K.S. Rangasamy College of Technology

(Autonomous)

CURRICULUM & SYLLABI
of
M.Tech., Food Technology

(For the batch admitted in 2025 – 2026)

R2025

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

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

Department of Food Technology

VISION

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

MISSION

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

PROGRAM EDUCATIONAL OBJECTIVES (PEOs)

PEO1: **Core Competence:** Our graduates apply technical knowledge to solve problems in Food safety, quality and sustainability.

PEO2: **Employability:** Our graduates exhibit technical expertise and professionalism to meet the needs of the Food industry and society.

PEO3: **Research and Development:** Our graduates promote research and development in Food Technology through lifelong learning, addressing challenges in Food safety, quality and sustainability.

PROGRAMME OUTCOMES (POs)

Engineering Graduates will be able to:

PO1: Develop expertise in Food Science and Food Engineering to innovate and critically evaluate novel concepts, driving advancements in the field

PO2: Apply scientific and technological expertise to design and conduct innovative research for high-throughput process and product development.

PO3: Develop innovative solutions for Food Technology challenges, balancing societal, health, cultural, and environmental needs

PO4: Apply modern engineering tools to model and optimize Food Engineering processes.

PO5: Analyze Food Tech challenges and develop innovative solutions through collaborative research and teamwork.

PO6: Apply professional ethics and social responsibility in project management

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

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

Programme Educational Objectives	Programme Outcomes					
	PO1	PO2	PO3	PO4	PO5	PO6
PEO 1	2	3	3	3	3	3
PEO 2	3	3	2	2	3	3
PEO 3	3	3	2	3	2	2

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

Passed in BoS Meeting held on 20/06/2025
Approved in Academic Council Meeting held on 19/07/2025

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MAPPING-PG-FOOD TECHNOLOGY

Year	Sem	Course Name	PO1	PO2	PO3	PO4	PO5	PO6
I	I	Applied Statistics for Food Technology	3	3			2	
		Unit Operations in Food Process Engineering	2.8	2.8	2.8	2.6	3	2.8
		Advanced Drying Technology	3	2.4	3	2.8	2.8	2.8
		Food Chemistry and Microbiology	2.6	2.8	2.8	2.4	3	3
		Research Methodology and IPR	2.5	3.0	2.5	2	0	2.7
		Food Testing and Evaluation Laboratory	3	2.8	3	3	2.8	2.8
		Food Chemistry and Microbiology Laboratory	3	2.8	3	3	2.8	2.8
	II	Instrumental Techniques and Methods for Food Analysis	2.8	2.6	2.6	3	2.8	2.8
		Cooling Technology for Food Processing	2.8	2.8	3	3	2.6	2.8
		Food Safety and Quality Control	3	2.8	2.8	2.6	2.8	2.8
		Food Products Development Laboratory	3	3	2.8	3	2.8	3
		Instrumental Food Analysis Laboratory	3	3	2.8	3	2.8	3
		Technical Seminar	3	3	3	3	3	3
II	III	Plantation Crops and Spices Technology	2.8	2.6	3	2.6	3	2.8
		Project Work-Phase I	3	3	3	2	2.2	3
	IV	Project Work-Phase II	3	3	3	2	2.2	3

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K.S. RANGASAMY COLLEGE OF TECHNOLOGY
Credit Distribution for M. Tech. Food Technology Programme – 2025–2026 Batch

SUMMARY

S. No.	Category	Credits Per Semester				Total Credits	Percentage (%)
		I	II	III	IV		
1	PC	21	14	3	-	**38**	**51.4**
2	PE	3	9	6	-	**18**	**24.3**
3	EEC	-	-	6	12	**18**	**24.3**
4	AC	AC I	AC II	-	-	**-**	**-**
Total		**22**	**23**	**15**	**12**	**74**	**100**

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

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Approved in Academic Council Meeting held on 19/07/2025

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

PROFESSIONAL CORE (PC)

S. No.	Course Code	Course Title	Category	Contact Periods	L	T	P	C	Prerequisite
1	70 PFT 101	Applied Statistics for Food Technology	PC	5	3	1	0	4	NIL
2	70 PFT 102	Unit Operations in Food Process Engineering	PC	5	3	1	0	4	NIL
3	70 PFT 103	Advanced Drying Technology	PC	3	3	0	0	3	NIL
4	70 PFT 104	Food Chemistry and Microbiology	PC	3	3	0	0	3	NIL
5	70 PIS 001	Research Methodology and IPR	PC	3	3	0	0	3	NIL
6	70 PFT 1P1	Food Testing and Evaluation Laboratory	PC	4	0	0	4	2	NIL
7	70 PFT 1P2	Food Chemistry and Microbiology Laboratory	PC	4	0	0	4	2	NIL
8	70 PFT 201	Instrumental Techniques and Methods for Food Analysis	PC	4	3	0	0	3	NIL
9	70 PFT 202	Cooling Technology for Food Processing	PC	5	3	1	0	4	Unit Operations in Food Process Engineering
10	70 PFT 203	Food Safety and Quality Control	PC	3	3	0	0	3	NIL
11	70 PFT 2P1	Food Product Development Laboratory	PC	4	0	0	4	2	NIL
12	70 PFT 2P2	Instrumental Food Analysis Laboratory	PC	4	0	0	4	2	NIL
13	70 PFT 301	Plantation Crops and Spices Technology	PC	3	3	0	0	3	NIL

PROFESSIONAL ELECTIVES (PE)

SEMESTER I, ELECTIVE I

S. No.	Course Code	Course Title	Category	Contact Periods	L	T	P	C	Prerequisite
1	70 PFT E11	Advanced Fruit and Vegetable Processing Technology	PE	3	3	0	0	3	NIL
2	70 PFT E12	Novel Technologies in Food Processing	PE	3	3	0	0	3	NIL
3	70 PFT E13	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	Prerequisite
1.	70 PFT E21	Industrial Engineering	PE	3	3	0	0	3	NIL
2.	70 PFT E22	Industrial Waste Management	PE	3	3	0	0	3	NIL
3.	70 PFT E23	Advanced Baking and Confectionery Technology	PE	3	3	0	0	3	Advanced Drying Technology

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SEMESTER II, ELECTIVE III

S. No.	Course Code	Course Title	Category	Contact Periods	L	T	P	C	Prerequisite
1.	70 PFT E31	Technology of Food Colours and Flavours	PE	3	3	0	0	3	NIL
2.	70 PFT E32	Advanced Separation Techniques in Food Processing	PE	3	3	0	0	3	Advanced Drying Technology
3.	70 PFT E33	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	Prerequisite
1.	70 PFT E41	Advanced Grain Science and Technology	PE	3	3	0	0	3	Advanced Drying Technology
2.	70 PFT E42	Food Additives, Nutraceuticals and Functional Foods	PE	3	3	0	0	3	NIL
3.	70 PFT E43	Advanced Beverage Technology	PE	3	3	0	0	3	NIL

SEMESTER III, ELECTIVE V

S. No.	Course Code	Course Title	Category	Contact Periods	L	T	P	C	Prerequisite
1.	70 PFT E51	Snacks and Extruded Products Technology	PE	3	3	0	0	3	Food Safety and Quality Control
2.	70 PFT E52	Internet of Things in Food and Agriculture	PE	3	3	0	0	3	NIL
3.	70 PFT E53	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	Prerequisite
1.	70 PFT E61	Modern Food Packaging Technology	PE	3	3	0	0	3	NIL
2.	70 PFT E62	Advanced Meat Processing Technology	PE	3	3	0	0	3	NIL
3.	70 PFT E63	Advanced Dairy Technology	PE	3	3	0	0	3	Cooling Technology for Food Processing

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AUDIT COURSES (AC)

S. No.	Course Code	Course Title	Category	Contact Periods	L	T	P	C	Prerequisite
1.	70 PAC 001	English for Research Paper Writing	AC	2	2	0	0	0	NIL
2.	70 PAC 002	Disaster Management	AC	2	2	0	0	0	NIL
3.	70 PAC 003	Constitution of India	AC	2	2	0	0	0	NIL

EMPLOYABILITY ENHANCEMENT COURSES (EEC)

S. No.	Course Code	Course Title	Category	Contact Periods	L	T	P	C	Prerequisite
1.	70 PFT 2P3	Technical Seminar	EEC	2	0	0	2	0	NIL
2.	70 PFT 3P1	Project Work-Phase I	EEC	12	0	0	12	6	NIL
3.	70 PFT 4P1	Project Work-Phase II	EEC	24	0	0	24	12	NIL

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TIRUCHENGODE-637215
(An Autonomous Institution affiliated to Anna University)
COURSES OF STUDY
(For the candidates admitted in 2025-2026)

SEMESTER–I								
S. No.	**Course Code**	**Course Title**	**Category**	**Contact Periods**	**L**	**T**	**P**	**C**
THEORY								
1	70 PFT 101	Applied Statistics for Food Technology	PC	5	3	1	0	4
2	70 PFT 102	Unit Operations in Food Process Engineering	PC	5	3	1	0	4
3	70 PFT 103	Advanced Drying Technology	PC	3	3	0	0	3
4	70 PFT 104	Food Chemistry and Microbiology	PC	3	3	0	0	3
5	70 PIS 001	Research Methodology and IPR	PC	3	3	0	0	3
6	70 PFT E1*	Professional Elective I	PE	3	3	0	0	3
7	70 PAC 001	English for Research Paper Writing	AC	2	2	0	0	0
PRACTICALS								
8	70 PFT 1P1	Food Testing and Evaluation Laboratory	PC	4	0	0	4	2
9	70 PFT 1P2	Food Chemistry and Microbiology Laboratory	PC	4	0	0	4	2
			Total	**32**	**20**	**2**	**8**	**24**

SEMESTER–II								
S. No.	**Course Code**	**Course Title**	**Category**	**Contact Periods**	**L**	**T**	**P**	**C**
THEORY								
1.	70 PFT 201	Instrumental Techniques and Methods for Food Analysis	PC	4	3	0	0	3
2.	70 PFT 202	Cooling Technology for Food Processing	PC	5	3	1	0	4
3.	70 PFT 203	Food Safety and Quality Control	PC	3	3	0	0	3
4.	70 PFT E2*	Professional Elective II	PE	3	3	0	0	3
5.	70 PFT E3*	Professional Elective III	PE	3	3	0	0	3
6.	70 PFT E4*	Professional Elective IV	PE	3	3	0	0	3
7.	70 PAC 002	Disaster Management	AC	2	2	0	0	0
PRACTICALS								
8.	70 PFT 2P1	Food Product Development Laboratory	PC	4	0	0	4	2
9.	70 PFT 2P2	Instrumental Food Analysis Laboratory	PC	4	0	0	4	2
10.	70 PFT 2P3	Technical Seminar	EEC	2	0	0	2	0
Total				**32**	**20**		**8**	**23**

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SEMESTER–III								
S. No.	**Course Code**	**Course Title**	**Category**	**Contact Periods**	**L**	**T**	**P**	**C**
THEORY								
1.	70 PFT 301	Plantation Crops and Spices Technology	PC	3	3	0	0	3
2.	70 PFT E5*	Professional Elective V	PE	3	3	0	0	3
3.	70 PFT E6*	Professional Elective VI	PE	3	3	0	0	3
PRACTICAL								
4.	70 PFT 3P1	Project Work-Phase I	EEC	12	0	0	12	6
Total				**31**	**15**	**2**	**12**	**23**

SEMESTER–IV								
S. No.	**Course Code**	**Course Title**	**Category**	**Contact Periods**	**L**	**T**	**P**	**C**
PRACTICAL								
1.	70 PFT 4P1	Project Work-Phase II	EEC	24	0	0	24	12
Total				**24**	**0**	**0**	**24**	**12**

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K.S.RANGASAMY COLLEGE OF TECHNOLOGY, TIRUCHENGODE - 637215
(An Autonomous Institution affiliated to Anna University)
M.E. / M.Tech. Degree Programme
SCHEME OF EXAMINATIONS
(For the candidates admitted in 2025 - 2026)
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	
				Continuous Assessment *	End Semester Exam **	Max. Marks	End Semester Exam	Total
THEORY								
1	70 PFT 101	Applied Statistics for Food Technology	2	40	60	100	45	100
2	70 PFT 102	Unit Operations in Food Process Engineering	2	40	60	100	45	100
3	70 PFT 103	Advanced Drying Technology	2	40	60	100	45	100
4	70 PFT 104	Food Chemistry and Microbiology	2	40	60	100	45	100
5	70 PIS 001	Research Methodology and IPR	2	40	60	100	45	100
6	70 PFT E1*	Professional Elective I	2	40	60	100	45	100
7	70 PAC 001	English for Research Paper Writing	2	100	-	100	-	100
PRACTICAL								
8	70 PFT 1P1	Food Testing and Evaluation Laboratory	3	60	40	100	45	100
9	70 PFT 1P2	Food Chemistry and Microbiology Laboratory	3	60	40	100	45	100

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

**End Semester Examination will be conducted for maximum marks of 100 and subsequently be reduced to 60 marks for theory end semester examination and 40 marks for practical end semester examination.

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Approved in Academic Council Meeting held on 19/07/2025

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70 PFT 101	Applied Statistics for Food Technology	Category	L	T	P	Credit
		PC	3	1	0	4

Objectives

- To comprehend the concepts of Linear Programming Problems.
- To learn the concepts of transportation and assignment models.
- To get exposed to the basics of descriptive statistics.
- To familiarize with various methods in testing of hypothesis.
- To understand the basic concepts of analysis of variance and control charts.

Pre-requisites

NIL

Course Outcomes		
On the successful completion of the course, students will be able to		
CO1	Analyze various methods in linear programming techniques.	Apply
CO2	Employ the different techniques for solving transportation and assignment models.	Apply
CO3	Apply the basics of descriptive statistics.	Apply
CO4	Test the statistical hypothesis using t, F, and chi-square tests.	Apply
CO5	Analyze the design of experiments and interpret quality control charts.	Apply

Mapping with Programme Outcomes

COS	PO1	P02	PO3	PO4	PO5	PO6
CO1	3	3			2	
CO2	3	3			2	
CO3	3	3			2	
CO4	3	3			2	
CO5	3	3			2	

Assessment Pattern

Bloom's Category	Continuous Assessment Tests (Marks)		End Sem Examination (Marks)
	1	2	
Remember	14	06	10
Understand	14	06	10
Apply	32	48	80
Analyze	0	0	0
Evaluate	0	0	0
Create	0	0	0
Total	60	60	100

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Approved in Academic Council Meeting held on 19/07/2025

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K.S. Rangasamy College of Technology–Autonomous R 2025

M. Tech. Food Technology

70 PFT 101 - Applied Statistics for Food Technology

Semester	Hours / Week			Total Hours	Credit	Maximum Marks		
	L	T	P		C	CA	ES	Total
I	3	1	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 - Traveling salesman problems.	[9]
Descriptive Statistics** Measures of Central tendency – Mean, Median, and 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 of fit – 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 X and Range R chart – np chart – P chart.	[9]
Total Hours(45)+Tutorial (15)	**60**

Text Book(s):

1.	Kanti Swarup, P.K. Gupta, and Man Mohan, "Operations Research," Sultan Chand & Sons, New Delhi.
2.	Gupta S.C. and Kapoor V.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.

***SDG 9 – Industry Innovation and Infrastructure**

****SDG 4: Quality Education**

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Course Contents and Lecture Schedule

S. No.	Topic	No. of Hours	Mode of content delivery
1	**Linear Programming Problems**		
1.1	Formulation of LP problem	1	LWD
1.2	Graphical method	2	LWD
1.3	Simplex method	2	LWD
1.4	Big-M method	2	LWD
1.5	Duality	1	Seminar
1.6	Tutorial	2	
2	**Transportation and Assignment Problems**		
2.1	North-west corner rule	1	LWD
2.2	Least cost method	1	LWD
2.3	Vogel's approximation method	1	LWD
2.4	MODI method	2	LWD
2.5	Balanced assignment problems	1	Seminar
2.6	Unbalanced assignment problems	1	LWD
2.7	Traveling salesman problems	1	LWD
2.8	Tutorial	2	
3	**Descriptive Statistics**		
3.1	Mean, Median, Mode	2	LWD
3.2	Quartile deviation	1	LWD
3.3	Mean deviation	1	LWD
3.4	Standard deviation	2	LWD
3.5	Coefficient of variation	2	LWD
3.6	Tutorial	2	
4	**Testing of Hypothesis**		
4.1	Student's 't' test	1	LWD
4.2	Single mean	1	LWD
4.3	Difference of means	1	LWD
4.4	F-test	1	Flipped Class
4.5	Chi-square test	2	LWD
4.6	Goodness of fit	1	LWD
4.7	Independence of attributes	1	LWD
4.8	Tutorial	2	
5	**Design of Experiments and Quality Control**		
5.1	One-way classification	1	LWD
5.2	Completely randomized design	1	LWD
5.3	Two-way classification	1	LWD
5.4	Randomized block design	1	LWD
5.6	Latin square	1	Seminar
5.7	Mean (X) and Range R chart	1	LWD
5.8	n chart	1	LWD
5.9	P chart	1	LWD
5.10	Tutorial	2	
	Total	60	

***LWD - Lecture with discussion

Course Designer(s)

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70 PFT 102	Unit Operations in Food Process Engineering	Category	L	T	P	Credit
		PC	3	1	0	4

Objectives

- Apply principles of material and energy balance in various food processing operations.
- Explain the physical properties of fluids and their relevance to fluid flow in food systems.
- Describe mechanical operations involved in food processing and evaluate equipment effectiveness.
- Understand modes of heat transfer and describe the working principles of heat exchangers and evaporators.
- Comprehend mass transfer operations and associated diffusion phenomena in food systems.

Pre-requisites

NIL

Course Outcomes

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

CO1	Apply stoichiometric principles and perform material and energy balance for food processing systems.	Apply
CO2	Analyze fluid properties and apply fluid flow principles in food processing operations.	Analyze
CO3	Understand various mechanical operations such as screening, sedimentation, and filtration.	Apply
CO4	Apply heat transfer mechanisms and solve problems related to conduction, convection, and radiation.	Analyze
CO5	Interpret mass transfer operations and calculate diffusion and transfer coefficients in food processes.	Analyze

Mapping with Programme Outcomes

COS	PO1	P02	PO3	PO4	PO5	PO6
CO1	3	3	3	3	3	3
CO2	3	3	3	3	3	3
CO3	3	2	3	2	3	3
CO4	2	3	3	3	3	3
CO5	3	3	2	2	3	2
3 - Strong; 2 - Medium; 1 – Some						

Assessment Pattern

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

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K.S. Rangasamy College of Technology–Autonomous **R 2025**

M. Tech. Food Technology

70 PFT 102–Unit Operations in Food Process Engineering

Semester	Hours / Week			Total Hours	Credit	Maximum Marks		
	L	T	P		C	CA	ES	Total
I	3	1	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 - Streamline 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 pump work	[9]
Mechanical Operation Screening - Screening equipment - Effectiveness of screens - Gravity settling - Sedimentation - Thickening - Clarifier - Flotation - 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 radiation - 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 operations: absorption, distillation, extraction, leaching, humidification	[9]
Total Hours:	**45**

Text Book(s):

1. Goshal, S. K., Sanyal, S. K., & Datta, S. (2006). *Introduction to Chemical Engineering* (19th ed.). Tata McGraw-Hill, Delhi.
2. McCabe, W. L., Smith, J. C., & Harriot, P. (2005). *Unit Operations of Chemical Engineering* (7th ed.). McGraw-Hill, New York.

Reference(s):

1. GavahaneK.A.,"Unit operation",27th Edition,Nirali Prakasham Publications,Pune,2016

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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
3.7	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 radiation	2
4.7	Emissivity and absorptivity	1
4.8	Kirchhoff's law	1
4.9	Tutorial	2
5	**Mass Transfer**	
5.1	Types of mass transfer operations	1
5.2	Fick's law	1
5.3	Molecular and eddy diffusion	1
5.4	Diffusivity measurement	1
5.5	Tutorial	2
5.6	Introduction to mass transfer operations	1
5.7	Distillation	1
5.8	Extraction	1
5.9	Leaching	1
5.10	Tutorial	2
	Total	60

Course Designer(s)

Mr.K.Balasubramani-balasubramanik@ksrct.ac.in

Passed in BoS Meeting held on 20/06/2025
Approved in Academic Council Meeting held on 19/07/2025

CHAIRMAN
BOARD OF STUDIES

70 PFT 103	Advanced Drying Technology	Category	L	T	P	Credit
		PC	3	0	0	3

Objectives

- Learn the basics of drying: principles, mechanisms, drying rate, water activity, and sorption isotherms.
- Understand the design and operation of spray dryers and freeze dryers.
- Get familiar with inert particle drying and fluidized bed drying in food processing.
- Explore new drying methods like superheated steam drying, heat pump drying, and high electric field drying.
- Study modern and hybrid drying methods such as microwave, infrared, and refractance window drying.

Pre-requisites

NIL

Course Outcomes

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

CO1	Explain how drying works, drying rate patterns, diffusion, and water activity in food.	Understand
CO2	Describe how spray dryers and freeze dryers work, their parts, and process improvements.	Understand
CO3	Explain pneumatic and fluidized bed drying systems and their uses.	Understand
CO4	Apply knowledge of new drying methods like sorption-based and superheated steam systems in food industries.	Apply
CO5	Compare different advanced drying methods to judge their efficiency and suitability for food applications.	Analyze

Mapping with Programme Outcomes

COS	PO1	P02	PO3	PO4	PO5	PO6
CO1	3	3	3	3	3	3
CO2	3	3	3	3	2	3
CO3	3	2	3	3	3	3
CO4	3	2	3	3	3	3
CO5	3	2	3	2	3	2
3 - Strong; 2 - Medium; 1 – Some						

Assessment Pattern

Bloom's Category	Continuous Assessment Tests (Marks)		End Sem Examination (Marks)
	1	2	
Remember	20	10	10
Understand	20	10	20
Apply	00	20	30
Analyze	0	20	40
Evaluate	0	0	0
Create	0	0	0
Total	**60**	**60**	**100**

Syllabus

K.S. Rangasamy College of Technology–Autonomous R 2025

M. Tech. Food Technology

70 PFT 103– Advanced Drying Technology

Semester	Hours / Week			Total Hours	Credit	Maximum Marks		
	L	T	P		C	CA	ES	Total
I	3	0	0	45	3	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 - Industrial freeze 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 - Infrared drying - Principles - Industrial dryers - Applications - Sonic drying - Slush drying - Refractance window drying.	[9]
Total Hours	**45**

Text Book(s):

1. Mujumdar, A. S. (2007). *Handbook of Industrial Drying* (3rd ed.). CRC Press, Taylor and Francis Group, UK.
2. Chen, X. D., & Mujumdar, A. S. (2008). *Drying Technologies in Food Processing* (1st ed.). Wiley-Blackwell.

Reference(s):

1. Kudra, T., & Mujumdar, A. S. (2009). *Advanced Drying Technologies* (2nd ed.). CRC Press, Taylor and Francis Group, UK.
2. Mujumdar, A. S. (2007). *Handbook of Industrial Drying* (3rd ed.). CRC Press, Taylor and Francis Group, UK.

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 characteristic 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
3.7	Tutorial	2
4	**Novel Drying**	
4.1	Super-heated steam drying	1
4.2	Principle, 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	Infrared dryers	1
5.7	Principles of infrared dryers	1
5.8	Sonic drying	1
5.9	Slush drying	1
5.10	Tutorial	2
	Total	60

Course Designer(s)

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Passed in BoS Meeting held on 20/06/2025
Approved in Academic Council Meeting held on 19/07/2025

CHAIRMAN
BOARD OF STUDIES

70 PFT 104	Food Chemistry and Microbiology	Category	L	T	P	Credit
		PC	3	0	0	3

Objectives

- To Understand water activity, molecular mobility, and their relationship with food quality, stability, and deterioration.
- To Learn the structure, properties, and industrial applications of food carbohydrates, lipids, and proteins.
- To Understand protein chemistry, reactions, and their functional roles in food systems.
- To Study the types of microorganisms in food, their effects, and the spoilage mechanisms of various food products.
- To Explore methods of microbial control and preservation using thermal and non-thermal techniques, and the role of biotechnology in food safety.

Pre-requisites

NIL

Course Outcomes

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

CO1	Explain the significance of water activity, glass transition, and carbohydrate chemistry in food stability.	Understand
CO2	Describe the classification, processing, deterioration, and nutritional roles of food lipids.	Understand
CO3	Interpret the structure, properties, and functional behavior of proteins in different food systems.	Apply
CO4	Identify food spoilage microorganisms and analyze microbial spoilage in various food products.	Understand
CO5	Apply microbial inactivation kinetics and preservation strategies including heat, cold, drying, radiation, and biotechnology for food safety.	Apply

Mapping with Programme Outcomes

COS	PO1	P02	PO3	PO4	PO5	PO6
CO1	2	3	3	2	3	3
CO2	3	3	3	3	3	3
CO3	2	3	2	3	3	3
CO4	3	2	3	2	3	3
CO5	3	3	3	2	3	3
3 - Strong; 2 - Medium; 1 – Some						

Assessment Pattern

Bloom's Category	Continuous Assessment Tests (Marks)		End Sem Examination (Marks)
	1	2	
Remember	30	10	20
Understand	30	20	30
Apply	00	30	50
Analyze	00	00	00
Evaluate	00	00	0
Create	00	00	0
Total	**60**	**60**	**100**

Syllabus

K.S. Rangasamy College of Technology–Autonomous R 2025

M. Tech. Food Technology

70 PFT 104–Food Chemistry and Microbiology

Semester	Hours / Week			Total Hours	Credit	Maximum Marks		
	L	T	P		C	CA	ES	Total
I	3	0	0	45	3	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 maltodextrins and corn syrup - Cyclodextrins - Chemistry and food applications - Polyols and their applications - Carbohydrates as fat substitutes.	[9]
Lipids Classifications - Structure and 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 - interesterification 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 microorganisms normally associated with food - mold, yeast, and bacteria - Physical and chemical factors influencing growth of microorganisms - Biochemical changes caused by microorganisms - 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, seafood, cereal products, bakery products, dairy products, fermented foods, and canned foods.	[9]
Microbiology and Food Preservation Effect of high temperature on microbes - TDT, D value, Z value, 12D concept - Calculation of process time. Effect of low temperature, radiation, and drying on microbes. Chemical preservatives. Advances in preservation of food by various biotechnological processes.	[9]
Total Hours:	**45**
Text Book(s):	

1.	Belitz, H. D., Grosch, W., & Schieberle, P. (2008). *Food Chemistry* (3rd ed.). Springer-Verlag, Berlin.
2.	Vaclavik, V. A., & Christian, E. W. (2005). *Essentials of Food Science* (2nd ed.). Springer.
Reference(s):	
1.	Frazier, W. C., & Westhoff. *Food Microbiology* (4th ed.). Tata McGraw-Hill, New Delhi, 2011.
2.	Vijaya, R. K. *Food Microbiology* (1st ed.). MJPP Publishers, Chennai, 2007.

Passed in BoS Meeting held on 20/06/2025
Approved in Academic Council Meeting held on 19/07/2025

CHAIRMAN
BOARD OF STUDIES

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	Cyclodextrins	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
3.4	Emulsifying effect	2
35	Denaturation of Proteins	2
4	**Microbial growth and Microbial Spoilage**	
4.1	Microorganisms associated with food	1
4.2	Physical and chemical factors	2
4.3	Biochemical changes	1
4.4	Microbial food fermentations	1
4.5	Microbiological standards of different foods	2
4.6	Spoilage of fruits	1
4.7	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
5.5	Effect of low temperature	1
5.6	Radiation and drying on microbes	2
5.7	Chemical preservatives	1
5.8	Advances in preservation of food	1
	Total	45

Course Designer(s)

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Passed in BoS Meeting held on 20/06/2025
Approved in Academic Council Meeting held on 19/07/2025

CHAIRMAN
BOARD OF STUDIES

70 PIS 001	Research Methodology and IPR	Category	L	T	P	Credit
		PC	3	0	0	3

Objectives

- To understand the principles of the research process.
- To develop knowledge in analytical skills for collection of research data.
- To understand the procedure in the preparation of reports.
- To gain a basic understanding of the process involved in intellectual property rights.
- To learn the process of patent filing

Pre-requisites

NIL

Course Outcomes

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

CO1	To understand the research process and design.	Apply
CO2	To gain knowledge about sources and methods of collecting research data.	Remember
CO3	To understand the procedure of data analysis, report preparation, and plagiarism checking.	Understand
CO4	To gain knowledge on trademarks and the role of UNESCO in intellectual property rights (IPR).	Apply
CO5	To learn about the benefits, e-filing, and examinations related to patents.	Apply

Mapping with Programme Outcomes

COS	PO1	P02	PO3	PO4	PO5	PO6
CO1	3	3	-	2	-	-
CO2	2	3	-	-	-	-
CO3	-	3	-	2	-	2
CO4	-	-	2	-	-	3
CO5	-	-	3	-	-	3
3 - Strong; 2 - Medium; 1 – Some						

Assessment Pattern

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

Syllabus

K.S. Rangasamy College of Technology–Autonomous R 2025

M. Tech. Food Technology

70 PIS 001- Research Methodology and IPR

Semester	Hours / Week			Total Hours	Credit	Maximum Marks		
	L	T	P		C	CA	ES	Total
I	3	0	0	45	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 multivariate analysis, hypotheses testing and measures of association. Presenting insights and findings using written reports and oral presentation. Checks for plagiarism, falsification, fabrication, and misrepresentation.	[9]
Intellectual Property Rights Intellectual Property – The concept of IPR, evolution and development of the 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 agreements, trademark, functions of UNESCO in IPR maintenance.	[9]
Patents Patents – Objectives and benefits of patents, concept and features of patents, inventive step, specification, types of patent applications, process of e-filing, examination of patents, grant of patents, revocation, equitable assignments, licenses, 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 J.K., “Business Research Methods,” Tata McGraw Hill Education, 11th Edition (2012).
Reference(s):	
1.	Chawla H.S., “Introduction to Intellectual Property Rights,” CBS PUB & DIST PVT Limited, India, 2019.
2.	Catherine J. Holland, “Intellectual Property: Patents, Trademarks, Copyrights, Trade Secrets,” Entrepreneur Press, 2007.
3.	David Hunt, Long Nguyen, 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 Act of Parliament, “Professional Programme Intellectual Property Rights, Law and Practice,” September 2013.

Passed in BoS Meeting held on 20/06/2025
Approved in Academic Council Meeting held on 19/07/2025

CHAIRMAN
BOARD OF STUDIES

Course Contents 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 multivariate analysis	1
3.2	Hypothesis 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 the concept of IPR, IPR development process	2
4.3	Trade secrets, utility models, IPR & biodiversity	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 agreements, trademark, functions of UNESCO in IPR maintenance	2
5.0	**Patents**	
5.1	Patents – Objectives and benefits of patents, concept, features of patents	2
5.2	Inventive step, specification, types of patent application	2
5.3	Process of e-filing, examination of patents	1
5.4	Grant of patent, revocation	1
5.5	Equitable assignments, licenses, licensing of related patents	2
5.6	Patent agents, registration of patent agents	1
	Total	**45**

Course Designer(s)

Dr.A.Murugesan–murugesana@ksrct.ac.in

Passed in BoS Meeting held on 20/06/2025
Approved in Academic Council Meeting held on 19/07/2025

CHAIRMAN
BOARD OF STUDIES

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

Objectives

- To Provide practical skills in testing and evaluating food products using standard laboratory methods.
- To Develop the ability to analyze chemical composition, functional properties, and nutritional quality of foods.
- To Train students to identify adulterants and contaminants in food samples.
- To Familiarize students with instrumental techniques for food analysis and quality assessment.
- To Enhance students' ability to conduct sensory, rheological, and textural evaluations of food products.

Pre-requisites

NIL

Course Outcomes

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

CO1	Assess freshness, composition, and quality of food products using standard laboratory methods.	Analyze
CO2	Evaluate cooking quality and compliance of foods with regulatory standards.	Apply
CO3	Detect adulterants and contaminants in food and agricultural commodities.	Apply
CO4	Apply drying and preservation methods to evaluate food quality.	Apply
CO5	Perform sensory, rheological, and textural analysis for food product evaluation	Apply

Mapping with Programme Outcomes

COS	PO1	P02	PO3	PO4	PO5	PO6
CO1	3	2	3	3	3	3
CO2	3	3	3	3	3	3
CO3	3	3	3	3	3	2
CO4	3	3	3	3	2	3
CO5	3	3	3	3	3	3
3 - Strong; 2 - Medium; 1 – Some						

Assessment Pattern

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

K.S. Rangasamy College of Technology–Autonomous R 2025								
M. Tech. Food Technology								
70 PFT 1P1- Food Testing and Evaluation Laboratory								
Semester	Hours/Week			Total hours	Credit	Maximum Marks		
	L	T	P		C	CA	ES	Total
I	0	0	4	60	2	60	40	100

Name of Experiments

1. Assessment of freshness and characterization of edible oil
2. Estimation of capsaicin content and pungency level of chilies
3. Analysis of proximate composition of food products
4. Evaluation and comparison of cooking quality characteristics of different types of pasta and compliance with FSSAI standards
5. Estimation of moisture content, reducing sugar, total ash, acid insoluble ash and SO_2 content
6. Estimation of energy value of food products
7. Detection of adulterants present in agriculture commodities and food products
8. Spectroscopic analysis of heavy metals in foods
9. Estimation of minerals present in food samples by flame photometry
10. Determination of drying using tray dryer/Freeze dryer
11. Analysis of turmeric: Moisture content
12. Analysis of tea and coffee: Moisture content
13. Discriminative and descriptive sensory analysis of food products
14. Rheological and Textural Profile analysis of Food products
15. Evaluation of cooking quality of pasta (linked with sensory attributes)

Course Designer(s)

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70 PFT 1P2	Food Chemistry and Microbiology Laboratory	Category	L	T	P	Credit
		PC	0	0	4	2

Objectives

- Provide hands-on training in testing the freshness, nutritional components, and bioactive compounds of food products.
- Develop skills in analyzing food composition such as carbohydrates, proteins, moisture, and polyphenols.
- Familiarize students with degradation studies, shelf-life evaluation, and food stability testing.
- Train students in microbiological examination and cultivation techniques for food samples.
- Introduce methods to study antimicrobial activity and food safety evaluation.

Pre-requisites

NIL

Course Outcomes

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

CO1	Assess freshness and evaluate bioactive compounds in food products.	Analyze
CO2	Estimate major nutrients such as carbohydrates and proteins in food.	Apply
CO3	Determine moisture content and analyze degradation kinetics of food components.	Apply
CO4	Conduct microbiological analysis and evaluate microbial contamination in foods.	Apply
CO5	Evaluate antimicrobial activity and predict shelf-life of food products.	Analyze

Mapping with Programme Outcomes

COS	PO1	P02	PO3	PO4	PO5	PO6
CO1	3	2	3	3	3	3
CO2	3	3	3	3	3	3
CO3	3	3	3	3	3	2
CO4	3	3	3	3	2	3
CO5	3	3	3	3	3	3
3 - Strong; 2 - Medium; 1 – Some						

Assessment Pattern

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

K.S. Rangasamy College of Technology–Autonomous R 2025								
M. Tech. Food Technology								
70 PFT 1P2- Food Chemistry and Microbiology Laboratory								
Semester	Hours/Week			Total hours	Credit	Maximum Marks		
	L	T	P		C	CA	ES	Total
I	0	0	4	60	2	60	40	100

Name of Experiments

1. Assessment of freshness and characterization of oil
2. Determination of total polyphenols and flavonoids in food products
3. Estimation of total carbohydrates in food products
4. Estimation of protein by Lowry's method and Kjeldahl method
5. Determination of moisture content by oven, IR and distillation methods
6. Study on degradation kinetics of pigments
7. Cultivation and enumeration of microorganisms using different plating methods
8. Microbial examination and enumeration of microorganisms in spoiled bakery/fruits and vegetable products
9. Study on antibiotic sensitivity/antimicrobial activity of plant extract
10. Accelerated shelf life study of a food product

Course Designer(s)

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

K.S.RANGASAMY COLLEGE OF TECHNOLOGY, TIRUCHENGODE - 637215
(An Autonomous Institution affiliated to Anna University)
M.E. / M.Tech. Degree Programme
SCHEME OF EXAMINATIONS
(For the candidates admitted in 2025 - 2026)
SECOND SEMESTER

S. No.	Course Code	Name of the Course	Duration of Internal Exam	Weightage of Marks			Minimum Marks for Passing End Semester Exam	
				Continuous Assessment*	End Semester Exam **	Max. Marks	End Semester Exam	Total
THEORY								
1	70 PFT 201	Instrumental Techniques and Methods for Food Analysis	2	40	60	100	45	100
2	70 PFT 202	Cooling Technology for Food Processing	2	40	60	100	45	100
3	70 PFT 203	Food Safety and Quality Control	2	40	60	100	45	100
4	70 PFT E2*	Professional Elective II	2	40	60	100	45	100
5	70 PFT E3*	Professional Elective III	2	40	60	100	45	100
6	70 PFT E4*	Professional Elective IV	2	40	60	100	45	100
7	70 PAC 002	Disaster Management	2	100	-	100	-	100
PRACTICAL								
8	70 PFT 2P1	Food Product Development Laboratory	3	60	40	100	45	100
9	70 PFT 2P3	Technical Seminar	2	100	-	100	-	100

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

**End Semester Examination will be conducted for maximum marks of 100 and subsequently be reduced to 60 marks for theory end semester examination and 40 marks for practical end semester examination.

Passed in BoS Meeting held on 20/06/2025
Approved in Academic Council Meeting held on 19/07/2025

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BOARD OF STUDIES

70 PFT 201	Instrumental Techniques and Methods for Food Analysis	Category	L	T	P	Credit
		PC	3	0	0	3

Objectives

- To introduce the fundamental principles and classification of instrumental techniques used in the analysis of food materials.
- To enable students to understand the theory, instrumentation, and applications of key spectroscopic methods such as UV-Vis, IR, Fluorescence, NMR, and Mass Spectrometry.
- To impart knowledge on thermal analytical techniques, microscopic imaging, and particle characterization methods for evaluating food structure and stability.
- To provide an overview of electrophoretic techniques and recent rapid analytical methods for food quality and safety assessment.
- To develop the ability to select and apply suitable chromatographic and hyphenated techniques for accurate identification and quantification of food components.

Pre-requisites

NIL

Course Outcomes

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

CO1	Understand how light interacts with matter and analyze results using UV-Visible and IR spectroscopy.	Analyze
CO2	Apply X-ray, flame photometry, polarimetry, and thermal analysis for food testing.	Apply
CO3	Understand and carry out analysis using electrophoresis and rapid tools like e-nose, e-tongue, and flow cytometry.	Understand
CO4	Apply AAS, NMR, and Mass Spectrometry to interpret results for food quality and safety.	Apply
CO5	Analyze and compare chromatographic methods (TLC, GC, HPLC) and their use in food analysis.	Analyze

Mapping with Programme Outcomes

COS	PO1	P02	PO3	PO4	PO5	PO6
CO1	2	3	3	3	3	3
CO2	3	2	3	3	3	2
CO3	3	3	2	3	3	3
CO4	3	2	3	3	2	3
CO5	3	3	2	3	3	3
3 - Strong; 2 - Medium; 1 – Some						

Assessment Pattern

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

Syllabus

K.S. Rangasamy College of Technology – Autonomous R 2025

M .Tech. Food Technology

70 PFT 201 - Instrumental Techniques and Methods for Food Analysis

Semester	Hours/Week			Total hours	Credit	Maximum Marks		
	L	T	P		C	CA	ES	Total
II	3	1	0	60	4	40	60	100

Introduction to Instrumental Methods and UV-Visible and IR Spectroscopy Classification of instrumental methods based on physical properties of molecules - The Electromagnetic spectrum - Interaction of photons with matter - Absorbance and transmittance - Beer and Lambert's laws. Deviation from Beer-Lambert's Law. Ultraviolet and Visible spectrometry: Theory - Types of Transitions - Red and blue shifts - Instrumentation - Single beam and double beam spectrophotometers and applications. Fluorimetry: Theory - Factors affecting fluorescence - Instrumentation and applications. Infrared spectrometry: Requirements for IR absorption - Modes of vibrations - Instrumentation - Applications - Fingerprint region.	[9]
X-Ray and Flame Photometer and Thermal Methods and Morphology Analysis Absorption - Non-dispersive Method - Diffraction - Rotating and powder crystal methods – Applications. Flame photometer, Polarimetry and Refractometry - Principle and instrumentation - Saccharimetry - Analysis of sugar. Thermogravimetry - Differential Thermal Analysis - Differential scanning calorimetry - Factors affecting the results - Instrumentation and applications. Morphology Analysis - Scanning Electron Microscopy - Transmission Electron Microscopy and Laser diffraction for particle analysis - Principle and Applications.	[9]
Electrophoresis and Rapid Techniques Basic Principle of paper - Starch gel, agarose, PAGE, SDS-PAGE electrophoresis – Immuno affinity techniques - Radio Assay Electrophoresis and applications. Isoelectric focusing, capillary electrophoresis - Microchip and 2D electrophoresis. Recent Development of Rapid Techniques - E-sensors - e-nose, e-tongue instrumentation - Applications and working principles - Flow cytometry - Epifluorescence microscopy - Principle and Applications.	[9]
Atomic Absorption Spectrophotometer and NMR and Mass Spectroscopy Principle, Advantages of AAS over FES - Instrumentation - Interference and applications. Nuclear Magnetic Resonance: Introduction to NMR - Energy levels of nucleus - Equivalent and non-equivalent protons - Chemical shift - Shielding - TMS - Factors affecting chemical shift - Splitting of signals and instrumentation (proton NMR) - Applications. Theory - Components of mass spectrometer - Mass spectrum. Resolution of mass spectrometer. Types of ions produced - General rules for Interpretation of mass spectra - Fragmentation methods - Applications of mass spectra.	[9]
Chromatography Techniques and Hyphenated Techniques Introduction - Classification of chromatographic methods: Column chromatography, Thin Layer chromatography, Paper chromatography, Gas chromatography and High-performance Liquid Chromatography (HPLC) - Principle, important components and their functions, mode of separation, Instrumentation and applications. ICP-MS, HR-MS, HPTLC, GC-MS, LC-MS and GC-FTIR – Principle, Instrumentation and applications.	[9]
Total Hours:45+15(Tutorial)	60

Text Book(s):

1.	Chatwal, G.R., & Anand, S.K. (2022). *Instrumentation Methods of Chemical Analysis* (5th ed.). Himalaya Publications, Bombay.
2.	Willard, H.H., Merritt, L.L., Dean, J.A., & Settle, F.A. (2004). *Instrumental Methods of Analysis* (7th ed.). CBS Publishers & Distributors, Delhi.

Reference(s):

1.	Yeshasahu, P., & Meloan, C.E. (1996). *Food Analysis* (2nd ed.). CBS Publishers & Distributors, Delhi.

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BOARD OF STUDIES

Course Contents and Lecture Schedule

S. No.	Topic	No. of Hours
1	**Introduction to Instrumental Methods and UV visible and IR Spectroscopy**	
1.1	Classification of Instrumental methods	1
1.2	Electromagnetic spectrum	2
1.3	Beer lamberts Law	1
1.4	Ultraviolet and Visible spectrometry	2
1.5	Fluorimetry	2
1.6	Modes of vibration	2
1.7	Tutorial	2
2	**X-ray and Flame Photometer and Thermal Methods and Morphology Analysis**	
2.1	Absorption Non-destructive Method	1
2.2	Diffraction	1
2.3	Application of Flame Photometer	1
2.4	Polarimeter	2
2.5	Tutorial	2
2.6	Thermogravimetry	1
2.7	Differential Scanning Calorimetry	1
2.8	Transmission Electron Microscope	1
2.9	Tutorial	2
3	**Electrophoresis and Rapid Techniques**	
3.1	Basic Principles of Paper Chromatography	2
3.2	Radio assay Electrophoresis and Applications	1
3.3	Isoelectric Focusing	1
3.4	Tutorial	2
3.5	E-Sensors	2
3.6	Flow Cytometer	2
3.7	Tutorial	2
4	**Atomic Absorption Spectrophotometer, NMR, Mass Spectroscopy**	
4.1	Principle and advantages of AAS over FES	1
4.2	Introduction to NMR	1
4.3	Energy Levels of Nucleus	1
4.4	Chemical Shift	1
4.5	Tutorial	2
4.6	Components of mass spectrometry	2
4.7	Resolution of mass spectrometry	1
4.8	Interpretation of mass spectra	1
4.9	Tutorial	2
5	**Chromatography Techniques and Hyphenated techniques**	
5.1	Classification of Chromatographic Methods	1
5.2	Thin Layer Chromatography	1
5.3	Paper Chromatography	1
5.4	Gas Chromatography	1
5.5	Tutorial	2
5.6	ICP-MS (Inductively Coupled Plasma Mass Spectrometry)	1
5.7	HR-MS (High-Resolution Mass Spectrometry)	1
5.8	GC-MS (Gas Chromatography-Mass Spectrometry)	1
5.9	FTIR (Fourier Transform Infrared Spectroscopy)	1
5.10	Tutorial	2
	Total	60

Course Designers

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Passed in BoS Meeting held on 20/06/2025
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CHAIRMAN
BOARD OF STUDIES

70 PFT 202	Cooling Technology For Food Processing	Category	L	T	P	Credit
		PC	3	1	0	4

Objectives

- Explain the basic role and principles of cooling in food preservation.
- Introduce refrigeration systems, their parts, and methods to check efficiency.
- Teach cryogenic and freezing methods, equipment, and their effect on food quality.
- Explore new and advanced cooling technologies, including renewable energy options.
- Highlight food safety, quality, and sustainability in cooling system design and use.

Pre-requisites

Unit Operations in Food Process Engineering

Course Outcomes

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

CO1	Understand why cooling is important in food processing and classify different cooling systems.	Understand
CO2	Identify parts of refrigeration systems and analyze their performance and common faults.	Analyze
CO3	Apply cryogenic principles and compare freezing methods based on their effect on food quality.	Apply
CO4	Analyze advanced cooling technologies and judge their suitability for various food applications.	Analyze
CO5	Examine sustainability, food safety, and regulations related to cooling in the food industry.	Analyze

Mapping with Programme Outcomes

COS	PO1	P02	PO3	PO4	PO5	PO6
CO1	3	3	3	3	3	3
CO2	2	2	3	3	3	3
CO3	3	3	3	3	2	3
CO4	3	3	3	3	2	3
CO5	3	3	3	3	3	2
3 - Strong; 2 - Medium; 1 – Some						

Assessment Pattern

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

Syllabus

K.S. Rangasamy College of Technology – Autonomous R 2025

M. Tech. Food Technology

70 PFT 202 - Cooling Technology For Food Processing

Semester	Hours/Week			Total hours	Credit	Maximum Marks		
	L	T	P		C	CA	ES	Total
II	3	1	0	60	4	40	60	100

Fundamentals of Cooling Technology Introduction to cooling in food processing - Importance of temperature control in food preservation - Principles of refrigeration and cooling - Classification of cooling systems - Refrigerants and their properties - Heat transfer mechanisms in cooling - Cold chain logistics and management - Psychrometry in cooling applications - Cooling load estimation - Energy efficiency in cooling systems	[9]
Refrigeration Systems and Components Vapor compression refrigeration system - Vapor absorption refrigeration system - Components of refrigeration systems - Compressors: types and working principles - Condensers and evaporators: design and function - Expansion devices and control mechanisms - Refrigeration system performance evaluation - Refrigeration system troubleshooting - Alternative refrigeration technologies	[9]
Cryogenic Cooling and Freezing Techniques Cryogenic principles and applications in food processing - Cryogenic gases and their properties - Freezing mechanisms in food preservation - Types of freezing: blast freezing, plate freezing, immersion freezing - Equipment for cryogenic freezing - Influence of freezing rate on food quality - Freezer design and optimization - Thawing methods and quality considerations - Advances in cryogenic food processing - Safety considerations in cryogenic systems	[9]
Advanced Cooling Technologies in Food Industry Supercooling and its applications - Ice slurry technology in food processing - Hydro-cooling and vacuum cooling - High-pressure assisted cooling - Ohmic and electromagnetic cooling - Phase change materials (PCM) for thermal energy storage - Intelligent and adaptive cooling systems - Application of nanotechnology in cooling - Integration of renewable energy in cooling - Waste heat recovery and utilization in cooling processes	[9]
Food Safety, Quality, and Sustainability in Cooling Effects of cooling on food quality and texture - Microbial control through cooling - Cooling-induced biochemical changes in food - Packaging considerations in cooling applications - HACCP and food safety regulations for cooling systems - Energy-efficient cooling practices - Carbon footprint reduction in cooling processes - Sustainable cooling technologies - Life cycle assessment of cooling systems - Future trends in food cooling technologies	[9]
Total Hours:45+15(Tutorial)	60

Text Book(s):

1.	Singh, R. P., & Heldman, D. R. (2013). *Introduction to Food Engineering.* Academic Press
2.	Fellows, P. J. (2009). *Food Processing Technology: Principles and Practice.* CRC Press.
3.	Rahman, M. S. (2007). *Handbook of Food Preservation.* CRC Press.

Reference(s):

1.	Sun, D. W. (2006). *Handbook of Frozen Food Processing and Packaging.* CRC Press
2.	Grandison, A. S., & Brennan, J. G. (2011). *Food Processing Handbook.* Wiley-Blackwell
3.	Heldman, D. R., & Moraru, C. I. (2010). *Encyclopedia of Agricultural, Food, and Biological Engineering.* CRC Press.

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Course Contents and Lecture Schedule

S. No.	Topic	No. of Hours
1	**Introduction to Refrigeration**	
1.1	Introduction to cooling in food processing	1
1.2	Importance of temperature control in food preservation	1
1.3	Principles of refrigeration and cooling	1
1.4	Classification of cooling systems	1
1.5	Refrigerants and their properties	1
1.6	Heat transfer mechanisms in cooling	1
1.7	Cold chain logistics and management	1
1.8	Psychrometry in cooling applications	1
1.9	Cooling load estimation , Energy efficiency in cooling systems	1
2	**Refrigeration Systems and Components**	
2.1	Vapor compression refrigeration system	1
2.2	Vapor absorption refrigeration system	1
2.3	Components of refrigeration systems	1
2.4	Compressors: types and working principles	1
2.5	Condensers and evaporators: design and function	1
2.6	Expansion devices and control mechanisms	1
2.7	Refrigeration system performance evaluation	1
2.8	Refrigeration system troubleshooting	1
2.9	Alternative refrigeration technologies	1
3	**Cryogenic Cooling and Freezing Techniques**	
3.1	Cryogenic principles and applications in food processing	1
3.2	Cryogenic gases and their properties	1
3.3	Freezing mechanisms in food preservation	1
3.4	Types of freezing: blast freezing, plate freezing, immersion freezing	1
3.5	Equipment for cryogenic freezing, Influence of freezing rate on food quality	1
3.6	Freezer design and optimization	1
3.7	Thawing methods and quality considerations	1
3.8	Advances in cryogenic food processing	1
3.9	Safety considerations in cryogenic systems	1
4	**Advanced Cooling Technologies in Food Industry**	
4.1	Supercooling and its applications	1
4.2	Ice slurry technology in food processing -	1
4.3	Hydro-cooling and vacuum cooling, High-pressure assisted cooling	1
4.4	Ohmic and electromagnetic cooling -	1
4.5	Phase change materials (PCM) for thermal energy storage	1
4.6	Intelligent and adaptive cooling systems	1
4.7	Application of nanotechnology in cooling	1
4.8	Integration of renewable energy in cooling	1
4.9	Waste heat recovery and utilization in cooling processes	1
5	**Food Safety, Quality, and Sustainability in Cooling**	
5.1	Effects of cooling on food quality and texture	1
5.2	Microbial control through cooling	1
5.3	Cooling-induced biochemical changes in food	1
5.4	Packaging considerations in cooling applications	1
5.5	HACCP and food safety regulations for cooling systems	1
5.6	Energy-efficient cooling practices	1
5.7	Carbon footprint reduction in cooling processes	1
5.8	Sustainable cooling technologies	1
5.9	Life cycle assessment of cooling systems - Future trends in food cooling technologies	1
	Total	45

Course Designers

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Passed in BoS Meeting held on 20/06/2025
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BOARD OF STUDIES

70 PFT 203	Food Safety and Quality Control	Category	L	P	T	Credit
		PC	3	0	0	3

Objectives

- Explain the importance of food safety and quality in today's food systems.
- Train students to identify and manage food hazards, contaminants, allergens, and toxins.
- Teach microbial inactivation methods and predictive microbial modeling.
- Provide knowledge of food safety agencies, regulations, and their roles at national and international levels.
- Equip students to use food safety systems like HACCP, GMP, ISO 22000, and perform audits.

Pre-requisites

NIL

Course Outcomes

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

CO1	Understand the principles, strategies, and consumer needs for food safety and quality.	Understand
CO2	Identify food hazards, contaminants, and toxins, and suggest suitable risk management methods.	Apply
CO3	Evaluate microbial inactivation methods and use predictive models for food safety.	Analyze
CO4	Analyze the structure, roles, and standards of national and international food safety agencies.	Analyze
CO5	Develop and assess food safety management systems like HACCP, GMP, and ISO 22000 in food industries.	Analyze

Mapping with Programme Outcomes

COS	PO1	P02	PO3	PO4	PO5	PO6
CO1	3	3	2	3	3	3
CO2	3	3	3	3	3	3
CO3	3	2	3	2	2	2
CO4	3	3	3	3	3	3
CO5	3	3	3	2	3	3
3 - Strong; 2 - Medium; 1 – Some						

Assessment Pattern

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

Syllabus

K.S. Rangasamy College of Technology – Autonomous R 2025

M. Tech. Food Technology

70 PFT 203 - Food Safety and Quality Control

Semester	Hours/Week			Total hours	Credit	Maximum Marks		
	L	T	P		C	CA	ES	Total
II	3	0	0	45	3	40	60	100

Contemporary Food Safety Strategies Principles and need for quality control and safety, strategy and criteria for food safety. Consumer lifestyle and demand, issues in food safety, food traceability and recall, case against food biotechnology and irradiation. Case studies in food safety.	**[9]**
Food Hazards and Contaminants Characterization of food hazards, foodborne diseases and their control, food contaminants and their control. Naturally available toxins in foods, cross-contamination: toxicants resulting from food processing. Management of food allergens. Risk analysis of food hazards.	**[9]**
Microbial Growth and Modelling Inactivation of microbial growth - thermal and non-thermal methods, process dependent microbial modelling, integration of process and microbial growth modelling. Applications of predictive microbial modelling. Advanced methods for rapid detection of food spoilage.	**[9]**
Quality Control and Food Safety Agencies National Regulatory Agencies and International Agencies: Quality control importance, measures and procedures. BIS, AGMARK, FSSAI. Organizational structure and functions of United States Food and Drug Administration (USFDA), Global Food Safety Initiative (GFSI), International Consultative Group on Food Irradiation (ICGFI), European Food Safety Authority (EFSA), British Retail Consortium (BRC) global standards, Codex Alimentarius, Sanitary and Phyto-Sanitary measures (SPS), Plant Quarantine Act.	**[9]**
Food Quality Management System 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, Good Manufacturing Practices (GMP), Good Hygienic Practices (GHP), Good Laboratory Practices (GLP), ISO 22000, FSSC 22000, Food Safety Audit.	**[9]**
Total Hours: 45	**45**

Textbook(s):

1. DaWenSun.,“Handbook of Food Safety Engineering”, 1stEdition, JohnWiley & Sons, NewJersey, 2011.
2. Ronald H.Schmidt and Gary E.Rodrick., “Food Safety Hand book”, 1stEdition, John Wiley & Sons, New Jersey,2003.

Reference(s):

1. Yasmine Motarjemi and Huub Lelieveld. “Food Safety Management – A Practical Guide for the Food Industry.” 1st edition, Elsevier, New York, 2013.
2. S.P. Singh. “Food Safety, Quality Assurance and Global Trade: Concerns and Strategies.” 1st edition, International Book Distribution Company, India, 2009.

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Course Contents and Lecture Schedule

S. No.	Topic	No. of Hours
1	**Contemporary Food Safety Strategies**	
1.1	Principles and need for quality	1
1.2	Strategy and food safety	1
1.3	Consumer Lifestyle	2
1.4	Food Traceability	1
1.5	Case against food biotechnology	1
1.6	Case studies in food safety	1
2	**Food Hazards and Contaminants**	
2.1	Characterization of food hazards	1
2.2	Foodborne diseases	2
2.3	Food contaminants	1
2.4	Naturally available toxins in food	2
2.6	Cross-contamination	1
2.7	Management of food allergens	1
2.8	Risk analysis and food hazards	1
3	**Microbial Growth and Modelling**	
3.1	Inactivation of microbial growth	2
3.2	Thermal and non-thermal methods	1
3.3	Microbial growth modelling	2
3.5	Applications of predictive microbial modelling	2
3.6	Rapid detection of food spoilage	2
4	**Quality Control and Food Safety Agencies**	
4.1	National Regulatory Agencies	1
4.2	Quality control importance	2
4.3	BIS, AGMARK, FSSAI	1
4.4	USFDA	1
4.6	International Consultative Group on Food Irradiation	2
4.7	European Food Safety Authority	1
4.8	Plant Quarantine Act	1
5	**Food Quality Management Systems**	
5.1	Duties and responsibilities of food safety regulators	2
5.2	Food safety standard management	1
5.3	HACCP	2
5.4	Good Manufacturing Practices	1
5.6	Good Hygienic Practices	1
5.7	Good Laboratory Practices	2
5.8	ISO 22000	1
5.9	FSSC 22000	1
	Total	45

Course Designers

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70 PFT 2P1	Food Product Development	Category	L	T	P	Credits

Passed in BoS Meeting held on 20/06/2025
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BOARD OF STUDIES

	Laboratory	**PC**	**0**	**0**	**6**	**3**

Objectives

- To develop skills in designing innovative food products with functional and nutritional attributes.
- To impart knowledge on incorporating novel ingredients, additives, and processing techniques in product development.
- To provide hands-on training in evaluating sensory, physicochemical, and microbial quality parameters.
- To familiarize students with formulation challenges and problem-solving in food product development.
- To enhance students' ability to integrate food safety, consumer acceptance, and market feasibility into product design

Pre-requisites

NIL

Course Outcomes

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

CO1	Apply principles of food formulation to develop innovative and value-added food products.	Apply
CO2	Analyze the nutritional, functional, and phytochemical attributes of developed products.	Analyze
CO3	Evaluate sensory, textural, and physicochemical properties of newly developed products.	Analyze
CO4	Design and optimize product formulations using alternative ingredients and health-focused approaches.	Analyze
CO5	Demonstrate practical skills in product development, documentation, and presentation aligned with industry needs.	Apply

Mapping with Programme Outcomes

COS	PO1	P02	PO3	PO4	PO5	PO6
CO1	3	3	3	3	3	3
CO2	3	3	2	3	3	3
CO3	3	3	3	3	3	3
CO4	3	3	3	3	2	3
CO5	3	3	3	3	3	3
3 - Strong; 2 - Medium; 1 – Some						

Assessment Pattern

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

Syllabus

K.S. Rangasamy College of Technology – Autonomous R 2025

M.Tech. Food Technology

70 PFT 2P1 – Food Product Development Laboratory

Semester	Hours/Week			Total hours	Credit	Maximum Marks		
	L	T	P		C	CA	ES	Total
II	0	0	6	90	3	60	40	100

List of Experiments:

1. Development of protein-enriched biscuits/cookies and evaluation.
2. Development of nutritional/energy bar and product analysis.
3. Development of pasta using whole wheat flour and estimation of sensory attributes.
4. Development of phytochemicals-rich beverage and estimation of phytochemical content.
5. Development of dry health food premix and evaluation of quality and sensory attributes.
6. Development of sugar-free confectionery product and evaluation.
7. Development of marshmallow and assessment of texture and quality.
8. Development of gelatos and jellies and evaluation of sensory and quality parameters.
9. Development of low fat spread and sensory evaluation.
10. Development of product using dairy replacer specialty fats and quality evaluation.
11. Development of eggless cake and quality evaluation.
12. Development of millet-based ice cream wafer and evaluation of its quality.
13. Development of symbiotic dairy product and its sensory and microbiological analysis.
14. Development of deep fat fried snack product and analysis of quality parameters.
15. Virtual Lab: Canning of foods – Demo.

Course Designer

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Passed in BoS Meeting held on 20/06/2025
Approved in Academic Council Meeting held on 19/07/2025

CHAIRMAN
BOARD OF STUDIES

70 PFT 2P2	Instrumental Food Analysis Laboratory	Category	L	T	P	Credits
		PC	0	0	4	2

Objectives

- To train students in the use of modern instruments for food quality analysis.
- To develop competency in physicochemical, nutritional, and sensory evaluation using standard methods.
- To provide knowledge of food adulteration detection and compliance with regulatory standards.
- To expose students to rheological, textural, and drying analysis of food materials.
- To strengthen skills in data interpretation, reporting, and problem-solving in food analysis

Pre-requisites

NIL

Course Outcomes

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

CO1	Apply principles of instrumental methods for qualitative and quantitative food analysis.	Apply
CO2	Analyze physicochemical and nutritional properties of food products using standard instruments.	Analyze
CO3	Evaluate food adulteration and assess compliance with national/international food standards	Analyze
CO4	Assess rheological, drying, and sensory properties of food products using instrumental methods	Analyze
CO5	Demonstrate proficiency in handling instruments, interpreting data, and preparing scientific reports.	Apply

Mapping with Programme Outcomes

COS	PO1	P02	PO3	PO4	PO5	PO6
CO1	3	3	3	3	3	3
CO2	3	3	2	3	3	3
CO3	3	3	3	3	3	3
CO4	3	3	3	3	2	3
CO5	3	3	3	3	3	3
3 - Strong; 2 - Medium; 1 – Some						

Assessment Pattern

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

Syllabus

K.S. Rangasamy College of Technology – Autonomous R 2025

M.Tech. Food Technology

70 PFT 2P2 – Instrumental Food Analysis Laboratory

Semester	Hours/Week			Total hours	Credit	Maximum Marks		
	L	T	P		C	CA	ES	Total
II	0	0	6	90	3	60	40	100

List of Experiments:

1. Analysis of turmeric – UV spectroscopy
2. Virtual Laboratory: Flame photometer
3. Color analysis of food products using color spectrophotometer
4. Estimation of viscosity of liquid foods using viscometer
5. Estimation of energy value of food products using bomb calorimeter
6. Moisture content determination using hot air oven/drying method
7. Evaluation and comparison of cooking quality characteristics of pasta with FSSAI standards
8. Estimation of ash content and Fibre Content in different food sample
9. Determination of quality characteristics in edible oils with FSSAI standards
10. Discriminative and descriptive sensory analysis with statistical correlation
11. Drying characteristics of food using tray dryer/flash dryer
12. Determination of melting point and Heating point of fats/oils *(extra)*
13. Shelf-life study of a selected food product under controlled storage
14. Determination of protein content in different food sample
15. Determination of pH and titratable acidity in fruit juice

Course Designer

Mr. S. Nithishkumar – nithishkumar@ksrct.ac.in

Passed in BoS Meeting held on 20/06/2025
Approved in Academic Council Meeting held on 19/07/2025

CHAIRMAN
BOARD OF STUDIES

70 PFT 2P3	Technical Seminar	Category	L	T	P	Credit
		PC	0	0	2	0

Objectives

- Develop their scientific and technical reading and writing skills that they need to understand and construct research articles.
- A term paper requires a student to obtain information from a variety of sources (i.e., journals, dictionaries, reference books) and then place it in logically developed ideas.
- To identify the recent topics in the research area and formulate the problem.
- To analyze the mathematical model for the identified problem.
- To design and simulate/develop prototype models.

Pre-requisites

NIL

Course Outcomes

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

CO1	Survey the relevant bibliography such as national/international referred journals for the preferred areas of research	Analyze
CO2	Develop scientific, technical reading and writing skills for the technical report preparation to apply it in their topics of research	Apply
CO3	Implement and Analyze the various complex problems in different practical applications	Apply
CO4	Analyze the mathematical model for the identified problem.	Analyze
CO5	Design and simulate/develop prototype models.	Apply

Mapping with Programme Outcomes

COS	PO1	P02	PO3	PO4	PO5	PO6
CO1	3	3	3	3	3	3
CO2	3	3	3	3	3	3
CO3	3	3	3	3	3	3
CO4	3	3	3	3	3	3
CO5	3	3	3	3	3	3
3 - Strong; 2 - Medium; 1 – Some						

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Activity	Instructions	Submission week	Evaluation
Selection of area of interest and Topic Stating an Objective	An area of interest, topic has to be selected and objective to be framed	2nd week	3 % Based on clarity of thought, current relevance and clarity in writing
Collecting Information	1.List 1 Special Interest Groups or professional society	3rd week	3% (the selected
about chosen area & topic	List 2j ournals List 3 conferences, symposia or workshops List1thesistitle List 5 web presences (mailing lists, forums News sites) List 6 authors who publish regularly in your area Attach a call for papers(CFP)from your area. Conference/Journal/Symposium In the chosen area.		Information must be area specific and of international and national standard)
Collection of Journal papers in the topic in the context of the objective – collect 20 &then filter	Provide a complete list of references you will be using- Based on the objective -Search various digital libraries and Google Scholar When picking papers to read–tryt o: Pick papers that are related to each other in some ways and/or that are in the same field so that a meaningful survey can be written Favour papers from well-known journals and conferences, Favour-first or foundational papers in the field (as indicated in other people's survey paper),Favour more recent papers, Pick a recent survey of the field so you can quickly gain an overview, Find relationships with respect to each other and to your topic area(classification scheme/categorization) Mark in the hard copy of papers whether complete work or section/sections of the paper are Being considered	4th week	6% (the list of standard papers and reason for selection)

Reading and notes for first 5papers	Reading Paper Process For each paper form at able answering the following questions: What is the main topic of the article? What was/were the main issue(s)the authors aid they want to discuss? Why did the author claim it was important? How does the work build on other‘s work, in the author‘s opinion? What simplifying assumptions does the author claim to be making? What did the author do? How did the author claim they were going to evaluate their work and compare it to others? What did the authors were the limitations of the research? What did the authors were the important directions for future research?	5th week	8% (the table given should indicate your understanding of the paper and the evaluation is based on your conclusions about each paper)
	Concludewithlimitations/issuesnotaddressedbythepaper(fromtheperspectiveofyoursurvey)		
Reading and notes for next5papers	Repeat Reading Paper Process	6th week	8%(the table given should indicate your understanding of the paper and the evaluation is based on your conclusions About each paper)
Reading and notes for final5 papers	Repeat Reading Paper Process	7^{th}week	**8%**(the table given should indicate your understanding of the paper and the evaluation is based on Your conclusions about each paper)
Draftoutline1andLinkingpapers	Prepare a draft Outline, your survey goals, along with a classification/categorization diagram	8^{th}week	**8%**(this component will be evaluated based on the linking and classification among The papers)
Abstract	Prepare a draft abstract and give a presentation	9^{th}week	**6%** (Clarity, purpose and conclusion)**6%** Presentation & Viva Voce
Introduction Background	Write an introduction and Background sections	10^{th}week	**5%**(clarity)

Sections of the paper	Write the sections of your paper based on the classification/categorization diagram in keeping with the goals of your survey	11^{th}week	**10%**(this component will be evaluated based on the linking and classification among the papers)
Conclusions	Write your conclusions and future work	12^{th}week	**5%**(conclusions–clarity and your ideas)
Final Draft	Complete the final draft of your paper	13^{th}week	**10%** (formatting, English, Clarity and linking) **4%**Plagiarism Check Report
Seminar	Abrief15slidesonyourpaper	14^{th}&15^{th} week	**10%**(based on presentation and Viva-voce)

K.S. Rangasamy College of Technology–Autonomous R 2025								
70 PFT 2P3–Technical Seminar								
M. Tech. Food Technology								
Semester	Hours/Week			Total hours	Credit	Maximum Marks		
	L	T	P		C	CA	ES	Total
II	0	0	2	30	0	60	40	100

The work involves the following steps:

- Selecting a subject, narrowing the subject into a topic.
- Stating an objective.
- Collecting the relevant bibliography(at least 15 journal papers)
- Preparing a working outline.
- Studying the papers and understanding the authors contributions and critically analyzing each paper.
- Preparing a working outline.
- Linking the papers and preparing a draft of the paper.
- Preparing conclusions based on the reading of all the papers.
- Writing the Final Paper and giving final Presentation
- Please keep a file where the work carried out by you is maintained. Activities to be carried out

Course Designer
Dr. K. Prabha – prabhak@ksrct.ac.in

Passed in BoS Meeting held on 20/06/2025
Approved in Academic Council Meeting held on 19/07/2025

CHAIRMAN
BOARD OF STUDIES

K.S.RANGASAMY COLLEGE OF TECHNOLOGY, TIRUCHENGODE - 637215
(An Autonomous Institution affiliated to Anna University)
M.E. / M.Tech. Degree Programme
SCHEME OF EXAMINATIOS
(For the candidates admitted in 2025 - 2026)

THIRD SEMESTER

S. No.	Course Code	Name of the Course	Duration of Internal Exam	Weightage of Marks			Minimum Marks for Pass in End Semester Exam	
				Continuous Assessment*	End Semester Exam **	Max. Marks	End Semester Exam	Total
THEORY								
1	70 PFT 301	Plantation Crops and Spices Technology	2	40	60	100	45	100
4	70 PFT E5*	Professional Elective V	2	40	60	100	45	100
5	70 PFT E6*	Professional Elective VI	2	40	60	100	45	100
PRACTICAL								
6	70 PFT 3P1	Project Work Phase I	3	60	40	100	100	100

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

**End Semester Examination will be conducted for maximum marks of 100 and subsequently be reduced to 60 marks for theory end semester examination and 40 marks for practical end semester examination.

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70 PFT 301	Plantation Crops and Spices Technology	Category	L	T	P	Credit
		PE	3	0	0	3

Objectives

- Provide fundamental knowledge on plantation crops and their recent technological advancements in processing.
- Explore the functional, nutritional, and commercial significance of spices and condiments in food systems.
- Impart understanding of advanced extraction and processing techniques for spice oils and oleoresins.
- Familiarize with various herbs used in foods, their post-harvest handling, functional properties, and industrial relevance.
- Introduce the chemistry of flavour compounds and recent developments in natural flavour production and stabilization.

Pre-requisites

Nil

Course Outcomes

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

CO1	Describe the classification and processing of plantation crops and assess innovations in tea, coffee, cocoa, and coconut.	Analyze
CO2	Explain the functional roles, nutritional value, and various commercial forms of spices and condiments	Apply
CO3	Analyze the principles and evaluate the effectiveness of advanced spice processing methods like SCFE and cryogenic grinding	Evaluate
CO4	Discuss the processing, quality issues, and health benefits of various herbs used in food applications	Apply
CO5	Apply knowledge of flavouring materials and assess recent trends in flavour stabilization and retention techniques	Evaluate

Mapping with Programme Outcomes

COS	PO1	P02	PO3	PO4	PO5	PO6
CO1	2	3	3	2	3	3
CO2	3	3	3	3	3	3
CO3	3	2	3	3	3	2
CO4	3	2	3	2	3	3
CO5	3	3	3	3	3	3
3 - Strong; 2 - Medium; 1 – Some						

Assessment Pattern

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

Syllabus

K.S.Rangasamy College of Technology–Autonomous R 2025

M.Tech. Food Technology

70 PFT 301 – Plantation Crops and Spices Technology

Semester	Hours/Week			Total hours	Credit	Maximum Marks		
	L	T	P		C	CA	ES	Total
III	3	0	0	45	3	40	60	100

Plantation Crops Types of Plantation crops. Recent trends and innovation in cocoa, coconut, cashew and tuber crops processing. Tea: Manufacturing of diversified tea products — instant tea, functional and herbal tea products. Coffee: Chemistry, Recent Trends in coffee technology, Quality grading of coffee, Chicory chemistry	**[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 and seasonings formulations. Emerging spice blends and seasonings –Popular global spice blends. Growing demand for authenticity.	**[9]**
Advances in spice processing Spice oil - advances in SCFE, novel solvent free extraction methods using microwave, ultrasound. Cryogenic grinding of spices. Extraction of oleoresins, concepts and technology, desolventization methods, regulatory and statutory requirements for oleoresin processing. Spice encapsulation. Recent spice research- antioxidants, antimicrobial and health benefits of spice compound Intact Heater(DCH),Plate Heater(PHE),advantages and disadvantages. Evaporator-types-Performance measures.	**[9]**
Herbal spices 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, health benefits and innovations of herbs in food Industry.	**[9]**
Flavouring Materials Recent advances and trends Natural flavours, sources of natural flavouring materials — herbs and spices, Genetic engineering in flavour, Flavours generated by enzymes and biological systems, Key aroma and taste components, Flavour stability during food processing and storage, Retention and release of flavours.	**[9]**
Total Hours: 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, Scientific Publishers,India,2013.

Reference(s):

1. AmitBaranSharangi,SuchandDatta.,"ValueAdditionofHorticulturalCrops:RecentTrends and Future Directions",1stedition,Springer,India,2015.

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Approved in Academic Council Meeting held on 19/07/2025

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Course Contents and Lecture Schedule

S. No.	Topic	No. of Hours
1	**Plantation Crops**	
1.1	Types of Plantation Crops	1
1.2	Recent Trends and Innovation in Cocoa	1
1.3	Manufacturing of Diversified Tea Products	2
1.4	Quality Grading of Coffee	1
1.5	Chicory Chemistry	2
2	**Spices & Condiments**	
2.1	Classification of Spices	1
2.2	Different Forms of Spices	2
2.3	Commercial Spice Blends	1
2.4	Seasoning Formulation	2
2.6	Emerging Spice Blends	1
2.7	Popular Global Spice Blends	1
2.8	Growing Demand for Authenticity	1
3	**Advances in Spice Processing**	
3.1	Spice Oil and Advances in SCFE	2
3.2	Novel Solvent-Free Extraction	1
3.3	Extraction of Oleoresins	2
3.5	Spice Encapsulation	2
3.6	Evaporator and Its Types	2
4	**Herbal Spices**	
4.1	Description of Various Types of Spices	1
4.2	Basil	2
4.3	Cilantro	1
4.4	Coriander	1
4.6	Oregano	2
4.7	Processing and Post-Harvest Handling	1
4.8	Innovations in Food Industry	1
5	**Flavouring Materials Recent Advances and Trends**	
5.1	Natural Flavours	2
5.2	Sources of Natural Flavouring Agents	1
5.3	Genetic Engineering in Flavours	2
5.4	Enzymes and Biological Systems	1
5.6	Aroma and Taste Components	1
5.7	Flavour Stability	2
5.8	Storage	1
5.9	Retention and Release of Flavours	1
	Total	45

Course Designers

Dr. K. Prabha – prabhak@ksrct.ac.in

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70 PFT 3P1	Project Work-Phase I	Category	L	T	P	Credit
		PC	0	0	12	6

Objective

- To impart practical knowledge to the students.
- To make them carry out the technical procedures in their project work.
- To provide an exposure to the students to refer, read, and review the research articles, journals, and conference proceedings relevant to their project work.
- To independently carry out research/investigation.
- To conduct development work to solve practical problems in the field of Food Technology.

Prerequisite

NIL

Course Outcomes

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

CO1	Survey the relevant literature such as books, national/international refereed journals, and contact resource persons for the selected topic of research.	Analyze
CO2	Use different experimental techniques, software, and computational / analytical tools.	Apply
CO3	Conduct tests on existing setups/equipment.	Apply
CO4	Work in a research environment or in an industrial environment, drawing logical conclusions from the results after analyzing them.	Apply
CO5	Survey the relevant literature such as books, national/international refereed journals, and contact resource persons for the selected topic of research.	Apply

Mapping with Programme Outcomes

COS	PO1	P02	PO3	PO4	PO5	PO6
CO1	3	3	3	2	3	3
CO2	3	3	3	2	2	3
CO3	3	3	3	2	2	3
CO4	3	3	3	2	2	3
CO5	3	3	3	2	2	3
3 - Strong; 2 - Medium; 1 – Some						

Assessment Pattern

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

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Syllabus

K.S. Rangasamy College of Technology–Autonomous R 2025								
M. Tech. Food Technology								
70 PFT 3P1– Project Work-Phase I								
Semester	Hours/Week			Total hours	Credit	Maximum Marks		
	L	T	P		C	CA	ES	Total
III	0	0	12	180	6	100	-	100

- The project work should preferably be a problem with research potential.
- The project should involve scientific research, design, generation/collection, and analysis of data, determining a solution, and must preferably bring out the individual contribution.
- The seminar should be based on the area in which the candidate has undertaken the dissertation work as per the common instructions for all branches of M.E/M. Tech.
- Three reviews will be conducted by a committee of subject experts.
- Each review has to be evaluated for 100 marks.
- Internal evaluation has to be done for 100 marks.
- The final examination shall consist of the preparation of a report consisting of a detailed problem statement and a literature review.
- The preliminary results (if available) of the problem may also be discussed in the report.
- The work has to be presented in front of the examiners panel set by the Head and PG Project Coordinator.

Total Hours: 180

Course Designer

Dr. A. S. Ruby Celsia – rubycelsia@ksrct.ac.in

Passed in BoS Meeting held on 20/06/2025
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M.E. / M.Tech. Degree Programme
SCHEME OF EXAMINATIOS
(For the candidates admitted in 2025 - 2026)

FOURTH SEMESTER

S. No.	Course Code	Name of the Course	Duration of Internal Exam	Weightage of Marks			Minimum Marks for Pass in End Semester Exam	
				Continuous Assessment *	End Semester Exam **	Max. Marks	End Semester Exam	Total
PRACTICAL								
1	70 PFT 4P1	Project Work-Phase II	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 40 marks for Project end semester examination.

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70 PFT 4P1	Project Work-Phase II	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 their innovative ideas to forefront the risk issues and to retrieve the hazards by adopting suitable assessment methodologies and staring it to global

Prerequisite

NIL

Course Outcomes

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

CO1	Develop attitude of life-long learning and will develop interpersonal Skills to deal with people working in diversified field will.	Apply
CO2	Write technical reports and research papers to publish at national and international level	Apply
CO3	Develop strong communication skills to defend their work in front Of technically qualified audience.	Apply
CO4	Work in a research environment or in an industrial environment, drawing logical conclusions from the results after analyzing them.	Apply
CO5	Survey the relevant literature such as books, national/international refereed journals, and contact resource persons for the selected topic of research.	Apply

Mapping with Programme Outcomes

COS	PO1	P02	PO3	PO4	PO5	PO6
CO1	3	3	3	2	3	3
CO2	3	3	3	2	2	3
CO3	3	3	3	2	2	3
CO4	3	3	3	2	2	3
CO5	3	3	3	2	2	3
3 - Strong; 2 - Medium; 1 – Some						

Assessment Pattern

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

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K.S. Rangasamy College of Technology–Autonomous R 2025								
M. Tech. Food Technology								
60PFT4P1– Project Work Phase II								
Semester	Hours/ Week			Total hours	Credit	Maximum Marks		
	L	T	P		C	CA	ES	Total
IV	0	0	24	360	12	60	40	100
It is a continuation of Project work started in semester III. Students have to submit the report in prescribed format and also present a seminar. The dissertation should be presented in standard format as provided by the department. The candidate has to prepare a detailed project report consisting of introduction of the problem, problem statement, literature review, objectives of the work, methodology (experimental set up or numerical details as the case may be) of solution and results and discussion. The report must bring out the conclusions of the work and future scope for the study. The work has to be presented in front of the examiners panel consisting of an approved external examiner, an internal examiner and a guide, co-guideetc.as decided by the Head and PG coordinator. The candidate has to be in regular contact with his guide.								
Total Hours: 60								

Course Designer

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

PROFESSIONAL ELECTIVE I

Passed in BoS Meeting held on 20/06/2025
Approved in Academic Council Meeting held on 19/07/2025

CHAIRMAN
BOARD OF STUDIES

70 PFT E11	Advanced Fruit and Vegetable Processing Technology	Category	L	P	T	Credit
		PE	3	0	0	3

Objectives

- Provide knowledge on post-harvest handling and storage technologies for fruits and vegetables.
- Introduce genetic modification approaches to extend shelf life and control ripening.
- Familiarize students with edible coatings and vacuum technologies for enhancing produce quality.
- Explain the principles and challenges in minimal processing and fresh-cut product management.
- Introduce students to modern techniques like ozonation and enzyme maceration in fruit and vegetable processing.

Pre-requisites

NIL

Course Outcomes

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

CO1	Explain post-harvest physiological processes and analyze modern storage methods like MAP, CA, and hypobaric systems.	Analyze
CO2	Assess the role of genetic modification in controlling fruit ripening and improving shelf life of vegetables.	Evaluate
CO3	Describe the composition, properties, and effectiveness of different edible coatings and apply them in preserving quality.	Apply
CO4	Identify the effects of minimal processing on quality and safety of fresh-cut produce and develop appropriate strategies for loss minimization.	Apply
CO5	Evaluate the principles and applications of ozone and enzyme technologies in fruit and juice processing.	Evaluate

Mapping with Programme Outcomes

COS	PO1	P02	PO3	PO4	PO5	PO6
CO1	3	3	-	2	-	-
CO2	3	-	2	-	3	-
CO3	3	-	3	-	2	-
CO4	3	-	2	-	-	2
CO5	3	2	-	3	-	-
3 - Strong; 2 - Medium; 1 – Some						

Assessment Pattern

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

Syllabus

K.S. Rangasamy College of Technology – Autonomous R 2025

M. Tech. Food Technology

Passed in BoS Meeting held on 20/06/2025
Approved in Academic Council Meeting held on 19/07/2025

CHAIRMAN
BOARD OF STUDIES

70 PFT E11 - Advanced Fruit and Vegetable Processing Technology								
Semester	Hours/Week			Total hours	Credit	Maximum Marks		
	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 Post-harvest 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, future trends.	[9]
Edible Coatings and Vacuum Technology: Introduction, principle, selection of edible coatings, polysaccharide, protein, and lipid-based coatings. Gas permeation properties, wettability, coating effectiveness, diffusivities of fruits-determination, measuring internal gas composition, future trends. Introduction, principles-mass transfer and product behavior. Applications and future trends.	[9]
Minimal Processing: Introduction, quality changes, processing-physiological and microbiological impacts. Fresh-cut products-fresh produce quality and safety. Strategies for minimizing quality loss, improving quality, bio-control agents, browning inhibition. Storage and packaging. Fresh-cut chain-harvest to market. Equipment requirements, traceability of fresh-cut products, layout of a fresh-cut processing facility.	[9]
Fruit and Vegetable Product Manufacturing: Jams and jellies-gelling agent, sweetening agent, acidulants, colouring and flavouring agents, method of manufacturing. Fruit beverages-classification, production of filtered and cloudy fruit drinks-preparation steps, juice extraction, clarification, concentrate production. Production of fruit nectars-preparation steps, freeze concentration.	[9]
Ozonation and Enzyme Maceration: Introduction, ozone properties, ozone generation methods-electrical, electrochemical, radiochemical, and ultraviolet methods. Ozone in fruit juice processing-gaseous and aqueous applications, factors affecting efficacy of ozone processing-extrinsic and intrinsic parameters. Mechanism of microbial inactivation, effect on food quality, industrial health and safety. Introduction-function of enzymes in fruit juice processing-applications and future trends.	[9]
Total Hours:45	**45**

Text Book(s):	
1.	Jongen, W. “Fruit and Vegetable Processing: Improving Quality.” 1st Edition, Woodhead Publishing Series in Food Science, Technology and Nutrition, 2002.
2.	Nirmal Sinha, Jiwan Sidhu, Jozsef Barta, James Wu, M. Pila Cano. “Handbook of Fruits and Fruit Processing.” 2nd Edition, Blackwell Publishing, 2012.
Reference(s):	
1.	Srivastava, R. P., & Sanjeev Kumar. “Fruit and Vegetable Preservation: Principles and Practices.” 3rd Edition, CBS Publishers & Distributors, New Delhi, 2014.
2.	Rodrigues, Sueli, and Fabiano Andre Narciso Fernandes (Eds). “Advances in Fruit Processing Technologies.” 1st Edition, CRC Press, 2012.

Course Contents and Lecture Schedule

Passed in BoS Meeting held on 20/06/2025
Approved in Academic Council Meeting held on 19/07/2025

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BOARD OF STUDIES

S. No.	Topic	No. of Hours
1	**Post-harvest Processing and Improving the Shelf-life of Vegetables by Genetic Modification**	
1.1	Pre-harvest Factors	1
1.2	Maturity Index	1
1.3	Storage	2
1.4	Ripening Rooms and Techniques	1
1.5	Genetic Code of Leaf Senescence	2
2	**Edible coating and Vacuum Technology**	
2.1	Introduction, Principles, Selection of Edible Coating	1
2.2	Polysaccharide	2
2.3	Lipid-based Coating	1
2.4	Gas Permeation Properties	2
2.6	Wettability	1
2.7	Coating Effectiveness	1
2.8	Diffusivities of Fruits	1
3	**Minimal Processing**	
3.1	Quality Changes and Processing	2
3.2	Physiological and Microbiological Impacts	1
3.3	Fresh cut products	2
3.5	Strategies form in minimizing quality loss	2
3.6	Traceability of fresh cut	2
4	**Fruit and vegetable products**	
4.1	Manufacturing of Jam and Jellies	1
4.2	Fruit beverages	2
4.3	Production of filtered and cloudy fruit drink	1
4.4	Juice extraction	1
4.6	Concentrate production	2
4.7	Production of Fruit nectars	1
4.8	Freeze concentration	1
5	**Ozonation and Enzyme Maceration**	
5.1	Ozone properties	2
5.2	Radio chemical and Ultraviolet method	1
5.3	Ozone in fruit juice processing	2
5.4	Gaseous and aqueous applications	1
5.6	Efficiency of ozone processing	1
5.7	Extrinsic and intrinsic para meters	2
5.8	Mechanism of microbial inactivation	1
5.9	Effect on food Quality	1
	Total	45

Course Designers

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Passed in BoS Meeting held on 20/06/2025
Approved in Academic Council Meeting held on 19/07/2025

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70 PFT E12	Novel Technologies in Food Processing	Category	L	P	T	Credit
		PE	3	0	0	3

Objectives

- Provide an in-depth understanding of novel enzyme and membrane technologies used in food processing and protein fractionation.
- Introduce shock wave technology and its application in meat tenderization and quality improvement.
- Explain the principles and process variables of vacuum frying and its influence on product quality and stability.
- Familiarize students with fluidized bed coating and antimicrobial packaging technologies for functional food safety and shelf-life enhancement.
- Explore vacuum cooling and osmotic membrane distillation processes, their equipment, and applications in different food systems.

Pre-requisites

NIL

Course Outcomes

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

CO1	Explain the principles and applications of cross-linking enzymes and membrane technology in food processing and protein concentration	Apply
CO2	Evaluate the effect of shock wave technology on meat structure, tenderness, and quality attributes	Evaluate
CO3	Analyze the impact of process parameters in vacuum frying and describe the combination with vacuum microwave drying	Analyze
CO4	Describe the working principles of fluidized bed coating and assess its applicability and challenges in food powder coating	Evaluate
CO5	Apply the concepts of vacuum cooling and osmotic membrane distillation for processing various food categories and evaluate the process parameters	Apply

Mapping with Programme Outcomes

COS	PO1	P02	PO3	PO4	PO5	PO6
CO1	**3**	**2**	**2**	**3**	**2**	**-**
CO2	**3**	**2**	**3**	**2**	**3**	**-**
CO3	**3**	**3**	**3**	**2**	**3**	**1**
CO4	**3**	**2**	**3**	**3**	**2**	**-**
CO5	**3**	**2**	**2**	**3**	**3**	**-**
3 - Strong; 2 - Medium; 1 – Some						

Assessment Pattern

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

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Approved in Academic Council Meeting held on 19/07/2025

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Syllabus

K.S. Rangasamy College of Technology – Autonomous R 2025

70 PFT E12–Novel Technologies in Food Processing

M.Tech .Food Technology

Semester	Hours/ Week			Total hours	Credit	Maximum Marks		
	L	T	P		C	CA	ES	Total
I	3	0	0	45	3	40	60	100

Novel Enzyme Technology in Food Processing and Novel Membrane Technology for Protein Concentration and Fractionation Introduction–Typesofcross-linkingmethods–Applicationsofcross-linking enzymes. Meat and fish products, bakery and pasta products, dairy and miscellaneous products. Introduction –principles – configurations – mode of operation – scale up strategies - Applications using concentration and fractionation.	[9]
Shock Waves for Meat Tenderization Meat tenderness – processing interventions for meat tenderization – shock wave technology –principle - effect of shock wave treatment on meat tenderization – shock wave implication on biochemical components and microstructure–effect on other meat quality traits. Cost analysis and future considerations.	[9]
Vacuum Frying Technology Principles–processandequipment–effectofvacuumfryingconditionsonfriedfoods-pre-Treatment, frying temperature, time and pressure. Combination of vacuum microwave drying with vacuum frying. Storage stability of vacuum fried products.	[9]
Fluidized Bed Coating Technology and Anti-microbial food packaging Principles — Batch fluidized bed coating — Design, modification and possibilities for the food industry–Continuous fluidized bed coating–Applications Issues and problems in food powder coating technology introduction, agents, factors, non-migratory bioactive polymers (NMBP) in food packaging, introduction, Advantages of NMBP, limitations, Polymers with immobilized bioactive Compounds	[9]
Vacuum Cooling and Osmotic Membrane Distillation(OMD) Principles–Process–Equipment–Application–Fruits and Vegetables, Bakery, Fishery, Particulate foods, Ready meals. Advantages and Disadvantages–Process Parameters. Fundamentals–OMD membranes–Process parameters–Osmotic agent, Concentration, Temperature, Membrane. Direct osmosis. Applications in food system.	[9]
Total Hours:	**45**

Text Book(s):

1. Maria Laura Passos, Claudio P.Ribeiro ,Innovation in Food Engineering-New Techniques and Products, 1stEdition, CRCPress, 2016.
2. Kai Knoerzer, Pablo Juliano, Geoffrey W. Smithers, Innovative Food Processing Technologies :Extraction, Separation, Component Modification and Process Intensification, 1stEdition, Woodhead Publishing Ltd,2016.

Reference(s):

1. Bhattacharya, Suvendu, (Eds), “Conventional and Advanced Food Processing Technologies”, 1stEdition, John Wiley & Sons, 2014.

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Course Contents and Lecture Schedule

S.No.	Topic	No.of Hours
1	**Novel Enzyme Technology in Food Processing and Novel Membrane Technology for Protein Concentration and Fractionation**	
1.1	Introduction	1
1.2	Types of cross-linking methods	1
1.3	Application of Cross-linking enzymes	2
1.4	Meat and fish products	1
1.5	Dairy and Miscellaneous products	2
2	**Shock waves for Meat Tenderization**	
2.1	Meat Tenderness	1
2.2	Shock wave technology	2
2.3	Effect of shockwave	1
2.4	Shock wave implications	2
2.6	Effect of meat traits	1
2.7	Cost analysis	1
2.8	Future considerations	1
3	**Vacuum Frying Technology**	
3.1	Principle of Process equipment	2
3.2	Effect of Vacuum frying	1
3.3	Pretreatment	2
3.5	Frying temperature	2
3.6	Combination of vacuum microwave drying	2
4	**Fluidized Bed Coating and Anti-Microbial Food Packaging**	
4.1	Principle of Batch Fluidized Bed Coating	1
4.2	Design and Modification	2
4.3	Continuous Fluidized Bed Coating	1
4.4	Application Issues and Problems	1
4.6	Non-Migrating Bioactive Compounds	2
4.7	Advantages of NMBP (Non-Migrating Bioactive Packaging)	1
4.8	Polymer with Immobilized Bioactive Compound	1
5	**Vacuum Cooling and Osmotic Membrane Distillation**	
5.1	Principle and Process Equipment	2
5.2	Fruits and Vegetables	1
5.3	Particulate Food	2
5.4	Ready Meals	1
5.6	Process Parameters	1
5.7	OMD Membranes (Osmotic Membrane Distillation Membranes)	2
5.8	Osmotic Agents	1
5.9	Application in Food Systems	1
	Total	45

Course Designers

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BOARD OF STUDIES

70 PFT E13	Heat and Mass Transfer Operations in Food Processing	Category	L	P	T	Credit
		PE	3	0	0	3

Objectives

- Introduce fundamental principles of condensation and boiling with applications in food processing.
- Develop an understanding of the design and performance evaluation of single and multiple-effect evaporators.
- Enable students to analyze heat exchanger operations using LMTD and NTU methods with attention to compact and variable property systems.
- Explain distillation processes including binary and multicomponent systems using standard design methods.
- □ Provide knowledge of mass transfer processes like extraction and leaching, including both conventional and emerging techniques.

Pre-requisites

NIL

Course Outcomes

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

CO1	Explain the principles of condensation and boiling heat transfer and apply simplified relations for basic calculations.	Apply
CO2	Analyze the design, performance, and economy of single and multiple effect evaporators considering boiling point elevation.	Evaluate
CO3	Calculate heat exchanger performance using LMTD and NTU methods and evaluate compact heat exchanger applications.	Evaluate
CO4	Design and interpret distillation processes using McCabe-Thiele and Ponchon-Savarit methods for binary systems.	Analyze
CO5	Describe and differentiate mass transfer operations such as extraction and leaching, and assess novel extraction technologies.	Evaluate

Mapping with Programme Outcomes

COS	PO1	P02	PO3	PO4	PO5	PO6
CO1	**3**	**3**	**2**	**2**	**2**	**-**
CO2	**3**	**3**	**3**	**2**	**3**	**-**
CO3	**3**	**3**	**3**	**3**	**3**	**-**
CO4	**3**	**2**	**3**	**3**	**2**	**1**
CO5	**3**	**2**	**2**	**3**	**2**	**1**
3 - Strong; 2 - Medium; 1 – Some						

Assessment Pattern

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

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BOARD OF STUDIES

Syllabus

K.S. Rangasamy College of Technology – Autonomous R 2025

70 PFT E13–Heat and Mass Transfer Operations in Food Processing

M. Tech. Food Technology

Semester	Hours/Week			Total hours	Credit	Maximum Marks		
	L	T	P		C	CA	ES	Total
I	3	0	0	45	3	40	60	100

Condensation and Boiling and Evaporators Condensation number – Film condensation – Boiling heat transfer – Simplified relations. Single and multiple effect evaporators – Performance of evaporators and boiling point elevation – capacity – economy and heat balance – Types of evaporators.	[9]
Heat Exchangers Overall heat transfer coefficients – Fouling factor – Types of Heat Exchanger – LMTD – Heat exchanger effectiveness by NTU method – Compact Heat Exchangers – Analysis for variable properties.	[9]
Distillation Batch Distillation – Flash Vaporization – Continuous fractionation – Design of multistage tray towers for binary systems: McCabe-Thiele method and Panchon-Savorit method. Introduction to multicomponent distillation.	[9]
Extraction Single stage, multistage cross current and multistage counter current operations – Introduction to newer extraction techniques: Supercritical extraction, pulsed electric field extraction, microwave extraction, ultrasound-assisted extraction, subcritical water extraction, high-pressure assisted 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 multistage systems – continuous contactors.	[9]
Total Hours:	**45**

Text Book(s):

1. McCabe, W. L., Smith, J. C., Harriott, P., "*Unit Operations of Chemical Engineering*", 5th Edition, McGraw-Hill Education, 2010.
2. Holman, J. P., "*Heat Transfer*", 10th Edition, McGraw-Hill, New York, 2012.

Reference(s):

1. Treybal, R. E., "*Mass Transfer Operations*", 3rd Edition, McGraw-Hill, New York, 2012.
2. Ibarz, A., "*Unit Operations in Food Engineering*", 1st Edition, CRC Press, 2003.

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Course Contents and Lecture Schedule

S. No.	Topic	No. of Hours
1	Condensation and Boiling and Evaporators	
1.1	Condensation Number	1
1.2	Film Condensation	1
1.3	Boiling Heat Transfer	2
1.4	Simplified Relations	1
1.5	Types of Evaporators	2
2	Heat Exchangers	
2.1	Overall Heat Transfer	1
2.2	Fouling Factor	2
2.3	Types of Heat Exchanger	1
2.4	LMTD (Log Mean Temperature Difference)	2
2.6	NTU Method (Number of Transfer Units Method)	1
2.7	Compact Heat Exchanger	1
2.8	Analysis of Variable Properties	1
3	**Distillation**	
3.1	Batch Distillation	2
3.2	Flash Vaporization	1
3.3	Continuous Fractionation	2
3.5	Design of Multistage Tray Towers for Binary Systems	2
3.6	McCabe-Thiele Method	2
4	**Extraction**	
4.1	Single Stage Countercurrent Operation	1
4.2	Multistage Countercurrent Operation	2
4.3	Introduction to Newer Techniques	1
4.4	Supercritical Extraction	1
4.6	Pulsed Electric Field Extraction	2
4.7	Microwave Extraction	1
4.8	High-Pressure Assisted Extraction	1
5	**Leaching**	
5.1	Solid liquid equilibria	2
5.2	Single stage leaching	1
5.3	Multi stage Cross current	2
5.4	Counter current leaching	1
5.6	Calculations for number of stages	1
5.7	Leaching experiment	2
5.8	Batch percolators	1
5.9	Fixed bed multi stage systems	1
	Total	45

Course Designer

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PROFESSIONAL ELECTIVE II

70 PFT E21	Industrial Engineering	Category	L	T	P	Credit
		PE	3	0	0	3

Objectives

- Understand the history and basics of Production and Operations Management, including types of production systems.
- Learn work study techniques like method study, work measurement, ergonomics, and safety.
- Explore forecasting methods and their use in production planning and decision-making.
- Study facility location, capacity planning, plant layout, and material handling systems.
- Build decision-making skills using value engineering, make-or-buy analysis, and financial tools.

Pre-requisites

Nil

Course Outcomes

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

CO1	Understand how Production and Operations Management evolved and compare different production systems using productivity and BPR.	Analyze
CO2	Use work study methods to improve efficiency, considering ergonomics and safety.	Apply
CO3	Apply forecasting models to predict demand and check their accuracy.	Evaluate
CO4	Plan plant layouts, select facility locations, and choose material handling systems.	Analyze
CO5	Use value engineering and basic financial tools to support make-or-buy decisions.	Evaluate

Mapping with Programme Outcomes

COS	PO1	P02	PO3	PO4	PO5	PO6
CO1	**3**	**3**	**2**	**2**	**2**	**1**
CO2	**3**	**3**	**3**	**2**	**3**	**1**
CO3	**3**	**3**	**2**	**3**	**2**	**1**
CO4	**3**	**2**	**3**	**3**	**2**	**2**
CO5	**3**	**2**	**2**	**3**	**2**	**2**
3 - Strong; 2 - Medium; 1 – Some						

Assessment Pattern

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

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Syllabus

K.S. Rangasamy College of Technology – Autonomous R 2025

M.Tech. Food Technology

70 PFT E21–Industrial Engineering

Semester	Hours / Week			Total Hours	Credit	Maximum Marks		
	L	T	P		C	CA	ES	Total
II	3	0	0	45	3	40	60	100

Historical Evolution of Production and Operations Management Management - Industrial Engineering – Role of Industrial Engineering – System concept of production - Types of production system-flow, job, batch and project- Productivity- Factors affecting productivity-Productivity measures – Productivity improvement techniques -Business Process Re-engineering (BPR)	[9]
Work Study Method, basic procedure – Selection – Recording of process – Critical analysis, Development - Implementation – Micromotion and memo motion study – Principles of motion economy-Work measurement Techniques of work measurement -Time study –computation of standard time-Work sampling- Synthetic data- Predetermined motion time standards- Job Evaluation, Merit Rating-Ergonomics and Safety	[9]
Modules of pre-planning Introduction- Forecasting: Need for forecasting- demand patterns- Forecasting models-Judgmental Techniques, Time series analysis, moving average, exponential smoothing, Regression and correlation method- Forecast error costs and accuracy of forecasts.	[9]
Facility Planning Facility location- factors influencing plant location- single and multifacility location problems-Minimax, Gravity and Euclidean– Distance location problem. Capacity planning, Models for Facility Decisions - Plant layout- Layout classification- Layout Design Procedures- CRAFT, ALDEP, CORELAP- Material handling systems unit load concept- material handling principles-Types of Material handling equipment and its selection	[9]
Value Engineering Value engineering– function, aims, procedure. Make or buy decision, Interest formulae and their applications: Time value of money, Single payment compound amount factor, Single payment present worth factor, Equal payment series sinking fund factor, Equal payment series payment Present worth factor- equal payment series capital recovery factor-Uniform gradient series, annual equivalent factor, Effective interest rate, Introduction to Methods of comparison of Alternatives	[9]
Total Hours:	**45**

Text Book(s):

1. Gupta S., Starr M., “Production and Operations Management Systems”,1st Edition, CRC Press, 2014.
2. HooverC., “Industrial Engineering and Production Management”,1st Edition, Clanrye International, 2017.

Reference(s):

1. Telsang M., “Industrial Engineering and Production Management”,1st Edition,S.Chand and Company, New Delhi, 2006.

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Course Contents and Lecture Schedule

S. No.	Topic	No. of Hours
1	**Historical Evolution of Production and Operations**	
1.1	Management and Industrial Engineering	1
1.2	Role of Industrial Engineering	1
1.3	System concept of production	2
1.4	Types of production	1
1.5	Business process re-engineering	2
2	**Work Study**	
2.1	Method basic procedure	1
2.2	Selection, Recording of process	2
2.3	Critical Analysis	1
2.4	Work Measurement Techniques	2
2.6	Time study computation	1
2.7	Work sampling	1
2.8	Merit rating	1
3	**Modules Preplanning**	
3.1	Introduction	2
3.2	Need for forecasting	1
3.3	Demand patterns	2
3.5	Forecasting model	2
3.6	Regression and Forecasting method	2
4	**Facility Planning**	
4.1	Facility locators	1
4.2	Multifacility location	2
4.3	Minimax gravity	1
4.4	Material Handling system	1
4.6	Material handling principles	2
4.7	Material handling equipment	1
4.8	Selection of material handling equipment	1
5	**Value engineering**	
5.1	Value engineering function	2
5.2	Procedure make or buy decision	1
5.3	Interest formulae and their application	2
5.4	Single payment compound factor	1
5.6	Single payment present worth factor	1
5.7	Equal payment series	2
5.8	Present worth factor equal	1
5.9	Uniform gradient series	1
	Total	45

Course Designers

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BOARD OF STUDIES

70 PFT E22	Industrial Waste Management	Category	L	T	P	Credit
		PE	3	0	0	3

Objectives

- Provide an overview of industrial activities in India and their environmental implications, especially in relation to wastewater generation and characteristics.
- Introduce various treatment technologies for industrial wastewater and promote understanding of effluent treatment systems.
- Develop knowledge of solid waste sources, segregation, and integrated waste management practices.
- Explain energy recovery methods and modern disposal techniques, including landfill design and operation.
- Examine waste management strategies in different industrial sectors, focusing on wastewater and solid waste reduction and treatment.

Pre-requisites

Nil

Course Outcomes

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

CO1	Explain environmental impacts of industrial activities, types of wastewater, and relevant regulatory requirements.	Understand
CO2	Describe and compare industrial wastewater treatment methods, reuse strategies, and ZLD systems.	Analyze
CO3	Identify solid waste sources and analyze segregation, collection, and transport practices under Indian regulations.	Analyze
CO4	Apply appropriate waste processing, energy recovery, and landfill technologies based on waste characteristics.	Evaluate
CO5	Analyze waste generation and develop treatment flow sheets for major industrial sectors.	Create

Mapping with Programme Outcomes

COS	PO1	P02	PO3	PO4	PO5	PO6
CO1	**3**	**3**	**2**	**3**	**2**	**3**
CO2	**3**	**3**	**3**	**2**	**3**	**3**
CO3	**3**	**3**	**2**	**3**	**2**	**3**
CO4	**3**	**2**	**3**	**3**	**3**	**3**
CO5	**3**	**3**	**3**	**3**	**3**	**3**
3 - Strong; 2 - Medium; 1 – Some						

Assessment Pattern

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

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Syllabus

K.S. Rangasamy College of Technology – Autonomous R 2025

M.Tech Food Technology

70 PFT E22–Industrial Waste Management

Semester	Hours / Week			Total Hours	Credit	Maximum Marks		
	L	T	P		C	CA	ES	Total
II	3	0	0	45	3	40	60	100

Industries and Environment Industrial scenario in India – Industrial activity and Environment – Uses of water by industry –Sources and types of industrial waste water– Industrial waste water and environmental impacts– Regulatory requirements for treatment of industrial wastewater – Industrial waste survey – Industrial wastewater generation rates, characterization and variables – Population equivalent –Toxicity of industrial effluents and Bio assay tests.	[9]
Management of Industrial Waste Water and Treatment Plants Treatments: Aerobic and anaerobic biological treatment– batch and high- rate reactors–Chemical oxidation — Ozonation — Photo catalysis — Wet Air Oxidation — Evaporation — Ion Exchange – Membrane Technologies. Individual and common Effluent Treatment plants – Joint treatment of industrial waste water– Zero effluent discharge systems–Quality requirements for waste water reuse– Industrial reuse–DisPOsal on water and land–Residuals of Industrial waste water treatment.	[9]
Solid Waste Sources and Segregation Sources: Types and Sources of solid wastes– Need for solid waste management–Elements of integrated waste management and roles of stakeholders– Salient features of Indian legislations on management and handling of municipal solid wastes. Handling and segregation of wastes at sources– storage and collection of municipal solid wastes– Analysis of collection systems– Need for transfer and transport– Transfer stations- Optimizing waste allocation–compatibility.	[9]
Energy Recovery and DisPOsal Objectives of waste processing – material separation and processing technologies – biological and chemical conversion technologies– methods and controls of comPOsting–energy recovery and other modern techniques in managing solid waste– case studies. Waste disPOsal options–DisPOsal in land fills – Land fill classification, types and methods – site selection – design and operation of sanitary landfills, secure landfills – leachate and land fill gas management – landfill Closure of landfills– land fill remediation.	[9]
Waste Management in different industrial segments Industrial manufacturing process description- wastewater and solid waste characteristics – source reduction options and waste treatment flow sheet for Textiles – Tanneries – pulp and paper –petroleum refining–pharmaceuticals–sugar and distilleries–Food processing–fertilizers– Thermal power plants and Industrial Estates.	[9]
Total Hours:	**45**
Text Book(s):	
1. Arceivals S.J., “Wastewater Treatment for Pollution Control”, 3rd Edition, Tata Mc Graw-Hill, 2017	
2. Ecken felder W.W.,“Industrial Water Pollution Control”, 3rd Edition, Mc Graw-Hill, 2017.	
Reference(s):	
1. Landreth R.E. and Rebers P.A., “Municipal Solid Wastes-Problems and Solutions”,1st Edition, CRC Publishers, 2019.	

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BOARD OF STUDIES

Course Contents and Lecture Schedule

S. No.	Topic	No. of Hours
1	**Industries and Environment**	
1.1	Industrial Scenario in India	1
1.2	Industrial Waste water and environmental impact	1
1.3	Industrial waste water generation rates	2
1.4	Toxicity of industrial Effluents	1
1.5	Bio assay Tests	2
2	**Management of Industrial Waste water and Treatment Plant**	
2.1	Aerobic and Anaerobic biological Treatment	1
2.2	Photo Catalysis	2
2.3	Joint treatment of Industrial Waste water	1
2.4	Zero effluent Discharge systems	2
2.6	Industrial Reuse	1
2.7	Disposal on water and land	1
2.8	Industrial Wastewater Treatment	1
3	**Solid Waste Sources and Segregation**	
3.1	Types and sources of solid waste	2
3.2	Salient features of Indian Legislations	1
3.3	Handling and Segregation of wastes at sources	2
3.5	Need for transfer and Transport	2
3.6	Optimizing Waste allocation	2
4	**Energy Recovery and Disposal**	
4.1	Objectives of waste processing	1
4.2	Material Separation	2
4.3	Waste Disposal option	1
4.4	Landfill Classification	1
4.6	Secure landfills	2
4.7	Leachate and Land fill gas Management	1
4.8	Land fill closure	1
5	**Waste Management in Different Industrial Segments**	
5.1	Industrial Manufacturing Process	2
5.2	Water and Solid waste Characteristics	1
5.3	Source reduction options	2
5.4	Waste water flow sheet for textiles	1
5.6	Pulp and Paper Industries	1
5.7	Food Processing industries	2
5.8	Fertilizer	1
5.9	Thermal power plant and Industrial Estates	1
	Total	45

Course Designers

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70 PFT E23	Advanced Baking and Confectionery Technology	Category	L	T	P	Credit
		PE	3	0	0	3

Objectives

- Provide knowledge on essential and functional ingredients used in bakery formulations and their roles.
- Familiarize students with bakery equipment and processes used in commercial baking operations.
- Introduce rheological properties of dough and batter and the impact of ingredients and processing variables.
- Explain the formulation, processing, and quality control of various bakery and dietetic bakery products.
- Develop understanding of ingredient interactions and technological processes in confectionery production.

Pre-requisites

Advanced Drying Technology

Course Outcomes

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

CO1	Identify and explain the role of essential and functional ingredients in bakery products and their clean-label alternatives.	Understand
CO2	Describe and operate various bakery equipment used in the bulk handling, fermentation, and baking processes.	Apply
CO3	Analyze the rheological behavior of dough and batter using fundamental and empirical testing methods.	Analyze
CO4	Formulate and evaluate bakery products such as bread, biscuits, and cakes considering quality and nutritional needs.	Evaluate
CO5	Apply principles of ingredient interactions and develop formulations and processing techniques for confectionery products meeting quality and shelf-life standards.	Create

Mapping with Programme Outcomes

COS	PO1	P02	PO3	PO4	PO5	PO6
CO1	**3**	**3**	**2**	**2**	**2**	**-**
CO2	**3**	**3**	**3**	**2**	**3**	**-**
CO3	**3**	**3**	**3**	**3**	**3**	**1**
CO4	**3**	**2**	**3**	**3**	**2**	**2**
CO5	**3**	**2**	**3**	**3**	**2**	**2**

3 - Strong; 2 - Medium; 1 – Some

Assessment Pattern

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

Passed in BoS Meeting held on 20/06/2025
Approved in Academic Council Meeting held on 19/07/2025

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BOARD OF STUDIES

Syllabus

K.S. Rangasamy College of Technology – Autonomous R 2025

M.Tech Food Technology

70 PFT E23 – Advanced Baking and Confectionery Technology

Semester	Hours / Week			Total Hours	Credit	Maximum Marks		
	L	T	P		C	CA	ES	Total
II	3	0	0	45	3	40	60	100

Bakery Ingredients and Equipment Essential bakery ingredients: Flour, yeast and sour dough, water, salt- Other ingredients: Sugar, colour, flavour, fat, milk, bread improvers, leavening agents, shortenings, enzymes, emulsifiers and antioxidants. Role of fat and sugar replacers, clean label ingredients. Bulk handling of ingredients, dough mixers, dividers, rounders, sheeters, laminators, Fermentation enclosures and brew equipment, ovens and slicers.	[9]
Rheological Properties of Dough and Batter Rheological methods-Fundamental testing and Empirical methods, Rheological testing equipment, compression, penetration, modified penetrometers, transient tests, dynamic tests, extensional viscosity. Effect of ingredients, mixing, dosing and temperature on rheological properties, cake batter rheology and bread dough rheology	[9]
Technology of Bakery Products: Bread and Cake, Biscuits and Other bakery products Various stages and methods, Formulation and production-frozen dough, refrigerated dough and partially baked bread. Types-Foam style and shortened style, industrial preparation and baking of cakes. Production process and quality control, healthy biscuit formulation. Manufacture of cookies, pretzel sand pastries. Requirement of dietetic bakery	[9]
Interactions between formulation and process methodologies and Confectionery Basic concepts of heat and mass transfer mechanism in bakery products. Foam to sponge conversion and the collapse of bakery products, Effect of ingredient, recipe and product interactions. Classification, Ingredients sources and their role for various products: sweeteners —alternative and high intensity sweeteners, water, lipids, emulsifiers, starch, protein, pectin, gums and other ingredients. Factors influencing rheology of candy mass and chocolate	[9]
Technology for confectionery products Formulation and Processing— Hard candy, fondant, creams, jellies, gummies, licorices, compressed tablets, chocolates and compound coatings, sugar free confections. Quality standards of confectionery products. Packaging and shelf life of Confectionery products.	[9]
Total Hours:	**45**

Text Book(s):

1. Weibiao Zhou and Y.H.Hui.,"Bakery Products Science and Technology",2nd Edition, Wiley Black well, US,2014.
2. Servet Gulum Sumnuand Serpil Sahin., "Food Engineering Aspects of Baking Sweet Goods",1st Edition, CRC Press, USA, 2008.

Reference(s):

1. Richard W. Hartel,JoachimH.von Elbe, Randy Hofberger., "Confectionery science and technology",1st Edition, Springer,2022

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Course Contents and Lecture Schedule

S. No.	Topic	No. of Hours
1	**Bakery Ingredients and Equipment**	
1.1	Essential Bakery ingredients	1
1.2	Bread improvers	1
1.3	Emulsifiers and antioxidants	2
1.4	Bulk handling of ingredients	1
1.5	Ovens and Slicers	2
2	**Rheological Properties of Dough and Batter**	
2.1	Rheological Methods	1
2.2	Fundamental Testing and Empirical methods	2
2.3	Modified penetrometers	1
2.4	Transient tests	2
2.6	Effect of dosing on rheological properties	1
2.7	Cake Batter rheology	1
2.8	Bread dough Rheology	1
3	**Technology of Bakery Products: Bread and Cake, Biscuits and Other Bakery Products**	
3.1	Various Stages and Methods	2
3.2	Formulation and Production of Frozen Dough	1
3.3	Industrial preparation and baking of cakes	2
3.5	Healthy Biscuits formulation	2
3.6	Manufacturing of Cookies, Pretzels and Pastries	2
4	**Interactions between formulation and process methodologies and Confectionary**	
4.1	Basic Concepts of heat and mass transfer mechanism	1
4.2	Foam to sponge conversion	2
4.3	Effect of ingredients	1
4.4	Product interactions	1
4.6	Classification, Ingredient sources and their role	2
4.7	Water, lipids and emulsifiers	1
4.8	Factors influencing rheology of candy mass and chocolate	1
5	**Technology of Confectionary Products**	
5.1	Formulation and Processing	2
5.2	Compound coatings	1
5.3	Emulsifiers	2
5.4	Pectin	1
5.6	Gums	1
5.7	Sugar free confections	2
5.8	Quality Standard of confectionary products	1
5.9	Packaging and shelf life of confectionary products	1
	Total	45

Course Designers

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BOARD OF STUDIES

70 PFT E31	Technology of Food Colours and Flavours	Category	L	T	P	Credit
		PE	3	0	0	3

Objectives

- To provide foundational knowledge on the chemistry, classification, and sensory perception of food flavours.
- To introduce natural and synthetic food colour sources and their technological aspects.
- To understand the evolution of flavours during food processing and their extraction and stabilization.
- To study analytical methods used for flavour and colour analysis.
- To explore the practical applications of food flavours and colours in various food products.

Pre-requisites

Nil

Course Outcomes

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

CO1	Explain types of food flavours and how we sense taste and smell.	Understand
CO2	Identify natural and synthetic food colours and understand how they are made and kept stable.	Apply
CO3	Describe how flavours change during cooking and how they are extracted or created.	Analyse
CO4	Use lab tools to test and measure food flavours and colours.	Evaluate
CO5	Apply flavours and colours in foods and check how they affect taste and appearance.	Create

Mapping with Programme Outcomes

COS	PO1	P02	PO3	PO4	PO5	PO6
CO1	**3**	**3**	**2**	**2**	**2**	**-**
CO2	**3**	**3**	**3**	**2**	**3**	**-**
CO3	**3**	**3**	**3**	**3**	**3**	**1**
CO4	**3**	**2**	**3**	**3**	**2**	**2**
CO5	**3**	**2**	**3**	**3**	**2**	**2**

3 - Strong; 2 - Medium; 1 – Some

Assessment Pattern

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

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Approved in Academic Council Meeting held on 19/07/2025

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BOARD OF STUDIES

Syllabus

K.S. Rangasamy College of Technology – Autonomous R 2025

M.Tech Food Technology

70 PFT E31–Technology of Colours and Flavours

Semester	Hours / Week			Total Hours	Credit	Maximum Marks		
	L	T	P		C	CA	ES	Total
II	3	0	0	45	3	40	60	100

Basics of Food Flavours and Basics of Food Colours Introduction, classification of food flavours, perception of flavour and taste–Theories of olfaction -Molecular structure and activity relationships of taste — sweet, bitter, acid and salt, Chemicals causing pungency, astringency, cooling effect — properties. Regulations regarding additions, toxicology and safety aspects of food flavour.	[9]
Origin of Food colours and Technology of food colours Plant - Chlorophyll and chlorophyll derivatives, carotenoids, annatto, saffron, turmeric, Caramel colour, anthocyanins and betalains. Animal- Haems and bilins, monascus, cochineal and related pigments. Synthetic -Forms and types, certified F, D and C colourants. Technology for the production of dried colourants, stability- pH, temperature and other processing conditions. Role of Microorganism in synthesis of food colours, encapsulated food colourants.	[9]
Food flavours from plant origin and Flavours evolution during processing and Technology of food flavours Alliaceous flavours, bittering agents, coffee and cocoa, fruit flavours. Enzymatic development, effect of roasting, cooking, frying on flavour developments. Essential oils and oleoresins — extraction methods. Liquid and dry flavour production, encapsulated flavours, microbial synthesis of flavours, Flavour enhancer and seasonings. Factors affecting stability of flavours	[9]
Flavour Analysis and Colour Analysis Aroma Compounds - Sample Selection/Preparation, Principles of Aroma Isolation — Solubility, Sorptive Extraction, Volatility. Methods of Aroma Isolation — Static Headspace, Headspace Concentration Methods (Dynamic Headspace)- Distillation Methods – Solvent Extraction, Sorptive Extraction - Concentration for Analysis, Aroma Isolation, Prefractionation - Gas Chromatography, GC/Olfactometry (GC/O) GC- MS/Olfactometry (GC-MS/O), Mass Spectrometry. Preparation and isolation of sample, spectrophotometry, colourimetry, Hunter Colour lab, CI Esystem, Lovi bond Tintometer, Munsell colour system.	[9]
Flavourant applications in food and Colourants applications in food Soups and stocks, sauces, seasonings, and marinades, baked goods and bakery products, snack foods, sugar based confectionery products and chewing gum, dairy Products - flavoured milks, flavoured yogurts, flavoured dairy desserts. Beverages, dairy products, confections, baked products and other foods.	[9]
Total Hours:	**45**
Text Book(s):	
1. Re ineccius G.and HeathH.B.,“Flavour Chemistry and Technology”, 2nd Edition, CRC Press, 2006.	
2. Carmen Socaciu., “Food Colourants: Chemical and Functional Proerties”,1st Edition, CRC Press, 2008.	
Reference(s):	
1. Rowe D.J.,“Chemistry and Technology of Flavours and Fragrances”,1st Edition, Blackwell Publishing	

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Course Contents and Lecture Schedule

S. No.	Topic	No. of Hours
1	**Basics of Food Flavours and Basics of Food Colours**	
1.1	Introduction and classification of food flavours	1
1.2	Perception of flavour and Taste	1
1.3	Chemicals causing pungency	2
1.4	Regulations regarding additions	1
1.5	Toxicology and Safety aspects of food flavour	2
2	**Origin of Food Colours and Technology of Food Colours**	
2.1	Plant chlorophyll and chlorophyll derivatives	1
2.2	Carotenoids	2
2.3	Synthetic forms and types	1
2.4	Certified food colourants	2
2.6	Technology for production of dried colourants	1
2.7	Synthesis of food colours	1
2.8	Encapsulated food colourants	1
3	**Food flavours from plant origin and flavours evolution during processing and technology of foods**	
3.1	Alliaceous flavours	2
3.2	Enzymatic Development	1
3.3	Effect of roasting	2
3.5	Effect of frying on flavour development	2
3.6	Factors affecting stability of flavours	2
4	**Flavour Analysis and Colour analysis**	
4.1	Aroma compounds	1
4.2	Sample selection	2
4.3	Principles of Aroma isolation	1
4.4	Methods of Aroma Isolation	1
4.6	Solvent extraction	2
4.7	Flavour enhancer	1
4.8	Munsell Colour system	1
5	**Flavourant applications in food and Colourants applications in food**	
5.1	Soups and stocks	2
5.2	Sauces and seasonings	1
5.3	Baked goods and bakery products	2
5.4	Confectionary products and Chewing Gum	1
5.6	Dairy products	1
5.7	Flavoured milks	2
5.8	Flavoured Yogurts	1
5.9	Baked products	1
	Total	45

Course Designers

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BOARD OF STUDIES

70 PFT E32	Advanced Separation Techniques in Food Processing	Category	L	T	P	Credit
		PE	3	0	0	3

Objectives

- To introduce the fundamental principles of separation techniques used in food processing.
- To provide knowledge on solid and liquid separation methods based on particle properties.
- To explain adsorption-based separations and powder classification techniques.
- To familiarize students with membrane technologies and their applications in the food industry.
- To understand ionic separation and permeation processes and their relevance in food systems.

Pre-requisites

Advanced Drying Technology

Course Outcomes

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

CO1	Explain basic separation methods used for solids, liquids, and gases in food processing.	Understand
CO2	Describe solid separation techniques based on particle properties and their applications.	Apply
CO3	Understand adsorption-based methods and powder separation techniques used in the food industry.	Apply
CO4	Apply membrane technologies like microfiltration and reverse osmosis in food processing.	Analyze
CO5	Explain ionic separation and permeation techniques and their food-related applications.	Apply

Mapping with Programme Outcomes

COS	PO1	P02	PO3	PO4	PO5	PO6
CO1	**3**	**3**	**2**	**2**	**2**	**-**
CO2	**3**	**3**	**3**	**2**	**3**	**-**
CO3	**3**	**3**	**3**	**3**	**3**	**1**
CO4	**3**	**2**	**3**	**3**	**2**	**2**
CO5	**3**	**2**	**3**	**3**	**2**	**2**
3 - Strong; 2 - Medium; 1 – Some						

Assessment Pattern

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

Passed in BoS Meeting held on 20/06/2025
Approved in Academic Council Meeting held on 19/07/2025

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BOARD OF STUDIES

Syllabus

K.S. Rangasamy College of Technology – Autonomous R 2025

M.Tech Food Technology

70 PFT E32–Advanced Separation Techniques in Food Processing

Semester	Hours / Week			Total Hours	Credit	Maximum Marks		
	L	T	P		C	CA	ES	Total
II	3	0	0	45	3	40	60	100

Separation Techniques Introduction, separation from solids, separation from liquids, separation from gases and vapors, Filtration- centrifugation- equipment and application in food processing.	[9]
Solid Separation Process Separation Concept based on particle size and shape. Magnetic separation, Eddy-current separation, Ballistic separation, Colour separation, Wet Separation Process, liquid-solid and liquid-liquid separation by hydro cyclones, Surface velocity classifier, Elutriators, Impingement separator, Electrostatic precipitation.	[9]
Adsorption based and other Separation Processes and Powder Technology Types and choice of adsorbents, Mechanisms of Affinity chromatography and immune chromatography. Foam separation, Super critical fluid extraction - Food Application. Classification of powder, separation of powder sieving, air classification and its factors affecting, air separation, particle size distribution.	[9]
Membrane Technology Membrane modules, Mechanism and equipment employed for micro-filtration, ultrafiltration, nano filtration, reverse osmosis, concentration polarization, pervaporation and application of membrane technology in food industry.	[9]
Ionic Separation Processes and Permeation Techniques Electrophoresis, Dielectrophoresis, ion-exchange chromatography, electro dialysis-Theory and equipment Permeation of liquids and gases.	[9]
Total Hours:	**45**

Text Book(s):

1. King, C.J. “Separation Processes”,2nd Edition, Dover Publications, inc. Mineola, New York, 2013.
2. Grandison A.S., and LewisM.J., “Separation process in the food & biotechnology industries”, 1st Edition, wood head publication, England,1996.

Reference(s):

1. Ronald. W. Rousseau., “Handbook of Separation Process Technology”,1st Edition, Wiley India Pvt Ltd, 2009.

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Course Contents and Lecture Schedule

S. No.	Topic	No. of Hours
1	**Separation Techniques**	
1.1	Introduction	1
1.2	Separation from solids	1
1.3	Separation from liquids	2
1.4	Separation from gases and Vapors	1
1.5	Application in Food Processing	2
2	**Solid Separation Process**	
2.1	Separation Concept based on particle size	1
2.2	Magnetic separation	2
2.3	Eddy Current Separation	1
2.4	Wet separation process	2
2.6	Liquid solid and Liquid–liquid separation	1
2.7	Elutriators	1
2.8	Electrostatic Separator	1
3	**Adsorption based and other separation processes and powder technology**	
3.1	Types and choices of adsorbents	2
3.2	Mechanism of Affinity Chromatography	1
3.3	Immuno Chromatography	2
3.5	Super critical fluid extraction	2
3.6	Classification and separation of powder	2
4	**Membrane Technology**	
4.1	Membrane Modules	1
4.2	Mechanism and membrane employed for microfiltration	2
4.3	Microfiltration	1
4.4	Ultrafiltration	1
4.6	Nanofiltration	2
4.7	Pervaporation	1
4.8	Application of Membrane technology in Food industries	1
5	**Ionic Separation Process and permeation technique**	
5.1	Electrophoresis	2
5.2	Dielectrophoresis	1
5.3	Ion-exchange chromatography	2
5.4	Electrodialysis	1
5.6	Equipment	1
5.7	Permeation	2
5.8	Permeation of Liquids	1
5.9	Permeation of Gases	1
	Total	45

Course Designers

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70 PFT E33	Food Product Design and	Category	L	T	P	Credit

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	Development	**PE**	**3**	**0**	**0**	**3**

Objectives

- To understand the fundamentals, drivers, and opportunities of new product development in the food industry.
- To gain insights into the process and methodology of designing and developing innovative food products.
- To learn the use of novel ingredients and technologies for recipe development and large-scale production.
- To develop skills in evaluating sensory quality, shelf life, and ensuring regulatory compliance.
- To explore strategies for marketing, product positioning, and real-world case studies of food innovation.

Pre-requisites

Nil

Course Outcomes

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

CO1	Explain the concepts, value addition, and market factors influencing new food products.	Understand
CO2	Apply NPD processes, modify traditional recipes, and select ingredients for innovation and large-scale production.	Analyze
CO3	Design standardized processes, perform sensory tests, and compare product quality using statistical tools.	Evaluate
CO4	Evaluate shelf-life, packaging systems, and regulatory requirements for food product safety and stability.	Evaluate
CO5	Develop marketing strategies, assess consumer preferences, and analyze successful and failed case studies.	Create

Mapping with Programme Outcomes

COS	**PO1**	**P02**	**PO3**	**PO4**	**PO5**	**PO6**
CO1	**3**	**3**	**3**	**2**	**2**	**2**
CO2	**3**	**3**	**3**	**3**	**3**	**2**
CO3	**3**	**3**	**3**	**3**	**3**	**2**
CO4	**3**	**3**	**3**	**3**	**3**	**3**
CO5	**2**	**2**	**3**	**2**	**3**	**3**
3 - Strong; 2 - Medium; 1 – Some						

Assessment Pattern

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

Passed in BoS Meeting held on 20/06/2025
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BOARD OF STUDIES

Syllabus

K.S. Rangasamy College of Technology – Autonomous R 2025

M.Tech. Food Technology

70 PFT E33 – Food Product Design and Development

Semester	Hours / Week			Total Hours	Credit	Maximum Marks		
	L	T	P		C	CA	ES	Total
II	3	0	0	45	3	40	60	100

New product development Introduction-new products, customers and consumers, value addition, market. Marketing characteristics of new products- Product life cycle, profit picture. Corporate avenues for growth and profitability, opportunities in the market place for new product development, technological advances driving new product development, government's role in new product development.	[9]
Designing new products New Food Product Development (NPD) process and activities, NPD success factors, new product design, food innovation case studies, market-oriented NPD methodologies, organization for successful NPD; Recipe development; use of traditional recipe and modification; involvement of consumers, chefs and recipe experts; selection of materials/ingredients for specific purPOses; modifications for production on large scale, cost effectiveness, nutritional needs or uniqueness; Use of novel food ingredients and novel processing technologies.	[9]
Standardization & Large scale production Process and equipment design; establishing process parameters for optimum quality; sensory evaluation; lab requirements; different techniques and tests; statistical analysis; application in product development and comparison of market samples; stages of the integration of market and Sensory analysis	[9]
Quality, Safety & Regulatory aspects Product stability; evaluation of shelf life; changes in sensory attributes and effects of environmental conditions; accelerated shelf-life determination; developing packaging systems for maximum stability and cost effectiveness; regulatory aspects; approval for proprietary product	[9]
Advertisement, Marketing & Case studies Product performance testing market POsitioning, Marketing: developing test market strategies; various tools and methodologies to evaluate consumer attitudes, preferences and market acceptance factors; Case Studies- successes and failures, innovation, best practices, technological and marketing approaches to NPD; food choice models and new product trends	[9]
Total Hours:	**45**

Text Book(s):

1.	Brody, A.L. and John B.L. ,"Developing New Food Products for a Changing Marketplace", 2nd Edition, CRC press, Taylor and Francis Group, UK, 2008.
2.	Gordon W Fuller., "New Food Product Development: From Concept to Market place",3rd Edition, CRC press, Taylor and Francis Group, UK, 2016.

Reference(s):

1.	Catherine Side., "Food Product Development: Based on Experience",2nd Edition, Low State Press, Black well publications, 2008.

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Course Contents and Lecture Schedule

S.No.	Topic	No.of Hours
1	**New Product Development**	
1.1	Introduction to New Products	1
1.2	Value Addition	1
1.3	Marketing Characteristics	2
1.4	Product Life Cycle	1
1.5	Government's Role in New Product Development	2
2	**Designing New Product**	
2.1	New food product development	1
2.2	Recipe development	2
2.3	Recipe modification	1
2.4	Involvement of customers	2
2.6	Chefs and recipe experts	1
2.7	Cost-effectiveness	1
2.8	Novel processing technologies	1
3	Standardization & large-scale production	
3.1	Process and equipment design	2
3.2	Establishing process parameters for optimum quality	1
3.3	Statistical analysis	2
3.5	Application in food product development	2
3.6	Integration of market and sensory evaluation	2
4	Quality, safety, and regulatory aspects	
4.1	Product stability	1
4.2	Evaluation of shelf life	2
4.3	Changes in sensory attributes	1
4.4	Effects of environmental conditions	1
4.6	Shelf-life determination	2
4.7	Developing packaging systems	1
4.8	Approval for proprietary products	1
5	Advertisement, marketing & case study	
5.1	Product performance	2
5.2	Marketing	1
5.3	Methodologies to evaluate consumer attitudes	2
5.4	Preferences and market acceptance factors	1
5.6	Case studies	1
5.7	Innovation in NPD	2
5.8	Technological and marketing approaches	1
5.9	Food choice models	1
	Total	45

Course Coordinator

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70 PFT E41	Advanced Grain Science and Technology	Category	L	T	P	Credit
		PE	3	0	0	3

Objectives

- To provide knowledge on the structure, properties, and post-harvest handling of cereal grains.
- To understand the processes and equipment used in rice milling and its impact on quality.
- To study wheat milling technology and the functional characteristics of wheat flour components.
- To introduce processing of other cereals like barley, corn, and oats, and their value-added products.
- To explore various cereal-based products and understand recent developments and trends in the cereal industry.

Pre-requisites

Advanced Drying Technology

Course Outcomes

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

CO1	Explain the structure and post-harvest handling methods of cereal grains, including storage and pest control.	Understand
CO2	Describe rice milling techniques, analyze changes during aging, and assess quality using modern instruments.	Evaluate
CO3	Understand wheat milling operations and evaluate dough properties using rheological tools.	Evaluate
CO4	Explain processing methods for barley, corn, and oats, and identify value-added and functional products.	Apply
CO5	Apply knowledge to develop and evaluate cereal-based food products and recognize current trends in the industry.	Create

Mapping with Programme Outcomes

COS	PO1	P02	PO3	PO4	PO5	PO6
CO1	**3**	**3**	**2**	**2**	**2**	**-**
CO2	**3**	**3**	**3**	**2**	**3**	**-**
CO3	**3**	**3**	**3**	**3**	**3**	**1**
CO4	**3**	**2**	**3**	**3**	**2**	**2**
CO5	**3**	**2**	**3**	**3**	**2**	**2**
3 - Strong; 2 - Medium; 1 – Some						

Assessment Pattern

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

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BOARD OF STUDIES

Syllabus

K.S. Rangasamy College of Technology – Autonomous R 2025

M.Tech Food Technology

70 PFT E41– Advanced Grain Science and Technology

Semester	Hours / Week			Total Hours	Credit	Maximum Marks		
	L	T	P		C	CA	ES	Total
II	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, control of insects, microorganisms and rodents during storage	[9]
Rice Milling Structure. Principles of size reduction, rice milling - flow sheet. Improving nutritional properties of rice by different methods. Changes in physicochemical, pasting and milling properties during aging of rice. Water mist polishing, rice moisture conditioning, Instruments for rice quality control —rice analyzer, broken rice analyzer, fwm analyzer, rice taste analyzer.	[9]
Wheat Milling Morphology of wheat, Classification, Wheat milling - Flow sheet. Turbo milling, air classifiers. Criteria of wheat and flour quality, structure and functional properties of gluten, wheat grain protein, starch, phytochemicals, dough chemistry, rheology, evaluation of flour quality by farinograph, mixo graph, extension graph, alveo graph, rapid visco Analyzer, dynamic rheometry, mixolab.	[9]
Barley, Corn and Oat Milling Barley– Processing, finishes products and end uses. Corn–wet and dry milling, Manufacture of value-added products such as ze in from corn. Oat milling and flaking. Dietary fibre from barley and oats: β glucan structure, extraction, physiological effects and functional properties.	[9]
Cereal Products Rice snack foods, Rice noodles, quick cooking rice, canned and frozen rice, Baby foods, extruded rice, puffed rice cake, pasta, instant noodles, breakfast cereals, cereal enrichment, malted cereals, Special food ingredients from cereals, future trends.	[9]
Total Hours:	**45**

Text Book(s):

1. Karel Kulp., “Hand book of Cereal Science and Technology”, 2nd Edition, CRC Press,2000.
2. Amalendu Chakraverty, ArunS. Mujumdar, Hosahalli S. Ramaswamy., “Handbook of Postharvest Technology: Cereals, Fruits, Vegetables, Tea, and Spices”,1st Edition, CRC Press,2003.

Reference(s):

1. Serna-Saldivar, Sergio O.,“Cerealgrains: Properties, Processing and Nutritional Attributes”,1st Edition, CRC Press, 2016.

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Course Contents and Lecture Schedule

S. No.	Topic	No. of Hours
1	**Grains**	
1.1	Structural components of cereal grains	1
1.2	Engineering properties of grains	1
1.3	Harvesting	2
1.4	Threshing and Grain cleaning	1
1.5	Stored grain management	2
2	**Rice Milling**	
2.1	Structure and principle of size reduction	1
2.2	Rice milling flow sheet	2
2.3	Improving nutritional properties of rice	1
2.4	Changes in Physio-chemical properties	2
2.6	Instruments for rice quality	1
2.7	Instruments for rice quality	1
2.8	FWM Analyzer	1
3	**Wheat Milling**	
3.1	Morphology of Wheat	2
3.2	Wheat Milling	1
3.3	Structure and Functional properties of gluten	2
3.5	MIxo graph	2
3.6	Mixo lab	2
4	**Barley, Corn and Oat milling**	
4.1	Barley processing	1
4.2	Corn wet and dry milling	2
4.3	Manufacturing of Value-added products	1
4.4	Oat Milling and Flaking	1
4.6	Dietary Fiber from barley	2
4.7	Physiological effects	1
4.8	Functional Properties	1
5	**Cereal Products**	
5.1	Rice snack foods	2
5.2	Rice Noodles	1
5.3	Quick cooking rice	2
5.4	Canned and Frozen rice	1
5.6	Instant Noodles	1
5.7	Cereal enrichment	2
5.8	Malted Cereals	1
5.9	Special Food ingredients	1
	Total	45

Course Designers

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70 PFT E42	Food Additives, Nutraceuticals and Functional Foods	Category	L	T	P	Credit
		PE	3	0	0	3

Objectives

- To introduce the types, functions, and applications of food additives in processed foods.
- To understand the role of nutraceuticals and functional ingredients in promoting specific health benefits.
- To explore ingredients used for eye, heart, digestive, women's, bone, and joint health.
- To gain knowledge about dietary supplements, their forms, and bioactive compounds.
- To study Asian functional foods and their health-promoting effects.

Pre-requisites

Nil

Course Outcomes

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

CO1	Classify food additives and explain their roles in improving food quality and stability.	Understand
CO2	Identify key nutraceutical ingredients for eye, heart, and digestive health and describe their sources and benefits.	Evaluate
CO3	Explain functional ingredients for women, bone, and joint health and their physiological effects.	Apply
CO4	Describe various dietary supplements, their forms, and associated bioactive compounds.	Evaluate
CO5	Discuss Asian functional foods and evaluate their health effects based on scientific evidence.	Evaluate

Mapping with Programme Outcomes

COS	PO1	P02	PO3	PO4	PO5	PO6
CO1	**3**	**3**	**2**	**2**	**2**	**2**
CO2	**3**	**3**	**3**	**2**	**3**	**2**
CO3	**3**	**3**	**3**	**3**	**3**	**2**
CO4	**3**	**2**	**3**	**3**	**2**	**3**
CO5	**2**	**2**	**3**	**3**	**2**	**3**
3 - Strong; 2 - Medium; 1 – Some						

Assessment Pattern

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

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Syllabus

K.S. Rangasamy College of Technology – Autonomous R 2025

M.Tech Food Technology

60PFTE42–Food Additives, Nutraceuticals and Functional Foods

Semester	Hours / Week			Total Hours	Credit	Maximum Marks		
	L	T	P		C	CA	ES	Total
II	3	0	0	45	3	40	60	100

Food Additives Introduction, classification and functions; Role of additives in foods - preservatives, antioxidants, sequestrants, emulsifiers -selection of emulsifier based on Hydrophilic and Lipophilic balance (HLB)and its application, stabilizers and thickeners, bleaching and maturing agents, starch modifiers, food colourants and colour retention agents, sweeteners, humectants, flavourants and flavour enhancers, leavening agents, pH control agents, fat substitutes and replacers, anti-foaming agents. International Product Code.	[9]
Introduction to Nutraceuticals and Eye, Heart and Digestive Health Ingredients Sources, understanding benefits of nutraceuticals. Scope involved in industry, Indian and global scenario. Eye health ingredients — lutein, zeaxanthin, astaxanthin, beta-carotene, bilberry extracts; Heart health ingredients - omega-3, omega-6, omega-9, beta-glucan, soy protein, phytosterols; Digestive Health Ingredients– prebiotics, probiotics, synbiotics, digestive enzymes, zinccarnosine.	[9]
Women Health Ingredients and Bone and Join the alth ingredients Women health ingredients - Vitamin D, iron, calcium, soy isoflavones, folic acid, cranberry extract, lycopene, phytoestrogens. Prebiotic fiber, glucosamine, chondroitin, collagen peptide, hyaluronic acid, devil sclaw, olive polyphenols, boswelia Serrata, horsetail extract.	[9]
Dietary Supplements and Functional food and beverages Introduction to dietary supplements, Dietary supplements—Need for dietary supplements, supplements forms- tablets, capsules, powders, softgels, gelcaps, liquids. Agnuscastus, Aloevera, Bee products, Chitosan, Echinacea, Garlic, Ginger, Ginkg obiloba, Ginseng, Guarana, Kelp, Milk thistle, Saw palmetto, Spirulina, Chlorella, Hypericum perforatum, Tea extracts.	[9]
Asian Functional Food Functional Foods from Meat, Fruit, Fermented Vegetable Products: Kimchi, Sugarcane, Garlic, Onion, Date Fruits, Japanese Green Tea, Miso, Fermented Soybean Products. Cereal based Functional food and their health effects.	[9]
Total Hours:	**45**

Text Book(s):

1.	Wildman, Robert E.C.,Robert Wildman,Taylor C.Wallace(Eds).,"Hand book of Nutraceuticals And Functional Foods",2nd edition, CRC Press, New York, 2007.
2.	Titus A. M. M sagati.,"Chemistry of Food Additives and Preservatives", 1st edition, Wiley-Blackwell,2013.

Reference(s):

1.	John Shi,Chi-Tang Ho and Fereido on Shahidi.,"Asian Functional Foods",1st Edition, CRC Press, 2005.

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Course Contents and Lecture Schedule

S. No.	Topic	No.of Hours
1	**Food Additives**	
1.1	Classification and Function	1
1.2	Role of Additives in food	1
1.3	Selection of Emulsifier based on hydrophilic and lipophilic balance	2
1.4	Flavourants	1
1.5	International Product Code	2
2	**Introduction to Nutraceuticals and Eye, Heart and Digestive Health Ingredients**	
2.1	Sources	1
2.2	Scope involved in the industry	2
2.3	Indian and Global Scenario	1
2.4	Eye health ingredients	2
2.6	Heart Health Ingredients	1
2.7	Digestive health ingredients	1
2.8	Prebiotics and Probiotics	1
3	**Women Health Ingredients and Bone and Joint Health ingredients**	
3.1	Woman Health ingredients	2
3.2	Prebiotic fibre	1
3.3	Hyaluronic acid	2
3.5	Devils Claw	2
3.6	Horsetail extract	2
4	**Dietary Supplements and Functional Foods and Beverages**	
4.1	Introduction to dietary supplements	1
4.2	Need for dietary supplements	2
4.3	Supplements from capsules	1
4.4	Agnus Castus	1
4.6	Milk Thistle	2
4.7	Spirulina	1
4.8	Tea extracts	1
5	**Asian Functional Food**	
5.1	Functional Foods from meat	2
5.2	Fruits	1
5.3	Fermented Vegetables	2
5.4	Sugarcane	1
5.6	Japanese green tea	1
5.7	Miso	2
5.8	Fermented soybeans products	1
5.9	Cereal based functional foods	1
	Total	45

Course Designers

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70 PFT E43	Advanced Beverage Technology	Category	L	T	P	Credit
		PE	3	0	0	3

Objectives

- To introduce the classification, nutritional importance, and ingredient properties of beverages.
- To study the formulation, processing, and packaging of non-alcoholic beverages.
- To understand the production processes and defects in various alcoholic beverages.
- To learn carbonation processes, equipment, and formulation of different carbonated beverages.
- To explore quality control, sanitation, and regulatory standards in the beverage industry.

Course Outcomes

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

CO1	Explain the classification and nutritional aspects of beverages and describe the functions of various ingredients used.	Understand
CO2	Describe the production, formulation, and preservation methods of non-alcoholic beverages like fruit-based and milk-based drinks.	Apply
CO3	Understand the types and manufacturing processes of alcoholic beverages and identify common defects.	Understand
CO4	Demonstrate knowledge of syrup preparation, carbonation, and equipment used in the manufacture of carbonated beverages.	Apply
CO5	Evaluate the quality parameters, sanitation practices, and regulatory standards followed in the beverage industry.	Evaluate

Mapping with Programme Outcomes

COS	PO1	P02	PO3	PO4	PO5	PO6
CO1	**3**	**2**	**2**	**2**	**2**	**2**
CO2	**3**	**3**	**3**	**2**	**3**	**2**
CO3	**3**	**3**	**3**	**3**	**3**	**2**
CO4	**3**	**3**	**3**	**3**	**3**	**3**
CO5	**3**	**3**	**2**	**3**	**2**	**3**
3 - Strong; 2 - Medium; 1 – Some						

Assessment Pattern

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

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Syllabus

K.S. Rangasamy College of Technology – Autonomous R 2025

M.Tech Food Technology

70 PFT E43 - Advanced Beverage Technology

Semester	Hours / Week			Total Hours	Credit	Maximum Marks		
	L	T	P		C	CA	ES	Total
II	3	0	0	45	3	40	60	100

Unit 1- Beverage Overview Beverage: Introduction, Global and Indian scenario. Classification of beverages. Nutritional benefits. Properties of ingredients - Water, sweeteners, bulking agents, acidulants, emulsifiers, stabilizers. Flavouring and Colouring agents. Threshold limits of ingredients.	[9]
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 of tender coconut water. Milk-based beverages – condensed milk, flavoured 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**

Text Book(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.Rama lakshmi, “Recent trend in Soft beverages’, Woodhead Publishing India Pvt Ltd., New Delhi 2011

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Course Contents and Lecture Schedule

S. No.	Topic	No. of Hours
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	Flavouring and Colouring agents	1
1.9	Threshold limits of ingredients.	1
2	**Non-alcoholic Beverages**	
2.1	Carbonated beverages - types of soft drinks and their functions	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 natural fruit-based juices, squash	1
2.5	Formulation of various natural fruit-and RTS (ready to serve)- a modern method of processing	1
2.6	Preservation of tender coconut water	1
2.7	Milk-based beverages – condensed milk	1
2.8	Milk-based beverages – flavoured 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	1
4.2	Carbonation of soft drinks	1
4.3	Filling, packaging	1
4.4	Containers, and closures.	1
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.	1
5	**Quality Control**	
5.1	Quality control in soft drink industries	1
5.2	Water and other ingredient quality	1
5.3	Requirements of Soluble solids in beverages	1

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5.4	Requirements of titratable acidity in beverages	1
5.5	Threshold limits of ingredients	1
5.6	Standards and regulations in India	1
5.7	Sanitation and Hygiene in Beverage Industries	1
5.8	HACCP concept.	2
	Total	**45**

Course Designers

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70 PFT E51	Snacks and Extruded Products Technology	Category	L	T	P	Credit
		PE	3	0	0	3

Objectives

- To understand the current scenario and classification of snack foods in India.
- To study the raw materials, ingredients, and their roles in snack food formulations.
- To explain the processing technologies for corn-based, potato-based, and rice-based snacks.
- To introduce extrusion technology and its application in snack food production.
- To describe the production of pasta and other ready-to-eat convenience foods.

Pre-requisites

Food Safety and Quality Control

Course Outcomes

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

CO1	Explain the types and ingredients of snack foods and describe the current status of the Indian snack food industry	Understand
CO2	Describe and apply the processing methods of corn-based snacks like popcorn, tortilla chips, and corn puffs.	Apply
CO3	Illustrate the production process of potato and rice-based snacks and identify quality parameters.	Apply
CO4	Understand extrusion technology and its applications in the production of breakfast cereals and other snack foods.	Apply
CO5	Explain the processing steps for pasta, pretzels, and other convenience food products.	Understand

Mapping with Programme Outcomes

COS	PO1	P02	PO3	PO4	PO5	PO6
CO1	**3**	**2**	**2**	**2**	**2**	**-**
CO2	**3**	**3**	**3**	**2**	**3**	**1**
CO3	**3**	**3**	**3**	**3**	**3**	**2**
CO4	**3**	**2**	**3**	**3**	**2**	**2**
CO5	**3**	**3**	**3**	**3**	**3**	**2**
3 - Strong; 2 - Medium; 1 – Some						

Assessment Pattern

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

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Syllabus

K.S. Rangasamy College of Technology–Autonomous R 2025

70 PFT E51 - Snacks and Extruded Products Technology

M. Tech. Food Technology

Semester	Hours/Week			Total hours	Credit	Maximum Marks		
	L	T	P		C	CA	ES	Total
III	3	0	0	45	3	40	60	100

Introduction: Current status of snack food industry in India. Types of snack food — Raw Vegetable Snack, Formed dough products from potato and maize derivatives, Directly expanded extruded snack, Puffed Snacks and other. Types and Functions of ingredients – structure forming materials, dispersed phase/filling materials, plasticizers/lubricants, soluble solids, nucleating substances, colouring and flavouring substances.	[9]
Corn Based Snacks: Popcorn-Popping methods, oil popping and dry popping. Commercial and industrial popcorn process. Flavourings and Applicators. Tortilla chip processing-Corn soaking, steeping, milling, Sheeting and Cutting, Baking and Frying, cooling, addition of flavour. Corn puff-production process.	[9]
Potato and Rice based Snacks: Potato chips production process: Pre cleaning and peeling, slicing, drying/frying, salting and seasoning, quality control. Fabricated potato snacks – potato flakes, potato granules, potato starch, ground and crushed dehydratedpotato.RicebasedSnacks–Productsusingwholegrains–Puffedrice, flaked rice, papad production, products using flours.	[9]
Extrusion Technology: 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]
Pasta and other Products: Overview of pasta making process, Types of Pasta products, Production process of Spaghetti, noodles and macaroni. Pretzel–Types–Formulation and Processing 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. Edmund W. Lusas andLloydW.Rooney,"SnackFoodProcessing",1st Edition, CRC Press,Florida,2001.
2. Robin Guy, "Extrusion cooking: Technologies and Applications",1st Edition, CRC Press,Florida,2001

Reference(s):

1. Panda H., "The Complete Technology Book on Snack Foods", National Institute of Industrial Research, New Delhi,2003
2. Sergio O. Serna-Saldivar, "Industrial Manufacture of Snack Food "Wood head Publishing, New Delhi, 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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Course Contents and Lecture Schedule

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S. No	Topic	No. of Hours
1	**Introduction**	
1.1	Current status of snack food industry in India.	1
1.2	Types of snack food — Raw Vegetable Snack, Formed dough products from potato and maize derivatives,	1
1.3	Directly expanded extruded snack, Puffed Snacks and other.	1
1.4	Types and Functions of ingredients – structure forming materials,	1
1.5	Dispersed phase/filling materials,	1
1.6	Plasticizers/lubricants,	1
1.7	Soluble solids,	1
1.8	Nucleating substances,	1
1.9	Colouring and flavouring substances	1
2	**Corn Based Snacks**	
2.1	Popcorn – Popping methods, oil popping and dry popping.	2
2.2	Commercial and industrial popcorn process. Flavourings and Applicators	2
2.3	Tortilla chip processing — Corn soaking, steeping, milling, Sheeting and Cutting,	2
2.4	Baking and Frying, cooling, addition of flavour.	1
2.5	Corn puff–production process.	2
3	**Potato and Rice based Snacks**	
3.1	Potato chips production process: Pre cleaning and peeling, slicing, drying/frying, salting and seasoning, quality control.	2
3.2	Fabricated potato snacks – potato flakes, potato granules,	1
3.3	potato starch, ground and crushed dehydrated potato.	1
3.4	Rice based Snacks.	1
3.5	Products using whole grains	1
3.6	Puffed rice, flaked rice, papad production,	2
3.7	Products using flours	1
4	**Extrusion Technology**	
4.1	Food Extrusion: Definition, introduction to extruders,	1
4.2	principles and types(Single screw extruder and Twins crew 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
5	**Pasta and other Products**	
5.1	Overview of pasta making process, Types of Pasta products,	1
5.2	Production process of Spaghetti, noodles and macaroni.	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**

Course Designers

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70 PFT E52	Internet of Things in Food and Agriculture	Category	L	T	P	Credit
		PC	3	0	0	3

Objectives

- To introduce the fundamentals and architecture of the Internet of Things (IoT).
- To familiarize students with Python programming and hardware platforms for IoT.
- To explore applications of IoT in agriculture and the food industry.
- To understand the role of IoT in food safety, spoilage prevention, and quality control.
- To study IoT-based traceability and food waste management systems.

Pre-requisites

NIL

Course Outcomes

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

CO1	Describe the characteristics, architecture, and protocols of IoT systems and identify implementation challenges.	Understand
CO2	Write Python programs and interface physical devices such as Raspberry Pi for IoT applications.	Apply
CO3	Explain the use of IoT in agriculture and food supply chains, including RFID integration and big data analytics.	Analyze
CO4	Analyze IoT solutions for food safety and spoilage detection using biosensors and wearable devices.	Analyze
CO5	Design IoT-based systems for food traceability and food waste management using smart sensing technologies.	Create

Mapping with Programme Outcomes

COS	PO1	P02	PO3	PO4	PO5	PO6
CO1	**3**	**2**	**2**	**2**	**3**	**2**
CO2	**3**	**2**	**2**	**2**	**3**	**2**
CO3	**3**	**3**	**3**	**3**	**3**	**3**
CO4	**3**	**3**	**3**	**3**	**3**	**3**
CO5	**3**	**3**	**3**	**3**	**3**	**3**
3 - Strong; 2 - Medium; 1 – Some						

Assessment Pattern

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

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BOARD OF STUDIES

Syllabus

K.S. Rangasamy College of Technology–Autonomous R 2025

70 PFT E52–Internet of Things in Food and Agriculture

M. Tech. Food Technology

Semester	Hours / Week			Total Hours	Credit	Maximum Marks		
	L	T	P		C	CA	ES	Total
III	3	0	0	45	3	40	60	100

Introduction to Internet of Things (IoT) Definition and Characteristics of IoT, Physical Design of IoT – IoT Protocols, IoT Communication Models - IoT Communication application programming interfaces – IoT enabled technologies – Wireless Sensor Networks - Cloud Computing – Big data analytics – Communication Protocols, Embedded Systems – IoT Levels and Templates - organizational implementation and management challenges.	[9]
Python, Physical Devices and Endpoints for IoT Language features of Python, Data types, data structures, Control of flow, functions, modules, packaging, classes, exception handling. Python packages – HTTPLib, URLLib, SMTPLib. Introduction to Raspberry PI – Interfaces (serial, Serial Peripheral Index (SPI), I2C Programming) – Python program with Raspberry PI with focus of interfacing external gadgets – controlling output – reading input from pins – connecting IoT to Cloud – Xively.	[9]
IoT in Agriculture and IoT in Food Smart agriculture, type of IoT sensors for agriculture – monitoring of climate conditions, Greenhouse automation, crop management, cattle monitoring and management, End-to-End farm management systems. Benefits and applications of smart farming, Issues and challenges in food and agriculture-efficient routing protocols and ambient energy harvesting for IoT. RFID and sensor network integration in food industry - RFID in food production, food supply chain, retailing and sustainability. RFID in sensor network and food processing - Case studies - Big data analytics in food industries - Food supply chain visibility, Intelligent food supply chain. Blockchain - Concepts - Potential Applications in Food Industry.	[9]
IoT in Food Spoilage and Safety Importance of IoT concerning food quality, safety and security. Biosensors for detection of foodborne pathogens – prevention & retardation of food spoilage. Microbial detection, GIS, Sensor Networks. Case study on ensuring safety by enhanced IoT. IoT linked wearable devices for managing food safety in the healthcare sector.	[9]
IoT in Food Traceability and IoT in Food Waste Management Food Traceability: Need of new technologies in food traceability systems. Architecture of traceability system - ICT & Electronic Product Code (EPC) enabled systems. Real-time tracking and remote monitoring – Wireless sensing technologies, remote communications, and Intelligent traceability. Food Waste Management: Scope and significance of IoT in food waste management. Smart Garbage System (SGS) - components, design, architecture of SGS, implementation and efficiency, real-time application in food waste	[9]
Total Hours:	**45**

Text Book(s):

1. Qusay F. Hassan, Attaur Rehman Khan, Sajjad A. Madani. "Internet of Things: Challenges, Advances, and Applications," 1st Edition, CRC Press, Taylor and Francis Group, 2017.
2. Selwyn Piramuthu, Weibiao Zhou. "RFID and Sensor Network Automation in the Food Industry: Ensuring Quality and Safety through Supply Chain Visibility," 1st Edition, Wiley & Sons,UK, 2016.

Reference(s):

1. Montserrat Espiñeira, Francisco J. Santaclara. *Advances in Food Traceability Techniques and Technologies: Improving Quality Throughout the Food Chain*, 1st Edition, Woodhead Publishing, 2016.

Passed in BoS Meeting held on 20/06/2025
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Course Contents and Lecture Schedule

S. No.	Topic	No. of Hours
1	**Introduction to internet of Things (IoT)**	
1.1	Definition and Characteristics of IoT	1
1.2	Communication application programing interfaces	1
1.3	Big Data Analytics	2
1.4	Communication Protocols	1
1.5	Embedded systems	2
2	**Python, Physical Devices and End points for IoT**	
2.1	Language Features of Python	1
2.2	Data types	2
2.3	Data structures	1
2.4	Control of Flow	2
2.6	12C Programming	1
2.7	Rasp berry Pi	1
2.8	Connecting IoT cloud Xively	1
3	**IoT in Agriculture and IoT in Food**	
3.1	Smart Agriculture	2
3.2	Type of IoT Sensors	1
3.3	Monitoring of Climate Conditions	2
3.5	RFID Sensors	2
3.6	Block chain concepts	2
4	**IoT in Food Spoilage and Safety**	
4.1	Importance of IoT concerning food quality	1
4.2	Bio sensors	2
4.3	Microbial detection	1
4.4	GIS	1
4.6	Sensornet works	2
4.7	IoT linked wearable	1
4.8	Health Sector	1
5	**IoT in Food Traceability and IoT in Food Waste Management**	
5.1	Food Traceability	2
5.2	Need of new technologies	1
5.3	Real time tracking and remote monitoring	2
5.4	Wireless sensing Technology	1
5.6	Remote Communication	1
5.7	Intelligent Traceability	2
5.8	Food Waste Management	1
5.9	Smart Garbage	1
	Total	45

Course Designer(s)

Ms. Srinithi Priya B - srinithipriya@ksrct.ac.in

Passed in BoS Meeting held on 20/06/2025
Approved in Academic Council Meeting held on 19/07/2025

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70 PFT E53	Sensory Evaluation of Foods	Category	L	T	P	Credit
		PC	3	0	0	3

Objective

- To introduce the principles and importance of sensory evaluation in the food industry.
- To understand the human sensory systems and factors influencing sensory perception.
- To learn the planning and execution of sensory experiments using appropriate test methods.
- To apply descriptive, discriminative, and affective test methods for food evaluation.
- To explore sensory applications in product development and consumer research.

Prerequisite

Nil

Course Outcomes

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

CO1	Define sensory evaluation and explain the sensory modalities and factors influencing sensory measurement.	*Understand*
CO2	Plan sensory projects including test design, product type, sample presentation, and selection of appropriate statistical tools.	*Apply*
CO3	Perform discriminative tests like triangle, duo-trio, and paired comparison to detect sensory differences.	*Apply*
CO4	Conduct descriptive and affective tests to generate detailed product profiles and consumer preferences.	*Analyze*
CO5	Evaluate the role of sensory evaluation in new product development and adapt testing for specific consumer groups.	*Create*

Mapping with Programme Outcomes

COS	PO1	P02	PO3	PO4	PO5	PO6
CO1	**3**	**2**	**2**	**2**	**2**	**2**
CO2	**3**	**2**	**3**	**2**	**2**	**2**
CO3	**3**	**3**	**3**	**3**	**3**	**2**
CO4	**3**	**3**	**3**	**3**	**3**	**3**
CO5	**3**	**3**	**3**	**3**	**3**	**3**
3 - Strong; 2 - Medium; 1 – Some						

Assessment Pattern

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

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Syllabus

K.S. Rangasamy College of Technology–Autonomous R 2025

70 PFT E53 - Sensory Evaluation of Foods

M.Tech. Food Technology

Semester	Hours/Week			Total hours	Credit	Maximum Marks		
	L	T	P		C	CA	ES	Total
III	3	0	0	60	3	40	60	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. Similarity test - 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+15(Tutorial)	45

Textbook(s):

1.	Sarah Kemp, Tracey Hollowood, Joanne Hort., "Sensory Evaluation: A Practical Handbook", 1st Edition, Wiley Blackwell 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, Hetaher A.Thomas., "Sensory Evaluation Practices", 4th Edition, Academic Press, 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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S. No.	Topic	No. of Hours
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
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**

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Course Contents and Lecture Schedule

Course Designer

Mr. S. Nithishkumar – nithishkumar@ksrct.ac.in

70 PFT E61	Modern Food Packaging Technology	Category	L	T	P	Credit
		PE	3	0	0	3

Objectives

- Understand the evolution, role, and regulatory aspects of food packaging.
- Explore the characteristics and functions of various food packaging materials.
- Learn about advanced packaging techniques and technologies.
- Analyze packaging requirements for different food categories and related machinery.
- Evaluate sustainability issues and innovative trends in food packaging.

Pre-requisites

Nil

Course Outcomes

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

CO1	**Understand** how food packaging started, what it does, and the rules that govern it.	Understand
CO2	**Learn and compare** different packaging materials and how they affect food.	Evaluate
CO3	**Use** modern packaging methods like MAP, CAP, vacuum, and smart packaging in real-life situations.	Apply
CO4	**Figure out** the right packaging for different foods and **check** how machines and tests help keep food safe and fresh.	Evaluate
CO5	**Think of eco-friendly ideas** using new tech like AI, IoT, and biodegradable materials to make packaging better for the planet.	Create

Mapping with Programme Outcomes

COS	PO1	P02	PO3	PO4	PO5	PO6
CO1	**3**	**2**	**2**	**2**	**2**	**2**
CO2	**3**	**3**	**3**	**2**	**3**	**3**
CO3	**3**	**3**	**3**	**3**	**3**	**3**
CO4	**3**	**3**	**3**	**3**	**3**	**3**
CO5	**3**	**3**	**3**	**3**	**3**	**3**
3 - Strong; 2 - Medium; 1 – Some						

Assessment Pattern

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

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Syllabus

K.S. Rangasamy College of Technology – Autonomous R 2025

M.Tech Food Technology

70 PFT E61– Modern Food Packaging Technology

Semester	Hours / Week			Total Hours	Credit	Maximum Marks		
	L	T	P		C	CA	ES	Total
III	3	0	0	45	3	40	60	100

Introduction to Food Packaging Historical development of food packaging, functions of food packaging, types of packaging materials - metal, glass, paper, plastics, composite materials, characteristics of food packaging materials, permeability and barrier properties, food-package interaction, migration studies, regulatory aspects of food packaging, printing and labeling on food packages.	[9]
Packaging Systems and Techniques Aseptic packaging - principles and applications, modified atmosphere packaging (MAP), controlled atmosphere packaging (CAP), vacuum packaging, active packaging - oxygen scavengers and moisture absorbers, intelligent packaging - sensors and indicators, biodegradable packaging materials, edible coatings and films, nanotechnology in food packaging, smart packaging trends.	[9]
Packaging of Different Food Products Packaging of fresh fruits and vegetables, packaging of dairy products - milk, cheese, yogurt, packaging of bakery and confectionery products, packaging of meat and poultry, packaging of seafood, packaging of frozen and refrigerated foods, packaging of ready-to-eat and processed foods, packaging of beverages - carbonated and non-carbonated, packaging of dry food products - cereals, pulses, spices, case studies on food packaging.	[9]
Packaging Machinery and Testing Types of packaging machinery - filling, sealing, labeling, and wrapping, vacuum packaging machines, extrusion and thermoforming machines, packaging line automation, testing of packaging materials - mechanical, chemical, and barrier properties, shelf-life testing of packaged foods, migration testing and food safety standards, role of packaging in logistics and supply chain management, cost analysis of food packaging, food packaging waste management strategies.	[9]
Sustainability and Future Trends in Food Packaging Environmental impact of food packaging, biodegradable and compostable packaging solutions, recycling and reuse of packaging materials, life cycle assessment (LCA) of food packaging, regulatory policies for sustainable packaging, consumer perceptions and preferences for sustainable packaging, advances in bio-based packaging materials, digital printing in food packaging, role of artificial intelligence and IoT in packaging, future innovations and research trends in food packaging technology.	[9]
Total Hours:	**45**

Text Book(s):

1. Robertson, G. L. (2016). *Food Packaging: Principles and Practice*. CRC Press.
2. Yam, K. L. (2010). *The Wiley Encyclopedia of Packaging Technology*. Wiley-Blackwell.
3. Coles, R., McDowell, D., & Kirwan, M. J. (2003). *Food Packaging Technology*. CRC Press.

Reference(s):

1. Han, J. H. (2013). Innovations in Food Packaging. Academic Press.
2. Ahvenainen, R. (2003). Novel Food Packaging Techniques. CRC Press.

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Approved in Academic Council Meeting held on 19/07/2025

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Course Contents and Lecture Schedule

S. No.	Topic	No. of Hours
1	**Introduction to Food Packaging**	
1.1	Historical development of food packaging	1
1.2	Functions of food packaging,	1
1.3	types of packaging materials - metal, glass, paper, plastics, composite materials,	1
1.4	characteristics of food packaging materials,	1
1.5	permeability and barrier properties,	1
1.6	food-package interaction,	1
1.7	migration studies,	1
1.8	regulatory aspects of food packaging,	1
1.9	printing and labeling on food packages.	1
2	**Packaging Systems and Techniques**	
2.1	Aseptic packaging - principles and applications	1
2.2	modified atmosphere packaging (MAP)	1
2.3	controlled atmosphere packaging (CAP)	1
2.4	vacuum packaging, active packaging	1
2.6	oxygen scavengers and moisture absorbers, intelligent packaging	1
2.7	sensors and indicators	1
2.8	biodegradable packaging materials, edible coatings and films	1
2.9	nanotechnology in food packaging, smart packaging trends	1
3	**Packaging of Different Food Products**	
3.1	Packaging of fresh fruits and vegetables,	1
3.2	packaging of dairy products - milk, cheese, yogurt,	1
3.3	packaging of bakery and confectionery products,	1
3.4	packaging of meat and poultry, packaging of seafood,	1
3.5	packaging of frozen and refrigerated foods,	1
3.6	packaging of ready-to-eat and processed foods,	1
3.7	packaging of beverages - carbonated and non-carbonated,	1
3.8	packaging of dry food products -	1
3.9	Cereals, pulses, spices, case studies on food packaging.	1
4	**Packaging Machinery and Testing**	
4.1	Types of packaging machinery - filling, sealing, labeling, and wrapping,	1
4.2	vacuum packaging machines,	1
4.3	extrusion and thermoforming machines,	1
4.4	packaging line automation,	1
4.5	testing of packaging materials - mechanical, chemical, and barrier properties,	1
4.6	shelf-life testing of packaged foods,	1
4.7	migration testing and food safety standards,	1
4.8	role of packaging in logistics and supply chain management,	1
4.9	Cost analysis of food packaging, food packaging waste management strategies.	1
5	**Sustainability and Future Trends in Food Packaging**	
5.1	Environmental impact of food packaging, biodegradable and compostable packaging solutions	1
5.2	recycling and reuse of packaging materials	1
5.3	life cycle assessment (LCA) of food packaging	1
5.4	regulatory policies for sustainable packaging	1
5.6	consumer perceptions and preferences for sustainable packaging	1
5.7	advances in bio-based packaging materials, digital printing in food packaging	1
5.8	role of artificial intelligence and IoT in packaging	1
5.9	future innovations and research trends in food packaging technology.	1
	Total	45

Course Designers

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

Passed in BoS Meeting held on 20/06/2025
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BOARD OF STUDIES

70 PFT E62	Advanced Meat Processing Technology	Category	L	T	P	Credit
		PE	3	0	0	3

Objectives

- Understand the composition, structure, and scientific handling of meat and poultry.
- Learn quality assurance techniques and recent advancements in detecting fraud and ensuring meat traceability.
- Explore egg quality, safety, processing technologies, and bioactive applications.
- Study marine product processing methods, quality management, and value addition.
- Discover innovations in meat product development, including functional foods and alternative proteins.

Pre-requisites

Nil

Course Outcomes

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

CO1	Explain the structure and processing of meat and poultry, including pre- and post-slaughter operations.	Understand
CO2	Identify and evaluate new methods for detecting fraud, traceability, and quality in meat and eggs.	Evaluate
CO3	Describe the structure, safety, and processing of eggs and their functional properties.	Apply
CO4	Apply modern techniques in marine product processing and identify value-added uses of fish and seaweed.	Analyze
CO5	Explore and develop innovative meat products, including nitrite-free, probiotic, and alternative protein sources.	Create

Mapping with Programme Outcomes

COS	PO1	P02	PO3	PO4	PO5	PO6
CO1	**3**	**3**	**2**	**2**	**3**	**2**
CO2	**3**	**3**	**3**	**3**	**3**	**3**
CO3	**3**	**3**	**3**	**3**	**3**	**3**
CO4	**3**	**3**	**3**	**3**	**3**	**3**
CO5	**3**	**3**	**3**	**3**	**3**	**3**

3 - Strong; 2 - Medium; 1 – Some

Assessment Pattern

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

Passed in BoS Meeting held on 20/06/2025
Approved in Academic Council Meeting held on 19/07/2025

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BOARD OF STUDIES

Syllabus

K.S. Rangasamy College of Technology – Autonomous R 2025

M.Tech. Food Technology

70 PFT E62–Advanced Meat Processing Technology

Semester	Hours / Week			Total Hours	Credit	Maximum Marks		
	L	T	P		C	CA	ES	Total
III	3	0	0	45	3	40	60	100

Meat and Advances in Meat Quality Assurance Chemical composition and structure of meat. Scientific slaughter: stunning techniques – mechanical & electrical. Pre-and post-slaughter operations. Factors affecting post-mortem changes. Advances in meat fraud detection. Gene technology for meat traceability and safety. Rapid identification of animal and meat quality. Drug residues in meat.	[9]
Poultry Meat Birds common 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-products from poultry processing. Low fat, low salt poultry products. Problems and solutions in deboning of poultry meat. Poultry waste management – selecting the right approach.	[9]
Egg Commercially important eggs. Hen egg - structure, composition, chemical contaminants in eggs. Pre harvest measures to improve the safety of eggs. Advances in egg defect detection and quality assessment. Traceability of eggs along the supply chain. Effects of processing on the allergenicity of egg proteins. Bioactive egg compounds - applications. Frozen egg products. Designer eggs.	[9]
Marine Products Processing Edible products from the sea. Fish – types, on-board fish processing and its advantages. Individual quick freezing. Retort pouch processing of fish. Quality chain management in fish processing. Food utilization of by-catch and underutilized species; advances in fishery by-products technology - production of fish protein concentrate, fish liver oil, fish sauce, and insulin. Bioactive substances from seaweeds.	[9]
Advances in Meat Products and Processing Operations Accelerated conditioning technologies for meat. New approaches for the development of functional meat products. Tailored designing of nitrite-free meat products. Latest developments in meat bacterial starters. Probiotic meat products, spreadable raw fermented sausage. Advances in the manufacture of sausage casings. Advances in bulk packaging for the transport of fresh fish. New sources of animal protein – cultured meat, edible insects.	[9]
Total Hours:	**45**

Text Book(s):

1. AlaaEl-DinA, Bekhit.,"Advances in Meat Processing Technology",1st Edition, CRC Press, USA, 2017.
2. George M. Hall, "Fish Processing: Sustainability and New Opportunities",1st Edition, Wiley Blackwell Publications, USA, 2011.

Reference(s):

1. Patricia Hester., "Egg Innovations and Strategies for Improvements",1st Edition, Academic Press, UK, 2017.

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Course Contents and Lecture Schedule

S. No.	Topic	No. of Hours
1	**Meat and Advances in meat quality Assurance**	
1.1	Chemical composition and structure of meat	1
1.2	Scientifics laughter	1
1.3	Factors affecting postmortem changes	2
1.4	Advances in meat fraud detection	1
1.5	Drug residues in meat	2
2	**Poultry Meat**	
2.1	Birds commemorative bird marketing system	1
2.2	Poultry birds pre slaughter	2
2.3	Co products and-byproducts from poultry processing	1
2.4	Low fat products	2
2.6	Problems and solution in bonding	1
2.7	Poultry waste management	1
2.8	Selecting the right approach	1
3	**Egg**	
3.1	Commercially important eggs	2
3.2	Hen egg structure composition	1
3.3	Advances in egg defect detection	2
3.5	Effects of processing on the allergenic of egg protein	2
3.6	Bioactive egg compounds	2
4	**Marine Products processing**	
4.1	Edible products from sea	1
4.2	On board fish processing	2
4.3	Quality chain management in fish processing	1
4.4	Food utilization by catch	1
4.6	Advances in fishery by-product technology	2
4.7	Production of fish protein concentrate	1
4.8	Fish liver oil	1
5	**Advances in Meat products and Processing Operations**	
5.1	Accelerating conditioning technologies	2
5.2	New approaches for development of functional meat	1
5.3	Designing of nitrite free meat products	2
5.4	Latest developments in meat bacterial starters	1
5.6	Probiotic meat	1
5.7	Spread able raw fermented as usage	2
5.8	Advances in manufacturing sausage casings	1
5.9	New sources of animal protein	1
	Total	45

Course Designers

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70 PFT E63	Advanced Dairy	Category	L	T	P	Credit

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	Technology	PE	3	0	0	3

Objectives

- Understand the composition, properties, and bioactive potential of milk and the factors affecting them.
- Examine the effects of heat treatment and explore biotech applications in dairy processing.
- Explore non-thermal and emerging technologies in advanced dairy processing.
- Learn about the manufacture of specialized dairy products and innovations in formulation.
- Understand operational challenges, fouling control, and automation strategies in the dairy industry.

Pre-requisites

Cooling Technology for Food Processing

Course Outcomes

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

CO1	Explain the components and physical properties of milk, and how processing affects them.	Understand
CO2	Analyze heat-induced reactions and evaluate biotech approaches in dairy products.	Analyze
CO3	Apply non-thermal and advanced processing methods for improving dairy product safety and shelf life.	Apply
CO4	Describe and assess the manufacturing processes of innovative dairy and dairy-like products.	Evaluate
CO5	Identify operational limitations and propose automation strategies for efficient dairy processing.	Create

Mapping with Programme Outcomes

COS	**PO1**	**P02**	**PO3**	**PO4**	**PO5**	**PO6**
CO1	**3**	**3**	**2**	**2**	**3**	**2**
CO2	**3**	**3**	**3**	**3**	**3**	**3**
CO3	**3**	**3**	**3**	**3**	**3**	**3**
CO4	**3**	**3**	**3**	**3**	**3**	**3**
CO5	**3**	**3**	**3**	**3**	**3**	**3**
3 - Strong; 2 - Medium; 1 – Some						

Assessment Pattern

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

Passed in BoS Meeting held on 20/06/2025
Approved in Academic Council Meeting held on 19/07/2025

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Syllabus

K.S. Rangasamy College of Technology – Autonomous R 2025

M.Tech Food Technology

70 PFT E63– Advanced Dairy Technology

Semester	Hours / Week			Total Hours	Credit	Maximum Marks		
	L	T	P		C	CA	ES	Total
III	3	0	0	45	3	40	60	100

Milk Constituents and Its Properties Constituents of milk, factors affecting milk composition, properties of milk - thermal, optical, electrical, and rheological properties, refractive index, effects of high-pressure treatment on constituents and properties of milk, bioactive compounds from milk, advances in fractionation and analysis of milk.	[9]
Heat-Induced Changes and Biotech Approaches in Dairy Products Chemical and physical changes in Ultra Heat Temperature treatment, heat-induced reactions in milk – surface reactions, bulk reactions. Genetically modified cheese: a novel biotechnological development. Recent biotechnological approaches in dairy and food industry: bio-functional whey-based beverages, production and enrichment of bioactive peptides derived from milk proteins, membrane bioreactors: classification, theory, applications of membrane bioreactors and fermenters in the dairy industry.	[9]
Advanced Dairy Processing Microwave processing, high-pressure processing, pulsed electric field processing, ultrasound processing, ultraviolet and pulsed light processing, advanced heating processes - extended shelf life (ESL), innovative steam injection (ISI), modern approaches to lactose production.	[9]
Dairy Products Manufacture Liquid infant formulae, anhydrous milk fat, frozen cream, dried cream, processed cheese, dairy protein products, blends and blended spreads – production and quality aspects, glycosylated whey proteins, milk imitations, fermented whey, indirect biological acidification process, manufacturing process for cholesterol reduction.	[9]
Operational Considerations, Limitations, and Automation in Dairy Industry Fouling - types, mechanisms, factors affecting fouling, biofilm - formation, detection, control. Factors contributing to automation, stages in automation in dairy, automation at the enterprise level - Enterprise Resource Planning.	[9]
Total Hours:	**45**

Text Book(s):

1. Spreer E.,“Milk and Dairy Product Technology”,1st Edition, Routlege,UK,2017.
2. Nurcan Koca.,“Technological Approaches for Novel Applications in Dairy Processing”,1st Edition,InTech Open,UK, 2022.

Reference(s):

1. Datta N., Tomasula P.M., “Emerging Dairy Processing Technologies: Opportunities for the Dairy Industry”,1st Edition,John Wiley & Sons, US,2015.

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Course Contents and Lecture Schedule

S. No.	Topic	No. of Hours
1	**Milk Constituents and its Properties**	
1.1	Constituent so milk	1
1.2	Factors affecting Milk composition	1
1.3	Properties of milk	2
1.4	Effects of high-pressure treatment	1
1.5	Advances in Fractional and Analysis of Milk	2
2	**Heat induced changes and biotech approaches in dairy products**	
2.1	Chemical and Physical changes in Ultra heat Temperature	1
2.2	Heat induced reactions	2
2.3	Genetically Modified cheese	1
2.4	Food Industry	2
2.6	Production and enrichment of bioactive peptides	1
2.7	Membrane bioreactors	1
2.8	Application of membrane bioreactor	1
3	**Advanced Dairy Processing**	
3.1	Microwave Processing	2
3.2	Pulsed electric field processing	1
3.3	Advanced heating processes	2
3.5	Extended Shelf life	2
3.6	Approaches to Lactose production	2
4	**Dairy Products Manufacture**	
4.1	Liquid infant formulation	1
4.2	Anhydrous Milk fat	2
4.3	Frozen cream	1
4.4	Production and quality aspects	1
4.6	Glycosylated whey protein	2
4.7	Indirect biological acidification process	1
4.8	Manufacturing process for cholesterol reduction	1
5	**Operational Considerations and limitations and Automation in Dairy Industry**	
5.1	Fouling types	2
5.2	Factors affecting fouling	1
5.3	Biofilm formation	2
5.4	Factors contributing to automation	1
5.6	Stages in automation in dairy	1
5.7	Automation at Enterprise level	2
5.8	Enterprise Resources Planning	2
	Total	45

Course Designers

Mr. S. Nithishkumar – nithishkumar@ksrct.ac.in

70 PAC 001	English for Research Paper	Category	L	T	P	Credit

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	Writing	AC	2	0	0	0

Objectives

- Understand the structure and language requirements of a research paper.
- Develop clarity and conciseness in academic writing.
- Gain skills for organizing key sections of a research paper, including title, abstract, introduction, and conclusion.
- Enhance skills in presenting research findings ethically and effectively.
- Learn to review, edit, and verify research work for final submission.

Pre-requisites

Nil

Course Outcomes

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

CO1	Identify and apply the correct structure and language conventions for writing research papers.	Apply
CO2	Construct clear and concise sentences and paragraphs, avoiding redundancy and ambiguity.	Create
CO3	Prepare the essential parts of a research paper, including title, abstract, introduction, and literature review.	Create
CO4	Present results, discussions, and conclusions using appropriate academic style and ethical practices.	Evaluate
CO5	Use tools to check plagiarism and evaluate the quality of the paper before submission.	Evaluate

Mapping with Programme Outcomes

COS	PO1	P02	PO3	PO4	PO5	PO6
CO1	3	3	3	3	3	3
CO2	3	3	3	3	3	3
CO3	3	3	3	3	3	3
CO4	3	3	3	3	3	3
CO5	3	3	3	3	3	3
3 - Strong; 2 - Medium; 1 – Some						

Assessment Pattern

Bloom's Category	Continuous Assessment Tests (Marks)	
	1	2
Remember	40	40
Understand	40	40
Apply	20	20
Analyze	-	-
Evaluate	-	-
Create	-	-
Total	100	100

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Syllabus

K.S. Rangasamy College of Technology – Autonomous R 2025

M.Tech. Food Technology

70 PAC 001-English for Research Paper Writing

Semester	Hours / Week			Total Hours	Credit	Maximum Marks		
	L	T	P		C	CA	ES	Total
I	2	0	0	30	0	100	-	100

Introduction to Research Paper Writing Planning and Preparation, Word Order, Breaking up long sentences, Structuring Paragraphs and Sentences, Being Concise and Removing Redundancy, Avoiding Ambiguity and Vagueness.	[6]
Presentation Skills Clarifying Who Did What, Highlighting Your Findings, Hedging and Criticizing, Paraphrasing and Plagiarism, Sections of a Paper, Abstracts	[6]
Introduction Title Writing Skills Key skills needed when writing a Title ,Key skills needed when writing an Abstract, Key skills needed when writing an Introduction, Skills needed when writing a Review of the Literature, Methods, Results, Discussion, and Conclusions The Final Check.	[6]
Result Writing Skills Skills needed when writing the Methods, Skills needed when writing the Results, Skills needed when writing the Discussion, Skills needed when writing the Conclusions.	[6]
Verification Skills Useful Phrases, Checking Plagiarism, How to Ensure the Paper is as Good as It Could possibly Be for the First-Time Submission	[6]
Total Hours:	**30**
Text Book(s):	

1.	Adrian Wall work, *English for Writing Research Papers*, Springer, New York, Dordrecht, Heidelberg, London, 2011.
2.	Day R., *How to Write and Publish a Scientific Paper*, Cambridge University Press, 2006.
Reference(s):	
1.	Goldbort R., *Writing for Science*, Yale University Press, 2006 (available on Google Books).
2.	Highman N., *Handbook of Writing for the Mathematical Sciences*, SIAM, 1998.

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70 PAC 002	Disaster Management	Category	L	T	P	Credit
		AC	2	0	0	0

Objectives

- Understand the basic concepts, types, and impacts of natural and man-made disasters.
- Analyze the social, economic, and environmental repercussions of disasters.
- Identify disaster-prone areas and evaluate post-disaster effects in India.
- Explore disaster preparedness methods and risk evaluation tools.
- Assess disaster risk reduction strategies and the role of community participation.

Pre-requisites – Nil

Course Outcomes

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

CO1	Define and differentiate between hazards and disasters, and classify various types based on their nature.	Understand
CO2	Analyze the economic, ecological, and societal consequences of disasters.	Analyze
CO3	Identify disaster-prone regions in India and evaluate their vulnerability.	Evaluate
CO4	Explain disaster preparedness strategies and tools like remote sensing and meteorological data analysis.	Apply
CO5	Assess disaster risk and propose community-based mitigation and survival strategies.	Create

Mapping with Programme Outcomes

COS	PO1	P02	PO3	PO4	PO5	PO6
CO1	3	3	3	3	3	3
CO2	3	3	3	3	3	3
CO3	3	3	3	3	3	3
CO4	3	3	3	3	3	3
CO5	3	3	3	3	3	3
3 - Strong; 2 - Medium; 1 – Some						

Assessment Pattern

Bloom's Category	Continuous Assessment Tests (Marks)	
	1	2
Remember	30	30
Understand	30	30
Apply	40	40
Analyze	-	-
Evaluate	-	-
Create	-	-
Total	100	100

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Syllabus

K.S. Rangasamy College of Technology – Autonomous R 2025

M.Tech. Food Technology

70 PAC 002 –Disaster Management

Semester	Hours / Week			Total Hours	Credit	Maximum Marks		
	L	T	P		C	CA	ES	Total
II	2	0	0	30	0	100	-	100

Introduction Disaster: Definition, Factors and Significance, Difference between Hazard and Disaster, Natural and Manmade Disasters: Difference, Nature, Types and Magnitude	[6]
Repercussions of Disasters and Hazards Economic Damage, Loss of Human and Animal Life, Destruction of Ecosystem, Natural Disasters, Earthquakes, Volcanism, Cyclones, Tsunamis, Floods, Droughts, Famines, Landslides, Avalanches. Man-made Disasters: Nuclear Reactor Meltdown, Industrial Accidents, Oil Slicks and Spills, Disease Outbreaks, Epidemics, War, Conflicts	[6]
Disaster Prone Areas in India Study of Seismic Zones Areas Prone to Floods, Droughts, Landslides, Avalanches, Areas Prone to Cyclonic and Coastal Hazards (with special reference to Tsunamis),post-Disaster Diseases and Epidemi	[6]
Disaster Preparedness and Management Preparedness: Monitoring phenomena triggering a disaster or hazard ,Evaluation of Risk : Application of Remote Sensing, Meteorological Data, Media Reports Governmental and Community Preparedness	[6]
Risk Assessment Disaster Risk: Concept and Elements, Disaster Risk Reduction, Global and National Disaster Risk Situation, Techniques of Risk Assessment, Global Cooperation in Risk, Assessment and Warning People's Participation in Risk Assessment ,Strategies for Survival	[6]
Total Hours:	**30**

Text Book(s):

1. Goel S.L., *Disaster Administration and Management: Text And Case Studies*, Deep & Deep Publications Pvt. Ltd., New Delhi, 2009.
2. Nishitha Rai, Singh A.K., *Disaster Management in India: Perspectives, Issues and Strategies*, New Royal Book Company, 2007.

Reference(s):

1. Sahni, Pardeep et al., *Disaster Mitigation Experiences and Reflections*, Prentice Hall of India, 2001.
2. Subramanian R., *Disaster Management*, Vikas Publishing Housing Pvt. Ltd., 2018.

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60 PAC 003	Constitution of India	Category	L	T	P	Credit
		AC	2	0	0	0

Objectives

- Understand the historical evolution and philosophical foundation of the Indian Constitution.
- Learn the significance of Fundamental Rights, Duties, and Directive Principles of State Policy.
- Familiarize with the structure and functioning of the three organs of government.
- Explore the local self-governance system and the role of elected and appointed officials.
- Understand the role and functioning of the Election Commission and welfare institutions for marginalized groups.

Pre-requisites

Nil

Course Outcomes

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

CO1	Describe the history, drafting process, and core philosophy of the Indian Constitution.	Understand
CO2	Explain the Fundamental Rights, Duties, and Directive Principles and their significance.	Understand
CO3	Analyze the composition and powers of the Legislature, Executive, and Judiciary in India.	Analyze
CO4	Illustrate the structure of local governance and the roles of various officials at district, block, and village levels.	Apply
CO5	Evaluate the role of the Election Commission and other welfare bodies in upholding democracy and justice.	Evaluate

Mapping with Programme Outcomes

COS	PO1	P02	PO3	PO4	PO5	PO6
CO1	3	3	3	3	3	3
CO2	3	3	3	3	3	3
CO3	3	3	3	3	3	3
CO4	3	3	3	3	3	3
CO5	3	3	3	3	3	3
3 - Strong; 2 - Medium; 1 – Some						

Assessment Pattern

Bloom's Category	Continuous Assessment Tests (Marks)	
	1	2
Remember	30	30
Understand	30	30
Apply	40	40
Analyze	-	-
Evaluate	-	-
Create	-	-
Total	100	100

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Syllabus

K.S. Rangasamy College of Technology – Autonomous R 2025

M.Tech. Food Technology

60 PAC 003–Constitution of India

Semester	Hours / Week			Total Hours	Credit	Maximum Marks		
	L	T	P		C	CA	ES	Total
	2	0	0	30	0	100	-	100

History of Making of The Indian Constitution History, Drafting Committee: Composition & Working, Philosophy of The Indian Constitution, Preamble, Salient Features	[6]
Contours of Constitutional Rights and Duties, Fundamental Rights: Right to Equality, Right to Freedom , Right against Exploitation, Right to Freedom of Religion, Cultural and Educational Rights, Right to Constitutional Remedies, Directive Principles of State Policy, Fundamental Duties	[6]
Organs of Governance Parliament – Composition, Qualifications and Disqualifications, Powers and Functions, Executive, President , Governor, Council of Ministers, Judiciary, Appointment and Transfer of Judges, Qualifications, Powers, and Functions	[6]
Local Administration - District's Administration Head: Role and Importance, Municipalities: Introduction, Mayor and Role of Elected Representative, CEO, Municipal Corporation, Panchayat Raj: Introduction-PRI: Zila Panchayat, Elected Officials and Their Roles, CEO Zila Panchayat: POsition and Role, Block Level: Organizational Hierarchy (Different Departments), Village Level:Role of Elected and Appointed Officials,Importance of Grassroot Democracy	[6]
Election Commission Role and Functioning, Chief Election Commissioner and Election Commissioners, Institutes and Bodies for the Welfare of SC/ST/OBC and Women	[6]
Total Hours:	30

Text Book(s):

1. The Constitution of India, 1950 (Bare Act), Government Publication.
2. Busi S.N., Ambedkar B.R., *Framing of Indian Constitution, 1st Edition, 2015.

Reference(s):

1. Jain, M.P., Indian Constitutional Law*, 7th Edition, Lexis Nexis, 2014.
2. Basu, D.D., Introduction to the Constitution of India, Lexis Nexis, 2015.

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