K.S.Rangasamy College of Technology

(Autonomous Institution affiliated to Anna University, Chennai)

CURRICULUM ANDSYLLABI

FOR

M.Tech. Food Technology

(For the batch admitted in 2022-2023)

R2022

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

KSR Kalvi Nagar, Tiruchengode – 637215.
Namakkal District, Tamil Nadu, India.

Department of Food Technology

VISION

- To produce competent technologist, scientist, researchers and entrepreneurs in Food Technology

MISSION

- To pursue research in engineering areas of Food Science and Technology through quality education
- To impartent repreneurial skills for the production of quality food products

PROGRAM EDUCATIONAL OBJECTIVES (PEOs)

PEO1: Graduates are professionally competent in Food Technology to solve problems in food science, food engineering, processing, environmental, safety and quality.

PEO2: Graduates are expertise in theory and practice in use of recent techniques and skills which are essential in food technology

PEO3: Graduates perform as an individual and / or member of a team with professional and ethical behaviour.

PROGRAMME OUTCOMES (POs)

Engineering Graduates will be able to:

PO1: Carry out research / investigation independently and develop solutions to solve practical problems related to food industries

PO2: 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.

PO3: Demonstrate a degree of mastery over the area as per the specialization of the program. The mastery should be at a level higher than the requirements in the appropriate bachelor program.

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

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

Programme Educational Objectives	Programme Outcomes		
	PO1	PO2	PO3
PEO 1	2	3	3
PEO 2	3	3	2
PEO 3	3	3	2

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

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MAPPING-PG-FOODTECHNOLOGY

Year	Sem	CourseName	PO1	PO2	PO3
I	I	Applied statistics for Food Technology	1	2	2
		Advanced Drying Technology	1	2	2
		Unit operations in Food Process Engineering	1	1	1
		Food Chemistry and Microbiology	2	3	2
		Research Methodology and IPR	1	3	3
		Professional Electivel	1	2	2
		Mandatory Coursel	2	2	2
		Food Testing and Evaluation Laboratory	2	2	2
	II	Instrumental Techniques and methods for Food Analysis		2	1
		Advanced Refrigeration and Cold Chain Management	2		
		Food Safety and Quality Control	1	2	3
		Professional Elective II	1	2	1
		Professional Elective III	1	1	1
		Professional Elective IV	1	2	1
		Mandatory Course II	2	1	2
		Food Product Development Laboratory	1	2	3
		Term Paper and Seminar	2	3	3
II	III	Plantation Crops and Spices Technology	2	1	3
		Food Process Plant Layout and Design	1	2	2
		Food Rheology	1	2	1
		Professiona IV	1	1	2
		Professional Elective VI	2	1	2
		Project Work Phase I	3	3	3
	IV	Project Phase II	3	3	3

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Credit Distribution for M. Tech. Food Technology Programme – 2022 – 2023 Batch

SUMMARY

S.No.	Category	Credits Per Semester				Total Credits	Percentage (%)
		I	II	III	IV		
1	PC	19	14	3	-	**36**	**50.00**
2	PE	3	9	6	-	**18**	**25.00**
3	EEC	-	-	6	12	**18**	**25.00**
4	AC	AC I	AC II	-	-	**-**	**-**
Total		**22**	**23**	**15**	**12**	**72**	**100**

PC - PROFESSIONAL CORE
PE – PROFESSIONAL ELECTIVES
EEC – EMPLOYMENT ENHANCEMENT
COURSES AC – AUDIT COURSE

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PROFESSIONAL CORE (PC)

S.No.	Course Code	CourseTitle	Category	Contact Periods	L	T	P	C	Pre requisite
1	60PFT101	Applied Statistics for Food Technology	PC	5	3	2	0	4	NIL
2	60PFT102	Advanced Drying Technology	PC	5	3	2	0	4	NIL
3	60PFT103	Unit operations in Food Process Engineering	PC	3	3	0	0	3	NIL
4	60PFT104	Food Chemistry and Microbiology	PC	3	3	0	0	3	NIL
5	60PFT105	Research Methodology and IPR	PC	3	3	0	0	3	NIL
6	60PFT1P1	Food Testing and Evaluation Laboratory	PC	4	0	0	4	2	NIL
7	60PFT201	Instrumental Techniques and Methods for Food Analysis	PC	5	3	2	0	4	NIL
8	60PFT202	Advanced Refrigeration and Cold Chain Management	PC	5	3	2	0	4	NIL
9	60PFT203	Food Safety and Quality Control	PC	3	3	0	0	3	NIL
10	60PFT301	Plantation Crops and Spices Technology	PC	3	3	0	0	3	NIL
11	60PFT2P1	Food Products Development Laboratory	PC	6	0	0	6	3	NIL

PROFESSIONAL ELECTIVES (PE)
SEMESTER I, ELECTIVE I

S.No.	Course Code	CourseTitle	Category	Contact Periods	L	T	P	C	Pre requisite
1	60PFTE11	Advanced Fruit and Vegetable Processing Technology	PE	3	3	0	0	3	NIL
2	60PFTE12	Novel Technologies in Food Processing	PE	3	3	0	0	3	NIL
3	60PFTE13	Heat and Mass Transfer Operations in Food Processing	PE	3	3	0	0	3	NIL

SEMESTER II, ELECTIVE II

S.No.	Course Code	Course Title	Category	Contact Periods	L	T	P	C	Pre requisite
1.	60PFTE21	Industrial Engineering	PE	3	3	0	0	3	NIL
2.	60PFTE22	Industrial Waste Management	PE	3	3	0	0	3	NIL
3.	60PFTE23	Advanced Baking and Confectionery Technology	PE	3	3	0	0	3	NIL

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SEMESTER II, ELECTIVE III

S.No.	Course Code	Course Title	Category	Contact Periods	L	T	P	C	Pre requisite
1.	60PFTE31	Technology of Food Colours and Flavours	PE	3	3	0	0	3	NIL
2.	60PFTE32	Advanced Separation Techniques in Food Processing	PE	3	3	0	0	3	NIL
3.	60PFTE33	Food Product Design and Development	PE	3	3	0	0	3	NIL

SEMESTER II, ELECTIVE IV

S.No.	Course Code	Course Title	Category	Contact Periods	L	T	P	C	Pre requisite
1.	60PFTE41	Advanced Grain Science and Technology	PE	3	3	0	0	3	NIL
2.	60PFTE42	Food Additives, Nutraceuticals and Functional Foods	PE	3	3	0	0	3	NIL
3.	60PFTE43	Advanced Beverage Technology	PE	3	3	0	0	3	NIL

SEMESTER III, ELECTIVE V

S.No.	Course Code	CourseTitle	Category	Contact Periods	L	T	P	C	Pre requisite
1.	60PFTE51	Snacks and Extruded Products Technology	PE	3	3	0	0	3	NIL
2.	60PFTE52	Internet of Things in Food and Agriculture	PE	3	3	0	0	3	NIL
3.	60PFTE53	Sensory Evaluation of Foods	PE	3	3	0	0	3	NIL

SEMESTER III, ELECTIVE VI

S.No.	Course Code	Course Title	Category	Contact Periods	L	T	P	C	Pre requisite
1.	60PFTE61	Advanced Food supply chain management	PE	3	3	0	0	3	NIL
2.	60PFTE62	Advanced Meat ProcessingTechnology	PE	3	3	0	0	3	NIL
3.	60PFTE63	Advanced DairyTechnology	PE	3	3	0	0	3	NIL

AUDIT COURSES (AC)

S.No.	Course Code	CourseTitle	Category	Contact Periods	L	T	P	C	Pre requisite
1.	60PAC001	English for Research Paper Writing	MC	2	2	0	0	0	NIL
2.	60PAC002	Disaster Management	MC	2	2	0	0	0	NIL
3.	60AT008	Constitution of India	MC	2	2	0	0	0	NIL

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EMPLOYABILITY ENHANCEMENT COURSES (EEC)

S.No.	Course Code	Course Title	Category	Contact Periods	L	T	P	C	Pre requisite
1.	60PFT2P2	Term Paper and Seminar	EEC	2	0	0	2	0	NIL
2.	60PFT3P1	Project Work (PhaseI)	EEC	12	0	0	12	6	NIL
3.	60PFT4P1	Project Work (PhaseII)	EEC	24	0	0	24	12	NIL

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COURSES OF STUDY
(For the candidates admitted from 2022 – 2023 onwards)

SEMESTER-I								
S.No.	Course Code	Course Title	Category	Contact Periods	L	T	P	C
THEORY								
1	60PFT101	Applied Statistics for Food Technology	PC	5	3	2	0	4
2	60PFT102	Advanced Drying Technology	PC	5	3	2	0	4
3	60PFT103	Unit operations in Food Process Engineering	PC	3	3	0	0	3
4	60PFT104	Food Chemistry and Microbiology	PC	3	3	0	0	3
5	60PED001	Research Methodology and IPR	PC	3	3	0	0	3
6	60PFTE1*	Professiona lElective I	PE	3	3	0	0	3
7	60PAC001	English for Research Paper Writing	AC	2	2	0	0	0
PRACTICALS								
8	60PFT1P1	Food Testing and Evaluation Laboratory	PC	4	0	0	4	2
			Total	28	20	4	4	22

SEMESTER-II								
S.No.	Course Code	Course Title	Category	Contact Periods	L	T	P	C
THEORY								
1.	60PFT201	Instrumental Techniques and Methods for Food Analysis	PC	5	3	2	0	4
2.	60PFT202	Advanced Refrigeration and Cold Chain Management	PC	5	3	2	0	4
3.	60PFT203	Food Safety and Quality Control	PC	3	3	0	0	3
4.	60PFTE2*	Professional Elective II	PE	3	3	0	0	3
5.	60PFTE3*	Professional Elective III	PE	3	3	0	0	3
6.	60PFTE4*	Professional Elective IV	PE	3	3	0	0	3
7.	60PAC002	Disaster Management	AC	2	2	0	0	0
PRACTICALS								
8.	60PFT2P1	Food Products Development Laboratory	PC	6	0	0	6	3
9.	60PFT2P2	Term Paper and Seminar	EEC	2	0	0	2	0
			Total	32	20	4	8	23

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SEMESTER-III								
S.No.	**Course Code**	**Course Title**	**Category**	**Contact Periods**	**L**	**T**	**P**	**C**
THEORY								
1.	60PFT301	Plantation Crops and Spices Technology	PC	3	3	0	0	3
2	60 PFT 302	Food Process Plant Layout and Design	PC	5	3	2	0	4
3	60 PFT 303	Food Rheology	PC	5	3	2	0	4
2.	60PFTE5*	Professional Elective V	PE	3	3	0	0	3
3.	60PFTE6*	Professional Elective VI	PE	3	3	0	0	3
PRACTICAL								
4.	60PFT3P1	Project work Phase I	EEC	12	0	0	12	6
			Total	**31**	**15**	**4**	**12**	**23**

SEMESTER-IV								
S.No.	**Course Code**	**Course Title**	**Category**	**Contact Periods**	**L**	**T**	**P**	**C**
PRACTICAL								
1.	60PFT4P1	Project Work Phase II	EEC	24	0	0	24	12
			Total	**24**	**0**	**0**	**24**	**12**

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M.E. / M.Tech. Degree Programme

SCHEME OF EXAMINATIONS
(For the candidates admitted from 2022-2023 onwards)

FIRST SEMESTER

S.No.	Course Code	Name of the Course	Duration of Internal Exam	Weightage of Marks			Minimum Marks for Pass in End Semester Exam	
				ContinuousAssessment *	End Semester Exam **	Max. Marks	End Semester Exam	Total
THEORY								
1	60PFT101	Applied Statistics For Food Technology	2	40	60	100	45	100
2	60PFT102	Advanced Drying Technology	2	40	60	100	45	100
3	60PFT103	Unit operations in Food Process Engineering	2	40	60	100	45	100
4	60PFT104	Food Chemistry and Microbiology	2	40	60	100	45	100
5	60PFT105	Research Methodology and IPR	2	40	60	100	45	100
6	60PFTE1*	Professional Elective I	2	40	60	100	45	100
7	60AT00*	Audit Course I	2	100	-	100	-	-
PRACTICAL								
8	60PFT1P1	Food Testing and Evaluation 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 the award of terminal examination marks

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60 PFT101	ADVANCED MATHEMATICS FOR FOOD TECHNOLOGY	Category	L	T	P	Credit
		PC	3	2	0	4

Objective

- To comprehend the concepts of Linear Programming Problems.
- To learn the concepts of transportation and assignment models.
- To getexposed to basics of descriptive statistics.
- To familiarize with various smethods intesting of hypothesis.
- To understand the basic concepts of analysis of variance and control charts

Prerequisite

NIL

CourseOutcomes

On the successful completion ofthe course, students willbe able to

CO1	Analyze various methods in linear programming techniques	Remember, Understand, Analyze
CO2	Employ the different techniques for solving transportation and assignment models.	Remember, Understand, Apply
CO3	Apply the basics of descriptive statistics.	Remember, Apply
CO4	Test the statistical hypothesis using t, F and chi-square test	Remember, Understand, Analyze
CO5	Analyze the design of experiments and to interpret quality control charts.	Remember, Understand, Analyze

Mapping with Programme Outcomes

Cos	PO1	PO2	PO3
CO1	3	3	3
CO2	3	3	3
CO3	3	3	3
CO4	3	3	3
CO5	3	3	2
3- Strong, 2-Medium, 1-Some			

Assessment Pattern

Bloom's Category	Continuous Assessment Tests (Marks)		End Semester Examination (Marks)
	1	2	
Remember (Re)	10	10	10
Understand(Un)	10	10	20
Apply(Ap)	20	20	30
Analyze(An)	20	20	40
Evaluate(Ev)	0	0	0
Create(Cr)	0	0	0

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60PFT101-ADVANCED MATHEMATICS FOR FOOD TECHNOLOGY								
M.Tech. Food Technology								
Semester	Hours Week			Total hrs	Credit	MaximumMarks		
	L	T	P		C	CA	ES	Total
I	3	2	0	60	4	40	60	100

Linear Programming Problems Formulation of LP problem – Solution of LP problem: Graphical method-Simplex method – Big – M method – Duality	[9]
Transportation and Assignment Problems Transportation problems: North – west corner rule – Least cost method -Vogel's approximation method – MODI method – Assignment problems: Balanced and Unbalanced assignment problems-Travelling salesman problems	[9]
Descriptive Statistics Measures of Central tendency – Mean, Median, Mode – Measures of Dispersion – Quartile deviation – Mean deviation – Standard deviation – Coefficient of variation	[9]
Testing of Hypothesis Test of significance of small samples-Student's 't' test – Single mean –Difference of means – F - test-Chi-square test- Goodness off it- Independence of attributes	[9]
Design of Experiments and Quality Control Analysis of variance – One-way classification- Completely randomized design-Two-way classification- Randomized block design- Latin square- Control charts-Mean ($\bar{X}$) and Range(R) chart- nPchart- Pchart	[9]
Total Hours: 45+15 (Tutorial)	60

Text book(s):

1.	KantiSwarup, P.K.Gupta and Man Mohan,"Operations Research",Sultan Chand & Sons, New Delhi
2.	GuptaS.C and KapoorV.K., "Fundamentals of Mathematical Statistics", 11th Edition, Sultan Chand & Sons, New Delhi, 2007

Reference(s):

1.	Sundaresan V, Ganapathy Subramanian K S, and Ganesan K, "Operations Research", A.R.Publications, Chennai
2.	Veerarajan T., "Probability, Statistics and Random Process", Tata McGraw-Hill Publishing Company Ltd, New Delhi, 2nd Edition, 2008.
3.	Introduction to Operations Research- Dr. G.Srinivasan, NPTEL online video courses
4.	Probability and Statistics -Dr.Somesh Kumar, NPTEL online video courses

Course Contents and Lecture Schedule

S.No.	Topic	No. of Hours
1	**Linear Programming Problems**	
1.1	Formulation of LP problem	1
1.2	Graphical method	2
1.3	Simplex method	1
1.4	Tutorial	2
1.5	Big-M method	2
1.6	Duality	2
1.7	Tutorial	2
2	**Transportation and Assignment Problems**	
2.1	North – west corner rule	1
2.2	Least cost method	1
2.3	Vogel's approximation method	1
2.4	MODI method	2
2.5	Tutorial	2
2.6	Balanced assignment problems	1

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2.7	Unbalanced assignment problems	1
2.8	Travelling salesman problems	1
2.9	Tutorial	2
3	**Descriptive Statistics**	
3.1	Mean, Median, Mode	2
3.2	Quartile deviation	1
3.3	Mean deviation	1
3.4	Tutorial	2
3.5	Standard deviation	2
3.6	Coefficient of variation	2
3.10	Tutorial	2
4	**Testing of Hypothesis**	
4.1	Student's 't' test	1
4.2	Single mean	1
4.3	Difference of means	1
4.4	F-test	1
4.5	Tutorial	2
4.6	Chi-square test	2
4.7	Goodness off it	1
4.8	Independence of attributes	1
4.9	Tutorial	2
5	**Design of Experiments and Quality Control**	
5.1	One-way classification	1
5.2	Completely randomized design	1
5.3	Two-way classification	1
5.4	Randomized block design	1
5.5	Tutorial	2
5.6	Latin square	1
5.7	Mean ·X) and Range (R) chart	1
5.8	nP chart	1
5.9	P chart	1
5.10	Tutorial	2
	Total	60

Course Designers

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		Category	L	T	P	Credit
60 PFT102	ADVANCED DRYING TECHNOLOGY	PC	3	2	0	4

Objective

- To apply mechanism of drying and determine water activity
- To make use of spray and freeze-drying techniques for food materials
- To outline concepts of drying using inert particles,pneumatic and fluidized bed drying
- To select appropriate novel drying technique for drying of food materials
- To choose suitable advanced dryers for different food materials

Pre requisite

NIL

Course Outcomes

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

CO1	Apply mechanism of drying and determine water activity	Remember, Understand, Analyze
CO2	Make use of spray and freeze - drying techniques for food materials	Remember, Understand, Apply
CO3	Outline concepts of drying using inert particles, pneumatic and fluidized bed drying	Remember, Apply
CO4	Select appropriate novel drying technique for drying of food materials	Remember, Understand, Analyze
CO5	Choose suitable advanced dryers for different food materials	Remember, Understand, Analyze

Mapping with Programme Outcomes

COs	PO1	PO2	PO3
CO1	3	3	3
CO2	3	3	3
CO3	3	3	3
CO4	3	3	3
CO5	3	3	2
3-Strong;2-Medium;1-Some			

Assessment Pattern

Bloom's Category	Continuous Assessment Tests (Marks)		End Semester Examination (Marks)
	1	2	
Remember (Re)	10	10	10
Understand(Un)	10	10	20
Apply(Ap)	20	20	30
Analyze(An)	20	20	40
Evaluate(Ev)	0	0	0
Create(Cr)	0	0	0

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60PFT102- ADVANCED DRYING TECHNOLOGY								
M.Tech. Food Technology								
Semester	Hours / Week			Total hrs	Credit	Maximum Marks		
	L	T	P		C	CA	ES	Total
I	3	2	0	60	4	40	60	100

Introduction to Drying Drying and dehydration - Principles - Mechanism of drying - Internal and external conditions of drying - Drying rate characteristic curves - Diffusion theories of drying - Effective Fickian diffusivity - Water activity -Water activity predictive models – Calculations-Sorption Isotherm - Hysteresis - Determination of sorption isotherms – Gravimetric method-Manometric method and Hygroscopic methods	**[9]**
Spray drying and Freeze drying Spray drying-Concept-Components of spray drier-Spray dryer nozzle- Mechanism of atomization - Drop size and drop distribution. Drying of droplets - Fundamentals, residence time -Heat and mass balance -drier efficiency - new developments in Spray drying -Spray freeze drying.Freeze drying - Concept, principle. Stages in freeze drying - Heat and mass transfer, calculations, design considerations – Industria lfreeze dryers-Advances in freeze drying–Microwave freeze drying.	**[9]**
Drying on inert particles Introduction – Inert particle drying- Pneumatic drying – Principle – Mechanism Working and its applications. Fluidized bed drying-Principles of fluidization- Components of fluidized bed system-Classification of fluidized bed dryers-Conventional and modified FBD.	**[9]**
Novel drying Super-heated steam drying - Principles - Classification - Selection - Applications. Heat pump drying (HPD)–Principle- Low temperature HPD-Chemical HPD- Developments and trends.Contact-Sorption drying- Mechanism- Characteristics of sorbents / carriers- High electric field drying	**[9]**
Advanced dryers Microwave dryers-Basic concepts-Industrial applications- Hybrid microwave dryers- Infra-red drying-Principles-Industrial dryers-Applications-Sonic drying-Slush drying-Refractance Window drying.	**[9]**
TotalHours:45+15(Tutorial)	**60**

Text book(s):	
1.	Mujumdar A.S., “Hand book of Industrial Drying”, 3rd Edition, CRC Press, Taylor and Francis group, UK,2007.
2.	XiaoDongChen and Mujumdar A.S., “Drying Technologies in Food Processing”, 1st Edition, Wiley-Blackwell, 2008.
Reference(s):	
1.	Kudra T. and MujumdarA.S., “Advanced Drying Technologies”, 2nd Edition, CRC Press, Taylorand Francis Group,UK,2009.
2.	Mujumdar A.S., “Handbook of Industrial Drying”, 3rd Edition, CRC Press, Taylor and Francis group, UK,2007.

Course Contents and Lecture Schedule

S.No.	Topic	No.of Hours
1	Introduction to Drying	
1.1	Drying and dehydration principles	1
1.2	Mechanism of drying	2
1.3	Drying rate characteristics curves	1
1.4	Diffusion theory	2
1.5	Water activity	2

1.6	Determination of sorption isotherms	2
1.7	Tutorial	2
2	**Spray drying and Freeze drying**	
2.1	Spray drying concept	1
2.2	Components of Spray drying	1
2.3	Mechanism of atomization	1
2.4	Drying of droplets	2
2.5	Tutorial	2
2.6	Heat and Mass balance	1
2.7	Freeze drying	1
2.8	Advances in freeze drying	1
2.9	Tutorial	2
3	**Drying of inert particles**	
3.1	Inert particle drying	2
3.2	Pneumatic Drying principle	1
3.3	Mean deviation	1
3.4	Tutorial	2
3.5	Standard deviation	2
3.6	Coefficient of variation	2
3.10	Tutorial	2
4	**Novel Drying**	
4.1	Super-heated Steam drying	1
4.2	Principle and classification and applications	1
4.3	Heat pump drying	1
4.4	Low temperature HPD	1
4.5	Tutorial	2
4.6	Chemical HPD	2
4.7	Contact sorption drying	1
4.8	High electric field drying	1
4.9	Tutorial	2
5	**Advanced Drying**	
5.1	Microwave Dryers	1
5.2	Basic concepts	1
5.3	Industrial Applications	1
5.4	Hybrid Microwave dryers	1
5.5	Tutorial	2
5.6	Infra-red dryers	1
5.7	Principles Infrared dryers	1
5.8	Sonic Drying	1
5.9	Slush drying	1
5.10	Tutorial	2
	Total	60

Course Designers

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60 PFT103	UNIT OPERATIONS IN FOOD PROCESS ENGINEERING	Category	L	T	P	Credit
		PC	3	2	0	4

Objective

- To make use of material and energy balance in food processing operations
- To explain the concepts of fluids and fluid flow properties
- To outline the various mechanical operations carried in food processing
- To classify modes of heat transfer and explain heat exchangers and evaporators
- To summarize the various mass transfer operations

Pre requisite

NIL

Course Outcomes

On the successful completion of the course, students willbe able to

CO1	Make useof material and energy balance in food processing operations	Remember, Understand, Analyze
CO2	Explain the concepts of fluids and fluid flow properties	Remember, Understand, Apply
CO3	Outline the various mechanical operations carried in food processing	Remember,Apply
CO4	Classify modes of heat transfer and explain heat exchangers and evaporators	Remember, Understand, Analyze
CO5	Summarize the various mass transfer operations	Remember, Understand, Analyze

Mapping with Programme Outcomes

COs		PO1	PO2	PO3
CO1		3	2	3
CO2		3	3	3
CO3		3	2	2
CO4		3	3	3
CO5		3	2	2
	3-Strong;2-Medium;1-Some			

Assessment Pattern

Bloom's Category	Continuous Assessment Tests (Marks)		End Semester Examination (Marks)
	1	2	
Remember (Re)	10	10	10
Understand (Un)	10	10	20
Apply (Ap)	20	20	30
Analyze (An)	20	20	40
Evaluate (Ev)	0	0	0
Create (Cr)	0	0	0

K.S. Rangasamy College of Technology – Autonomous R2022								
60PFT 103–Unit Operations in Food Process Engineering								
M.Tech. Food Technology								
Semester	Hours / Week			Total hrs	Credit	Maximum Marks		
	L	T	P		C	CA	ES	Total
I	3	2	0	60	4	40	60	100

Material and Energy Balance Stoichiometric principles – Material balance without chemical reaction like distillation- Evaporation – Crystallization -Drying and extraction -Heat capacity of solids- Liquids, gases- enthalpy changes in food. Standard heat of reaction - Heats of formation - Combustion - Energy balance for systems without chemical reaction	**[9]**
Fluid flow Principles of fluid flow - Properties of liquids - Fluid dynamics - Potential energy - Kinetic energy - Pressure energy -Friction loss-Mechanical energy -Newtonian and non-Newtonian fluids- Stream line and turbulent flow - Flow measurement and measurement of viscosity - Kinematics of fluid flow - Concept of boundary layer - Basic equation of fluid flow: Equation of continuity and Bernoulli equation- Correction of Bernoulli equation for fluid friction – Application of Bernoulli equation for pumpwork.	**[9]**
Mechanical Operation Screening - Screening equipment - Effectiveness of screens - Gravity settling – Sedimentation - Thickening-Clarifier-Floatation-Filtration Principle-Types of filtrations- equipment.	**[9]**
Heat Transfer Concept of heat conduction - Fourier's law of heat conduction - One dimensional steady state heat conduction equation for flat plate and cylinder - Concept of heat convection - Natural and forced convection - Individual and overall heat transfer coefficient - Concept of radiations - Black body and grey body concept- Radiation Properties- Stefan Boltzmann law- Emissivity and absorptivity– Kirchhoff"s Law – Introduction to Heat exchanger and Evaporator equipment.	**[9]**
Mass Transfer Types of mass transfer operations – Fick"s law - Molecular and eddy diffusion in gas and liquids- Steady state diffusion under stagnant and laminar flow conditions-Diffusivity measurement -Local and overall mass transfer coefficients-Introduction to mass transfer operation: absorption- distillation- extraction- Leaching-Humidification.	**[9]**
Total Hours:45+15 (Tutorial)	**60**

Text book(s):	
1.	Goshal S.K., Sanyal S.K., DattaS., "Introduction to Chemical Engineering", 19th Edition, TataMc Graw-Hill, Delhi,2006.
2.	McCabeW.L.,Smith J.C. and HarriotP., "Unit Operations of Chemical Engineering", 7th Edition, McGraw -Hill, NewYork, 2005.
Reference(s):	
1.	Gavahane K.A.,"Unit operationI", 27th Edition, Nirali Prakasham Publications, Pune,2016

PassedinBoSMeetingheldon12/05/2023
ApprovedinAcademicCouncilMeetingheldon21/05/2023

BoSChairman

Course Contents and Lecture Schedule

S.No.	Topic	No.of Hours
1	**Material and Energy Balance**	
1.1	Stoichiometric principles	1
1.2	Material balance without chemical reaction	2
1.3	Evaporation	1
1.4	Drying and Extraction	2
1.5	Heat capacity of solids	2
1.6	Energy balance for systems	2
1.7	Tutorial	2
2	**Fluid Flow**	
2.1	Principles of fluid flow	1
2.2	Properties of liquid	1
2.3	Fluid dynamics	1
2.4	Newtonian and Non-Newtonian Fluids	2
2.5	Tutorial	2
2.6	Kinematics of fluid flow	1
2.7	Concept of boundary layer	1
2.8	Equation of Continuity	1
2.9	Tutorial	2
3	**Mechanical Operation**	
3.1	Screening	2
3.2	Effectiveness of Screening	1
3.3	Gravity settling	1
3.4	Tutorial	2
3.5	Sedimentation	2
3.6	Filtration Principle	2
3.10	Tutorial	2
4	**Heat Transfer**	
4.1	Concept of heat conduction	1
4.2	Fourier's law of Heat conduction	1
4.3	Concept of heat convection	1
4.4	Natural and forced Convection	1
4.5	Tutorial	2
4.6	Concept of Radiations	2
4.7	Emissivity and absorptivity	1
4.8	Kirchoffs law	1
4.9	Tutorial	2
5	**Mass Transfer**	
5.1	Types of Mass transfer Operation	1
5.2	Ficks Law	1
5.3	Molecular and Eddy Diffusion	1
5.4	Diffusivity Measurement	1
5.5	Tutorial	2
5.6	Introduction to Mass transfer Operation	1
5.7	Distillation	1
5.8	Extraction	1
5.9	Leaching	1
5.10	Tutorial	2
	Total	60

Course Designers

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PassedinBoSMeetingheldon12/05/2023
ApprovedinAcademicCouncilMeetingheldon21/05/2023

BoSChairman

60 PFT104	Food Chemistry and Microbiology	Category	L	T	P	Credit
		PC	3	0	0	3

Objective

- To analyze the role of water in food stability
- To examine the structure and functional role of food biomolecules
- To identify suitable technique for the modification of biomolecules
- To outline the significance of microbes in fermentation,spoilage and food borne infectious diseases

Pre requisite

NIL

Course Outcomes

On the successful completion of the course, students willbe able to

CO1	Analyze the role of waterin food stability	Remember, Understand, Analyze
CO2	Examine the structure and functional role of food biomolecules	Remember, Understand, Apply
CO3	Identify suitable technique for the modification of biomolecules	Remember, Apply
CO4	Outline the significance of microbes in fermentation, spoilage and food borne infectious	Remember, Understand, Analyze
CO5	Summarize the food preservation techniques	Remember, Understand, Analyze

Mapping with Programme Outcomes

COs	PO1	PO2	PO3
CO1	3	2	3
CO2	3	3	3
CO3	3	2	2
CO4	3	3	3
CO5	3	2	2
3-Strong;2-Medium;1-Some			

Assessment Pattern

Bloom's Category	Continuous Assessment Tests (Marks)		End Semester Examination (Marks)
	1	2	
Remember (Re)	10	10	10
Understand(Un)	10	10	20
Apply(Ap)	20	20	30
Analyze(An)	20	20	40
Evaluate(Ev)	0	0	0
Create(Cr)	0	0	0

K.S.Rangasamy College of Technology- Autonomous R2022								
60PFT 104-Food Chemistry and Microbiology								
M.Tech. Food Technology								
Semester	Hours/ Week			Total hrs	Credit	Maximum Marks		
	L	T	P		C	CA	ES	Total
I	3	0	0	60	4	40	60	100

Water relationships in Food and Carbohydrates Water activity and its relevance to deteriorative processes in foods- Glass transitions and molecular mobility - their relevance to quality and stability of foods. Structure and properties of simple and complex food carbohydrates- Modified starch and cellulose-Manufacture of malto dextrins and corn syrup- Cyclo dextrins-Chemistry and food applications-Polyols and its applications- Carbohydrates as fat substitutes	**[9]**
Lipids Classifications -Structureand roles of fatty acids. Food lipids and health– trans fatty acid, fatty acid, conjugated linolenic acid, phytosterols, carotenoids. Processing of oils and fats - refining - hydrogenation – inter esterification and winterization. Deterioration of oils - hydrolytic rancidity - oxidative rancidity and their prevention	**[9]**
Proteins Protein structure and conformation-Properties and reactions of proteins in food systems- Dissociation - Optical activity - solubility - hydration - swelling - foam formation - stabilization – gel formation- emulsifying effect- Denaturation of proteins- Food sources – functional role in foods- Texturized Proteins – methods	**[9]**
Microbial growth and Microbial Spoilage Types of microorganism normally associated with food-mold, yeast, and bacteria - Physical and chemical factors influencing growth of micro organisms – Biochemical changes caused by micro organisms - Microbial food fermentation – Microbiological standards for different foods – Food poisoning and microbial toxins. Principle and types of food spoilage - Microbial spoilage of different types of foods- Spoilage of fruits and vegetables – Fresh and processed meats,poultry,sea foods, Cereals products, bakery products, dairy products, fermented foods and canned foods.	**[9]**
Microbiology and Food Preservation Effect of high temperature on microbes- TDT, Dvalue, Zvalue, 12Dconcept-Calculation of process time. Effect of low temperature, radiation, drying on microbes. Chemical preservatives. Advances in preservation of food by various biotechnological processes.	**[9]**
Total Hours: 45	**45**

Textbook(s):

1. Belitz H.D., Grosch W., and Schieberle P., “Food Chemistry”, 3rd Edition, Springer Verley, Berlin, 2008.
2. Vaclavik V.A.and Christian E.W.,“Essential of Food Science”, 2nd Edition, Springer, 2005.

Reference(s):

1. Frazier W.C. and Westhoff ,“ Food Microbiology”, 4th Edition, Tata Mc Graw Hill, New Delhi, 2011.
2. Vijaya R.K., “Food Micro biology”, 1st edition, MJP Publishers, Chennai, 2007.

Course Contents and Lecture Schedule

S.No.	Topic	No. of Hours
1	**Water relationships in Food and Carbohydrates**	
1.1	Water activity and its relevance	1
1.2	Glass transitions and molecular mobility	1
1.3	Stability of foods	2
1.4	Modified starch	1
1.5	Cyclo dextrins	1
1.6	Carbohydrates as fat substitutes	1
2	**Lipids**	
2.1	Classification and structure of fatty acids	1
2.2	Food Lipids and health	2
2.3	Conjugated linolenic acid	1
2.4	Processing of oils and fats	2
2.6	Hydrogenation	1
2.7	Deterioration of oils	1
2.8	Hydrolytic rancidity	1
3	**Proteins**	
3.1	Protein structure and conformation	2
3.2	Properties and reactions of proteins	1
3.3	Optical activity	2
3.5	Emulsifying effect	2
3.6	Denaturation of Proteins	2
4	**Microbial growth and Microbial Spoilage**	
4.1	Micro organisms associated with food	1
4.2	Physical and chemical factors	2
4.3	Biochemical changes	1
4.4	Microbial food fermentations	1
4.6	Microbiological standards of different foods	2
4.7	Spoilage of fruits	1
4.8	Fermented foods and canned foods	1
5	**Microbiology and Food preservation**	
5.1	Effect of temperature on microbes	2
5.2	Calculation of process time	1
5.3	Effect of low temperature	2
5.4	Radiation	1
5.6	Effect of low temperature	1
5.7	Radiation and drying on microbes	2
5.8	Chemical preservatives	1
5.9	Advances in preservation of food	1
	Total	45

Course Designers

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PassedinBoSMeetingheldon12/05/2023
ApprovedinAcademicCouncilMeetingheldon21/05/2023

BoSChairman

60PFT 105	Research Methodology and IPR	Category	L	T	P	Credit
		PC	3	0	0	3

Objective(s)

- To understand the principles of research process.
- To develop knowledge in analytical skills for collection of research data.
- To understand the procedure in the preparation of reports.
- To accomplish basic idea about the process involved in intellectual property rights.
- To enlighten the process of patent filing.

Pre-requisite

Nil

Course Outcomes

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

CO1	To understand the research process and design.	Remember, Understand, Apply
CO2	To gain the knowledge about sources and collection ofr esearch data	Remember, Understand, Aanalyze
CO3	To understand the procedure of data analysis, preparation of reports and checking plagiarism	Remember, Understand, Analyze
CO4	To gain the knowledge on Trademark and functions of UNESCO in IPR	Remember, Understand, Apply
CO5	To enlighten the benefits, E-filing and Examinations related to patents	Remember, Understand, Apply

Mapping with Programme Outcomes

COURSE NAME	CO	PO		
		1	2	3
Research Methodology and IPR	CO1	3	3	2
	CO2	3	3	2
	CO3	3	3	2
	CO4	3	3	2
	CO5	3	3	2

Note: 3 – Strong Contribution; 2 – Average Contribution; 1 – Some Contribution

Assessment Pattern

Bloom's Category	Continuous Assessment Tests (Marks)		Model Exam (Marks)	End Semester Examination (Marks)
	1	2		
Remember	10	10	20	30
Understand	20	20	40	30
Apply	30	30	40	30
Analyse	0	0	0	10
Evaluate	0	0	0	0
Create	0	0	0	0

Syllabus

K. S. Rangasamy College of Technology– Autonomous					R2022		
60PFT 105 – Research Methodology and IPR							
Common to all Branches							
Semester	Hours/ Week			Total hrs	Credit	Maximum Marks	
	L	T	P		C	CA	ES	Total
I	3	0	0	30	3	40	60	100

Research Design Overview of research process and design-Use of Secondary and exploratory data to answer the research question, Qualitative research, Observation studies, Experiments and Surveys, Selection of the Right Medium and Journal for publication, Translation of Research	[9]
Data Collection and Sources Measurements, Measurement Scales, Questionnaires and Instruments, Sampling and methods. Data -Preparing, Exploring, examining and displaying.	[9]
Data Analysis and Reporting Overview of Multi variate Analysis, Hypotheses testing and Measures of Association. Presenting Insights and findings using written reports and oral presentation. Checks for Plagiarism, Falsification, Fabrication, and Mis representation	[9]
Intellectual Property Rights Intellectual Property – The concept of IPR, Evolution and development of concept of IPR, IPR development process,Trade secrets, utility Models, IPR & Biodiversity, Role of WIPO and WTO in IPR establishments, Right of Property, Common rules of IPR practices, Types and Features of IPR Agreement, Trademark, Functions of UNESCO in IPR maintenance.	[9]
Patents Patents–objectives and benefits of patent, Concept, features of patent, Inventive step, Specification, Types of patent application, process E-filling, Examination of patent, Grant of patent, Revocation, Equitable Assignments, Licences, Licensing of related patents, patent agents, Registration of patent agents.	[9]
Total Hours	45

Text Book (s):

1.	David I. Bainbridge, “Intellectual Property”, Longman, 9th Edition, 2012.
2	Cooper Donald R, Schindler Pamela S and Sharma JK, “Business Research Methods”, Tata Mc Graw Hill Education, 11e (2012).

Reference(s):

1.	Chawla H S., “Introduction to Intellectual Property Rights”, CBSPUB & DIST PVT Limited,INDIA, 2019.
2.	Catherine J. Holland, “Intellectual property: Patents, Trademarks, Copyrights, TradeSecrets”, Entrepreneur Press, 2007
3.	David Hunt, Long N guyen, Matthew Rodgers,“Patent searching: tools & techniques”, Wiley,2007
4.	Arun K. Narasani, Kankanala K.C., Radhakrishnan V., “Indian Patent Law and Practice”, Oxford University Press, 2010.
5.	Richard Stim, “Patent, Copyright & Trademark- An Intellectual Property Desk Reference”, NOLO Publishers, 2020.
6.	The Institute of Company Secretaries of India, Statutory body under an Actof parliament, “Professional Programme Intellectual Property Rights,Law and practice”,September2013.

Course Content and Lecture Schedule

S.No.	Topics	No. of hours
1.0	**Research Design**	
1.1	Overview of research process and design	1
1.2	Use of Secondary and exploratory data to answer the research question	2
1.3	Qualitative research	1
1.4	Observation studies	1
1.5	Experiments and Surveys	1
1.6	Selection of the Right Medium and Journal for publication	2
1.7	Translation of Research	1
2.0	**Data Collection and Sources**	
2.1	Measurements, Measurement Scales	2
2.2	Questionnaires and Instruments	2
2.3	Sampling and methods	2
2.4	Data-Preparing, Exploring, examining and displaying	3
3.0	**Data Analysis and Reporting**	
3.1	Overview of Multi variate analysis	1
3.2	Hypotheses testing and Measures of Association	2
3.3	Presenting Insights	1
3.4	Findings using written reports and oral presentation	2
3.5	Checks for Plagiarism	1
3.6	Falsification	1
3.7	Fabrication,and Misrepresentation	1
4.0	**Intellectual Property Rights**	
4.1	Intellectual Property- The concept of IPR	1
4.2	Evolution and development of concept of IPR, IPR development process	2
4.3	Trade secrets, utility Models, IPR& Bio diversity	2
4.4	Role of WIPO and WTO in IPR establishments	1
4.5	Right of Property, Common rules of IPR practices	1
4.6	Types and Features of IPR Agreement, Trade mark, Functions of UNESCO in IPR maintenance	2
5.0	**Patents**	
5.1	Patents- objectives and benefits of patent, Concept, features of patent	2
5.2	Inventive step, Specification, Types of patent application	2
5.3	Process E-filling, Examination of patent	1
5.4	Grant of patent, Revocation	1
5.5	Equitable Assignments, Licences, Licensing of related patents	2
5.6	Patent agents, Registration of patent agents	1
	Total	**45**

Course Designer

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PassedinBoSMeetingheldon12/05/2023
ApprovedinAcademicCouncilMeetingheldon21/05/2023

BoSChairman

60 PFT 1P1	Food Testing and Evaluation Laboratory	Category	L	T	P	Credit
		PC	0	0	4	2

Objective

- To analyze various food products
- To detect food adulteration and identify thecomponents infoods
- Toassess sensoryproperties andenergyvalues offoodproducts

Prerequisite

NIL

CourseOutcomes

On the successfulcompletion ofthe course,students willbe able to

CO1	Analyzevarious food products	Remember, Understand,Analyze
CO2	Detectfood adulteration and identifythecomponents in foods	Remember,Understand, Apply
CO3	Assesssensorypropertiesandenergyvalueoffoodproducts	Remember,Apply

MappingwithProgrammeOutcomes

COs	PO1	PO2	PO3
CO1	3	2	3
CO2	3	3	3
CO3	3	2	2
3-Strong;2-Medium;1-Some			

K.S.RangasamyCollegeofTechnology-Autonomous R2022

60PFT 1P1-FoodtestingandEvaluationLaboratory

M.Tech.FoodTechnology

Semester	Hours/Week			Totalhrs	Credit	Maximum Marks		
	L	T	P		C	CA	ES	Total
I	0	0	4	60	2	60	40	100

NameofExperiments

1. Assessmentoffreshnessandcharacterizationofedibleoil
2. Analysisofturmeric:Curcumincontent,Oleoresin,Moisturecontent
3. Estimationofcapsaicincontentandpungencylevelofchilies
4. Analysisofteaandcoffee: Caffeine,Moisture content, Solubility
5. Analysisofproximatecompositionoffoodproducts
6. Evaluationand comparisonofcooking qualitycharacteristicsofdifferenttypesofpasta andcomplythe resultswithFSSAIstandards
7. Detectionofadulterantspresentinagriculturecommoditiesandfoodproducts
8. Spectroscopicanalysisof heavymetalsinfoods
9. Discriminativeanddescriptivesensoryanalysisoffoodproducts
10. Estimationofmoisturecontent,reducingsugar,totalash,acid insoluble ashand SO_2content
11. Determinationonrate of dryingusing traydryer/Freezedryer.
12. Estimationofenergyvalueof foodproducts
13. RheologicalandTexturalProfileanalysisof Foodproducts
14. Estimationofmineralspresent infoodsamplesbyflamephotometry.

TotalHours: 60

CourseDesigner

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PassedinBoSMeetingheldon12/05/2023
ApprovedinAcademicCouncilMeetingheldon21/05/2023

BoSChairman

SECONDSEMESTER

S.No.	CourseCode	NameoftheCourse	DurationofInternalExam	WeightageofMarks			Minimum MarksforPassin EndSemester Exam	
				ContinuousAssessment *	EndSemesterExam **	Max. Marks	EndSemesterExam	Total
THEORY								
1	60PFT201	InstrumentalTechniquesandMethodsforFoodAnalysis	2	40	60	100	45	100
2	60PFT202	AdvancedRefrigerationand Cold ChainManagement	2	40	60	100	45	100
3	60PFT203	Food Safetyand QualityControl	2	40	60	100	45	100
4	60PFTE2*	Professional ElectiveII	2	40	60	100	45	100
5	60PFTE3*	Professional ElectiveIII	2	40	60	100	45	100
6	60PFTE4*	Professional ElectiveIV	2	40	60	100	45	100
7	60AT002	DisasterManagement	2	100	-	100	-	-
PRACTICAL								
7	60PFT2P1	FoodProducts DevelopmentLaboratory	3	60	40	100	20	40
8	60PFT2P2	TermPaperandSeminar	2	100	-	100	-	-

* CAevaluationpatternwilldifferfromcoursetocourseandfordifferent tests. Thiswillhavetobedeclaredinadvance to students. The department will put a process in place to ensure that the actual test paper follow the declaredpattern.

**End SemesterExaminationwillbeconducted formaximum marksof100 and subsequently be reducedto60 marksfortheawardofterminalexamination marks

PassedinBoSMeetingheldon12/05/2023
ApprovedinAcademicCouncilMeetingheldon21/05/2023

BoSChairman

60 PFT201	Instrumental Techniques and Methods forFoodAnalysis	Category	L	T	P	Credit
		PC	3	2	0	4

Objective

- To applyUV-Visibleand IRspectroscopyinfood analysis
- Toselectsuitable techniqueforinternal structure,thermal andmorphologyanalysis of foodmaterials
- Tochooseappropriateelectrophoreticandrapidtechniquestoseparateandidentifyfoodcomponents
- TomakeuseofAAS,NMRandmassspectroscopytoanalyzedifferent foodmaterials
- Toidentifysuitable chromatographicmethods to separateand quantifythe food components.

Prerequisite

NIL

CourseOutcomes

On the successfulcompletion ofthe course,students willbe able to

CO1	ApplyUV-VisibleandIR spectroscopyinfoodanalysis	Remember,Understand,Analyze
CO2	Select suitable technique for internal structure, thermal and morphologyanalysisoffood materials	Remember,Understand,Apply
CO3	Choose appropriate electrophoretic and rapid techniques to separateandidentifyfoodcomponents	Remember,Apply
CO4	Select Make use of AAS, NMR and mass spectroscopy to analyzedifferentfoodmaterials	Remember,Understand,Analyze
CO5	Choose suitable chromatographic methods to separate and quantify thefood components	Remember,Understand,Analyze

MappingwithProgrammeOutcomes

COs	PO1	PO2	PO3
CO1	3	3	2
CO2	1	2	3
CO3	1	2	1
CO4	1	3	3
CO5	3	3	2
3-Strong;2-Medium;1-Some			

AssessmentPattern

Bloom'sCategory	ContinuousAssessmentTests(Marks)		End Semester Examination (Marks)
	1	2	
Remember (Re)	10	10	10
Understand(Un)	10	10	20
Apply(Ap)	20	20	30
Analyze(An)	20	20	40
Evaluate(Ev)	0	0	0
Create(Cr)	0	0	0

PassedinBoSMeetingheldon12/05/2023
ApprovedinAcademicCouncilMeetingheldon21/05/2023

BoSChairman

K.S.RangasamyCollegeofTechnology-Autonomous R2022								
60PFT201-InstrumentaltechniquesandmethodsforFood Analysis								
M.Tech.FoodTechnology								
Semester	Hours/Week			Totalhrs	Credit	MaximumMarks		
	L	T	P		C	CA	ES	Total
II	3	2	0	60	4	40	60	100

IntroductiontoInstrumentalMethodsandUV-VisibleandIRSpectroscopy Classificationofinstrumentalmethodsbasedonphysicalpropertiesofmolecules-TheElectromagnetic spectrum - Interaction of photons with matter - Absorbance and transmittance - BeerandLambert"slaws.DeviationfromBeer-Lambert"sLaw.UltravioletandVisiblespectrometry: Theory - Types of Transitions - Red and blue shifts - Instrumentation - Single beamand double beam spectrophotometers and applications. Fluorimetry: Theory - Factors affectingfluorescence-Instrumentationandapplications.Infraredspectrometry:RequirementsforIR absorption- Modesofvibrations-Instrumentation-Applications-Fingerprintregion.	[9]
X-RayandFlamePhotometerandThermalMethodsandMorphologyAnalysis Absorption-Non-disperativeMethod-Diffraction-Rotatingandpowdercrystalmethods–Applications. Flame photometer, Polarimetry and Refractometry - Principle and instrumentation -Saccharimetry - Analysis of sugar. Thermogravimetry - Differential Thermal Analysis - Differentialscanning calorimetry - Factors affecting the results - Instrumentation and applications. MorphologyAnalysis - Scanning Electron Microscopy - Transmission Electron Microscopy and Laser diffractionforparticleanalysis-PrincipleandApplications.	[9]
ElectrophoresisandRapidTechniques Basic Principle of paper - Starch gel, agarose, PAGE, SDS-PAGE electrophoresis Immuno affinitytechniques-RadioAssayElectrophoresisandapplications.Isoelectricfocusing,capillaryelectrophoresis- Microchip and 2D electrophoresis. Recent Development of Rapid Techniques - Esensors -e-nose,e-tongueinstrumentation-Applicationsandworking principles-Flow cytometry-Epifluorescencemicroscopy-PrincipleandApplications.	[9]
AtomicAbsorptionSpectrophotometerandNMRandMassspectroscopy Principle, Advantages of ASS over FES - Instrumentation - Interference and applications. NuclearMagnetic Resonance: Introduction to NMR - Energy levels of nucleus - Equivalent and non-equivalent protons - Chemical shift - Shielding - TMS - Factors affecting chemical shift - Splitting ofsignalsandinstrumentation(protonNMR)-Applications.Theory–componentsofmassspectrometer – Mass spectrum. Resolution of mass spectrometer. Types of ions produced –GeneralrulesforInterpretationofmassspectra-Fragmentationmethods-Applicationsofmass spectra.	[9]
ChromatographyTechniquesandHyphenatedTechniques Introduction - Classification of chromatographic methods: Column chromatography, Thin Layerchromatography,Paperchromatography,GaschromatographyandHigh-performanceLiquidChromatography (HPLC) - Principle, important components and their functions mode of separation,Instrumentationandapplications.ICP-MS,HR-MS,HPTLC,GC-MS,LC-MSandGC-FTIR–Principle,Instrumentationsandapplications.	[9]
TotalHours:45+15(Tutorial)	**60**

Textbook(s):

1.	ChatwalGurdeepR.andAnandShamK.,"InstrumentationMethodsofChemical Analysis",5thEdition,HimalayaPublications,Bombay,2022.
2.	WillardH.H.,MerrittL.L.,DeanJ.A.,andSettleF.A.,"InstrumentalMethodsofAnalysis",7thEdition,CBSPublishers&Distributors,Delhi,2004.

Reference(s):

1.	YeshasahupomeranzandCliftonE.Meloan.,"FoodAnalysis",2ndEdition,CBSPublishers&Distributors,Delhi,1996.

CourseContentsandLectureSchedule

S.No.	Topic	No.of Hours
1	**Introduction toInstrumentalMethods andUVvisible and IR Spectroscopy**	
1.1	ClassificationofInstrumentalmethods	1
1.2	Electromagneticspectrum	2
1.3	Beer lambertsLaw	1
1.4	UltravioletandVisiblespectrometry	2
1.5	Fluorimetry	2
1.6	Modesofvibration	2
1.7	Tutorial	2
2	**X-ray and Flame photometer and Thermal methods andMorphologyanalysis**	
2.1	Absorptionnondesperativemethod	1
2.2	Diffraction	1
2.3	Applicationof flamephotometer	1
2.4	Polarimeter	2
2.5	Tutorial	2
2.6	Thermogravimetry	1
2.7	DifferentialScanningcalorimetry	1
2.8	TransmissionElectronMicroscope	1
2.9	Tutorial	2
3	**ElectrophoresisandRapidTechniques**	
3.1	Basicprinciplesofpaperchromatography	2
3.2	RadioAssayelectrophoresisandapplications	1
3.3	Isoelectricfocusing	1
3.4	Tutorial	2
3.5	E-Sensors	2
3.6	Flowcytometer	2
3.10	Tutorial	2
4	**Atomic AbsorptionSpectrophotometerandNMRandMassSpectroscopy**	
4.1	Principleandadvantages ofAAS over FES	1
4.2	IntroductiontoNMR	1
4.3	EnergyLevels ofNucleus	1
4.4	ChemicalShift	1
4.5	Tutorial	2
4.6	Componentsof massspectrometry	2
4.7	Resolutionof massspectrometry	1
4.8	Interpretationofmassspectra	1
4.9	Tutorial	2
5	**ChromatographyTechniquesandHyphenatedtechniques**	
5.1	ClassificationofChromatographicmethods	1
5.2	Thinlayerchromatography	1
5.3	Paperchromatography	1
5.4	Gaschromatorgraphy	1
5.5	Tutorial	2
5.6	ICP-MS	1
5.7	HR-MS	1
5.8	GC-MS	1
5.9	FTIR	1
5.10	Tutorial	2
	Total	60

CourseDesigners

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PassedinBoSMeetingheldon12/05/2023
ApprovedinAcademicCouncilMeetingheldon21/05/2023

BoSChairman

60 PFT202	Advanced Refrigeration and Cold Chain Management	Category	L	T	P	Credit
		PC	3	2	0	4

Objective

- To applythe concepts ofrefrigerationsystems and determine
- Toillustratetheworkingandfunctionof variouscomponentsof refrigerationsystems
- To examinethe effect oflowtemperature storageon product quality
- To classifyandconstructcoldstorage unitandcalculate coolingloads
- To developcoldchainsystem for transportingfoodproducts

Prerequisite

NIL

CourseOutcomes

On the successfulcompletion ofthe course,students willbe able to

CO1	Applythe conceptsof refrigerationsystemsanddetermine	Remember,Understand,Analyze
CO2	Select suitable working and function of various components ofrefrigeration systems	Remember,Understand,Apply
CO3	Choosetheeffectoflowtemperaturestorageonproductquality	Remember,Apply
CO4	Selectandconstructcoldstorage unitandcalculatecooling loads	Remember,Understand,Analyze
CO5	Choosecoldchainsystemfortransporting foodproducts	Remember,Understand,Analyze

MappingwithProgrammeOutcomes

COs	PO1	PO2	PO3
CO1	3	3	2
CO2	1	2	3
CO3	1	2	1
CO4	1	3	3
CO5	3	3	2
3-Strong;2-Medium;1-Some			

AssessmentPattern

Bloom'sCategory	ContinuousAssessmentTests(Marks)		End SemesterExamination (Marks)
	1	2	
Remember (Re)	10	10	10
Understand(Un)	10	10	20
Apply(Ap)	20	20	30
Analyze(An)	20	20	40
Evaluate(Ev)	0	0	0
Create(Cr)	0	0	0

PassedinBoSMeetingheldon
ApproPassedinBoSMeetingheldon12/05/2023

BoSChairman

K.S.RangasamyCollegeofTechnology-Autonomous R2022								
60PFT202-AdvancedRefrigerationandColdChainManagement								
M.Tech.FoodTechnology								
Semester	Hours/Week			Totalhrs	Credit	MaximumMarks		
	L	T	P		C	CA	ES	Total
II	3	2	0	60	4	40	60	100

IntroductiontoRefrigeration Refrigeration, Ton of refrigeration, refrigeration capacity calculations, Single vapour compressionandvapourabsorptionsystems-COPdeterminationsandcalculations.Refrigerants-characteristics ofdifferentrefrigerants,ozonedepletionpotentials,pressureenthalpycharts.	**[9]**
ComponentsofaRefrigerationSystem TypesofCompressors-positivedisplacementandroto-dynamictypeandperformance,Evaporators and their functional aspects, condensing units and cooling towers, Expansion valves,humidifying systems,pipinganddifferentcontrols.	**[9]**
LowTemperatureStorageofFoods Effectoftemperatureonfoodspoilage,LowtemperaturestorageMethods-Chilling,Freezing,Evaporative cooling and its applications. Novel freezing methods and freezer types, Freezing rates,growthrate ofice crystals,crystal sizeanditseffecton textureandqualityoffoods.	**[9]**
ColdandFrozenStorage Construction, Operation – Insulation, Types of storage rooms, Design and requirements of coldstore and frozen store, total refrigeration load calculations, Automated cold store, temperaturerequirementsinfrozen storage,maintenance,packaging,energyconservation.	**[9]**
ColdChainManagement Scope and importance of cold chain in food processing industry and retail chain, Cold chain – overview, planning and designing, transport of frozen foods - different modes, Time temperatureindicators - data loggers, safety aspects, Flexibility storage systems, cold chain transportationinlandandexport,retailandsupermarketcoldchain-Retaildisplaycabinets.	**[9]**
TotalHours:45+15(Tutorial)	**60**

Textbook(s):

1.	RajputR.K.,"RefrigerationandAir-conditioning",3rdEdition,S.K.Kataria&Sons,Delhi,2013.
2.	DellinoC.V.J.,"ColdandChilledStorageTechnology", 2ndEdition,Springer,2011.

Reference(s):

1.	KennedyC.J.,"ManagingFrozen Foods",1stEdition,WoodheadPublishingLtd.,2000.
2.	FellowsPJ"FoodProcessing Technology:PrinciplesandPractice"3rdEdition, WoodheadPublishing Ltd.,2009.

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CourseContentsandLectureSchedule

S.No.	Topic	No.of Hours
1	IntroductiontoRefrigeration	
1.1	Refrigerationandcapacitycalculation	1
1.2	SingleVapor Compression	2
1.3	Vaporabsorption	1
1.4	COPdeterminationandcalculation	2
1.5	Refrigerantsandozonedepletion	2
1.6	Pressureenthalpycharts	2
1.7	Tutorial	2
2	ComponentsofaRefrigerationSystem	
2.1	Typesof Compressors	1
2.2	Positivedisplacement	1
2.3	Evaporatoranditsfunctions	1
2.4	Condensingunits	2
2.5	Tutorial	2
2.6	Coolingtowers	1
2.7	Expansionvalves	1
2.8	Humidifyingsystems	1
2.9	Tutorial	2
3	Lowtemperaturestorageoffoods	
3.1	Effectoftemperatureonfoodspoilage	2
3.2	Lowtemperaturespoilage methods	1
3.3	Chillingfreezing	1
3.4	Evaporativecooling	2
3.5	Novelfreezingmethods	2
3.6	Crystalsize	2
3.10	Tutorial	2
4	Atomic AbsorptionSpectrophotometerandNMRandMassSpectroscopy	
4.1	ConstructionandOperation of coldstorage	1
4.2	Types ofStoragerooms	1
4.3	Designandrequirements	1
4.4	Refrigerationloadcalculation	1
4.5	Tutorial	2
4.6	AutomatedColdstore	2
4.7	Temperaturerequirements	1
4.8	MaintenanceandPackaging	1
4.9	Tutorial	2
5	ColdChainManagement	
5.1	Scope andimportanceof coldchain	1
5.2	Cold chainoverview	1
5.3	Transportof frozenfoods	1
5.4	Timetemperatureindicators	1
5.5	Tutorial	2
5.6	Safetyaspects	1
5.7	Flexibilityofstorage systems	1
5.8	Coldchaintransporation	1
5.9	SupermarketColdchain	1
5.10	Tutorial	2
	Total	60

CourseDesigners

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PassedinBoSMeetingheldon12/05/2023
ApprovedinAcademicCouncilMeetingheldon21/05/2023

BoSChairman

60 PFT203	FoodSafetyandQualityControl	Category	L	T	P	Credit
		PC	3	0	0	3

Objective

- Toinfer theimportanceoffoodqualityandsafety
- Tooutlinedifferentfoodhazards andtheircontrolmeasures
- Toselectsuitablemethodformicrobialinactivationandmicrobialgrowthmodeling
- Tooutlinethefunctionsofvariousnationalandinternationalfoodagencies
- Toidentifysuitablefoodsafetymanagement systems forfoodproduct

Prerequisite

NIL

CourseOutcomes

On the successfulcompletion ofthe course,students willbe able to

CO1	Analyze theimportance of food qualityand safety	Remember,Understand, Analyze
CO2	Examine differentfoodhazards and their controlmeasures	Remember,Understand, Apply
CO3	Identify suitable method for microbial inactivation and microbialgrowthmodeling	Remember,Apply
CO4	Outline the functions of various national and international foodagencies	Remember,Understand, Analyze
CO5	Summarize thefoodsafetymanagement systemsfor food product	Remember,Understand, Analyze

MappingwithProgrammeOutcomes

COs	PO1	PO2	PO3
CO1	3	2	3
CO2	3	3	3
CO3	3	2	2
CO4	3	3	3
CO5	3	2	2
3-Strong;2-Medium;1-Some			

AssessmentPattern

Bloom'sCategory	ContinuousAssessmentTests (Marks)		End SemesterExamination (Marks)
	1	2	
Remember (Re)	10	10	10
Understand(Un)	10	10	20
Apply(Ap)	20	20	30
Analyze(An)	20	20	40
Evaluate(Ev)	0	0	0
Create(Cr)	0	0	0

PassedinBoSMeetingheldon12/05/2023
ApprovedinAcademicCouncilMeetingheldon21/05/2023

BoSChairman

K.S.RangasamyCollegeofTechnology-Autonomous R2022								
60PFT 203-FoodSafetyandQualityControl								
M.Tech.FoodTechnology								
Semester	Hours/Week			Totalhrs	Credit	MaximumMarks		
	L	T	P		C	CA	ES	Total
II	3	0	0	60	4	40	60	100

ContemporaryFoodSafetyStrategies Principles and need for quality control and safety, strategy and criteria for food safety. Consumerlifestyleanddemand,issuesinfoodsafety,foodtraceabilityandrecall,caseagainstfoodbiotechnology and irradiation.Case studiesinfood safety.	**[9]**
FoodHazardsandContaminants Characterization of food hazards, Food borne diseases and their control, food contaminants andtheir control. Naturally available toxins in foods, Cross contamination: toxicants resulting from foodprocessing.Managementoffood allergens.Riskanalysisoffood hazards.	**[9]**
MicrobialGrowthandModelling Inactivation of microbial growth - thermal and non-thermal methods, process dependent microbialmodelling,integrationofprocessandmicrobialgrowthmodelling.Applicationsofpredictivemicrobialmodelling.Advancedmethodsforrapiddetectionoffood spoilage.	**[9]**
QualitycontrolandFoodsafetyAgencies National Regulatory Agencies and International Agencies: Quality control Importance, measuresand procedures. BIS, AGMARK, FSSAI.Organizational structure and functions of United StatesFoodandDrugAdministration(USFDA),GlobalFoodSafetyInitiative(GFSI),InternationalConsultative Group on Food Irradiation (ICGFI), European Food Safety Authority (EFSA), BritishRetailConsortium(BRC)globalstandards,CodexAlimentarius,SanitaryandPhyto-Sanitarymeasures(SPS),PlantQuarantineAct.	**[9]**
FoodQualityManagementSystem Duties and responsibilities of food safety regulators, food safety and standards for food products,implementation, validation, verification and improvement of food safety management systems.HACCP,GoodManufacturingPractices(GMP),GoodHygienicPractices(GHP),Good LaboratoryPractices (GLP),ISO22000,FSSC 22000,Food SafetyAudit.	**[9]**
TotalHours: 45	**45**

Textbook(s):	
1.	Da-WenSun.,"HandbookofFoodSafetyEngineering",1stEdition,JohnWiley&Sons,NewJersey,2011.
2.	RonaldH.SchmidtandGaryE.Rodrick.,"FoodSafetyHandbook",1stEdition,JohnWiley&Sons,New Jersey,2003.
Reference(s):	
1.	Yasmine Motarjemi and Huub Lelieveld., "Food Safety Management – A Practical Guide ForTheFoodIndustry",1steditionElsevier,NewYork,2013.
2.	S.P.Singh"Foodsafety.,QualityAssuranceandGlobalTrade:ConcernsandStrategies",1stEdition,InternationalBookDistribution Company,India,2009

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ApprovedinAcademicCouncilMeetingheldon21/05/2023

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CourseContentsandLectureSchedule

S.No.	Topic	No.of Hours
1	**ContemporaryFoodSafetyStrategies**	
1.1	Principles andneedfor quality	1
1.2	Strategyandfoodsafety	1
1.3	ConsumerLifestyle	2
1.4	FoodTraceability	1
1.5	Case againstfood biotechnology	1
1.6	Case studies infood safety	1
2	**FoodHazardsandContaminants**	
2.1	Characterizationof Food hazards	1
2.2	Food bornediseases	2
2.3	FoodContaminants	1
2.4	Naturallyavailable toxinsin food	2
2.6	Crosscontamination	1
2.7	ManagementofFood Allergens	1
2.8	Riskanalysis and FoodHazards	1
3	**MicrobialGrowthandmodelling**	
3.1	InactivationofMicrobialgrowth	2
3.2	Thermal andnon-thermal methods	1
3.3	MicrobialGrowthmodelling	2
3.5	Applicationsofpredictivemicrobialmodelling	2
3.6	Rapiddetection offood spoilage	2
4	**Qualitycontrolandfoodsafetyagencies**	
4.1	NationalRegulatoryAgencies	1
4.2	Qualitycontrol importance	2
4.3	BIS,AGMARK, FSSAI	1
4.4	USFDA	1
4.6	InternationalConsultativegroupofFoodIrradiation	2
4.7	Europeanfood SafetyAuthority	1
4.8	PlantQuarantineact	1
5	**FoodQualityManagementSystems**	
5.1	Dutiesand responsibilitiesoffoodsafetyregulators	2
5.2	Foodsafetystandardmanagement	1
5.3	HACCP	2
5.4	GoodManufacturingPractices	1
5.6	GoodHygienicPractices	1
5.7	Good LaboratoryPractices	2
5.8	ISO 22000	1
5.9	FSSC22000	1
	Total	45

CourseDesigners

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60 PFT 2P1	Food Product Development Laboratory	Category	L	T	P	Credit
		PC	0	0	4	2

Objective

- Todevelopnovelfoodproductsinthebakery,confectionary,beverage, dairyandsnackfoods
- Tomakeuseof functional andspecialtyingredientsinpreparingfoodproducts.
- Toevaluatethedeveloped foodproductsforthedesiredqualityparametersincludingsensoryattributes

Prerequisite

NIL

CourseOutcomes

Onthesuccessfulcompletionofthe course,studentswillbeableto

CO1	Develop novel food products in the bakery, confectionery,beverage,dairyand snackfoods	Remember,Understand, Analyze
CO2	Make use of functional and specialty ingredients in preparing foodproducts	Remember, Understand,Apply
CO3	Evaluate the developed food products for the desired qualityparametersincluding sensoryattributes.	Remember,Apply

MappingwithProgrammeOutcomes

Cos	PO1	PO2	PO3
CO1	3	2	3
CO2	3	3	3
CO3	3	2	2
3-Strong;2-Medium;1-Some			

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60PFT 2P1-FoodtestingandEvaluationLaboratory

M.Tech.FoodTechnology

Semester	Hours/Week			Totalhrs	Credit	Maximum Marks		
	L	T	P		C	CA	ES	Total
II	0	0	6	60	3	60	40	100

NameofExperiments

1. Developmentofproteinenrichedbiscuits/cookiesandevaluation.
2. Developmentofdeepfatfriedsnackproductandanalysisofqualityparameters.
3. Developmentofphytochemicalsrichbeverageandestimationofphytochemicalscontentintheproduct.
4. Developmentofblendedfoodflavour-basedproductsandqualityevaluation.
5. Developmentofdryhealthfood premix andevaluation ofqualityandsensoryattributes.
6. Developmentofmarshmallowandassessmentof textureandquality.
7. Developmentof productusingdairyreplacerspecialtyfatsand qualityevaluation.
8. Developmentof egglesscakeandqualityevaluation.
9. DevelopmentofNutritional/Energybarandproductanalysis.
10. Developmentoflowfatspreadandsensoryevaluation.
11. Developmentof symbioticdairyproductand itssensoryandmicrobiologicalanalysis
12. Developmentof sugarfreeconfectioneryproductandevaluation.
13. Development of Millet based icecream wafer and evaluated its quality.
14. Develoment of pasta using whole wheat flour and estimates its sensory attributes
15. Develoment of gelatos and jellish and evaluate its sensory and quality parameters
16. VirtualLab:Canningoffoods-Demo

TotalHours: 60

CourseDesigner

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BoSChairman

60 PFT 2P2	TermPaperandSeminar	Category	L	T	P	Credit
		PC	0	0	2	0

Objective

- Students willdeveloptheirscientificandtechnicalreadingand writingskillsthattheyneedto
- understandandconstructresearcharticles.
- Atermpaperrequiresa student toobtaininformationfromavarietyof sources(i.e.,
- Journals,dictionaries,referencebooks)andthenplaceit inlogicallydevelopedideas.
- Toidentifythe recenttopics intheresearchareaandformulatetheproblem
- Toanalyzethemathematicalmodelfortheidentifiedproblem
- Todesignandsimulate/develop prototypemodel

Prerequisite

NIL

CourseOutcomes

Onthesuccessfulcompletionofthe course,studentswillbeableto

CO1	Survey the relevant bibliography such as national/internationalreferredjournalsforthe preferredareasofresearch	Remember,Understand, Analyze
CO2	Develop scientific, technical reading and writing skills for thetechnicalreportpreparation toapplyit intheirtopics of research	Remember, Understand,Apply
CO3	Implementandanalyzethe variouscomplexproblemsindifferent practicalapplications	Remember,Apply

MappingwithProgrammeOutcomes

COs	PO1	PO2	PO3
CO1	3	2	3
CO2	3	3	3
CO3	3	2	2
3-Strong;2-Medium;1-Some			

K.S.RangasamyCollegeofTechnology-Autonomous R2022								
60PFT 2P2-Term Paper and Seminar								
M.Tech.FoodTechnology								
Semester	Hours/Week			Totalhrs	Credit	Maximum Marks		
	L	T	P		C	CA	ES	Total
II	0	0	4	60	2	60	40	100

Theworkinvolvesthefollowingsteps:

1. Selecting asubject,narrowingthesubject intoatopic.
2. Statinganobjective.
3. Collectingtherelevantbibliography(atleast 15journalpapers)
4. Preparingaworkingoutline.
5. Studying the papers and understanding the authors contributions and critically analysingeach paper.
6. Preparingaworkingoutline.
7. Linkingthepapersandpreparingadraft ofthepaper.
8. Preparingconclusions basedonthereadingofallthepapers.
9. WritingtheFinalPaper andgivingfinalPresentation

Please keep a file where the work carried out by you is maintained.Activitiestobe carriedout

[9]

Activity	Instructions	Submissionweek	Evaluation
Selection of area ofinterestand Topic StatinganObjective	An area of interest, topic has to beselected andobjectiveto beframed	2nd week	3 % Based on clarity ofthought, currentrelevancea ndclarityinwriting

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Collectingl nformation	1.List 1 Special Interest Groups orprofessionalsociety	3rdweek	3% (theselected
about chosenarea& topic	2. List2journals 3. List 3 conferences, symposia orworkshops 4. List1thesistitle 5. List 5 web presences (mailinglists, forumsNewssites) 6. List 6 authors who publishregularlyinyourarea 7. Attach a call for papers(CFP)fromyourare a. 8. Conference/Journal/Symposium inthechosenarea.		informationmustbe area specificand of internationalandna tionalstandard)
Collection of Journal papersin the topic in the context ofthe objective – collect 20 &thenfilter	• Provide acomplete listofreferences you will be using- Basedon the objective -Search variousdigitallibrariesandGoogleSc holar • Whenpickingpaperstoread- tryto: • Pickpapersthat arerelatedtoeach other in some ways and/orthat are in the same field so that ameaningfulsurveycanbewritten • Favour papers from well-knownjournalsAnd conferences, • Favour firstorfoundationalpapers in the field (as indicated inother people's survey paper),Favourmore recentpapers, • Pick a recent survey of the field soyoucanquicklygain anoverview, • Find relationships with respect toeachotherandtoyour topicarea(classificationscheme/ca tegorization) • Mark in the hard copy of paperswhethercompleteworkors ection/sectionsofthe paperare beingconsidered	4th week	6% (the listofstandard papersand reason forselection)

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Reading and notes for first 5papers	ReadingPaper Process • For each paper form atable answering the followingquestions: • Whatisthemaintopicofthearticle? • What was/were the main issue(s)the authorsaidthey wanttodiscuss? • Whydidtheauthor claimit wasimportant? • How does the work build onother's work, in the author'sopinion? • What simplifying assumptionsdoestheauthorclaimtobemaking? • What didtheauthordo? • How didtheauthorclaimtheyweregoingtoevaluatetheir workand compare itto others? • Whatdidtheauthorsaywerethelimitationsoftheirresearch? • Whatdidtheauthorsayweretheimportant directionsforfuture	5th week	8% (the table givenshould indicateyour understandingofthepaperandtheevaluationisbasedonyour conclusions abouteach paper)
	research? Concludewithlimitations/issuesnotaddressedbythepaper(fromthepersp ectiveofyoursurvey)		
Reading and notes for next5papers	RepeatReadingPaperProcess	6th week	8%(the table givenshould indicateyour understandingofthepaperandtheevaluationisbasedonyour conclusions abouteachpaper)
Reading and notes for final5 papers	RepeatReadingPaperProcess	7thweek	**8%**(the table givenshould indicateyour understandingofthepaperandtheevaluationisbasedon yourconclu sionsabout each paper)
Draftoutline1andLinkingpapers	Prepare a draft Outline, yoursurveygoals,alongwitha classification/categorization diagram	8thweek	**8%**(thiscomponent will beevaluated based onthelinkingandclassificationamong thepapers)
Abstract	Prepare a draft abstractandgiveapresentation	9thweek	**6%** (Clarity,purpose and conclusion)**6%** Presentation &VivaVoce

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IntroductionBackground	Writeanintroduction and backgroundsections	10thweek	**5%**(clarity)
Sectionsof the paper	Writethesectionsofyour paperbasedon theclassification/categorization diagram in keepingwiththegoalsofyoursurvey	11thweek	**10%**(thiscomponen t will beevaluated based onthelinkingandcla ssificationamong the papers)
Conclusions	Write your conclusions and futurework	12thweek	**5%**(conclusions-clarity and yourideas)
FinalDraft	Complete the final draft of yourpaper	13thweek	**10%** (formatting,English ,Clarityandlinking) **4%**Plagiarism CheckReport
Seminar	Abrief15slidesonyourpaper	14th&15thweek	**10%**(based onpresentatio nandViva-voce)

CourseDesigner

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THIRDSEMESTER

S.No.	CourseCode	NameoftheCourse	DurationofInternalExam	WeightageofMarks			Minimum MarksforPass in EndSemester Exam	
				ContinuousAssessment *	EndSemesterExam **	Max. Marks	EndSemesterExam	Total
THEORY								
1	60PFT301	Plantation Crops and Spices Technology	2	40	60	100	45	100
2	60PFT302	Food Process Plant Layout and Design	2	40	60	100	45	100
3	60PFT303	Food Rheology	2	40	60	100	45	100
PRACTICAL								
1	60PFT3P1	Project WorkPhaseI	1	2	100	-	100	-

* CAevaluationpatternwilldifferfromcoursetocourseandfordifferent tests. Thiswillhavetobedeclaredinadvance to students. The department will put a process in place to ensure that the actual test paper follow the declaredpattern.

**End SemesterExaminationwillbeconducted formaximum marksof100 and subsequently be reducedto60 marksfortheawardofterminalexamination marks

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60 PFT301	Plantation Crops and Spices Technology	Category	L	T	P	Credit
		PC	3	0	0	3

Objective

- Toexplaintherecent trendsinplantationcropsprocessing
- Toutilizefunctionalpropertiesof spicesandcondimentsinproductdevelopment
- Toselectextractionmethodsrequiredforspicesprocessing
- Tooutlinedifferentherbsandtheirprocessing
- Toanalyzetheadvancesinprocessing offlavormaterials

Prerequisite

NIL

CourseOutcomes

Onthesuccessfulcompletionofthe course,studentswillbeableto

CO1	Analyzetherecenttrendsinplantationcropsprocessing	Remember, Understand,Analyze
CO2	Examinethefunctionalproperties of spicesandcondimentsinproduct development	Remember, Understand,Apply
CO3	Identifytheextractionmethodsrequiredforspices processing	Remember,Apply
CO4	Outlinethe differentherbs andtheirprocessing	Remember, Understand,Analyze
CO5	Summarizetheadvancesinprocessingofflavormaterials	Remember,Understand, Analyze

MappingwithProgrammeOutcomes

COs	PO1	PO2	PO3
CO1	1	3	1
CO2	1	2	1
CO3	1	1	1
CO4	1	2	1
CO5	3	1	1
3-Strong;2-Medium;1-Some			

AssessmentPattern

Bloom'sCategory	ContinuousAssessmentTests (Marks)		End SemesterExamination (Marks)
	1	2	
Remember (Re)	10	10	10
Understand(Un)	10	10	20
Apply(Ap)	20	20	30
Analyze(An)	20	20	40
Evaluate(Ev)	0	0	0
Create(Cr)	0	0	0

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ApprovedinAcademicCouncilMeetingheldon21/05/2023

BoSChairman

K.S.RangasamyCollegeofTechnology-Autonomous R2022								
60PFT301 –PlantationCropsandSpicesTechnology								
M.Tech.FoodTechnology								
Semester	Hours/Week			Totalhrs	Credit	MaximumMarks		
	L	T	P		C	CA	ES	Total
III	3	0	0	45	3	40	60	100

PlantationCrops Types of Plantation crops. Recent trends and innovation in cocoa, coconut, cashew and tubercrops processing. Tea: Manufacturing of diversified tea products – instant tea, functional andherbal tea products. Coffee: Chemistry, Recent Trends in coffee technology, Quality grading ofcoffee,Chicorychemistry	[9]
Spices&Condiments Classification of spices. Functions of spices – Primary, secondary and emerging functions.Nutritive value of spices and their health benefits. Different forms of spices based on application –fresh, dried, volatile oils, oleoresins, paste, and other extractives. Commercial spice blends andseasoningsformulations.Emergingspiceblendsandseasonings –Popularglobalspiceblends.Growingdemandforauthenticity.	[9]
Advancesinspiceprocessing Spice oil - advances in SCFE, novel solvent free extraction methods using microwave, ultrasound.Cryogenic grinding of spices. Extraction of oleoresins, concepts and technology, desolventizationmethods, regulatory and statutory requirements for oleoresin processing. Spice encapsulation.Recent spice research- antioxidants, antimicrobial and health benefits of spice compound IntactHeater(DCH),PlateHeater(PHE),advantagesanddisadvantages.Evaporator-types-performancemeasures.	[9]
Herbalspices Description of various types of herbs - Basil, Cilantro, Dill, Coriander, Mint, Oregano, Borage,Thyme,Parsley,Curryleaves,bilvaleaves,Bayleaves,Safflower,Rosemary,Lavender.Processing and post - harvest handling. Functional properties. Quality issues. Recent trends,healthbenefitsandinnovationsofherbsinfood Industry.	[9]
FlavoringMaterialsRecentadvancesandtrends Natural flavors, sources of natural flavoring materials – herbs and spices, Genetic engineering inflavor, Flavors generated by enzymes and biological systems, Key aroma and taste components,Flavorstabilityduringfoodprocessingandstorage,Retentionandrelease offlavors.	[9]
TotalHours: 45	45

Textbook(s):	
1.	PeterK.V.,"HandbookofHerbsandSpices",2ndEdition,Woodhead Publishing, UK,2012.
2.	P.S.Ahuja,A.Gulati,R.D.Singh,R.K.Sud,R.C.Boruah.,"ScienceofTeaTechnology",1st Edition,ScientificPublishers,India,2013.
Reference(s):	
1.	AmitBaranSharangi,SuchandDatta.,"ValueAdditionofHorticulturalCrops:RecentTrends andFutureDirections",1stedition,Springer,India,2015.

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CourseContentsandLectureSchedule

S.No.	Topic	No.of Hours
1	**PlantationCrops**	
1.1	TypesofPlantationCrops	1
1.2	Recent TrendsandInnovationinCocoa	1
1.3	Manufacturingofdiversifiedteaproducts	2
1.4	QualitygradingofCoffee	1
1.5	Chicorychemistry	2
2	**Spices&Condiments**	
2.1	Classificationofspices	1
2.2	Differentformsof Spices	2
2.3	Commercialspiceblends	1
2.4	SeasoningFormulation	2
2.6	Emergingspiceblends	1
2.7	Popularglobalspiceblends	1
2.8	Growingdemandforauthenticity	1
3	**Advancesinspiceprocessing**	
3.1	Spiceoiland advances in SCFE	2
3.2	Novelsolventfreeextraction	1
3.3	Extractionofoleoresins	2
3.5	Spiceencapsulation	2
3.6	Evaporatoranditstypes	2
4	**HerbalSpices**	
4.1	Descriptionofvarioustypesof spices	1
4.2	Basil	2
4.3	Cilantro	1
4.4	Coriander	1
4.6	Oregano	2
4.7	ProcessingandPost-harvesthandling	1
4.8	InnovationsinfoodIndustry	1
5	**FlavoringmaterialsRecentadvancesandTrends**	
5.1	Naturalflavors	2
5.2	Sourcesofnaturalflavoringagent	1
5.3	Geneticengineeringinflavors	2
5.4	Enzymesandbiologicalsystems	1
5.6	AromaandTastecomponents	1
5.7	Flavorstability	2
5.8	Storage	1
5.9	Retentionandreleaseof flavors	1
	Total	45

CourseDesigners

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60 PFT302	Food process plant layout and safety	Category	L	T	P	Credit
		PC	3	0	0	3

Objective

- Toexplaintherecent trendsin food process
- Toutilizefunctionalpropertiesof productdevelopment
- Toselectextractionmethodsrequiredforspicesprocessing
- Tooutlinedifferent layout of industries
- Toanalyzetheadvancesinprocessing offood safty

Prerequisite

NIL

CourseOutcomes

Onthesuccessfulcompletionofthe course,studentswillbeableto

CO1	Analyzetherecenttrendsinplantationcropsprocessing	Remember, Understand,Analyze
CO2	Examinethefunctionalproperties of spicesandcondimentsinproduct Development	Remember, Understand,Apply
CO3	Identifytheextractionmethodsrequiredforspices processing	Remember,Apply
CO4	Outlinethe differentherbs andtheirprocessing	Remember, Understand,Analyze
CO5	Summarizetheadvancesinprocessingofflavormaterials	Remember,Understand, Analyze

MappingwithProgrammeOutcomes

COs	PO1	PO2	PO3
CO1	1	3	1
CO2	1	2	1
CO3	1	1	1
CO4	1	2	1
CO5	3	1	1
3-Strong;2-Medium;1-Some			

AssessmentPattern

Bloom'sCategory	ContinuousAssessmentTests (Marks)		End SemesterExamination (Marks)
	1	2	
Remember (Re)	10	10	10
Understand(Un)	10	10	20
Apply(Ap)	20	20	30
Analyze(An)	20	20	40
Evaluate(Ev)	0	0	0
Create(Cr)	0	0	0

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K.S.RangasamyCollegeofTechnology-Autonomous R2022								
60PFT302 – Food process plant layout and safety								
M.Tech.FoodTechnology								
Semester	Hours/Week			Totalhrs	Credit	MaximumMarks		
	L	T	P		C	CA	ES	Total
III	3	0	0	45	3	40	60	100

Selectionof Plant location: Introduction and classification of food processing plants, Site selection - location - types of layout-characteristics ofan efficient layout. Techniques of plant layout. General requirements and considerations for construction, materialsand floors.Drainsanddrain layout.Ventilation,flycontrol,mouldprevention,illuminationin foodplants.	**[9]**
Procedure For Plant Layout Introduction. Plant layout procedure. Layout prob- lems. Layout of a new plant. Workstation layout. Revising and Improving existing layout. Opera- tion Analysis. Reasons for inefficient layouts. Weak- nesses in a poor plant layout. Reasons for redesign of layout. Procedure of revision and improvement of layout.	**[9]**
IndustrialSafety: Potentialhazards,toxicchemicalsandphysicalsafetyanalysis,highpressure,hightemperatureoperation,radioactive materials, safe handling and operation of machineries. Safety Appraisal, steps to implement safetyprocedure,properselectionandreplacementofhandlingequipments,personal protectiveequipments.	**[9]**
Accidents: Industrial accidents – accident costs – identification of accident spots, remedial measures, identification andanalysis of causes of injury to men and machines – accident prevention – accident proneness – vocationalguidance,faultfreeanalysis.Firepreventionandfireprotection.	**[9]**
HealthHazardsandLegalAspects: Healthhazards-occupational-industrialhealthhazards-healthstandards, and rules – safe working environments – parliamentary legislations – factories act – labour welfare act – ESI Act -WorkmenCompensationAct.	**[9]**
TotalHours: 45	**45**

Textbook(s):

1.	JamesMMoore,"PlantLayoutandDesign",Mcmillan&Co.,(1959)
2.	Manufacturing Facilities Design and Material Handling by Fred E. Meyers, and Matthew P. Stephens, 3rdEdition,Pearson,PrenticeHall,2000

Reference(s):

1.	Bolz,HaroldAGeorgeE.,"MaterialHandlingHandbook
2.	MApple," Plantlayout and MaterialHandling",JohnWilley&Sons,(1977)

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CourseContentsandLectureSchedule

S.No.	Topic	No.of Hours
1	**Selectionof Plant location**	
1.1	Introduction and classification of food processing plants,	1
1.2	Site selection - location - types of layout-characteristics ofan efficient layout.	1
1.3	Techniques of plant layout. General requirements and considerations for construction, materialsand floors.	2
1.4	Drainsanddrain layout.	1
1.5	Ventilation,flycontrol,mouldprevention,illuminationin foodplants.	2
2	**Procedure For Plant Layout**	
2.1	Introduction. Plant layout procedure.	1
2.2	Layout problems. Layout of a new plant. Workstation layout.	2
2.3	Revising and Improving existing layout.	1
2.4	Operation Analysis.	1
2.6	Reasons for inefficient layouts.	1
2.7	Weaknesses in a poor plant layout.	1
2.8	Reasons for redesign of layout. Procedure of revision and improvement of layout	2
3	**IndustrialSafety:**	
3.1	Potentialhazards,toxicchemicalsandphysicalsafetyanalysis	2
3.2	Highpressure,hightemperatureoperation,	1
3.3	radioactive materials, safe handling and operation of machineries.	2
3.5	Safety Appraisal, steps to implement safetyprocedure,properselection	2
3.6	replacementofhandlingequipments,personal protectiveequipments.	2
4	**Accidents**	
4.1	Industrial accidents – accident costs	1
4.2	Identification of accident spots, remedial measures, identification	2
4.3	Remedial measures, identification	1
4.4	Analysis of causes of injury to men and machines	1
4.6	Accident prevention – accident proneness	2
4.7	vocationalguidance,faultfreeanalysis.	1
4.8	Firepreventionandfireprotection.	1
5	**HealthHazardsandLegalAspects**	
5.1	Healthhazards&occupational	2
5.2	industrialhealthhazards	1
5.3	healthstandards and rules	2
5.4	safe working environments	1
5.6	parliamentary legislations	1
5.7	factories act and Labour welfare act	2
5.8	ESI Act	1
5.9	WorkmenCompensationAct.	1
	Total	45

CourseDesigners

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BoSChairman

60 PFT303	FoodRheology	Category	L	T	P	Credit
		PC	3	0	0	3

Objective

- Toexplainthefundamentals offoodrheology
- Tointerpretthedifferentrheologicalmodels
- Toassesstherheologicalbehaviorof processedfluidsandsemi-solidfoods
- Toevaluatetherheologicalbehaviorof foodgels
- Toanalyzetheimportance of rheologyin fluidfoodhandling andprocessing

Prerequisite

NIL

CourseOutcomes

Onthesuccessfulcompletionofthe course,studentswillbeableto

CO1	Analyzethefundamentalsoffoodrheology	Remember, Understand,Analyze
CO2	Examinethedifferentrheologicalmodels	Remember, Understand,Apply
CO3	Identifytherheologicalbehaviorof processedfluidsandsemi-solid foods	Remember,Apply
CO4	Outlinetherheologicalbehaviorof foodgels	Remember, Understand,Analyze
CO5	Summarizetheimportanceofrheologyinfluidfoodhandlingand processing	Remember,Understand, Analyze

MappingwithProgrammeOutcomes

COs	PO1	PO2	PO3
CO1	1	2	1
CO2	1	2	2
CO3	1	2	1
CO4	1	2	1
CO5	3	1	1
3-Strong;2-Medium;1-Some			

AssessmentPattern

Bloom'sCategory	ContinuousAssessmentTests (Marks)		End SemesterExamination (Marks)
	1	2	
Remember (Re)	10	10	10
Understand(Un)	10	10	20
Apply(Ap)	20	20	30
Analyze(An)	20	20	40
Evaluate(Ev)	0	0	0
Create(Cr)	0	0	0

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K.S.RangasamyCollegeofTechnology-Autonomous R2022								
60PFT303-FoodRheology								
M.Tech.FoodTechnology								
Semester	Hours/Week			Totalhrs	Credit	MaximumMarks		
	L	T	P		C	CA	ES	Total
III	3	0	0	45	3	40	60	100

Foodrheology Stress and strain tensors, viscometric properties, shear stress-shear rate relationships, units inrheological measurements, types of fluid flow behavior, apparent viscosity, intrinsic viscosity,stress-strainbehaviorofsolidfoods,linearviscoelasticity, phasetransitionsinfoods.	**[9]**
ModelsforRheologicalPropertiesofFoods: Time-IndependentFlowBehaviour-NewtonianModel,PowerLawModel,Herschel-BulkleyModel, Quemada Model. Time-Dependent Flow Behaviour - Weltman Model, Tiu-Boger Model.Shear Thinning Foods - Cross and Carreau Models. Effect of Temperature on Viscosity, PecletNumberofDispersions.	**[9]**
RheologicalBehaviorofProcessedFluidandSemisolidFoods FruitJuicesandPurees:RoleofSolubleandInsolubleSolids,RheologicalPropertiesofChocolate, Rheology of Milk and Milk Concentrate, Rheology of Mayonnaise, Salad Dressing, andMargarine,RheologyofSalad Dressings, StructuralAnalysisofFoodDispersions.	**[9]**
RheologicalBehaviorofFoodGels Rheological Tests to Evaluate Properties of Gel Systems, Mechanisms of Gelation, Classificationof Gels. Theoretical Treatment of Gels - Rubber Elasticity, Percolation Theory, Cascade Theory.Gel Point andSol-Gel Transitionby Rheological Measurements. MixedPolymer Gels, StarchGels.	**[9]**
RheologyinFluidFoodHandlingandProcessing VelocityProfilesinTubes,PumpSelectionandPipeSizing,EnergyRequirementsforPumping,PowerConsumptioninAgitation,ResidenceTimeDistributioninAsepticProcessingSystems, RoleofRheologyinThermalProcessingofCannedFoods,ContinuousFlowSterilization.	**[9]**
TotalHours: 45	**45**

Textbook(s):

1.	RaoM.A.,"RheologyofFluidandSemisolidFoods:PrinciplesandApplications",2ndEdition, Springer,NewYork,2007.
2.	BourneM.C.,"FoodTextureandViscosity:ConceptandMeasurement",2ndEdition,Academic Press, USA, 2002.

Reference(s):

1.	JasimAhmed, PawelPtaszek,SantanuBasu,"Advances in FoodRheologyand Its Applications", 1stEdition,WoodHeadPublishing,USA,2017.

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CourseContentsandLectureSchedule

S.No.	Topic	No.of Hours
1	**FoodRheology**	
1.1	Stressandstraintensors	1
1.2	Viscometricproperties	1
1.3	Shearstress-Shearraterelationships	2
1.4	Typesof Fluidflowbehaviour	1
1.5	IntrinsicViscosity	2
2	**ModelsofRheologicalPropertiesofFoods**	
2.1	TimeIndependentflow	1
2.2	NewtonianModel	2
2.3	Powerlawmodel	1
2.4	Herschel-BulkleyModel	2
2.6	WeltmanModel	1
2.7	ShearthinningFoods	1
2.8	PecletNumberof Dispersions	1
3	**RheologicalBehaviorofProcessedFluidandSemiSolidFoods**	
3.1	FruitJuices andPurees	2
3.2	RoleofSolubleandInsolubleSolids	1
3.3	RheologicalpropertiesofChocolates	2
3.5	Rheologyof Mayonnaise	2
3.6	SaladDressing	2
4	**RheologicalbehaviorofFoodgels**	
4.1	RheologicaltesttoEvaluatepropertiesof Gelsystems	1
4.2	MechanismofGelatin	2
4.3	Treatmentof Gels	1
4.4	RubberElasticity	1
4.6	PercolationTheory	2
4.7	Cascadetheory	1
4.8	StarchGels	1
5	**RheologyinFluidFoodHandlingandProcessing**	
5.1	VelocityProfiles inTubes	2
5.2	EnergyRequirementsforpumping	1
5.3	Agitation	2
5.4	Powerconsumptioninagitation	1
5.6	TimedistributioninAsepticProcessingSystems	1
5.7	RoleofRheologyinThermalProcessing	2
5.8	CannedFoods	1
5.9	ContinuousFlowSterilization	1
	Total	45

CourseDesigners

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60PFT 3P1	PROJECTWORKPHASEI	Category	L	T	P	Credit
		PC	0	0	12	6

Objective

- To impart practical knowledge to the students and also to make them to carry out thetechnical proceduresintheirprojectwork.
- Toprovideanexposuretothestudentstorefer,readandreviewtheresearcharticles,journalsand conferenceproceedingsrelevanttotheirprojectwork.
- To Independently carry out research / investigation and development work to solve practical problems inthefieldofFoodTechnology

Prerequisite

NIL

CourseOutcomes

Onthesuccessfulcompletionofthe course,studentswillbeableto

CO1	Survey the relevant literature such as books, national/internationalrefereed journals and contact resource persons for the selectedtopicofresearch.	Remember,Understand, Analyze
CO2	Use different experimental techniques/different software/computational/analyticaltools.	Remember, Understand,Apply
CO3	Conducttestson existingsetups/ equipment'sanddrawslogical conclusions from the results after analyzing them. Work in aresearchenvironmentorinanindustrialenvironment	Remember,Apply

MappingwithProgrammeOutcomes

COs	PO1	PO2	PO3
CO1	3	2	3
CO2	3	3	3
CO3	3	2	2
3-Strong;2-Medium;1-Some			

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60PFT3P1- ProjectWorkPhaseI

M.Tech.FoodTechnology

Semester	Hours/Week			Totalhrs	Credit	Maximum Marks		
	L	T	P		C	CA	ES	Total
III	0	0	4	60	2	40	60	100

- TheProjectWorkshouldpreferablybe aproblemwithresearchpotential
- TheProjectshouldinvolvescientificresearch,design,generation/collectionandanalysisof
- data,determiningsolutionandmustpreferablybringouttheindividualcontribution
- Seminarshould bebasedonthearea inwhichthecandidate has undertakenthe
- dissertationwork asperthe commoninstructionsforallbranchesofM.E/M.Tech
- Threereviewswillbeconductedbyacommitteeofsubjectexperts
- Eachreviewhastobe evaluatedfor100 marks
- Internalevaluationhastobedonefor100marks
- The final examination shall consist of the preparation of report consisting of a detailedproblemstatementanda literaturereview.
- Thepreliminaryresults (if available)of the problem mayalsobediscussedin thereport
- The work has to be presented in front of the examiners panel set by Head and PG ProjectCoordinator

TotalHours: 60

CourseDesigner

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FOURTHSEMESTER

S.No.	CourseCode	NameoftheCourse	DurationofInternalExam	WeightageofMarks			Minimum Marksfor Pass in EndSemester Exam	
				ContinuousAssessment *	EndSemesterExam **	Max. Marks	EndSemesterExam	Total
PRACTICAL								
1	60PFT4P1	Project WorkPhaseII	1	2	100	-	100	-

* CAevaluationpatternwilldifferfromcoursetocourseandfordifferent tests. Thiswillhavetobedeclaredinadvance to students. The department will put a process in place to ensure that the actual test paper follow the declaredpattern.

**End SemesterExaminationwillbeconducted formaximum marksof100 and subsequently be reducedto60 marksfortheawardofterminalexamination marks

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60PFT 4P1	PROJECTWORKPHASEII	Category	L	T	P	Credit
		PC	0	0	24	12

Objective

- This enables and strengthens the students to carry out the project on their own and to implement theirinnovative ideas to forefront the risk issues and to retrieve the hazards by adopting suitable assessmentmethodologiesandstaringittooglobal

Prerequisite

NIL

CourseOutcomes

Onthesuccessfulcompletionofthe course,studentswillbeableto

CO1	Developattitudeoflifelonglearningandwilldevelopinterpersonal skillstodealwithpeopleworkingindiversifiedfield will.	Remember,Understand, Analyze
CO2	Write technical reports and research papers to publish at nationalandinternationallevel	Remember, Understand,Apply
CO3	Developstrongcommunicationskillstodefendtheirworkinfront oftechnicallyqualifiedaudience.	Remember,Apply

MappingwithProgrammeOutcomes

COs	PO1	PO2	PO3
CO1	3	2	3
CO2	3	3	3
CO3	3	2	2
3-Strong;2-Medium;1-Some			

K.S.RangasamyCollegeofTechnology-Autonomous R2022								
60PFT4P1- ProjectWorkPhaseII								
M.Tech.FoodTechnology								
Semester	Hours/Week			Totalhrs	Credit	Maximum Marks		
	L	T	P		C	CA	ES	Total
IV	0	0	4	60	2	40	60	100

It isa continuation of Project work started in semester III. Students have to submit the report in prescribedformat and also present a seminar. The dissertation should be presented in standard format as provided bythe department. The candidate has to prepare a detailed project report consisting of introduction of theproblem, problem statement, literature review, objectives of the work, methodology (experimental set up ornumerical details as the case may be) of solution and results and discussion. The report must bring out theconclusionsoftheworkandfuturescope forthestudy.

Theworkhastobepresentedinfrontoftheexaminers panel consisting of an approved external examiner, an internal examiner and a guide, co-guideetc.as decidedbytheHeadandPG coordinator.Thecandidatehas tobeinregular contactwithhisguide.

TotalHours: 60

CourseDesigner

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60 PFTE11	Advanced Fruit and Vegetable Processing Technology	Category	L	T	P	Credit
		PC	3	0	0	3

Objective

- Tochoosesuitablepost-harvestprocessingmethodsandgeneticmodification forfreshproduce
- Toselectsuitableediblecoatingsfor fruitsandvegetablesandoutlinetheapplicationsofvacuumtechnology onfruitprocessing
- Toapplyminimalprocessingtechniquesforthe production of freshcutfruitsand vegetables
- Todevelopfruit andvegetable-basedjam,jellyandjuiceproducts
- Toexaminethe effectof ozone andenzymemacerationin fruitprocessing

Prerequisite

NIL

CourseOutcomes

Onthesuccessfulcompletionofthe course,studentswillbeableto

CO1	Analyzesuitablepost-harvestprocessingmethodsandgenetic modificationforfreshproduce	Remember, Understand,Analyze
CO2	Examinedifferentediblecoatingsforfruitsandvegetablesandoutline theapplicationsofvacuumtechnologyonfruitprocessing	Remember, Understand,Apply
CO3	Identifyminimalprocessing techniquesfortheproductionof freshcut fruitsandvegetables	Remember,Apply
CO4	Outlinetheconcept of fruitand vegetable-based jam,jellyandjuice Products	Remember, Understand,Analyze
CO5	Summarizethe effectof ozone and enzymemacerationin fruit Processing	Remember,Understand, Analyze

MappingwithProgrammeOutcomes

COs	PO1	PO2	PO3
CO1	1	2	1
CO2	2	1	3
CO3	1	2	2
CO4	2	3	3
CO5	3	2	1
3-Strong;2-Medium;1-Some			

AssessmentPattern

Bloom'sCategory	ContinuousAssessmentTests (Marks)		End SemesterExamination (Marks)
	1	2	
Remember (Re)	10	10	10
Understand(Un)	10	10	20
Apply(Ap)	20	20	30
Analyze(An)	20	20	40
Evaluate(Ev)	0	0	0
Create(Cr)	0	0	0

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K.S.RangasamyCollegeofTechnology-Autonomous R2022								
60PFTE11- AdvancedFruitandVegetableProcessingTechnology								
M.Tech.FoodTechnology								
Semester	Hours/Week			Totalhrs	Credit	MaximumMarks		
	L	T	P		C	CA	ES	Total
I	3	0	0	45	3	40	60	100

Post-harvest Processing and Improving the shelf-life of vegetables by genetic modification Pre-harvest factors on postharvest life, Maturity index, Precooling, Post-harvest treatments-curing, sprout suppressants, degreening. Storage – Refrigerated storage, Hypobaric storage.Controlled atmosphere stores. MAP. Fruit ripening – changes during ripening, ripening rooms.Ethylene – sources, alternatives. Genetic control of leaf senescence and fruit ripening, futuretrends.	**[9]**
EdibleCoatingsandVacuumTechnology Introduction, Principle, selection of edible coatings, Polysaccharide, protein and lipidbasedcoatings. Gas permeation properties, Wettability, coating effectiveness, Diffusivities of fruits –determination.Measuringinternalgascomposition.Futuretrends.Introduction,principles-mass transferandproductbehavior.Applicationsandfuture trends.	**[9]**
MinimalProcessing Introduction, quality changes, Processing - physiological and microbiological impacts, Fresh cutproducts – Fresh produces quality and safety. Strategies for minimizing quality loss improvingquality, bio-control agents, browning inhibition. Storage and packaging. Fresh-cut chain - harvesttomarket.Equipmentrequirements.Traceabilityoffreshcutproducts.Layoutofafreshcut processingfacility.	**[9]**
FruitandVegetableProduct Manufacturing: jams and jellies – gelling agent, sweetening agent, acidulants, coloring andflavoring agents, method of manufacturing. Fruit Beverages - Classification, Production of filteredand cloudy fruit drinks - preparation steps, Juice extraction, clarification, concentrate production.Productionoffruitnectars–preparationsteps,freezesconcentration.	**[9]**
OzonationandEnzymeMaceration Introduction,ozoneproperties,ozonegenerationmethods– electrical,electrochemical,radiochemical and ultraviolet method. Ozone in fruit juice processing – gaseous and aqueousapplications, factors affecting efficacy of ozone processing - Extrinsic and intrinsic parameters.Mechanismofmicrobialinactivation.Effectonfoodquality.Industrialhealthandsafety. Introduction-functionofenzymesinfruitjuiceprocessing-Applicationsandfuture trends	**[9]**
TotalHours: 45	**45**

Textbook(s):

1.	JongenW.,"FruitandVegetableProcessing:ImprovingQuality",1stEdition,WoodheadPublishing Seriesin FoodScience,TechnologyandNutrition,2002
2.	NirmalSinha,JiwanSidhu,JozsefBarta,JamesWu,M.PilaCano,"HandbookofFruitsandFruitProcessing",2ndEdition,BlackwellPublishing,2012.

Reference(s):

1.	SrivastavaR.P&SanjeevKumar,"Fruitandvegetablepreservation:Principlesandpractices",3rd Edition,CBSPublishers&Distributers,New Delhi,2014.
2.	RodriguesSueli,andFabianoAndreNarcisoFernandes,(Eds),"AdvancesinFruitProcessingTechnologies",1stEdition,CRCPress,2012.

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CourseContentsandLectureSchedule

S.No.	Topic	No.of Hours
1	**Post-harvestProcessingandimprovingtheshelflifeofvegetablesbygeneticmodification**	
1.1	Pre-harvestfactors	1
1.2	MaturityIndex	1
1.3	Storage	2
1.4	Ripeningrooms and techniques	1
1.5	Genetic code ofLeafsenescense	2
2	**EdiblecoatingandVacuumTechnology**	
2.1	Introduction,principleselectionof Ediblecoating	1
2.2	Polysaccharide	2
2.3	Lipidbased coating	1
2.4	Gaspermeationproperties	2
2.6	Wettability	1
2.7	Coatingeffectiveness	1
2.8	Diffusivitiesoffruits	1
3	**MinimalProcessing**	
3.1	QualityChanges and Processing	2
3.2	PhysiologicalandMicrobiologicalImpacts	1
3.3	Freshcutproducts	2
3.5	Strategiesforminimizingqualityloss	2
3.6	Traceabilityoffreshcut	2
4	**Fruitandvegetableproducts**	
4.1	Manufacturing ofJamandJellies	1
4.2	Fruit beverages	2
4.3	Production offiltered andcloudyfruitdrink	1
4.4	Juiceextraction	1
4.6	Concentrateproduction	2
4.7	ProductionofFruitnectars	1
4.8	Freezeconcentration	1
5	**OzonationandEnzymeMaceration**	
5.1	Ozone properties	2
5.2	RadiochemicalandUltravioletmethod	1
5.3	Ozone infruitjuiceprocessing	2
5.4	Gaseousand aqueousapplications	1
5.6	Efficiencyofozone processing	1
5.7	Extrinsicandintrinsicparameters	2
5.8	Mechanismofmicrobialinactivation	1
5.9	Effect onfood Quality	1
	Total	45

CourseDesigners

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60 PFTE12	Novel Technologies in Food Processing	Category	L	T	P	Credit
		PC	3	0	0	3

Objective

- Toapplytheconcepts ofnovelenzymetechnologyandmembraneprocessinginfoodprocessing
- Tooutlinethebasicsof pulsedelectricfieldandlighttechnologyforfoodmaterials
- Todemonstratetheconceptof irradiationandultrasoundfor foodtreatments
- Toexplaintheconceptsof ohmicheatingandcold plasmatechniquesforfoodapplications
- Toapplytheconceptsof vacuumcooling andosmoticmembranedistillation infoodprocessing

Prerequisite

NIL

CourseOutcomes

Onthesuccessfulcompletionofthe course,studentswillbeableto

CO1	Analyze theconcepts ofnovelenzymetechnologyandmembrane processinginfoodprocessing	Remember, Understand,Analyze
CO2	Examinethe basics of pulsedelectricfieldand lighttechnologyforfood Materials	Remember, Understand,Apply
CO3	Identifytheconceptof irradiation and ultrasoundforfoodtreatments	Remember,Apply
CO4	Outlinetheconceptsofohmicheating and cold plasmatechniquesfor foodapplications	Remember, Understand,Analyze
CO5	Summarizetheconcepts ofvacuum coolingandosmoticmembrane distillationinfoodprocessing	Remember,Understand, Analyze

MappingwithProgrammeOutcomes

COs	PO1	PO2	PO3
CO1	1	2	1
CO2	1	1	3
CO3	1	2	1
CO4	2	2	3
CO5	3	2	1
3-Strong;2-Medium;1-Some			

AssessmentPattern

Bloom'sCategory	ContinuousAssessmentTests (Marks)		End SemesterExamination (Marks)
	1	2	
Remember (Re)	10	10	10
Understand(Un)	10	10	20
Apply(Ap)	20	20	30
Analyze(An)	20	20	40
Evaluate(Ev)	0	0	0
Create(Cr)	0	0	0

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BoSChairman

K.S.RangasamyCollegeofTechnology-Autonomous R2022								
60PFT E12-NovelTechnologiesinFoodProcessing								
M.Tech.FoodTechnology								
Semester	Hours/Week			Totalhrs	Credit	MaximumMarks		
	L	T	P		C	CA	ES	Total
I	3	0	0	45	3	40	60	100

NovelEnzymeTechnologyinFoodProcessingandNovelMembraneTechnologyforProtein Concentrationand Fractionation Introduction-Typesofcross-linkingmethods-Applicationsofcross-linkingenzymes-Meatandfish products, bakery and pasta products, dairy and miscellaneous products. Introduction – principles – configurations – mode of operation – scale up strategies - Applications usingconcentrationandfractionation.	[9]
ShockWavesforMeatTenderization Meat tenderness - processing interventions for meat tenderization – shock wave technology – principle - effect of shock wave treatment on meat tenderization – shock wave implication onbiochemicalcomponents andmicrostructure-effectonother meatqualitytraits.Costanalysis andfutureconsiderations.	[9]
VacuumFryingTechnology Principles-processandequipment-effectofvacuumfryingconditionsonfriedfoods-pre-treatment-fryingtemperature,timeandpressure.Combinationofvacuummicrowavedryingwithvacuumfrying.Storagestabilityofvacuum friedproducts	[9]
FluidizedBedCoatingTechnologyandAnti-microbialfoodpackaging Principles – Batch fluidized bed coating – Design, modification and possibilities for the foodindustry-Continuousfluidizedbedcoating-Applications-Issuesandproblemsinfoodpowdercoating technology introduction, agents, factors, non-migratory bioactive polymers (NMBP) in foodpackaging,introduction,AdvantagesofNMBP,limitations,Polymerswithimmobilizedbioactive Compounds	[9]
VacuumCoolingandOsmoticMembraneDistillation(OMD) Principles-Process-Equipment-Application-FruitsandVegetables,Bakery,Fishery,Particulatefoods,Readymeals.AdvantagesandDisadvantages-ProcessParameters. Fundamentals-OMDmembranes-Processparameters-Osmoticagent,Concentration, Temperature,Membrane.Directosmosis.Applicationsinfoodsystem.	[9]
TotalHours: 45	**45**

Textbook(s):

1.	MariaLauraPassos,ClaudioP.Ribeiro,InnovationinFoodEngineering-New TechniquesandProducts,1stEdition,CRCPress,2016.
2.	Kai Knoerzer, Pablo Juliano, Geoffrey W. Smithers, Innovative Food Processing Technologies :Extraction,Separation,ComponentModificationandProcessIntensification,1stEdition,Woodhead PublishingLtd,2016.

Reference(s):

1.	Bhattacharya,Suvendu,(Eds),"ConventionalandAdvancedFoodProcessingTechnologies",1stEdition,JohnWiley&Sons,2014.

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CourseContentsandLectureSchedule

S.No.	Topic	No.of Hours
1	**Novel Enzyme Technology in Food Processing and NovelMembraneTechnologyforProteinConcentrationand Fractionation**	
1.1	Introduction	1
1.2	Typesofcross-linkingmethods	1
1.3	ApplicationofCross-linkingenzymes	2
1.4	Meat and fishproducts	1
1.5	DairyandMiscellaneousproducts	2
2	**ShockwavesforMeatTenderization**	
2.1	MeatTenderness	1
2.2	Shock wave technology	2
2.3	Effectof shockwave	1
2.4	Shockwaveimplications	2
2.6	Effectof meattraits	1
2.7	Costanalysis	1
2.8	Futureconsiderations	1
3	**VacuumFryingTechnology**	
3.1	Principleof Processequipment	2
3.2	EffectofVacuumfrying	1
3.3	Pretreatment	2
3.5	Fryingtemperature	2
3.6	Combinationofvacuummicrowavedrying	2
4	**FluidizedbedCoatingandAnti-microbialFoodPackaging**	
4.1	Principlepfbatchfluidizedbedcoating	1
4.2	DesignandModification	2
4.3	ContinuousFluidizedbedcoating	1
4.4	ApplicationIssuesandproblem	1
4.6	Non-Migratingbioactivecompounds	2
4.7	AdvantagesofNMBP	1
4.8	Polymerwithimmobilizedbioactivecompound	1
5	**VacuumCoolingandOsmoticMembraneDistillation**	
5.1	PrincipleandProcessEquipment	2
5.2	Fruitsandvegetables	1
5.3	ParticulateFood	2
5.4	Readymeals	1
5.6	ProcessParameters	1
5.7	OMDmembranes	2
5.8	Osmoticagents	1
5.9	Applicationinfoodsystem	1
	Total	45

CourseDesigners

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60 PFTE13	Heat and Mass Transfer Operationsin Food Processing	Category	L	T	P	Credit
		PC	3	0	0	3

Objective

- Toexplaincondensationandevaporative heattransferphenomena
- Toanalyze theheat exchanger performance
- Toexplaindistillationprocessandestimatenumberofstages
- Tochooseand applyextractiontechniques
- Toexplainleaching processandestimatenumberofstages

Prerequisite

NIL

CourseOutcomes

Onthesuccessfulcompletionofthe course,studentswillbeableto

CO1	Analyzetheconceptscondensationandevaporativeheattransfer Phenomena	Remember, Understand,Analyze
CO2	Examinetheheatexchanger performance	Remember, Understand,Apply
CO3	Identifytheconceptof distillation processandestimate numberof Stages	Remember,Apply
CO4	Outlinetheextractiontechniques	Remember, Understand,Analyze
CO5	Summarize the conceptsof leachingprocessandestimatenumberof Stages	Remember,Understand, Analyze

MappingwithProgrammeOutcomes

COs	PO1	PO2	PO3
CO1	1	2	1
CO2	1	1	1
CO3	1	2	1
CO4	1	1	3
CO5	3	1	1
3-Strong;2-Medium;1-Some			

AssessmentPattern

Bloom'sCategory	ContinuousAssessmentTests (Marks)		End SemesterExamination (Marks)
	1	2	
Remember (Re)	10	10	10
Understand(Un)	10	10	20
Apply(Ap)	20	20	30
Analyze(An)	20	20	40
Evaluate(Ev)	0	0	0
Create(Cr)	0	0	0

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ApprovedinAcademicCouncilMeetingheldon21/05/2023

BoSChairman

K.S.RangasamyCollegeofTechnology-Autonomous R2022								
60PFT E13-HeatandMassTransferOperationsinFoodProcessing								
M.Tech.FoodTechnology								
Semester	Hours/Week			Totalhrs	Credit	MaximumMarks		
	L	T	P		C	CA	ES	Total
I	3	0	0	45	3	40	60	100

CondensationandBoilingandEvaporators Condensation number – Film condensation – Boiling heat transfer - Simplified relations. Singleand multiple effect evaporators – Performance of evaporators and boiling point elevation –capacity–economyandheatbalance-Typesofevaporators.	[9]
HeatExchangers Overall heat transfer coefficients – Fouling factor - Types of Heat Exchanger- LMTD - Heatexchanger effectiveness by NTU method- Compact Heat Exchangers – Analysis for variableProperties	[9]
Distillation Batch Distillation – Flash Vaporization – Continuous fractionation- Design of multistage traytowers for binary systems: McCabe Thiele method and Panchon-Savorit method. Introduction tomulticomponentdistillation.	[9]
Extraction Single stage, multistage cross current and multi stage counter current operations - Introduction tonewer extraction techniques: Super critical extraction, pulsed electric field extraction, microwaveextraction,ultrasoundassistedextraction,subcriticalwaterextraction,Highpressureassisted extraction.	[9]
Leaching Solid liquid equilibria, single stage leaching, multistage crosscurrent and counter current leaching,Calculations for number of stages - leaching equipment. Batch percolators – Fixed bed multistagesystems–continuouscontactors.	[9]
TotalHours: 45	45

Textbook(s):	
1.	McCabeW.L.,SmithJ.C.,HarriottP.,"UnitOperationsofChemicalEngineering",5thEdition,McGrawHillEducation,2010.
2.	HolmanJ.P.,"HeatTransfer",10th Edition, McGraw-Hill,New York,2012.
Reference(s):	
1.	TreybalR.E.,"MassTransferOperations",3rd Edition, McGraw-Hill,NewYork,2012.
2.	AlbertIbarz,"UnitOperationsinFood Engineering",1stEdition,CRC Press,2003.

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CourseContentsandLectureSchedule

S.No.	Topic	No.of Hours
1	**CondensationandBoilingandEvaporators**	
1.1	CondensationNumber	1
1.2	FilmCondensation	1
1.3	Boilingheattransfer	2
1.4	Simplifiedrelations	1
1.5	Typesof Evaporators	2
2	**HeatExchangers**	
2.1	OverallHeattransfer	1
2.2	Foulingfactor	2
2.3	Types ofheatexchanger	1
2.4	LMTD	2
2.6	NTUmethod	1
2.7	Compactheatexchanger	1
2.8	AnalysisofVariableproperties	1
3	**Distillation**	
3.1	BatchDistillation	2
3.2	FlashVaporization	1
3.3	Continuousfractionation	2
3.5	DesignofMultistageTraytower for binarysystem	2
3.6	McCabeThiele method	2
4	**Extraction**	
4.1	Singlestagecountercurrentoperation	1
4.2	Multistagecountercurrent operation	2
4.3	Introductiontonewertechniques	1
4.4	Supercriticalextraction	1
4.6	Pulsedelectricfieldextraction	2
4.7	MicrowaveExtraction	1
4.8	HighPressureassistedextraction	1
5	**Leaching**	
5.1	Solidliquidequilibria	2
5.2	Singlestageleaching	1
5.3	MultistageCrosscurrent	2
5.4	Countercurrentleaching	1
5.6	Calculationsfornumberofstages	1
5.7	Leachingexperiment	2
5.8	Batchpercolators	1
5.9	Fixedbedmultistagesystems	1
	Total	45

CourseDesigners

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BoSChairman

60 PFTE21	IndustrialEngineering	Category	L	T	P	Credit
		PC	3	0	0	3

Objective

- Tooutlinetherole of industrialengineeringandconceptof productivity
- Tomakeuseofconcepts ofworkstudyandapplyexistingmethodsofworkingforspecifiedjob
- Toexplainthesignificanceofforecastinginpre-planning
- Toselectsuitablelayout designproceduresoffacility
- Toidentifytheimportanceofindustrialengineeringincostanalysis

Prerequisite

NIL

CourseOutcomes

Onthesuccessfulcompletionofthe course,studentswillbeableto

CO1	Analyzetheroleof industrialengineeringandconceptofproductivity	Remember, Understand,Analyze
CO2	Examinetheconcepts ofworkstudyandapplyexistingmethods of workingforspecifiedjob	Remember, Understand,Apply
CO3	Identifythesignificanceofforecastinginpre-planning	Remember,Apply
CO4	Outlinethesuitablelayoutdesignproceduresoffacility	Remember, Understand,Analyze
CO5	Summarizetheimportanceofindustrialengineeringincostanalysis	Remember,Understand, Analyze

MappingwithProgrammeOutcomes

COs	PO1	PO2	PO3
CO1	1	2	1
CO2	1	1	1
CO3	1	2	1
CO4	1	1	3
CO5	3	1	1
3-Strong;2-Medium;1-Some			

AssessmentPattern

Bloom'sCategory	ContinuousAssessmentTests (Marks)		End SemesterExamination (Marks)
	1	2	
Remember (Re)	10	10	10
Understand(Un)	10	10	20
Apply(Ap)	20	20	30
Analyze(An)	20	20	40
Evaluate(Ev)	0	0	0
Create(Cr)	0	0	0

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BoSChairman

K.S.RangasamyCollegeofTechnology-Autonomous R2022								
60PFTE21-IndustrialEngineering								
M.Tech.FoodTechnology								
Semester	Hours/Week			Totalhrs	Credit	MaximumMarks		
	L	T	P		C	CA	ES	Total
II	3	0	0	45	3	40	60	100

HistoricalEvolutionofProductionandOperations Management-IndustrialEngineering-RoleofIndustrialEngineering-Systemconceptofproduction-Types of production system-flow, job, batch and project- Productivity- Factors affectingproductivity-Productivitymeasures-Productivityimprovementtechniques-BusinessProcessReengineering (BPR)	**[9]**
WorkStudy Method,basicprocedure-Selection-Recordingofprocess-Criticalanalysis,Development-Implementation-Micromotionandmemomotionstudy-Principlesofmotioneconomy-Workmeasurement Techniques of work measurement -Time study –computation of standard time-Worksampling-Syntheticdata-Predeterminedmotiontimestandards-JobEvaluation,MeritRating-Ergonomics andSafety	**[9]**
Modulesofpre-planning Introduction-Forecasting:Needforforecasting-demandpatterns-Forecastingmodels-JudgmentalTechniques,Timeseriesanalysis,movingaverage,exponentialsmoothing,Regressionand correlationmethod-Forecast errorcostsand accuracyofforecasts.	**[9]**
FacilityPlanning Facilitylocation-factorsinfluencingplantlocation-singleandmultifacilitylocationproblems-Minimax,GravityandEuclidean-Distancelocationproblem.Capacityplanning,ModelsforFacility Decisions - Plant layout- Layout classification-Layout Design Procedures-CRAFT, ALDEP,CORELAP-Materialhandlingsystemsunitloadconcept-materialhandlingprinciples-Typesof materialhandlingequipmentanditsselection	**[9]**
ValueEngineering Value engineering-function, aims, procedure. Make or buy decision, Interest formulae and theirapplications: Time value of money, Single payment compound amount factor, Single paymentpresent worth factor, Equal payment series sinking fund factor, Equal payment series paymentPresentworthfactor-equalpaymentseriescapitalrecovery factor-Uniformgradientseries,annualequivalentfactor,Effectiveinterestrate,IntroductiontoMethodsofcomparisonof Alternatives	**[9]**
TotalHours: 45	**45**

Textbook(s):	
1.	Gupta S., Starr M.,“Production andOperationsManagementSystems”,1stEdition,CRC Press, 2014.
2.	HooverC.,“IndustrialEngineeringandProductionManagement”,1stEdition,Clanrye International,2017.
Reference(s):	
1.	TelsangM.,“IndustrialEngineeringandProductionManagement”,1stEdition,S.Chandand Company,NewDelhi, 2006.

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CourseContentsandLectureSchedule

S.No.	Topic	No.of Hours
1	**HistoricalEvolutionofProductionandOperation**	
1.1	ManagementandIndustrialEngineering	1
1.2	RoleofIndustrialEngineering	1
1.3	System conceptofproduction	2
1.4	Typesof production	1
1.5	Businessprocessreengineering	2
2	**WorkStudy**	
2.1	Methodbasicprocedure	1
2.2	Selection,Recordingofprocess	2
2.3	CriticalAnalysis	1
2.4	WorkMeasurementTechniques	2
2.6	Timestudycomputation	1
2.7	Worksampling	1
2.8	Meritrating	1
3	**ModulesPreplanning**	
3.1	Introduction	2
3.2	Needforforecasting	1
3.3	Demandpatterns	2
3.5	Forecastingmodel	2
3.6	RegressionandForecastingmethod	2
4	**FacilityPlanning**	
4.1	Facilitylocators	1
4.2	Multifacilitylocation	2
4.3	Minimaxgravity	1
4.4	MaterialHandlingsystem	1
4.6	Materialhandlingprinciples	2
4.7	Materialhandlingequipment	1
4.8	Selectionofmaterialhandlingequipment	1
5	**Valueengineering**	
5.1	Valueengineeringfunction	2
5.2	Proceduremakeor buydecision	1
5.3	Interestformulaeandtheirapplication	2
5.4	Singlepayment compound factor	1
5.6	Singlepayment present worthfactor	1
5.7	Equalpaymentseries	2
5.8	Present worthfactorequal	1
5.9	Uniformgradientseries	1
	Total	45

CourseDesigners

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60 PFTE22	IndustrialWasteManagement	Category	L	T	P	Credit
		PC	3	0	0	3

Objective

- Tosummarizethepresent industrialimpactonenvironment
- Toselectsuitablewastewatertreatmentoptionsandreuse
- Tooutlinethesourcesofsolid wasteandsegregation
- Toutilizesolidwastefor energyrecoveryanddisposal
- Toapplywastemanagementprinciplesindifferentindustries

Prerequisite

NIL

CourseOutcomes

Onthesuccessfulcompletionofthe course,studentswillbeableto

CO1	Analyzethepresentindustrialimpactonenvironment	Remember, Understand,Analyze
CO2	Examinethesuitable waste watertreatmentoptionsandreuse	Remember, Understand,Apply
CO3	Identifythesourcesofsolidwasteandsegregation	Remember,Apply
CO4	Outlinethesolidwastefor energyrecoveryanddisposal	Remember, Understand,Analyze
CO5	Summarizethewastemanagementprinciplesindifferentindustries	Remember,Understand, Analyze

MappingwithProgrammeOutcomes

COs	PO1	PO2	PO3
CO1	1	2	1
CO2	2	1	2
CO3	1	2	1
CO4	1	1	3
CO5	3	1	1
3-Strong;2-Medium;1-Some			

AssessmentPattern

Bloom'sCategory	ContinuousAssessmentTests (Marks)		End SemesterExamination (Marks)
	1	2	
Remember (Re)	10	10	10
Understand(Un)	10	10	20
Apply(Ap)	20	20	30
Analyze(An)	20	20	40
Evaluate(Ev)	0	0	0
Create(Cr)	0	0	0

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BoSChairman

K.S.RangasamyCollegeofTechnology-Autonomous R2022								
60PFTE21-IndustrialEngineering								
M.Tech.FoodTechnology								
Semester	Hours/Week			Totalhrs	Credit	MaximumMarks		
	L	T	P		C	CA	ES	Total
II	3	0	0	45	3	40	60	100

IndustriesandEnvironment Industrial scenario in India – Industrial activity and Environment – Uses of water by industry – Sourcesandtypesofindustrialwastewater-Industrialwastewaterandenvironmentalimpacts- Regulatory requirements for treatment of industrial wastewater – Industrial waste survey – Industrial wastewater generation rates, characterization and variables – Population equivalent – ToxicityofindustrialeffluentsandBioassaytests.	[9]
ManagementofIndustrialWasteWaterandTreatmentPlants Treatments:Aerobicandanaerobicbiologicaltreatment-batchandhigh-ratereactors-Chemical oxidation – Ozonation – Photo catalysis – Wet Air Oxidation – Evaporation – IonExchange – Membrane Technologies.Individual and common Effluent Treatment plants – Jointtreatmentofindustrialwastewater-Zeroeffluentdischargesystems- Qualityrequirementsforwastewaterreuse-Industrialreuse-Disposalonwaterandland- ResidualsofIndustrial wastewatertreatment.	[9]
SolidWasteSourcesandSegregation Sources:TypesandSourcesofsolidwastes-Needforsolidwastemanagement- Elementsofintegratedwastemanagementandrolesofstakeholders- SalientfeaturesofIndianlegislationson management and handling of municipal solid wastes. Handling and segregation of wastes atsources-storageandcollectionofmunicipalsolidwastes- Analysisofcollectionsystems- Needfortransferandtransport-Transferstations-Optimizingwasteallocation-compatibility.	[9]
EnergyRecoveryandDisposal Objectives of waste processing – material separation and processing technologies – biologicalandchemicalconversiontechnologies-methodsandcontrolsofcomposting- energyrecoveryandothermoderntechniquesinmanagingsolidwaste- casestudies.Wastedisposaloptions-Disposal in landfills – Landfill classification, types and methods – siteselection – designandoperationofsanitarylandfills, secure landfills – leachate and landfillgasmanagement – landfill closureoflandfills-landfillremediation.	[9]
WasteManagementindifferentindustrialsegments Industrial manufacturing process description- wastewater and solid waste characteristics - sourcereduction options and waste treatment flow sheet for Textiles – Tanneries – pulp and paper –petroleumrefining-pharmaceuticals-sugaranddistilleries-Foodprocessing-fertilizers- ThermalpowerplantsandIndustrialEstates.	[9]
TotalHours: 45	**45**

Textbook(s):

1.	ArceivalsS.J.,"WastewaterTreatmentforPollutionControl",3rdEdition,TataMcGraw-Hill, 2017
2.	EckenfelderW.W.,"IndustrialWaterPollutionControl",3rdEdition,McGraw-Hill,2017.

Reference(s):

1.	LandrethR.E.andRebersP.A.,"MunicipalSolidWastes-ProblemsandSolutions",1stEdition, CRCPublishers,2019.

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CourseContentsandLectureSchedule

S.No.	Topic	No.of Hours
1	**IndustriesandEnvironment**	
1.1	IndustrialScenarioinIndia	1
1.2	IndustrialWastewaterandenvironmentalimpact	1
1.3	Industrialwastewatergenerationrates	2
1.4	ToxicityofindustrialEffluents	1
1.5	BioassayTests	2
2	**ManagementofIndustrialWastewaterandTreatmentPlant**	
2.1	AerobicandAnaerobicbiologicalTreatment	1
2.2	PhotoCatalysis	2
2.3	JointtreatmentofIndustrialWastewater	1
2.4	ZeroeffluentDischargesystems	2
2.6	IndustrialReuse	1
2.7	Disposalonwater andland	1
2.8	IndustrialWastewater Treatment	1
3	**SolidWasteSourcesandSegregation**	
3.1	Typesandsourcesofsolid waste	2
3.2	SalientfeaturesofIndianLegislations	1
3.3	Handlingand Segregationof wastes atsources	2
3.5	Needfor transferandTransport	2
3.6	OptimizingWasteallocation	2
4	**EnergyRecoveryandDisposal**	
4.1	Objectivesofwasteprocessing	1
4.2	MaterialSeparation	2
4.3	WasteDisposaloption	1
4.4	LandfillClassification	1
4.6	Securelandfills	2
4.7	LeachateandLandfillgas Management	1
4.8	Landfillclosure	1
5	**WasteManagementinDifferentIndustrialSegments**	
5.1	IndustrialManufacturingProcess	2
5.2	WaterandSolid wasteCharacteristics	1
5.3	Sourcereductionoptions	2
5.4	Wastewater flowsheetfortextiles	1
5.6	Pulpand PaperIndustries	1
5.7	FoodProcessingindustries	2
5.8	Fertilizer	1
5.9	Thermalpower plantandIndustrialEstates	1
	Total	45

CourseDesigners

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BoSChairman

60 PFTE23	Advanced Baking and Confectionary Technology	Category	L	T	P	Credit
		PC	3	0	0	3

Objective

- Tosummarizetheroleof ingredients and workingofequipmentinproduction ofbakeryproducts
- Toanalyze andinterpretrheologicalpropertiesof bakeryproducts
- Toselectthe appropriatetechniquesinindustrialproduction ofbakeryproducts
- Toapplytheheatandmasstransferphenomenainbakeryproductprocessingandoutlinetheroleofconfectioneryingredients
- Toapplytheprocesstechnologyfor developmentofconfectioneryproducts

Prerequisite

NIL

CourseOutcomes

Onthesuccessfulcompletionofthe course,studentswillbeableto

CO1	Analyze therole of ingredients and working of equipment in productionofbakeryproducts	Remember, Understand,Analyze
CO2	Examinetherheologicalpropertiesofbakeryproducts	Remember, Understand,Apply
CO3	Identifytheappropriatetechniques inindustrialproductionofbakery Products	Remember,Apply
CO4	Outlinetheheatandmasstransfer phenomenainbakeryproduct processingandoutlinetheroleofconfectioneryingredients	Remember, Understand,Analyze
CO5	Summarizetheprocesstechnologyfordevelopmentof confectionery Products	Remember,Understand, Analyze

MappingwithProgrammeOutcomes

COs	PO1	PO2	PO3
CO1	1	2	2
CO2	2	1	2
CO3	1	2	1
CO4	2	1	3
CO5	3	1	1
3-Strong;2-Medium;1-Some			

AssessmentPattern

Bloom'sCategory	ContinuousAssessmentTests (Marks)		End SemesterExamination (Marks)
	1	2	
Remember (Re)	10	10	10
Understand(Un)	10	10	20
Apply(Ap)	20	20	30
Analyze(An)	20	20	40
Evaluate(Ev)	0	0	0
Create(Cr)	0	0	0

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BoSChairman

K.S.RangasamyCollegeofTechnology-Autonomous R2022								
60PFTE23- AdvancedBakingandConfectionaryTechnology								
M.Tech.FoodTechnology								
Semester	Hours/Week			Totalhrs	Credit	MaximumMarks		
	L	T	P		C	CA	ES	Total
II	3	0	0	45	3	40	60	100

BakeryIngredientsandEquipment Essential bakery ingredients: Flour, yeast and sour dough, water, salt- Other ingredients: Sugar,color, flavor, fat, milk, bread improvers, leavening agents, shortenings, enzymes, emulsifiers andantioxidants. Role of fat and sugar replacers, clean label ingredients. Bulk handling of ingredients,doughmixers,dividers,rounders,sheeters,laminators,Fermentationenclosuresandbrewequipment,ovensandslicers.	[9]
RheologicalPropertiesofDoughandBatter Rheologicalmethods-FundamentaltestingandEmpiricalmethods,Rheologicaltestingequipment,compression,penetration, modifiedpenetrometers,transienttests,dynamictests,extensionalviscosity.Effectofingredients,mixing,dosingandtemperatureonrheological properties,cakebatter rheologyand breaddoughrheology	[9]
Technology of Bakery Products: Bread and Cake, Biscuits and Other bakery products Variousstagesandmethods,Formulationandproduction-frozendough,refrigerateddoughandpartiallybakedbread.Types-Foamstyleandshortenedstyle,industrialpreparationandbakingofcakes.Productionprocessandquality control,healthybiscuitformulation.Manufactureof cookies,pretzelsandpastries.Requirementof dieteticbakery	[9]
InteractionsbetweenformulationandprocessmethodologiesandConfectionery Basicconceptsofheatandmasstransfermechanisminbakery products.Foamtospongeconversionandthecollapseofbakeryproducts,Effectofingredient,recipeandproductinteractions.Classification, Ingredients sources and their role for various products: sweeteners – alternativeandhighintensitysweeteners,water,lipids,emulsifiers,starch,protein,pectin,gums andother ingredients.Factorsinfluencingrheologyof candymassandchocolate	[9]
Technologyforconfectioneryproducts FormulationandProcessing– Hardcandy,fondant,creams,jellies,gummies,licorices,compressedtablets,chocolatesandcompoundcoatings,sugarfreeconfections.Qualitystandards ofconfectioneryproducts.PackagingandshelflifeofConfectioneryproducts.	[9]
TotalHours: 45	**45**

Textbook(s):

1.	WeibiaoZhouandY.H.Hui.,"BakeryProductsScienceandTechnology",2ndEdition,Wiley Blackwell,US,2014.
2.	ServetGulumSumnuand Serpil Sahin.,"Food EngineeringAspectsofBaking SweetGoods",1st Edition,CRCPress,USA,2008.

Reference(s):

1.	RichardW.Hartel,JoachimH.vonElbe,RandyHofberger.,"Confectioneryscienceand technology",1stEdition,Springer,2022

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CourseContentsandLectureSchedule

S.No.	Topic	No.of Hours
1	**BakeryIngredientsandEquipment**	
1.1	EssentialBakeryingredients	1
1.2	Breadimprovers	1
1.3	Emulsifiersandantioxidants	2
1.4	Bulkhandlingofingredients	1
1.5	OvensandSlicers	2
2	**RheologicalPropertiesofDoughandBatter**	
2.1	RheologicalMethods	1
2.2	FundamentalTestingandEmpiricalmethods	2
2.3	Modifiedpenetrometers	1
2.4	Transienttests	2
2.6	Effectof dosingonrheologicalproperties	1
2.7	CakeBatterrheology	1
2.8	Bread doughRheology	1
3	**TechnologyofBakeryProducts:BreadandCake,Biscuitsand OtherBakeryProducts**	
3.1	VariousStagesandMethods	2
3.2	FormulationandProductionofFrozenDough	1
3.3	Industrialpreparationand bakingof cakes	2
3.5	HealthyBiscuitsformulation	2
3.6	ManufacturingofCookies,PretzelsandPastries	2
4	**Interactionsbetweenformulationandprocessmethodologiesa nd Confectionary**	
4.1	BasicConcepts of heatand masstransfermechanism	1
4.2	Foamtospongeconversion	2
4.3	Effectofingredients	1
4.4	Productinteractions	1
4.6	Classification,Ingredientsourcesandtheirrole	2
4.7	Water,lipidsandemulsifiers	1
4.8	Factorsinfluencing rheologyof candymassandchocolate	1
5	**TechnologyofConfectionaryProducts**	
5.1	FormulationandProcessing	2
5.2	Compoundcoatings	1
5.3	Emulsifiers	2
5.4	Pectin	1
5.6	Gums	1
5.7	Sugarfreeconfections	2
5.8	QualityStandardof confectionaryproducts	1
5.9	Packagingandshelflifeofconfectionaryproducts	1
	Total	45

CourseDesigners

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PassedinBoSMeetingheldon12/05/2023
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60 PFTE31	Technology of Food Colors andFlavors	Category	L	T	P	Credit
		PC	3	0	0	3

Objective

- Tosummarizethebasic concepts relatedtoflavors andcolors
- Toapplythetechnological aspectsof colors in foodproductdevelopment
- Toapplythetechnologicalaspects of flavors infoodproductdevelopment
- Toexaminethe techniquesinvolved inanalysisofflavorandcolor
- Toselectandapplyappropriateflavors andcolorsfor differentfoodproducts

Prerequisite

NIL

CourseOutcomes

Onthesuccessfulcompletionofthe course,studentswillbeableto

CO1	Analyzethebasicconceptsrelatedtoflavorsandcolors	Remember, Understand,Analyze
CO2	Examinethe technologicalaspectsofcolorsin foodproduct development	Remember, Understand,Apply
CO3	Identifythetechnologicalaspectsofflavorsinfoodproduct development	Remember,Apply
CO4	Outlinethetechniquesinvolved inanalysisofflavorandcolor	Remember, Understand,Analyze
CO5	Summarizetheappropriateflavorsandcolorsfordifferentfoodproducts	Remember,Understand, Analyze

MappingwithProgrammeOutcomes

COs	PO1	PO2	PO3
CO1	1	2	2
CO2	2	1	2
CO3	1	2	1
CO4	2	1	3
CO5	3	1	1
3-Strong;2-Medium;1-Some			

AssessmentPattern

Bloom'sCategory	ContinuousAssessmentTests (Marks)		End SemesterExamination (Marks)
	1	2	
Remember (Re)	10	10	10
Understand(Un)	10	10	20
Apply(Ap)	20	20	30
Analyze(An)	20	20	40
Evaluate(Ev)	0	0	0
Create(Cr)	0	0	0

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ApprovedinAcademicCouncilMeetingheldon21/05/2023

BoSChairman

K.S.RangasamyCollegeofTechnology-Autonomous R2022								
60PFT E31-TechnologyofColorsandFlavors								
M.Tech.FoodTechnology								
Semester	Hours/Week			Totalhrs	Credit	MaximumMarks		
	L	T	P		C	CA	ES	Total
II	3	0	0	45	3	40	60	100

BasicsofFoodFlavorsandBasicsofFoodColors Introduction, classification of food flavors, perception of flavor and taste-Theories of olfaction - Molecular structure and activity relationships of taste – sweet, bitter, acid and salt, Chemicalscausing pungency, astringency, cooling effect – properties. Regulations regarding additions,toxicologyandsafetyaspectsoffoodflavor.	**[9]**
OriginofFoodcolorsandTechnologyoffoodcolors Plant - Chlorophyll and chlorophyll derivatives, carotenoids, annatto, saffron, turmeric, Caramelcolor, anthocyanins and betalains. Animal- Haems and bilins ,monascus, cochineal and relatedpigments. Synthetic -Forms andtypes, certified F,D and C colorants.Technology for the productionofdriedcolorants,stability-pH, temperature andotherprocessingconditions. Role of microorganisminsynthesisoffoodcolors,encapsulatedfoodcolorants.	**[9]**
Food flavors from plant origin and Flavors evolution during processing and Technologyoffood flavors Alliaceous flavors, bittering agents, coffee and cocoa, fruit flavors.Enzymatic development, effectof roasting, cooking, frying on flavor developments. Essential oils and oleoresins – extractionmethods.Liquidanddryflavorproduction,encapsulatedflavors,microbialsynthesisofflavors, flavorenhancerandseasonings.factorsaffectingstabilityofflavors	**[9]**
FlavorAnalysisandColorAnalysis Aroma Compounds - Sample Selection/Preparation, Principles of Aroma Isolation – Solubility,Sorptive Extraction, Volatility. Methods of Aroma Isolation – Static Headspace, HeadspaceConcentration Methods (Dynamic Headspace)- Distillation Methods - Solvent Extraction, SorptiveExtraction - Concentration for Analysis, Aroma Isolation, Prefractionation - Gas Chromatography,GC/Olfactometry (GC/O) GC- MS/Olfactometry (GC-MS/O), Mass Spectrometry.Preparation andisolationofsample,spectrophotometry,colorimetry,HunterColorlab,CIEsystem, LovibondTintometer,Munsellcolorsystem.	**[9]**
FlavorantapplicationsinfoodandColorantsapplicationsinfood Soups and stocks, sauces, seasonings, and marinades, baked goods and bakery products, snackfoods, sugar based confectionery products and chewing gum, dairy Products - flavored milks,flavoredyogurts, flavoureddairydesserts.Beverages,dairyproducts,confections,baked products and otherfoods.	**[9]**
TotalHours: 45	**45**

Textbook(s):

1.	ReinecciusG.andHeathH.B.,"FlavorChemistryandTechnology",2ndEdition,CRCPress, 2006.
2.	CarmenSocaciu., "FoodColorants:ChemicalandFunctional Proerties",1stEdition, CRCPress, 2008.

Reference(s):

1.	RoweD.J.,"ChemistryandTechnologyofFlavorsandFragrances",1stEdition,Blackwell Publishing

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ApprovedinAcademicCouncilMeetingheldon21/05/2023

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CourseContentsandLectureSchedule

S.No.	Topic	No.of Hours
1	**BasicsofFoodFlavorsandBasicsofFoodColors**	
1.1	Introductionandclassificationoffoodflavors	1
1.2	Perceptionofflavor andTaste	1
1.3	Chemicalscausingpungency	2
1.4	Regulationsregardingadditions	1
1.5	ToxicologyandSafetyaspects offoodflavor	2
2	**OriginofFoodColorsandTechnologyofFoodColors**	
2.1	Plantchlorophyllandchlorophyllderivatives	1
2.2	Carotenoids	2
2.3	Syntheticformsandtypes	1
2.4	Certifiedfoodcolorants	2
2.6	Technologyforproduction of driedcolorants	1
2.7	Synthesisof foodcolors	1
2.8	Encapsulatedfoodcolorants	1
3	**Food flavors from plant origin and flavors evolution duringprocessing andtechnologyof foods**	
3.1	Alliaceousflavors	2
3.2	EnzymaticDevelopment	1
3.3	Effectofroasting	2
3.5	Effectoffryingonflavor development	2
3.6	Factorsaffectingstabilityofflavors	2
4	**FlavorAnalysisandColoranalysis**	
4.1	Aromacompounds	1
4.2	Sampleselection	2
4.3	PrinciplesofAromaisolation	1
4.4	MethodsofAromaIsolation	1
4.6	Solventextraction	2
4.7	Flavorenhancer	1
4.8	MunsellColorsystem	1
5	**Flavorant applications in food and Colorants applications infood**	
5.1	Soupsand stocks	2
5.2	Saucesandseasonings	1
5.3	Bakedgoodsandbakeryproducts	2
5.4	Confectionaryproductsand ChewingGum	1
5.6	Dairyproducts	1
5.7	Flavoredmilks	2
5.8	FlavoredYogurts	1
5.9	Bakedproducts	1
	Total	45

CourseDesigners

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60 PFTE32	Advanced Separation Techniques inFood Processing	Category	L	T	P	Credit
		PC	3	0	0	3

Objective

- Toinfertheconcepts of separationtechniques
- Tochoosedifferentsolid liquidseparationprocess
- Tooutlinethe adsorption andparticleseparationprocess
- Tocategorizeseparationbasedonmembranes
- Tomakeuseofionicseparationandpermeationprocesses

Prerequisite

NIL

CourseOutcomes

Onthesuccessfulcompletionofthe course,studentswillbeableto

CO1	Analyzetheconceptsofseparationtechniques	Remember, Understand,Analyze
CO2	Examinethedifferentsolidliquidseparationprocess	Remember, Understand,Apply
CO3	Identifytheadsorptionand particleseparationprocess	Remember,Apply
CO4	Outlinetheseparation basedonmembranes	Remember, Understand,Analyze
CO5	Summarizetheuseofionicseparationandpermeation processes	Remember,Understand, Analyze

MappingwithProgrammeOutcomes

COs	PO1	PO2	PO3
CO1	1	2	1
CO2	3	1	2
CO3	1	2	1
CO4	2	3	3
CO5	3	1	1
3-Strong;2-Medium;1-Some			

AssessmentPattern

Bloom'sCategory	ContinuousAssessmentTests (Marks)		End SemesterExamination (Marks)
	1	2	
Remember (Re)	10	10	10
Understand(Un)	10	10	20
Apply(Ap)	20	20	30
Analyze(An)	20	20	40
Evaluate(Ev)	0	0	0
Create(Cr)	0	0	0

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BoSChairman

K.S.RangasamyCollegeofTechnology-Autonomous R2022								
60PFTE32-AdvancedSeparationTechniquesinFoodProcessing								
M.Tech.FoodTechnology								
Semester	Hours/Week			Totalhrs	Credit	MaximumMarks		
	L	T	P		C	CA	ES	Total
II	3	0	0	45	3	40	60	100

SeparationTechniques Introduction,separationfromsolids,separationfromliquids,separationfromgasesandvapors,Filtration-centrifugation-equipmentand applicationin foodprocessing.	**[9]**
SolidSeparationProcess SeparationConceptbasedonparticlesizeandshape.Magneticseparation,Eddy-currentseparation, Ballistic separation, Color separation, Wet Separation Process, liquid-solid and liquid-liquidseparationbyhydrocyclones,Surfacevelocityclassifier,Elutriators,Impingementseparator,Electrostaticprecipitation.	**[9]**
AdsorptionbasedandotherSeparationProcessesandPowderTechnology Typesandchoiceofadsorbents,MechanismsofAffinitychromatographyandimmunochromatography. Foam separation, Super critical fluid extraction - Food Application.Classificationof powder, separation of powder sieving, air classification and its factors affecting, air separation,particle sizedistribution.	**[9]**
MembraneTechnology Membranemodules,Mechanismandequipmentemployedformicro-filtration,ultrafiltration,nanofiltration,reverseosmosis,concentrationpolarization,pervaporationandapplicationofmembrane technologyinfood industry.	**[9]**
IonicSeparationProcessesandPermeationTechniques Electrophoresis,Dielectrophoresis,ionexchangechromatography,electrodialysis-TheoryandequipmentPermeationofliquidsandgases.	**[9]**
TotalHours: 45	**45**

Textbook(s):

1.	King,C.J.,"SeparationProcesses",2ndEdition,DoverPublications,inc.Mineola,NewYork, 2013.
2.	GrandisonA.S.,andLewisM.J.,"Separationprocessinthefood&biotechnologyindustries", 1stEdition,woodheadpublication,England,1996.

Reference(s):

1.	Ronald.W.Rousseau.,"HandbookofSeparationProcessTechnology",1stEdition,WileyIndia Pvt Ltd, 2009.

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CourseContentsandLectureSchedule

S.No.	Topic	No.of Hours
1	**SeparationTechniques**	
1.1	Introduction	1
1.2	Separationfromsolids	1
1.3	Separationfromliquids	2
1.4	SeparationfromgasesandVapors	1
1.5	ApplicationinFoodProcessing	2
2	**SolidSeparationProcess**	
2.1	SeparationConceptbasedonparticlesize	1
2.2	Magneticseparation	2
2.3	EddyCurrentSeparation	1
2.4	Wetseparationprocess	2
2.6	LiquidsolidandLiquid-liquidseparation	1
2.7	Elutriators	1
2.8	ElectrostaticSeparator	1
3	**Adsorption based and other separation processes andpowdertechnology**	
3.1	Typesandchoicesof adsorbents	2
3.2	Mechanism ofAffinityChromatography	1
3.3	ImmunoChromatography	2
3.5	Supercriticalfluidextraction	2
3.6	Classificationandseparationofpowder	2
4	**MembraneTechnology**	
4.1	MembraneModules	1
4.2	Mechanismandmembraneemployedformicrofiltration	2
4.3	Microfiltration	1
4.4	Ultrafiltration	1
4.6	Nanofiltration	2
4.7	Pervaporation	1
4.8	Applicationof MembranetechnologyinFoodindustries	1
5	**IonicSeparationProcessandpermeationtechnique**	
5.1	Electrophoresis	2
5.2	Dielectrophoresis	1
5.3	Ionexchangechromatography	2
5.4	Electrodialysis	1
5.6	Equipment	1
5.7	Permeation	2
5.8	PermeationofLiquids	1
5.9	PermeationofGases	1
	Total	45

CourseDesigners

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BoSChairman

60 PFTE33	Food Product Design andDevelopment	Category	L	T	P	Credit
		PC	3	0	0	3

Objective

- Toinfer theconceptandimportanceofdeveloping newfoodproducts
- Todesigntheprocess fordevelopingnewfoodproducts
- Toidentifyprocessparametersforstandardizationand productscaleup
- Toinfer thequality,safetyandregulatoryaspects for newproductdevelopment
- Tooutlinetheadvertisementandmarketingstrategiesforthecommercialization

Prerequisite

NIL

CourseOutcomes

Onthesuccessfulcompletionofthe course,studentswillbeableto

CO1	Analyzetheconceptandimportance ofdevelopingnewfoodproducts	Remember, Understand,Analyze
CO2	Examinetheprocessfordeveloping newfoodproducts	Remember, Understand,Apply
CO3	Identifytheprocessparametersforstandardization andproductscale up	Remember,Apply
CO4	Outlinethequality,safetyandregulatoryaspects for newproduct development	Remember, Understand,Analyze
CO5	Summarizetheadvertisementandmarketingstrategiesforthe commercializationofproducts	Remember,Understand, Analyze

MappingwithProgrammeOutcomes

COs	PO1	PO2	PO3
CO1	1	2	1
CO2	3	1	2
CO3	1	2	1
CO4	2	3	3
CO5	3	1	1
3-Strong;2-Medium;1-Some			

AssessmentPattern

Bloom'sCategory	ContinuousAssessmentTests (Marks)		End SemesterExamination (Marks)
	1	2	
Remember (Re)	10	10	10
Understand(Un)	10	10	20
Apply(Ap)	20	20	30
Analyze(An)	20	20	40
Evaluate(Ev)	0	0	0
Create(Cr)	0	0	0

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BoSChairman

K.S.RangasamyCollegeofTechnology-Autonomous R2022								
60PFT E33-Food ProductDesignandDevelopment								
M.Tech.FoodTechnology								
Semester	Hours/Week			Totalhrs	Credit	MaximumMarks		
	L	T	P		C	CA	ES	Total
II	3	0	0	45	3	40	60	100

Newproductdevelopment Introduction-newproducts,customersandconsumers,valueaddition,market.Marketingcharacteristicsofnewproducts-Productlifecycle,profitpicture.Corporateavenuesforgrowthand profitability, opportunities in the marketplace for new product development, technologicaladvances drivingnewproductdevelopment, government's roleinnewproductdevelopment.	[9]
Designingnewproducts New Food Product Development (NPD) process and activities, NPD success factors, new productdesign,foodinnovationcasestudies,market-orientedNPDmethodologies,organizationforsuccessful NPD; Recipe development; use of traditional recipe and modification; involvement ofconsumers, chefs and recipe experts; selection of materials/ingredients for specific purposes;modificationsforproductiononlargescale,costeffectiveness,nutritionalneedsoruniqueness; useofnovelfoodingredientsandnovelprocessingtechnologies.	[9]
Standardization&Largescaleproduction Process and equipment design; establishing process parameters for optimum quality; sensoryevaluation; lab requirements; different techniques and tests; statistical analysis; application inproductdevelopmentandcomparisonofmarketsamples;stagesoftheintegrationofmarketand sensoryanalysis	[9]
Quality,Safety&Regulatoryaspects Productstability;evaluationofshelflife;changesinsensoryattributesandeffectsofenvironmental conditions; accelerated shelf-life determination; developing packaging systems formaximumstabilityandcosteffectiveness;regulatoryaspects;approvalfor proprietaryproduct	[9]
Advertisement,Marketing&Casestudies Product performance testing market positioning, Marketing: developing test market strategies;varioustoolsandmethodologiestoevaluateconsumerattitudes,preferencesandmarketacceptancefactors;CaseStudies-successesandfailures,innovation,bestpractices,technological andmarketingapproaches toNPD; foodchoicemodels andnew producttrends	[9]
TotalHours: 45	45

Textbook(s):

1.	Brody,A.L.,andJohnB.L.,"DevelopingNewFoodProductsforaChangingMarketplace",2nd Edition,CRCpress,TaylorandFrancisGroup, UK,2008.
2.	GordonWFuller.,"NewFoodProductDevelopment:FromConcepttoMarketplace",3rd Edition,CRCpress,TaylorandFrancisGroup, UK,2016.

Reference(s):

1.	CatherineSide.,"FoodProductDevelopment:BasedonExperience",2ndEdition,IowaState Press,Blackwellpublications,2008.

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CourseContentsandLectureSchedule

S.No.	Topic	No.of Hours
1	**NewProductDevelopment**	
1.1	Introductiontonewproducts	1
1.2	ValueAddition	1
1.3	MarketingCharacteristics	2
1.4	ProductLifeCycle	1
1.5	Government'sroleinnewproductdevelopment	2
2	**DesigningNewProduct**	
2.1	Newfoodproduct development	1
2.2	Recipedevelopment	2
2.3	Recipemodification	1
2.4	Involvementof customers	2
2.6	ChefsandRecipe experts	1
2.7	Costeffectiveness	1
2.8	NovelProcessingTechnologies	1
3	**Standardization&large-ScaleProduction**	
3.1	Processand EquipmentDesign	2
3.2	Establishingprocessparametersforoptimum quality	1
3.3	StatisticalAnalysis	2
3.5	Applicationinfoodproductdevelopment	2
3.6	Integrationof marketandsensoryevaluation	2
4	**QualitySafetyandRegulatoryAspect**	
4.1	Productstability	1
4.2	EvaluationofShelflife	2
4.3	ChangesinSensoryattributes	1
4.4	EffectsofenvironmentalCondition	1
4.6	Shelf-lifedetermination	2
4.7	Developingpackagingsystem	1
4.8	Approvalforproprietaryproduct	1
5	**Advertisement,Marketing&CaseStudy**	
5.1	Productperformance	2
5.2	Marketing	1
5.3	MethodologiestoevaluateConsumerAttitudes	2
5.4	PreferencesandMarketacceptancefactors	1
5.6	Casestudies	1
5.7	InnovationinNPD	2
5.8	TechnologicalandMarketingapproaches	1
5.9	FoodChoicemodels	1
	Total	45

CourseDesigners

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PassedinBoSMeetingheldon12/05/2023
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BoSChairman

60 PFTE41	Advanced Grain Science andTechnology	Category	L	T	P	Credit
		PC	3	0	0	3

Objective

- Tooutlinethegrainpropertiesandpreprocessingoperationsofgrains
- Toidentifythesuitablemillingtechnologiesforriceprocessing
- Tomakeuseof appropriate wheatmillingprocess and flourtreatmentmethods
- Tochoosevariousmilling methods suitableforbarley,cornandoats
- Todevelopdifferentcereal-basedproducts

Prerequisite

NIL

CourseOutcomes

Onthesuccessfulcompletionofthe course,studentswillbeableto

CO1	Analyzethegrainpropertiesandpreprocessingoperationsofgrains	Remember, Understand,Analyze
CO2	Examinethesuitablemillingtechnologiesforriceprocessing	Remember, Understand,Apply
CO3	Identifytheuseof appropriate wheat millingprocessandflour treatmentmethods	Remember,Apply
CO4	Outlinethe variousmilling methodssuitableforbarley,cornandoats	Remember, Understand,Analyze
CO5	Summarizethedifferentcereal-basedproducts	Remember,Understand, Analyze

MappingwithProgrammeOutcomes

COs	PO1	PO2	PO3
CO1	1	2	3
CO2	3	2	2
CO3	1	2	1
CO4	1	3	3
CO5	3	1	1
3-Strong;2-Medium;1-Some			

AssessmentPattern

Bloom'sCategory	ContinuousAssessmentTests (Marks)		End SemesterExamination (Marks)
	1	2	
Remember (Re)	10	10	10
Understand(Un)	10	10	20
Apply(Ap)	20	20	30
Analyze(An)	20	20	40
Evaluate(Ev)	0	0	0
Create(Cr)	0	0	0

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BoSChairman

K.S.RangasamyCollegeofTechnology-Autonomous R2022								
60PFTE41-AdvancedGrainScienceandTechnology								
M.Tech.FoodTechnology								
Semester	Hours/Week			Totalhrs	Credit	MaximumMarks		
	L	T	P		C	CA	ES	Total
III	3	0	0	45	3	40	60	100

Grains Introduction, structural components of cereal grains, engineering properties of grains, harvesting,threshing, grain cleaning, grading, drying, storage, aeration and stored grain management, controlofinsects,microorganismsand rodentsduring storage	**[9]**
RiceMilling Structure. Principles of size reduction, rice milling - flowsheet. Improving nutritional properties ofrice by different methods. Changes in physico-chemical, pasting and milling properties duringaging of rice. Water mist polishing, rice moisture conditioning, Instruments for rice quality control –rice analyzer,broken riceanalyzer,FWM analyzer,rice tasteanalyzer.	**[9]**
WheatMilling Morphology of wheat, Classification, Wheat milling - Flow sheet. Turbo milling, air classifiers.Criteria ofwheat and flour quality, structure and functional properties of gluten, wheat grainprotein,starch,phytochemicals,doughchemistry,rheology,evaluationofflourqualitybyfarinograph, mixograph, extensiograph, alveograph, rapid visco analyzer, dynamic rheometry,mixolab.	**[9]**
Barley,CornandOatMilling Barley–Processing,finishesproductsandenduses.Corn–wetanddrymilling,Manufactureofvalue-added products such as zein from corn. Oat milling and flaking. Dietary fibre from barleyandoats: β glucanstructure, extraction,physiologicaleffectsandfunctional properties.	**[9]**
CerealProducts Ricesnackfoods,Ricenoodles,quickcookingrice,cannedandfrozenrice,Baby foods,extrudedrice,puffed rice cake,pasta,instantnoodles,breakfast cereals, cereal enrichment, malted cereals, specialfoodingredientsfromcereals,futuretrends.	**[9]**
TotalHours: 45	**45**

Textbook(s):

1.	KarelKulp.,"Handbookof CerealScienceandTechnology", 2ndEdition,CRC Press,2000.
2.	AmalenduChakraverty,ArunS.Mujumdar,HosahalliS.Ramaswamy.,"HandbookofPostharvestTechnology:Cereals,Fruits,Vegetables,Tea,andSpices",1stEdition,CRC Press,2003.

Reference(s):

1.	Serna-Saldivar,Sergio O.,"Cerealgrains: Properties,ProcessingandNutritionalAttributes",1st Edition,CRCPress,2016.

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CourseContentsandLectureSchedule

S.No.	Topic	No.of Hours
1	**Grains**	
1.1	Structuralcomponentsofcerealgrains	1
1.2	Engineeringpropertiesofgrains	1
1.3	Harvesting	2
1.4	ThreshingandGraincleaning	1
1.5	Storedgrainmanagement	2
2	**RiceMilling**	
2.1	Structureandprincipleofsizereduction	1
2.2	Ricemillingflowsheet	2
2.3	Improvingnutritionalpropertiesofrice	1
2.4	ChangesinPhysiochemicalproperties	2
2.6	Instrumentsforricequality	1
2.7	Instrumentsforricequality	1
2.8	FWMAnalyzer	1
3	**WheatMilling**	
3.1	MorphologyofWheat	2
3.2	WheatMilling	1
3.3	StructureandFunctionalpropertiesofgluten	2
3.5	MIxograph	2
3.6	Mixolab	2
4	**Barley,CornandOatmilling**	
4.1	Barleyprocessing	1
4.2	Corn wetanddrymilling	2
4.3	ManufacturingofValue-addedproducts	1
4.4	OatMillingandFlaking	1
4.6	DietaryFiber frombarley	2
4.7	Physiologicaleffects	1
4.8	FunctionalProperties	1
5	**CerealProducts**	
5.1	Ricesnackfoods	2
5.2	RiceNoodles	1
5.3	Quickcookingrice	2
5.4	CannedandFrozenrice	1
5.6	InstantNoodles	1
5.7	Cerealenrichment	2
5.8	MaltedCereals	1
5.9	SpecialFoodingredients	1
	Total	45

CourseDesigners

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60 PFTE42	Food Additives, Nutraceuticals and Functional Foods	Category	L	T	P	Credit
		PC	3	0	0	3

Objective

- Toclassifyandchoosefoodadditivesfor variousfood applications
- Toselectthesuitabletypes of eyes, heart and digestivehealthingredients
- Tomakeuseof appropriateingredients forwomen,boneandjointhealth
- Tosummarize variousfunctionalfoodsand nutraceuticalsinthemarket
- Toinferthesignificanceof Asianfunctionalfoods

Prerequisite

NIL

CourseOutcomes

Onthesuccessfulcompletionofthe course,studentswillbeableto

CO1	Analyzethefoodadditivesforvariousfoodapplications	Remember, Understand,Analyze
CO2	Examinethesuitabletypes of eye,heart anddigestive health ingredients	Remember, Understand,Apply
CO3	Identifytheuseof appropriate ingredientsforwomen,bone andjoint health	Remember,Apply
CO4	Outlinethe variousfunctionalfoodsand nutraceuticalsinthemarket	Remember, Understand,Analyze
CO5	SummarizethesignificanceofAsianfunctionalfoods	Remember,Understand, Analyze

MappingwithProgrammeOutcomes

COs	PO1	PO2	PO3
CO1	1	2	1
CO2	1	2	2
CO3	1	2	1
CO4	1	2	1
CO5	3	1	1
3-Strong;2-Medium;1-Some			

AssessmentPattern

Bloom'sCategory	ContinuousAssessmentTests (Marks)		End SemesterExamination (Marks)
	1	2	
Remember (Re)	10	10	10
Understand(Un)	10	10	20
Apply(Ap)	20	20	30
Analyze(An)	20	20	40
Evaluate(Ev)	0	0	0
Create(Cr)	0	0	0

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K.S.RangasamyCollegeofTechnology-Autonomous R2022								
60PFTE42-Food Additives,NutraceuticalsandFunctionalFoods								
M.Tech.FoodTechnology								
Semester	Hours/Week			Totalhrs	Credit	MaximumMarks		
	L	T	P		C	CA	ES	Total
III	3	0	0	45	3	40	60	100

FoodAdditives Introduction, classification and functions; Role of additives in foods - preservatives,antioxidants,sequestrants, emulsifiers -selection of emulsifier based on Hydrophilic and Lipophilic balance(HLB)anditsapplication,stabilizersandthickeners,bleachingandmaturingagents,starchmodifiers, food colourants and colour retention agents, sweeteners, humectants, flavorants andflavorenhancers,leaveningagents,pHcontrolagents,fatsubstitutesandreplacers,anti-foaming agents.InternationalProductCode.	[9]
IntroductiontoNutraceuticalsandEye,HeartandDigestiveHealthIngredients Sources, understanding benefits of nutraceuticals. Scope involved in industry, Indian and globalscenario.Eye health ingredients – lutein, zeaxanthin, astaxanthin, beta-carotene, bilberry extracts;Heart health ingredients - omega-3, omega-6, omega-9, beta-glucan, soy protein, phytosterols;DigestiveHealthIngredients- prebiotics,probiotics,synbiotics,digestiveenzymes,zinccarnosine.	[9]
WomenHealthIngredientsandBoneandJointhealthingredients Women health ingredients - Vitamin D, iron, calcium, soy isoflavones, folic acid, cranberry extract,lycopene, phytoestrogens.Prebiotic fiber, glucosamine, chondroitin, collagen peptide, hyaluronicacid,devilsclaw,olivepolyphenols,boswelia Serrata,horsetailextract.	[9]
DietarySupplementsandFunctionalfoodandbeverages Introductiontodietarysupplements,Dietarysupplements– Needfordietarysupplements,supplementsforms- tablets,capsules,powders,softgels,gelcaps,liquids. Agnuscastus,Aloevera,Beeproducts,Chitosan,Echinacea,Garlic,Ginger,Ginkgobiloba,Ginseng,Guarana,Kelp,Milkthistle,Sawpalmetto,Spirulina,Chlorella,Hypericumperforatum, Teaextracts.	[9]
AsianFunctionalFood FunctionalFoodsfromMeat,Fruit,FermentedVegetableProducts:Kimchi,Sugarcane,Garlic,Onion,DateFruits,JapaneseGreenTea,Miso,FermentedSoybeanProducts.Cerealbased Functionalfoodandtheir healtheffects.	[9]
TotalHours: 45	**45**

Textbook(s):

1.	Wildman,RobertE.C.,RobertWildman,TaylorC.Wallace(Eds).,"HandbookofNutraceuticals andFunctionalFoods",2ndedition, CRCPress,NewYork, 2007.
2.	TitusA. M. Msagati.,"Chemistryof FoodAdditivesand Preservatives", 1st edition,Wiley-Blackwell,2013.

Reference(s):

1.	JohnShi,Chi-TangHoandFereidoonShahidi.,"AsianFunctionalFoods",1stEdition,CRC Press,2005.

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CourseContentsandLectureSchedule

S.No.	Topic	No.of Hours
1	**FoodAdditives**	
1.1	ClassificationandFunction	1
1.2	RoleofAdditives infood	1
1.3	Selection of Emulsifier based on hydrophilic and lipophilicbalance	2
1.4	Flavourants	1
1.5	InternationalProductCode	2
2	**Introduction to Nutraceuticals and Eye, Heart and DigestiveHealth Ingredients**	
2.1	Sources	1
2.2	Scopeinvolved in the industry	2
2.3	IndianandGlobalScenario	1
2.4	Eyehealthingredients	2
2.6	HeartHealthIngredients	1
2.7	Digestivehealthingredients	1
2.8	PrebioticsandProbiotics	1
3	**Women Health Ingredients and Bone and Joint Healthingredients**	
3.1	WomanHealthingredients	2
3.2	Prebioticfibre	1
3.3	Hyaluronicacid	2
3.5	DevilsClaw	2
3.6	Horsetailextract	2
4	**DietarySupplementsandFunctionalFoodsandBeverages**	
4.1	Introductiontodietarysupplements	1
4.2	Needfor dietarysupplements	2
4.3	Supplementsfromcapsules	1
4.4	AgnusCastus	1
4.6	MilkThistle	2
4.7	Spirulina	1
4.8	Teaextracts	1
5	**AsianFunctionalFood**	
5.1	FunctionalFoodsfrom meat	2
5.2	Fruits	1
5.3	FermentedVegetables	2
5.4	Sugarcane	1
5.6	Japanese greentea	1
5.7	Miso	2
5.8	Fermentedsoybeansproducts	1
5.9	Cerealbasedfunctionalfoods	1
	Total	45

CourseDesigners

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60 PFT E43	Advanced Beverage Technology	Category	L	T	P	Credit
		PC	3	0	0	3

Objective

•To provide students with a knowledge about ingredients used in beverages
•To know the production process of different kinds of beverages.
•To instigate to develop new formulation in beverage processing
•To learn the quality control related to beverage technology.
•To impart the knowledge on safety issues of beverage industry

Course Outcomes

On the successfulcompletionof the course, students willbe ableto

CO1	Recall the scope and ingredients of different beverage.	Remember, Understand
CO2	Assess the production process of alcoholic beverages	Understand, Apply
CO3	Analyse the process of carbonated beverage, fruit and milk based beverages	Apply, Analyze
CO4	Identify the processing technology of coffee, tea, cocoa, sports beverages and bottled wate	Understand, Apply
CO5	Recall the quality control and safety issues of beverages	Analyze, Evaluate

Mapping with Programme Outcomes

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	2	1	2	2	2	2	1	1	2	3
CO2	1	2	3	3	2	2	2	2	1	1	3	2
CO3	2	3	1	2	3	2	2	2	2	2	2	2
CO4	2	3	1	2	3	2	2	1	2	2	2	2
CO5	2	3	1	2	3	2	2	2	2	1	2	
3-Strong;2-Medium;1-Some												

Assessment Pattern

Bloom's Category	Continuous Assessment Tests (Marks)		Model Exam (Marks)	End Sem Examination (Marks)
	1	2		
Remember (Re)	10	0	10	10
Understand (Un)	40	10	30	30
Apply(Ap)	10	40	30	30
Analyze(An)	0	10	20	20
Evaluating (Ev)	0	0	10	10
Create(Cr)	0	0	0	0
Total	60	60	100	100

K. S. RangasamyCollegeofTechnology-Autonomous R2022								
Advanced Beverage Technology								
B. Tech Food Technology								
Semester	Hours/Week			Totalhrs	Credit	Maximum Marks		
	L	T	P		C	CA	ES	Total
	3	0	0	45	3	40	60	100

Unit 1- Beverage Overview [9]

Beverage: Introduction , Global and Indian scenario. Classification of beverages. Nutritional benefits. Properties of ingredients - Water, sweeteners, bulking agents, acidulants, emulsifiers, stabilizers. Flavoring and Coloring agents. Threshold limits of ingredients.

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Unit 2 - Non-alcoholic Beverages Carbonated beverages - types of soft drinks and their functions, Properties of carbon dioxide, methods of production - Preparation of syrup, filling, and packaging. Formulation of various natural fruit-based juices, squash, and RTS (ready to serve) – a modern method of processing. Preservation oftender coconut water. Milk-based beverages – condensed milk, flavored milk, whey-based beverages.	[9]
Unit 3 - Alcoholic Beverages Alcoholic Beverages: Types of alcoholic beverages. Wine – types – production and defects. Beer – Types – Production and defects. Distilled beverages – Brandy, Whiskey, Rum, Gin – Production and defects.	[9]
Unit 4 - Carbonated Beverage Preparation of Syrup making, blending, Carbonation of soft drinks, filling, packaging, containers, and closures. Powdered dry mix; Energy drinks and sports drinks; Fruit-based carbonated beverages, carbonated water. Equipment used in the manufacture of carbonated beverages.	[9]
Unit 5 - Quality Control Quality control in soft drink industries – water and other ingredient quality, Requirements of Soluble solids and titratable acidity in beverages, Threshold limits of ingredients, Standards and regulations in India. Sanitation and Hygiene in Beverage Industries. HACCP concept.	[9]
Total Hours	45

Textbook(s):	
1.	Philip R. Ashurst, “Chemistry and Technology of Soft Drinks and Fruit Juices”, 2nd Edition, Blackwell Publishing Ltd., 2005
2.	**Paquin P., “Functional and Speciality Beverage Technology”, 1st Edition, Wood Head Publishing in Food Science Technology and Nutrition, 2009**
Reference(s):	
1.	R.Singaravelan, “Food and Beverage service”, Oxford university press, New Delhi, 2011
2.	Mitchell A.J., “Formulation and Production Carbonated Soft Drinks” Blackie and Sons Ltd., USA, 1990.
3.	Jagan Mohan Rao and K.Ramalakshmi, “Recent trend in Soft beverages’, Woodhead Publishing India Pvt Ltd., New Delhi 2011

CourseContentsandLectureSchedule

S. No.	Topic	No. ofHours
1	**Beverage Overview**	
1.1	Beverage: Introduction	1
1.2	Global and Indian scenario	1
1.3	Classification of beverages	1
1.4	Nutritional benefits	1
1.5	Properties of ingredients - Water, sweeteners	1
1.6	Properties of ingredients - bulking agents, acidulants	1
1.7	Properties of ingredients - emulsifiers, stabilizers	1
1.8	Flavoring and Coloring agents	1
1.9	Threshold limits of ingredients.	1
2	**Non-alcoholic Beverages**	

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2.1	Carbonated beverages - types of soft drinks and theirfunctions	1
2.2	Properties of carbon dioxide,methods of production	1
2.3	Preparation of syrup, filling, and packaging.	1
2.4	Formulation of various naturalfruit-based juices, squash	1
2.5	Formulation of various naturalfruit-and RTS (ready to serve)- a modern method of processing	1
2.6	Preservation oftender coconut water	1
2.7	Milk-based beverages – condensed milk	1
2.8	Milk-based beverages – flavored milk	1
2.9	Milk-based beverages – whey-based beverages.	1
3	**Alcoholic Beverages**	
3.1	Alcoholic Beverages	1
3.2	Types of alcoholic beverages	1
3.3	Wine – types	1
3.4	Production and defects	1
3.5	Beer –Types	1
3.6	Production and defects	1
3.7	Distilled beverages – Brandy, Whiskey	1
3.8	Distilled beverages- Rum, Gin	1
3.9	Production and defects.	1
4	**Carbonated Beverage**	
4.1	Preparation of Syrup making, blending	2
4.2	Carbonation of soft drinks	1
4.3	Filling, packaging	1
4.4	Containers, and closures.	2
4.5	Powdered dry mix	1
4.6	Energy drinks and sports drinks	1
4.7	Fruit-based carbonated beverages	1
4.8	Carbonated water	1
4.9	Equipment used in the manufacture of carbonated beverages.	
5	**Quality Control**	
5.1	Quality control in soft drink industries	1
5.2	Water and other ingredient quality	1
5.3	Requirements of Solublesolids in beverages	1
5.4	Requirements of titratable acidity in beverages	1
5.5	Threshold limits of ingredients	1
5.6	Standards and regulations inIndia	1
5.7	Sanitation and Hygiene in Beverage Industries	1
5.8	HACCP concept.	2

Course Designers

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60 PFT E51	Snacks and Extruded Products Technology	Category	L	T	P	Credit
		PC	3	-	-	3

Objective

- To learnt about the production process of snacks and extruded products.
- To impart the concept of characteristic features of ingredients used in snacks.
- To learn equipment implemented in production of extruded products.
- To recall the concept of extrusion technology.
- To elaborate the production process of pasta and noodles

Prerequisite

Nil

Course Outcomes

On the successfulcompletionof the course, students willbe ableto

CO1	Illustrate the types and characteristic features of ingredients used in snacks.	Understand
CO2	Inferthe different methodsofpopcorn, cornpuff andtortilla production	Analyze
CO3	Analyze the production process of potato and rice based chips	Apply
CO4	Recall theconceptofextrusion	Apply
CO5	Elaborate the production processof pastaand noodles	Analyze

Mapping with Programme Outcomes

Cos	PO1	PO2	PO3
CO1	3	3	3
CO2	3	3	3
CO3	3	3	3
CO4	3	3	3
CO5	3	3	2
3- Strong, 2-Medium, 1-Some			

Assessment Pattern

Bloom'sCategory	ContinuousAssessmentTests (Marks)		End SemesterExamination (Marks)
	1	2	
Remember (Re)	10	10	10
Understand(Un)	10	10	20
Apply(Ap)	20	20	30
Analyze(An)	20	20	40
Evaluate(Ev)	0	0	0
Create(Cr)	0	0	0

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K.S.RangasamyCollegeofTechnology-AutonomousR2022								
60 PFT E51 - Snacks and Extruded Products Technology								
M.Tech Food Technology								
Semester	Hours/Week			Totalhrs	Credit	Maximum Marks		
	L	T	P		C	CA	ES	Total
	3	-	-	45	3	60	40	100

Introduction: Current status of snack food industry in India. Types of snack food – Raw Vegetable Snack, Formed doughproducts from potato and maize derivatives, Directly expanded extruded snack, Puffed Snacks and other. Typesand Functions of ingredients - structure forming materials, dispersed phase/filling materials, plasticizers/lubricants,solublesolids,nucleatingsubstances,coloringandflavoringsubstances.	[9]
CornBasedSnacks: Popcorn - Popping methods, oil popping and dry popping. Commercial and industrial popcorn process. Flavoringsand Applicators. Tortilla chip processing – Corn soaking, steeping, milling, Sheeting and Cutting, Baking andFrying,cooling,additionofflavor.Cornpuff–productionprocess.	[9]
PotatoandRicebasedSnacks: Potato chips production process: Pre cleaning and peeling, slicing, drying/frying, salting and seasoning, qualitycontrol. Fabricated potato snacks - potato flakes, potato granules, potato starch, ground and crushed dehydratedpotato.RicebasedSnacks–Productsusingwholegrains–Puffedrice,flakedrice,papadproduction,Productsusingflours.	[9]
ExtrusionTechnology: Food Extrusion: Definition, introduction to extruders, principles and types(Single screw extruder and Twin-screw extruder), Uses of extruders in the food industry, Pre-conditioning of raw materials used in extrusion process, Extruder Selection, Design, and Operation for Different Food Applications. Effect of extrusion on food products. Breakfast cereals by extrusion technology. Recent Advances in extrusion technology.	[9]
Pastaand otherProducts: Overview of pasta making process, Types of Pasta products, Production process of Spaghetti, noodles andmacaroni.Pretzel–Types–FormulationandProcessing-mixing,extrusion,proofing,cooking,surfacesalting,bakinganddrying,Other food products - some breads (croutons, bread sticks, and flat breads), various ready-to-eat snacks, pre-made cookie dough, some baby foods, some beverages, and dry and semi-moist pet foods.	[9]
Total Hours	45

Textbook(s):

1.	EdmundW.Lusas andLloydW.Rooney,"SnackFoodProcessing",1stEdition,CRC Press,Florida,2001.
2.	RobinGuy,"Extrusioncooking:TechnologiesandApplications",1stEdition,CRC Press,Florida,2001

Reference(s):

1.	Panda H.,"The Complete Technology Book on Snack Foods", National Institute of Industrial Research, NewDelhi,2003
2.	SergioO. Serna-Saldivar, "IndustrialManufactureof SnackFood",WoodheadPublishing,NewDelhi, 2008
3.	Jean Marie Bouvier Osvaldo H. Campanella. "Extrusion Processing Technology: Food and Non FoodBiomaterials",JohnWiley&Sons,Ltd.2014.
4.	Fast R.B. and Caldwell E.F. "Breakfast Cereals and How they are made. American Association of CerealChemists",St.Paul,Minnesota,2000

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CourseContentsandLectureSchedule

S. No	Topic	No. ofHours
1	**Introduction**	
1.1	Current status of snack food industry in India.	1
1.2	Types of snack food – Raw Vegetable Snack, Formed doughproducts from potato and maize derivatives,	1
1.3	Directly expanded extruded snack, Puffed Snacks and other.	1
1.4	Typesand Functions of ingredients – structure forming materials,	1
1.5	Dispersed phase/filling materials,	1
1.6	Plasticizers/lubricants,	1
1.7	Solublesolids,	1
1.8	Nucleatingsubstances,	1
1.9	Coloringandflavoringsubstances	1
2	**CornBasedSnacks**	
2.1	Popcorn – Popping methods, oil popping and dry popping.	2
2.2	Commercial and industrial popcorn process. Flavoringsand Applicators	2
2.3	Tortilla chip processing – Corn soaking, steeping, milling, Sheeting and Cutting,	2
2.4	Baking andFrying,cooling,additionofflavor.	1
2.5	Cornpuff–productionprocess.	2
3	**PotatoandRicebasedSnacks**	
3.1	Potato chips production process: Pre cleaning and peeling, slicing, drying/frying, salting and seasoning, qualitycontrol.	2
3.2	Fabricated potato snacks – potato flakes, potato granules,	1
3.3	potato starch, ground and crushed dehydratedpotato.	1
3.4	RicebasedSnacks.	1
3.5	Productsusingwholegrains	1
3.6	Puffedrice,flakedrice,papadproduction,	2
3.7	Productsusingflours	1
4	**ExtrusionTechnology**	
4.1	Food Extrusion: Definition, introduction to extruders,	1
4.2	principles and types(Single screw extruder and Twinscrew extruder)	1
4.3	Uses of extruders in the food industry	1
4.4	Pre-conditioning of raw materials used in extrusion process.	1
4.5	Uses of extruders in the food industry	1
4.6	Pre-conditioning of raw materials used in extrusion process	1
4.7	Extruder Selection, Design, and Operation for Different Food Applications.	1
4.8	Effect of extrusion on food products.	1
4.9	Breakfast cereals by extrusion technology.	1

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5	**Pastaand otherProducts**	
5.1	Overview of pasta making process, Types of Pasta products,	1
5.2	Production process of Spaghetti, noodles andmacaroni.	1
5.3	Pretzel–Types–FormulationandProcessing-mixing,extrusion,proofing,cooking,surfacesalting,bakinganddrying,	2
5.4	Other food products - some breads (croutons, bread sticks, and flat breads),	1
5.5	Various ready-to-eat snacks.	1
5.6	Pre-made cookie dough,	1
5.7	Some baby foods, some beverages,	1
5.8	Dry and semi-moist pet foods	1
	Total	**45**

CourseDesigners

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60 PFTE52	Internet of Things in Food andAgriculture	Category	L	T	P	Credit
		PC	3	0	0	3

Objective

- Tooutlinethebasic concepts ofIoT
- Tosummarizethefundamentalconcepts ofInternet-connectedproduct
- Toapplytheconcept ofIoTformanagement ofagricultureandsupplychain
- Tomakeuseof appropriate IoTconcepts forrapid detection of foodspoilage
- Toutilize IoT methods tosolvefood traceabilityandfood wastemanagement

Prerequisite

NIL

CourseOutcomes

Onthesuccessfulcompletionofthe course,studentswillbeableto

CO1	Analyzethebasicconcepts of IoT	Remember, Understand,Analyze
CO2	ExaminethefundamentalconceptsofInternet-connectedproduct	Remember, Understand,Apply
CO3	IdentifytheconceptofIoTformanagementofagricultureandsupply. chain	Remember,Apply
CO4	Outlinethe appropriateIoTconceptsforrapid detectionof foodspoilage	Remember, Understand,Analyze
CO5	Summarize the IoTmethodstosolvefoodtraceabilityandfood waste managementproblems	Remember,Understand, Analyze

MappingwithProgrammeOutcomes

COs	PO1	PO2	PO3
CO1	1	3	1
CO2	1	2	1
CO3	1	1	1
CO4	1	2	1
CO5	3	1	1
3-Strong;2-Medium;1-Some			

AssessmentPattern

Bloom'sCategory	ContinuousAssessmentTests (Marks)		End SemesterExamination (Marks)
	1	2	
Remember (Re)	10	10	10
Understand(Un)	10	10	20
Apply(Ap)	20	20	30
Analyze(An)	20	20	40
Evaluate(Ev)	0	0	0
Create(Cr)	0	0	0

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BoSChairman

K.S.RangasamyCollegeofTechnology-Autonomous R2022								
60PFTE52-InternetofThingsinFoodand Agriculture								
M.Tech.FoodTechnology								
Semester	Hours/Week			Totalhrs	Credit	MaximumMarks		
	L	T	P		C	CA	ES	Total
III	3	0	0	45	3	40	60	100

IntroductiontoInternetofThings(IoT) Definition and Characteristics of IoT, Physical Design of IoT - IoT Protocols, IoT CommunicationModels - IoT Communication application programing interfaces - IoT enabled technologies -WirelessSensorNetworks-CloudComputing-Bigdataanalytics-CommunicationProtocols,EmbeddedSystems-IoTLevelsandTemplates-organizationalimplementationandmanagementchallenges.	[9]
Python,PhysicalDevicesandEndpointsforIoT Language features of Python, Data types, data structures, Control of flow, functions, modules,packaging, classes, exception handling. Python packages – HTTPLib, URLLib, SMTPLib.:IntroductiontoRaspberryPI-Interfaces(serial,SerialPeripheralIndex(SPI),12CProgramming – PythonprogramwithRaspberryPIwithfocusofinterfacingexternalgadgets-controllingoutput – readinginputfrompins-connectingIoTtoCloud-Xively.	[9]
IoTinAgricultureandIoTinFood Smartagriculture,typeofIoTsensorsforagriculture– monitoringofclimateconditions,Greenhouse automation, crop management, cattle monitoring and management, End-to-End farmmanagement systems. Benefits and applications of smart farming, Issues and challenges in foodand agriculture-efficient routing protocols and ambient energy harvesting for IoT. RFID andsensor network integration in food industry-RFID in food production, food supply chain, retailingand sustainability. RFID in sensor network and food processing-Case studies-Big data analytics infoodindustries-Foodsupplychainvisibility,Intelligentfoodsupplychain.Blockchain-Concepts-PotentialApplications inFoodIndustry	[9]
IoTinFoodSpoilageandSafety Importance of IoT concerning food quality, safety and security. Biosensors for detection of foodborne pathogens – prevention & retardation of food spoilage. Microbial detection, GIS, SensorNetworks.CasestudyonensuringsafetybyenhancedIoT.IoTlinkedwearabledevicesfor managingfood safetyinthehealthcaresector	[9]
IoTinFoodTraceabilityandIoT inFoodWasteManagement FoodTraceability:Needofnewtechnologiesinfoodtraceabilitysystems.Architectureoftraceability system- ICT& ElectronicProduct Code (EPC)enabled systems. Real time trackingand remote monitoring – Wireless sensing technologies, remote communications and Intelligenttraceability.Food Waste Management: Scope and significance of IoT in food waste management.SmartGarbageSystem(SGS)-components,design,architectureofSGS,implementationand efficiency,real-timeapplicationinfoodwaste	[9]
TotalHours: 45	**45**

Textbook(s):

1.	QusayF.Hassan,AttaurRehmanKhan,SajjadA.Madani.,"InternetofThingsChallenges, Advancesand Applications",1stEdition, CRC Press,TaylorandFrancisGroup, 2017.
2.	SelwynPiramuthu,WeibiaoZhou.,"RFIDandSensorNetworkAutomationintheFoodIndustry: EnsuringQualityandSafetythroughSupplyChainVisibility",1st Edition,Wiley&Sons,UK,2016.

Reference(s):

1.	Montserrat Espiñeira, Francisco J. Santaclara., "Advances in Food Traceability Techniques andTechnologies - Improving Quality Throughout the Food Chain",1st Edition,Wood head Publishing,2016.

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CourseContentsandLectureSchedule

S.No.	Topic	No.of Hours
1	**IntroductiontointernetofThings(IoT)**	
1.1	DefinitionandCharacteristicsofIoT	1
1.2	Communicationapplicationprograminginterfaces	1
1.3	BigDataAnalytics	2
1.4	CommunicationProtocols	1
1.5	Embedded systems	2
2	**Python,PhysicalDevicesandEndpointsforIoT**	
2.1	LanguageFeaturesof Python	1
2.2	Datatypes	2
2.3	Datastructures	1
2.4	ControlofFlow	2
2.6	12CProgramming	1
2.7	RaspberryPi	1
2.8	ConnectingIoT cloudXively	1
3	**IoTinAgricultureandIoTinFood**	
3.1	SmartAgriculture	2
3.2	Type of IoTSensors	1
3.3	MonitoringofClimateConditions	2
3.5	RFIDSensors	2
3.6	Blockchainconcepts	2
4	**IoTinFoodSpoilageandSafety**	
4.1	ImportanceofIoT concerningfoodquality	1
4.2	Biosensors	2
4.3	Microbialdetection	1
4.4	GIS	1
4.6	Sensornetworks	2
4.7	IoTlinkedwearable	1
4.8	HealthSector	1
5	**IoTinFoodTraceabilityandIoT inFoodWasteManagement**	
5.1	FoodTraceability	2
5.2	Needof newtechnologies	1
5.3	Realtimetrackingandremotemonitoring	2
5.4	WirelesssensingTechnology	1
5.6	RemoteCommunication	1
5.7	IntelligentTraceability	2
5.8	FoodWasteManagement	1
5.9	SmartGarbage	1
	Total	45

CourseDesigners

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60 PFT E53	Sensory Evaluation of Foods	Category	L	T	P	Credit
		PE	3	-	-	3

Objective

- Know the various kinds Sensory evalutionmethods
- Familiarize with planning a sensory project.
- Analyze the different types of Discriminative Test Methods
- Study the different types of Descriptive Tests and Affective Tests
- Apply sensory application in various new product development of food secters.

Prerequisite

Nil

Course Outcomes

On the successfulcompletionof the course, students willbe ableto

CO1	Demonstrate an understanding of the concepts in sensory evaluation and detail about the sensory organs in evaluation	Understand
CO2	Know about the requirements for sensory testing and plan a sensory evaluation session	Analyze
CO3	Detail about the difference test methods in sensory evaluation and outline the discriminative test methods	Apply
CO4	Select suitable descriptive test for sensory analysis and outline the affirmative test methods	Apply
CO5	Sutline the basic statistical concepts for sensory evaluation and elaborate on steps involved in statistical method	Analyze

Mapping with Programme Outcomes

Cos	PO1	PO2	PO3
CO1	3	3	3
CO2	3	3	3
CO3	3	3	3
CO4	3	3	3
CO5	3	3	2
3- Strong, 2-Medium, 1-Some			

Assessment Pattern

Bloom'sCategory	ContinuousAssessmentTests (Marks)		End SemesterExamination (Marks)
	1	2	
Remember (Re)	10	10	10
Understand(Un)	10	10	20
Apply(Ap)	20	20	30
Analyze(An)	20	20	40
Evaluate(Ev)	0	0	0
Create(Cr)	0	0	0

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K.S.RangasamyCollegeofTechnology-Autonomous R2022								
60 PFT E53 - Sensory Evaluation of Foods								
M.Tech Food Technology								
Semester	Hours/Week			Totalhrs	Credit	Maximum Marks		
	L	T	P		C	CA	ES	Total
				45				100

Introduction Sensory evaluation – definition, Role of sensory evaluation in food industry, Sensory perception – vision, gustation, olfaction, touch, audition, multimodal perception. Factors affecting sensory measurements, Factors contributing to successful sensory evaluation. Requirements for sensory testing – Resources, Sample preparation and presentation, Assessors – screening and selection, training, motivation, advantages and disadvantages of internal and external panels	[9]
Planning a Sensory Project Product type, Budget, Timings, Selecting the test method, Setting action standards, Experimental design - treatment structure, design structure, Measurement scales, Sensory data analysis – types of data, distribution, data handling, choosing appropriate statistical test.	[9]
Discriminative Test Methods Overall Difference tests - Triangle test, Duo-trio test, Difference from control test, Same and different test, 'A' 'not A' test. Attribute specific test - Paired comparison, Alternative forced choice, Ranking test. Similaritytest - The power of the test, Proportion of true discriminators, Selecting the correct number of assessors.	[9]
Descriptive Tests and Affective Tests Consensus profiling, Flavour Profiling, Texture Profiling, Quantitative Descriptive Analysis, Spectrum method, Free choice profiling, Flash profiling, Difference from control profiling, Temporal dominance of sensations. Questionnaire design, Qualitative methods - Focus groups, Preference tests, Acceptance tests, Attribute diagnostics. Linking consumer, sensory and product data. Advantages and disadvantages of test locations.	[9]
Sensory applications in new product development and consumer research Adoption and use of Flash Profiling in standardizing new product development, Improving team tasting in the food industry, Alternative methods of sensory testing -working with chefs, culinary professionals and brew masters, Sensory testing with flavourists: challenges and solutions. Working with children, older people. Empathy and experiment – working with new population groups	[9]
Total Hours	45

Textbook(s):

1. Sarah Kemp, Tracey Hollowood, Joanne Hort., "Sensory Evaluation: A Practical Handbook", 1st Edition, WileyBlackwell Publishers, UK, 2009.
2. 2. Julien Delarue, J., Ben Lawlor, Michel Rogeaux., "Rapid Sensory Profiling Techniques and Related Methods", 1st Edition, Woodhead Publishing, UK, 2015

Reference(s):

1. Herbert Stone, Rebecca N. Bleibaum, HetaherA.Thomas., "Sensory Evaluation Practices", 4th Edition, AcademicPress, USA, 2018.
2. Harry T. Lawless and Hildegarde Heymann., "Sensory Evaluation of Food: Principle and Practices", 2nd Edition,Springer, UK, 2010.

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CourseContentsandLectureSchedule

S.No	Topic	No. ofHours
1	**Introduction**	
1.1	Sensory evaluation – definition, Role of sensory evaluation in food industry	2
1.2	Sensory perception – vision, gustation, olfaction, touch, audition, multimodal perception.	2
1.3	Factors affecting sensory measurements	1
1.4	Factors contributing to successful sensory evaluation	1
1.5	Requirements for sensory testing – Resources, Sample preparation and presentation	1
1.6	Assessors – screening and selection, training, motivation	1
1.7	Advantages and disadvantages of internal and external panels	1
2	**Planning a Sensory Project**	
2.1	Product type	1
2.2	Budget, Timings	1
2.3	Selecting the test method	1
2.4	Setting action standards	1
2.5	Experimental design - treatment structure	1
2.6	Design structure	1
2.7	Measurement scales	1
2.8	Sensory data analysis - types of data, distribution, data handling	1
2.9	Choosing appropriate statistical test.	1
3	**Discriminative Test Methods**	
3.1	Overall Difference tests - Triangle test	1
3.2	Duo-trio test	1
3.3	Difference from control test	1
3.4	Same and different test	1
3.5	'A' 'not A' test.	1
3.6	Attribute specific test - Paired comparison	1
3.7	Alternative forced choice	1
3.8	Ranking test	1
3.9	Similarity test - The power of the test, Proportion of true discriminators, Selecting the correct number of assessors.	1
4	**Descriptive Tests and Affective Tests**	
4.1	Consensus profiling, Flavour Profiling	1
4.2	Texture Profiling, Quantitative Descriptive Analysis	1
4.3	Spectrum method, Free choice profiling	1
4.4	Flash profiling, Difference from control profiling	1
4.5	Temporal dominance of sensations.	1
4.6	Questionnaire design	1
4.7	Qualitative methods - Focus groups, Preference tests, Acceptance tests, Attribute diagnostics.	1
4.8	Linking consumer, sensory and product data.	1
4.9	Advantages and disadvantages of test locations	1

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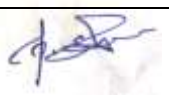

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5	**Sensory applications in new product development and consumer research**	
5.1	Adoption and use of Flash Profiling in standardizing new product development	2
5.2	Improving team tasting in the food industry	1
5.3	Alternative methods of sensory testing	1
5.4	Working with chefs, culinary professionals and brew masters	2
5.5	Sensory testing with flavourists: challenges and solutions.	1
5.6	Working with children, older people.	1
5.7	Empathy and experiment – working with new population groups	1
	Total	**45**

CourseDesigners

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

60 PFTE61	Advanced Food Supply chainmanagement	Category	L	T	P	Credit
		PC	3	0	0	3

Objective

- Tolearnabout thefoodsupplychainand its logistics.
- Toanalyze theimportand exportrequirements
- Tolearnlogisticsmanagement.
- ToimpartknowledgeonIndianagencies inlogistics.
- Toreviewtheexportand importproceduresand itsdocumentation.

Prerequisite

NIL

CourseOutcomes

On the successfulcompletion ofthe course,students willbe able to

CO1	Analyzethefundamentals oflogistics,supplychainmanagementand understandthescopesignificanceand driversof supplychain.	Remember, Understand,Analyze
CO2	Examinedifferentdemandplanning,demandforecastprocessand analyzethewarehouse	Remember, Understand,Apply
CO3	Identifyvarioussourcesofdistributionchannelsintransportation	Remember,Apply
CO4	Outline the concept of packaging and its logistics and elaborate onexportandimportlabelling	Remember, Understand,Analyze
CO5	Summarize the export and import procedures and its documentationwith riskmanagement	Remember,Understand, Analyze

MappingwithProgrammeOutcomes

COs	PO1	PO2	PO3
CO1	3	2	1
CO2	2	3	3
CO3	3	2	2
CO4	2	3	3
CO5	3	2	2
3-Strong;2-Medium;1-Some			

AssessmentPattern

Bloom'sCategory	ContinuousAssessmentTests (Marks)		End SemesterExamination (Marks)
	1	2	
Remember (Re)	10	10	10
Understand(Un)	10	10	20
Apply(Ap)	20	20	30
Analyze(An)	20	20	40
Evaluate(Ev)	0	0	0
Create(Cr)	0	0	0

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BoSChairman

K.S.RangasamyCollegeofTechnology-Autonomous R2022								
60PFT E61-Advanced Food supply chain management								
M.Tech.FoodTechnology								
Semester	Hours/Week			Totalhrs	Credit	MaximumMarks		
	L	T	P		C	CA	ES	Total
III	3	0	0	60	4	40	60	100

Introduction Logistics and supply chain management; fundamentals of LSCM - Scope, Significance andDrivers;BasicModel–PrimaryandSecondaryActivities;RoleandChallengesofLogisticsandsupplychainmanagementinfoodindustry.	[9]
Procurementandwarehousing Demandandsupplymanagement;Demandplanning,anddemandforecastingprocesses,Forecastingtechniques,Strategicplanningformaterialsourcing,OutsourcingstrategiesOrganizing and detailing of all tactical & operational information:, Warehouse strategies Planningandmanagingwarehouseoperations;Inventorymodelsandcontrol techniques.	[9]
Distributionandtransportation Varioussourcesofdistributionchannels,Distributionmodels:Nature,Functions&Servicesof3PLand4PL,Distributionnetworkplanning:customer-sideandnetwork-sidesolutions,Modesof transportation,Designoftransshipment:Conceptsoftransportationmanagementandmanagingtransportation operationsand itsinteraction.	[9]
Packagingandinformationtechnology ApplicationsofPackaginginlogistics,Typesofpackagingandpackagingmaterials,Export&importpackagingandlabelingdetails,Containerization,PervasivenessofITinSupplyChain Management-ERP,Bar-coding,RFID,GPS,E-Procurement	[9]
GlobalLSCMandperformanceanalysis Export and import procedure and Documentation, Risk management in global logistics, Customerrelationship management in LSCM, Performance metrics in Supply Chain, Indian agencies- EIC,EIA,APEDA,MEPEDA	[9]
TotalHours: 45	45

Textbook(s):	
1.	D K Agarwal, “Logistics and supply chain management”, Macmillan Publishers India Ltd., EighthImpressions,2010
2.	SunilChopraandPeter Meindi,“Supply chain management” PearsonEducation, 6thedition,2016
Reference(s):	
1.	DavidTaylorandDavidBrunt,“ManufacturingOperationsandSupply chainManagement”,VikasThomson Learningpublishers,2009
2.	MichaelA.BourlakisandPaulW.H. Weightman“FoodSupplyChainManagement”,BlackwellPublishing Limited,2004

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CourseContentsandLectureSchedule

S.No.	Topic	No.of Hours
1	**Introduction**	
1.1	Logisticsandsupplychainmanagement	1
1.2	Fundamentals ofLSCM	1
1.3	Basic Model	2
1.4	Secondaryactivity	1
1.5	Role andChallengesoflogistics	2
2	**ProcurementandWarehousing**	
2.1	Demand and Supplychain management	1
2.2	Demandplanning	2
2.3	DemandForecasting	1
2.4	Forecastingand strategicplanning	2
2.6	Outsourcingstrategies	1
2.7	Warehousestrategies	1
2.8	Inventorymodels and control techniques	1
3	**Distributionandtransportation**	
3.1	VariousSourcesof distributionchannels	2
3.2	Distributionmodels	1
3.3	Distributionandnetwork planning	2
3.5	Modes oftransport	2
3.6	TransportationManagement	2
4	**PackagingandInformationTechnology**	
4.1	Applicationsof PackaginginLogistics	1
4.2	Typesofpackaging and packagingmaterials	2
4.3	ExportandImport packaging	1
4.4	Labellingdetails	1
4.6	Containerization	2
4.7	ITinSupplychainmanagement	1
4.8	Bar coding	1
5	**GlobalLSCMandPerformanceanalysis**	
5.1	ExportandImport procedure	2
5.2	Riskmanagementinglobal logistics	1
5.3	Customerrelations	2
5.4	PerformancemetricsinSupplychain	1
5.6	IndianAgencies	1
5.7	EIC	2
5.8	EIA	1
5.9	APEDA	1
	Total	45

CourseDesigners

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60 PFTE62	Advanced Meat ProcessingTechnology	Category	L	T	P	Credit
		PC	3	0	0	3

Objective

- Toselectsuitabletechniquesformeatslaughterand meatqualityevaluation
- Toapplyvariousmethods topreservepoultryproductsandutilize poultrywaste
- Toexaminethe qualityof eggsanddevelopbeneficial egg products
- Toselectsuitablemethodforutilizationandpreservationof marineproducts
- Tomakeuseofadvancetechnologies inmeatandfish processing

Prerequisite

NIL

CourseOutcomes

Onthesuccessfulcompletionofthe course,studentswillbeableto

CO1	Analyze thesuitable techniques for meat slaughter and meat qualityevaluation	Remember, Understand,Analyze
CO2	Examinethevariousmethodstopreserve poultryproductsandutilize poultrywaste	Remember, Understand,Apply
CO3	Identifythequalityof eggsand develop beneficialegg products	Remember,Apply
CO4	Outlinethesuitablemethodforutilizationandpreservationofmarine products	Remember, Understand,Analyze
CO5	Summarizetheadvancetechnologiesinmeatandfishprocessing	Remember,Understand, Analyze

MappingwithProgrammeOutcomes

COs	PO1	PO2	PO3
CO1	1	3	1
CO2	2	2	2
CO3	1	1	1
CO4	1	2	1
CO5	3	1	3
3-Strong;2-Medium;1-Some			

AssessmentPattern

Bloom'sCategory	ContinuousAssessmentTests (Marks)		End SemesterExamination (Marks)
	1	2	
Remember (Re)	10	10	10
Understand(Un)	10	10	20
Apply(Ap)	20	20	30
Analyze(An)	20	20	40
Evaluate(Ev)	0	0	0
Create(Cr)	0	0	0

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K.S.RangasamyCollegeofTechnology-Autonomous R2022								
60PFTE62-AdvancedMeatProcessingTechnology								
M.Tech.FoodTechnology								
Semester	Hours/Week			Totalhrs	Credit	MaximumMarks		
	L	T	P		C	CA	ES	Total
III	3	0	0	45	3	40	60	100

MeatandAdvancesinmeatqualityassurance Chemicalcompositionandstructureofmeat.Scientificslaughter:Stunningtechniques–mechanical&electrical.Pre-andpost-slaughteroperations.Factorsaffectingpost-mortemchanges.Advancesinmeatfrauddetection.Genetechnologyformeattraceabilityandsafety. Rapididentificationof animalandmeatquality.Drugresiduesinmeat.	**[9]**
PoultryMeat Birdscommon to the live bird marketing system. Poultry birds - pre-slaughter care and dressing.Strategies for shelf-life extension of poultry meat and its products. Co-products and by-productsfrom poultry processing. Low fat, low salt poultry products. Problems and solutions in deboning ofpoultrymeat.Poultrywastemanagement–selectingtherightapproach.	**[9]**
Egg Commercially important eggs. Hen egg - structure, composition, chemical contaminants in eggs.Preharvest measures to improve the safety of eggs. Advances in egg defect detection and qualityassessment. Traceability of egg along the supply chain. Effects of processing on the allergenicityofeggproteins.Bioactiveeggcompounds - applications.Frozeneggproducts.Designer eggs.	**[9]**
Marineproductsprocessing Edible products from sea. Fish – types, on board fish processing and its advantages. Individualquick freezing. Retort pouch processing of fish. Quality chain management in fish processing.Foodutilization of by-catchandunderutilizedspecies; Advances infisheryby-productstechnology -Productionoffishproteinconcentrate,fishliveroil,fishsauceandinsulin.Bioactivesubstances fromseaweeds.	**[9]**
AdvancesinMeatProductsandProcessingOperations Accelerated conditioning technologies for meat. New approaches for development of functionalmeatproducts.Tailordesigningofnitritefreemeatproducts.Latestdevelopmentsinmeatbacterial starters. Probiotic meat products,Spreadable raw fermented sausage. Advances in themanufactureofsausagecasings.Advancesinbulkpackagingforthetransportoffreshfish.New sourcesofanimalprotein–culturedmeat,edibleinsects.	**[9]**
TotalHours: 45	**45**

Textbook(s):

1.	AlaaEl-DinA,Bekhit.,"AdvancesinMeatProcessingTechnology",1stEdition,CRCPress, USA,2017.
2.	GeorgeM.Hall.,"FishProcessing:SustainabilityandNewOpportunities",1stEdition,Wiley BlackwellPublications,USA,2011.

Reference(s):

1.	PatriciaHester.,"EggInnovationsandStrategiesforImprovements",1stEdition,Academic Press,UK,2017.

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CourseContentsandLectureSchedule

S.No.	Topic	No.of Hours
1	**MeatandAdvancesinmeatqualityAssurance**	
1.1	Chemicalcompositionandstructureofmeat	1
1.2	Scientificslaughter	1
1.3	Factorsaffectingpostmortemchanges	2
1.4	Advancesinmeatfrauddetection	1
1.5	Drugresiduesinmeat	2
2	**PoultryMeat**	
2.1	Birdscommontolive bird marketingsystem	1
2.2	Poultrybirdspreslaughter	2
2.3	Coproducts andbyproducts frompoultryprocessing	1
2.4	Lowfat products	2
2.6	Problemsandsolutionindeboning	1
2.7	Poultrywastemanagement	1
2.8	Selectingtheright approach	1
3	**Egg**	
3.1	Commerciallyimportanteggs	2
3.2	Heneggstructure composition	1
3.3	Advancesineggdefectdetection	2
3.5	Effectsof processingon theallergenicityof egg protein	2
3.6	Bioactiveeggcompounds	2
4	**MarineProductsprocessing**	
4.1	Edibleproductsfromsea	1
4.2	Onboardfishprocessing	2
4.3	Qualitychainmanagementinfishprocessing	1
4.4	Foodutilizationbycatch	1
4.6	Advancesinfisheryby-producttechnology	2
4.7	Productionoffishproteinconcentrate	1
4.8	Fishliveroil	1
5	**AdvancesinMeatproductsandProcessingOperations**	
5.1	Acceleratingconditioningtechnologies	2
5.2	Newapproaches for developmentof functionalmeat	1
5.3	Designingof nitritefreemeatproducts	2
5.4	Latestdevelopmentsinmeatbacterialstarters	1
5.6	Probioticmeat	1
5.7	Spreadablerawfermentedsausage	2
5.8	Advancesinmanufacturingsausagecasings	1
5.9	Newsources ofanimalprotein	1
	Total	45

CourseDesigners

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BoSChairman

60 PFTE63	AdvancedDairyTechnology	Category	L	T	P	Credit
		PC	3	0	0	3

Objective

- Tooutlinethecharacteristicsofmilkconstituentsanditsanalyticaltechniques
- Toexaminechangesinmilkduetoheatand biotechnologicalinterventions
- Toidentifythe advancedmethods in dairyprocessing
- Tomakeuseofadvances oftechnologyfor manufacturing dairyproducts
- Tointerpretfoulingprocess andautomationindairyindustry

Prerequisite

NIL

CourseOutcomes

Onthesuccessfulcompletionofthe course,studentswillbeableto

CO1	Analyze thecharacteristics of milk constituents and its analyticaltechniques	Remember, Understand,Analyze
CO2	Examinethechanges inmilkduetoheatand biotechnological interventions	Remember, Understand,Apply
CO3	Identifytheadvancedmethodsindairyprocessing	Remember,Apply
CO4	Outlinethe useof advancesoftechnologyfor manufacturing dairy products	Remember, Understand,Analyze
CO5	Summarizethefoulingprocessandautomationindairyindustry	Remember,Understand, Analyze

MappingwithProgrammeOutcomes

COs	PO1	PO2	PO3
CO1	1	3	1
CO2	2	2	2
CO3	1	1	1
CO4	1	2	1
CO5	3	1	3
3-Strong;2-Medium;1-Some			

AssessmentPattern

Bloom'sCategory	ContinuousAssessmentTests (Marks)		End SemesterExamination (Marks)
	1	2	
Remember (Re)	10	10	10
Understand(Un)	10	10	20
Apply(Ap)	20	20	30
Analyze(An)	20	20	40
Evaluate(Ev)	0	0	0
Create(Cr)	0	0	0

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K.S.RangasamyCollegeofTechnology-Autonomous R2022								
60PFT E63– AdvancedDairyTechnology								
M.Tech.FoodTechnology								
Semester	Hours/Week			Totalhrs	Credit	MaximumMarks		
	L	T	P		C	CA	ES	Total
III	3	0	0	45	3	40	60	100

MilkConstituentsandItsProperties Constituents of milk, Factors affecting milk composition, Properties of milk - Thermal, Optical,Electrical and Rheological properties, Refractive Index, Effects of high-pressure treatment onconstituentsand properties of milk, Bioactive compounds from milk, Advances in FractionationandAnalysisofMilk.	[9]
Heat-inducedChangesandBiotechApproachesinDairyProducts Chemical and physical changes in Ultra Heat Temperature treatment, Heat-induced reactions inmilk – surface reactions, bulk reactions.Genetically Modified Cheese: A Novel BiotechnologicalDevelopment, Recent Biotechnological Approaches in Dairy and Food Industry: Bio-FunctionalWhey BasedBeverages,Productionandenrichment ofbioactive peptidesderived frommilkproteins,membranebioreactors:classification,theory,Applicationsofmembranebioreactorsa nd fermentersindairyindustry	[9]
AdvancedDairyProcessing Microwaveprocessing,HighPressureprocessing,PulsedElectricFieldprocessing,Ultrasound processing,UltravioletandPulsedLightProcessing,Advancedheatingprocesses-ExtendedShelfLife(ESL),InnovativeSteamInjection(ISI),Modernapproaches tolactoseproduction.	[9]
DairyProductsManufacture Liquid infant formulae, Anhydrous Milk Fat, Frozen cream, Dried cream, Processed Cheese, Dairyprotein products, Blends and blended spreads – production and quality aspects, Glycosylatedwheyproteins,Milkimitations,Fermentedwhey,IndirectBiologicalAcidificationprocess, manufacturingprocessforcholesterolreduction	[9]
OperationalConsiderationsandLimitationsandAutomationinDairyIndustry Fouling - types, mechanisms, factors affecting fouling, Biofilm - formation, detection, control.Factorscontributingtoautomation,Stagesinautomationindairy,Automationatenterpriselevel-Enterprise ResourcePlanning.	[9]
TotalHours: 45	**45**

Textbook(s):

1.	SpreerE.,"Milk andDairyProductTechnology",1stEdition, Routlege,UK,2017.
2.	NurcanKoca.,"TechnologicalApproachesforNovelApplicationsinDairyProcessing",1st Edition,InTechOpen,UK, 2022.

Reference(s):

1.	DattaN., Tomasula P.M., "Emerging DairyProcessingTechnologies: Opportunitiesfor the Dairy Industry",1st Edition,JohnWiley& Sons, US,2015.

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CourseContentsandLectureSchedule

S.No.	Topic	No.of Hours
1	**MilkConstituentsanditsProperties**	
1.1	Constituentsofmilk	1
1.2	FactorsaffectingMilkcomposition	1
1.3	Propertiesofmilk	2
1.4	Effectsof high-pressuretreatment	1
1.5	AdvancesinFractionationandAnalysisofMilk	2
2	**Heat induced changes and biotech approaches in dairyproducts**	
2.1	ChemicalandPhysicalchanges inUltraheatTemperature	1
2.2	Heatinducedreactions	2
2.3	GeneticallyModifiedcheese	1
2.4	FoodIndustry	2
2.6	Productionandenrichmentofbioactivepeptides	1
2.7	Membranebioreactors	1
2.8	Applicationofmembranebioreactor	1
3	**AdvancedDairyProcessing**	
3.1	MicrowaveProcessing	2
3.2	Pulsedelectricfieldprocessing	1
3.3	Advancedheatingprocesses	2
3.5	ExtendedShelflife	2
3.6	ApproachestoLactoseproduction	2
4	**DairyProductsManufacture**	
4.1	Liquidinfantformulation	1
4.2	AnhydrousMilk fat	2
4.3	Frozencream	1
4.4	Production andqualityaspects	1
4.6	Glycosylatedwheyprotein	2
4.7	Indirectbiologicalacidificationprocess	1
4.8	Manufacturingprocessforcholesterolreduction	1
5	**Operational Considerations and limitations and Automationin DairyIndustry**	
5.1	Foulingtypes	2
5.2	Factorsaffectingfouling	1
5.3	Biofilmformation	2
5.4	Factorscontributingtoautomation	1
5.6	Stagesin automation indairy	1
5.7	AutomationatEnterpriselevel	2
5.8	EnterpriseResourcesPlanning	2
	Total	45

CourseDesigners

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		Category	L	T	P	Credit
60PAC001	ENGLISHFORRESEARCHPAPERWRITING	AC	2	0	0	0

Objective

- Teachhowtoimprovewriting skillsandlevelof readability
- Tellabout whattowriteineach section
- SummarizetheskillsneededwhenwritingaTitle
- Infertheskills neededwhenwriting theConclusion
- Ensurethequalityofpaperatveryfirst-timesubmission

Prerequisite

NIL

CourseOutcomes

Onthesuccessfulcompletionofthecourse,studentswillbeableto

CO1	Understandthathowto improve yourwriting skills andlevelofreadability
CO2	Learn aboutwhat towriteineachsection
CO3	Understandtheskillsneeded when writingaTitle
CO4	Understandtheskills neededwhenwritingtheConclusion
CO5	Ensurethegoodqualityofpaperatveryfirst-timesubmission

AssessmentPattern

Bloom'sCategory	ContinuousAssessmentTests(Marks)	
	1	2
Remember	10	10
Understand	20	20
Apply	30	30
Analyse	0	0
Evaluate	0	0
Create	0	0

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BoSChairman

K.S.RangasamyCollegeof Technology-AutonomousR2022

60PCA001-EnglishforResearchPaperWriting

CommontoallBranches

Semester	Hours/Week			Totalhrs	Credit	MaximumMarks		
	L	T	P		C	CA	ES	Total
I/II	2	0	0	30	0	100	-	100

IntroductiontoResearchPaperWriting PlanningandPreparation,WordOrder,Breakinguplongsentences,StructuringParagraphsandSentences,Being Conciseand RemovingRedundancy,AvoidingAmbiguityandVagueness	[6]
PresentationSkills ClarifyingWhoDidWhat,HighlightingYourFindings,HedgingandCriticizing,ParaphrasingandPlagiarism,Sectionsofa Paper,Abstracts,Introduction	[6]
TitleWritingSkills Key skills are needed when writing a Title, key skills are needed when writing an Abstract, key skills are neededwhenwritinganIntroduction,skillsneededwhenwritingaReviewoftheLiterature,Methods,Results,Discussion, Conclusions,TheFinalCheck	[6]
ResultWritingSkills SkillsareneededwhenwritingtheMethods,skillsneededwhenwritingtheResults,skillsareneededwhenwriting the Discussion,skillsare neededwhenwriting the Conclusions	[6]
VerificationSkills Usefulphrases,checkingPlagiarism,howtoensurepaperisasgoodasitcouldpossiblybethefirsttimesubmission	[6]
TotalHours	**30**

TextBook(s):

1.	AdrianWallwork,EnglishforWritingResearch Papers,SpringerNewYork DordrechtHeidelberg London,2011
2	DayRHowtoWriteandPublisha Scientific Paper, CambridgeUniversityPress 2006

Reference(s):

1.	GoldbortRWritingforScience,Yale UniversityPress (availableonGoogle Books)2006
2.	HighmanN,Handbookof WritingfortheMathematicalSciences, SIAM.Highman'sbook 1998.
3.	PhillWilliams,AdvancedWritingskillsforstudentsofEnglish,RumianPublishers,2018
4.	Sudhir S. Pandhye, English Grammar andWritingSkills,Notion Press,2017.

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BoSChairman

		Category	L	T	P	Credit
60PAC002	DISASTERMANAGEMENT	AC	2	0	0	0

Objective

- Summarizebasicsofdisaster
- Explaina critical understanding ofkey conceptsindisaster riskreduction andhumanitarianresponse.
- Illustratedisasterriskreductionandhumanitarianresponsepolicyandpracticefrommultipleperspectives.
- Describeanunderstandingofstandardsofhumanitarianresponseandpracticalrelevanceinspecifictypesofdisastersandconflictsituations.
- Develop the strengthsandweaknessesofdisastermanagement approachesTeach how toimprovewritingskillsandlevel ofreadability

Prerequisite

NIL

CourseOutcomes

On the successfulcompletion ofthe course,students willbe able to

CO1	Abilityto summarizebasicsofdisaster
CO2	Ability to explain a critical understanding of key concepts in disaster risk reductionandhumanitarian response.
CO3	Ability to illustrate disaster risk reduction and humanitarian response policy andpracticefrommultipleperspectives.
CO4	Ability to describe an understanding of standards of humanitarian response andpracticalrelevanceinspecifictypesofdisastersandconflictsituations.
CO5	Ability to develop the strengths and weaknesses of disaster managementapproaches

AssessmentPattern

Bloom'sCategory	ContinuousAssessmentTests(Marks)	
	1	2
Remember	10	10
Understand	20	20
Apply	30	30
Analyse	0	0
Evaluate	0	0
Create	0	0

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K.S.RangasamyCollegeof Technology-AutonomousR2022

60PCA002-DisasterManagement

CommontoallBranches

Semester	Hours/Week			Totalhrs	Credit	MaximumMarks		
	L	T	P		C	CA	ES	Total
I/II	2	0	0	30	0	100	-	100

Introduction Disaster:Definition,FactorsandSignificance;DifferencebetweenHazardandDisaster;NaturalandManmadeDisasters: Difference,Nature,TypesandMagnitude.	[6]
RepercussionsofDisastersandHazards Economic Damage, Loss of Human and Animal Life, Destruction of Ecosystem. Natural Disasters: Earthquakes,Volcanisms,Cyclones,Tsunamis,Floods,DroughtsAndFamines,LandslidesAndAvalanches,Man-madedisaster: Nuclear Reactor Meltdown, Industrial Accidents, Oil Slicks And Spills, Outbreaks Of Disease AndEpidemics,WarAndConflicts.	[6]
DisasterProne AreasInIndia Study ofSeismicZones;AreasProneto Floodsand Droughts,Landslidesand Avalanches;AreasProne toCyclonic andCoastalHazards withSpecialReferenceToTsunami; Post-DisasterDiseases andEpidemics	[6]
DisasterPreparednessandManagement Preparedness: Monitoring of Phenomena Triggering a Disaster or Hazard; Evaluation of Risk: Application ofRemote Sensing, Data from Meteorological and other Agencies, Media Reports: Governmental and CommunityPreparedness.	[6]
RiskAssessment Disaster Risk: Concept and Elements, Disaster Risk Reduction, Global and National Disaster Risk Situation.TechniquesofRiskAssessment,GlobalCo-OperationinRiskAssessmentandWarning,People'sParticipationin RiskAssessment.StrategiesforSurvival.	[6]
TotalHours	**30**

TextBook(s):

1.	GoelS.L.,DisasterAdministration and ManagementTextAndCase Studies",Deep&Deep PublicationPvt. Ltd.,NewDelhi,2009.
2	NishithaRai, SinghAK,"DisasterManagementinIndia:Perspectives,issuesand strategies"'NewRoyalbook Company,2007.

Reference(s):

1.	Sahni,Pardeepet.al.,"DisasterMitigationExperiencesandReflections",Prentice HallofIndia,2001.
2.	SubramanianR,"DisasterManagement",VikaspublishingHousingPvt.Ltd.,2018.
3.	Chu-huaKuei,ChristianNMadu,Handbook ofDisasterManagementRisk Reduction&Management:Climate changeandNaturalDisaster,worldscientific,2017.
4.	JankiAndharia,Disasterstudies:ExploringIntersectionaltiesinDisasterDiscourse,Springer,2020.

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		Category	L	T	P	Credit
60PAC003	CONSTITUTIONOFINDIA	AC	2	0	0	0

Objective

- Understand the premises informing the twin themes of liberty and freedom from a civilrightsperspective.
- ToaddressthegrowthofIndianopinionregardingmodernIndianintellectuals'constitutional. Roleandentitlementtocivilandeconomicrightsaswellastheemergencenation hoodinthe early yearsofIndiannationalism.
- To address the role of socialism in India after the commencement of the BolshevikRevolutionin1917anditsimpact ontheinitial draftingoftheIndianConstitution.

Prerequisite

NIL

CourseOutcomes

Onthesuccessfulcompletionofthecourse,studentswillbeableto

CO1	DiscussthegrowthofthedemandforcivilrightsinIndiaforthebulkofIndiansbefore the arrivalofGandhiinIndianpolitics.
CO2	Discusstheintellectualoriginsoftheframework ofargumentthatinformedtheconceptualizationofsocialreformsleadingto revolutioninIndia
CO3	Discuss the circumstances surrounding the foundation of the Congress SocialistParty [CSP] under the leadership of Jawaharlal Nehru and the eventual failure of theproposal ofdirectelectionsthroughadultsuffrageintheIndianConstitution.
CO4	Discuss thepassageoftheHinduCodeBillof1956.
CO5	Discuss the roleandfunctioning ofelection commission ofIndia.

AssessmentPattern

Bloom'sCategory	ContinuousAssessmentTests(Marks)	
	1	2
Remember	10	10
Understand	20	20
Apply	30	30
Analyse	0	0
Evaluate	0	0
Create	0	0

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K.S.RangasamyCollegeof Technology-AutonomousR2022								
60PCA003-ConstitutionofIndia								
CommontoallBranches								
Semester	Hours/Week			Totalhrs	Credit	MaximumMarks		
	L	T	P		C	CA	ES	Total
I/II	2	0	0	30	0	100	-	100

HistoryofMakingofTheIndianConstitution History,DraftingCommittee,(Composition&Working)	[3]
PhilosophyofTheIndianConstitution Preamble,SalientFeatures	[3]
ContoursofConstitutionalRightsandDuties Fundamental Rights, Right to Equality, Right to Freedom, Right against Exploitation, Right to Freedom ofReligion, Cultural and Educational Rights, Right to Constitutional Remedies, Directive Principles of StatePolicy,FundamentalDuties.	[6]
OrgansofGovernance Parliament, Composition, Qualifications and Disqualifications, Powers and Functions, Executive, President,Governor, Council of Ministers, Judiciary, Appointment and Transfer of Judges, Qualifications, Powers andFunctions.	[6]
LocalAdministration District's Administration head: Role and Importance Municipalities: Introduction, Mayor and role of ElectedRepresentative, CEO, Municipal Corporation. Panchayat raj: Introduction, PRI: ZilaPanchayat. Electedofficialsandtheirroles,CEOZilaPanchayat:Positionandrole.Blocklevel: OrganizationalHierarchy(Different departments), Village level: Role of Elected and Appointed officials, Importance of grass rootdemocracy.	[6]
ElectionCommission ElectionCommission:RoleandFunctioning.ChiefElectionCommissionerandElectionCommissioners-Institute andBodiesforthewelfare ofSC/ST/OBCandwomen.	[6]
TotalHours	**30**

TextBook(s):

1.	TheConstitutionofIndia,1950(BareAct),GovernmentPublication.
2	BusiSN,AmbedkarBR,"FramingofIndianConstitution",1stEdition,2015.

Reference(s):

1.	Jain,MP,"Indian ConstitutionLaw",7thEdition,Lexis Nexis,2014
2.	Basu,D D,"Introduction to theConstitution of India",LexisNexis,2015.
3.	BhansaliSR.,"TextbookonTheConstitution of India",UniversalPublishers,2015
4.	Jain,MP.,"Outlinesof IndianLegalandConstitutionalHistory",LexisNexis,2014

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