment pecific microb	face plots or obioprocess ou to investigate oil culture an	contour plots itput. the mass b d substrate,	s to visualize alance of a b and vary par	the relationsl ioreactor usi ameters sucl	nip betweening FLOWTR	AN. e,	
elected fac Design ar hoose a sp ubstrate co	n experiment pecific microb ncentration, a	face plots or obioprocess ou to investigate in culture an and inoculum	contour plots utput. e the mass b d substrate, size. Measu	s to visualize alance of a b and vary par ure the input	the relationshioreactor using ameters such and output co	nip between ng FLOWTR n as flow rationcentration	AN. e, s of	[30
elected fac . Design ar choose a sp ubstrate co iomass, sul	n experiment becific microb incentration, a bstrate, and b	face plots or obioprocess ou to investigate oial culture an and inoculum by-products to	contour plots atput. the mass b d substrate, size. Measu	alance of a band vary par ure the input	the relationshioreactor using ameters such and output command particles and such as the su	nip between ng FLOWTR n as flow rate oncentration ce assumpti	AN. e, s of ons.	[30
elected factorial control cont	n experiment becific microb incentration, a bstrate, and b a MATLAB so	face plots or obioprocess of to investigate oil culture an and inoculum by-products to simula	contour plots atput. the mass b d substrate, size. Measure or validate the the behave	alance of a band vary par ure the input a steady-state ior of a CSTF	the relationshioreactor using ameters such and output commass balance operating in	nip between ng FLOWTR n as flow rate oncentration ce assumpti	AN. e, s of ons.	[30
elected factorial control cont	n experiment pecific microb incentration, a bstrate, and b a MATLAB so on of a microl	face plots or obioprocess of to investigate oial culture an and inoculum by-products to simula bial product.	contour plots utput. the mass b d substrate, size. Measu validate the te the behav	alance of a band vary par and vary par are the input e steady-state ior of a CSTF aculd include	the relationshioreactor using ameters such and output commass balan Roperating in	nip between ng FLOWTR n as flow rate oncentration ce assumption continuous	AN. e, s of ons. mode for	[30]
elected factorial control cont	n experiment pecific microb incentration, a bstrate, and b a MATLAB so on of a microl	face plots or obioprocess of to investigate oil culture an and inoculum by-products to simula	contour plots utput. the mass b d substrate, size. Measu validate the te the behav	alance of a band vary par and vary par are the input e steady-state ior of a CSTF aculd include	the relationshioreactor using ameters such and output commass balan Roperating in	nip between ng FLOWTR n as flow rate oncentration ce assumption continuous	AN. e, s of ons. mode for	[30]
elected factorial control cont	n experiment becific microb ncentration, a bstrate, and b a MATLAB so on of a microl eters such as	face plots or obioprocess of to investigate oial culture an and inoculum by-products to simula bial product.	contour plots utput. the mass b d substrate, size. Measu validate the te the behav The script sh ne, feed flow	alance of a band vary par and vary par are the input e steady-state ior of a CSTF hould include a rate, inlet su	the relationslationeactor using ameters such and output commass balan Roperating ireduced by the concept of the	nip between ng FLOWTR n as flow rate oncentration ce assumpti n continuous entration, an	AN. e, s of ons. mode for d reaction	[30
elected factorial control cont	n experiment becific microb ncentration, a bstrate, and b a MATLAB so on of a microl eters such as	face plots or bioprocess of to investigate bial culture an op-products to cript to simula bial product. It reactor volurations represe	contour plots utput. the mass b d substrate, size. Measu validate the te the behav The script sh ne, feed flow	alance of a band vary par and vary par are the input e steady-state ior of a CSTF hould include a rate, inlet su	the relationslationeactor using ameters such and output commass balan Roperating ireduced by the concept of the	nip between ng FLOWTR n as flow rate oncentration ce assumpti n continuous entration, an	AN. e, s of ons. mode for d reaction	[30]
elected factorial control cont	n experiment becific microb ncentration, a bstrate, and ba MATLAB so on of a microl eters such as erential equals in the reacon method to see the second method to second method to see the second method to second method method to second method method to second method to second method to second method method to second method method to second method met	face plots or obioprocess out to investigate it in investigate in individual and individual and individual products to cript to simula bial product. It is reactor volurations represector.	contour plots utput. the mass b d substrate, size. Measu validate the te the behav The script sh ne, feed flow nting the ma	alance of a band vary paraure the input esteady-state ior of a CSTF hould include a rate, inlet su	the relationslationeactor using ameters such and output command amendment of the mass balant operating in the bestrate concerns of the substrate ally.	nip between ng FLOWTR n as flow rate oncentration ce assumpti n continuous entration, an	AN. e, s of ons. mode for d reaction	[30]
elected fact. Design are Choose a specification ass, sults. Develop a he production put parametics. Difficoncentration. United Transports. United	n experiment becific microb nicentration, a bstrate, and be a MATLAB so on of a microl eters such as erential equal in sin the reacon method to substration of substration	face plots or obioprocess out to investigate ial culture an and inoculum by-products to simula bial product. The reactor volur tions represent or.	contour plots utput. the mass b d substrate, size. Measu o validate the te the behav The script sh ne, feed flow nting the ma	alance of a band vary par and vary par are the input e steady-state ior of a CSTF hould include or rate, inlet su ass balances tions numerication profiles of	the relationship ioreactor using ameters such and output contents and emass balant Roperating in bstrate concern for substrate ally.	nip between ng FLOWTR n as flow rate oncentration ce assumpti n continuous entration, an and product	AN. e, s of ons. mode for d reaction	[30]
delected factorial control con	n experiment pecific microb nicentration, a bstrate, and be a MATLAB so on of a microl eters such as erential equains in the reacon method to stion of substratof steady-star	face plots or obioprocess out to investigate ial culture an and inoculum by-products to simula bial product. The reactor volur tions represented to the different and product at and product te conditions	contour plots utput. e the mass b d substrate, size. Measu o validate the te the behav The script sh ne, feed flow nting the ma erential equat act concentra and sensitivit	alance of a band vary par and vary par are the input of a cesteady-state ior of a CSTF and include or rate, inlet su ass balances tions numerication profiles of ty analysis fo	the relationship ioreactor using ameters such and output contents and emass balant Roperating in bstrate concents for substrate ally.	nip between ng FLOWTR n as flow rate oncentration ce assumpti n continuous entration, an and product	AN. e, s of ons. mode for d reaction	[30]
elected faction and continuous as specific production and continuous and continuo	n experiment becific microb incentration, a bstrate, and be a MATLAB scorn of a microl eters such as erential equains in the reacon method to stion of substration of steady-starsign Expert, description of steady-starsign Expert expe	face plots or obioprocess out to investigate ial culture an and inoculum by-products to simula bial product. The reactor volur tions represent to simulate and product at and product te conditions tesign an expection.	contour plots atput. The the mass be d substrate, size. Measu o validate the te the behave The script sh ne, feed flow arential equat act concentra and sensitivit eriment to op	alance of a band vary par and vary par are the input of a csteady-state ior of a CSTF and include or rate, inlet su ass balances tions numerication profiles of ty analysis for	the relationship ioreactor using ameters such and output content of the mass baland operating in the content of the substrate concentrations on the content of the content	nip between ng FLOWTR n as flow rate oncentration ce assumpti n continuous entration, an and product ters. of different	AN. e, s of ons. mode for d reaction	[30]
elected factorial delected facto	n experiment pecific microb nicentration, a bstrate, and be a MATLAB so on of a microl eters such as erential equains in the reacon method to stion of substration of steady-statistign Expert, description in the second steady-statistign expert, description in the second steady-statistic of steady-statistic	face plots or obioprocess out to investigate ial culture an and inoculum by-products to simula bial product. The reactor volur tions represented to the different and product at and product te conditions	contour plots utput. e the mass b d substrate, size. Measu o validate the te the behav The script sh ne, feed flow nting the ma erential equat act concentra and sensitivit eriment to op ce, nitrogen	alance of a band vary paraure the input of a CSTF and include or rate, inlet sures balances tions numerication profiles of ty analysis for the consource, view and view	the relationship ioreactor using ameters such and output content of the mass baland operating in the content of the mass baland	nip between ng FLOWTR n as flow rate oncentrations ce assumpti n continuous entration, an and product ters. of different	AN. e, s of ons. mode for d reaction	[30



biopr	esign a robustness testing experiment using Design Expert to evaluate the robustness of a ocess to variations in key parameters (such as raw material quality, operating conditions) and ify critical factors affecting process performance.	
	Total Hours: (Lecture - 30; Practical - 30)	60
Text	Book(s):	
1.	Rao, D.G., "Introduction to Biochemical Engineering", Second Edition, Tata McGraw Hill Ed Pvt. Ltd., New Delhi, India, 2010.	ducation
2.	Ashok Kumar verma, Process Modelling and Simulation in Chemical, Biochemical and Engineering, CRC Publication press. 2014.	vironmental
Refe	rence(s):	
1.	Shuler, M.L. and Kargi, F.," Bioprocess Engineering Basic Concepts", Prentice Hall of India, Pvt. Delhi, India, 2003.	Ltd., New
2.	Chien Wei Ooi, Pau Loke Show, Tau Chuan Ling, "Bioprocess Engineering Downstream CRC Press, 2019.	Processing",

^{*}SDG 9 – Industry Innovation and Infrastructure

S. No.	Topics	No. of Hours
1	Introduction to Bioprocess Technology	l
1.1	Introduction to Bioprocessing	1
1.2	Historical development of Bioprocess technology	1
1.3	General requirements and types of fermentation processes	1
1.4	Designing of media for fermentation process	1
1.5	Aerobic fermentation process.	1
1.6	Anaerobic fermentation process.	1
2	Fermentation processes	<u> </u>
2.1	Medium requirements for fermentation processes	1
2.2	Batch growth	1
2.3	Balanced growth	1
2.4	Effect of substrate concentration	1
2.5	Monod model	1
2.6	Determining cell kinetic parameters from batch data	1
3	Process Design And Control of Bioreactors	<u> </u>
3.1	Bioreactor design and construction	1
3.2	Reactor Engineering in perspective	1
3.3	Types of Reactors (Batch, Fed Batch and Continuous)	1
3.4	Design of Stirrers and impellers	1
3.5	Bioprocess design for Plant cell reactor	1
3.6	Bioprocess design for Animal cell reactor	1
4	Rheology and Scale up of Fermentation	· ·
4.1	Newtonian fluids	1
4.2	Non Newtonian fluids	1
4.3	Effect of scale on oxygenation	1

4.4	Mixing sterilization	1
4.5	Nutrient availability and supply	1
4.6	Scale-up criteria for bioreactors based on oxygen transfer	1
5	Simulation and Validation in Bioprocess Technology	
5.1	Simulation techniques (Software): Reactor design (Autocad)	1
5.2	Simulation techniques (Software): Reactor design (ANSYS)	1
5.3	Simulation techniques (Software): Reactor design (Fluent)	1
5.4	Evaluation of Design of experiments (DOE)	1
5.5	Dynamic simulation of the bioreactor	2
Practical:		
1	Design a packed bed reactor system for a catalytic chemical reaction using AutoCAD.	3
2	Create a computational model of a fluidized bed reactor using ANSYS Fluent.	3
3	Perform sensitivity analysis to identify key operating parameters affecting reactor performance using CFD	3
4	Design a screening experiment using a fractional factorial design or other DOE approach to identify the most significant factors influencing the bioprocess and their interactions.	3
5	Evaluate the significance of each factor using analysis of variance (ANOVA) or other appropriate statistical tests.	3
6	Generate response surface plots or contour plots to visualize the relationship between the selected factors and the bioprocess output.	3
7	Design an experiment to investigate the mass balance of a bioreactor using FLOWTRAN. Choose a specific microbial culture and substrate, and vary parameters such as flow rate, substrate concentration, and inoculum size. Measure the input and output concentrations of biomass, substrate, and by- products to validate the steady-state mass balance assumptions.	3
8	Develop a MATLAB script to simulate the behavior of a CSTR operating in continuous mode for the production of a microbial product. The script should include: Input parameters such as reactor volume, feed flow rate, inlet substrate concentration, and reaction kinetics. a. Differential equations representing the mass balances for substrate and product concentrations in the reactor. b. Integration method to solve the differential equations numerically. c. Visualization of substrate and product concentration profiles over time. Analysis of steady-state conditions and sensitivity analysis for key parameters.	3
9	Using Design Expert, design an experiment to optimize the concentrations of different media components (such as carbon source, nitrogen source, vitamins, etc.) for maximizing the production of a specific metabolite by a microbial strain in a bioprocess.	3
10	Design a robustness testing experiment using Design Expert to evaluate the robustness of a bioprocess to variations in key parameters (such as raw material quality, operating conditions) and identify critical factors affecting process performance.	3

Course Designer(s)
1. Dr. A.S. Ruby Celsia

-rubycelsia@ksrct.ac.in



60 FT F32	Traditional Foods	Category	L	T	Р	Credit
00 F1 E32	Traditional Foods	PE	2	0	2	3

- To understand the historical and traditional perspective of foods and food habits
- To identify the suitable Methods and Production of Traditional foods.
- To understand the wide diversity and common features of traditional Indian foods and meal patterns
- To understand the wide diversity and common features of traditional Indian foods and meal patterns.
- To understand the wide diversity and common features of traditional Indian foods and meal patterns

Pre-requisites

Nil

Course Outcomes

Off the succ	cessial completion of the coarse, stadents will be able to	
CO1	Recall about cultural perspectives and basic ingredient for food preparation and impact of Traditional food	Understand
CO2	Exemplify knowledge in Methods and Production of Traditional food	Analyze
CO3	Assess the concept of packed Traditional food and food preservation	Analyze
CO4	Learn about health aspects of Traditional food and food patterns	Understand
CO5	Assess the Traditional foods used for specific ailments /illnesses	Apply

Mappi	ng with	Progra	amme C	Outcom	es										
COs	Os POs											PSOs			
003	1	1 2 3 4 5 6 7 8 9 10 11 1										12	1	2	3
CO1	3	-	3	-	-	-	3	2	-	3	-	2	3	3	2
CO2	3	- 3 3 2 - 3 - 2									2	3	3	2	
CO3	3	-	3	-	-	-	3	2	-	3	-	2	2	3	3
CO4	3	-	3	-	-	-	3	2	-	3	-	2	3	3	3
CO5	3	-	3	-	-	-	3	2	-	3	-	2	3	3	3
3 - Stro	ong; 2 -	Mediur	n; 1 - S	ome											

Assessment Pattern								
Bloom's Category	Contir	nuous Asse	ssment Te	sts (Marks)	Model Examination	End Sem Examination (Marks)		
Dicom o outogory	Tes	st 1	Tes	st 2	(Marks)			
	Theory	Lab	Theory	Lab	Lab	Theory	Lab	
Remember	20	-	20	-	-	30	-	
Understand	30	-	30	-	-	40	-	
Apply	10	50	10	50	50	30	50	
Analyze	-	50	-	50	50	-	50	
Evaluate	-	-	-	-	-	-	-	
Create	-	•	-	-	-	-	-	
Total	60	100	60	100	100	100	100	

	KCD	angasamy (College	of Technolo	gy – Autonor	mous P2022)	
	N.J.N	angasamy (h Food Tech		IIOUS NZUZZ	•	
		6		32 – Tradition				
	Hours	/ Week	• • • • • • • • • • • • • • • • • • • 	Total	Credit	Ma	ximum Marks	3
Semest		Т	Р	Hours	С	CA	ES	Total
VI	2	0	2	60	3	50	50	100
	cal and Cultural Persp	-				00	00	100
	nce of food in understa		an cultu	re - variahilit	v diversity fr	om hasic ind	aredients to	
	eparation; impact of							[6]
•	s festivals, mourning; K							
-	fficiency, yield, shelf life				modernmen	od compans	ons chargy	
	onal Methods of Food							
	nal methods of milling of			and corn – ec	uinment and	nrocesses a	s compared	
	ern methods. Equipme							[0]
	cture – comparison ([6]
	ation – sun-drying, osm							
fish, Te	mp, soya sauce and ve	getable ferm	nented p	products.				
	onal Food Patterns							
	breakfast, meal and sn							
	ian / Global. Popular re							[6]
	ges, snacks, desserts			foods; IPR	issues in trac	litional foods	3.	
	ercial Production of Tr							
	ercial production of trac							
	- types marketed, turi							[6]
	nies; commercial produ neera, lassi, buttermilk							[6]
	astes, tamarind pastes,					ie 1000s – g	ginger and	
	Aspects of Traditional							
	rison of traditional foo		cal fast	foods / junk	foods - cos	t food safe	ty nutrient	
	sition, bioactive compor							[6]
	sed for specific ailment		y and o	i i i i i i i i i i i i i i i i i i i	oodio oi iiaa	aronar roodo	, traditional	
Practic								
	orm experiment on Foo	d Preservation	on and i	preparation b	v Smokina me	thods.		
	yout experiment on trac							
	sure the pH levels of va		-		-	-	/ levels and	
	their quality.	nous traditio	niai pion	aca vegetable	3 to actermin	s trion acians	, icvois and	
	itify the effects of different	ent cookina r	nethods	s on the sens	orv attributes	of traditional	foods.	
	stigate the fermentation							[30]
	eriments on controlling	•						
	ermination and compari					dow drvina.		
	servation of fruits through)g aa oa			
	ng of vegetables and pr		•					
	eriment on canning of fi							
		<u> </u>	,010.0.	Total Hours	s: (Lecture - 3	0: Practical	I - 30)	60
Text Bo	ook(s):						,	
,	Mohammed Al-Khusail	oi, Nasser A	\l-Habsi	i, Mohammad	d Shafiur Rah	nman Tradit	ional Foods:	History,
	Preparation, Processing							•
	Davidar, Ruth N. "India					o Traditiona	l Recipes: Ea	st West
	Books, 2001.							
	Sen, Colleen Taylor "Fo	od Culture in	n India" (Greenwood P	ress, 2005.			
Referer								
1	Aneja. R.P, Mathur.BN,	R.C. Chand	lan,and	Banerjee.A.k	(. Technology	of Indian Mil	lk Products.	
	Dairy India Year Book,		-	•	37			
	Steinkrus.K.H. Handboo		ous Fer	mented Food	s, CRC press	1995.		

^{*}SDG 9 – Industry Innovation and Infrastructure
**SDG 3 – Good Health and Well Being



Course Co	ntents and Lecture Schedule	_
S. No.	Topics	NO. OT Hours
1	Historical and Cultural Perspectives	
1.1	Importance of food in understanding human culture	1
1.2	Learn the impact of customs and traditions on food habits	1
1.3	Festive occasions and specific religious festivals foods	1
1.4	Comparisons of Tradition and modern method	1
1.5	Tradition method - energy costs, efficiency, yield,	1
1.6	Tradition method - shelf life and nutrient content.	1
2	Traditional Methods of Food Processing	
2.1	Traditional methods of milling grains	1
2.2	Equipment and processes for edible oil extraction, paneer, butter and ghee	1
2.3	Comparison of traditional and modern methods in food Processing.	1
2.4	Traditional methods of food preservation	1
2.5	Learn about sun-drying, osmotic drying, brining, pickling.	1
2.6	Smoking process of dry fish, Temp, soya sauce and vegetable fermented products.	1
3	Traditional Food Patterns	
3.1	Typical breakfast, meal and snack foods of different regions of India.	1
3.2	Regional foods that have gone Pan Indian / Global.	1
3.3	Popular regional foods;	1
3.4	Traditional fermented foods, pickles and preserves,	1
3.5	Beverages, snacks, desserts and sweets with street foods	1
3.6	IPR issues in traditional foods	1
4	Commercial Production of Traditional Foods	
4.1	Commercial production of traditional breads, snacks, ready-to-eat foods and instant mixes,	1
4.2	Frozen foods – types marketed	2
4.3	Turnover; role of SHGs, SMES industries, national and multinational companies	1
4.4	Commercial production and packaging of traditional beverages	1
4.5	Commercial production of intermediate foods	1
5	Health Aspects of Traditional Foods	
5.1	Comparison of traditional foods with typical fast foods / junk foods	1
5.2	Cost of the Traditional foods	1
5.3	Food safety for the Traditional foods	1
5.4	nutrient composition and bioactive components	1
5.5	Energy and environmental costs of traditional foods	1
5.6	Traditional foods used for specific ailments /illnesses	1
Practical:		
1.	Perform experiment on Food Preservation and preparation by Smoking methods	3
2.	Carryout experiment on traditional drying methods for Preserving for Pulses and grains	3
0	Measure the pH levels of various traditional pickled vegetables to determine their acidity	0
3.	levels and assess their quality.	3
4	Identify the effects of different cooking methods on the sensory attributes of traditional	2
4.	foods.	3
5.	Investigate the fermentation process of traditional fermented foods like idli and dosa batters.	3
6.	Experiments on controlling browning reaction in fruits and vegetables.	3
7.	Determination and comparison on rate of drying using Sun drying and shadow drying	3
8.	Preservation of fruits through osmotic dehydration.	3
9.	Curing of vegetables and production of Pickles.	3
10.	Experiment on canning of fruits and vegetable.	3
10.	Exponential of ratio and vogotable.	<u> </u>

1. Dr. P. Shanmugam

-shanmugam@ksrct.ac.in



	Advances in Fruit and	Category	L	T	Р	Credit
60 FT E33	Vegetable Processing Technologies	PE	2	0	2	3

- Familiarize students with advanced fruit and vegetable processing techniques and its applications
- Understand the effect of Novel non thermal methods on quality and safety of fruit and vegetable products.
- Learn the evaluation techniques to analyse the quality of fruit and vegetable products.
- Understand the quality of fruit and vegetable products on the impact of novel non- thermal methods.
- Understand the importance of sensory evaluation and drying technology.

Pre-requisites

Nil

Course Outcomes

On the successful completion of the course, students will be able to

CO1	Analyze various non-thermal food processing techniques and their applications in fruit and vegetable processing.	Analyze
CO2	Evaluate novel non-thermal sterilization methods for fruits and Vegetables	Analyze
CO3	Assess the quality of fruit and vegetable products using different evaluation techniques.	Apply
CO4	Examine the impact of novel non-thermal methods on the quality and safety of fruit and vegetable products	Analyze
CO5	Assess the quality of fruit and vegetable products using sensory evaluation.	Analyze

Mappii	ng with	Progra	amme (Outcom	nes															
COs		Pos												PSOs						
COS	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3					
CO1	3	3	3	-	-	-	-	-	2	-	-	2	3	3	3					
CO2	3	3	3	-	-	-	-	-	2	-	-	2	3	3	3					
CO3	3	3	3	-	-	-	-	-	2	-	-	2	3	3	3					
CO4	3	3	3	-	-	-	-	-	2	-	-	2	3	2	2					
CO5	3	3	3	-	-	-	-	-	2	-	-	2	3	2	3					
3 - Stro	ong; 2 -	Mediu	m; 1 – S	Some		•	•	•	•	•			•	•						

Assessment Pattern

Assessine in Falleri	•							
Bloom's Category	Contin	uous Asse (Mai	ssment Tes rks)	sts	Model Examination (Marks)	End Sem Examination (Marks)		
Diooni 3 Category	Te	st 1	Те	st 2				
	Theory	Lab	Theory	Lab	Lab	Theory	Lab	
Remember	10	-	10	-	-	30	-	
Understand	30	-	30	-	-	40	-	
Apply	10	50	10	50	50	20	50	
Analyze	10	50	10	50	50	10	50	
Evaluate	-	-	-	-	-	-	-	
Create	-	-	-	-	-	-	-	
Total	60	100	60	100	100	100	100	



Syllabus	1/	C Donassa	ny College	of Tooknole	av Autor-	mous Baca	2	
	K	S.Rangasar		Food Tech	gy – Autono	mous R202	2	
	60 FT	F33 - Advan			ble Process	ing Technol	logies	
		lours / Week		Total	Credit		ximum Mark	S
Semester	L	Т	Р	Hours	C	CA	ES	Total
VI	2	0	2	60	3	50	50	100
Non-Therma	I Processin	g Technolog	jies for Frui	ts And Vege	tables			
Ultraviolet lig	ht for proce	ssing of fruit	and vegetab	le products,	high pressure	e processing	g of fruit	[6]
and vegetab	le, ultrasoun	d application	of fruit and	vegetable pr	oducts, minin	nal processi	ng	[O]
	_	s in Fruit an	-					
					hnologies, h		/ pulsed	[6]
electric field	applications	, applications	of ozone in	fruit and veg	getable proce	ssing,		[~]
-		resh fruit and		-	-			
_	=	for Enhance		_	-		al mushisation	
•		•	•	•	obiotic microc	•	•	[6]
preservation			ılı and vegel	lable applica	tion in proces	ssing, role of	canning in	
			-l ifa Evtano	sion in Eruit	s and Vegeta	ahlae**		
					sing, refrigera		d chain	
		table product	•	•	•	alion and cor	a chain	[6]
		Fruits and V		aibic coating	J.			
	_		•	e juices effe	ect of fruit ar	nd vegetable	2	
					egetable pro			[6]
		e dielectric h					,	
ractical:								
1. Apply UV	light to fresh	fruits and co	mpare micro	obial load be	fore and after	treatment.		
2. Use ultras	sound (via	ultrasonic ba	th or clean	er) to treat	vegetable jui	ce and me	asure yield	
	ent and clari							
			versus no	blanching of	on color and	texture ret	ention in	
		or broccoli.						
		etup (e.g., clo	oth or filter p	aper) to clar	ify fruit juices	and compa	re clarity	
and flavor		maa lika naat	inaaa an frui	ita (a.a. ann	es) to break	down the se	II otruoturo	
		stency of the		its (e.g., app	es) to break	down the ce	ii structure	
				serve microl	oial growth ar	nd changes i	in acidity	[30]
over time.	one canales	to moon man	jaioo aria oo		orar growar ar	ia onangoo	iii aciany	
7. Can fruits	(e.g., peach	es) in syrup i	using basic o	canning tech	niques and e	valuate tast	e, texture,	
and color	after preserv	ation.	_	_				
					temperature,	refrigerator	, freezer)	
		in shelf life, t						
					arch or gela	tin) and app	oly them to	
		ge rates and			and analyze th	a a a a a a a a a a a a a a a a a a a	ata d liquid	
	content and		o maw parii	ally, collect a	ind analyze th	ie concentra	ated liquid	
ioi sugai d	content and	iiavoi.		Total Haur	s: (Lecture - :	20. Proofice	1 20)	60
Text Book(s):			TOLAI HOURS	. (Lecture -	ou, Fractica	ıı - 30 <i>)</i>	00
Rodric		ernandes. F.	A. N. "Advan	ces in Fruit P	rocessina Te	chnologies."	CRC Press, 2	2016.
1.								
						getables: Su	ıstainable Pro	ocessing
TECHI		he Fruit and	vegetable Ir	idustry. Spr	inger, 2017.			
Reference(s) e Callina	Fortuni D	"Advanas =	in Fronk Cod	Enuite and	Vogotobles	
		5., & Soliva- Press. 2016		. Auvances	in Fresh-Cut	i riuits and	vegetables	

Processing." CRC Press, 2016.

*SDG 9 – Industry Innovation and Infrastructure



^{**}SDG 3 - Good Health and Well Being

S. No.	Topics	No. of
		Hours
1	Non-Thermal Processing Technologies for Fruits And Vegetables	
1.1	Ultraviolet light for processing of fruit and vegetable products	2
1.2	high pressure processing of fruit and vegetable	1
1.3	ultrasound application of fruit and vegetable products	2
1.4	minimal processing	1
2	Innovative Technologies in Fruit and Vegetable Processing	
2.1	Membrane application in fruit and vegetable processing technologies	2
2.2	high intensity pulsed electric field applications	1
2.3	applications of ozone in fruit and vegetable processing	1
2.4	irradiation application in fresh fruit and vegetable produce processing	2
3	Processing Techniques for Enhanced Fruit and Vegetable Quality	
3.1	Enzyme maceration,	1
3.2	fruit and vegetable juices as vehicle for probiotic microorganism and prebiotics	2
	oligosaccharides,	
3.3	vacuum frying of fruit and vegetable application in processing,	2
3.4	role of canning in preservation of fruits and vegetables	1
4	Preservation Techniques and Shelf-Life Extension in Fruits And Vegetables	
4.1	Freeze concentration applications in fruit processing	1
4.2	Freeze concentration applications in vegetable processing	2
4.3	Refrigeration and cold chain effects on fruit product shelf life	1
4.4	Refrigeration and cold chain effects on vegetable product shelf life	1
4.5	edible coatings	1
5	Thermal Processing in Fruits and Vegetables	
5.1	Thermal treatment effects in fruit and vegetable juices,	1
5.2	effect of fruit and vegetable processing on product aroma,	1
5.3	sensory evaluation in fruit and vegetable product development,	2
5.4	ohmic heating,	1
5.5	microwave dielectric heating recent trends in drying	1
ractical:		· I
	Apply UV light to fresh fruits and compare microbial load before and after	
1.	treatment.	3
2	Use ultrasound (via ultrasonic bath or cleaner) to treat vegetable juice and	2
2.	measure yield improvement and clarity.	3
3.	Compare the effects of blanching versus no blanching on color and texture	3
J.	retention in vegetables like carrots or broccoli.	3
4.	Use a basic filtration setup (e.g., cloth or filter paper) to clarify fruit juices and	3
	compare clarity and flavor retention.	
5.	Use commercial enzymes like pectinase on fruits (e.g., apples) to break down	3
	the cell structure and observe the consistency of the puree.	
6.	Add probiotic cultures to fresh fruit juice and observe microbial growth and	3
	changes in acidity over time.	
7.	Can fruits (e.g., peaches) in syrup using basic canning techniques and evaluate	3
	taste, texture, and color after preservation. Store fruits and vegetables at different temperatures (room temperature, refrigerator,	
8.	freezer) and observe changes in shelf life, texture, and appearance.	3
	Prepare edible coatings using natural ingredients (e.g., starch or gelatin) and apply	
9.	them to fruits; compare spoilage rates and texture over time.	3
	Freeze fruit juice and allow it to thaw partially; collect and analyze the	
10.	concentrated liquid for sugar content and flavor.	3

1. Dr.K. Prabha

- prabhak@ksrct.ac.in



60 FT E34	Modern Technology in	Category	L	T	Р	Credit
0011234	Cereals, Pulses and Spices	PE	2	0	2	3

- To Understand the processing of Cereal pulses and spices
- To Analyze the cereal pulses and spices based on its properties
- To analyze various aspects of milling of pulses
- To develop value added products from pulses
- To recognize the milling techniques of cereals and pulses

Pre-requisites

Nil

Course Outcomes

CO1	Understand the processing of Cereal pulses and spices	Understand
CO2	Evaluate the basic composition and structural parts of food grains.	Analyze
CO3	Practice the various methods on drying of grains	Analyze
CO4	Prepare value added products from the by-products obtained during milling.	Understand
CO5	Demonstrate the equipment involved in the milling of pulses.	Apply

Mappii	Mapping with Programme Outcomes																	
COs	Pos												PSOs					
COS	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3			
CO1	3	-	3	-	-	-	3	2	-	3	-	2	3	3	2			
CO2	3	-	3	-	-	-	3	2	-	3	-	2	3	3	2			
CO3	3	-	3	-	-	-	3	2	-	3	-	2	2	3	3			
CO4	3	-	3	-	-	-	3	2	-	3	-	2	3	3	3			
CO5	3	-	3	-	-	-	3	2	-	3	-	2	3	3	3			
3 - Stro	ong; 2 -	Mediur	n; 1 – S	ome			3 - Strong; 2 - Medium; 1 – Some											

Assessment Pattern								
Bloom's	Contin	uous Asse	ssment Te	sts (Marks)	Model Examination (Marks)	End Sem Examination (Marks)		
Category	Tes	st 1	Tes	st 2				
	Theory	Lab	Theory	Lab	Lab	Theory	Lab	
Remember	20	-	20	-	-	30	-	
Understand	30	-	30	-	-	40	-	
Apply	10	50	10	50	50	30	50	
Analyze	-	50	-	50	50	-	50	
Evaluate	-	-	-	-	-	-	-	
Create	-	-	-	-	-	-	-	
Total	60	100	60	100	100	100	100	

	us	K	.S.Rangasa	my College	of Technolo	gy – Autono	mous R2022	<u> </u>	
				B.Tech	Food Tech	nology			
				lodern Techi					
Semes	ster	. 1	ours / Week		Total	Credit		ximum Marks	
		L	T	Р	Hours	С	CA	ES	Total
VI		2	0	2	60	3	50	50	100
			ulses, and			01:1			
				rice, maize,		-		-	[6]
-				•	_	-		on, economic	[6]
				cal significand			de, and cultu	irai neritage.	
				essing, distrib	ution, and co	nsumption.			
	Processing			aradina and	corting took	niauna Millin	a taabajayaa	. Dr. milling	[6]
				grading, and hilling. Flour q				s. Dry milling,	[6]
				ch properties.					
	Processing			cii piopeilles.	r ackaging a	ind storage.			
				Mechanical, p	neumatic. w	ater-based t	echniques.	Splitting and	
	-	-		-			-	assurance:	[6]
	-			article size,		-			
		-	-	eld processin			ing toomore	gioo. Tiigii	
	Processing			ola processing	g, miorowave	, arying.			
Drvina	methods:	Sun drvi	ng. hot air d	Irying and fre	eze drvina. E	xtraction me	thods: Stean	n distillation.	[6]
								sture content,	[-]
volatile	oil conten	, microb	ial load.				•		
Innova	ations and	Future ⁻	Trends						
Nano e	encapsulation	on, nano	-sensors for	quality monit	oring. Waste	utilization, en	ergy-efficient	t	[6]
techno	logies, wat	er recyc	ling. Organi	c, non-GMO,	clean label,	functional foo	ods.		
Praction									
				sprouting pro	ocess in legu	mes like chic	kpeas or len	tils,	
				nt availability.					
				oil extraction				1 - 421 -	
			nology to gr ncing flavol	ind spices like	e cinnamon o	or cloves, pre	serving their	voiatile	
				มา. hancement th	rough enzyr	natic hydrolys	eis		
								e turmeric or	
				life and contr					
				zation with ex					
				gy to extract b		•	spices such	as black	[30]
				their antioxid					
				g to extend the ts without the			ai and puise	products,	
				modify the te			or chickness	improving	
			educing coo		Attale of pais	es like bearis	or critekpeak	s, improving	
				xtract essenti	al oils from a	romatic spice	s like cloves	or	
				entrated flavo					
					Total Hour	s: (Lecture -	30; Practica	al - 30)	60
	ook(s):								
1.	Academic I	Press. 2	012.	,				raceutical Appl	
2.	Technology	/ and Ńι	itrition. 2012	2	·		•	eries in Food S	cience,
		, & CITCI	e, 5. J 5pi	ce: Flavors of	uie ⊨astern	iviediterranea	ın. ⊓arperCo	IIIIIS,∠UTb.	
Dotoro	1166(2):								
	Leo M I N	امالم + "⊔	andhook of	Meat Poultry	and Soafoo	Muality" Pla	ckwall Dublic	shing 2007	
				Meat, Poultry				shing, 2007 Edition, Vikas F	Puhlishir

^{*}SDG 9 – Industry Innovation and Infrastructure



S. No.	Topics	No. of Hours
1	Introduction to Cereal, Pulses, and Spices	'
1.1	Overview of Cereal Grains- Wheat, rice, maize, millets	1
1.2	Overview of pulses- Chickpeas, lentils, beans, peas	1
1.3	Overview of spices- Pepper, turmeric, cumin, cardamom	1
1.4	Importance in global food systems: Nutrition, economic significance, cultural aspects.	1
1.5	Historical significance: Role in human diet, trade, and cultural heritage.	1
1.6	Current challenges: Production, processing, distribution, and consumption.	1
2	Cereal Processing Technology	•
2.1	Pre-processing operations: Cleaning, grading, and sorting techniques.	1
2.2	Milling techniques: Dry milling, wet milling.	1
2.3	Milling techniques: Roller milling, stone milling	1
2.4	Flour quality and characteristics: Protein content, gluten formation	1
2.5	Flour quality and characteristics: Starch properties	1
2.6	Packaging and storage	1
3	Pulse Processing Technology	l.
3.1	Cleaning and dehulling methods: Mechanical, pneumatic.	1
3.2	Cleaning and dehulling methods: Water-based techniques	1
3.3	Splitting and fractionation processes: Milling, splitting	1
3.4	Splitting and fractionation processes: Sieving, grading	1
3.5	Quality assessment and assurance	1
3.6	Emerging technologies	1
4	Spice Processing Technology	
4.1	Drying methods: Sun drying, hot air drying	1
4.2	Drying methods: Freeze drying	1
4.3	Extraction methods: Steam distillation, solvent extraction	1
4.4	Extraction methods: Supercritical fluid extraction	1
4.5	Quality control measures: Purity, moisture content	1
4.6	Quality control measures: Volatile oil content, microbial load.	1
5	Innovations and Future Trends	'
5.1	Electric Vehicles: Function, Types, Layout, Components, Working Principle and challenges	1
5.2	Fuel Cell Vehicle: Function, Types, Layout, Components and Working Principle	1
5.3	Hybrid Vehicle: Function, Types, Layout, Components and Working Principle	1
5.4	Autonomous Vehicles: Levels of Autonomous Vehicles, Layout, Components, Working Principle and Challenges	1
5.5	Advanced Driver-Assistance Systems (ADAS): Function, Layout, Components and Working Principle	1
5.6	Connected Vehicle: Function, Types of Vehicle Connectivity, Components, Working Principle and Challenges	1
Practical:		•
1.	Microwave pulses to enhance the sprouting process in legumes like chickpeas or	3
	lentils, improving digestibility and nutrient availability.	
2. 3.	To determine the spice essential oil extraction via supercritical CO2. Utilize cryogenic technology to grind spices like cinnamon or cloves, preserving their	3
	volatile compounds and enhancing flavour.	
4.	Demonstrate the spice flavour enhancement through enzymatic hydrolysis	3



5.	Determine the nano encapsulation to encapsulate volatile compounds from spices like turmeric or ginger, ensuring prolonged shelf life and controlled release in food products.	3
6.	To determine cereal pulse texturization with extrusion processing	3
7.	Examine the ultrasound technology to extract bioactive compounds from spices such as black pepper or cardamom, enhancing their antioxidant properties.	3
8.	Employ high-pressure processing to extend the shelf life of cooked cereal and pulse products, preserving freshness and nutrients without the need for additives.	3
9.	Utilize hydrothermal treatment to modify the texture of pulses like beans or chickpeas, improving their mouthfeel and reducing cooking time.	3
10.	Employ molecular distillation to extract essential oils from aromatic spices like cloves or cinnamon, producing highly concentrated flavor extracts for use in food products.	3

Ms. P. Aarthi-<u>aarthi@ksrct.ac.in</u>



60 FT E35	Food Industry Waste Management	Category	L	Т	Р	Credit
00 F1 E33	1 000 maastry waste management	PE	2	0	2	3

- To study the standards and acts in industrial waste management.
- To learn by products and its utilisation for various purposes.
- To study the characterisation of food industry effluents
- To explain the biological oxidation process
- To study the advanced waste management systems

Pre-requisites

NIL

Course Outcomes

On the suc	cessial completion of the course, students will be able to	
CO1	Recognize the various acts and standards implemented for waste Disposal	Remember
CO2	Analyse the various by-product from food waste and its utilisation	Analyze
CO3	Analyse the various characterisation methods of food industry effluent methods.	Analyze
CO4	Illustrate the biological oxidation process and the methods employed in industries.	Apply
CO5	Discuss the advance waste management systems employed for treating food industry effluents	Understand

Mappi	Mapping with Programme Outcomes															
COs		POs												PSOs		
003	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	
CO1	3	3	3	-	-	-	-	-	2	2	-	-	3	3	2	
CO2	3	3	3	-	-	-	-	-	-	-	-	-	3	3	2	
CO3	3	3	3	-	-	-	-	-	2	2	-	-	2	3	3	
CO4	3	3	3	-	-	-	-	-			-	-	3	3	3	
CO5	3	3	3	-	-	-	-	-	2	2		2	3	3	3	
3 - Stro	3 - Strong; 2 - Medium; 1 – Some															

Assessment Pattern								
Bloom's Category	Contir	nuous Asse	essment Te	sts (Marks)	Examination	End Sem Examination (Marks)		
Biodin o datogory	Tes	st 1	Tes	st 2	(Marks)			
	Theory	Lab	Theory	Lab	Lab	Theory	Lab	
Remember	20	-	20	-	-	30	-	
Understand	30	-	20	-	-	40	-	
Apply	-	50	10	50	50	20	50	
Analyze	-	50	10	50	50	10	50	
Evaluate	-	-	-	-	-	-	-	
Create	-		-	-	-	-	-	
Total	60	100	60	100	100	100	100	

		on tangaca		Food Tech		mous R2022		
		en et			nology aste Managel	mont		
	Н	ours / Week		Total	Credit		ximum Marks	
Semester	L	T	Р	Hours	C	CA	ES	Total
VI	2	0	2	60	3	50	50	100
discharge	and Acts try wastes, Foot of environmer Act, 1986. Ele	ntal polluta	nts from foo	od process	ing Industries	s as per E	invironment	[6]
Characteriz	s and their Uti ation and utiliz roducts, ferme	ation of by-						[6]
Physical and Fats, Oils a	cation of Food d chemical para nd grease, For factants, Color	meters, Ox ms of Nitro	ygen demand gen, Sulphur				(solids),	[6]
Activated sl	Oxidation Organisms, Fudge process, nodifications							[6]
Advanced v Ultra filtrati	Waste Water Naste water no and reversorption, lon-exception, lon-exception, lon-exception.	nanagemen se osmosis	t systems: P s, Physico-ch	nemical sep	arations: acti		Filters,	[6]
 Determin 	nation of Physic nation of total S nation of total p nation of electri nation of chloric nation of acidity nation of biolog nation of Chem nation of dissol	solids, Volat hosphorous cal conduct des and sulp and alkalin ical oxygen ical oxygen Contamina	ile solids and from waste v ivity and turbio phates of was ity of waste w demand (BOI demand (CO tion of water	Fixed solids vater dity of waste tewater vater D) of wastev D) of wastev	of waste wate water /ater	-		[30]
				Total Hou	s: (Lecture -	30; Practica	I - 30)	60
1. Mana	s): ka Thakur, V agement", Spri Narvanen, Nir	nger 2020.		•				inger,202
Reference(s):							
, Wan	g L.K., Hung Y or and Francis			aste Treatm	ent in the Foo	od Processing	g Industry", CF	RC press
	nitoyannis IS. s, 2008.	, and. Jog	dhand S.N.,	"Waste Ma	nagement for	the Food Ir	ndustries", Aca	ademic

^{*}SDG 9 – Industry Innovation and Infrastructure
**SDG 7 – Affordable and Clean Energy



Course C	ontents and Lecture Schedule	
S. No.	Topics	No. of Hours
1	Standards and Acts	
1.1	Food industry wastes	1
1.2	Food waste treatment	1
1.3	ISO 14001 standards	2
1.4	Standards for emission or discharge of environmental pollutants from food processing Industries as per Environment (Protection) Act, 1986	1
1.5	Elements of importance in the efficient management of food processing	1
2	By Products and their Utilization	
2.1	Characterization and utilization of by-products from cereal, pulses, oilseeds	1
2.2	Characterization and utilization of by-products: oilseeds, fruits and vegetables	1
2.3	Characterization and utilization of by-products: plantation products	1
2.4	Characterization and utilization of by-products: fermented foods, milk	1
2.5	Characterization and utilization of by-products: fish, meat, egg	1
2.6	Characterization and utilization of by-products: poultry processing industries.	1
3	Characterization of Food Industry Effluents	
3.1	Physical and chemical parameters,	1
3.2	Oxygen demands and their inter relationship	<u>·</u> 1
3.3	Residues (solids), Fats, Oils and grease	<u>.</u> 1
3.4	Forms of Nitrogen, Sulphur and Phosphorus	<u>.</u> 1
3.5	Anions and cations	1
3.6	Surfactants, Colour, Odour, Taste	<u></u> 1
4	Biological Oxidation	ı
4.1	Objectives, Organisms, Reactions, Oxygen requirements,	1
4.2	Aeration devices	1
4.2	Systems: Lagoons	1
	Systems: Activated sludge process	
4.4	Systems: Oxidation ditches	1
4.5 4.6	Systems: Rotating biological contactors and their Variations and advanced modifications	<u>1</u> 1
5	Advanced Waste Water Management	<u> </u>
5.1	Advanced waste water management systems	1
5.2	Physical separations- Micro-strainers,	<u>·</u> 1
5.3	Filters, Ultra filtration and reverse osmosis,	<u>.</u> 1
5.4	Physico-chemical separations: activated carbon adsorption	1
5.4	Physico-chemical separations: lon-exchange	<u></u> 1
	Physico-chemical separations: let exertainge Physico-chemical separations: electro-dialysis and magnetic separation	
5.6 Practical:		1
1.	Determination of Physical parameters of Waste water Temperature, Colour, Odour, pH	2
2.	Determination of total Solids, Volatile solids and Fixed solids of waste water	4
3.	Determination of total phosphorous from waste water.	4
4.	Determination of electrical conductivity and turbidity of waste.	2
5.	Determination of chlorides and sulphates of waste water	2
6.	Determination of acidity and alkalinity of waste.	4
7.	Determination of biological oxygen demand (BOD) of waste water	4
8.	Determination of Chemical oxygen demand (COD) of waste water	2
9.	Determination of faecal Contamination of water	4
10.	Determination of dissolved oxygen from waste.	2
Course D	esigner(s)	

Course Designer(s)
Mr. G. Bharath - bharathg@ksrct.ac.in



60 FT E36	Industrial Production of	Category	L	Т	Р	Credit
0011230	Cookies and Biscuits	PE	2	0	2	3

- Understand hard and soft dough biscuit processing methods.
- Explain operation and role of different biscuit-making machines.
- Understand cookie production and impact of automation and efficiency.
- Describe construction and operation of cookie-making machines.
- Understand cracker, wafer, and pretzel production technologies.

Pre-requisites

Nil

Course O	utcomes	
On the su	ccessful completion of the course, students will be able to	
CO1	Learn ingredient effects on dough spread during baking.	Understand
CO2	Analyse the machine performance to ensure product quality.	Analyze
CO3	Design energy-efficient, automated cookie production processes.	Analyze
CO4	Apply advanced techniques for hygienic, customizable cookie production.	Apply
CO5	Apply innovative cracker products using modern techniques and packaging.	Apply

Mappii	Mapping with Programme Outcomes														
COs		POs													
003	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1	3	3	2	2	-	-	-	-	-	-	-	2	2	2	2
CO2	3	3	2	2	-	-	-	-	-	-	-	2	2	2	3
CO3	3	3	3	3	-	-	-	-	-	-	-	3	3	3	3
CO4	3	3	3	3	-	-	-	-	-	-	-	3	3	3	3
CO5	3	3	3	3	-	-	-	-	-	-	-	3	3	3	3
3 - Stro	ong; 2 -	Mediu	m; 1 – S	Some											

Assessment Pattern								
Bloom's Category	Contir	nuous Asse	essment Te	sts (Marks)	Model Examination	End Sem Examination		
Bloom's Category	Tes	st 1	Tes	st 2	(Marks)	(Marks)		
	Theory	Lab	Theory	Lab	Lab	Theory	Lab	
Remember	20	-	20	-	-	20	-	
Understand	40	-	20	-	-	40	-	
Apply	-	50	10	50	50	30	50	
Analyze	-	50	10	50	50	10	50	
Evaluate	-	-	-	-	-	-	-	
Create	-	-	-	-	-	-	-	
Total	60	100	60	100	100	100	100	

	K	.S.Rangasaı	ny College	of Technolo	gy – Autono	mous R202	2	
		gasa.		. Food Tech				
		60 FT E36 -		roduction o		nd Biscuits		
_		lours / Week		Total	Credit		aximum Marks	
Semester	L	Т	Р	Hours	С	CA	ES	Total
VI	2	0	2	60	3	50	50	100
Classifica	tion and proce	essing techr	ology of bis	scuits*		-I		
Hard doug	h biscuits - ing	gredients and	I formulation	s, dough mix				[6]
•	ging, Soft dou cooling and pa	•	- ingredients	and formula	ations, dough	n mixing, for	ming, baking,	
Biscuit Ma	king Machine	es*						
Sheeting r	nachines, she	eeters, gaug	e rolls, lami	nators, Reci	procating	cutters -	construction,	[6]
	rinciple, cross			n. Rotary cu	tters -			
	on, shaping p							
	tion And Proc	_						501
		-		-		-	lients used in	[6]
	•	es, general p	rocess of co	okies produc	tion - mixing	g, dough she	eting, baking,	
cooling an	d packaging.							
Cookie Ma	king Machine	es*						
Rotary mo	ulders - intro	duction, Cor	nstruction, m	noulding prin	ciple, transm	nission syste	em, operation.	[6]
Extruder 8	depositor -	Construction	n – Dough	feed assemi	bly, Die ass	embly, Sha	ping principle,	
Transmiss	ion system & d	operation.	•					
	And Miscellan		t Like Produ	ıcts**				
	on of crackers				nufacturing t	echnology of	f	[6]
	Vafers and pre							
	y. Sustainabili							
Practical:	-							
	multiple batch	es of hard do	ough biscuits	s using varyir	g proportion	s of flour, fat	t, and sugar.	
	e the texture, o			0 ,		,		
	e manual and			ods for hard o	lough. Meas	ure dough co	onsistency,	
	, and baking r							
Bake ha	rd dough biscu	uits at differe	nt temperatu	res and time	s, observing	changes in	color, texture,	
	sture content.							
					a, fruit extra	cts) on Soft	Dough Biscuits	
	ess their impa						1 16 176	
	biscuits using					oil) and obse	erve shelf life	
	oring moisture					o impost of	dough	[20]
	nual sheeting a s and shape o				. Observe in	ie impact or t	uougri	[30]
7 Hee diffe	erent grades of	f raw materia	or texture an	ıar fat) and e	valuate the	cookies hase	ed on texture	
	and flavor.	i iaw inatona	no (nour, oug	jar, ratj aria c	valuate the t	occinico baci	oa on toxtaro,	
		mes for cook	ie dough and	d analyze the	impact on d	louah consis	tency, spread	
	aking, and ove			a aa., = 0		.og ooo.o	, op. oa.	
				compare the	effect on text	ture, rise, an	d flavor profile.	
10. Prepar	e wafers of dif	ferent thickn	esses and c	ompare the i	mpact on tex	ture, crispne	ess, and baking	
times.								
					:: (Lecture -	30; Practica	al - 30)	60
	(s):			I otal Hours	(=======		,	
					•		•	
1. Mar	ley, Duncan, "			Crackers, and	Cookies", Fo		•	
2. Par	eyt, Bram et al			Crackers, and	Cookies", Fo		•	
 Mar Par Reference	eyt, Bram et al	., "Engineerir	ng Aspects o	Crackers, and f Baking", Fir	Cookies", Fo)20.	, 2011.	
1. Mar 2. Par Reference Mar 1. Ingr	eyt, Bram et al (s): nley, Duncan, edients", First	., "Engineering" "Biscuit, Co Edition, 199	ng Aspects o okie, and C 8.	Crackers, and f Baking", Fir Cracker Man	Cookies", Footst Edition, 20	Manuals:	, 2011. Volume 1 -	
1. Mar 2. Par Reference 1. Mar Ingr	eyt, Bram et al (s): nley, Duncan, edients", First	"Biscuit, Co Edition, 199	ng Aspects o okie, and C 8.	Crackers, and f Baking", Fir Cracker Man	Cookies", Footst Edition, 20	Manuals:	, 2011.	



^{*}SDG 9 – Industry Innovation and Infrastructure
**SDG 12 – Responsible Consumption and Production

Course Co	ontents and Lecture Schedule	
S. No.	Topics	No. of Hours
1	Classification and Processing Technology of Biscuits	
1.1	Hard dough biscuits - ingredients and formulations, dough mixing	1
1.2	Hard dough biscuits - forming, baking, flavoring	1
1.3	Hard dough biscuits cooling and packaging	1
1.4	Soft dough biscuits - ingredients and formulations, dough mixing	1
1.5	Soft dough biscuits - forming, baking, flavoring	1
1.6	Soft dough biscuits - cooling and packaging	1
2	Biscuit Making Machines	
2.1	Sheeting machines	2
2.2	Sheeters	1
2.3	Gauge rolls	1
2.4	Laminators	2
2.5	Reciprocating cutters – construction, shaping principle, crosshead drive, transmission	
2.6	Rotary cutters - Construction, shaping principle, transmission	
3	Classification and Processing Technology of Cookies	
3.1	Characteristic features of ingredients of cookies,	1
3.2	Quality assessment of raw ingredients used in cookies.	1
3.3	Types of cookies,	1
3.4	General process of cookies production - mixing, dough sheeting, baking, cooling and packaging.	3
4	Cookie Making Machines	
4.1	Rotary moulders – introduction, Construction	1
4.2	moulding principle, transmission system, operation.	1
4.3	Extruder & depositor – Construction – Dough feed assembly,	2
4.4	Die assembly, Shaping principle,	1
4.5	Transmission system & operation.	1
5	Crackers and Miscellaneous Biscuit like Products	
5.1	Classification of crackers - cream, soda and snack crackers	1
5.2	Manufacturing technology of crackers	1
5.3	Wafers and pretzels biscuits	1
5.4	Fermentation in Cracker Production	1
5.5	Innovations in Wafer Technology	1
5.6	Sustainability in Cracker Packaging	1
Practical:		
1.	Prepare multiple batches of hard dough biscuits using varying proportions of flour, fat, and sugar. Compare the texture, crispness, and flavor.	3
2.	Compare manual and mechanical mixing methods for hard dough. Measure dough consistency, elasticity, and baking results.	3
3.	Bake hard dough biscuits at different temperatures and times, observing changes in color, texture, and moisture content.	3
4.	Experiment with different flavoring agents (e.g., vanilla, cocoa, fruit extracts) on Soft Dough Biscuits and assess their impact on taste and consumer preference.	3
5.	Package biscuits using different materials (e.g., plastic wrap, aluminum foil) and observe shelf life by monitoring moisture content and texture changes over time.	3



6.	Use manual sheeting and cutting techniques to form biscuits. Observe the impact of dough thickness and shape on final product texture and uniformity.	3
7.	Use different grades of raw materials (flour, sugar, fat) and evaluate the cookies based on texture, spread, and flavor.	3
8.	est different mixing times for cookie dough and analyze the impact on dough consistency, spread during baking, and overall cookie texture.	3
9.	Ferment cracker dough for different times and compare the effect on texture, rise, and flavor profile.	3
10.	Prepare wafers of different thicknesses and compare the impact on texture, crispness, and baking times.	3

Course Designer(s)

1. Mr.P. Kalai Rajan - kalairajan@ksrct.ac.in

Analyze

60 FT E37	Technology of Fats and Oils	Category	L	T	Р	Credit
0011207		PE	2	0	2	3

Objectives

- To learn about sources and quality analysis of oils and fats.
- To study the pre-treatment techniques and its uses.
- To understand the refining process and modification in edible oils.
- To know the preparation and processing of Plant and Animal products.
- To realize the importance and application of by products from Oils and Fats.

Emphasis the importance of by product and its utilization.

Pre-requisites

• Nil

CO5

Course Outcomes

CO1	Explain the various sources and quality parameters of Oils and Fats	Understand
CO2	Details on novel techniques of oil extraction.	Analyze
CO3	Elucidate the suitable refining and modification process for Oils and Fats.	Analyze
CO4	Summarize the technology applied for preparation and processing of plant and animal products.	Apply

Mappii	Mapping with Programme Outcomes																
COs	POs														PSOs		
COS	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3		
CO1	3	3	2	-	-	-	2	-	2	2	-	2	3	3	2		
CO2	3	3	2	-	-	-	2	-	2	2	-	2	3	3	2		
CO3	3	3	3	-	-	-	2	-	2	2	-	2	2	3	3		
CO4	3	3	3	-	-	-	2	-	2	2	-	3	3	3	3		
CO5	3	3	2	-	-	-	2	-	2	2	-	3	3	3	3		
3 - Str	ong; 2	- Mediu	ım; 1 –	Some													

	Contir	nuous Asse	ssment Te	sts (Marks)	Model Examination	End Sem Examination (Marks)	
Bloom's Category	Tes	st 1	Tes	st 2	(Marks)		
	Theory	Lab	Theory	Lab	Lab	Theory	Lab
Remember	20	-	20	-	-	20	-
Understand	30	-	30	-	-	40	-
Apply	10	50	10	50	50	20	50
Analyze	-	50	-	50	50	20	50
Evaluate	-	-	-	-	-	-	-
Create	-	-	-	-	-	-	-
Total	60	100	60	100	100	100	100

		.S.Rangasam		Food Techno				
		60 F			Fats and Oil	S		
_	He	ours / Week		Total	Credit		ximum Marks	}
Semeste	r L	T	Р	Hours	С	CA	ES	Total
VI	2	0	2	60	3	50	50	100
Sources	of oils and fats	and quality a	nalysis	1	1			
Natural s	ources of oils	and fats (pla	ant and ar	nimal), curre	nt status, is	sues and c	hallenges:	
	otion- nutritional a						f fatty acid	[6]
	ants in edible oil	. Quality para	meters and	d internationa	l and regiona	I		
regulation		of all average	ation*					
	ment techniques			trootmont n	ooooo Dhyoi	aal mathada		[6]
	rocess: thermal, action- principles						extraction	[o]
	gy- meal desolve					33 – 30IVEIII	extraction	
	I refining and m		HOVEI LECITI	ilques of oil e	ALIACIOII.			
	Refining - Filtra		nina. neutra	alisation, blea	achina, deodo	orization and		[6]
	refining. Membra							
	blending and for						3	
	ion and Proces							
	value-manufactu				nd methods, s	storage and		[6]
industrial	application of pla	ınt oil (seed oi	I, fruits and	nuts, rice bra	ın oil) and aniı	mal fats (fish	, dairy	
cream ,g	nee, lard). Oil pov	wder - proces	sing and its	application.				
By produ	ct utilization of	oils and fats	**					
Propertie	s and utilization	of major by-pr	roducts of o	oil mill indust	ry. Other prod	ducts - Prote	in powder –	[6]
	ns – TVP – ani				ompounds -	lecithin prod	duction and	
application	n - Biodiesel, eth	nanol and glyc	cerol produ	ction.				
Practical								
	tative test to iden				given sample	Э.		
	mination of lodin							
	mination of Sapo							
	tigate the temper						understand	
	nplications of the						indicator	
	ation of quantify ir quality and sh		acid contei	nt in dillerent	iats and oils,	which is an	indicator	
	tigate the emulsi		rtipe of vari	ious fats and	oile and their	suitability fo	r	
	n food emulsions		illes oi vaii	ious iais aiiu	ons and then	Sultability 10	'	[30]
	ation of the oxid		of fats and	oils under ac	celerated agi	na condition	s.	[00]
	cking storage and	•				3	-,	
8. Dete	mination of Free	Fatty Acids ar	nalysis in O	ils and Fats b	oy suitable me	ethod.		
9. Sepa	ration of glyceri	n, a valuable	byproduct	t from the tr	ansesterificat	ion process	used to	
	ice biodiesel from							
	ss the nutritional			from oilseed	I processing a	and evaluate	its	
suita	oility as a compo	nent of anima	il feed.					
	17.			Total Hour	s: (Lecture -	30; Practica	ıl - 30)	60
Text Boo		"F.1					15 12: 0=	0.5
1. Ri	chard D. O'Brien,	"Fats and Oils	s: Formulat	ting and Proc	essing for App	plications", 3	rd Edition, CR	C Press,
	ndon, 2010.						<u> </u>	<u> </u>
Lo	Chakraverty. Pos	st-Harvest Te	٠.	t Cereals, Pu	Ises and Oilse	eds, 3rd Ed	. Oxford and II	3H
2. A.								
2. A. Pu		Ltd., New De	elhi.2008.					
2. A. Pu	e(s):							
2. A. Pu Reference 1. Gu	e(s): instone, F. (Ed.).			chnology: cor	nposition, pro	perties and ι	uses. John Wil	ey &
2. A. Pu Reference 1. Gu	e(s):	Vegetable oils	s in food ted			•		

^{*}SDG 9 – Industry Innovation and Infrastructure **SDG 3 – Good Health and Well Being



S. No.	Topics	No. of
3. NO.	·	Hours
1	Sources of oils and fats and quality analysis	ı
1.1	Natural sources of oils and fats (plant and animal)	1
1.2	Current status, issues and challenges	1
1.3	Consumption-nutritional and healthy values	1
1.4	Chemical composition of fat and oil	1
1.5	Types of fatty acid, Antioxidants in edible oil	1
1.6	Quality parameters - International and regional regulations	1
2	Pre-treatment techniques of oil extraction	
2.1	Primary process - thermal, enzymatic process,	1
2.2	Novel pre-treatment process	1
2.3	Physical methods of oil extraction, principles and mechanism	1
2.4	Factors affecting extraction process	1
2.5	Solvent extraction technology	1
2.6	Meal desolventization - novel techniques of oil extraction	1
3	Edible oil refining and modification	I
3.1	Principle – Refining - Filtration, degumming,	1
3.2	Neutralisation, bleaching	1
3.3	Deodorization and physical refining	1
3.4	Modification - fractionation, winterization - Margarine	1
3.5	Edible oil blending and fortification	1
3.6	Edible oil packaging and its regulations	1
4	Preparation and Processing of plant oil and animal fats	<u> </u>
4.1	Nutritive value-manufacturing process of plant oil	1
4.2	Packaging materials and methods, storage of plant oil	1
	Industrial application of plant oil, Nutritive value-manufacturing process of animal	<u>'</u>
4.3	fat	1
4.4	Packaging materials and methods, storage of animal fat	1
4.5	Industrial application of animal fat	1
4.6	Oil powder - processing and its application.	1
5	By product utilization of oils and fats	
5.1	Properties and utilization of major by-products of oil mill industry	1
5.2	Other products - protein powder – edible films	1
5.3	TVP – animal feed – extraction of bioactive compounds	1
5.4	Lecithin production and application	1
5.5	Biodiesel production	1
5.6	Ethanol and glycerol production	1
Practical:		
1	Qualitative test to identify the presence of oils and fats in the given sample.	[3]
2	Determination of Iodine number of fried fats and oils.	[3]
3	Determination of Saponification number of fried oils and fats.	[3]
4	Investigate the temperature affects the melting points of various fats and oils, and to understand the implications of these properties in culinary and industrial applications.	[3]
5	Evaluation of quantify the free fatty acid content in different fats and oils, which is an indicator of their quality and shelf life.	[3]
6	Investigate the emulsification properties of various fats and oils and their suitability for use in food emulsions.	[3]



7	Evaluation of the oxidative stability of fats and oils under accelerated aging conditions, mimicking storage and processing.	[3]
8	Determination of Free Fatty Acids analysis in Oils and Fats by suitable method.	[3]
9	Separation of glycerine, a valuable by-product from the transesterification process used to produce biodiesel from vegetable oils.	[3]
10	Assess the nutritional value of oil cake derived from oilseed processing and evaluate its suitability as a component of animal feed.	[3]

Course Designer(s)

1. Dr.K.Prabha- prabhak@ksrct.ac.in

PROFESSIONAL ELECTIVE - IV

60 FT E41	Downstream Processing of	Category	Г	Т	Р	Credit
00 11 241	Bioproducts	PE	3	0	0	3

Objectives

- To learn various unit operations and their applications in downstream processing of bio products.
- To emphasis the need for separation techniques in downstream processing
- To acquire knowledge in recovery, purification and formulation of bio products of commercial interest.
- To provide knowledge on downstream processing economics
- To introduce sequential stages of downstream processing

Pre-requisites

Thermal Engineering

Course Outcomes

CO1	Review cost cutting strategies and bio-product release kinetics	Understand
CO2	Interpret the design and principle of filtration and centrifugation	Analyze
CO3	Identify suitable unit operation for product recovery and concentration	Apply
CO4	Demonstrate the principles and operation of chromatographic Techniques	Apply
CO5	Discuss the operational requirements of industrial crystallizers and Lyophilizer	Analyze

Mappi	Mapping with Programme Outcomes														
COs	Pos											PSOs			
003	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1	3	3	3	-	-	-	-	-	-	-	-	-	3	3	2
CO2	3	3	3	-	-	-	-	-	-	-	-	-	3	3	2
CO3	3	3	3	-	-	-	-	-	-	-	-	-	2	3	3
CO4	3	3	2	-	-	-	-	-	-	-	-	-	3	3	3
CO5	3	3	2	-	-	-	-	-	-	-	-	-	3	3	3
3 - Str	ong; 2 -	Mediur	m; 1 – S	Some											

Assessment Pattern										
Bloom's Category	Continuous Asse (Mar		End Sem Examination (Marks)							
	1	2								
Remember	10	10	20							
Understand	10	30	30							
Apply	20	20	30							
Analyze	10	-	20							
Evaluate	-	-	-							
Create	-	-	-							
Total	60	60	100							

	r	K.S.Rangasa			"	ilious RZ022	<u> </u>			
B.Tech Food Technology 60 FT E41 - Downstream Processing of Bioproducts										
		Hours/Week	i - Downsti	Total	Credit		ximum Marks			
Semester		T	P	Hours	C	CA	FS	Total		
VII 3 0 0 45 3 40 60										
ntroduction processing ocation o	ion to downst on to downstrea g - cost cutting products and process; pretro	am processing strategy - phy product relea	g - character sico chemic se kinetics -	ristics of biom al basis of bion cell disruption	nolecules - ed oseparation - n methods: n			[9]		
Principle of rame filte continuou of centrifu	eparation and of batch filtratio or press, leaf to s filtration - cer gation- Calcula oplication of sin	n - pretreatm filter, continu ntrifugation: p tions in settlii	ous filtratior rinciple, des ng velocity, s	n: rotary dru sign and type sigma factor	m filter - cal	lculations in al centrifuges	batch and s - scale up	[9]		
Adsorption boint time luid extra and dialys	ecovery and con: Isotherms, book in fixed bed a ction - membris, precipitation	atch, continuadsorption - prane separation of proteins b	ous operation orinciple of control on processory different n	cloud point, a es: microfiltra	aqueous two	phase and	supercritical	[9]		
Principle hase, p	urification by and practice, i seudo affinity graphy and gas	on exchange	s, size exclu graphy, hig	gh performa	nity, hydroph ince liquid			[9]		
Crystalliza populatior	luct purification: nucleation density, industrying - drying tos.	n, crystal g strial crystalli	rowth, crys zers, recrys	tallization, M	ATLAB prog	ramming for	the kinetic	[9]		
						Т	otal Hours:	45		
Text Bool	• •									
	oralabettu Krish arning Private L				chnology - A N	New Horizon	In Biotechnolo	gy", PH		
	asankar B., "Bio hi, 2006.	oseparations	- Principles	and Techniqu	ies", Prentice	Hall of India	Private Limited	d, New		
Reference	e(s):									
	rrison, R.G., To tion. Oxford Ur			Petrides, D.P	Bioseparati	ions Science	and Engineeri	ng. 2 no		
2. Ro	ger.G, Harrison gineering" Oxfo	, Paul Todd, S ord University	Scott R.Rudg Press, New	ge and Deme york , 2003.	tri P.Petrides	, "Bioseperat	ion Science ar	ıd		
		,	, -	• •						

^{*}SDG 9 – Industry Innovation and Infrastructure



Course C	ontents and Lecture Schedule	
S. No.	Topics	No. of hours
1.0	Introduction to downstream and intracellular product release	
1.1	Introduction to downstream processing	1
1.2	characteristics of biomolecules	1
1.3	economics of downstream processing	1
1.4	cost cutting strategy	1
1.5	physico chemical basis of bioseparation	1
1.6	location of products and product release kinetics	1
1.7	cell disruption methods: mechanical, chemical	1
1.8	cell disruption methods: enzymatic process	1
1.9	pre-treatment and stabilization of bioproducts.	1
2.0	Primary separation and isolation	1 4
2.1	Principle of batch filtration	1
2.2	pre-treatment of fermentation broth	1
2.3	design of industrial filters:	1
2.4	plate and frame filter press, leaf filter, continuous filtration	1
2.5	rotary drum filter	1
2.6	calculations in batch and continuous filtration	1
-	centrifugation: principle, design and types of industrial centrifuges	1 1
2.8	scale up of centrifugation Calculations in settling velocity, sigma factor and number of discs in centrifugation	1
2.9	with the application of simple MATLAB programming.	1
3.0	Product recovery and concentration	·
3.1	Adsorption: Isotherms, batch, continuous operations	2
3.2	problems in adsorption isotherms	1
3.3	break point time in fixed bed adsorption	1
3.4	principle of cloud point	1
3.5	aqueous two phase and supercritical fluid extraction	1
3.6	membrane separation processes: microfiltration, ultrafiltration	1
3.7	membrane separation processes: reverse osmosis and dialysis,	1
3.8	Precipitation of proteins by different methods.	1
4.0	Product purification by chromatography	
4.1	Principle and practice, ion exchange, size exclusion,	1
4.2	bioaffinity, hydrophobic interaction,	1
4.3	reverse phase, pseudo affinity chromatography,	1
4.4	high performance liquid chromatography,	2
4.5	flash chromatography	2
4.6	gas chromatographic techniques	2
5.0	Final product purification and polishing	
5.1	Crystallization: nucleation, crystal growth, crystal size distribution,	2
5.2	kinetics of crystallization, population density,	2
5.3	industrial crystallizers, recrystallization,	1
5.4	MATLAB programming for the kinetic studies;	2
5.5	drying - drying terminologies, drying curve, industrial dryers,	1
5.6	freeze drying principles and applications.	1

1. Dr. P. Shanmugam – shanmugam@ksrct.ac.in

Passed in BoS Meeting held on 22.05.24 Approved in Academic Council Meeting held on 25.05.24



60 FT E42	Food Product	Category	L	Т	Р	Credit
0011 242	Development	PE	3	0	0	3

- To understand the fundamentals of food product development and its significance in the food industry.
- To study the functionality of ingredients and their application in food product formulations.
- To understand the principles of product design and scaling production processes.
- To learn the regulatory and quality assurance aspects of food product development.
- To explore the commercialization and marketing strategies for food products.

Pre-requisites

Nil

Course Outcomes

01111100000	beend completion of the course, stadents will be able to	
CO1	Explain key factors influencing new product development and identify stages of the NPD process.	Understand
CO2	Analyze ingredient roles in food formulation and create product prototypes.	Analyze
CO3	Develop effective product designs and understand scaling-up of production processes.	Apply
CO4	Understand food regulations and apply quality assurance protocols in product development.	Understand
CO5	Apply marketing strategies and assess the commercial viability of new food products.	Apply

Mappii	Mapping with Programme Outcomes														
COs	Pos										PSOs				
COS	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1	3	3	3	3	-	-	-	-	-	ı	-	3	3	3	3
CO2	3	3	3	3	-	-	-	-	-	ı	-	3	3	3	3
CO3	3	3	3	3	-	-	-	-	-	1	-	3	3	3	3
CO4	3	3	3	3	-	3	-	-	-	1	-	3	3	3	3
CO5	3	3	3	3	-	-	-	-	-	1	-	3	3	3	3
3 - Stro	ong; 2 -	Mediur	m; 1 – S	ome											

Assessment Pattern									
	Continuous Asse	essment Tests (Marks)							
Bloom's Category			End Sem Examination (Marks)						
	1	2							
Remember	10	10	20						
Understand	20	30	40						
Apply	20	20	30						
Analyze	10	-	10						
Evaluate	-	-	-						
Create	-	-	-						
Total	60	60	100						



					gy – Autono		•		
B. Tech. Food Technology 60 FT E42 - Food Product Development									
		ours/Week		Total	Credit		ximum Marks		
Semester		T	Р	Hours	C	CA			
VII	3	0	0	45	3	40	60	Total 100	
Definition ar food production	n to Food Production of Importance cts, The role at: Consumer at (NPD) process	of Food Pro of innovati preference	oduct Develo on in the fo es, market	ood industry needs, com	orical evolution, Factors in	fluencing foo ages of ne	od product w product	[9]	
Role of ingreemulsifiers, nutrition, tas	Functionality a edients in food Use of natural ste, and shelf lif it, Product cost	product de and artificia e in formula	velopment, F al additives: p ations, Produ	reservatives ct formulatio	, colorants, a	and flavors, l	Balancing	[9]	
Designing forocess des consideration	sign and Proc ood products sign for products ins for differed in product deve	for sensor ct manuface ent types	ry appeal, n cturing, Scali of food pro	ing up from oducts, Sen	pilot to full sory evalua	production, tion: Techn	Packaging	[9]	
Food laws a claims, Haz GMP) and	lations and Quand regulations card Analysis food safety stamicrobiological	(FDA, FSS and Critica andards, Q	AI, Codex Ali al Control Po uality assura	oints (HACC ince method	CP), Good N s in product	/lanufacturing developmer	g Practices	[9]	
Market rese	alization and March and consu	_		Loto*					
Distribution	nd execution.	esign for co ogistics. La	nsumer appe unching a ne	strategies ar eal, Pricing s w product:	trategies and	l competitive	analysis.	[9]	
Distribution Planning an mprovemen	nd execution. ts.	esign for co ogistics. La	nsumer appe unching a ne	strategies ar eal, Pricing s w product:	trategies and	competitive Metrics a	analysis.	[9] 45	
Distribution Planning an mprovemen	nd execution. ts.	esign for co ogistics. La Evaluating	onsumer appe unching a ne g product po	strategies ar eal, Pricing s w product: erformance	trategies and	competitive Metrics a	analysis. otal Hours:	45	
Distribution Planning al mprovemen	nd execution. ts.	esign for co ogistics. La Evaluating	onsumer appe unching a ne g product po	strategies ar eal, Pricing s w product: erformance	trategies and	competitive Metrics a	analysis. otal Hours:	45	
Distribution Planning as mprovemen Fext Book(s 1. Fulle 2. Gorto	nd execution. its. s): r, G.W., "New F	esign for co ogistics. La Evaluating	nsumer appe unching a ne g product po ct Developme	strategies ar eal, Pricing s w product: erformance	post-launch:	competitive Metrics a	analysis. otal Hours:	45	
Distribution Planning as mprovemen Fext Book(s 1. Fulle 2. Gorto	nd execution. its. s): r, G.W., "New F	esign for co ogistics. La Evaluating	nsumer appe unching a ne g product po ct Developme	strategies ar eal, Pricing s w product: erformance	post-launch:	competitive Metrics a	analysis. otal Hours:	45	
Distribution Planning as improvement Fext Book(s 1. Fulle 2. Gorto Reference(s 1. Earle	nd execution. ts. r, G.W., "New F on, Laurie, "Bak s): d, M.D., Earle, F	esign for co ogistics. La Evaluating Food Productory Productory R.L., and An	ct Development Dev	strategies ar eal, Pricing s ew product: erformance ent: From Co nt", First Editi	post-launch: ncept to Mari	T Metrics and T Metrics T	otal Hours: ird Edition, 20	45	
Distribution Planning as mprovemen Fext Book(s 1. Fulle 2. Gorto Reference(s 1. Earle	nd execution. ts. r, G.W., "New F on, Laurie, "Bak s): r, M.D., Earle, F y, A.L., and Lor	esign for co ogistics. La Evaluating Food Productory Productory R.L., and An	ct Development Dev	strategies ar eal, Pricing s ew product: erformance ent: From Co nt", First Editi	post-launch: ncept to Mari	T Metrics and T Metrics T	otal Hours: ird Edition, 20	45	
Distribution Planning as improvement Fuller 2. Gorto Reference(structure 1. Earlet 2. 2008	nd execution. ts. r, G.W., "New F on, Laurie, "Bak s): r, M.D., Earle, F y, A.L., and Lor	esign for coogistics. La Evaluating Food Product ery Product R.L., and An d, J.B., "De	ct Development Developing New	strategies ar eal, Pricing s ew product: erformance ent: From Co ent", First Editi Food Product v Food Product	post-launch: ncept to Mari on, 2010. t Developme	d competitive : Metrics an T ketplace", Th nt", First Edit anging Marke	otal Hours: ird Edition, 20	45	

^{*}SDG 12 – Responsible Consumption and Production



^{**}SDG 3 - Good Health and Well Being

5. No.	Topics	No. of hours
1.0	Introduction to Food Product Development	•
1.1	Definition and Importance of Food Product Development,	1
1.2	Historical evolution and current trends in food products,	1
1.3	The role of innovation in the food industry,	1
1.4	Factors influencing food product development: Consumer preferences, market needs, competition	2
1.5	Stages of new product development (NPD) process	2
1.6	Idea generation and concept development	1
1.7	Screening and feasibility studies	1
2.0	Ingredient Functionality and Formulation	
2.1	Role of ingredients in food product development	1
2.2	Functionality of proteins, carbohydrates, fats, and emulsifiers	2
2.3	Use of natural and artificial additives: preservatives, colorants, and flavors	2
2.4	Balancing nutrition, taste, and shelf life in formulations,	1
2.5	Product formulation techniques and prototype development	2
2.6	Product cost analysis and scale-up challenges.	1
3.0	Product Design and Process Development	
3.1	Designing food products for sensory appeal, nutrition, and safety	2
3.2	Equipment selection and process design for product manufacturing	2
3.3	Scaling up from pilot to full production	1
3.4	Packaging considerations for different types of food products	1
3.5	Sensory evaluation: Techniques and importance in product development,	2
3.6	Process optimization and yield improvement.	1
4.0	Food Regulations and Quality Assurance	
4.1	Food laws and regulations (FDA, FSSAI, Codex Alimentarius)	2
4.2	Labeling requirements and nutritional claims	1
4.3	Hazard Analysis and Critical Control Points (HACCP)	1
4.4	Good Manufacturing Practices (GMP) and food safety standards	1
4.5	Quality assurance methods in product development.	1
4.6	Shelf-life testing and microbiological analysis.	1
4.7	Product recall and risk management strategies	2
5.0	Commercialization and Marketing of Food Products	
5.1	Market research and consumer testing	2
5.2	Marketing strategies and positioning of food products	1
5.3	Branding and packaging design for consumer appeal	1
5.4	Pricing strategies and competitive analysis	1
5.5	Distribution channels and logistics.	1
5.6	Launching a new product: Planning and execution.	1
5.7	Evaluating product performance post-launch: Metrics and improvements.	2

1. Mr. P. Kalai Rajan- kalairajan@ksrct.ac.in



60 FT E43	Fruit and Vegetable	Category	L	Т	Р	Credit
0011243	Storage	PE	3	0	0	3

- To understand the basic processing Harvesting techniques.
- To identify the safe storage of food materials.
- To know novel and advanced methods of food Transportation.
- To Understand the Basics of food temperature conditions.
- To know design of storage Structures and handling for various categories of food product

Pre-requisites

• Nil

Course Outcomes

On the su	ccessful completion of the course, students will be able to	
CO1	Understand trends and development storage technologies aiming at assuring the safety and quality of fruits and vegetables.	Understand
CO2	Explain the design, construction, operation, control and maintenance of commercial refrigeration systems and cold storages for fruits and vegetables	Apply
CO3	Assess basic in storage of fruits and vegetables	Apply
CO4	Examine the design of storage Structures for various categories of food product	Understand
CO5	Analyse storage Structures and handling for various categories of food product	Apply

Mappir	Mapping with Programme Outcomes														
COs		Pos										PSOs			
COS	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1	3	3	3	-	-	-	-	-	-	-	3	3	3	3	3
CO2	3	3	3	-	-	-	-	-	-	-	3	3	3	3	3
CO3	3	3	3	-	-	-	-	-	-	-	3	3	3	3	3
CO4	3	3	3	-	-	-	-	-	-	-	3	3	3	2	2
CO5	3	3	3	-	-	-	-	-	-	-	3	3	3	2	3
3 - Stro	ong; 2 -	Mediur	n; 1 – S	ome		•		•	•	•					

Assessment Pattern								
Bloom's Category	Continuous Asse (Ma		End Sem Examination (Marks)					
	1	2	<u> </u>					
Remember	20	20	30					
Understand	30	30	50					
Apply	10	10	20					
Analyze	-	-	-					
Evaluate	-	-	-					
Create	-	-	-					
Total	60	60	100					



	<u> </u>	K.S.Rangasaı				nous K2022	4	
		60		. Food Tech	nology table Storag	Δ		
		Hours/Week	11 643-110	Total	Credit		aximum Marks	
Semester	L	T	Р	Hours	C	CA	ES	Total
VII	3	0	0	45	3	40	60	100
Introductio methods, o storage, h	g and Storage n – storage of changes during umidity and te pre-storage tre	pperation, ha g storage, fac mperature –	tors influenc	ing storage,	genetic effect	cts on		[9]
Pre-cooling system, co duct, air di mechanism moisture lo and veget psychrome	f Fruits and Vog g of fruits and embined forced stribution, pack n, equipment, loss and produ ables – hydro etric of EC produitations, maint	d vegetables d and extract kaging icing, advantages, ce cooling paracooling rate, cess, types of	ion system, cooling load limitations, attern with fo methods; e	low cost col calculations, Commercial orced air coo	d room, store vacuum coo forced air co ling; heat loa	ehouse – la ling – princip poling metho d; hydrococ	yout of floor ole, process, ods, product oling of fruits	[9]
Hypobaric norticultura nyperbaric	ation of Food storage – mod al commodities storage – mal al commodities	le of action, to and process ode of action	ed products, n, effect on	vacuum infil	tration and co	ooling,		[9]
Controlled mechanisme hortice effect of governour apwith O2 me	Atmospherical atmosphere (in, equipment bultural commodas atmosphere plied to MA prodeling, chilling emperature, ab	CA) – change for producing dities and pro e and interact rocess operatory,	es during sto and regulaticessed productions, MAP	tion CA, des ducts, gas m – techniques	ign, construction neasurement s, polymeric	tion and op and control film properti	eration - on technology, es, gas and	[9]
Handling ovegetables beaches, a lettuce, mo	and Storage of common fruits, storage and apricot and berelon, mushroonsport. – sea, es.	ts and vegeta transportation ries. Vegetab m, okra, onic	ables – recor n of fruits - c lles – articho nn, parsnip,	itrus, sub-tro kes, asparaç	pical, pears, gus, corn, cud	grapes, plur cumber, egg	ns, cherries, plant, garlic,	[9]
						7	Total Hours:	45
Text Book	mpson, A. K.,	Thompson, A	. K. (2015).	Fruit and Ve		ge: Hypobai	ric, Hyperbaric	
		hara Carma		International				
Cor Put 2. A. k	tongsiri, T., Pra (., Bancroft, R. ted Kingdom: (D. (2018). Co	ny: Springer hompson, A	. K., Bancrof	t, R. D., Putto		range, R. K., T les.	and
Cor Put 2. A. I Uni	K., Bancroft, R. ted Kingdom: C	ange, R. K., T D. (2018). Co	ny: Springer hompson, A	. K., Bancrof	t, R. D., Putto			and
Put 2. A. h Uni Reference	K., Bancroft, R. ted Kingdom: C (s): kaging and Sto	ange, R. K., T D. (2018). Co CABI.	ny: Springer Thompson, A ontrolled Atm	K., Bancrof nosphere Sto	t, R. D., Putto rage of Fruit	andVegetab		and

^{**}SDG 3 – Good Health and Well Being



Course C	ontents and Lecture Schedule	
S. No.	Topics	No. of hours
1.0	Harvesting and Storage Operations	
1.1	Introduction	1
1.2	Storage operation, harvest and pre-harvest factors	1
1.3	Traditional and modern storge methods	1
1.4	Changes during storage	1
1.5	Factors influencing storage & genetic effects on storage	1
1.6	Humidity and temperature – measurement and control technology	2
1.7	Store design and methods	1
1.8	Pre-storage treatments	1
2.0	Cooling of fruits and Vegetables	
2.1	Pre-cooling methods, estimation of cooling time, ventilation & forced system	2
2.2	Combined forced and extraction system, low-cost cold room, storehouse – layout of floor duct, air distribution, packaging icing, cooling load calculations	2
2.3	vacuum cooling – principle, process, mechanism, equipment, advantages, limitations	1
2.4	Commercial forced air-cooling methods, product moisture loss and producecooling pattern with forced air cooling	1
2.5	heat load; hydrocooling of fruits and vegetables – hydrocooling rate, methods; evaporative cooling (EC)	1
2.6	thermodynamics and psychrometric of EC process, types of EC system, limitations, maintenance and design	2
3.0	Transportation of Food products	
3.1	Hypobaric storage	1
3.2	Mode of action, transport	1
3.3	Effect on fruits and vegetables	1
3.4	Case studies on raw horticultural commodities and processed products	2
3.5	Vacuum infiltration and cooling, hyperbaric storage	1
3.6	Case studies on raw horticultural commodities and processed products	1
4.0	Controlled Atmospheric Conditions	
4.1	Controlled atmosphere (CA) – changes during storage	1
4.2	Biochemical considerations, gas exchange mechanism	1
4.3	Equipment for producing and regulation CA	1
4.4	Design, construction and operation on raw horticultural commodities and processed products	1
4.5	Gas measurement and control technology	1
4.6	Effect of gas atmosphere and interactions	1
4.7	MAP – techniques, polymeric film properties, gas and vapour applied to MA process operation	1
4.8	Effect on shelf life of fruits and vegetables	2
4.9	MAP design with O2 modeling, chilling injury, control of temperature, absorbers	1
5.0	Handling and Storage of food products	'
5.1	Handling of common fruits and vegetables	1
5.2	Recommended storage conditions for various fruits	1
5.3	Recommended storage conditions for various vegetables	1
5.4	Storage and transportation of fruits - citrus, sub-tropical, pears, grapes, plums, cherries, peaches, apricot and berries	2
5.5		4
5.5 5.6	Vegetables – artichokes, asparagus, corn, cucumber, eggplant, garlic, lettuce Vegetables - melon, mushroom, okra, onion, parsnip, parsley, peas, pepper,potato,	2
5.7	spinach, canned foods Transport. – sea, CA, hypobaric, MA – case studies	1
5.7	Transport – sea, On, hypobatic, ivin – case studies	

Dr.K. Balasubramani - balasubramanik@ksrct.ac.in

Passed in BoS Meeting held on 22.05.24 Approved in Academic Council Meeting held on 25.05.24



60 FT E44	Technology of Snacks and	Category	L	T	Р	Credit
0011 244	Extruded Products	PE	3	0	0	3

- To understand the scope and types of snack products in India
- To learn the different types and flavouring the method of Pop-corn
- To study the production and quality parameters of Potato and Rice based snacks
- To explain the types and importance of Extruder products.
- To study the pasta making process and its importance in Food industry

Pre-requisites

Nil

Course Outcomes

On the succ	cessful completion of the course, students will be able to	
CO1	Understand the Importance of Snack industry and the different methods snacks in Indian scenario.	Understand
CO2	Summarize the process of dry and oil popping and flavouring process in popcorn.	Remember
CO3	Illustrate the process and Production of Potato and rice-based snack products.	Apply
CO4	Exemplify the Process and production of second and third generation extruder snack products.	Apply
CO5	Illustrate the Types and Production of Pasta along with its formulations.	Analyze

Mappii	Mapping with Programme Outcomes														
COs						P	os							PSOs	
003	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1	3	2	3	-	-	3	3	-	2	2	-	3	3	3	2
CO2	2	2	3	-	-	3	3	-	-	-	-	3	3	3	2
CO3	1	3	3	-	-	3	3	-	2	2	-	3	3	3	2
CO4	2	3	3	-	-	3	3	-	-	-	-	3	3	3	2
CO5	3	3	3	-	-	3	3	-	2	2	-	3	3	3	2
3 - Stro	3 - Strong; 2 - Medium; 1 – Some														

Assessment Pattern									
Bloom's Category	Continuous Ass (Ma	essment Tests erks)	End Sem Examination (Marks)						
	1	2							
Remember	30	20	30						
Understand	30	20	30						
Apply	-	20	20						
Analyze	-	-	20						
Evaluate	-	-	-						
Create	-	-	-						
Total	60	60	100						



Syllal	bus								
		K	.S.Rangasaı			• •	nous R2022		
	B.Tech. Food Technology 60 FT E44 - Technology of Snacks and Extruded Products								
_			Hours/Week	rcciniology	Total	Credit		ximum Marks	<u> </u>
Seme	ester	L	T	Р	Hours	С	CA ES		Total
V	/II	3	0	0	45	3	40	60	100
Intro	duction								
Current status of snack food industry in India. Types of snack food- Raw Vegetable Snack, Formed dough products from potato and maize derivatives, Directly expanded extruded snack, Puffed Snacks and other. Types and Functions of ingredients – structure forming materials, dispersed phase/filling materials, plasticizers/lubricants, soluble solids, nucleating substances, coloring and flavoring substances.									[9]
Popce proce Shee	orn – F ess. Fla ting and	vorings and	hods, oil pop Applicators. king and Fryir	Tortilla chi	p processing	– Corn soa			[9]
Potato and Rice based Snacks** Potato chips production process: Pre cleaning and peeling, slicing, drying/frying, salting and									[9]
Extru and	der com advanta	ages of ext	Single and Techical	nology, Sec	-				[9]
Overv Spag	view of hetti, no	odles and m	t s** ng process, nacaroni. Pre e salting, bak	zel – Types	- Formulatio	n and Proces	=		[9]
							T	otal Hours:	45
Text			and Lloyd W	. Rooney, "S	nack Food P	rocessing", 1	st Edition, CF	RC Press,	
2.	Robin	· ·	sion cooking:	Technologie	s and Applica	tions", 1st Ed	lition, CRC P	ress,	
Refer	ence(s								
1.	Resea	arch, New De							
2.	New E	Delhi, 2008.	Saldivar, "Indu						
3.	Non F	ood Biomate	r Osvaldo H. erials",John W	'iley & Sons,	Ltd. 2014.				
4.			dwell E.F. "Bre s", St. Paul, M			they are mad	e. American	Association	

^{*}SDG 9 - Industry Innovation and Infrastructure



^{**}SDG 3 - Good Health and Well Being

Course Contents and Lecture Schedule

S. No.	Topics	No. of
	-	hours
1.0	Introduction:	
1.1	Current status of snack food industry in india	1
1.2	Types of snack food- raw vegetable snack, formed dough products from	2
	Potato and maize derivatives,	
1.3	Directly expanded extruded snack, puffed snacks and other.	2
1.4	Types and functions of ingredients – structure forming materials,	1
1.5	Dispersed phase/filling materials, plasticizers/lubricants,	1
1.6	Soluble solids, nucleating substances,.	1
1.7	Colouring and flavouring substances	1
2.0	Corn Based Snacks:	
2.1	Popcorn – Popping methods, oil popping and dry popping.	2
2.2	Commercial and industrial popcorn process.	2
2.3	Flavorings and Applicators.	1
2.4	Tortilla chip processing – Corn soaking, steeping,	1
2.5	Milling, Sheeting and Cutting,	1
2.6	Baking and Frying, cooling, addition of flavor.	1
2.7	Corn puff – production process.	1
3.0	Potato and Rice based Snacks:	
3.1	Potato chips production process: Pre cleaning and peeling, slicing,	2
3.2	Drying/frying, salting and seasoning, quality control.	1
3.3	Fabricated potato snacks – potato flak3es, potato granules	1
3.4	Potato starch, ground and crushed dehydrated potato.	1
3.5	Rice based Snacks	1
3.6	Products using whole grains – Puffed rice,	1
3.7	Flaked rice, papad production,	1
3.8	Products using flours.	1
4.0	Extrusion Technology:	
4.1	Extruder components – Single and Twin screw,	2
4.2	Single and Multiple die extruders.	2
4.3	Functions and advantages of extruded Technology,	2
4.4	Second generation and Third generation snacks,	1
4.5	Co extruded snacks,	1
4.6	Masa based snack	1
5.0	Pasta and other Products:	•
5.1	Overview of pasta making process,	1
5.2	Types of Pasta products,	1
5.3	Production process of Spaghetti, noodles and macaroni.	2
5.4	Pretzel – Types – Formulation and Processing - mixing, extrusion,	2
5.5	proofing, cooking, surface salting, baking and drying,	2
5.6	Flat and crisp bread.	1

Course Designer(s)

Dr. J. Philip Robinson -hodft@ksrct.ac.in



60 FT E45	Food Quality Assurance	Category	L	T	Р	Credit
0011 243	and Quality Control	PE	3	0	0	3

- To give students a thorough understanding of food quality assurance and control in the food industry.
- To introduce the key concepts of quality assurance in food production, including Total Quality
 Management (TQM), Hazard Analysis and Critical Control Points (HACCP), and Good Manufacturing
 Practices (GMP).
- To provide students with the knowledge and skills to carry out food quality control methods, such as sampling, analytical techniques, and microbiological testing.
- To give students a basic understanding of statistical methods in food quality assurance, including statistical process control (SPC), control charts, and data analysis for improvement.
- To help students become familiar with food quality management systems (like TQM and Six Sigma) and auditing processes for meeting quality standards and gaining certification.

Pre-requisites

NIL

Course Outcomes

On the successful completion of the course, students will be able to

CO1	Explain the role of food quality assurance and control in maintaining food safety and meeting consumer expectations.	Understand
CO2	Apply principles of TQM, HACCP, and GMP to ensure food safety and quality during production.	Apply
CO3	Demonstrate proficiency in sampling techniques, analytical methods, and microbiological testing to assess food quality.	Apply
CO4	Use statistical methods like statistical process control (SPC) and control charts to monitor and enhance food quality processes.	Apply
CO5	Identify and implement continuous improvement strategies within food quality management systems to boost product quality and compliance.	Analyze

Mappii	Mapping with Programme Outcomes														
COs	Pos										PSOs				
003	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1	3	-	-	-	-	-	-	-	2	2	-	-	-	-	2
CO2	3	-	-	-	-	-	-	-			-	-	-	-	2
CO3	3	-	-	-	-	-	-	-	2	2	-	-	-	-	2
CO4	3	-	-	-	-	-	-	-			-	-	-	-	2
CO5	3	-	-	-	-	-	-	-	2	2	-	2	-	-	2
3 - Stro	Strong: 2 - Medium: 1 - Some														

Assessment Pattern

Bloom's	Continuous Ass (Ma	sessment Tests rks)	End Sem Examination (Marks)
Category	1	2	7
Remember	20	20	20
Understand	30	30	40
Apply	10	10	30
Analyze	-	-	10
Evaluate	-	-	-
Create	-	-	-
Total	60	60	100



	ŀ	K.S.Rangasam				mous R2022	!	
				ood Techno				
	.		Food Qual	ity Assuranc				
Semester		Hours/Week		Total	Credit		ximum Marks	T
\/II	1 L 3	T	P	Hours	С	CA	ES	Total
VII		0	0	45	3	40	60	100
Overview o control in the manageme	f food quality a e food industr nt systems, Ob	ality Assurand assurance and y, Historical pe ojectives and g s governing fo	quality con erspective a oals of food	ntrol, Importar and evolution d quality assu	nce of quality of food qua	lity		[9]
Principles Manageme principles a safety and	and concepts nt (TQM) in t nd implementa quality, Qualit	ty Assurance of of quality as the food industriation, Good Mary managementation in the food	ssurance stry, Hazar anufacturin at systems:	d Analysis a g Practices (and Critical GMP) and th	Control Poin	ts (HACCP)	[9]
Food Quality Control Methods and Techniques* Sampling techniques and sample preparation in food quality control, Analytical methods for assessing food quality parameters: Analytical methods for assessing physical quality parameters (texture, color), Chemical analysis methods for evaluating composition (moisture content, fat content, nutritional compound), Microbiological testing methods for assessing microbial safety and quality, Instrumentation and equipment used in food quality control laboratories.							[9]	
Basic statis echniques process va echniques and interpro	tical concepts for monitoring riation (X-bai (attribute sam etation for con	and their appl and controlling and controlling and R charte pling, variable tinuous improvessurance and control	ication in q ng food pros, control l sampling), vement in f	oduction prod limits), Samp Data analysic ood quality n	cesses, Con bling plans a s nanagement	ntrol charts fo and acceptan	r monitoring ce sampling	[9]
Overview of auditing properties of the contract of the contrac	of food quality decedures for assertification (e FSSC 22000 o quality devi	ent Systems are management sessing composes in SO 2200 (a), Corrective a ations; Continuar enhancing for	systems of systems of the systems of	(Total Quality of quality stander); Food safetive actions	dards, Exterrety audits: (CAPA) and	nal auditing p GFSI-approve	rocesses for ed schemes	[9]
Tand David	-1-						Total Hours:	45
Text Book(•	atiatiant		u than for all to I		van Calaraa o	Dunings NA	1:- 0044
1.	·				, ,		Business Med	ນa. 2012
		assurance: pr	inciples and	d practices. C	RC Press. 2	2003.		
Reference(elieveld, H. Foo	d Safety M	anagement: A	A Practical G	uide for the Fo	ood Industry. El	sevier.
	4							
201). Food analys						

^{*} SDG 12 – Responsiple Consumption and Production

	ontents and Lecture Schedule	Na -4				
S. No.	Topics	No. of hours				
1.0	Introduction to Food Quality Assurance and Quality Control	Hours				
1.1	Overview of food quality assurance	1				
1.2	Overview of food quality control	1				
1.3	Importance of quality assurance in the food industry	1				
1.4	Importance of quality control in the food industry,	1				
1.5	Historical perspective and evolution of food quality management systems	2				
1.6	Objectives and goals of food quality assurance	1				
1.7	Objectives and goals of quality control.	1				
1.8	Regulatory frameworks and standards governing food safety and quality					
2.0	Principles of Food Quality Assurance					
2.1	Principles and concepts of quality assurance in food production	1				
2.2	Principles of Total Quality Management (TQM) in the food industry	2				
2.3	Hazard Analysis and Critical Control Points (HACCP) principles and Implementation	2				
2.4	Good Manufacturing Practices (GMP) and their role in ensuring food safety and quality	2				
2.5	Quality management systems: ISO 9000 series standards and their application in the food industry	2				
3.0	Food Quality Control Methods and Techniques					
3.1	Sampling techniques and sample preparation in food quality control	1				
3.2	Analytical methods for assessing food quality parameters: Analytical methodsfor	2				
	assessing physical quality parameters (texture, color)					
3.3	Chemical analysis methods for evaluating composition (moisture content, fat	2				
	content, nutritional compound)					
3.4	Microbiological testing methods for assessing microbial safety and quality	2				
3.5	Instrumentation and equipment used in food quality control laboratories	2				
4.0	Statistical Methods in Food Quality Assurance	4				
4.1	Basic statistical concepts and their application in quality assurance	1				
4.2	Statistical process control (SPC) techniques for monitoring and controlling food production processes	2				
4.3	Control charts for monitoring process variation (X-bar and R charts, control limits)	2				
4.4	Sampling plans and acceptance sampling techniques (attribute sampling, variable sampling)	2				
4.5	Data analysis and interpretation for continuous improvement in food quality Management	1				
4.6	Application of statistical methods in food quality assurance and control decision-making.	1				
5.0	Food Quality Management Systems and Auditing					
5.1	Overview of food quality management systems (Total Quality Management, Six Sigma)	2				
5.2	Internal auditing procedures for assessing compliance with quality standards	1				
5.3	External auditing processes for achieving certification (e.g., ISO 22000, HACCP)	1				
5.4	Food safety audits: GFSI-approved schemes (BRC, SQF, FSSC 22000)	2				
5.5	Corrective and preventive actions (CAPA) and root cause analysis inresponse to quality deviations	2				
5.6	Continuous improvement strategies for enhancing food quality management Systems	1				

1. Dr. P. Shanmugam – shanmugam@ksrct.ac.in



60 FT E46	Industrial Production of Bun, Bread, Cakes and	Category	L	Т	Р	Credit
	Pastries	PE	3	0	0	3

- To understand the complete process of industrial bread making
- To learn the role of ingredients and machines in bread making.
- To understand cake formulation and baking techniques
- To study various cake mixing methods and process technologies
- To explore various types of pastry and their preparation methods

Pre-requisites

Nil

Course Outcomes

On the successful completion of the course, students will be able to

011 1110 0400	beer an completion of the course, stade the time of able to	
CO1	Identify key stages like mixing, fermentation, baking.	Understand
CO2	Recognize importance of additives and key machinery in production.	Understand
CO3	Identify ingredients' roles and analyze common cake faults	Apply
CO4	Distinguish different cake types and appropriate mixing methods	Analyze
CO5	Identify types of pastries and understand key preparation techniques	Understand

Mapping with Programme Outcomes

шаррі		g man regramme euteemee													
COs	POs	POs										PSOs			
COS	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1	3	3	3	2	-	-	-	-	-	-	-	-	2	2	2
CO2	3	3	3	3	-	-	-	-	-	-	-	-	2	2	3
CO3	3	3	3	3	-	-	-	-	-	-	-	-	3	3	3
CO4	3	3	3	3	-	-	-	-	-	-	-	-	3	3	3
CO5	3	3	3	2	-	-	-	-	-	-	-	-	3	3	3
3 - Str	ong; 2 -	- Mediu	ım; 1 - 🛚	Some											

Assessment Pattern								
Bloom's	Continuous Assess	ment Tests (Marks)	End Sem Examination (Marks)					
Category	1	2						
Remember	20	10	20					
Understand	40	30	40					
Apply	-	10	20					
Analyze	-	10	20					
Evaluate	-	-	-					
Create	-	-	-					
Total	60	60	100					

		1/							
		<u> </u>	.S.Rangasa			gy – Autono	mous R2022		
		00 FT			Food Techi		I D (-	•	
			E46 - Indus Hours/Week		Total	, Bread, Cake Credit			
Seme	ster	L	T	Р	Hours	Credit	CA	ximum Marks	Total
VI	II	3	0	0	45	3	40	60	10tai
		ng Process	U	U	40	3	40	00	100
Status proofir with re	s of bal ng and especti	kery industry baking. Rav	v material re n) – kneadir	ceiving – qu ng – molding	ality check-	ing procedur batch making Proofing – ba s.	g (addition of	ingredients	[9]
Role o powde metho	of ingre er, sod ods of b	lium bicarbo pread prepara	ves and imp nate, ammonation - quality	rovers in bre nium bicarbo y aspects of l	onate cream bread and st	Chemical leav of tartar. Di andards. Divi ding principle	ifferent types ders – Cons	of bread - truction,	[9]
Role o - meth Heat t	nods of transfe	dients - flours mixing - prep r in the over	paration of fa	incy cakes aid delivery of	nd technique	s and nuts- ty s - quality - c	ake faults an		[9]
			iei, baking o	vens- band,	tunnel & reel		7.4.0		
Shorte batter formul	ening s mixing la bala	ods and Prostyle cakes, og, foam style	cessing Tec creaming me e cakes – a production	chnology of ethod, flour bangel food, s of cakes and	Cakes patter method sponge, chifd d pastry - mi		e, emulsion, cake. Type cooling and	s of cakes, packaging.	[9]
Shorter batter formul Cakes Pastry Basic combined	ening s mixing la bala s faults y formul ines flo	ods and Prostyle cakes, og, foam stylence in cake, shape, struation - differ	creaming mee cakes – a production cucture, texturent types - tie - types and	chnology of ethod, flour bangel food, so of cakes and e, crust and flaky, puff ard methods. F	Cakes patter method sponge, chifd pastry - micolour faults.	d, single stag fon, genoise xing, baking,	le, emulsion, cake. Type cooling and f cake faults.	s of cakes, packaging.	[9]
Shorte batter formul Cakes Pastry Basic combin	ening s mixing la bala s faults y formul ines flo	ods and Prostyle cakes, og, foam style nce in cake, - shape, struation - differ ur and fat. P	creaming mee cakes – a production cucture, texturent types - tie - types and	chnology of ethod, flour bangel food, so of cakes and e, crust and flaky, puff ard methods. F	Cakes patter method sponge, chifd pastry - micolour faults.	d, single stag fon, genoise xing, baking, Remedies o	e, emulsion, cake. Type cooling and f cake faults.	s of cakes, packaging.	
Shorte batter formul Cakes Pastry Basic combin of ingr	ening s mixing la bala s faults y formul ines flo	ods and Prostyle cakes, of the	creaming mee cakes – a production cucture, texturent types - tie - types and	chnology of ethod, flour bangel food, so of cakes and e, crust and flaky, puff ard methods. F	Cakes patter method sponge, chifd pastry - micolour faults.	d, single stag fon, genoise xing, baking, Remedies o	e, emulsion, cake. Type cooling and f cake faults.	s of cakes, packaging.	[9]
Shortes batter formul Cakes Pastry Basic combin of ingr	ening s mixing la bala s faults y formul ines flo redients Cauva	ods and Prostyle cakes, og, foam style nce in cake, structure ation - differ ur and fat. Ps used. Cold	creaming me e cakes – a production cucture, texturent types – file – types and and hot pas	chnology of ethod, flour bangel food, so of cakes and e, crust and flaky, puff ard methods. Fitries	Cakes patter method sponge, chifd pastry - micolour faults. and danish pareparation necessory.	d, single stag fon, genoise xing, baking, Remedies o astry- bakery nethods of da	pe, emulsion, cake. Type cooling and f cake faults. products that inish pasties	s of cakes, packaging. at and the role Total Hours:	[9]
Shorted batter formul Cakes Pastry Basic combine of ingr	ening s mixing la bala s faults y formul ines flo redients Cauva	ods and Prostyle cakes, og, foam style nce in cake, structure ation - differ ur and fat. Ps used. Cold	creaming me e cakes – a production cucture, texturent types – file – types and and hot pas	chnology of ethod, flour bangel food, so of cakes and e, crust and flaky, puff ard methods. Fitries	Cakes patter method sponge, chifd pastry - micolour faults. and danish pareparation necessory.	d, single stag fon, genoise xing, baking, Remedies o astry- bakery nethods of da	pe, emulsion, cake. Type cooling and f cake faults. products that inish pasties	s of cakes, packaging. at and the role	[9]
Shorted batter formul Cakes Pastry Basic combine of ingr Text B 1. 2.	ening s mixing la bala s faults y formul ines flo redients Cauva	ods and Prostyle cakes, og, foam style nce in cake, structure attion - differ ur and fat. Prostyle used. Cold D: Weibiao, and	creaming me e cakes – a production cucture, texturent types – file – types and and hot pas	chnology of ethod, flour bangel food, so of cakes and e, crust and flaky, puff ard methods. Fitries	Cakes patter method sponge, chifd pastry - micolour faults. and danish pareparation necessory.	d, single stag fon, genoise xing, baking, Remedies o astry- bakery nethods of da	pe, emulsion, cake. Type cooling and f cake faults. products that inish pasties	s of cakes, packaging. at and the role Total Hours:	[9]
Shorted batter formul Cakes Pastry Basic combine of ingr Text B 1. 2.	ening s mixing la bala s faults y formul ines flo redients Zhou, Pyler,	ods and Prostyle cakes, of the cakes, of the cake, of the	creaming me e cakes – a production lecture, texturent types – file – types and and hot pase d'., and Young d'Hui, Y. H., "	chnology of ethod, flour bangel food, so of cakes and e, crust and flaky, puff ar d methods. F tries	Cakes Patter method sponge, chifd pastry - micolour faults. The danish party - micolour faults. The danish party - micolour faults.	d, single stag fon, genoise xing, baking, Remedies o astry- bakery nethods of da	pe, emulsion, cake. Type cooling and f cake faults. products that inish pasties Tag", Third Editogy", Second	s of cakes, packaging. at and the role Total Hours:	[9] 45
Shorted batter formul Cakes Pastry Basic combin of ingr Text B 1. 2. Reference	ening s mixing la bala s faults y formul ines flo redients Zhou, Pyler, Fourtl Camp	ods and Prostyle cakes, of g, foam style nee in cake, - shape, structure ation - differ ur and fat. Ps used. Cold i: ain, Stanley P Weibiao, and j: E.J., and Goth Edition, 200 bbell, Grant M	creaming me e cakes – a production lecture, texturent types – fie – types and hot passed Hui, Y. H., " crton, Laurie, 08. L., et al., "Bre	chnology of ethod, flour bangel food, so of cakes and e, crust and flaky, puff ard methods. Furies "Bakery Production of the Cheroman of the	Cakes	d, single stag fon, genoise xing, baking, Remedies o astry- bakery nethods of da	products that anish pasties Ting", Third Editogy", Second	s of cakes, packaging. at and the role fotal Hours: tion, 2015. Edition, 2014.	[9] 45

^{*}SDG 9 - Industry Innovation and Infrastructure

S. No. Topics Sead Making Process 1.0 Status of bakery industry 1 1.2 Status of bakery industry 1.1 Status of bakery industry 1.2 Bread formulation, basic bread making procedure 1.1 Imministry 1.2 Imministry 1.3 Imministry 1.3 Imministry 1.4 Raw material receiving – quality check 2.2 Statch making (addition of ingredients with respective proposition) 1.1 Imministry 1.2 Imministry 1.3 Advantages and limitations of various bread processes 1.3 Impredients & Bread Making Machines 1.2 Impredients 1.3 Impredients 1	Course C	ontents and Lecture Schedule	
1.1 Status of bakery industry 1.2 Bread formulation, basic bread making procedure 1.3 mixing Fermentation, proofing and baking 1.4 Raw material receiving — quality check 2. 2 1.5 batch making (addition of ingredients with respective proposition) 1.6 kneading — modifing — panning 1.7 Proofing — baking — cooling — slicing — packing 1.8 Advantages and limitations of various bread processes 1.1 Ingredients & Bread Making Machines 2.1 Role of ingredients, additives and improvers in bread making 2.2 Chemical leavening agents - baking powder 2.1 Role of ingredients, additives and improvers in bread making 2.2 Chemical leavening agents - baking powder 2.3 sodium bicarbonate 2.4 ammonium bicarbonate cream of tartar 2.5 Different types of bread - methods of bread preparation 2.6 quality aspects of bread and standards 2.7 Dividers — Construction, dividing principle and operation 2.8 Rounders - Construction, rounding principle and operation 3.0 Baking of Cakes 3.1 Role of ingredients — flours, oils and fats, eggs, sugar, dried fruits and nuts 2. types of cakes — methods of mixing 3.1 Role of ingredients — flours, oils and fats, eggs, sugar, dried fruits and nuts 2. types of cakes — methods of mixing 3.1 Cake quality 3.2 Cake quality 3.3 preparation of fancy cakes and techniques 4.1 Shortening style cakes, creaming method 4.2 Blour batter method, single stage 4.1 Shortening style cakes, creaming method 4.2 flour batter method, single stage 4.1 Shortening style cakes, creaming method 4.2 flour batter method, single stage 4.3 emulsion, continuous batter mixing 4.4 foam style cakes — angel food, sponge, chiffon, genoise cake 4.5 Types of cakes and pastry — mixing, baking, cooling and packaging 4.7 Cakes faults — shape, structure, texture, crust and colour faults 4.8 Remedies of cake faults 5.9 Pastry 5.1 Basic formulation - different types 5.2 flaky, puff and danish pastry 5.3 bakery products that combines flour and fat 5.4 Pie - types and methods 5.5 Preparation methods of danish pasties and the role of ingredients used	S. No.	Topics	
1.2 Bread formulation, basic bread making procedure 1.3 mixing Fermentation, proofing and baking 1.4 Raw material receiving — quality check 2.5 batch making (addition of ingredients with respective proposition) 1.6 kneading — molding — panning 1.7 Proofing — baking — cooling — slicing — packing 1.8 Advantages and limitations of various bread processes 1.0 Ingredients & Bread Making Machines 2.1 Role of ingredients, additives and improvers in bread making 2.2 Chemical leavening agents- baking powder 2.3 sodium bicarbonate 3.1 Role of ingredients, additives and improvers in bread making 3.2 Sodium bicarbonate 3.3 sodium bicarbonate 3.4 ammonium bicarbonate 1 3.5 Different types of bread - methods of bread preparation 3.6 quality aspects of bread and standards 3.7 Dividers — Construction, dividing principle and operation 3.8 Rounders - Construction, rounding principle and operation 3.9 Baking of Cakes 3.1 Role of ingredients – flours, oils and fats, eggs, sugar, dried fruits and nuts 3.2 types of cakes — methods of mixing 3.3 preparation of fancy cakes and techniques 3.4 Cake quality 3.5 cake faults and remedies 4.6 Heat transfer in the oven, mixing and delivery of batter 4.0 Mixing Methods and Processing Technology of Cakes 4.1 Shortening style cakes, creaming method 4.2 flour batter method, single stage 4.3 emulsion, continuous batter mixing 5.4 flour batter method, single stage 4.5 Types of cakes - angel flood, sponge, chiffon, genoise cake 4.6 production of cakes and pastry - mixing, baking, cooling and packaging 4.7 Cake faults - shape, structure, texture, crust and colour faults 4.8 Remedies of cake faults 5.9 Pastry 5.1 Basic formulation - different types 5.2 flaky, puff and danish pastry 5.3 bakery products that combines flour and fat 5.4 Pie - types and methods 5.5 Preparation methods of danish pasties and the role of ingredients used	1.0	Bread Making Process	
1.3 mixing Fermentation, proofing and baking 1.4 Raw material receiving – quality check 2.1.5 batch making (addition of ingredients with respective proposition) 1.6 kneading – molding – panning 1.7 Proofing – baking – cooling – slicing – packing 1.8 Advantages and limitations of various bread processes 1.9 Ingredients & Bread Making Machines 2.1 Role of ingredients, additives and improvers in bread making 2.2 Chemical leavening agents- baking powder 2.3 sodium bicarbonate cream of tartar 2.4 ammonium bicarbonate cream of tartar 2.5 Different types of bread – methods of bread preparation 2.6 quality aspects of bread and standards 2.7 Dividers – Construction, dividing principle and operation 2.8 Rounders - Construction, only injuriciple and operation 3.0 Baking of Cakes 3.1 Role of ingredients – flours, oils and fats, eggs, sugar, dried fruits and nuts 2.2 types of cakes – methods of mixing 3.1 Preparation of fancy cakes and techniques 3.2 types of cakes – methods of mixing 3.3 preparation of fancy cakes and techniques 3.4 Cake quality 3.5 cake faults and remedies 4.0 Mixing Methods and Processing Technology of Cakes 4.1 Shortening style cakes, creaming method 4.2 flour batter method, single stage 4.1 Shortening style cakes, creaming method 4.2 flour batter method, single stage 4.3 emulsion, continuous batter mixing 4.4 foam style cakes, angel food, sponge, chiffon, genoise cake 4.5 Types of cakes – angel food, sponge, chiffon, genoise cake 4.6 production of cakes and pastry – mixing, baking, cooling and packaging 4.7 Cakes faults - shape, structure, texture, crust and colour faults 4.8 Remedies of cake faults 5.4 Pie - types and methods 5.5 Preparation methods of danish pasties and the role of ingredients used 5.5 Preparation methods of danish pasties and the role of ingredients used	1.1	Status of bakery industry	1
1.4 Raw material receiving — quality check 2.1.5 batch making (addition of ingredients with respective proposition) 1.6 kneading — molding — panning 1.7 Proofing — baking — cooling — slicing — packing 1.8 Advantages and limitations of various bread processes 1.0 Ingredients & Bread Making Machines 2.0 Ingredients & Bread Making Machines 2.1 Role of ingredients, additives and improvers in bread making 2.2 Chemical leavening agents- baking powder 2.3 sodium bicarbonate 2.4 ammonium bicarbonate cream of tartar 2.5 Different types of bread - methods of bread preparation 2.6 quality aspects of bread and standards 2.7 Dividers — Construction, dividing principle and operation 2.8 Rounders - Construction, dividing principle and operation 2.9 Role of ingredients — flours, oils and fats, eggs, sugar, dried fruits and nuts 3.0 Baking of Cakes 3.1 Role of ingredients — flours, oils and fats, eggs, sugar, dried fruits and nuts 3.2 types of cakes — methods of mixing 3.3 preparation of fancy cakes and techniques 3.4 Cake quality 3.5 cake faults and remedies 3.6 Heat transfer in the oven, mixing and delivery of batter 3.7 batch & continuous mixers, depositing the batter 3.8 baking ovens- band, tunnel & reel ovens 4.0 Mixing Methods and Processing Technology of Cakes 4.1 Shortening style cakes, creaming method 4.2 flour batter method, single stage 4.3 emulsion, continuous batter mixing 4.4 foam style cakes — angel food, sponge, chiffon, genoise cake 4.1 Cakes faults — shape, structure, texture, crust and colour faults 4.8 Remedies of cake faults 5.0 Pastry 5.1 Basic formulation - different types 5.2 lifeypes and methods 5.3 bakery products that combines flour and fat 5.4 Pie - types and methods 5.5 Preparation methods of danish pasties and the role of ingredients used	1.2	Bread formulation, basic bread making procedure	1
1.5 batch making (addition of ingredients with respective proposition) 1.6 kneading – molding – panning 1.7 Proofing – baking – cooling – slicing – packing 1.8 Advantages and limitations of various bread processes 1.9. Ingredients & Bread Making Machines 2.1 Role of ingredients, additives and improvers in bread making 2.2 Chemical leavening agents- baking powder 2.3 sodium bicarbonate 2.4 ammonium bicarbonate cream of tartar 2.5 Different types of bread - methods of bread preparation 2.6 quality aspects of bread and standards 2.7 Dividers – Construction, dividing principle and operation 3.0 Baking of Cakes 3.1 Role of ingredients – flours, oils and fats, eggs, sugar, dried fruits and nuts 3.2 types of cakes – methods of mixing 3.3 preparation of fancy cakes and techniques 3.4 Cake quality 3.5 cake faults and remedies 3.6 Heat transfer in the oven, mixing and delivery of batter 3.7 baking ovens- band, tunnel & reel ovens 4.0 Mixing Methods and Processing Technology of Cakes 4.1 Shortening style cakes, creaming method 4.2 flour batter method, single stage 4.3 emulsion, continuous mixers, depositing the batter 4.5 Types of cakes, angel food, sponge, chiffon, genoise cake 4.1 Cake quality a mulsion, continuous batter mixing 4.4 foam style cakes, creaming method 4.5 Types of cakes, formula balance in cake 4.6 production of cakes and pastry - mixing, baking, cooling and packaging 4.7 Cakes faults - shape, structure, texture, crust and colour faults 4.8 Remedies of cake faults 5.4 Pie - types and methods 5.5 Preparation methods of danish pasties and the role of ingredients used	1.3	mixing Fermentation, proofing and baking	1
1.6 kneading – molding – panning 1.7 Proofing – baking – cooling – slicing – packing 1.8 Advantages and limitations of various bread processes 1.1 Ingredients & Bread Making Machines 2.0 Ingredients & Bread Making Machines 2.1 Role of ingredients, additives and improvers in bread making 2.2 Chemical leavening agents- baking powder 1. sodium bicarbonate 2.4 ammonium bicarbonate cream of tartar 2.5 Different types of bread - methods of bread preparation 2.6 quality aspects of bread and standards 1. Dividers – Construction, dividing principle and operation 2.7 Dividers – Construction, rounding principle and operation 3.0 Baking of Cakes 3.1 Role of ingredients – flours, oils and fats, eggs, sugar, dried fruits and nuts 3.2 types of cakes – methods of mixing 3.3 preparation of fancy cakes and techniques 3.4 Cake quality 3.5 cake faults and remedies 3.6 Heat transfer in the oven, mixing and delivery of batter 3.7 batch & continuous mixers, depositing the batter 3.8 baking ovens- band, tunnel & reel ovens 4.0 Mixing Methods and Processing Technology of Cakes 4.1 Shortening style cakes, creaming method 4.2 flour batter method, single stage 4.3 emulsion, continuous batter mixing 4.4 foam style cakes – angel food, sponge, chiffon, genoise cake 4.5 Types of cakes faults - shape, structure, texture, crust and colour faults 4.8 Remedies of cake faults 5.1 Basic formulation - different types 5.1 Basic formulation - different types 5.2 Flaky, puff and danish pastry 5.3 bakery products that combines flour and fat 5.4 Pie - types and methods 5.5 Preparation methods of danish pasties and the role of ingredients used	1.4		2
1.7 Proofing – baking – cooling – silicing – packing 1.8 Advantages and limitations of various bread processes 1.0 Ingredients & Bread Making Machines 2.1 Role of ingredients, additives and improvers in bread making 2.2 Chemical leavening agents- baking powder 2.3 sodium bicarbonate 2.4 ammonium bicarbonate cream of tartar 2.5 Different types of bread - methods of bread preparation 2.6 quality aspects of bread and standards 2.7 Dividers – Construction, dividing principle and operation 3.0 Baking of Cakes 3.1 Role of ingredients – flours, oils and fats, eggs, sugar, dried fruits and nuts 3.2 types of cakes – methods of mixing 3.3 preparation of fancy cakes and techniques 3.4 Cake quality 3.5 cake faults and remedies 3.6 Heat transfer in the oven, mixing and delivery of batter 3.7 batch & continuous mixers, depositing the batter 3.8 baking ovens- band, tunnel & reel ovens 4.0 Mixing Methods and Processing Technology of Cakes 4.1 Shortening style cakes, creaming method 4.2 flour batter method, single stage 4.3 emulsion, continuous batter mixing 4.4 foam style cakes, creaming method 4.5 Types of cakes and pastry - mixing, baking, cooling and packaging 4.7 Cake faults - shape, structure, texture, crust and colour faults 4.8 Remedies of cake faults 5.0 Pastry 5.1 Basic formulation - different types 5.2 flaky, puff and danish pastry 5.3 bakery products that combines flour and fat role of ingredients used 5 Preparation methods of danish pastres and the role of ingredients used	1.5	batch making (addition of ingredients with respective proposition)	1
1.8 Advantages and limitations of various bread processes 1 2.0 Ingredients & Bread Making Machines 2 2.1 Role of ingredients, additives and improvers in bread making 2 2.2 Chemical leavening agents- baking powder 1 2.3 sodium bicarbonate 1 2.4 ammonium bicarbonate eream of tartar 1 2.5 Different types of bread - methods of bread preparation 1 2.6 quality aspects of bread and standards 1 2.7 Dividers - Construction, dividing principle and operation 1 2.8 Rounders - Construction, dividing principle and operation 1 2.8 Rounders - Construction, rounding principle and operation 1 3.0 Baking of Cakes 3 3.1 Role of ingredients - flours, oils and fats, eggs, sugar, dried fruits and nuts 2 3.2 types of cakes - methods of mixing 1 3.3 preparation of fancy cakes and techniques 1 3.4 Cake quality 1 3.5 cake faults and remedies 1 3.6 Heat transfer in the oven, mixing and delivery of batter 1 3.7 batch & continuous mixers, depositing the batter 1 3.8 baking ovens- band, tunnel & reel ovens 1 4.0 Mixing Methods and Processing Technology of Cakes 4 4.1 Shortening style cakes, creaming method 1 4.2 flour batter method, single stage 1 4.3 emulsion, continuous batter mixing 1 4.4 foam style cakes - angel food, sponge, chiffon, genoise cake 1 4.5 Types of cakes, formula balance in cake 1 4.6 production of cakes and pastry - mixing, baking, cooling and packaging 2 4.7 Cakes faults - shape, structure, texture, crust and colour faults 1 5.0 Pastry 5 5.1 Basic formulation - different types 1 5.2 flaky, puff and danish pastry 1 5.3 bakery products that combines flour and fat 1 5.4 Pie - types and methods 2 5.5 Preparation methods of danish pasties and the role of ingredients used 2			1
2.0 Ingredients & Bread Making Machines 2.1 Role of ingredients, additives and improvers in bread making 2.2 Chemical leavening agents- baking powder 3. sodium bicarbonate 3. sodium bicarbonate 4. ammonium bicarbonate cream of tartar 2.4 ammonium bicarbonate cream of tartar 3. Different types of bread - methods of bread preparation 4. quality aspects of bread and standards 4. Dividers - Construction, dividing principle and operation 5. Rounders - Construction, rounding principle and operation 7. Role of ingredients - flours, oils and fats, eggs, sugar, dried fruits and nuts 7. Role of ingredients - flours, oils and fats, eggs, sugar, dried fruits and nuts 7. All types of cakes - methods of mixing 7. Superaration of fancy cakes and techniques 7. Cake quality 7. Cake quality 7. Cake qualits and remedies 7. Baking ovens- band, tunnel & reel ovens 7. Baking ovens- band, tunnel & reel ovens 7. Baking ovens- band, tunnel & reel ovens 7. Bortening style cakes, creaming method 7. Shortening style cakes, creaming method 7. Shortening style cakes, creaming method 7. Cakes faults - shape, structure, texture, crust and colour faults 7. Cakes faults - shape, structure, texture, crust and colour faults 7. Cakes faults - shape, structure, texture, crust and colour faults 7. Cakes faults - shape, structure, texture, crust and colour faults 7. Cakes faults - shape, structure, texture, crust and colour faults 7. Cakes faults - shape, structure, texture, crust and colour faults 7. Cakes faults - shape, structure, texture, crust and colour faults 7. Cakes faults - shape, structure, texture, crust and colour faults 7. Cakes faults - shape, structure, texture, crust and colour faults 7. Cakes faults - shape, structure, texture, crust and colour faults 7. Cakes faults - shape, structure, texture, crust and colour faults 7. Cakes faults - shape, structure, texture, crust and colour faults 7. Cakes faults - shape, structure, texture, crust and colour faults 7. Cakes faults - shape, structure, texture, crust and colour faults 7. Cakes f	1.7	The state of the s	1
2.1 Role of ingredients, additives and improvers in bread making 2.2 Chemical leavening agents- baking powder 3.1 sodium bicarbonate 4.2 ammonium bicarbonate cream of tartar 5.5 Different types of bread - methods of bread preparation 7.6 quality aspects of bread and standards 7.7 Dividers - Construction, dividing principle and operation 7.8 Rounders - Construction, rounding principle and operation 7.8 Rounders - Construction, rounding principle and operation 7.0 Baking of Cakes 7.1 Role of ingredients - flours, oils and fats, eggs, sugar, dried fruits and nuts 7.2 types of cakes - methods of mixing 7.3 preparation of fancy cakes and techniques 7.3 preparation of fancy cakes and techniques 7.3 cake faults and remedies 7.3 cake faults and remedies 7.3 batch & continuous mixers, depositing the batter 7.3 batch & continuous mixers, depositing the batter 7.3 batch & continuous mixers, depositing the batter 8.4 baking ovens- band, tunnel & reel ovens 8.4 Mixing Methods and Processing Technology of Cakes 8.4 Shortening style cakes, creaming method 9.4 flour batter method, single stage 9.4 cakes faults - shape, structure, texture, crust and colour faults 9.4 Remedies of cakes, formula balance in cake 9.5 Preparation drifferent types 9.5 Pastry 9.5 Basic formulation - different types 9.5 Preparation methods 9.5 Preparation methods of danish pastry 9.5 Preparation methods of danish pasties and the role of ingredients used 9.5 Preparation methods of danish pasties and the role of ingredients used	1.8		1
2.2 Chemical leavening agents- baking powder 2.3 sodium bicarbonate 2.4 ammonium bicarbonate cream of tartar 2.5 Different types of bread - methods of bread preparation 2.6 quality aspects of bread and standards 2.7 Dividers - Construction, dividing principle and operation 2.8 Rounders - Construction, rounding principle and operation 3.0 Baking of Cakes 3.1 Role of ingredients - flours, oils and fats, eggs, sugar, dried fruits and nuts 2.2 types of cakes - methods of mixing 3.3 preparation of fancy cakes and techniques 3.4 Cake quality 3.5 cake faults and remedies 3.6 Heat transfer in the oven, mixing and delivery of batter 3.7 batch & continuous mixers, depositing the batter 3.8 baking ovens- band, tunnel & reel ovens 4.0 Mixing Methods and Processing Technology of Cakes 4.1 Shortening style cakes, creaming method 4.2 flour batter method, single stage 4.3 emulsion, continuous batter mixing 4.4 foam style cakes - angel food, sponge, chiffon, genoise cake 4.5 Types of cakes, formula balance in cake 4.6 production of cakes and balance in cake 4.7 Cakes faults - shape, structure, texture, crust and colour faults 4.8 Remedies of cake faults 5.0 Pastry 5.1 Basic formulation - different types 5.2 flaky, puff and danish pastry 5.3 bakery products that combines flour and fat 5.4 Pie - types and methods 5.5 Preparation methods of danish pasties and the role of ingredients used	2.0	Ingredients & Bread Making Machines	
2.3 sodium bicarbonate 1 2.4 ammonium bicarbonate cream of tartar 1 2.5 Different types of bread - methods of bread preparation 1 2.6 quality aspects of bread and standards 1 2.7 Dividers - Construction, dividing principle and operation 1 2.8 Rounders - Construction, rounding principle and operation 1 3.0 Baking of Cakes 3 3.1 Role of ingredients - flours, oils and fats, eggs, sugar, dried fruits and nuts 2 3.2 types of cakes - methods of mixing 1 3.3 preparation of fancy cakes and techniques 1 3.4 Cake quality 1 3.5 cake faults and remedies 1 3.6 Heat transfer in the oven, mixing and delivery of batter 1 3.7 batch & continuous mixers, depositing the batter 1 3.8 baking ovens- band, tunnel & reel ovens 1 4.0 Mixing Methods and Processing Technology of Cakes 4 4.1 Shortening style cakes, creaming method 1 4.2 flour batter method, single stage 1 4.3 emulsion, continuous batter mixing 1 4.4 foam style cakes, formula balance in cake 1 4.5 Types of cakes, formula balance in cake 1 4.6 production of cakes and pastry - mixing, baking, cooling and packaging 2 4.7 Cakes faults - shape, structure, texture, crust and colour faults 1 5.0 Pastry 5 5.1 Basic formulation - different types 1 5.2 flaky, puff and danish pastry 1 5.3 bakery products that combines flour and fat 5 5.4 Pie - types and methods 2 5.5 Preparation methods of danish pasties and the role of ingredients used 2	2.1		2
2.4 ammonium bicarbonate cream of tartar 2.5 Different types of bread - methods of bread preparation 1 2.6 quality aspects of bread and standards 1 2.7 Dividers - Construction, dividing principle and operation 1 2.8 Rounders - Construction, rounding principle and operation 1 3.0 Baking of Cakes 3.1 Role of ingredients - flours, oils and fats, eggs, sugar, dried fruits and nuts 2 3.2 types of cakes - methods of mixing 3.3 preparation of fancy cakes and techniques 1 3.4 Cake quality 3.5 cake faults and remedies 1 3.6 Heat transfer in the oven, mixing and delivery of batter 3.7 batch & continuous mixers, depositing the batter 1 3.8 baking ovens- band, tunnel & reel ovens 4.0 Mixing Methods and Processing Technology of Cakes 4.1 Shortening style cakes, creaming method 4.2 flour batter method, single stage 4.3 emulsion, continuous batter mixing 4.4 foam style cakes - angel food, sponge, chiffon, genoise cake 1 4.5 Types of cakes, formula balance in cake 4.6 production of cakes and pastry - mixing, baking, cooling and packaging 2 4.7 Cakes faults - shape, structure, texture, crust and colour faults 1 5.0 Pastry 5.1 Basic formulation - different types 5.2 flaky, puff and danish pastry 5.3 bakery products that combines flour and fat 5.4 Pie - types and methods 5 Preparation methods of danish pasties and the role of ingredients used	2.2	Chemical leavening agents- baking powder	1
2.5 Different types of bread - methods of bread preparation 2.6 quality aspects of bread and standards 2.7 Dividers - Construction, dividing principle and operation 2.8 Rounders - Construction, rounding principle and operation 3.0 Baking of Cakes 3.1 Role of ingredients - flours, oils and fats, eggs, sugar, dried fruits and nuts 2 types of cakes - methods of mixing 3.2 types of cakes - methods of mixing 3.4 Cake quality 3.5 cake faults and remedies 3.6 Heat transfer in the oven, mixing and delivery of batter 3.7 batch & continuous mixers, depositing the batter 3.8 baking ovens- band, tunnel & reel ovens 4.0 Mixing Methods and Processing Technology of Cakes 4.1 Shortening style cakes, creaming method 4.2 flour batter method, single stage 4.3 emulsion, continuous batter mixing 4.4 foam style cakes - angel food, sponge, chiffon, genoise cake 4.5 Types of cakes, formula balance in cake 4.6 production of cakes and pastry - mixing, baking, cooling and packaging 2 4.7 Cakes faults - shape, structure, texture, crust and colour faults 1 5.0 Pastry 5.1 Basic formulation - different types 5.2 flaky, puff and danish pastry 5.3 bakery products that combines flour and fat 5.4 Pie - types and methods 5 Preparation methods of danish pasties and the role of ingredients used	2.3	sodium bicarbonate	1
2.6 quality aspects of bread and standards 2.7 Dividers – Construction, dividing principle and operation 1 2.8 Rounders - Construction, rounding principle and operation 3.0 Baking of Cakes 3.1 Role of ingredients – flours, oils and fats, eggs, sugar, dried fruits and nuts 2 types of cakes – methods of mixing 3.1 preparation of fancy cakes and techniques 3.2 types of cakes – methods of mixing 3.3 preparation of fancy cakes and techniques 3.4 Cake quality 3.5 cake faults and remedies 1 1 3.6 Heat transfer in the oven, mixing and delivery of batter 3.7 batch & continuous mixers, depositing the batter 3.8 baking ovens- band, tunnel & reel ovens 4.0 Mixing Methods and Processing Technology of Cakes 4.1 Shortening style cakes, creaming method 4.2 flour batter method, single stage 4.3 emulsion, continuous batter mixing 4.4 foam style cakes – angel food, sponge, chiffon, genoise cake 4.5 Types of cakes, formula balance in cake 4.6 production of cakes and pastry - mixing, baking, cooling and packaging 2 4.7 Cakes faults - shape, structure, texture, crust and colour faults 1 4.8 Remedies of cake faults 1 5.0 Pastry 5.1 Basic formulation - different types 1 5.2 flaky, puff and danish pastry 1 5.3 bakery products that combines flour and fat 5.4 Pie - types and methods 2 5.5 Preparation methods of danish pasties and the role of ingredients used	2.4	ammonium bicarbonate cream of tartar	1
2.7 Dividers – Construction, dividing principle and operation 2.8 Rounders - Construction, rounding principle and operation 3.0 Baking of Cakes 3.1 Role of ingredients – flours, oils and fats, eggs, sugar, dried fruits and nuts 2 types of cakes – methods of mixing 3.2 types of cakes – methods of mixing 3.3 preparation of fancy cakes and techniques 1 cake quality 3.4 Cake quality 3.5 cake faults and remedies 1 date transfer in the oven, mixing and delivery of batter 3.6 Heat transfer in the oven, mixing and delivery of batter 3.7 batch & continuous mixers, depositing the batter 3.8 baking ovens- band, tunnel & reel ovens 4.0 Mixing Methods and Processing Technology of Cakes 4.1 Shortening style cakes, creaming method 4.2 flour batter method, single stage 4.3 emulsion, continuous batter mixing 4.4 foam style cakes – angel food, sponge, chiffon, genoise cake 1 to foam style cakes – angel food, sponge, chiffon, genoise cake 4.5 Types of cakes, formula balance in cake 4.6 production of cakes and pastry - mixing, baking, cooling and packaging 2 4.7 Cakes faults - shape, structure, texture, crust and colour faults 1 to Pastry 5.1 Basic formulation - different types 5.2 flaky, puff and danish pastry 5.3 bakery products that combines flour and fat 5.4 Pie - types and methods 2 preparation methods of danish pasties and the role of ingredients used	2.5		1
2.8 Rounders - Construction, rounding principle and operation 3.0 Baking of Cakes 3.1 Role of ingredients – flours, oils and fats, eggs, sugar, dried fruits and nuts 2 types of cakes – methods of mixing 3.2 types of cakes – methods of mixing 3.3 preparation of fancy cakes and techniques 3.4 Cake quality 3.5 cake faults and remedies 1 1 3.6 Heat transfer in the oven, mixing and delivery of batter 3.7 batch & continuous mixers, depositing the batter 3.8 baking ovens- band, tunnel & reel ovens 4.0 Mixing Methods and Processing Technology of Cakes 4.1 Shortening style cakes, creaming method 4.2 flour batter method, single stage 4.3 emulsion, continuous batter mixing 4.4 foam style cakes – angel food, sponge, chiffon, genoise cake 4.5 Types of cakes, formula balance in cake 4.6 production of cakes and pastry - mixing, baking, cooling and packaging 2 4.7 Cakes faults - shape, structure, texture, crust and colour faults 1 4.8 Remedies of cake faults 5.0 Pastry 5.1 Basic formulation - different types 5.2 flaky, puff and danish pastry 5.3 bakery products that combines flour and fat 5.4 Pie - types and methods 2 Preparation methods of danish pasties and the role of ingredients used	2.6	quality aspects of bread and standards	1
3.0 Baking of Cakes 3.1 Role of ingredients – flours, oils and fats, eggs, sugar, dried fruits and nuts 2 types of cakes – methods of mixing 3.2 types of cakes – methods of mixing 3.3 preparation of fancy cakes and techniques 1 cake quality 3.5 cake faults and remedies 3.6 Heat transfer in the oven, mixing and delivery of batter 3.7 batch & continuous mixers, depositing the batter 3.8 baking ovens- band, tunnel & reel ovens 4.0 Mixing Methods and Processing Technology of Cakes 4.1 Shortening style cakes, creaming method 4.2 flour batter method, single stage 4.3 emulsion, continuous batter mixing 4.4 foam style cakes – angel food, sponge, chiffon, genoise cake 4.5 Types of cakes, formula balance in cake 4.6 production of cakes and pastry - mixing, baking, cooling and packaging 2 4.7 Cakes faults - shape, structure, texture, crust and colour faults 4.8 Remedies of cake faults 5.0 Pastry 5.1 Basic formulation - different types 5.2 flaky, puff and danish pastry 5.3 bakery products that combines flour and fat 5.4 Pie - types and methods 2 Preparation methods of danish pasties and the role of ingredients used	2.7	Dividers – Construction, dividing principle and operation	1
3.1 Role of ingredients – flours, oils and fats, eggs, sugar, dried fruits and nuts 3.2 types of cakes – methods of mixing 3.3 preparation of fancy cakes and techniques 3.4 Cake quality 3.5 cake faults and remedies 1 1 3.6 Heat transfer in the oven, mixing and delivery of batter 3.7 batch & continuous mixers, depositing the batter 3.8 baking ovens- band, tunnel & reel ovens 4.0 Mixing Methods and Processing Technology of Cakes 4.1 Shortening style cakes, creaming method 4.2 flour batter method, single stage 4.3 emulsion, continuous batter mixing 4.4 foam style cakes – angel food, sponge, chiffon, genoise cake 1 Types of cakes, formula balance in cake 4.6 production of cakes and pastry - mixing, baking, cooling and packaging 2 A7 Cakes faults - shape, structure, texture, crust and colour faults 1 Remedies of cake faults 5.0 Pastry 5.1 Basic formulation - different types 1 flaky, puff and danish pastry 5.2 flaky, puff and danish pastry 5.3 bakery products that combines flour and fat 5.4 Pie - types and methods 2 Preparation methods of danish pasties and the role of ingredients used	2.8	Rounders - Construction, rounding principle and operation	1
types of cakes – methods of mixing 3.3 preparation of fancy cakes and techniques 1 cake quality 3.4 Cake quality 3.5 cake faults and remedies 1 heat transfer in the oven, mixing and delivery of batter 3.6 Heat transfer in the oven, mixing and delivery of batter 3.7 batch & continuous mixers, depositing the batter 3.8 baking ovens- band, tunnel & reel ovens 4.0 Mixing Methods and Processing Technology of Cakes 4.1 Shortening style cakes, creaming method 4.2 flour batter method, single stage 4.3 emulsion, continuous batter mixing 4.4 foam style cakes – angel food, sponge, chiffon, genoise cake 4.5 Types of cakes, formula balance in cake 4.6 production of cakes and pastry - mixing, baking, cooling and packaging 4.7 Cakes faults - shape, structure, texture, crust and colour faults 4.8 Remedies of cake faults 5.0 Pastry 5.1 Basic formulation - different types 5.2 flaky, puff and danish pastry 5.3 bakery products that combines flour and fat 5.4 Pie - types and methods 2 Preparation methods of danish pasties and the role of ingredients used	3.0	Baking of Cakes	
3.3 preparation of fancy cakes and techniques 3.4 Cake quality 3.5 cake faults and remedies 3.6 Heat transfer in the oven, mixing and delivery of batter 3.7 batch & continuous mixers, depositing the batter 3.8 baking ovens- band, tunnel & reel ovens 4.0 Mixing Methods and Processing Technology of Cakes 4.1 Shortening style cakes, creaming method 4.2 flour batter method, single stage 4.3 emulsion, continuous batter mixing 4.4 foam style cakes – angel food, sponge, chiffon, genoise cake 4.5 Types of cakes, formula balance in cake 4.6 production of cakes and pastry - mixing, baking, cooling and packaging 4.7 Cakes faults - shape, structure, texture, crust and colour faults 4.8 Remedies of cake faults 5.0 Pastry 5.1 Basic formulation - different types 5.2 flaky, puff and danish pastry 5.3 bakery products that combines flour and fat 5.4 Pie - types and methods 2 Preparation methods of danish pasties and the role of ingredients used	3.1	Role of ingredients – flours, oils and fats, eggs, sugar, dried fruits and nuts	2
3.4 Cake quality 3.5 cake faults and remedies 3.6 Heat transfer in the oven, mixing and delivery of batter 3.7 batch & continuous mixers, depositing the batter 3.8 baking ovens- band, tunnel & reel ovens 4.0 Mixing Methods and Processing Technology of Cakes 4.1 Shortening style cakes, creaming method 4.2 flour batter method, single stage 4.3 emulsion, continuous batter mixing 4.4 foam style cakes – angel food, sponge, chiffon, genoise cake 4.5 Types of cakes, formula balance in cake 4.6 production of cakes and pastry - mixing, baking, cooling and packaging 4.7 Cakes faults - shape, structure, texture, crust and colour faults 4.8 Remedies of cake faults 5.0 Pastry 5.1 Basic formulation - different types 5.2 flaky, puff and danish pastry 5.3 bakery products that combines flour and fat 5.4 Pie - types and methods 5.5 Preparation methods of danish pasties and the role of ingredients used	3.2	types of cakes – methods of mixing	1
3.5 cake faults and remedies 3.6 Heat transfer in the oven, mixing and delivery of batter 3.7 batch & continuous mixers, depositing the batter 3.8 baking ovens- band, tunnel & reel ovens 4.0 Mixing Methods and Processing Technology of Cakes 4.1 Shortening style cakes, creaming method 4.2 flour batter method, single stage 4.3 emulsion, continuous batter mixing 4.4 foam style cakes – angel food, sponge, chiffon, genoise cake 4.5 Types of cakes, formula balance in cake 4.6 production of cakes and pastry - mixing, baking, cooling and packaging 4.7 Cakes faults - shape, structure, texture, crust and colour faults 4.8 Remedies of cake faults 5.0 Pastry 5.1 Basic formulation - different types 5.2 flaky, puff and danish pastry 5.3 bakery products that combines flour and fat 5.4 Pie - types and methods 7 Preparation methods of danish pasties and the role of ingredients used	3.3	preparation of fancy cakes and techniques	1
3.6 Heat transfer in the oven, mixing and delivery of batter 3.7 batch & continuous mixers, depositing the batter 3.8 baking ovens- band, tunnel & reel ovens 4.0 Mixing Methods and Processing Technology of Cakes 4.1 Shortening style cakes, creaming method 4.2 flour batter method, single stage 4.3 emulsion, continuous batter mixing 4.4 foam style cakes – angel food, sponge, chiffon, genoise cake 4.5 Types of cakes, formula balance in cake 4.6 production of cakes and pastry - mixing, baking, cooling and packaging 4.7 Cakes faults - shape, structure, texture, crust and colour faults 4.8 Remedies of cake faults 5.0 Pastry 5.1 Basic formulation - different types 5.2 flaky, puff and danish pastry 5.3 bakery products that combines flour and fat 5.4 Pie - types and methods 2 Preparation methods of danish pasties and the role of ingredients used	3.4	Cake quality	1
3.7 batch & continuous mixers, depositing the batter 1 3.8 baking ovens- band, tunnel & reel ovens 1 4.0 Mixing Methods and Processing Technology of Cakes 4.1 Shortening style cakes, creaming method 1 4.2 flour batter method, single stage 1 4.3 emulsion, continuous batter mixing 1 4.4 foam style cakes – angel food, sponge, chiffon, genoise cake 1 4.5 Types of cakes, formula balance in cake 1 4.6 production of cakes and pastry - mixing, baking, cooling and packaging 2 4.7 Cakes faults - shape, structure, texture, crust and colour faults 1 4.8 Remedies of cake faults 1 5.0 Pastry 5.1 Basic formulation - different types 1 5.2 flaky, puff and danish pastry 1 5.3 bakery products that combines flour and fat 1 5.4 Pie - types and methods 2 5.5 Preparation methods of danish pasties and the role of ingredients used 2	3.5	cake faults and remedies	1
3.8baking ovens- band, tunnel & reel ovens14.0Mixing Methods and Processing Technology of Cakes4.1Shortening style cakes, creaming method14.2flour batter method, single stage14.3emulsion, continuous batter mixing14.4foam style cakes – angel food, sponge, chiffon, genoise cake14.5Types of cakes, formula balance in cake14.6production of cakes and pastry - mixing, baking, cooling and packaging24.7Cakes faults - shape, structure, texture, crust and colour faults14.8Remedies of cake faults15.0Pastry5.1Basic formulation - different types15.2flaky, puff and danish pastry15.3bakery products that combines flour and fat15.4Pie - types and methods2Preparation methods of danish pasties and the role of ingredients used2	3.6	Heat transfer in the oven, mixing and delivery of batter	1
4.0 Mixing Methods and Processing Technology of Cakes 4.1 Shortening style cakes, creaming method 4.2 flour batter method, single stage 4.3 emulsion, continuous batter mixing 4.4 foam style cakes – angel food, sponge, chiffon, genoise cake 1 Types of cakes, formula balance in cake 4.5 Types of cakes, formula balance in cake 4.6 production of cakes and pastry - mixing, baking, cooling and packaging 2 4.7 Cakes faults - shape, structure, texture, crust and colour faults 1 Remedies of cake faults 5.0 Pastry 5.1 Basic formulation - different types 5.2 flaky, puff and danish pastry 5.3 bakery products that combines flour and fat 5.4 Pie - types and methods 2 Preparation methods of danish pasties and the role of ingredients used	3.7	batch & continuous mixers, depositing the batter	1
4.1 Shortening style cakes, creaming method 4.2 flour batter method, single stage 4.3 emulsion, continuous batter mixing 4.4 foam style cakes – angel food, sponge, chiffon, genoise cake 4.5 Types of cakes, formula balance in cake 4.6 production of cakes and pastry - mixing, baking, cooling and packaging 4.7 Cakes faults - shape, structure, texture, crust and colour faults 4.8 Remedies of cake faults 5.0 Pastry 5.1 Basic formulation - different types 5.2 flaky, puff and danish pastry 5.3 bakery products that combines flour and fat 5.4 Pie - types and methods 2 5.5 Preparation methods of danish pasties and the role of ingredients used	3.8	baking ovens- band, tunnel & reel ovens	1
4.2flour batter method, single stage14.3emulsion, continuous batter mixing14.4foam style cakes – angel food, sponge, chiffon, genoise cake14.5Types of cakes, formula balance in cake14.6production of cakes and pastry - mixing, baking, cooling and packaging24.7Cakes faults - shape, structure, texture, crust and colour faults14.8Remedies of cake faults15.0Pastry15.1Basic formulation - different types15.2flaky, puff and danish pastry15.3bakery products that combines flour and fat15.4Pie - types and methods25.5Preparation methods of danish pasties and the role of ingredients used2	4.0	Mixing Methods and Processing Technology of Cakes	<u>.</u>
4.3 emulsion, continuous batter mixing 4.4 foam style cakes – angel food, sponge, chiffon, genoise cake 4.5 Types of cakes, formula balance in cake 4.6 production of cakes and pastry - mixing, baking, cooling and packaging 4.7 Cakes faults - shape, structure, texture, crust and colour faults 4.8 Remedies of cake faults 5.0 Pastry 5.1 Basic formulation - different types 5.2 flaky, puff and danish pastry 5.3 bakery products that combines flour and fat 5.4 Pie - types and methods 2 Preparation methods of danish pasties and the role of ingredients used	4.1	Shortening style cakes, creaming method	1
4.4 foam style cakes – angel food, sponge, chiffon, genoise cake 4.5 Types of cakes, formula balance in cake 4.6 production of cakes and pastry - mixing, baking, cooling and packaging 2. Cakes faults - shape, structure, texture, crust and colour faults 4.8 Remedies of cake faults 5.0 Pastry 5.1 Basic formulation - different types 5.2 flaky, puff and danish pastry 5.3 bakery products that combines flour and fat 5.4 Pie - types and methods 2. Preparation methods of danish pasties and the role of ingredients used	4.2	flour batter method, single stage	1
4.5 Types of cakes, formula balance in cake 4.6 production of cakes and pastry - mixing, baking, cooling and packaging 2 4.7 Cakes faults - shape, structure, texture, crust and colour faults 1 4.8 Remedies of cake faults 5.0 Pastry 5.1 Basic formulation - different types 5.2 flaky, puff and danish pastry 5.3 bakery products that combines flour and fat 5.4 Pie - types and methods 5.5 Preparation methods of danish pasties and the role of ingredients used 2	4.3	emulsion, continuous batter mixing	1
4.6 production of cakes and pastry - mixing, baking, cooling and packaging 4.7 Cakes faults - shape, structure, texture, crust and colour faults 4.8 Remedies of cake faults 5.0 Pastry 5.1 Basic formulation - different types 5.2 flaky, puff and danish pastry 5.3 bakery products that combines flour and fat 5.4 Pie - types and methods 5.5 Preparation methods of danish pasties and the role of ingredients used 2	4.4	foam style cakes – angel food, sponge, chiffon, genoise cake	1
4.7 Cakes faults - shape, structure, texture, crust and colour faults 4.8 Remedies of cake faults 5.0 Pastry 5.1 Basic formulation - different types 5.2 flaky, puff and danish pastry 5.3 bakery products that combines flour and fat 5.4 Pie - types and methods 5.5 Preparation methods of danish pasties and the role of ingredients used 2	4.5	Types of cakes, formula balance in cake	1
4.8Remedies of cake faults15.0Pastry5.1Basic formulation - different types15.2flaky, puff and danish pastry15.3bakery products that combines flour and fat15.4Pie - types and methods25.5Preparation methods of danish pasties and the role of ingredients used2	4.6	production of cakes and pastry - mixing, baking, cooling and packaging	2
5.0 Pastry 5.1 Basic formulation - different types 5.2 flaky, puff and danish pastry 5.3 bakery products that combines flour and fat 5.4 Pie - types and methods 5.5 Preparation methods of danish pasties and the role of ingredients used 2	4.7	Cakes faults - shape, structure, texture, crust and colour faults	1
5.1 Basic formulation - different types 5.2 flaky, puff and danish pastry 5.3 bakery products that combines flour and fat 5.4 Pie - types and methods 5.5 Preparation methods of danish pasties and the role of ingredients used 2	4.8	Remedies of cake faults	1
5.2 flaky, puff and danish pastry 5.3 bakery products that combines flour and fat 5.4 Pie - types and methods 5.5 Preparation methods of danish pasties and the role of ingredients used 2	5.0		
5.3 bakery products that combines flour and fat 5.4 Pie - types and methods 2 5.5 Preparation methods of danish pasties and the role of ingredients used 2	5.1	Basic formulation - different types	1
5.4 Pie - types and methods 2 5.5 Preparation methods of danish pasties and the role of ingredients used 2	5.2	flaky, puff and danish pastry	1
5.5 Preparation methods of danish pasties and the role of ingredients used 2	5.3	bakery products that combines flour and fat	1
	5.4	Pie - types and methods	2
5.6 Cold and hot pastries 2	5.5	Preparation methods of danish pasties and the role of ingredients used	2
	5.6	Cold and hot pastries	2

1. Ms. T. Swathy - swathyt@ksrct.ac.in



60 FT E47	Cane Sugar Technology	Category	L	T	Р	Credit
0011247	Carle Ougar Technology	PE	3	0	0	3

- To know about an outline of sugar industry
- To gain knowledge on machinery and process involved in sugarcane technology
- To identify sugar cane constituents and apply pre-processing operations
- To recommend suitable cane juice extraction and processing method
- To apply the acquired knowledge for manufacturing of cane sugar by-products

Pre-requisites

• Nil

Course Outcomes

CO1	Study about the overview of sugar industry and identify different methods for harvesting	Remember
CO2	Recognize the extraction and clarification methods of cane juice	Understand
CO3	Discuss about the different method of filtration and concentration process	Analyze
CO4	Exemplify the crystallization methods and refining factors in sugar production	Apply
CO5	Study about the by-product management and manufacture of jaggery and gur	Understand

Mappi	Mapping with Programme Outcomes														
COs	POs												PSC	s	
COS	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1	3	3	3	-	-	-	-	-	-	-	-	-	3	3	2
CO2	3	3	3	-	-	-	-	-	-	-	-	-	3	3	2
CO3	3	3	3	-	-	-	-	-	-	-	-	-	2	3	3
CO4	3	3	3	-	-	-	-	-	-	-	-	-	3	3	3
CO5	3	3	3	-	-	-	-	-	-	-	-	-	3	3	3
3 - Str	ong; 2 -	Mediu	ım; 1 - :	Some											

Assessment Patte	rn		
Bloom's Category	Continuous Ass	essment Tests (Marks)	End Sem Examination (Marks)
Category	1	2	
Remember	20	10	20
Understand	40	20	40
Apply	-	20	30
Analyze	-	10	10
Evaluate	-	-	-
Create	-	-	-
Total	60	60	100

	bus								
		K	.S.Rangasa				mous R2022	2	
					. Food Tech				
			lours/Week		Cane Sugar	Technology Credit		ximum Marks	
Seme	ester	L	T	Р	Hours	Credit	CA	ES ES	Total
	/II	3	0	0	45	3	40	60	100
Introd Overv Cane	duction view of cutting	Sugar industr g: Manual, Me ashing, Shrec	chanical. T	ransportation				indices.	[9]
Crush types Scale agent	hing: Ty s, Macer e and Ma ts and i	etion and Cla types of Crust ration, Theory agnetic Flow of ts importance rated lime pover	shers, Crush of cane differmeter. Clarife. Bleaching	fusivity: Type fication; meth	es of diffuser ods, clarifyin	, weighing of g	juice, Maxwe	ell Boulogne	[9]
Filtrat wash Direc	tion of r ing. Co t Conta	ion and Cond nud - Filter ty ncentration, lu ct Heater (DC mance meas	pes - filter p mportance: CH), Plate H	types of heat	ters, construc	ction and wo	rking of tubul	ar heater,	[9]
Suga shock Affina	r boiling k seed ation, cl ifugation	on and Refing, Nucleation ing, true se arification, can, dewatering	and crysta eding. Crysta arbonation, s	stallizers. R sulphitation,	efining, Bro phosphitatio	wn sugar, n, decoloriza	importance ation,	of refining,	[9]
By-pr Utiliza produ Conc	roducts: ation of uction, I	and process Drying and u Molasses, Inverted syru In of Juice, D	ises of Baga Distilling Ind p. Jaggery	asse, Back st dustries, App and Gur pro	rap Molasse olications in duction: Ext	animal feed raction of Ju	d, Biogas, B uice, Clarifica	io fertilizers tion of Gur,	[9]
una o	occorrat.	·						Total Hours	45
Text	Book(s								
1.	Herio	tT, H. P., —"7	The Manufac	cture of Suga	r From The C	Cane and Bee	et", Read Boo	ks, New York,	2007.
				Hand Book o	of Cane Suga	r Technology	y", Oxford and	d IBH Publishir	
2.	Comp	any, new be	lhi, 1995.						ng
		• •	lhi, 1995.						ng
Refer	rence(s):	–"Handbook			nual for the D	esign and Op	peration of Su	
2. Refer 1. 2.	rence(s Chung Refini): g Chi Chou, – ngFacilities", ns, George Ho	–"Handbook John Wiley orner. "Introc	and Sons, 20 luction to can	000. ie sugar tech	nology". Else	vier, 2013		gar
Refer	rence(s Chung Refini Jenkir Patura York,	g Chi Chou, – ngFacilities", ns, George Ho au J.M., —"By 1989.	-"Handbook John Wiley orner. "Introd /-Products o	and Sons, 20 Juction to can of the Cane S	000. ne sugar tech ugar Industry	nology". Else	evier, 2013 n, Elsevier Pu	peration of Sugnitude of Sugnit	gar

^{*}SDG 3 - Good Health and Well Being



Course Contents and Lecture Schedule							
S. No.	Topics	No. of hours					
1.0	Introduction						
1.1	Overview of Sugar industry: Sugarcane, Constituents	2					
1.2	Type of Sugar cane	1					
1.3	Harvesting indices	1					
1.4	Cane cutting: Manual, Mechanical.	2					
1.5	Transportation: loading, unloading.	1					
1.6	Cane conveyor: Washing, Shredders, Types.	2					
2.0	Juice Extraction and Clarification						
2.1	Crushing: Types of Crushers, Crushing efficiency	2					
2.2	Extraction of juice: methods, accumulators: types, Maceration	2					
2.3	Theory of cane diffusivity: Types of diffuser, weighing of juice	1					
2.4	Maxwell Boulogne Scale and Magnetic Flow meter.	1					
2.5	Clarification; methods, clarifying agents and its importance.	1					
2.6	Bleaching agents. lime; specification, storage.	1					
2.7	Milk of lime, rotary lime slacker, hydrated lime powder.	1					
3.0	Juice Filtration and Concentration						
3.1	Filtration of mud - Filter types - filter press	2					
3.2	rotary vacuum filter, Rapi – Floc process	1					
3.3	Filter cake washing. Concentration	1					
3.4	Importance: types of heaters, construction and working of tubular heater,	1					
3.5	Direct Contact Heater (DCH),	1					
3.6	Plate Heater (PHE),	1					
3.7	Advantages and disadvantages	1					
3.8	Evaporator, types, performance measures	1					
4.0	Crystallization and Refining						
4.1	Sugar boiling, Nucleation and crystal growth,	1					
4.2	super saturation and meta stable stage,	1					
4.3	Seeding, shock seeding, true seeding.	1					
4.4	Crystallizers. Refining, Brown sugar, importance of refining,	1					
4.5	Affination, clarification,	1					
4.6	carbonation, sulphitation,	1					
4.7	phosphitation, decolorization,	1					
4.8	Centrifugation, dewatering of sugar.	1					
4.9	Drying, Bagging and storage. Factors affecting sugar refining process.	1					
5.0	By-products and processing of unrefined sugars						
5.1	By-products: Drying and uses of Bagasse,	1					
5.2	Back strap Molasses, Characteristics of Molasses.	1					
5.3	Direct Utilization of Molasses, Distilling Industries,	1					
5.4	Applications in animal feed, Biogas, Bio fertilizers production, Inverted syrup.	2					
5.5	Jaggery and Gur production: Extraction of Juice,	1					
5.6	Clarification of Gur, Concentration of Juice,	1					
5.7	Drying and grading of Gur, Storage of Gur,	1					
5.8	Production of sugar from palm and coconut.	1					

1. Ms. P. Aarthi -aarthi@ksrct.ac.in



PROFESSIONAL ELECTIVE - V

60 FT E51	Food Allergy and	Category	L	Т	Р	Credit
0011231	Toxicology	PE	3	0	0	3

Objectives

- To know the basics concept of food allergens and toxicology and their mechanism.
- To recognize the allergic reaction and their symptoms and disorder
- To familiarize the concept, types and factors responsible for toxicity.
- To understand the types of toxicants produced from food processing.
- To realize the foundational understanding of assessment of toxicants in food samples.

Pre-requisites

Nil

Course Outcomes On the successful completion of the course, students will be able to To explain the importance of food allergens and toxicants and their mechanism Understand of action in immune resources, To identify and analyze the types allergic reaction and their symptoms of CO₂ Understand disease caused by allergens. To demonstrate the basics and factors affecting toxicity ant to analyze how it is CO3 Understand stored and excrete from blood and brain barrier. To identify and assess the types of toxicants formed in processing of foods and CO4 Apply able to analyze case studies about possible toxic effects. Emphasis the importance of toxicants assessments by various methods and its CO₅ Apply risk, standard regulation for toxicants.

Mappi	Mapping with Programme Outcomes														
COs	POs										PSOs				
003	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1	3	3	2	2	-	-	2	-	-	2	-	2	-	-	2
CO2	3	3	2	2	-	-	2	-	-	2	-	2	-	-	2
CO3	3	3	3	3	-	-	2	-	-	2	-	2	-	-	2
CO4	3	3	3	3	-	-	2	-	-	2	-	3	-	-	2
CO5	3	3	2	3	-	-	2	-	1	2	-	3	-	-	2
3 - Str	ong; 2 -	- Mediu	m; 1 - S	ome		•		•		•	•		•	•	_

Assessment Pattern									
Bloom's Category	Continuous Asse	essment Tests (Marks)	End Sem Examination (Marks)						
	1	2							
Remember	20	10	30						
Understand	40	30	40						
Apply	-	20	30						
Analyze	-	-	-						
Evaluate	-	-	-						
Create	-	-	-						
Total	60	60	100						

CHAIRMAN BOARD OF STUDIES

	ous								
		K.S.Rangasa				mous R2022			
				Food Techno					
			FT E51 - Foo						
Seme		Hours/Week		Total Hours	Credit		ximum Marks		
	L	T	Р		C	CA	ES	Total	
V		0	0	45	3	40	60	100	
Defini Micro cell m	tion and need biological, nutriti	Ilergens and to for understand onal and enviror es. Allergen and	ding food a nmental. Basi	cs of immun	e resources -	humoral and	t l	[9]	
Natur reacti metab	on, Metabolic polism, Lactose i	nsitivity Chemistry of the food disorders, ntolerance, Celian MSG, Sulfites. T	, Idiosyncrat ic disease, ar	ic reactions nd asthma. Fo	s. Food dis ood allergy	orders asso		[9]	
Princi toxins fruits.	, Natural food t Biological fact tion of toxins a	gy gy, classification toxicants - toxic ors that influen nd the compone	ity of pulses ice toxicity,	, mushroom toxin absorp	alkaloids, s otion in the	eafood, vege G.I.track, s	etables and torage and	[9]	
Toxic	ants formed du	!							
Intent enhar organ carcir	ional direct add ncers, food cold ic residues an nogens and muta	iring Food Proc litives - food propurs. Indirect and packaging ragens – Polycycl nide and their mo	eservatives, i dditives - rei naterials. To lic aromatic h	sidues and exicity of he eydrocarbons	contaminant eated and s, N -	s, heavy m	etals, other	[9]	
Intent enhar organ carcir nitros Asse Quan Instru and ri	ional direct add neers, food coloic residues an agens and muta amines, Acrylam ssment of Toxic titative and qua mental analysis sk benefit indices developmental	litives - food pre ours. Indirect ac id packaging n agens – Polycycl	eservatives, inditives - re- naterials. To lic aromatic hade of action ampling of toxicants LISA and AA sure, acute to toxicity and	sidues and oxicity of he sydrocarbons - possible to: in foods; ES. Assessme oxicity, reproc	contaminant eated and s, N - xic effects. Biological defent of food seductive	s, heavy morocessed for the forcessed for the forcessed for the forces forces for the forces forces for the forces for the forces for the forces for the forces forces for the forces forces for the forces forces for the forces forces for the forces forces for the forces for the forces for the forces forces f	etals, other cods, food of toxicants assessment	[9]	
Intent enhar organ carcir nitros Asse Quan Instru and ri	ional direct add neers, food coloic residues an agens and muta amines, Acrylam ssment of Toxic titative and qua mental analysis sk benefit indices developmental	litives - food pre- burs. Indirect ac d packaging nagens - Polycyclaide and their mo- cants in Food Salitative analysis of toxicants - Ess of human expo- toxicity, neuro	eservatives, inditives - re- naterials. To lic aromatic hade of action ampling of toxicants LISA and AA sure, acute to toxicity and	sidues and oxicity of he sydrocarbons - possible to: in foods; ES. Assessme oxicity, reproc	contaminant eated and s, N - xic effects. Biological defent of food seductive	s, heavy moreocessed for the control of the control	etals, other cods, food of toxicants assessment		
Intenti enhar organ carcir nitros Asse Quan Instru and ri and Stand	ional direct add neers, food coloic residues an agens and muta amines, Acrylam ssment of Toxio titative and qua mental analysis k benefit indices developmental lards and regula sook(s):	litives - food pre- burs. Indirect ac d packaging n agens - Polycyc hide and their mo cants in Food S litative analysis of toxicants - E s of human expo- toxicity, neuro tion related totox	eservatives, inditives - re- naterials. To lic aromatic hade of action ampling of toxicants LISA and AA sure, acute to toxicity and kins.	sidues and exicity of he hydrocarbons - possible to: in foods; E. S. Assessme exicity, reproduced behavioura	contaminant eated and p s, N - xic effects. Biological defent of food so ductive al effect, in	ermination cafety – Risk a	of toxicants assessment	[9]	
Intenti enhar organ carcir nitros Asse Quan Instru and ri and Stand	ional direct add neers, food coloic residues an agens and muta amines, Acrylam ssment of Toxio titative and qua mental analysis sk benefit indices developmental lards and regulamok(s): Helferich, Willia	litives - food pre- burs. Indirect ac d packaging nagens - Polycyclaide and their mo- cants in Food Salitative analysis of toxicants - Ess of human expo- toxicity, neuro tion related totox	eservatives, inditives - re- naterials. To lic aromatic hade of action ampling of toxicants LISA and AA sure, acute to toxicity and kins.	sidues and oxicity of he sydrocarbons - possible to: in foods; ES. Assessmoxicity, reproductive behavioura	contaminant eated and s, N - xic effects. Biological defent of food siductive al effect, in	ermination of afety – Risk anmunotoxicit	of toxicants assessment otal Hours:	[9]	
Intenti enhar organ carcir nitros Asse Quan Instru and ri and Stand	ional direct add neers, food coloic residues an agens and muta amines, Acrylam ssment of Toxio titative and qua mental analysis sk benefit indices developmental lards and regulamok(s): Helferich, Willia	litives - food pre- burs. Indirect ac d packaging n agens - Polycyc hide and their mo cants in Food S litative analysis of toxicants - E s of human expo- toxicity, neuro tion related totox	eservatives, inditives - re- naterials. To lic aromatic hade of action ampling of toxicants LISA and AA sure, acute to toxicity and kins.	sidues and oxicity of he sydrocarbons - possible to: in foods; ES. Assessmoxicity, reproductive behavioura	contaminant eated and s, N - xic effects. Biological defent of food siductive al effect, in	ermination of afety – Risk anmunotoxicit	of toxicants assessment otal Hours:	[9]	
Intenti enhar organ carcir nitros Asse: Quan Instru and ri and Stand Text I 1.	ional direct add neers, food coloic residues an angens and muta amines, Acrylam ssment of Toxic titative and qua mental analysis sk benefit indices developmental lards and regulamental and regulamental and regulamental ards are arts and regulamental arcs are arts are ar	litives - food pre- purs. Indirect ac ad packaging nagens - Polycyclaide and their mo- cants in Food S ditative analysis of toxicants - Es of human expo- toxicity, neuro tion related totox	eservatives, reditives - renaterials. To lic aromatic hode of action ampling of toxicants LISA and AA sure, acute to toxicity and kins.	sidues and oxicity of he hydrocarbons - possible to: in foods; E. S. Assessmoxicity, reproductive behavioura - poxicology. Cl. gy. Paragon	contaminant eated and s, N - xic effects. Biological defent of food siductive al effect, in	ermination of afety – Risk annunotoxicit T 01. Publishers, 2	of toxicants assessment otal Hours:	[9] 45	
Intention enhance or gan carcin nitros Asse: Quan Instru and ria and Stand Text I 1. 2.	ional direct add neers, food coloic residues an agens and muta amines, Acrylam ssment of Toxio titative and qua mental analysis sk benefit indices developmental lards and regula Alluwalia, Vikasence(s): Shibamoto, Tal Press,	litives - food pre- burs. Indirect ac d packaging n agens - Polycyc hide and their mo cants in Food S litative analysis of toxicants - E s of human expo- toxicity, neuro tion related totox	eservatives, inditives - re- naterials. To lic aromatic hade of action ampling of toxicants LISA and AA sure, acute to toxicity and kins.	sidues and exicity of he hydrocarbons - possible to: in foods; E. S. Assessmenticity, reproduced behavioura - possicology. Cl. gy. Paragon - possicology. Cl. gy. gy. Paragon - possicology. Cl. gy. gy. Paragon - possicology. Cl. gy. Paragon - possicology. Cl. gy. gy. gy. gy. gy. gy. gy. gy. gy. gy	contaminant eated and part of solution to Food	ermination cafety – Risk anmunotoxicit T O1. Publishers, 2	etals, other cods, food of toxicants assessment y, otal Hours: 2007	[9] 45	
Intent enhar organ carcir nitros Asse: Quan Instru and ria and Stand Text I 1. 2. Refer	ional direct add neers, food coloic residues an agens and muta amines, Acrylam ssment of Toxio titative and qua mental analysis sk benefit indices developmental lards and regula Alluwalia, Vikas ence(s): Shibamoto, Tal Press, Maleki, Soheila	litives - food pre- burs. Indirect ac d packaging n agens - Polycyc hide and their mo cants in Food S ditative analysis of toxicants - E s of human expo- toxicity, neuro tion related totox am and Carl K.W s "Food Hygiene ka yuki and Leor	eservatives, inditives - renaterials. To lic aromatic hode of action ampling of toxicants LISA and AA sure, acute to toxicity and kins.	sidues and oxicity of he hydrocarbons - possible to: in foods; E. S. Assessmoxicity, reproduced behavioura - poxicology" Clay" Paragon - poxicology and the control oxicology	contaminant eated and so, N - exic effects. Biological defent of food so ductive all effect, in effect, in effect, international election to Food pood Allergy",	ermination cafety – Risk anmunotoxicit T O1. Publishers, 2 ASM Press, 2	etals, other cods, food of toxicants assessment y, otal Hours: 2007 2ndEdition. A	[9]	
Intent enhar organ carcir nitros Asse: Quan Instru and riand Stand Text I 1. Refer 1.	ional direct add neers, food coloic residues an agens and muta amines, Acrylam ssment of Toxio titative and qua mental analysis sk benefit indices developmental lards and regula Alluwalia, Vikas ence(s): Shibamoto, Tal Press, Maleki, Soheila	litives - food pre- burs. Indirect ac d packaging n agens - Polycyc hide and their mo cants in Food S litative analysis of toxicants - E s of human expo- toxicity, neuro tion related totox	eservatives, inditives - renaterials. To lic aromatic hode of action ampling of toxicants LISA and AA sure, acute to toxicity and kins.	sidues and oxicity of he hydrocarbons - possible to: in foods; E. S. Assessmoxicity, reproduced behavioura - poxicology" Clay" Paragon - poxicology and the control oxicology	contaminant eated and so, N - exic effects. Biological defent of food so ductive all effect, in effect, in effect, international election to Food pood Allergy",	ermination cafety – Risk anmunotoxicit T O1. Publishers, 2 ASM Press, 2	etals, other cods, food of toxicants assessment y, otal Hours: 2007 2ndEdition. A	[9]	

^{*}SDG 3 - Good Health and Well Being



Course Contents and Lecture Schedule								
S. No.	Topics	No. of hours						
1.0	Introduction about allergens and toxicology							
1.1	Definition and need for understanding - food allergens	1						
1.2	Definition and need for understanding – Food toxicology	1						
1.3	Hazards - Microbiological, nutritional	1						
1.4	Hazards – environmental	1						
1.5	Basics of immune resources - humoral resources	1						
1.6	Basics of immune resources - cell mediated resources	1						
1.7	Allergen and mechanism of allergic resources	1						
1.8	FDA approved common allergy food products	2						
2.0	Food Allergy and Sensitivity							
2.1	Natural sources and Chemistry of food allergens	2						
2.2	Types of food sensitivities – Anaphylactoid reaction	1						
2.3	Metabolic food disorders, Idiosyncratic reactions	1						
2.4	Food disorders associated with metabolism, Lactose intolerance	2						
2.5	Celiac disease, and asthma	1						
2.6	Food allergy due to food additives: MSG, Sulfites	1						
2.7	Typical symptoms related to food allergy	1						
3.0	Concept of Toxicology	•						
3.1	Principles of toxicology, classification of toxic agents	1						
3.2	toxins of plant and animal origin- microbial toxins	1						
3.3	Natural food toxicants - toxicity of pulses, mushroom alkaloids	1						
3.4	Toxicity of seafood, vegetables and fruits	1						
3.5	Biological factors that influence toxicity	1						
3.6	toxin absorption in the G.I.track	1						
3.7	storage and excretion of toxins	1						
3.8	components protect the toxins in Industrial microflora, blood, brain barrier	2						
4.0	Toxicants formed during Food Processing							
4.1	Intentional direct additives - food preservatives, nitrate, nitrite, effects	2						
4.2	N- nitroso compound flavour enhancers, food colours	1						
4.3	Indirect additives - residues and contaminants, heavy metals	1						
4.4	other organic residues and packaging materials	1						
4.5	Toxicity of heated and processed foods	1						
4.6	food carcinogens and mutagens – Polycyclic aromatic hydrocarbons	1						
4.7	N – nitrosamines and their mode of action - possible toxic effects	1						
4.8	Acrylamide and their mode of action - possible toxic effects	1						
5.0	Assessment of Toxicants in Food Sampling	•						
5.1	Quantitative and qualitative analysis of toxicants in foods	1						
5.2	Biological determination of toxicants Instrumental analysis of toxicants – ELISA and AAS	3						
5.3	Assessment of food safety – Risk assessment	1						
5.4	Risk benefit indices of human exposure, acute toxicity	1						
5.5	reproductive and developmental toxicity	1						
5.6	neurotoxicity and behavioural effect, immunotoxicity	1						
5.7	Standards and regulation related totoxins	1						

1. Dr.K.Prabha-<u>prabhak@ksrct.ac.in</u>



60 FT E52	Food Processing	Category	L	Т	Р	Credit
0011 232	Equipment Design	PE	3	0	0	3

- To provide students with a basic knowledge about materials of construction, design
- To impart knowledge in pressure vessel design.
- To provide student the knowledge about design of sterilization equipment.
- To impart knowledge about design of heat exchangers.
- To provide student knowledge about dryers, mixers.

Pre-requisites

Nil

Course Outcomes

On the suc	On the successful completion of the course, students will be able to								
CO1	Know the importance of materials and mechanical properties in equipment design.	Understand							
CO2	Analyse the process parameters and design of pressure vessels.	Analyze							
CO3	Illustrate, analyse the process and design of sterilization equipment.	Analyze							
CO4	Identify and comprehend the design of heat exchangers, evaporators.	Apply							
CO5	Recognize different types and design of dryers and mixers.	Understand							

Mappii	Mapping with Programme Outcomes														
COs	POs										PSOs				
COS	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1	3	2	3	2	-	-	-	-	-	-	-	-	-	2	3
CO2	3	2	3	2	-	-	-	-	-	-	-	-	-	2	3
CO3	3	2	3	2	-	-	-	-	-	-	-	-	-	2	3
CO4	3	2	3	2	-	-	-	-	-	-	-	-	-	2	3
CO5	3	2	3	2	-	-	-	-	-	-	-	-	-	2	3
3 - Stro	ong; 2 -	Mediur	n; 1 - S	ome											

Assessment Pattern									
Bloom's Category	Continuous Ass	essment Tests (Marks)	End Sem Examination (Marks)						
	1	2							
Remember	10	10	20						
Understand	30	30	40						
Apply	10	10	60						
Analyze	10	10	20						
Evaluate	-	-	-						
Create	-	-	-						
Total	60	60	100						

Syllabus									
	K	.S.Rangasa			gy – Autonor	mous R2022	!		
	B.Tech – Food Technology 60 FT E52 - Food Processing Equipment Design								
	-	lours/Week	-52 - F000 P	Total	Credit		ximum Marks	<u> </u>	
Semeste	r L	T	Р	Hours	C	CA	ES	Total	
VIII	3	0	0	45	3	40	60	100	
Basic co	sign considerate onsiderations in s and materials. flow diagrams (I nt.	process e Design cons	quipment de siderations - s	esign. Matei stresses crea	rials of cons ated due to st	tatic and dyn	amic loads.	[9]	
Design of shell and Vessels shell and	of pressure vess onditions and st lits components subjected to inter d spherical she Optimum propo	resses – de s – cylindric nal pressure ll, stresses	al and spher and combine induced in	rical shells, I ed loading – c vessel. Ves	nead, nozzle: ylindrical ssels subject	s and flange	thickness.	[9]	
Design of heat exchangers and evaporators* Types of heat exchangers – double pipe heat exchangers, shell and tube heat exchangers, and special types of heat exchangers. Design of shell and tube heat exchanger. Design of single effect, multiple effect evaporators.								[9]	
Dryers: 7 bed drye Piping sy	of Dryers and mi Types, General c r, heat pump dr Testem – Flow co Design of agitat	onsideration yer, foam m ntrol devices	at dryer, fre a. Mixing dev	eze dryer, S rices, Types	pray dryer: I of agitators.	Equipment <i>A</i> Power requi	Ancillaries –	[9]	
Selection screw ex the Del fa Richards	of food extruders and importance truders. Over vie actor during heating rapid method on cycles, The s	of extruders w of steriliza ng and cooli for the desi	in food indu tion, Design ng, Calculation gn of	stry, Design of batch steri on of the hold	lization proce ling time atco	sses - Calcu	lation of	[9]	
						Т	otal Hours:	45	
1. M	o k(s): ahajani V.V and	Umarji S.B. ʻ	'Joshi's proc	ess equipme	nt design". Tı	rinity Press.	New Delhi, 20	14.	
2. SI	nrikant D Dawan	de. "Process	design of ed	quipments". (Central Techn	o Publication	ns, Nagpur, 20	005.	
Reference									
1. D	ngh &Heldman." elhi, 2013.			_					
Z. BI	sim Ahmed, Moh ackwell, April 20	12.				_	volume Set" V	Viley-	
	oran P. M., Biopro								
4. M	aroulis Z.B. and S	Saravacos G	.D. "Food Pro	ocess Desigr	n", Marcel Del	kker Inc. 200	3.		

^{*}SDG 9 - Industry Innovation and Infrastructure



Course Contents and Lecture Schedule								
S. No.	Topics	No. of hours						
1.0	Basic design considerations and materials of construction							
1.1	Basic considerations in process equipment design	2						
1.2	Materials of construction – mechanical properties	1						
1.3	Materials of construction – materials	1						
1.4	Design considerations - stresses created due to static loads.	1						
1.5	Design considerations - stresses created due to dynamic loads.	1						
1.6	Process flow diagrams (PFD)	1						
1.7	symbols used in PFD	1						
1.8	Selection and importance of different food equipment	1						
2.0	Design of pressure vessels							
2.1	Design conditions and stresses – design stress	1						
2.2	Design conditions and stresses – design criteria	1						
2.3	Design conditions and stresses – corrosion allowance	1						
2.4	Design of a shell and its components – cylindrical and spherical shells	1						
2.5	Design of a shell and its components –head, nozzles and flange thickness	1						
2.6	Vessels subjected to internal pressure and combined loading	1						
2.7	stresses induced in vessel	1						
2.8	Vessels subjected to external pressure	1						
2.9	Optimum proportions of a vessel and optimum vessel size							
3.0	Design of heat exchangers and evaporators							
3.1	Types of heat exchangers – double pipe heat exchangers	1						
3.2	Types of heat exchangers – shell and tube heat exchangers	1						
3.3	Types of heat exchangers – special types of heat exchangers	1						
3.4	Design of shell and tube heat exchanger	2						
3.5	Design of single effect	2						
3.6	multiple effect evaporators	2						
4.0	Design of Dryers and mixers							
4.1	Dryers: Types, General considerations	1						
4.2	Rotary Dryer, Tray dryer	1						
4.3	foam mat dryer, Cabinet dryer	1						
4.4	fluidized bed dryer	1						
4.5	heat pump dryer	1						
4.6	freeze dryer	1						
4.7	Spray dryer: Equipment Ancillaries – Piping system – Flow control devices	1						
4.8	Types of agitators. Power requirements for agitation	1						
4.9	Design of agitation system components – shaft design and agitator design	1						
5.0	Design of food extruders, sterilization equipment							
5.1	Selection and importance of extruders in food industry	1						
5.2	Design of food extruders - single and twin-screw extruders.	2						
5.3	Overview of sterilization	1						
5.4	Design of batch sterilization processes	1						
5.5	Calculation of the Del factor during heating and cooling	1						
5.6	Calculation of the holding time at constant temperature	2						
5.7	Richards' rapid method for the design of sterilization cycles	1						

1. Dr.A.S.Ruby Celsia - rubycelsia@ksrct.ac.in



60 FT E53	Fruit and Vegetable Industry	Category	L	Т	Р	Credit
0011 233	Safety and Laws	PE	3	0	0	3

- To understand the various food laws
- To identify functions of food safety management systems
- To know on food laws and safety in food processing
- To Understand the Basics of food and their spoilage
- To know the Importance of food Safety.

Pre-requisites

Nil

Course Outcomes

On the succ	Off the successful completion of the course, students will be able to									
CO1	Identify the Agency responsible for legislation & implementation when facing a problem concerning fruits and vegetables	Understand								
CO2	Elaborate on the relevant legislation/standard for a fruits and vegetables based product	Apply								
CO3	Assess the meaning of what is written in the relevant legislation when facing a problem concerning fruits and vegetables	Apply								
CO4	Propose to pertinent Authorities amendments to existing legislation/standard whenever it seems justifiable	Understand								
CO5	Assess the importance of food safety.	Apply								

Mappi	ng with	Progra	amme C	Outcome	S										
		POs												PSOs	
COs	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1	3	3	3	-	-	-	-	-	-	-	2	2	3	3	3
CO2	3	3	3	-	-	-	-	-	-	-	2	2	3	3	3
CO3	3	3	3	-	-	-	-	-	-	-	2	2	3	3	3
CO4	3	3	3	-	-	-	-	-	-	-	2	2	3	2	2
CO5	3	3	3	-	-	-	-	-	-	-	2	2	2	2	2
3 - Str	3 - Strong: 2 - Medium: 1 - Some														

Bloom's Category	Continuous Asse (Mar		End Sem Examination(Marks)
	1	2	7
Remember	20	20	30
Understand	30	30	50
Apply	10	10	20
Analyze	-	-	-
Evaluate	-	-	-
Create	-	-	-
Total	60	60	100



Semester	T)-2022-20		nous R2022	av – Autonor	of Technolog	nv College	.S.Rangasaı	K	
Hours/Week									
New York Semester L			and Laws	ustry Safety	getable Ind	Fruit and Vo	60 FT E53 -		
VIII 3 0 0 45 3 40 60								ŀ	Semester
Necessity of Law in Fruit and Vegetable Processing Industry Establishment of US Pure Food Law in early 1900s and of Food & Drug Administration to enforce safety of food products; Urbanisation of population and necessity of processed and preserved foods and the necessity of ensuring quality of food to prevent adulteration. PFA; Various aspects of defining adulteration, taking samples of food for analysis by public analyst, prosecution for adulteration and punishment; Standards of various food products; FPO; Use of permitted additives like colours, preservatives, emulsifiers, stabilisers, antioxidants etc. Food Safety & Standards Act 2006 and the provisions therein; Integrated Food Law - Multi departmental - multilevel to single window control system, consumer protection Act. Food Safety in Processing Fruit and vegetable processing industry - Building and equipment design; microbiological quality of fruit and vegetable products, air; Safety in food procurement, storage, handling and manufacture; Food safety in retail fruit and vegetable product businesses; international food service operators, institutional food service operators; application of the principals of modern hygiene; Food handlers, habits, clothes, illness Key Safety Principles Fruit and vegetable processing industry - Training & Education for safe methods of handling fruits and vegetables; cleaning and sanitization of processing plants; principles of cleaning and sterilization; sterilization & disinfection- different methods used-detergents, heat, chemicals; selecting and installing equipment; Cleaning of equipment and premises. Safety limits of sanitizers; pest control; management and disposal of waste. Food Safety Management System** Fruit and vegetable processing industry - Physical, chemical and Microbial hazards and their control in food industry; Quality systems standards including ISO; - ISO 9000; total quality management (TQM); hazard analysis of critical control points (HACCP); good manufacturing practices (GMP) Management** Managem	Total		CA					L	
Establishment of US Pure Food Law in early 1900s and of Food & Drug Administration to enforce safety of food products; Urbanisation of population and necessity of processed and preserved foods and the necessity of ensuring quality of food to prevent adulteration. PFA; Various aspects of defining adulteration, taking samples of food for analysis by public analyst, prosecution for adulteration and punishment; Standards of various food products; FPO; Use of permitted additives like colours, preservatives, emulsifiers, stabilisers, antioxidants etc. Food Safety & Standards Act 2006 and the provisions therein; Integrated Food Law - Multi departmental - multilevel to single window control system, consumer protection Act. Food Safety in Processing Fruit and vegetable processing industry - Building and equipment design; microbiological quality of fruit and vegetable products, air; Safety in food procurement, storage, handling and manufacture; Food safety in retail fruit and vegetable product businesses; international food service operators, institutional food service operators; application of the principals of modern hygiene; Food handlers, habits, clothes, illness Key Safety Principles Fruit and vegetable processing industry - Training & Education for safe methods of handling fruits and vegetables; cleaning and samitization of processing plants; principles of cleaning and sterilization; sterilization & disinfection- different methods used-detergents, heat, chemicals; selecting and installing equipment; Cleaning of equipment and premises. Safety limits of sanitizers; pest control; management and disposal of waste. Food Safety Management System** Fruit and vegetable processing industry - Physical, chemical and Microbial hazards and their control in food industry; Quality systems standards including ISO; - ISO 9000; total quality management (TQM); hazard analysis of critical control points (HACCP); good manufacturing practices (GMP) Management** Good Manufacturing Practice and HACCP; Surveillance networks, Consumer a	100	60	40	_	_				
Fruit and vegetable processing industry - Building and equipment design; microbiological quality of fruit and vegetable products, air; Safety in food procurement, storage, handling and manufacture; Food safety in retail fruit and vegetable product businesses; international food service operators, institutional food service operators; application of the principals of modern hygiene; Food handlers, habits, clothes, illness Key Safety Principles Fruit and vegetable processing industry - Training & Education for safe methods of handling fruits and vegetables; cleaning and sanitization of processing plants; principles of cleaning and sterilization; sterilization & disinfection- different methods used-detergents, heat, chemicals; selecting and installing equipment; Cleaning of equipment and premises. Safety limits of sanitizers; pest control; management and disposal of waste. Food Safety Management System** Fruit and vegetable processing industry - Physical, chemical and Microbial hazards and their control in food industry; Quality systems standards including ISO; - ISO 9000; total quality management (TQM); hazard analysis of critical control points (HACCP); good manufacturing practices (GMP) Management** Good Manufacturing Practice and HACCP; Surveillance networks, Consumer and food service operator education; GM Foods, safety and labeling; International Food Standards ISO 9000 and related standards; Impact of food safety on global trade. Concepts and trends in food Legislation, Information-Domination in the European Food Industry, Agriculture, Ethics and Law, WHO in Global Food Safety Governance, The Right to Food in International Law with Case Studies. Intellectual Property and Food Labelling: Trademarks and Geographical Indications, Agricultural Innovation: Patenting and Plant Variety Rights Protection, Cross-Contamination, Genetic Drift, and GMO Co-existence with Non-GM Crops, Legal Barriers to International Food Trade, food policies.	[9]	red foods ts of on for ed additives ndards Act	and preserverious aspect t, prosecution of permitte safety & Star	& Drug Adm of processed ion. PFA; Va public analys s; FPO; Use s etc. Food S	and of Food nd necessity ent adulterat analysis by food products antioxidant	early 1900s population a food to prev of food for s of various s, stabilisers ated Food La	Food Law in banisation of ring quality of ing samples ent; Standards, emulsifiers perein; Integral	t of US Pure products; Ur ssity of ensu- teration, taki- nd punishman preservative provisions the	Establishmen safety of food and the neces defining adulteration a like colours, 2006 and the
Fruit and vegetable processing industry - Training & Education for safe methods of handling fruits and vegetables; cleaning and sanitization of processing plants; principles of cleaning and sterilization; sterilization & disinfection- different methods used-detergents, heat, chemicals; selecting and installing equipment; Cleaning of equipment and premises. Safety limits of sanitizers; pest control; management and disposal of waste. Food Safety Management System** Fruit and vegetable processing industry - Physical, chemical and Microbial hazards and their control in food industry; Quality systems standards including ISO; - ISO 9000; total quality management (TQM); hazard analysis of critical control points (HACCP); good manufacturing practices (GMP) Management** Good Manufacturing Practice and HACCP; Surveillance networks, Consumer and food service operator education; GM Foods, safety and labeling; International Food Standards ISO 9000 and related standards; Impact of food safety on global trade. Concepts and trends in food legislation, Information-Domination in the European Food Industry, Agriculture, Ethics and Law, WHO in Global Food Safety Governance, The Right to Food in International Law with Case Studies. Intellectual Property and Food Labelling: Trademarks and Geographical Indications, Agricultural Innovation: Patenting and Plant Variety Rights Protection, Cross-Contamination, Genetic Drift, and GMO Co-existence with Non-GM Crops, Legal Barriers to International Food Trade, food policies.	[9]	nanufacture; e operators,	dling and m food service	storage, han nternational	rocurement, ousinesses; i	ety in food pole product by	essing industrates cts, air; Safe and vegetab	etable proce etable produ n retail fruit ood service o	Fruit and veg fruit and vege Food safety i institutional fo
Fruit and vegetable processing industry - Physical, chemical and Microbial hazards and their control in food industry; Quality systems standards including ISO; - ISO 9000; total quality management (TQM); hazard analysis of critical control points (HACCP); good manufacturing practices (GMP) Management** Good Manufacturing Practice and HACCP; Surveillance networks, Consumer and food service operator education; GM Foods, safety and labeling; International Food Standards ISO 9000 and related standards; Impact of food safety on global trade. Concepts and trends in food legislation, Information-Domination in the European Food Industry, Agriculture, Ethics and Law, WHO in Global Food Safety Governance, The Right to Food in International Law with Case Studies. Intellectual Property and Food Labelling: Trademarks and Geographical Indications, Agricultural Innovation: Patenting and Plant Variety Rights Protection, Cross-Contamination, Genetic Drift, and GMO Co-existence with Non-GM Crops, Legal Barriers to International Food Trade, food policies. Total Hours: Text Book(s):	[9]	sterilization; lecting and	aning and semicals; sel	nciples of cle ts, heat, ch	g plants; pri	of processin methods us	sanitization n- different aning of equip	etable procestleaning and disinfection in the disinfection in the disinfection in the distribution in the	Fruit and vege vegetables; of sterilization & installing equ
Good Manufacturing Practice and HACCP; Surveillance networks, Consumer and food service operator education; GM Foods, safety and labeling; International Food Standards ISO 9000 and related standards; Impact of food safety on global trade. Concepts and trends in food legislation, Information-Domination in the European Food Industry, Agriculture, Ethics and Law, WHO in Global Food Safety Governance, The Right to Food in International Law with Case Studies. Intellectual Property and Food Labelling: Trademarks and Geographical Indications, Agricultural Innovation: Patenting and Plant Variety Rights Protection, Cross-Contamination, Genetic Drift, and GMO Co-existence with Non-GM Crops, Legal Barriers to International Food Trade, food policies. Total Hours: Text Book(s):	[9]	agement	uality mana	9000; total of	ig ISO; - ISO	ards includir	ssing industry stems stand	etable proce ry; Quality sy	Fruit and vegon food indust
Text Book(s): Rees Naomi and David Watson —International Standards for Food Safety — Aspen Publication 20	[9]	000 and od ics and with Case ndications,	ards ISO 90 ends in foc culture, Ethi tional Law graphical In s-Contamina	I Food Stand neepts and tr Industry, Agr od in Interna rks and Geo tection, Cross	Internationa al trade. Cor bean Food Right to Foo ng: Tradema ty Rights Pro	and labeling ety on glob the Europ rnance, The ood Labelli Plant Varie	oods, safety and took food safety omination in a Safety Government of the control	acturing Pra- cation; GM F ards; Impac nformation-D Global Food llectual Pro nnovation: F and GMO C	Good Manufa operator educ related stand legislation, Ir Law, WHO in Studies. Inte Agricultural Ir Genetic Drift,
Text Book(s): Rees Naomi and David Watson —International Standards for Food Safety — Aspen Publication 20	45	otal Hours:	To						
"				for Food Sat	nal Standards	—Internatio	avid Watson		
2. Schmidt, Ronald H. and Rodrick, G.E. —Food Safety Handbook□, Wiley Interscience, UK,2005		e, UK,2005	Interscience	dbook□, Wiley	Safety Hand	G.E. —Food	and Rodrick,	dt, Ronald H.	2. Schmid
Reference(s):									Reference(s)
Mehta, Rajesh and J. George —Food Safety Regulations, Concerns and Trade: The Developing © Perspective□, Macmillan, 2005.	country	ne Developing	nd Trade: Th	, Concerns a	Regulations	Food Safety			
2. The Prevention of Food Adulteration Act, 1954□, Commercial Law Publishers India) Pvt. Ltd.		Pvt. Ltd.	shers India) I	cial Law Publi	4□, Commerc	tion <u>Act</u> , 195	ood Adultera	evention of F	2. The Pr

^{**}SDG 3 - Good Health and Well Being



Course Contents and Lecture Schedule

S. No.	Topics	No. o
1.0	Necessity of law in fruit and vegetable processing industry	•
1.1	Establishment of US Pure Food Law in early 1900s and of Food & Drug Administration to enforce safety of food products	1
1.2	Urbanisation of population and necessity of processed and preserved foods and the necessity of ensuring quality of food to prevent adulteration	1
1.3	PFA; Various aspects of defining adulteration	1
1.4	Taking samples of food for analysis by public analyst, prosecution for adulteration and punishment	1
1.5	Standards of various food products; FPO; Use of permitted additives like colours, preservatives, emulsifiers, stabilisers, antioxidants etc.	1
1.6	Food Safety & Standards Act 2006	2
1.7	The provisions therein Act; Integrated Food Law	1
1.8	Multi departmental, multilevel to single window control system, consumer protection Act.	1
2.0	Food safety in processing	'
2.1	Fruit and vegetable processing industry	2
2.2	Building and equipment design; microbiological quality of fruit and vegetable product	2
2.3	Safety in food procurement, storage, handling and manufacture	1
2.4	Food safety in retail fruit and vegetable product businesses; international food service operators	1
2.5	Institutional food service operators	1
2.6	Application of the principals of modern hygiene; Food handlers, habits, clothes, illness	2
3.0	Key safety principles	
3.1	Fruit and vegetable processing industry - Training	1
3.2	Education for safe methods of handling fruits and vegetables	1
3.3	Cleaning and sanitization of processing plants	1
3.4	Principles of cleaning and sterilization	2
3.5	Sterilization & disinfection- different methods used-detergents, heat, chemicals; selecting and installing equipment	1
3.6	Cleaning of equipment and premises	1
3.7	Safety limits of sanitizers	1
3.8	pest control; management and disposal of waste	1
4.0	Food safety management system	<u>'</u>
4.1		1 1
	Fruit and vegetable processing industry	1
4.2	Physical hazards	1
4.3	Chemical hazards	1
4.4	Microbial hazards	1
4.5	Control in food industry	1
4.6	Quality systems standards	1
4.7	ISO 9000	1
4.8	Total quality management (TQM)	2
4.9	Hazard analysis of critical control points (HACCP); good manufacturing practices (GMP)	1
5.0	Management	•
5.1	Good Manufacturing Practice and HACCP, Surveillance networks	1
5.2	Consumer and food service operator education; GM Foods, safety and labelling.	1
5.3	International Food Standards ISO 9000 and related standards; Impact of food safety on global trade	1
5.4	Concepts and trends in food legislation, Information-Domination in the European Food Industry, Agriculture, Ethics and Law, WHO in Global Food Safety Governance, The Right to Food in International Law with Case Studies	2
5.5	Intellectual Property and Food Labelling: Trademarks and Geographical Indications, Agricultural Innovation	1
5.6	Patenting and Plant Variety Rights Protection, Cross-Contamination, Genetic Drift, and GMO Co-existence with Non-GM Crops	2
5.7	Legal Barriers to International Food Trade, food policies	1

Course Designer(s)

Mr.G. Bharath - bharathg@ksrct.ac.in
Passed in BoS Meeting held on 22.05.24
Approved in Academic Council Meeting held on 25.05.24



60 FT E54	Energy Management in Modern Food Process	Category	L	Т	Р	Credit
0011 234	Industries	PE	3	0	0	3

- Develop a comprehensive understanding of various energy sources and their classifications, with a specific emphasis on renewable energy alternatives
- To introduce students to the principles and applications of renewable energy sources
- Gain insight into energy units, perspectives, and norms, and their significance in energy management practices, enabling students to evaluate and optimize energy usage effectively
- To Learn about energy accounting methods and the design of energy management systems to enhance overall energy performance in various industrial settings
- To Acquire knowledge of energy and water conservation technologies applicable to food processing industries

Pre-requisites

Nil

Course Outcomes

On the succ	On the successful completion of the course, students will be able to									
CO1	Understanding of different energy sources and their classifications, focusing on renewable energy alternatives.	Understand								
CO2	Introduced to the principles and applications of renewable energy sources, with a focus on biomass.	Remember								
CO3	Understanding of energy units, perspectives, and norms, and their role in energy management.	Understand								
CO4	Learn about energy accounting methods and the design of energy management systems.	Apply								
CO5	Equipped with knowledge of energy and water conservation technologies applicable to food processing facilities.	Analyze								

Mappii	Mapping with Programme Outcomes														
COs		POs											PSOs		
003	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1	3	-	3	2	-	-	3	-	-	-	-	-	-	2	3
CO2	3	-	3	2	-	-	3	-	-	-	-	-	-	2	3
CO3	3	-	3	2	-	-	-	-	-	-	-	-	-	2	3
CO4	3	-	3	2	-	-	3	-	-	-	-	-	-	-	3
CO5	3	-	3	2	-	-	3	-	-	-	-	-	-	-	3
3 - Stro	3 - Strong; 2 - Medium; 1 - Some														

Assessment Pattern			
Bloom's Category	Continuous Ass	essment Tests (Marks)	End Sem Examination (Marks)
	1	2	
Remember	20	20	20
Understand	40	30	40
Apply	-	10	20
Analyze	-	-	20
Evaluate	-	-	-
Create	-	-	-
Total	60	60	100



					gy – Autonor				
B.Tech. Food Technology 60 FT E54 - Energy Management in Modern Food Process Industries									
Hours/Week Total Credit Maximum Mark									
Semester		T	P	Hours	Credit	CA	ES ES	Total	
VIII	3	0	0	45	3	40	60	100ai	
	ion of Energy			45	3	40	00	100	
Classification ypes, const	n of energy so ruction, working renewable ene	ources; Introd g principle, u	usages and s	afety environr	nental aspect		of biomass;	[9]	
Solar passi ntroduction	on to Renewak ve heating do to wind energ mbustion, biod	evices, pho gy, hydroele	tovoltaic cell ctric energy,	ocean energ	y, briquetting	and baling of		[9]	
Energy form agro-proces	ms and Units ns and units, e ssing units, da Non-conventio	energy persp ata collection	pective, norm on and analy	s and scenar	gy conservat			[9]	
Rescue and sources, Er	counting and decalculation of calculation of calculation of calculation can be calculated as a	of used steating methods	m, hot waters, measurem	ents of energ		•	• •	[9]	
Energy and Water Consideration a compressed the com	d Water Cor servation Tec and consumpt d air system, c ergy storage i opportunities.	nservation hnologies A ion system, onservation	Technologies Applied to Formation energy considering power and	es in Food ood Processi ervation in he d electrical sy	ng Facilities: eat exchange estems, waste	Conservatiors, conservate-heat recov	in in steam tion in very and	[9]	
						To	otal Hours:	45	
Text Book(s):								
	:								
1. A. Ho				Industry" Wo					
1. A. Ho							, CRC Press 2	018.	
1. A. Ho 2. Conr	nelly R. J., "En						, CRC Press 2	018.	
1. A. Ho 2. Conr Reference(nelly R. J., "En	ergy Efficier	ncy and Mana	agement in Fo	ood Processir	ng Facilities",	, CRC Press 2 dings: A Life C		
1. A. Ho 2. Conr Reference(1. Hagh Appr	nelly R. J., "En s): nighat F., Sing	ergy Efficier al J. K., Aboress 2018.	ncy and Mana ou-Ziyan M., '	agement in Fo	ood Processir f Energy Effic	ng Facilities", iency in Build			

^{*}SDG 7 – Affordable and Clean Energy



Course Contents and Lecture Schedule								
S. No.	Topics	No. of						
0.110.	Торіоз	hours						
1.0	Classification of Energy Sources							
1.1	Classification of energy sources	2						
1.2	Introduction to renewable energy sources	1						
1.3	Characterization of biomass	1						
1.4	Types, construction, working principle	2						
1.5	Usages and safety environmental aspects of different renewable energy	3						
1.5	Devices like gasifiers, biogas plants							
2.0	Introduction to Renewable Energy Sources	,						
2.1	Solar passive heating devices	2						
2.2	Photovoltaic cells and arrays, Phase Changing Materials	1						
2.3	Brief Introduction to wind energy	1						
2.4	Hydroelectric energy, ocean energy	2						
2.5	Briquetting and baling of biomass	1						
2.6	Biomass combustion	1						
2.7	Biodiesel preparation and energy conservation in agriculture	1						
3.0	Energy Forms and Units; Energy Perspective and Norms							
3.1	Energy forms and units	1						
3.2	Energy perspective	1						
3.3	Norms and scenario	1						
3.4	Energy audit and management in agro-processing units	2						
3.5	Data collection and analysis for energy conservation in food processing Industries	2						
3.6	Non-conventional energy sources in agro-processing industries	2						
4.0	Energy Accounting and Management Systems							
4.1	Rescue and calculation of used steam, hot water	2						
4.2	Chimney gases and cascading of energy sources	2						
4.3	Energy accounting methods	1						
4.4	Measurements of energy	2						
4.5	Design of computer-based energy management systems	1						
4.6	Economics of energy use	1						
5.0	Energy and Water Conservation Technologies in Food Processing Facilities							
5.1	Conservation in steam generation and consumption system	1						
5.2	Energy conservation in heat exchangers	2						
5.3	Conservation in compressed air system	1						
5.4	Conservation in power and electrical systems	1						
5.5	Waste-heat recovery and thermal energy storage in food processing facilities	1						
5.6	Building envelop audit	1						
5.7	Energy consumption and saving opportunities	2						

1. Dr. J. Philip Robinson-<u>philip@ksrct.ac.in</u>



60 FT E55	Food Laws – Indian and	Category	L	Т	Р	Credit
00 F1 E33	International	PE	3	0	0	3

- To provide a comprehensive understanding of national and international food laws.
- To familiarize students with legal frameworks on food safety and labeling.
- To analyze roles of regulatory authorities and industry stakeholders.
- To explore emerging issues in food regulation and global trade.
- To develop critical thinking skills in applying food law principles.

Pre-requisites

NIL

Course Outcomes

On the succ	cessial completion of the coarse, students will be able to	
CO1	Demonstrate understanding of the Food Safety and Standards Act.	Understand
CO2	Compare regulatory frameworks in India, EU, and USA.	Apply
CO3	Identify roles of FSSAI and international regulatory agencies.	Apply
CO4	Evaluate food regulatory systems using case studies.	Apply
CO5	Develop strategies for compliance with food regulations.	Analyze

Mappii	Mapping with Programme Outcomes														
COs	POs										PSOs				
003	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1	3	3	3	-	-	-	-	-	2	2	-	-	3	2	2
CO2	3	3	3	-	-	-	-	-			-	-	3	2	2
CO3	3	3	3	-	-	-	-	-	2	2	-	-	3	3	2
CO4	3	3	3	-	-	-	-	-			-	-	3	3	3
CO5	3	3	3	-	-	-	-	-	2	2	-	2	3	3	3
3 - Stro	ong; 2 -	Mediur	m; 1 - S	ome											

Bloom's	Continuous Asse (Ma		End Sem Examination (Marks)
Category	1	2	,
Remember	20	20	20
Understand	30	30	40
Apply	10	10	20
Analyze	-	-	20
Evaluate	-	-	-
Create	-	-	-
Total	60	60	100

Sylla	bus								
- ,		K.	.S.Rangasa	my College	of Technolog	gy – Autono	mous R2022	<u> </u>	
					Food Techno				
				55 - Food L					
Seme	ester	Н	lours/Week	1	Total	Credit		ximum Marks	
		L	T	P	Hours	C	CA	ES	Total
	/	3	0	0	45	3	40	60	100
Introduction to Food Laws and Regulatory Frameworks Overview of food laws and regulations at national and international levels, Historical development and evolution of food regulatory systems, Role of government agencies and international organizations in food regulation, Comparison of regulatory frameworks in India and key international jurisdictions. Indian Food Laws and Regulations*									
Food (FSS Authorsafety	safety and Regulation Regulation (Incomplete Incomplete) Regulation (Incomplete) Regulary (Incomplete) Regular	d standard ons, 2011 lia (FSSAI additives,	ds regulation I, Regulato), Ministry of contaminal	ns in India: F ry authorities of Health and nts, and pack ies for non-co	s and their d Family Wel aging.	roles: Food fare, Key pr	Safety and ovisions rela	Standards	[9]
International Food Laws and Standards* Overview of international food standards-setting bodies: Codex Alimentarius Commission, World Health Organization (WHO), Food and Agriculture Organization (FAO), International agreements and treation related to food safety and trade: Sprittery and Phytoconitary (SPS), Agreement, Tochnical								[9]	
Introd Contr Cons certifi	duction to for rol Points sortium), Sortium	ood safety (HACCP), QF (Safe 0 I audit requ	managemer Certificatio Quality Food uirements fo	and Certificant systems (Fon schemes add), IFS (Internor food busine and quality as	SMS): ISO 22 and accredita ational Featu esses, Benefi	ation bodies: ired Standar	: BRC (Britis ds). Process	h Retail of	[9]
Curre nano asses	Emerging Issues and Future Trends in Food Regulation Current challenges and emerging issues in food regulation: Novel foods, biotechnology, nanotechnology, food fraud. Regulatory responses to emerging risks and technologies: Risk assessment, risk management, risk communication. Future trends in food regulation: Transparency, traceability, blockchain technology, sustainable food systems.								
									[9]
	Pack(c).						Т	otal Hours:	[9] 45
Text	. , ,								45
Text 1.	. , ,	ta Guha &	Basudeb G	uha. (2022) F	undamentals	of Indian Fo		otal Hours:	45
	Proshan Ltd.			uha. (2022) Fel. (2017) Inte			ood Laws: Un	iversity Book I	45
1.	Proshan Ltd. Gabriela rence(s):	Steier & K	iran K. Pate	el. (2017) Inte	rnational Foo	d Law And P	ood Laws: Un	iversity Book I	45 House Pvt.
1. 2.	Proshan Ltd. Gabriela rence(s):	Steier & K	iran K. Pate	el. (2017) Inte	rnational Foo	d Law And P	ood Laws: Un	iversity Book I	45 House Pvt.

^{*}SDG 12 – Responsible Consumption and Production



Course Contents and Lecture Schedule

S. No.	Topics	No. of hours
1.0	Introduction to Food Laws and Regulatory Frameworks	
1.1	Overview of food laws	1
1.2	Regulations at national and international levels	2
1.3	Historical development and evolution of food regulatory systems	1
1.4	Role of government agencies	1
1.5	Role of international organizations in food regulation	2
1.6	Comparison of regulatory frameworks in India	1
1.7	Key international jurisdictions	1
2.0	Indian Food Laws and Regulations	
2.1	Food safety and standards regulations in India	1
2.2	Fssai act, 2006	1
2.3	Food Safety and Standards (FSS) Regulations, 2011	1
2.4	Food Safety and Standards Authority of India (FSSAI)	1
2.5	Ministry of Health and Family Welfare	1
2.6	Key provisions related to food safety, labeling, additives, contaminants, and Packaging.	2
2.7	Enforcement mechanisms and penalties for non-compliance with food regulations.	1
3.0	International Food Laws and Standards	
3.1	Codex alimentarius commission	1
3.2	World health organization (who)	1
3.3	Food and Agriculture Organization (FAO)	1
3.4	Sanitary and Phytosanitary (SPS) Agreement	1
3.5	Technical Barriers to Trade (TBT) Agreement	1
3.6	Harmonization of food standards and regulations: Importance, challenges, And implications for global trade	1
3.7	Codex alimentarius, eu food law	1
3.8	US FDA regulations	1
4.0	Food Safety Management Systems and Certification	
4.1	Introduction to food safety management systems (FSMS)	1
4.2	ISO 22000	1
4.3	Hazard Analysis and Critical Control Points (HACCP)	2
4.4	BRC (british retail consortium)	1
4.5	SQF (safe quality food)	1
4.6	IFS (international featured standards)	1
4.7	Process of certification and audit requirements for food businesses.	1
4.8	Benefits of implementing FSMS and obtaining certification for food safety and Quality assurance	1
5.0	Emerging Issues and Future Trends in Food Regulation	
5.1	Current challenges and emerging issues in food regulation: Novel foods & Biotechnology	2
5.2	Current challenges and emerging issues in food regulation: nanotechnology & Food fraud.	2
5.3	Regulatory responses to emerging risks and technologies: Risk assessment, Risk management, risk communication.	2
5.4	Future trends in food regulation: Transparency.	1
5.5	Future trends in food regulation: Traceability, blockchain technology	1
5.6	Future trends in food regulation: Sustainable food systems.	1

Course Designer(s)

1. Mr. P. Kalai Rajan - kalairajan@ksrct.ac.in



60 FT E56	Packaging of Bakery and Confectionery Products	Category	L	Т	Р	Credit
	Confectionery Froducts	PE	3	0	0	3

- To understand the fundamentals and significance of food packaging.
- To explore the packaging methods and regulations for bread.
- To learn about packaging methods and materials for biscuits.
- To examine packaging materials and techniques for confectionery.
- To investigate advancements in packaging technologies and materials.

Pre-requisites

• Nil

On the succ	On the successful completion of the course, students will be able to								
CO1	Identify packaging materials and their functional properties effectively.	Understand							
CO2	Analyze storage options and packaging techniques for bread.	Analyze							
CO3	Differentiate between various biscuit packaging techniques and functions.	Apply							
CO4	Identify types of containers and sealing methods for confectionery.	Understand							
CO5	Assess new packaging methods and their benefits for shelf life.	Analyze							

Mappi	Mapping with Programme Outcomes															
COs	POs												PSOs			
COS	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	
CO1	3	3	3	2	-	-	-	-	-	-	-	-	2	2	2	
CO2	3	3	3	3	-	-	2	-	-	-	-	-	2	2	3	
CO3	3	3	3	3	-	-	2	-	-	-	-	-	3	3	3	
CO4	3	3	3	3	-	-	2	-	-	-	-	-	3	3	3	
CO5	3	3	3	3	-	-	2	-	-	-	-	-	3	3	3	
3 - Str	ong; 2 ·	- Mediu	ım; 1 - :	Some	•		•	•			•	•	•	<u> </u>		

Assessment Pattern			
Bloom's Category	Continuous As	sessment Tests (Marks)	End Sem Examination (Marks)
	1	2	
Remember	10	10	20
Understand	30	30	40
Apply	10	20	20
Analyze	10	-	20
Evaluate	-	-	-
Create	-	-	-
Total	60	60	100

Syllab	ous	14	O D	O - II	- (T l l-	A1	D0000		
		K	S.Rangasa		of Technolog Food Techn		mous R2022	<u>′</u>	
		6	0 ET E56 - D		Bakery and		ory Broducts	<u> </u>	
			Hours/Week		Total	Credit		ximum Marks	
Seme	ster	L	T	Р	Hours	C	CA	ES	Total
VI	II	3	0	0	45	3	40	60	100
Introd Introdu relatio packa	luction, uction, on to th ging- r	History, Impo	ortance and f s, package o	unctions of Following	ood packagin for flexible p containers- pr	g. Properties ackaging ma	of packaging	g material in rials used in	[9]
Storag – fund Regula	lament ations	read, packag al classificat	ion, different ance for Bre	packaging n	teristics of pa naterials. Pac ing - Modifie	ckaging			[9]
Types Packa	of Bis				Packaging N Edge Flowpad				[9]
The co	ontaine metalli y and	zed films, sh	is, paper and irink and stre	d associated etch films, lar	materials, ty ninates, the hods, dessic	type of wrap			[9]
Advan secon produc	nce in p dary a cts. Re	nd tertiary) indecent packag	in packaging ing techniqu	g. Selection of es to extend	als, methods of packaging the shelf life convenient in	materials a of the	nd standard	s for baked	[9]
Total	Hours	:							45
	Book(s								
1.		,	, "Packaging	of Food Mate	erials", First E	dition, 2015		L	
2.					ng", Second E				
Refere	ence(s								
		•							
1.					nciples and F		rd Edition, 20)13.	
1. 2.					nciples and F yy", First Editi		rd Edition, 20	13.	
	Coles Yam,	, Richard, "Fo Kit L., "The V	ood Packagi Viley Encyclo	ng Technolog pedia of Pac		on, 2003. nology", Thire	d Edition, 200		

^{*}SDG 9 – Industry Innovation and Infrastructure



B.TECH.(FT)-2022-2023 **Course Contents and Lecture Schedule** No. of S. No. **Topics** hours 1.0 Introduction 1.1 Introduction, History, Importance and functions of Food packaging 1 1.2 1 Properties of packaging material in relation to these functions 1.3 1 package design 1.4 Tests for flexible packaging materials 1 1.5 Materials used in packaging-rigid 1 1.6 semi rigid and flexible 1 1.7 Types of containers-primary & secondary 1 1.8 flexible & rigid 1 1.9 hermetic & non hermetic 1 2.0 **Bread Packaging** 2.1 Storage of bread, packaging specifications 2 2.2 characteristics of packaging material 1 Types of packaging – fundamental classification 2 2.3 2.4 different packaging materials 1 2.5 Packaging Regulations and Compliance for Bread 1 2.6 Packaging - Modified Atmosphere Packaging (MAP) 1 2.7 Vacuum Packaging of Bread. 1 3.0 **Biscuit Packaging** 3.1 Types of Biscuit Packaging 1 Packaging Functions, Packaging Materials 2 3.2 3.3 Modified Atmosphere Packaging 1 Vertical Form Fill Seal Packaging 1 3.4 2 3.5 On Edge Flowpack, Biscuits in Trays Pile Packs 3.6 1 3.7 Cartons, Biscuit Tins 1 4.0 **Packaging of Confectionery Products** 4.1 The container, metal cans, paper and associated materials 2 4.2 2 types of paper, metal foil, transparent films metallized films, shrink and stretch films 4.3 1 4.4 1 laminates, the type of wrap 4.5 wrapping materials in display and advertising 1 1 4.6 mechanical sealing methods 4.7 Desiccant pouches 1 5.0 **Packaging Advances** 5.1 Advance in packaging 1 5.2 different packaging materials 1

methods and machineries involved (primary, secondary and tertiary) in

Selection of packaging materials and standards for baked products

Recent packaging techniques to extend the shelf life of the product

Course Designer(s)

5.3

5.4

5.5

5.6

5.7

1. Dr. J. Philip Robinson - philip@ksrct.ac.in



2

2

1

1

1

Technologies-MAP, hermetic packaging

Convenient intelligent and smart packaging.

60 FT E57	Waste Management and By-product Development	Category	L	Т	P	Credit
	in Food Industries	PE	3	0	0	3

- To classify food waste and explain the strategies for waste minimization
- To utilize the wastes from cereal industries for developing byproducts
- To make use of wastes from oilseeds and tuber processing industries for developing byproducts
- To utilize the animal processing industries waste for developing byproducts
- To apply the concept of waste utilization of fruit and vegetable, sugar and packaging industries

Pre-requisites

Nil

Course Outcomes	
On the successful completion of the course	students will be able to

Classify food waste and explain the strategies for waste minimization CO1 Understand CO2 Utilize the wastes from cereal industries for developing byproducts Apply Make use of wastes from oilseeds and tuber processing industries for Developing CO3 Apply byproducts CO4 Utilize the animal processing industries waste for developing byproducts Apply Apply the concept of waste utilization of fruit and vegetable, sugar and Packaging CO₅ Apply

Mappi	Mapping with Programme Outcomes														
COs	POs													PSOs	
COS	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1	3	3	2	-	2	-	-	-	-	-	-	1	3	2	3
CO2	3	3	2	-	2	-	-	-	-	-	-	1	3	2	3
CO3	3	3	2	-	2	-	-	-	-	-	-	1	3	2	3
CO4	3	3	2	-	2	-	-	-	-	-	-	1	3	2	3
CO5	3	3	2	-	2	2	-	-	-	-	-	2	2	3	3
3 - Str	3 - Strong; 2 - Medium; 1 - Some														

Assessment Pattern

industries

Bloom's Category	Continuous Asse (Mar		End Sem Examination (Marks)			
	1	2				
Remember	20	20	30			
Understand	30	20	40			
Apply	10	20	30			
Analyze	-	-	-			
Evaluate	-	-	-			
Create	-	-	-			
Total	60	60	100			



		K.S.Rangasa				IIIOUS INZUZZ	_			
B.Tech – Food Technology 60 FT E57 - Waste Management and By-product Development in Food Industries										
Hours/Week Total Credit Maximum Mark										
Semester	L	T	Р	Hours	C	CA	ES	Total		
VIII	3	0	0	45	3	40	60	100		
Introduction different was Industrial magnitude managem	ion on Waste a on: Different So vaste, potential Waste and disp e of waste gen ent, Economica strategies for min	ources of wast is and prospectors and strategion posal strategion peration in dial aspects of waste	te from Food ects of deve es : Classific fferent food vaste treatme	eloping by pro cation of wast processing in cent and	oducts in Inc e, character ndustries, im	lia. Characte ization of wa portance of v	ristics of aste, vaste	[9]		
Waste ut biotechno different t	lization in Cereilization in Ce logical uses of hermal applica ran utilization.	ereal Food I rice husk- py	ndustries: V rolysis and	gasification c	of rice husk-			[9]		
By Product De-oiled of processing	cts from Oil Sects from Oil Sects from Oil Sectake, animal feet g industries- International Section 1985	ed and Tuber ed, fertilizer, b troduction, en	Processing pio sorbents, rzyme produ	Industries: O waxes, soap	il processing stock, coco	a butter repla	acer. Tuber	[9]		
,	syrup, organic	acids, nutrac	ceuticals.	, 0	,,	,, 510 Girari	n, arminar			
By Production By Production Whey, biodextract, geoblood, ker	cts from Anima cts from Anima surfactants, bac elatin, heparin, atin form anima vitamins and m	al Product bas I Product bas cteriocin. Mea pepsin, bio m al hair, bone r	ased Industries sed Industries at, fish, poultr nolecule from meal, meat n	ries s: Dairy indury processing n bone and	stry - Introdu industries- b	uction- oppor pio active pe	tunities – otide, protein	[9]		
By Production By	cts from Anima cts from Anima surfactants, bac elatin, heparin, atin form anima	al Product bas teriocin. Mea pepsin, bio mal hair, bone r ninerals, pigm getables and /egetables wential oils, ar , by products	ased Industries at, fish, poultr colecule from meal, meat n ments. Food Packa aste: proces ntioxidants, a	ries s: Dairy indury processing n bone and neal, chondro aging Waste ses for waste and organic dustry. Hand	e utilization f acids. Distilling of Food	uction- oppor pio active per qualene, fish rom fruits an lation for pi	tunities – otide, protein n oil, micro d vegetable	[9]		
By Production By	cts from Anima cts from Anima surfactants, bacelatin, heparin, atin form anima vitamins and m of Fruits, Veg of Fruits and N —Pectin, esse CP production, g Waste: Hance	al Product bas teriocin. Mea pepsin, bio mal hair, bone r ninerals, pigm getables and /egetables wential oils, ar , by products	ased Industries at, fish, poultr colecule from meal, meat n ments. Food Packa aste: proces ntioxidants, a	ries s: Dairy indury processing n bone and neal, chondro aging Waste ses for waste and organic dustry. Hand	e utilization f acids. Distilling of Food	uction- oppor pio active pe qualene, fish rom fruits an lation for pi	tunities – otide, protein n oil, micro d vegetable			
By Production By	cts from Anima cts from Anima surfactants, bacelatin, heparin, atin form anima vitamins and m of Fruits, Veg of Fruits and N —Pectin, esse CP production, g Waste: Hance ((s):	al Product bas teriocin. Mea pepsin, bio mal hair, bone r ninerals, pigm getables and /egetables wantial oils, ar , by products dling and trea	ased Industries at, fish, poultr colecule from meal, meat n cents. Food Packa aste: proces atioxidants, a of sugar inc atment, far	ries s: Dairy indu ry processing n bone and neal, chondro aging Waste ses for waste and organic dustry. Hand waste, incine	e utilization f acids. Distilling of Food eration of s	uction- oppor pio active pe qualene, fish rom fruits an lation for pi	tunities – otide, protein n oil, micro d vegetable roduction of aste and its	[9] 45		
By Production By	cts from Anima cts from Anima cts from Anima surfactants, bacelatin, heparin, atin form anima vitamins and m of Fruits, Veg of Fruits and V —Pectin, esse CP production, g Waste: Hance (s): sso Oreopoulou lustry", 1st Editi	al Product baseteriocin. Meason pepsin, bio mal hair, bone minerals, pigma petables and regetables was ential oils, are, by products alling and treate & Winfried Rion, Springer	ased Industries at, fish, poultr nolecule from meal, meat n nents. Food Packa aste: proces ntioxidants, a of sugar incatment, far Russ, "Utilizat Science and	ries s: Dairy indury processing a bone and neal, chondro aging Waste ses for waste and organic dustry. Hand waste, incine	e utilization f acids. Distilling of Food eration of s	reatment of V	tunities – otide, protein n oil, micro d vegetable roduction of aste and its Total Hours	[9]		
By Production By	cts from Anima cts from Anima surfactants, bacelatin, heparin, atin form anima vitamins and m of Fruits, Veg of Fruits and N —Pectin, esse CP production, g Waste: Hance (s): esso Oreopoulou	al Product baseteriocin. Meapepsin, bio mal hair, bone minerals, pigmagetables and regetables was ential oils, are, by products alling and treater al. & Winfried Rion, Springer al. Food Byproduct based on the second of the sec	ased Industries at, fish, poultr nolecule from meal, meat n nents. Food Packa aste: proces ntioxidants, a s of sugar incatment, far Russ, "Utilizar Science and ducts Manager	ries s: Dairy indury processing bone and neal, chondro aging Waste ses for waste and organic dustry. Hand waste, incine	e utilization f acids. Distilling of Food eration of s	reatment of V	tunities – otide, protein n oil, micro d vegetable roduction of aste and its Total Hours	[9]		
By Production By	cts from Anima cts from Anima surfactants, bace elatin, heparin, atin form anima vitamins and m of Fruits, Veg of Fruits and N —Pectin, esse CP production g Waste: Hand ((s): sso Oreopoulou ustry", 1st Editi mez-García, R. et ple Academic Pr e(s):	al Product bas cteriocin. Mea pepsin, bio mal hair, bone r ninerals, pigm getables and regetables wantial oils, ar by products alling and treat u & Winfried R ion, Springer al. Food Bypro- ress Inc.; CRC	ased Industries at, fish, poultr nolecule from meal, meat n ents. Food Packa aste: proces ntioxidants, a of sugar inc atment, far Russ, "Utilizat Science and ducts Manager C Press. 2024.	ries s: Dairy indury processing n bone and neal, chondro aging Waste ses for waste and organic dustry. Hand waste, incine tion of By-Pro	e utilization f acids. Distilling of Food eration of s	qualene, fish rom fruits an lation for pi olid food wa reatment of V 0006.	tunities – otide, protein n oil, micro d vegetable roduction of aste and its Total Hours Vaste in the Fo	[9] 45 ood FL:		
By Production By	cts from Anima cts from Anima cts from Anima surfactants, bace elatin, heparin, atin form anima vitamins and m n of Fruits, Veg of Fruits and N —Pectin, esse CP production g Waste: Hance (s): sso Oreopoulou sustry", 1st Editi mez-García, R. et ole Academic Pr	al Product bas cteriocin. Mea pepsin, bio mal hair, bone r ninerals, pigm getables and regetables wantial oils, ar by products alling and treat u & Winfried R ion, Springer al. Food Bypro- ress Inc.; CRC	ased Industries at, fish, poultr nolecule from meal, meat n ents. Food Packa aste: proces ntioxidants, a of sugar inc atment, far Russ, "Utilizat Science and ducts Manager C Press. 2024.	ries s: Dairy indury processing n bone and neal, chondro aging Waste ses for waste and organic dustry. Hand waste, incine tion of By-Pro	e utilization f acids. Distilling of Food eration of s	qualene, fish rom fruits an lation for pi olid food wa reatment of V 0006.	tunities – otide, protein n oil, micro d vegetable roduction of aste and its Total Hours Vaste in the Fo	[9] 45 ood FL:		
By Production By	cts from Anima cts from Anima surfactants, bace elatin, heparin, atin form anima vitamins and m of Fruits, Veg of Fruits and N —Pectin, esse CP production g Waste: Hand ((s): sso Oreopoulou ustry", 1st Editi mez-García, R. et ple Academic Pr e(s):	al Product baseteriocin. Meapepsin, bio mal hair, bone minerals, pigmal petables and degetables wential oils, arrow, by products alling and treated and book of ward product based on the product of the produ	ased Industries at, fish, poultries at, meat in meal, meat in ments. Food Packa aste: proces atioxidants, at of sugar indicatment, far atment, far atment, far atment, far considered by the constant of the	ries s: Dairy indury processing bone and neal, chondro aging Waste ses for waste and organic dustry. Hand waste, incindustry. Hand waste, incindustry and their corrects of Business Ment and their corrects by the correct of Business Ment and their corrects of By-Processing By-Proces	e utilization f acids. Distilling of Food eration of s oducts and T edia, USA, 2 utilization. First	reatment of Voo6. Tel Bay, Flat Edition, Control of Co	tunities – otide, protein n oil, micro d vegetable roduction of aste and its Total Hours Vaste in the Fo	[9] 45 ood FL: A, 2016		
By Production By	cts from Anima cts from Anima surfactants, bace elatin, heparin, atin form anima vitamins and m n of Fruits, Veg of Fruits and V —Pectin, esse aCP production, g Waste: Hance ((s): sso Oreopoulou stry", 1st Editi mez-García, R. et ple Academic Pr e(s): andrasekaran M ith Waldron, "Ha	al Product bas teriocin. Mea pepsin, bio mal hair, bone rainerals, pigm getables and regetables was trial oils, ar, by products alling and treat a & Winfried Fion, Springer al. Food Byproress Inc.; CRC M., "Valorizational book of washing Ltd, Engand to the shing Ltd, Engand to the strength of the stre	ased Industries at, fish, poultries at, meat ments. Food Packar aste: process atioxidants, as of sugar incatment, far Russ, "Utilizat Science and ducts Manager Concess. 2024. On of Food Paste manage gland, 2007.	ries s: Dairy indury processing bone and neal, chondro aging Waste ses for waste and organic dustry. Hand waste, incine tion of By-Prod Business Ment and their and th	e utilization f acids. Distil ling of Food eration of s oducts and T edia, USA, 2 utilization. First	qualene, fish rom fruits an lation for proportion of the properties of the propertie	tunities – otide, protein n oil, micro d vegetable roduction of aste and its Total Hours Vaste in the Fo -, Boca Raton, RC Press, US processing", 1s	[9] 45 ood FL: A, 2016		

^{*}SDG 9 – Industry Innovation and Infrastructure



Course Contents and Lecture Schedule

S. No.	Topics	No. of hours
1.0	Introduction on Waste and disposal strategies *	
1.1	Introduction : Different Sources of waste from Food Industries and their availability in India	2
1.2	Nature of different waste, potentials and prospects of developing by products in India.	1
1.3	Characteristics of Industrial Waste and disposal strategies: Classification of waste	1
1.4	Characterization of waste	1
1.5	Magnitude of waste generation in different food processing industries,	1
1.6	Importance of waste management	1
1.7	Economical aspects of waste treatment and disposal,	1
1.8	Strategies for minimizing waste	11
1.9	Application of 3R_s and Life Cycle Assessment (LCA).	1
2.0	Waste utilization in Cereal Food Industries *	
2.1	Waste utilization in Cereal Food Industries	1
2.2	Waste utilization from rice mill	1
2.3	Thermal and biotechnological uses of rice husk	1
2.4	Pyrolysis and gasification of rice husk	11
2.5	Cement preparation	1
2.6	Different thermal applications	1
2.7	Utilization of rice bran	1
2.8	Stabilization	11
2.9	Defatted bran utilization	1
3.0	By Products from Oil Seed and Tuber Processing Industries *	
3.1	By Products from Oil Seed and Tuber Processing Industries	1
3.2	Oil processing industries – Introduction, De-oiled cake, animal feed	11
3.3	Fertilizer, bio sorbents, waxes	1
3.4	Soap stock, cocoa butter replacer	1
3.5	Tuber processing industries- Introduction, enzyme production,	1
3.6 3.7	Biogas, bakers yeast Bio-ethanol, animal feed	11
		<u>1</u> 1
3.8 3.9	Corn syrup, organic acids Nutraceuticals	1
4.0	By Products from Animal Product based Industries *	
4.1	By Products from Animal Product based Industries: By Products from Animal Product based Industries: Dairy industry - Introduction-	1
	opportunities – whey	
4.2	Bio surfactants, bacteriocin	11
4.3	Meat, fish, poultry processing industries	11
4.4	Bio active peptide	1
4.5	Protein extract, gelatin, heparin	1
4.6	Pepsin, bio molecule from bone and blood	1
4.7	Keratin form animal hair, bone meal, meat meal	1
4.8	Chondroitinsulfate, squalene, fish oil	1
4.9	Micro nutrients- vitamins and minerals, pigments	1
5.0	Utilization of Fruits, Vegetables and Food Packaging Waste	
	Utilization of Fruits and Vegetables waste: processes for waste utilization from fruits and	
5.1	vegetable industries	1
5.2	Pectin, essential oils, antioxidants, and organic acids.	1
5.3	Distillation for production of alcohol	1
5.4	SCP production	1
	·	
5.5	By products of sugar industry	1
5.6	Handling of Food Packaging Waste	1
5.7	Handling and treatment	1
5.8	Far waste	1
5.9	Incineration of solid food waste and its disposal	1

Course Designer(s)

1. Dr.A.S.Ruby Celsia- rubycelsia@ksrct.ac.in

Passed in BoS Meeting held on 22.05.24 Approved in Academic Council Meeting held on 25.05.24



OPEN ELECTIVE

60 FT L01	Nutrition and Healthy Life	Category	L	T	Р	Credit
0011 201		OE	3	0	0	3

Objectives

- Knowledge in nutrition, balanced diet
- To learn nutritional disorder
- To learn the concept of disease management
- To impart knowledge on nutritional requirements of exercise
- Knowledge about healthy life style and fitness.

Pre-requisites

Thermal Engineering

Course Outcomes

CO1	pronounce major types of food groups, balanced diet and RDA requirement for all age	Understand
CO2	illustrate the concept and types of management of nutritional disorder	Understand
CO3	explicit the complication and symptoms of CVD, diabetes and liver	Analyze
CO4	remember the complication and management of gastrointestinal diseases	Analyze
CO5	recall the importance, benefits and nutritional requirements of exercise and fitness	Understand

Mappir	Mapping with Programme Outcomes														
COs		POs												PSOs	
COS	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1	3	3	3	-	-	-	2	-	-	-	-	-	3	3	2
CO2	3	3	3	-	-	-	2	-	-	-	-	-	3	3	2
CO3	3	3	3	-	-	-	-	-	-	-	-	-	3	3	2
CO4	3	3	3	-	-	-	-	-	-	-	-	-	3	3	2
CO5	3	3	3	-	-	-	2	-	-	-	-	-	3	3	2
3 - Stro	3 - Strong; 2 - Medium; 1 - Some														

Assessment	Pattern
ASSESSIIICIII	ı aucııı

Bloom's Category	Continuous Asso (Ma	essment Tests irks)	End Sem Examination (Marks)
Category	1	2	
Remember	20	20	30
Understand	40	20	50
Apply	-	10	10
Analyse	-	10	10
Evaluate	-	-	-
Create	-	-	-
Total	60	60	100

Sylla	bus									
		K	.S.Rangasa			gy – Autono	mous R2022	2		
B. Tech. Food Technology 60 FT L01 - Nutrition and Healthy Life										
			6 Hours/Week	0 F I L01 - N				wimum Marka		
Seme	ester		T T	Р	Total Hours	Credit C	CA	ximum Marks ES	Total	
	_	3	0	0	45	3	40	60	100ai	
Food	- I Group		ŭ	ū	45		40	00	100	
Food Groups and Overview of Nutrition Introduction to food science, Major food groups and their classification, Balanced diets, Recommended Dietary Allowances (RDA) for all age groups. Planning a healthy diet, BMR and BMI calculations. Nutritional requirements of carbohydrates, protein and fats; Water - recommended intakes; fluid/electrolyte balance.								/IR and BMI	[9]	
Nutri Type:	tional C s - and ency –	Disorders emia, Malnu	trition: Kwas			obesity, vita and Parenter		najor mineral ation. Dietary	[9]	
Etiolo criter	ia and	nptoms, clas manageme		s diseases	- Cardiovas	omplications - cular diseas lisease		monitoring	[9]	
Comp Cro	hn's dis	and managease, diarrhe		on, ulcerative		disorders - (l Peptic ulcer logy of	[9]	
Exerc requi	cise an rements	for exercis	Definition, b	aptation – e	nergy need	nd indicators - macronutrie meditation.			[9]	
							T	otal Hours:	45	
Text	Book(s									
1.						a Mahna & So ublishing Hou		umud Khanna		
2.	Srilak	shmi B., "Nut	trition Science	e", 7 th Editio	n, New Age I	nternational L	td., New Del	hi, 2022.		
Refe	rence(s):			-					
		lan C., B.V. F CMR,	Rama Sastri, 200		asubramania	an S. C. "Nutr	itive Value of	Indian Foods"		
1.	INIIN, I	O ,	200	• • •						
1. 2.	Damo			· · · · ·	na. "Fennema	a's Food Chen	nistry". 4th Ed	dition, CRC		

^{*}SDG 3 - Good Health and Well Being

Course Co	ontents and Lecture Schedule	
S. No.	Topics	No. of hours
1.0	Food Groups and overview of nutrition	1
1.1	Introduction to food science	1
1.2	Food Groups and overview of nutrition	1
1.3	Major food groups and their classification	1
1.4	Balanced diets	1
1.5	Recommended Dietary Allowances (RDA) for all age groups	1
1.6	Planning a healthy diet	1
1.7	BMR and BMI calculations.	1
1.8	Nutritional requirements of carbohydrates, protein and fats	1
1.9	Water - recommended intakes; fluid/electrolyte balance	1
2.0	Nutritional disorders	
2.1	Nutritional disorders - definitions	1
2.2	Types - anemia,	1
2.3	Malnutrition: Kwashiorkor and Marasmus, obesity, vitamin	1
2.4	Major mineral deficiency	1
2.5	Malnutrition: diagnosing	1
2.6	Malnutrition: long term effect	1
2.7	Treatment – oral administration.	1
2.8	Treatment – parenteral administration.	1
2.9	Dietary changes	1
3.0	Diet for diseases I	<u>.</u>
3.1	Diet for diseases - Etiology, symptoms	1
3.2	Classification of diseases	1
3.3	Short term and long term complications - prevention	1
3.4	Monitoring criteria and management of various diseases	1
3.5	Cardiovascular disease	1
3.6	Diabetes	1
3.7	Diseases of Liver	1
3.8	Gall bladder & Pancreas	1
3.9	Renal disease	1
4.0	Diet for diseases II	,
4.1	Complication and management of Gastrointestinal diseases/disorders	1
4.2	Gastritis and Peptic ulcer	2
4.3	Crohn's disease Diarrhea	1
4.4	Constipation	1
4.5	Ulcerative colitis	1
4.6	Diagnosis	1
4.7	Nutrition in the etiology of cancer	1
4.8	Nutritional implications of cancer therapy	1
5.0	Nutrition and physical fitness	ı
5.1	Physical fitness and Exercise	1
5.2	Fitness- Definition and benefits	1
5.3	Exercise and Fitness - components and indicators of fitness.	1
5.4	Nutritional requirements for exercise, Body adaptation	2
5.5	Energy need – macronutrient and fluids	1
5.6	Energy need - vitamins and minerals requirement.	1
5.7	Alternative health and fitness	1
5.8	Yoga and meditation	1
	I ~	l .

Dr. P. Shanmugam – <u>shanmugam@ksrct.ac.in</u>

Passed in BoS Meeting held on 12.05.23 Approved in Academic Council Meeting held on 03.06.23



60 FT L02	Livestock, Poultry and Fish	Category	L	T	Р	Credit
0011 202	Production Management	OE	3	0	0	3

- Knowledge in livestock and poultry management.
- To learn about feeding, farming and management system
- To know about swine husbandry, care and management
- To impart knowledge on feed and composition of chick
- To learn about the Fish production management

Pre-requisites

Thermal Engineering

Course Outcomes

CO1	Significance of livestock and poultry and understand about integrated farming and management system	Understand
CO2	Classification of cattle breed and its importance and study about the care management and nutrition	Understand
CO3	Classification of sheep breeds and understand about swine husbandry care and management	Understand
CO4	Describe the poultry management and study about the feed and composition of chick	Understand
CO5	Describe about breeding of fishes and feed	Analyze

Mappir	Mapping with Programme Outcomes														
COs	POs								PSOs						
COS	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1	3	3	3	-	-	3	3	-	-	-	-	-	3	3	2
CO2	3	3	2	-	-	3	3	3	-	-	-	-	3	3	2
CO3	3	3	2	-	-	2	2	-	-	-	-	-	3	3	2
CO4	3	3	2	-	-	2	2	3	-	-	-	-	3	3	2
CO5	3	3	2	-	-	2	2	-	-	-	-	-	3	3	2
3 - Stro	3 - Strong; 2 - Medium; 1 - Some														

Assessment Patte	Assessment Pattern								
Bloom's Category	Continuous Asse (Mar		End Sem Examination (Marks)						
Category	1	2	7						
Remember	20	20	30						
Understand	40	40	50						
Apply	-	-	10						
Analyze	-	-	10						
Evaluate	-	-	-						
Create	-	-	-						
Total	60	60	100						

Syllabus									
	K	.S.Rangasa	my College			mous R2022	2		
	B. Tech Food Technology 60 FT L02 - Livestock, Poultry and Fish Production Management								
Semester		lours/Week		Total Hours	Credit		ximum Marks		
	L L	T	Р		С	CA	ES	Total	
-	3	0	0	45	3	40	60	100	
Introduction to Livestock and Poultry Management Significance of livestock and poultry management in Indian economy-Livestock and Poultry census, export and import scenario - Various systems of livestock production- extensive - semi intensive- intensive mixed. Integrated Farming systems- Definition, Scope, Factors and Advantages.								[9]	
Definition cross bree and work	Cow and Buffalo Breeding and management Definition of breed-classification of indigenous, exotic cattle and buffaloes. Breeding- importance of cross breeding. Care and management of new born calf and heifers, pregnant, lactating animals and work bullocks. Clean milk production- method of milking- hand and machine milking. Feed system Nutrition-Definition-Ration-Balanced ration.								
Classificat and mana Husbandr	Sheep, Goat and Swine Farming Classification of Breeds: Indian and exotic origin. Systems of rearing-Housing management. Care and management of ram, ewe and lamb- Nutrition Feeds and fodder for small Ruminants. Swine Husbandry –Common breeds of exotic origin - housing of pigs. Care and management of Sow, Boar and Piglets-Nutrition- Creep feeding.								
Classificat broiler stra	anagement ion of poultry - ins. Brooder m trition-Feed for	anagement	- Care and m	anagement	of day old ch	icks, layers a	and broilers.	[9]	
for spawni	ding ind composition ng, Induced spa ring, planning o	awning and e	gg collection,	Egg incubat	ion and hatch	ning, Incubate		[9]	
						T	otal Hours:	45	
Text Book	• •								
1. Cei	nes, R. Gillespie ngage Learning	, 2010.				-			
	2. Ramesh Nandan, K. "Livestock and Poultry Production: Management and Planning", Anmol Publication, 2015.								
	Reference(s):								
	Gideon Waddwell- "Poultry Science" Published by Larsen and Keller Education, 2017.								
2. Cai	los Hassey – "A	Animal Breed	ling and Lives	stock Manag	ement", Syra	wood Publisł	ning House, 20)17.	
	. Bharti Sh K.B ıncil of Agricult			eed Production	on of Finfishe	s and Shellfi	shes", Indian		

Course Co	ontents and Lecture Schedule	
S. No.	Topics	No. of hours
1.0	Introduction to Livestock and Poultry Management	
1.1	Significance of livestock and poultry management in Indian economy	2
1.2	Livestock and Poultry census	1
1.3	export scenario	1
1.4	import scenario	1
1.5	Various systems of livestock production	1
1.6	extensive - semi intensive- intensive mixed	2
1.7	Integrated Farming systems Definition, Scope, Factors and Advantages	1
2.0	Cow and Buffalo Breeding and management	
2.1	Definition of breed-classification of indigenous, exotic cattle and buffaloes	2
2.2	Breeding- importance of cross breeding	1
2.3	Care and management of new born calf and heifers	1
2.4	pregnant, lactating animals and work bullocks	1
2.5	Clean milk production- method of milking	1
2.6	hand and machine milking.	1
2.7	Feed system Nutrition	1
2.8	Ration-Balanced ration.	1
3.0	Sheep ,Goat and Swine Farming	
3.1	Classification of Breeds: Indian and exotic origin	2
3.2	Systems of rearing-Housing management	1
3.3	Care and management of ram, ewe and lamb	1
3.4	Nutrition Feeds and fodder for small Ruminants	1
3.5	Swine Husbandry –Common breeds of exotic origin	1
3.6	housing of pigs	1
3.7	Care and management of Sow, Boar and Piglets-Nutrition	1
3.8	Creep feeding	1
4.0	Poultry management	
4.1	Classification of poultry - layer, broiler and dual purpose	1
4.2	Nomenclature of commercial layer and broiler strains	1
4.3	Nomenclature of broiler strains	1
4.4	Brooder management - Care and management of day old chicks, layers and broilers	3
4.5	Poultry Nutrition	2
4.6	Feed formulation of chick mash grower, layer, broiler starter and finisher mashes	1
5.0	Fish Breeding	
5.1	Structure and composition of fish	1
5.2	Types of breeding – natural, semi natural, artificial	2
5.3	Brood stock fish for spawning	1
5.4	Induced spawning and egg collection	1
5.5	Egg incubation and hatching	1
5.6	Incubators – types, Larval rearing	1
5.7	planning of small hatchery	1
5.8	Fish feeds types and proximate composition.	1

Dr. J. Philip Robinson-philip@ksrct.ac.in



60 FT L03	Food Supply Chain	Category	L	Т	Р	Credit
0011203	Management	OE	3	0	0	3

- To learnt about the food supply chain and its logistics.
- To analyse the import and export requirements
- To learn logistics management.
- To impart knowledge on Indian agencies in logistics.
- To review the export and import procedures and its documentation

Pre-requisites

Nil

Course Outcomes

On the succ	On the successful completion of the course, students will be able to								
CO1	O1 Recall the fundamentals of logistics, supply chain management and understand the scope significance and drivers of supply chain.								
CO2	Infer the different demand planning, demand forecast process and analyse the warehouse.	Understand							
CO3	Identify the various sources of distribution channels in transportation.	Understand							
CO4	Recall the concept of packaging and its logistics and elaborate on export and import labelling.	Understand							
CO5	Recall the concept of packaging and its logistics and elaborate on export and import labelling	Understand							

N	lappi	ing with	n Programme	Outcomes
---	-------	----------	-------------	----------

COs		POs											PSOs		
003	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1	3	2	2	2	-	-	-	-	-	-	-	-	3	-	-
CO2	3	3	3	2	-	-	-	-	-	-	-	-	3	2	3
CO3	3	2	3	2	-	-	-	-	-	-	-	-	3	2	2
CO4	3	2	3	3	-	-	-	-	-	-	-	-	3	2	3
CO5	3	2	3	3	-	-	-	-	-	-	-	-	3	-	2
3 - Str	3 - Strong; 2 - Medium; 1 - Some														

Bloom's Category	Continuous Asse (Ma		End Sem Examination (Marks)
outogot y	1	2	
Remember	20	20	40
Understand	40	40	60
Apply	-	-	-
Analyse	-	-	-
Evaluate	-	-	-
Create	-	-	-
Total	60	60	100

				B.Tech	. Food Tech	nology							
			60 F	T L03 - Food	Supply Cha	ain Managen	ent						
Semes	stor	ŀ	lours/Week		Total	Credit	Ма	Maximum Mark					
Seme	SIGI	L	T	Р	Hours	С	CA	ES	Total				
-		3	0	0	45	3	40	60	100				
Logisti Basic I	ics and Model	l supply chai	n managem d Secondar		entals of LSC	M - Scope, S Illenges of Lo			[9]				
Demar Foreca and de	nd an asting t etailing	techniques, Sof all tactica	nanagement Strategic pla Il & operation	nning for ma	terial sourcir on; Warehou	nd demand ng, Outsourci se strategies es.	ng strategies	Organizing	[9]				
Variou and 4F transpo	s sourd PL, Dis ortation	tribution netv	ution channe vork plannin ransshipmer	g: customer- nt: Concepts of	side and net	ture, Functior work-side soli ion managem	utions, Mode	s of	[9]				
Packa	aina a	nd informat	ion technol	- au *									
Applica packaç	ations ging ar	of Packaging	g in logistics etails, Conta	, Types of pa ainerization, F		packaging m s of IT in Su			[9]				
Application package —ERP, Globa Export relation	ations ging ar Bar-co ILSCN and ir	of Packaging of labeling do oding, RFID, of and performort proced nanagement is	g in logistics, etails, Conta GPS, E- Pro mance anal ure and Doo in LSCM, Pe	, Types of pa ainerization, F ocurement lysis cumentation,	Pervasivenes Risk manage etrics in Supp		oply Chain M	lanagement	[9]				
Application Application Application Package Pa	ations ging ar Bar-co ILSCN and ir	of Packaging of labeling do oding, RFID, of and performort proced nanagement is	g in logistics, etails, Conta GPS, E- Pro mance anal ure and Doo in LSCM, Pe	, Types of pa hinerization, Focurement lysis cumentation, erformance me	Pervasivenes Risk manage etrics in Supp	ement in glob	oply Chain N al logistics, (lanagement					
Application Applic	ations ging ar Bar-co ILSCN and ir nship n ies- El Book(s	of Packaging of labeling doding, RFID, of and performport proced management in C, EIA, APED	g in logistics, etails, Conta GPS, E- Promance anal ure and Doc in LSCM, Pe DA, MEPEDA	, Types of pa ainerization, F ocurement lysis cumentation, erformance mo a. Rapid alert	Pervasivenes Risk manage etrics in Supp system.	ement in glob	oply Chain Male of the control of th	Customer	[9] 45				
Application package—ERP, Globa Export relation agenci	ations ging ar Bar-co ILSCN and ir nship n ies- El Book(s	of Packaging of labeling doding, RFID, of and performport proced management in C, EIA, APED of the control of t	g in logistics, etails, Conta GPS, E- Promance anal ure and Doc in LSCM, Pe DA, MEPEDA	, Types of pa ainerization, F ocurement lysis cumentation, erformance mo a. Rapid alert	Pervasivenes Risk manage etrics in Supp system.	ement in glob	oply Chain Male of the control of th	lanagement Customer	[9] 45				
Applica packaq –ERP, Globa Export relation agenci	ations ging ar Bar-c ILSCN and ir nship n ies- El DKA 2010.	of Packaging of labeling doding, RFID, of and perfor nport proced nanagement in C, EIA, APED of the performance of the performa	g in logistics, etails, Conta GPS, E- Promance analure and Docin LSCM, Pero A, MEPEDA	, Types of pa ainerization, F ocurement lysis cumentation, erformance ma A. Rapid alert	Risk manage etrics in Supp system.	ement in glob oly Chain, Ind	al logistics, (an Dishers India	Customer	[9] 45 mpression				
Application Application Package — ERP, Globa Export relation agenci	ations ging ar Bar-co I LSCN and ir nship n ies- El D K A 2010. Sunil	of Packaging of labeling doding, RFID, If and perfor anagement in C, EIA, APED (Chopra and I	g in logistics, etails, Conta GPS, E- Promance analure and Docin LSCM, Pero A, MEPEDA	, Types of pa ainerization, F ocurement lysis cumentation, erformance ma A. Rapid alert	Risk manage etrics in Supp system.	ement in glob oly Chain, Ind	al logistics, (an Dishers India	Customer otal Hours:	[9] 45 mpression				
Application Application Application Package — ERP, Globa Export relation agencia — Text B 1	ations ging ar Bar-ca I LSCN and ir nship n ies- El Cook(s D K A 2010. Sunil	of Packaging of labeling doding, RFID, and performport proced nanagement in C, EIA, APED garwal, "Logis Chopra and I	g in logistics, etails, Conta GPS, E- Promance analure and Docin LSCM, Pero A, MEPEDA Stics and suppeter Meind David Brunt	, Types of pa ainerization, F ocurement lysis cumentation, erformance ma a. Rapid alert opply chain ma i, "Supply chain,	Pervasivenes Risk manage etrics in Supp system. Inagement", I	ement in glob oly Chain, Ind	al logistics, (ian Tolishers Indian Education,	Customer Cotal Hours: Ltd., Eighth I 6th edition, 2	[9] 45 mpression				
Application Application Package — ERP, Globa Export relation agenciation Text B 1. 2. Refere	ations ging ar Bar-co I LSCN and ir nship n ies- El Book(s D K A 2010. Sunil Pence(s David Vikas Micha	of Packaging of labeling doding, RFID, M and performport proced nanagement in C, EIA, APED garwal, "Logis Chopra and I tomson Lea	g in logistics, etails, Conta GPS, E- Promance analure and Docin LSCM, Peropa, MEPEDA Stics and suppeter Meind David Bruntarning publis	, Types of parainerization, Focurement lysis cumentation, erformance manda. Rapid alert lysis cumentation, erformance manda. Rapid alert lysis chain manda. "Supply chain manda.", "Manufactushers, 2009.	Risk manage etrics in Supp system.	ement in glob bly Chain, Ind Macmillan Pul nent" Pearsor	al logistics, (ian Tolishers Indian Education,	Customer Cotal Hours: Ltd., Eighth I 6th edition, 2	[9] 45 mpression 016.				
Application Application Application Package — ERP, Globa Export relation agenciated Text B 1. 2. Reference 1.	ations ging ar Bar-co I LSCN and ir nship n ies- El D K A 2010. Sunil Pence(s David Vikas Micha Limite Dougl	of Packaging of labeling doding, RFID, of and performport proced nanagement in C, EIA, APED Chopra and I Taylor and Thomson Lead of 2004 as M. "Supplication of labeling in the labeling in	g in logistics, etails, Conta GPS, E- Promance analure and Docin LSCM, Pero A, MEPEDA Stics and suppersonant of the promand of	, Types of pa ainerization, F ocurement lysis cumentation, erformance ma a. Rapid alert oply chain ma i, "Supply chain, i, "Manufactushers, 2009.	Pervasivenes Risk manage etrics in Supp system. Inagement", I ain managen ring Operation man "Food S ocesses", Pa	ement in globoly Chain, Ind Macmillan Pulment" Pearson ons and Supply Chain I	al logistics, (sian Tolishers Indian Education, oly chain Ma	Customer Cotal Hours: Ltd., Eighth I 6th edition, 2	[9] 45 mpression 016.				

^{*}SDG 12 - Responsible Consumption and Production

Course C	Course Contents and Lecture Schedule							
S. No.	Topics	No. of hours						
1.0	Introduction to Food Supply Chain Management							
1.1	Logistics and supply chain management	1						
1.2	Fundamentals of LSCM	1						
1.3	Scope of LSCM	1						
1.4	Significance and Drivers	1						
1.5	Basic Model – Primary Activities	1						
1.6	Basic Model – Secondary Activities	1						
1.7	Role and Challenges of Logistics	1						
1.8	Supply chain management in food industry.	2						
2.0	Procurement and warehousing							
2.1	Demand and supply management	1						
2.2	Demand planning and demand forecasting processes	1						
2.3	Forecasting techniques	1						
2.4	Strategic planning for material sourcing	1						
2.5	Outsourcing strategies Organizing and detailing of all tactical	1						
2.6	Operational information	1						
2.7	Warehouse strategies Planning	1						
2.8	Managing warehouse operations	1						
2.9	Inventory models and control techniques	1						
3.0	Distribution and transportation							
3.1	Various sources of distribution channels	1						
3.2	Distribution models: Nature	1						
3.3	Distribution models: Functions & Services of 3PL and 4PL	2						
3.4	Distribution network planning: customer-side solutions	1						
3.5	Distribution network planning: network-side solutions	1						
3.6	Modes of transportation	1						
3.7	Design of trans-shipment: Concepts of transportation management	1						
3.8	Managing transportation operations and its interaction	1						
4.0	Packaging and information technology							
4.1	Applications of Packaging in logistics	1						
4.2	Types of packaging and packaging materials	1						
4.3	Export &import packaging	1						
4.4	Labelling details	1						
4.5	Containerization	1						
4.6	Pervasiveness of IT in Supply Chain Management –ERP	1						
4.7	Bar-coding	1						
4.8	RFID, GPS, E- Procurement	3						
5.0	Global LSCM and performance analysis							
5.1	Export and import procedure and Documentation	1						
5.2	Risk management in global logistics	1						
5.3	Customer relationship management in LSCM	1						
5.4	Performance metrics in Supply Chain	1						
5.5	Indian agencies- EIC	1						
5.6	EIA	1						
5.7	APEDA, MEPEDA	2						
5.8	Rapid alert system	1						

Mr. S. Nithishkumar - nithishkumar@ksrct.ac.in



60 FT L04	Basics of Packaging	Category	L	T	Р	Credit
0011104	Technology	OE	3	0	0	3

- To provide students with different types of packaging and its background
- To learn the produce and pack using glass materials
- To learn the Cushion materials manufacturing and used in pack.
- To study the different types of metals and its application
- To provide the classification and use of steel packaging

Pre-requisites

NIL

Course Outcomes

CO1	Understand different types of paper for packaging	Understand
CO2	Explain about types of glass and glass containers	Understand
CO3	Analysis of cushioning material	Understand
CO4	Understand different types of metal cans.	Understand
CO5	Analysis of various types of Corrugated Board.	Understand

Mappi	ng with	Progra	amme (Outcom	nes										
COs						P	Os							PSOs	
003	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1	3	3	2	2	-	-	2	-	-	-	-	-	-	-	2
CO2	3	3	2	2	-	-	3	-	-	-	-	-	3	-	3
CO3	3	3	2	2	-	-	3	-	-	-	-	-	2	-	3
CO4	3	3	2	2	-	-	3	-	-	-	-	-	3	-	3
CO5	3	3	2	2	-	-	3	-	-	-	-	-	3	-	3
3 - Str	ong; 2 -	Mediur	m; 1 - S	ome											

A	D-11
Assessment	Pattern

Bloom's Category	Continuous Ass (Ma	essment Tests irks)	End Sem Examination (Marks)
Category	1	2	7
Remember	20	20	40
Understand	40	40	60
Apply	-	-	-
Analyse	-	-	-
Evaluate	-	-	-
Create	-	-	-
Total	60	60	100

Sylla	bus								
		K	.S.Rangasa		of Technolog		mous R2022	2	
					. Food Techr				
			60 F1 Hours/Week	L04 - Basic	cs of Packag			wina um Marka	
Semester	<u>r</u>	T T	Р	Total Hours	Credit C	CA	ximum Marks	Total	
			•	-		-			100ai
- 3 0 0 45 3 40 60 Paper & Corrugated Board in Packaging** Types of Papers for Packaging, Corrugated Board, Materials, Components of Corrugated Board, Liners, Fluting, Adhesives, Board and box manufacture, Box style, Box Dimensions,									[9]
Glass Histor Mater glass	s in Pac ry, Intro rials us contair	ed for manut	Glass Materia facturing gla Applications	als, Composi ss containers Advantages	tion of Glass s, Properties & Disadvant	of Glass, Ty	pes of Glas	s, Types of	[9]
Cush of cus	ioning r shion m oning n	aterials, Soli	ctor Conside d vs. Loose t	ill, Foam-in-	n design, Ne blace, Cushic ing and adva	on curves and	d design, cor	rugated as a	[9]
Histor their	ry, Intro properti	es (Physical,	Chemical &	Mechanical)	ction Process , Aluminum t their applica	pased packag	ging*, Conve	rsion	[9]
Steel Cans Seam - its	based: : Histor nless Ca design,	ry of Metal Cans, and Can	Cans, Types Dimensionir & & Disadva	of Metal Cang. Introduction of the control of the c	red steels like Ins - Three pon to Metal Coduction to A	oiece & Two ollapsible Tu	piece Cans bes	, Welded &	[9]
							Т	otal Hours:	45
Text	Book(s	•							
1.		ta, Walter. Fu es, IL 2014.	ındamentals	of Packaging	Technology	, Institute of I	Packaging Pi	ofessionals, S	
2.	Josep	h Hanlon E I							t.
		ni i i ai ii oi i i . i	Handbook of	Package En	gineering. Mo	Graw-Hill, 20	016.		t.
Refer	rence(s):							t.
Refer 1.	rence(s Mark):						edition, Wiley-	t.

^{*}SDG 9 – Industry Innovation and Infrastructure
**SDG 3 – Good Health and Well Being
***SDG 12 - Responsible consumption and production

ourse CC	ontents and Lecture Schedule	ourse Contents and Lecture Schedule								
S. No.	Topics	No. of hours								
1.0	Paper & Corrugated Board in Packaging									
1.1	Types of Papers for Packaging, Corrugated Board	1								
1.2	Materials, Components of Corrugated Board	2								
1.3	Liners, Fluting, Adhesives	1								
1.4	Board and box manufacture	1								
1.5	Box style, Box Dimensions, printing, Closing Box,	2								
1.6	Box Design, Flute selection.	2								
2.0	Glass in Packaging :									
2.1	History, Introduction to Glass Materials	1								
2.2	Composition of Glass, Chemical Structure of Glass	1								
2.3	Raw Materials used for manufacturing glass containers	1								
2.4	Properties of Glass	1								
2.5	Types of Glass, Types of glass containers, Uses, Applications	2								
2.6	Advantages & Disadvantages of glasses	1								
2.7	Types and Design of Bottles, Closures, Seals	1								
2.8	Glass Industry, Market Overview	1								
3.0	Cushioning Materials Packaging:	•								
3.1	Cushioning materials	1								
3.2	Factor Considered in cushion design	1								
3.3	Need of cushion Packaging	1								
3.4	Properties of cushion materials	1								
3.5	Solid vs. Loose fill, Foam-in-place	2								
3.6	Cushion curves and design, corrugated as a cushioning material	1								
3.7	Economics of cushion designing and advantages	1								
3.8	packaging costs vs. product damage	1								
4.0	Metals in Packaging-I:	l								
4.1	History of Metals	1								
4.2	Introduction of Metals	1								
4.3	Overview of Extraction Processes	1								
4.4	Important Metals in Packaging & their properties (Physical, Chemical & Mechanical)	2								
4.5	Aluminum based packaging	1								
4.6	Conversion processes for Sheets	1								
4.7	Aluminum Foil, properties & their applications.	1								
4.8	Market & Industry Overview	1								
5.0	Metals in Packaging-II:									
5.1	Steel based: Stainless	1								
5.2	Galvanized Steel - Coated steels like Tin plate	1								
5.3	Tin free Steel and Metal Cans	1								
5.4	History of Metal Cans	1								
5.5	Types of Metal Cans - Three piece & Two piece Cans	1								
5.6	Welded & Seamless Cans, and Can Dimensioning	1								
5.7	Introduction to Metal Collapsible Tubes - its design, Advantages & Disadvantages.	1								
5.8	Introduction to Aerosol Containers Classification of Aerosols	1								

1. Dr. P. Shanmugam-<u>shanmugam@ksrct.ac.in</u>

