INTEGRATED CERTIFICATE CUM DIPLOMA PROGRAMME (ICD)

Study Scheme with Syllabus

(APPLICABLE FOR STUDENTS ADMITTED FROM THE ACADEMIC YEAR 2024-2025 ONWARDS)

SANT LONGOWAL INSTITUE OF ENGINEERING & TECHNOLOGY
***(*DEEMED-to – be-UNIVERSITY*)*, Established by Govt. of India,**
LONGOWAL, DISTT. SANGRUR (PUNJAB)

INTRODUCTION

The Govt. of India in 1991 has established Sant Longowal Institute of Engineering & Technology (SLIET). It has got the status of a Deemed to be University in the year 2007, and is presently offering the following study programmes: -

Integrated Certificate Diploma (ICD) Programmes
Under Graduate Programmes
Post Graduate Programmes
Doctor of Philosophy Programmes

Criteria of ICD curriculum restructuring

The Academic Year is divided into two regular terms (excluding the industrial training). Each term of nearly eighteen weeks is known as a semester. The program of study consists of prescribed courses that are sequentially distributed among relevant semesters. The system of examination is internal and is based upon continuous evaluation. This system inculcates the punctuality and hard work among the students and consequently reduces the percentage of failures. At the end of a semester the semester transcripts indicating the performance of the students are prepared and issued to the students.

The ICD program has been designed to impart technical and practical knowledge and know-how to the students. The course curriculum has been dividing into two parts:

i) One part covers the main courses including theory and practical which has been designed to impart the highest level of education in latest technological streams to produce competent technical & supervisory level manpower which collude act as a role model of certificate and diploma level educational institutions in the country and inculcate the concept of intellectual skills, courage and integrity, awareness and sensibility to the technical needs and aspirations of the rural/urban societies and industries.

ii) The other part of the course curriculum covers the industrial oriented technical quality packs. The purpose emphasizes the need to impart educational training and other criteria required to perform a job role. The qualification packs cover the technical knowledge which imparts specific knowledge needed to accomplish specific designated responsibilities including core skills or generic skills that are key to learning and working in today's world. These skills are typically needed in any work environment. In the context of the occupational standards, these include communication related skills that are applicable to most job roles. The occupational standards specify the standards of performance an individual must achieve when carrying out a function in the workplace, together with the knowledge and understanding they need to meet that standard consistently. Performance Criteria (PC) elaborate the specify standard of performance required when carrying out a task. The occupational standards uniquely applied in the Indian context, include the knowledge and understanding statements which together specify the technical, generic, professional, and organizational specific knowledge that an individual needs to perform to the required standard. Organizational Context included in the quality packs understand the way the organization is structured and how it operates, including the extent of operative knowledge managers have of their relevant areas of responsibility.

The objectives of the ICD Programmes are:

i) to produce supervisory level technical manpower. More emphasis is given on practical oriented class work with an extensive training in industry.
ii) The provisions contained in this set of regulations govern the policies and procedures on the admission of students, imparting instructions of courses, conduct of examinations and evaluation and certification of students' performance leading to the ICD programmes.
iii) This set of regulations shall be binding on all students undergoing the ICD programmes. These rules will be effective from the 2023 batch onwards.
iv) This set of regulations may evolve and get revised/refined or updated or amended or modified or changed through appropriate approvals from the Senate, from time to time, and shall be binding on all parties concerned, including the Students, Faculty, Staff, Departments, Institute Authorities.
v) In order to guarantee fairness and justice to all the parties concerned, in view of the periodic evolutionary refinements, any specific issues or matters of concern shall be addressed separately, by the appropriate authorities, as and when found necessary.
vi) The effect of year-to-year (periodic) refinements in the Rules & Regulations, on the students admitted in earlier years, shall be dealt with appropriately and carefully, so as to ensure that those students are not subjected to any unfair situation whatsoever, although they are required to conform to these revised set of Rules & Regulations, without any undue favour or considerations.

ADMISSION

Admission to all courses will be made in the odd semester of each session at the first-year level based on the relative performance in all India SLIET Entrance test. Details of admission procedure, reservation of seats etc. in any of the ICD Program is published every year in the month of January/ February in the form of "Information Brochure".

Eligibility: The minimum qualification for admission to the 3 Year ICD Programme is Matriculation Examination/ Matric pass (Pass in English, Mathematics and Science is compulsory) from a State Education Board/ CBSE/ ICSE/ National Open School or an equivalent examination recognized/approved by MHRD, Government of India. Those who are appearing in matriculation examination may also apply.

VISION OF THE DEPARTMENT

To be a Centre of excellence in training, research, outreach and consultancy services in food engineering and technology with emphasis on value addition of agricultural produce, food bioprocessing and technology, food nutrition, food quality and safety.

MISSION OF THE DEPARTMENT

1. To produce trained technical manpower of highest standard in the field of food engineering and technology
2. To re-orient and develop safe food products by applying fundamental and applied technologies
3. To provide solutions to the problem and leadership in education, training, and research

ICD PROGRAM OUTCOMES

The curriculum and syllabus for **DIPLOMA IN FOOD TECHNOLOGY (DFT) & CERTIFICATE IN FOOD PROCESSING & PRESERVATION (CFP)** conforms to outcome-based teaching learning process. In general, **seven program outcome** (1-7) have been identified and the curriculum and syllabus have been structured in such a way that each of the courses meets one or more of these outcomes. Student outcomes describe what students are expected to know and be able to do by the time of diploma. These relate to the skills, knowledge, and behaviours that students acquire as they progress through the program. Further each course in the program spells out clear instructional objectives which are mapped to the student outcomes.

PROGRAMME OUTCOMES (PO):

Food Technology Diploma holders of the Sant Longowal institute of Engineering and technology, Deemed University, Longowal will have ability to:

1. **Basic And Discipline specific Knowledge:** Apply knowledge of basic mathematics, science and engineering fundamentals and engineering specialization to solve engineering problems.

2. **Problem Analysis:** identify and analyze well-defined engineering problems using codified standard methods.

3. **Design/development of solutions:** Design solution for well-defined technical problems and assist with the design of systems components or processes to meet specified needs.

4. **Engineering tools, Experimentation and Testing:** Apply modern engineering tools and appropriate techniques to conduct standard tests and measurements.

5. **Engineering practices for society, sustainability, and environment:** Apply appropriate technology in context of society, sustainability, environment, and ethical practices.

6. **Project Management:** Use engineering management principals individually, as a team member or a leader to manage projects and effectively communicate about well-defined engineering activities.

7. **Life-long learning:** ability to analyze individual needs and engage in updating in the context of technological changes.

Study Scheme and Syllabus of Integrated Certificate Diploma (ICD), (DIPLOMA IN FOOD TECHNOLOGY & CERTIFICATE IN FOOD PROCESSING & PRESERVATION (CFP)

SEMESTER-I								Page No.
S. No.	Code No.	Course Title	Hours per week			Hours	Credits	
			L	T	P			
1.	BSMA-101	Mathematics-I	3	1	0	4	4	
2.	BSPH-103	Applied Physics-I	2	1	0	3	3	
3.	BSCY-105	Applied Chemistry	2	1	0	3	3	
4.	HSMH-101	Communication Skills in English	2	0	0	2	2	
5.	BSPH-107	Applied Physics-I LAB	0	0	2	2	1	
6.	BSCY-109	Applied Chemistry LAB	0	0	2	2	1	
7.	HSMH-105	Communication Skills in English LAB	0	0	2	2	1	
8.	ESME-101	Engineering Graphics	0	0	2	2	1	
9.	ESWS-103	Engineering Workshop Practice	0	0	4	4	2	
10.	HSSP-103	Sports and Yoga	0	0	2	2	1	
TOTAL			9	3	14	26	**19**	
11.	QPFT-101	Basic Good Manufacturing Practices in Food Industry (Lerner-I)	0	0	8	8	**01**	

SEMESTER-II								Page No.
S. No.	Code No.	Course Title	Hours per week			Hours	Credits	
			L	T	P			
1.	BSMA-102	Mathematics-II	3	1	0	4	4	
2.	BSPH-104	Applied Physics-II	2	1	0	3	3	
3.	ESCS-102	Introduction to IT Systems	2	0	0	2	2	
4.	ESEE-104	Fundamentals of Electrical Engineering	2	0	0	2	2	
5.	ESEC-108	Fundamentals of Electronics Engineering	2	0	0	2	2	
6.	ESME-106	Engineering Mechanics	2	1	0	3	3	
7.	BSPH-106	Applied Physics-II LAB	0	0	2	2	1	
8.	ESCS-110	Introduction to IT Systems LAB	0	0	2	2	1	
9.	ESEE-112	Fundamentals of Electrical Engineering LAB	0	0	2	2	1	
10.	ESEC-114	Fundamentals of Electronics Engineering LAB	0	0	2	2	1	
11.	ESME-116	Engineering Mechanics LAB	0	0	2	2	1	
TOTAL			13	3	10	26	**21**	
12.	QPFT-102	Good Manufacturing Practices in	0	0	8	8	**01**	

		Food Industry Lerner-II						
13.	EAA-102	Extra Academic Activities (A/B/C)	-	-	-	-	**1 (S/US)**	

SUMMER-I								**Page No.**
S. No.	**Code No.**	**Course Title**	**Hours per week**			**Hours**	**Credits**	
			L	**T**	**P**			
1.	QPFT-103	Fruits and Vegetables Processing (4 Weeks)	0	0	24	24	**3**	

SEMESTER-III								**Page No.**
S. No.	**Code No.**	**Course Title**	**Hours per week**			**Hours**	**Credits**	
			L	**T**	**P**			
1.	PCFT-201	Principals of Food Processing and Preservation	3	0	0	3	3	
2.	PCFT-203	Food Microbiology	3	0	0	3	3	
3.	PCFT-205	Food Chemistry	3	1	0	4	4	
4.	PCFT-207	Elements of Food Engineering	3	1	0	4	4	
5.	PCFT-209	Technology of Food Grains	3	0	0	3	3	
6.	PCFT-211	Food Processing and Preservation LAB	0	0	2	2	1	
7.	PCFT-213	Food Chemistry and Microbiology LAB	0	0	2	2	1	
8.	PCFT-215	Food Engineering LAB	0	0	2	2	1	
9.	AUCH-201	Environmental Science	2	0	0	2	**S/US**	
TOTAL			17	2	6	25	**20**	
10.	QPFT-201	Food Grain Milling	0	0	8	8	**1**	
11.	EAA-201	Extra Academic Activities (A/B/C)	-	-	-	-	**1 (S/US)**	

SEMESTER-IV								**Page No.**
S. No.	**Code No.**	**Course Title**	**Hours per week**			**Hours**	**Credits**	
			L	**T**	**P**			
1.	PCFT-202	Technology of Fruits and Vegetables Processing	3	1	0	4	4	
2.	PCFT-204	Technology of Milk and Milk Products	3	0	0	3	3	
3.	PCFT-206	Unit Operations in Food Processing	3	1	0	4	4	
4.	PEFT-202 (a,b,c)	Program Elective-I	3	0	0	3	3	
5.	OEFT-202	Food and Nutrition	3	0	0	3	3	
6.	PCFT-208	Technology of Fruits and Vegetables Processing LAB	0	0	2	2	1	
7.	PCFT-210	Unit Operations in Food Processing LAB	0	0	2	2	1	

8	PEFT-212 (a,b,c)	Program Elective-I LAB	0	0	2	2	1	
9.	AUMH-202	Essence of Indian Knowledge and Tradition	2	0	0	2	S/US	
TOTAL			17	2	6	25	**20**	
10	QPFT-202	Milk and Milk Products	0	0	8	8	**1**	
11.	EAA-202	GP: Extra Academic Activities	-	-	-	-	**1 (S/US)**	

SUMMER-II								**Page No.**
S. No.	**Code No.**	**Course Title**	**Hours per week**			**Hours**	**Credits**	
			L	**T**	**P**			
1.	TPID-201	Summer Internship (4-6 weeks)	0	0	6	6	**1**	
2.	QPFT-203	Food Laboratory Techniques (6 weeks)	0	0	16	16	**2**	
TOTAL			-	-	-	-	**3**	

SEMESTER-V								**Page No.**
S. No.	**Code No.**	**Course Title**	**Hours per week**			**Hours**	**Credits**	
			L	**T**	**P**			
1.	HSMH-301	Entrepreneurship and Start-ups	3	1	0	4	4	
2.	PCFT-301	Technology of Meat, Fish, and Poultry Processing	3	0	0	3	3	
3.	PCFT-303	Bakery and Confectionery Technology	3	0	0	3	3	
4.	PEFT-301 (a,b,c)	Programme Elective -II	3	1	0	4	4	
5.	OEFT-301	Technology of Fermented Beverages	3	0	0	3	3	
6.	PCFT-305	Technology of Meat, Fish, and Poultry Processing LAB	0	0	2	2	1	
7.	PRFT-301	Minor Project	0	0	4	4	2	
TOTAL			15	2	6	23	**20**	
8.	QPFT-301	Bakery and Confectionery			8	8	**1**	

SEMESTER-VI								**Page No.**
S. No.	**Code No.**	**Course Title**	**Hours per week**			**Hours**	**Credits**	
			L	**T**	**P**			
1.	AUMH-302	Indian Constitution	2	0	0	2	S/US	
2.	PCFT-302	Principles of Food Analysis and Quality Control	3	1	0	4	4	
3.	PEFT-302 (a,b,c)	Program Elective -III	3	1	0	2	4	
4.	PEFT-304 (a,b,c)	Program Elective-IV	3	0	0	3	3	
5.	OEFT-302	Chocolate and Candy Manufacturing	3	0	0	3	3	
6.	PCFT-304	Food Analysis and Quality Control	0	0	2	2	1	

		LAB						
7.	PRFT-302	Major Project	0	0	8	8	4	
8.	SEFT-302	Seminar	1	0	0	1	1	
TOTAL			15	2	10	27	**20**	
9.	QPFT-302	Honey Processing			8	8	**1**	

Course Code	Definitions
L	Lecture
T	Tutorial
P	Practical
HS	Humanities & Social Sciences Courses
BS	Basic Science Courses
ES	Engineering Science Courses
PC	Program Core Courses
PE	Program Elective Courses
OE	Open Elective Courses
AU	Audit Courses
SI	Summer Internship
PR	Project
SE	Seminar
XX	EE (Electrical engineering)
	IE (Instrumentation Engineering)
	EC (Electronics & Communication Engineering)
	CS (Computer Science & Engineering)
	CH (Chemical Engineering)
	ME (Mechanical Engineering)
	FT (Food Technology)

LIST OF PROGRAMME ELECTIVES

ELECTIVE -1 SEMESTER -IV		
	PEFT-202a	Technology of Food Packaging
	PEFT-202b	Technology of Spices, and Condiments
	PEFT-202c	Technology of Food Beverages
ELECTIVE -II SEMESTER -V		
	PEFT-301a	Food Flavors
	PEFT-301b	Technology of Fermented Foods
	PEFT-301c	Refrigeration and Cold Storage
ELECTIVE -III SEMESTER -VI		
	PEFT- 302a	Post-Harvest Technology
	PEFT-302b	Technology of Extruded Products
	PEFT-302c	Food By-product and Waste Utilization
ELECTIVE -IV SEMESTER -VI		
	PEFT-304a	Food Laws and Quality Assurance
	PEFT-304b	Technology of Functional Foods
	PEFT-304c	Technology of Oils and Fats

LIST OF OPEN ELECTIVES

OPEN ELECTIVE-1 SEMESTER -IV		
	OEFT-202	Food and Nutrition
OPEN ELECTIVE -II SEMESTER -V		
	OEFT-301	Technology of Fermented Beverages
OPEN ELECTIVE -III SEMESTER -VI		
	OEFT-302	Chocolate and Candy Manufacturing

HOURS AND CREDITS DISTRIBUTION DETAILS

Sl. No	Semester	Course Title	Hours per week			Hours	Credits
			L	T	P		
MAIN THEORY AND PRACTICAL COURSES							
1	S1	Total credits per semester for Theory/Practical	9	3	14	26	19
2	S2	Total credits per semester for Theory/Practical	13	3	10	26	21
3	S3	Total credits per semester for Theory/Practical	17	2	6	25	20
4	S4	Total credits per semester for Theory/Practical	17	2	6	25	20
5	S5	Total credits per semester for Theory/Practical	15	2	6	23	20
6	S6	Total credits per semester for Theory/Practical	15	2	10	27	20
7	**Total (1-6th Semester)**	**Total hours & credits per semester for Theory/Practical**	**86**	**14**	**52**	**152**	**120 Theory=94 Practical=26**
8		Percentage	56.58 % Hrs	9.21 % Hrs	34.21% Hrs	100	78.33% (T) 21.66% (P)
QUALITY PACKS (AS PER NSDP)							
9	S1	QP in Basic Food Laboratory Practices	0	0	8	8	**04**
10	S2	QP in Good Hygienic Practices	0	0	8	8	**04**
11	S3	On Job Training (QP in Food Grain Milling)	0	0	10	10	**05**
12	S4	On Job Training (QP in Milk and Milk Products)	0	0	10	10	**05**
13	S5	On Job Training (QP in Bakery and Confectionery)	0	0	12	12	**06**
14	S6	On Job Training (QP in Honey Processing)	0	0	8	8	**04**
15	**Total (1-6th Semester)**	**On Job Training/ Quality packs**	**0**	**0**	**56**	**56**	**28**
SUMMER TRAININGS							
16	Summer-I	On Job Training (4 Weeks) QP in Fruits and	0	0	32	32	**16**

		Vegetables Processing					
17	Summer-II	On Job Training (4 Weeks) (QP in Food Laboratory Techniques)	0	0	26	26	**13**
18	**Total**	**Summer I & II**	**0**	**0**	**58**	**58**	**29**
19.	TPID-201	Summer Internship (4-6 weeks)	0	0	06	06	**3**
20.	**Grand Total**	**Main Courses T+(P+QP+ST+INT)**	**86**	**14**	**172**	**272**	**94+ (26+28+29+3) =180**
21.		**Percentage**	**31.62 %Hrs**	**5.15 %Hrs**	**63.24 %Hrs**	**100**	**52.08%(T) 47.77%(P)**
22	**GP: Extra Academic Activities (Sem II. III & IV**		**-**	**-**	**-**	**-**	**3**

ICD- SYLLABUS

Semester-III							
Sl. No	**Code No.**	**Course Title**	**Hours per week**			**Hours**	**Credits**
			L	**T**	**P**		
1.	PCFT-201	Principal of Food Processing and Preservation	3	0	0	3	3

Course Objectives:

Objective of this course is to impart knowledge about

- Importance of food processing and preservation, classification of foods based on shelf life, pH, and origin.
- Basic understanding of the concept of food spoilage.
- Basic understanding of various food preservation methods

Course Outcomes:

On successful completion of the subject, the students will be able to:

CO1	Discuss fundamental principles of food preservation	Understanding
CO2	Explain the various types of food spoilage and their effect on food quality	Understanding
CO3	Describe the principles of low and high-temperature preservation	Understanding
CO4	Discuss the principles of non-thermal preservation methods	Understanding
CO5	Explain the working of various preservation equipment such as dryers and freezers	Understanding

Mapping of Course Outcome and Program Outcome:

CO/PO Mapping: Principal of Food Processing and Preservation
(Strong(3) / Medium(2) / Weak (1) indicates strength of correlation):

PO/CO		Program Outcome (PO)						
		PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**
Course Outcome (CO)	**CO1**	3	2	2	1	1	1	3
	CO2	3	1	1	1	1	1	2
	CO3	3	2	1	1	1	2	2
	CO4	3	2	1	1	1	2	2
	CO5	3	2	2	2	2	2	3
Average		3	1.8	1.4	1.2	1.2	1.6	2.4

Units	Contents	Lectures
I	**Introduction:** Importance of food processing and preservation; classification of foods based on shelf life, pH, origin	6
	Food spoilage: Different types of food spoilage viz. microbiological, enzymatic, chemical,and physical and their effects on food quality	6
	Low-Temperature Preservation: Low-temperature requirement for different foods — Refrigeration, slow and fast freezing, freezing process; Types of the freezer, their advantages and limitations; Storage and thawing of frozen food	8
II	**High-Temperature Preservation:** Canning: Definition, advantages, and disadvantages; Can formation; Unit operations in canning: Selection of raw material, peeling/coring, blanching, filling, brining/syruping, exhausting, sealing, processing, cooling, labeling and storage	8
	Low Moisture preservation: Drying and dehydration methods- Solar, cabinet, tray, and drum	6
	Chemical preservation: Introduction, classification, and applications.	4
	Radiation preservation: Introduction, sources, and applications.	4
	Total	**42**

Recommended Books

S No	Title	Author	Publisher
1,	The Technology of Food Preservation (Fourth Edition)	Norman W. Desrosier & James N. Desrosier	CBS Publishers & Distributors Pvt Ltd, India (ISBN:978-8123911281)
2.	Principles of Food Science (Vol-I,)	O. R. Fennema, M. Karel, D. B. Lund Dekker	AVI
3.	Food Processing And Preservation	B. Sivasankar	PHI Learning

Semester-III							
Sl. No	**Code No.**	**Course Title**	**Hours per week**			**Hours**	**Credits**
			L	**T**	**P**		
6.	PCFT-211	Food Processing and Preservation LAB	0	0	2	2	1

Course Objectives:

Objective of this course is to impart knowledge about

- Proximate composition of the food products and physicochemical properties of food such as grains
- Unit operations involved in the canning of fruits and vegetables and milling of food grains.
- Dehydration of various fruits and vegetables and milling and parboiling of paddy

Course Outcomes:

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

Course Outcomes:

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

CO1	Estimate proximate composition of food products and physicochemical analysis of wheat flour for Pelshenke value, sedimentation value, and free fatty acids	Analyzing
CO2	Perform can reforming, flanging, and seaming.	Analyzing
CO3	Prepare brine and syrup solution for the canning of fruits and vegetables, prepare dehydrated fruits and vegetables	Applying
CO4	Parboiling of paddy and study of parboiling on paddy milling quality	Applying
CO5	Perform milling of corn by dry and wet milling, Study of pulse milling and its treatments	Applying

Mapping of Course Outcome and Program Outcome:

CO/PO Mapping: **Principal of Food Processing and Preservation Lab**
(Strong(3) / Medium(2) / Weak(1) indicates strength of correlation):

PO/CO		Program Outcome (PO)						
		PO1	PO2	PO3	PO4	PO5	PO6	PO7
Course Outcome (CO)	CO1	3	2	3	2	2	2	3
	CO2	3	2	2	2	2	2	2
	CO3	3	2	2	2	2	2	3

	CO4	3	3	3	3	2	2	3
	CO5	3	2	2	2	2	2	3
Average		3	2	2.4	2.4	2	2	2.8

List of Practicals:

1. Proximate analysis of food products
2. Identification of foods based on pH.
3. To perform can reforming.
4. To perform can flanging and seaming.
5. To examine the can seam
6. Selection of raw material like fruits/vegetables for canning.
7. Preparation of brine and syrup for canning
8. Peeling of fruit and vegetables
9. Dehydration of onion, potato, and bottle-gourd
10. Dehydration of apple and grapes
11. Examination of canned food
12. Chemical preservation of foods viz., preparation of squash, RTS
13. Visit to Fruits and Vegetable industry to see above operations.
14. Determination of vitreousness / mealiness of wheat grains
15. Determination of Zeleny's sedimentation value of flour
16. Determination of Pelshenke value of wheat flour
17. Determination of maltose figure of wheat flour
18. Estimation of free fatty acids of wheat flour
19. Determination of Pearling index of wheat grain
20. Determination of milling yield of paddy.
21. Preform parboiling of paddy by various methods
22. Grading rice grain based on shape and size.
23. Study of the effect of parboiling of paddy on the yield of head rice and breakage.
24. Preparation of pulses and its milling
25. Milling of barley
26. Industrial visit to flour and rice mills, and bakery.

Semester-III							
Sl. No	**Code No.**	**Course Title**	**Hours per week**			**Hours**	**Credits**
			L	**T**	**P**		
2.	PCFT-203	**Food Microbiology**	3	0	0	3	3

Course objectives: Objective of this course is to impart knowledge about

- Food microbiology and microorganisms
- Factors affecting the growth of microorganisms.
- Association of microorganisms in the spoilage of various food products

Course Outcomes: On successful completion of the subject, the subject will be able to

CO1	Explain the significance of microbiology in food	Understanding
CO2	Discuss the morphology, structure, and reproduction of bacteria	Understanding
CO3	Discuss the morphology, structure, and reproduction of fungi	Understanding
CO4	Describe the factors affecting the growth of microorganisms	Understanding
CO5	Explain the association of microorganisms in the spoilage of various food products	Understanding

Mapping of Course Outcome and Program Outcome:

CO/PO Mapping: Food Microbiology
(Strong(3) / Medium(2) / Weak(1) indicates strength of correlation):

PO/CO		Program Outcome (PO)						
		PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**
Course Outcome (CO)	**CO1**	3	2	1	1	1	2	3
	CO2	3	2	2	1	1	2	3
	CO3	3	2	2	1	1	2	3
	CO4	3	2	2	1	1	2	3
	CO5	3	2	2	1	1	2	3
Average		3	2	1.8	1	1	2	3

Unit	Contents	Lectures
I	**Introduction** Definition; historical developments in food microbiology and their significance; concept of prokaryotes and eukaryotes.	8
	Morphology of bacteria and reproduction Morphology and Reproduction of Bacteria: cell structure, shapes, types, structure and chemical composition of the cell wall; Gram staining: the difference between Gram positive and Gram-Negative bacteria; endospore formation; different methods of reproduction.	12
II	**Morphology of fungi and reproduction** Types; cell structure; composition of the cell wall; methods of reproduction: asexual and sexual, the importance of fungi; comparative physiology of bacteria and fungi	11
	Microbiology of food and food products Incidence of micro-organisms on foods, factors affecting the growth of microbes, the microbiology of milk and milk products, fruit, vegetable, and their products, meat, fish, and poultry products, cereals, and cereal products	12
	Total	**43**

Recommended Books

1. Michal J Pleczer, Basic Food Microbiology,Chapman and Hall.
2. W.C. Frazier, Food Microbiology, TMH.
3. James M. Jay, Modern Food Microbiology, CBS.

Semester-III							
Sl. No	**Code No.**	**Course Title**	**Hours per week**			**Hours**	**Credits**
			L	**T**	**P**		
3.	PCFT-205	**Food Chemistry**	3	0	0	3	3

Course Objective: Objective of this course is to impart knowledge about

1. To know about chemistry of water and its relationship with food and its constituents.
2. To learn about classification and structures of food components.
3. To demonstrate physical and chemical characteristics and importance of food constituents in food.

Course Outcomes:

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

CO1	Explain the chemical composition food and of their macro- and micro-constituents	Understanding
CO2	Demonstrate the physical and chemical properties of various food constituents	Applying
CO3	Describes the functions of various food constituents	Understanding
CO4	Elaborate the role of water in food system	Applying
CO5	Demonstrate the importance of food and their major constituents	Applying

Mapping of Course Outcome and Program Outcome:

CO/PO Mapping: Food Chemistry
(Strong(3) / Medium(2) / Weak(1) indicates strength of correlation):

PO/CO		Program Outcome (PO)						
		PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**
Course Outcome (CO)	**CO1**	3	2	1	1	1	2	3
	CO2	3	3	2	1	1	3	2
	CO3	2	2	2	1	1	2	2
	CO4	3	2	2	1	1	2	2
	CO5	3	2	2	1	1	2	3
Average		3	2.2	1.8	1	1	2.2	2.4

Unit	Contents	Lectures
I	**Introduction:** Food Chemistry, role, importance, objectives, and developments	3
	Water: Structure, properties of water, water as a reactant and chemical reactions mediated by water, water types, food moisture and its role in food	6
	Carbohydrates: Definition, sources, and classification; structure, physical and chemical properties of monosaccharides, disaccharides, oligosaccharides and polysaccharides and applications and importance as food, brief about effect of processing	8
	Proteins Definition, sources, classification, structure, functions of amino acids, proteins, and their importance in food, brief about effect of processing	8
II	**Lipids**: Definition, sources, compositions, structure, classification, functions, physical and chemical properties, rancidity, and reversion, importance of lipids in food and diet, brief about effect of processing	8
	Pigments: Their occurrence in food, importance, types and applications, a brief about effect of processing,	5
	Vitamins and Minerals: Classification and sources and importance (A, D, E, C, B_1, B_2,B_5,B_6, B_9)	4
		44

Recommended Books

1. A V. V. S Ramarao , A textbook of biochemistry, AVI.
2. L. Mayor, Food Chemistry, CBS.

Semester-III							
Sl. No	**Code No.**	**Course Title**	**Hours per week**			**Hours**	**Credits**
			L	**T**	**P**		
7.	PCFT-213	Food Chemistry and Microbiology Lab	0	0	2	2	1

Course Objectives: Objective of this course is to impart knowledge about

1. the chemistry underlies the properties and reactions of various food components.
2. principle of working of food analytical and food microbiological equipment.
3. the different analytical and microbiology techniques related in food testing and control.

Course Outcomes:

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

CO1	Titrimetric analysis of food components	Analysis
CO2	Learn the principles behind analytical techniques related to food testing	Applying
CO3	Analyse the amount of food constituents in food products	Analysis
CO4	Perform staining of various microorganisms and demonstrate about microbial testing	Applying
CO5	Carry out microbiological analysis of food	Analysis

Mapping of Course Outcome and Program Outcome:

CO/PO Mapping: Food Chemistry and Microbiology Lab (Strong(3) / Medium(2) / Weak(1) indicates strength of correlation):								
PO/CO		Program Outcome (PO)						
		PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**
Course Outcome (CO)	**CO1**	3	2	3	1	1	2	3
	CO2	3	3	3	1	2	2	3
	CO3	3	3	2	2	2	2	3
	CO4	3	2	2	2	2	3	2
	CO5	3	3	2	2	2	2	3
Average		3	2.6	2.4	1.6	1.8	2.4	2.8

List of Practicals:

1. Preparation of standard solution for Acid-base titration
2. Qualitative analysis of water sample
3. Determination of water hardness
4. Analysis of flour for moisture/ash
5. Determination of moisture/volatile matter of given oil/fat
6. Determination of saponification value of fat sample
7. Determination of wet/dry/gluten in maida/whole wheat flour
8. Determination of starch content in maida
9. Determination of Vitamin-C by titremetric method
10. Study of different parts of microscope.
11. Study of different types of bacteria.
12. Study of structure of yeast and mold.
13. To perform the simple staining techniques of bacteria
14. To perform the gram's staining of microorganisms.
15. To carry the bacterial cell count using heamocytometer.
16. Study of growth of microorganism on the petri plates.
17. To determine the total cell count by plate method

Semester-III							
Sl. No	**Code No.**	**Course Title**	**Hours per week**			**Hours**	**Credits**
			L	**T**	**P**		
4.	PCFT-207	**Elements of Food Engineering**	3	1	0	4	4

Course Objectives:

Objective of this course is to impart knowledge about

- The concept of SI system and the conversion from one system to another.
- Application of the fluid flow, heat, and mass transfer principles to analyze and design food processes
- The theory and application of basic engineering operations.

Course Outcomes:

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

CO1	Apply the principles of mass and energy balance to food processing systems.	Applying
CO2	Explain the different types of fluids and their properties	Understanding
CO3	Understand the basic heat transfer operations	Understanding
CO4	Interpret the psychometric charts and their applications	Applying
CO5	Explain the types, construction, designs, and working principle of evaporators, dryers, and refrigerators	Understanding

Mapping of Course Outcome and Program Outcome:

CO/PO Mapping: Elements of Food Engineering
(Strong(3) / Medium(2) / Weak(1) indicates strength of correlation):

PO/CO		Program Outcome (PO)						
		PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**
Course Outcome (CO)	**CO1**	3	2	2	3	3	2	2
	CO2	3	3	2	2	3	2	2
	CO3	3	3	2	3	3	3	3
	CO4	3	2	2	3	3	2	3
	CO5	3	2	2	3	3	2	3
Average		3	2.4	2	2.8	3	2.2	2.6

UNIT	CONTENTS	LECTURES
I	**Introduction** Concept of food engineering, unit conversion, mass and energy balance.	6
	Fluid flow operations Physical properties of fluid, Type of fluid- Newtonian and non-Newtonian fluids, concept of Reynold's number and its determination, Classification of fluid flow working features of different type of pumps like centrifugal and rotary pumps.	7
	Basics of heat Transfer Different methods of Heat transfer, the concept of conduction, convection, and radiation, and its application in food processing.	6
	Heat exchangers Heat exchangers, different types, and their Working principle advantages and limitations.	5
	Psychrometry Definition, psychometric properties, and charts.	4
	Drying Bound and unbound water, moisture content on dry and wet basis, equilibrium moisture content, critical moisture content, drying rate, working of different type of driers used in the food industry.	5
II	**Evaporation** Basic principle of evaporation, different types of evaporators, their working principle advantages and limitations.	5
	Refrigeration systems Refrigeration cycle, types of refrigerants and components of a refrigerator.	5
	Total	**43**

RECOMMENDED BOOKS:

Authors	Title	Publishers
Heldman & SinghSmith	Introduction to Food Engg, Introduction to Food Process Engg,	Academic PressSpringer
R.T. Toledo	Fundamentals of Food process Engg,	CBS

Semester-III							
Sl. No	Code No.	Course Title	Hours per week			Hours	Credits
			L	T	P		
8.	PCFT-215	**Food Engineering Lab**	0	0	2	2	1

Course Objectives:

Objective of this course is to impart knowledge about

- Physicochemical characteristics of fluids/fluid flow in food system.

1. Heat, and mass transfer characteristics in food processes and psychometric chart

- Study of construction and working of various equipment's and unit operations.

Course Outcomes:

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

CO1	Determination of physical properties of fluids in food systems.	Analysis
CO2	determinate the heat transfer coefficient in natural convection	Analysis
CO3	study the constructional and working features of heat exchangers	Applying
CO4	constructional and working features of evaporators	Applying
CO5	Study of properties of food using psychometric chart	Applying

Mapping of Course Outcome and Program Outcome:

CO/PO Mapping: Elements of Food Engineering
(Strong(3) / Medium(2) / Weak(1) indicates strength of correlation):

PO/CO		Program Outcome (PO)						
		PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**
Course Outcome (CO)	**CO1**	3	2	2	3	3	2	2
	CO2	3	3	2	2	3	2	2
	CO3	3	3	2	3	3	3	3
	CO4	3	2	2	3	3	2	3
	CO5	3	2	2	3	3	2	3
Average		3	2.4	2	2.8	3	2.2	2.6

LIST OF PRACTICALS

1. Determination of critical velocity and type of fluid flow
2. Verification of Bernoulli's Equation.
3. To study the constructional and working features of centrifugal pump.
4. To study the constructional and working features of rotary pump.
5. To determinate the thermal conductivity of a given food sample
6. To determinate the thermal conductivity of composite slab
7. To determinate the heat transfer coefficient in natural convection over a vertical cylinder
8. To determinate the average heat transfer coefficient in a pipe under forced convection.
9. To study the constructional and working features of double pipe heat exchanger.
10. To study the constructional and working features of plate heat exchanger.
11. To determinate the dry and wet bulb temperature using sling psychrometer
12. To determinate the various properties of air-water-vapour mixture using psychometric chart
13. To draw the drying rate curve of a given food material.
14. Determination of the elevation in boiling point using thermometer.
15. To study the constructional and working features of open pan evaporator.
16. To study the constructional and working features of rising/falling film evaporator.
17. To study the constructional and working of refrigeration tutor.

Semester-III							
Sl. No	Code No.	Course Title	Hours per week			Hours	Credits
			L	T	P		
5.	PCFT-209	**Technology of Food Grains**	3	0	0	3	3

Objective of this course is to impart knowledge about

- Composition and importance of food grains in food and nutrition.
- Various types of processing methods of cereals and pulses.
- Milling operations of food grains and the various products obtained.

Course Outcomes:

CO1	Describe the composition, structure, and storage of food grains	Understanding
CO2	Explain the technology of paddy processing and its products	Understanding
CO3	Describe the traditional and modern milling operations of food grains	Understanding
CO4	Describe the concept of rice parboiling and its related advantages and disadvantages	Understanding
CO5	Discuss the processing of food grains to various products	Understanding

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

Mapping of Course Outcome and Program Outcome:

CO/PO Mapping: Technology of Food Grains
(Strong(3) / Medium(2) / Weak(1) indicates strength of correlation):

PO/CO		Program Outcome (PO)						
		PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**
Course Outcome (CO)	**CO1**	3	2	2	1	2	2	2
	CO2	3	3	2	2	2	2	2
	CO3	3	3	2	2	2	3	3
	CO4	3	2	2	2	2	2	3
	CO5	3	2	2	2	2	2	3
Average		3	2.5	2	1.8	2	2.2	2.6

UNIT	CONTENTS	LECTURES
I	**Introduction** Importance of cereal grains in human nutrition; structure and composition of cereals	**6**
	Wheat Types of wheat; traditional and modern methods of wheat milling (an overview); wheat milling products- whole wheat flour (Atta), wheat flour (maida), semolina, wheat germ, bran	**12**
	Barley Milling of barley; milling products and utilization and malting of barley	**4**
II	**Rice** Types of rice; paddy parboiling (concept, advantages, disadvantages); milling of paddy; milling products- head rice, brokens, rice husk and rice bran.	**8**
	Maize Types of maize; dry and wet milling of corn (an overview); milling products and uses.	**4**
	Pulses Pretreatments of pulse milling into dal. Pulse milling equipment, Traditional and modern methods of pulse milling (an overview). Anti-nutritional factors and methods of inactivation.	**6**
	Total	**40**

RECOMMENDED BOOKS:

Authors	Title	Publishers
RL Kent	Cereal Technology	AVI
A Chakravorty	Post-harvest Technology of Cereals, Pulses and Oil Seeds	Oxford and IBH
SB Arora	Handbook of Bakery Products	SIRI

Semester-IV							
Sl. No	**Code No.**	**Course Title**	**Hours per week**			**Hours**	**Credits**
			L	**T**	**P**		
1.	AUCH-201	**Environmental Science**	2	0	0	2	S/US

Semester-IV							
Sl. No	**Code No.**	**Course Title**	**Hours per week**			**Hours**	**Credits**
			L	**T**	**P**		
1.	**PCFT-202**	**Technology of Fruits and Vegetable Processing**	**3**	**0**	**0**	**3**	**3**

Course Objectives:

Objective of this course is to impart knowledge about

- Need for food processing and the types of spoilage concerned with the food products
- Physiology of the fruits and vegetables and the method to extend their shelf life
- Thermal processing of fruit and vegetables and various other preservation methods

Course Outcomes:

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

CO1	Explain the factors affecting the shelf life of fresh fruits and vegetables	Understanding
CO2	Describe the physiology of the fruits and vegetables	Understanding
CO3	Explain thermal processing of fruits and vegetables	Understanding
CO4	Explain the role and importance of preservation techniques to improve the shelf life of Fs & Vs	Understanding
CO5	Discuss the processing of tomatoes into products	Applying

Mapping of Course Outcome and Program Outcome:

CO/PO Mapping: Technology of Fruits and Vegetable Processing (Strong(3) / Medium(2) / Weak(1) indicates strength of correlation):								
PO/CO		Program Outcome (PO)						
		PO1	PO2	PO3	PO4	PO5	PO6	PO7
Course Outcome (CO)	CO1	3	2	2	1	1	2	2
	CO2	3	3	1	1	1	2	2
	CO3	3	3	2	2	2	3	3
	CO4	3	3	2	1	1	2	3
	CO5	3	3	2	2	2	3	3
Average		3	2.6	1.8	1.4	1.4	2.4	2.6

UNIT	CONTENTS	LECTURES
I	**Introduction** Need of processing fruits and vegetables, reasons for spoilage, methodof processing, classification of fruits and vegetables	4
	Physiology Respiration, transpiration, ripening, senescence, climactericand non-climacteric fruits	6
	Fresh fruits and vegetable technology Techniques of extension of shelf life of fruits and vegetables, waxing, chilling	6
	Thermal processing of fruits and vegetables Steps of canning fruits and vegetables, factors affecting process-time and temperature, containers of canning, syrups and brines for canning, spoilage in cannedfoods	6
II	**Preservation using sugar** Ingredients and processes technology for the manufacture ofjam, jellies, marmalade, and preserves	6
	Preservation using salt. Concept of fermented and non-fermented pickles	4
	Drying and dehydration Drying of selected fruits and vegetables, changes duringdrying and spoilage of dehydrated fruits and vegetable	5
	Tomato products Selection of tomatoes, pulping & processing of tomato juice, tomato puree, paste, ketchup, sauce and soup	6
	TOTAL	**43**

BOOKS RECOMMENDED:

Authors	**Title**
Girdhari Lal and Sidappa	Preservation of Fruits and Vegetable
Shrivastava and Kumar	Fruit and Vegetable Preservation
N Shakuntala Manay	Foods, Facts and Principles
Luh and Wudruf	Commercial Fruit Processing
Wills, Lee	Post-Harvest Physiology
& Handling of Fruits &Vegetables	

Semester-IV							
Sl. No	Code No.	Course Title	Hours per week			Hours	Credits
			L	T	P		
6.	PCFT-208	**Technology of Fruits and Vegetable Processing Lab**	0	0	2	2	1

Objective of this course is to impart knowledge about

- Quality evaluation of fruits and vegetable products.
- Unit operations involved in the canning process of fruits and vegetables.
- Dehydration of various fruits and vegetables.

Course Outcomes:

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

CO1	Estimation of the Quality of fruits and vegetable products.	Analyzing
CO2	Extraction and preservation of juice by different methods	Applying
CO3	Identifying different cans and canning process.	Applying
CO4	Preparation of brine and syrup solution for the canning of fruits and vegetables	Applying
CO5	Preparation of dehydrated fruits and vegetables	Applying

Mapping of Course Outcome and Program Outcome:

CO/PO Mapping: Technology of Fruits and Vegetable Processing Lab
(Strong(3) / Medium(2) / Weak(1) indicates strength of correlation):

PO/CO		Program Outcome (PO)						
		PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**
Course Outcome (CO)	**CO1**	3	2	3	3	3	2	3
	CO2	3	3	2	1	1	2	3
	CO3	3	3	2	2	2	3	3
	CO4	3	3	2	2	2	2	3
	CO5	3	3	2	2	2	3	3
Average		3	1.8	2	2	2	2.4	3

List of practicals:

1. Preparation of standard solution for Acid-base titration
2. Determination of Brix (TSS), pH and acidity
3. Determination of Vitamin C by titrimetric method
4. Extraction and preservation of juice by different methods
5. Selection of raw material like fruits/vegetables for canning.
6. Preparation of brine and syrup for canning
7. Peeling of fruit and vegetables
8. Dehydration of onion, potato, and bitter gourd
9. Dehydration of apple and grapes
10. Examination of canned food
11. Preparation of squash, RTS, Cordial and determination of Brix (TSS), pH and acidity
12. Preparation of Mixed Fruit Jam, Jelly and Citrus Marmalades and determination of Brix (TSS), pH and acidity.
13. Preparation of Tomato Ketchup/Soup and determination of Brix (TSS), pH and acidity.

Semester-IV							
Sl. No	**Code No.**	**Course Title**	**Hours per week**			**Hours**	**Credits**
			L	**T**	**P**		
2.	PCFT-204	**Technology of Milk and Milk Products**	3	0	0	3	3

Course Objectives:

Objective of this course is to impart knowledge about

- Milk composition and properties and factors affecting them.
- Unit operations involved in milk processing.
- Manufacturing of various special milk and milk products.

Course Outcomes:

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

CO1	Explain the composition and physicochemical properties of milk	Understanding
CO2	Describe the factors affecting the milk composition and properties	Understanding
CO3	Explain various unit operations involved in the processing of various milk and its products	Understanding
CO4	Describe the thermal processes involved in milk such as pasteurization etc.	Understanding
CO5	Elaborate the techniques of processing of milk into various products	Applying

Mapping of Course Outcome and Program Outcome:

CO/PO Mapping: Technology of Milk and Milk Products
(Strong(3) / Medium(2) / Weak(1) indicates strength of correlation):

PO/CO		Program Outcome (PO)						
		PO1	PO2	PO3	PO4	PO5	PO6	PO7
Course Outcome (CO)	CO1	3	2	3	1	1	2	3
	CO2	3	3	2	1	1	2	3
	CO3	3	3	3	3	3	2	2
	CO4	3	3	2	2	2	2	3
	CO5	3	3	2	2	2	3	3
Average		3	3	2.4	1.8	1.8	2.2	2.8

UNIT	CONTENTS	LECTURES
I	**Introduction** Milk composition, factors affecting composition of milk; Physico-chemical properties of milk; milk procurement and pricing pattern in Indian.	**8**
	Milk processing (Fundamentals and overview) Handling, transportation, and reception (unloading, weighing, testing,) of milk, grading of milk. Platform tests for incoming milk. Filtration and clarification. Cream separation by gravity and centrifugation. Standardization of milk and cream (toned, double toned, skimmed). Homogenization of milk and its mode of operation. Pasteurization of milk by LTLT, HTST and other methods. Packaging, storage, and distribution. Cleaning and sanitization of dairy equipment	**14**
II	**Special milks** Manufacturing process of sterilized, flavoured, condensed and evaporated milks.	**6**
	Milk products Methods of manufacturing of butter, kulfi,softy, ice cream, spray and drum dried milk powder. chhana/ paneer, khoa, lassi, butter oil, desi ghee, dahi.	**12**
	TOTAL	**40**

RECOMMENDED BOOKS:

Authors	Title	Publishers
Sukumar De	Outlines of Dairy Technology	Oxford
Lampart Hill	Dairy products	Tata McGraw

Semester-IV							
Sl. No	**Code No.**	**Course Title**	**Hours per week**			**Hours**	**Credits**
			L	**T**	**P**		
3.	PCFT-206	**Unit Operations in Food Processing**	3	1	0	4	4

Course Objectives:

Objective of this course is to impart knowledge about

- The theory and application of basic unit operations performed in various food processing industries.
- The size reduction, and mixing operations of different types of foods necessary in the processing of foods.
- The separation of valuable components from the liquid, solid streams by physical, contact equilibrium processes as well as the distillation process.

Course Outcomes:

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

CO1	Describe the processing of foods in terms of common unit operations like size reduction, mixing, and separation	Understanding
CO2	Explain the principle and application of the leaching and extraction process.	Understanding
CO3	Discuss the construction, working, and applicability of various size reduction, mixing, and separation equipment.	Understanding
CO4	Explain the principle, construction, and working mechanism of distillation systems	Understanding
CO5	Explain the construction, designs, and working principle of filtration, centrifugation, and sedimentation processes	Understanding

Mapping of Course Outcome and Program Outcome:

CO/PO Mapping: Unit Operations in Food Processing (Strong(3) / Medium(2) / Weak(1) indicates strength of correlation):								
PO/CO		Program Outcome (PO)						
		PO1	PO2	PO3	PO4	PO5	PO6	PO7
Course Outcome (CO)	CO1	3	2	2	3	3	2	2
	CO2	3	3	2	3	3	2	2
	CO3	3	3	3	3	3	3	3
	CO4	3	3	2	3	3	3	2
	CO5	3	3	2	3	3	3	2
Average		3	2.8	2.2	3	3	2.6	2.2

UNIT	CONTENTS	LECTURES
I	**Introduction** Definition and application in food processing.	**1**
	Size reduction Size reduction equipment used in the food industry e.g grinders, crushers, and pulverizers, their working, advantages, and limitations	**8**
	Sieving Separation based on size, types of screens, their working, advantages and limitations. Factors affecting the sieving process.	**6**
	Mixing Equipment for liquid and solid mixing, their working, advantages and limitations.	**6**
II	**Leaching and Extraction** Equipment for leaching and extraction, their working, advantages, and limitations.	**5**
	Distillation Equipment for distillation, their working, advantages and limitations	**4**
	Filtration Filtration equipment, their working, advantages,and limitations.	**6**
	Sedimentation and Centrifugal Separation Equipment for sedimentation and centrifugal separation, their working, advantages, and limitations.	**6**
	TOTAL	**42**

RECOMMENDED BOOKS

Authors	Title	Publishers
P. Fellows	Food Processing Technology	Woodhead Pub
R. L. Earle	Unit operations in food processing	

Semester-IV							
Sl. No	**Code No.**	**Course Title**	**Hours per week**			**Hours**	**Credits**
			L	**T**	**P**		
8.	PCFT-212	**Unit Operations in Food Processing Lab**	0	0	2	2	1

Course Objectives: Objective of this course is to impart knowledge about

- Construction and working mechanism of various types of milling equipment.
- Principle working of mixers and extractors
- Sedimentation rate and working of distillation, filtration, and centrifugation systems

Course Outcomes:

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

CO1	Handle the equipment independently	Applying
CO2	Learn the principles behind milling equipment and their working	Applying
CO3	Determine the sedimentation rates	Evaluate
CO4	Obtain knowledge about the working of centrifugation systems	Applying
CO5	Learn the principle and working of a distillation unit	Applying

Mapping of Course Outcome and Program Outcome:

CO/PO Mapping: Unit Operations in Food Processing Lab (Strong(3) / Medium(2) / Weak(1) indicates strength of correlation):								
PO/CO		Program Outcome (PO)						
		PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**
Course Outcome (CO)	**CO1**	3	2	2	3	3	2	3
	CO2	3	3	2	3	3	2	2
	CO3	3	3	2	3	3	3	2
	CO4	3	3	2	3	3	3	2
	CO5	3	3	2	3	3	3	2
Average		3	2.8	2	3	3	2.6	2.2

List of practicals:

1. To study the constructional and working features of ball mill.
2. To study the constructional and working features of hammer mill.
3. To study the constructional and working features of burr mill.
4. To study the constructional and working features of seed grader.
5. To study the constructional and working features of indented cylinder.
6. To study the constructional and working features of planetary mixer.
7. To study the constructional and working features of a bed extractor.
8. To study the constructional and working features of distillation equipment.
9. To study the constructional and working features of plate & frame filter press.
10. To study the constructional and working features of rotary drum vacuum filter.
11. Determination of sedimentation rate of a slurry.
12. To study the constructional and working features of disc bowl centrifuge

Semester-VI							
Sl. No	**Code No.**	**Course Title**	**Hours per week**			**Hours**	**Credits**
			L	**T**	**P**		
4.	PEFT-304	**Elective-I**	3	0	0	3	3
		PEFT-202a (Technology of Food Packaging)					

Course Objectives:

Objective of this course is to impart knowledge about

- Functions of packaging and familiarize them with different types of food packaging materials and their properties.
- Theory of permeability and barrier properties of different food packaging materials.
- Different food packaging equipment and machinery.

Course Outcomes:

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

CO1	Describe the objectives, and functions of packaging and select the packaging material based on the requirement and properties of the material.	Understanding
CO2	Discuss the manufacturing and characteristics of various packaging materials viz paper, glass, metal, and plastic	Understanding
CO3	Discuss the packaging equipment and machinery and packaging systems for various types of food.	Understanding
CO4	Explain specialized techniques in food packaging such as Active, aseptic, controlled & modified atmospheric packaging etc.	Understanding
CO5	Discuss the various labeling types and the concerned regulations	Understanding

Mapping of Course Outcome and Program Outcome:

CO/PO Mapping: Technology of Food Packaging (Strong(3) / Medium(2) / Weak(1) indicates strength of correlation):								
PO/CO		Program Outcome (PO)						
		PO1	PO2	PO3	PO4	PO5	PO6	PO7
Course Outcome (CO)	CO1	3	3	2	2	1	1	2
	CO2	3	3	2	2	2	2	2
	CO3	2	3	3	3	2	2	3
	CO4	2	3	2	2	2	3	3
	CO5	2	3	2	2	1	3	3
Average		2.4	3	2.2	2.2	1.6	2.2	2.6

Unit	Contents	Lectures
I	**Introduction** Definition; origin and types of packaging materials;function of packaging	**4**
	Packagingmaterials Paper, polymeric films, laminates, plastics, glass, metal,biodegradable materials; package forms	**10**
	Package evaluation WVTR; GTR; bursting strength; tensile strength; tearing strength; drop test	**6**
II	**Packaging machinery** Bottling; canning; form-fill-seal machines; bags, theirmanufacturing and closing	**6**
	Applications of packaging material Meat, fish, poultry, eggs; Milk and dairy products;Fruits and Vegetables; Cereal grains and baked foods	**8**
	Packaging environment Inert gas; vacuum; aseptic; CAP and MAP	**4**
	Package labeling Labeling types; functions and regulations	**4**
	TOTAL	**42**

Books Recommended:

Author	**Title**
Frank A. Paine	A Handbook of Food Packaging
N.T. Crosby	Food Packaging Materials
Calvin J. Bening	Plastic Films for Packaging

Semester-VI							
Sl. No	**Code No.**	**Course Title**	**Hours per week**			**Hours**	**Credits**
			L	**T**	**P**		
	PEFT-308	Elective -IV LAB	0	0	2	2	1
		PEFT-204a (**Technology of Food Packaging LAB**)					

Course Objectives:

Objective of this course is to impart knowledge about

- Identification of different types of packaging materials.
- Working of different package testing machines.
- Working of different food packaging and filling machines.

Course Outcomes:

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

CO1	Identify different types of plastic packaging materials.	Understanding
CO2	Select different types of packaging materials for varieties of processed foods.	Applying
CO3	Handle different food package testing machines.	Applying
CO4	Operate food packaging and filling machines.	Applying
CO5	Calculate water permeability and selection of different packaging materials.	Analyzing

Mapping of Course Outcome and Program Outcome:

CO/PO Mapping: Technology of Food Packaging LAB (Strong(3) / Medium(2) / Weak(1) indicates strength of correlation):								
PO/CO		Program Outcome (PO)						
		PO1	PO2	PO3	PO4	PO5	PO6	PO7
Course Outcome (CO)	CO1	3	3	2	2	1	1	2
	CO2	3	3	2	2	2	2	2
	CO3	3	3	3	3	2	2	3
	CO4	3	3	2	2	2	3	3
	CO5	2	3	2	2	2	3	3
Average		2.8	3	2.2	2.2	2	2.2	2.6

LIST OF PRACTICALS

1. Study of various equipment present in packaging lab
2. Analysis wax coating of wrap cover
3. Determination of the tensile strength of the cardboard
4. Determination of compression strength of wooden box using compression strength tester
5. To check the resistance of given packaging material using drop-test
6. To check the thermal resistance of glass bottles
7. To check the uniformity of packaging material
8. To check different packaging material
9. To perform vacuum packaging using vacuum sealing machine
10. To check heat seal-ability of different packaging materials
11. Study of the seal and shrink-packaging machine
12. Determination of water transmission rate of packaging material
13. Determination of the puncture resistance by using puncture resistance machine
14. Determination of grease resistance of packaging material.
15. Determination of water vapor transmission rate

Semester-IV							
Sl. No	**Code No.**	**Course Title**	**Hours per week**			**Hours**	**Credits**
			L	**T**	**P**		
4.	**PEFT-202**	**Elective-I**	3	0	0	3	3
		PEFT-202b (Technology of Spices, and Condiments)					

Course Objectives:

Objective of this course is to impart knowledge about

- Importance of spices, herbs, and condiments in the food processing and products
- Different types of spices, herbs, and condiments and their health benefits
- Processing of spices and herbs and their applications.

Course Outcomes:

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

CO1	Explain the significance of spices, herbs, and condiments in food processing and products	Understanding
CO2	Explain the classification and properties of various spices, herbs, and condiments	Understanding
CO3	Describe the processing of different spices, herbs, and condiments	Understanding
CO4	Explain the different spices products such as oleoresins and essential oils.	Understanding
CO5	Explain the applications of various spices, herbs, and condiments	Understanding

Mapping of Course Outcome and Program Outcome:

CO/PO Mapping: Technology of Spices, and Condiments
(Strong(3) / Medium(2) / Weak(1) indicates strength of correlation):

PO/CO		Program Outcome (PO)						
		PO1	PO2	PO3	PO4	PO5	PO6	PO7
Course Outcome (CO)	CO1	3	3	2	1	1	2	3
	CO2	3	3	2	1	1	2	2
	CO3	3	3	3	2	2	2	3
	CO4	3	3	2	2	2	2	3
	CO5	3	3	2	1	1	3	3
Average		3	3	2.2	2.4	2.4	2.2	2.8

UNIT	CONTENTS	LECTURES
I	**Introduction** Importance and role of spices, herbs and condiments in food processing and food products.	**6**
	Classification and properties Classification and properties of spices, herbs, and condiments– their products, including health benefits and medicinal properties	**8**
	Processing steps Cleaning, grading, milling, blending, formulating, and packaging of spices and spice mixes.	**5**
II	**Processing of spicesand herbs** Rhizome: Ginger, turmeric Bulb: Onion and garlic Bud spices: Clove. Fruit spices: Nutmeg, chilli and cardamom Leafy spices: bay, oregano, basil (tulsi), mint, thyme, and curry leaves. Seed spices: pepper fenugreek, mustard, dill, andcoriander. Common aromatic herbs: mint, lemon grass.	**10**
	Spice products Introduction of oleoresins and essential oils.	**6**
	Application Spices and spice products.	**6**

RECOMMENDED BOOKS :

Title	Authors
Medicinal Plants	NS Chauhan
Spices and Condiments	J S Pruthy
Food and Beverage Service	Dennis & Lilly Crap

Semester-IV							
Sl. No	**Code No.**	**Course Title**	**Hours per week**			**Hours**	**Credits**
			L	**T**	**P**		
4.	**PEFT-202**	**Elective-I**	0	0	2	2	1
		PEFT-204b (Technology of Spices, and Condiments LAB)					

Course Objectives:

Objective of this course is to impart knowledge about

- Identify different Spices, Herbs & Condiments.
- Unit operations involved in the production of Spices, Herbs & Condiments.
- Identify the possible adulterants of Spices, Herbs & Condiments.

Course Outcomes:

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

CO1	Identify the common Spices, Herbs & Condiments.	Analyzing
CO2	Able to understand the process of essential oil and oleoresin extraction	Understanding
CO3	Identify different unit operations of spice manufacturing.	Analysis
CO4	Identify common adulterants of spices, herbs & condiments	Applying
CO5	Identify the quality of spices, herbs & condiments	Applying

<u>Mapping of Course Outcome and Program Outcome:</u>

CO/PO Mapping: Technology of Spices, and Condiments LAB (Strong(3) / Medium(2) / Weak(1) indicates strength of correlation):								
PO/CO		Program Outcome (PO)						
		PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**
Course Outcome (CO)	**CO1**	3	3	2	1	1	2	3
	CO2	3	3	2	1	1	2	2
	CO3	3	3	2	2	2	2	3
	CO4	3	3	2	2	2	2	3
	CO5	3	3	2	1	1	2	3
Average		3	3	2	1.4	1.4	2	2.8

LIST OF PRACTICALS

1. Demonstration of process of essential oil extraction and oleoresin of different spices
2. Study of detection of adulteration in spices
3. Study of constituents and sensory characteristics of essential oils and oleoresins
4. Demonstration of actual processing of different spices, herbs and plantation products
5. Practical related to:
    1. cleaning,
    2. grading,
    3. milling,
    4. blending,
    5. formulating and preparing of spices and spice mixes.
6. Visit to relevant industries.

Semester-IV							
Sl. No	**Code No.**	**Course Title**	**Hours per week**			**Hours**	**Credits**
			L	**T**	**P**		
4.	**PEFT-202**	**Elective-I**	3	0	0	3	3
		PEFT-202c (Technology of Food Beverages)					

Course Objectives:

Objective of this course is to impart knowledge about

- Importance of beverage and status of beverage industry in India
- Different types of beverages and their formulation.
- The alcoholic beverages and their processing.

Course Outcomes:

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

CO1	Explain the various types of beverages and their nutritional significance	Understanding
CO2	Discuss the technology of carbonated soft drinks	Understanding
CO3	Describe the processing of different types of tea and coffee	Understanding
CO4	Explain the methodologies involved in the production of alcoholic beverages	Understanding
CO5	Explain the role of various ingredients used in the production of alcoholic beverages	Understanding

Mapping of Course Outcome and Program Outcome:

CO/PO Mapping: Technology of Food Beverages (Strong(3) / Medium(2) / Weak(1) indicates strength of correlation):								
PO/CO		Program Outcome (PO)						
		PO1	PO2	PO3	PO4	PO5	PO6	PO7
Course Outcome (CO)	CO1	3	2	3	1	1	2	3
	CO2	3	3	2	2	1	2	2
	CO3	3	3	3	2	2	2	3
	CO4	3	3	2	2	2	2	3
	CO5	3	3	2	2	2	3	3
Average		3	2.8	2.4	1.8	1.6	2.2	2.8

UNIT	CONTENTS		LECTURES
I	**Introduction**	Status and scope of the beverage industry in India, classification of beverages and their nutritional Significance	**6**
	Technology of Carbonated andNon-Alcoholic Beverages	Definition of soft drinks, different ingredients for soft drinks and their functions, methods of preparation of carbonated and non-alcoholic beverages, related equipment and machinery of preparation of food beverages. Malted beverages	**8**
	Malted beverages	Different types of malt, malting process, malting of barley, malted beverages an overview of the process	**6**
II	**Tea and Coffee Processing**	Tea types and classification, nutritional significance, methods and processing of tea and coffee, related equipment and machinery	**8**
	Alcoholic Beverages	Ingredients and their role in beer and wine preparation, methods of manufacturing of wine, beer, scotch, whiskey, brandy, rum, vodka and gin and theirrelated equipment.	**10**
		TOTAL	**38**

RECOMMENDED BOOKS

Authors	Title	Publishers
Potter and Hotchkisn	Food Science	CBI publication
Ashurst Press	Chemistry and Technology of Soft Drinks and Fruit Juices	Sheffield Academic

Semester-IV							
Sl. No	**Code No.**	**Course Title**	**Hours per week**			**Hours**	**Credits**
			L	**T**	**P**		
4.	**PEFT-202**	**Elective-I**	0	0	3	2	1
		PEFT-204c (Technology of Food Beverages LAB)					

COURSE OBJECTIVES: Objective of this course is to impart knowledge about

1. To impart basic understanding on estimation of alkanity, hardness and chlorine content of potable water.
2. To understand processes of malting, fermentation, carbonation, distillation and methodology of preparation grape wine and cider.
3. To provide basic understanding of estimation of alcoholic content in alcoholic beverages and caffeine content in tea and coffee.

COURSE OUTCOMES: On successful completion of subject, the students will be able to

CO1	Estimation alkalinity and chlorine content of potable water.	Analysis
CO2	Study the preparation of grape wine and cider.	Applying
CO3	Study of malting process and malt preparation basics of malting.	Applying
CO4	Analysis of physicochemical characteristics of beverages.	Analysis
CO5	Study of food beverages processing by visiting bottling and food beverages plants.	Applying

Mapping of Course Outcome and Program Outcome:

CO/PO Mapping: Technology of Food Beverages (Strong(3) / Medium(2) / Weak(1) indicates strength of correlation):								
PO/CO		Program Outcome (PO)						
		PO1	PO2	PO3	PO4	PO5	PO6	PO7
Course Outcome (CO)	CO1	3	2	3	1	1	2	3
	CO2	3	3	2	2	1	2	2
	CO3	3	3	3	2	2	2	3
	CO4	3	3	2	2	1	2	3
	CO5	3	3	2	2	2	3	3
Average		3	2.8	2.4	1.8	1.4	2.2	2.8

LIST OF PRACTICALS

1. Determination of alkalinity of potable water
2. Determination of chloride content of potable water
3. Determination of hardness of potable water by EDTA method
4. Study the process of fermentation
5. Study the process of distillation
6. Estimation of alcoholic content of alcoholic beverages
7. Estimation of caffeine content of tea
8. Estimation of caffeine content of coffee
9. Preparation of grape wine
10. Preparation of cider
11. Study the process of malting
12. Study the process of carbonation
13. Visit to bottling plant
14. Visits to beverages plants

Semester-IV							
Sl. No	**Code No.**	**Course Title**	**Hours per week**			**Hours**	**Credits**
			L	**T**	**P**		
5.	**OEFT-202**	**Food and Nutrition**	3	0	0	3	3

Course Objectives: Objective of this course is to impart knowledge about

1. Concept of human food requirements and digestion.
2. Best use of available nutrients in order to full fill the requirements of balanced diet for the consumers.
3. The nutritional daily requirements of various age groups.

Course Outcomes:

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

CO1	Describe the importance of biomolecules in the human body.	Understanding
CO2	Explain the processes involved in the digestion and absorption of food nutrients.	Understanding
CO3	Explain the common health problems related to the inadequate/excessive intake of nutrients.	Understanding
CO4	Describe the food allergies and their classification.	Understanding
CO5	Explain the effect of processing on food nutrients.	Understanding

Mapping of Course Outcome and Program Outcome:

CO/PO Mapping: Food and Nutrition
(Strong(3) / Medium(2) / Weak(1) indicates strength of correlation):

PO/CO		Program Outcome (PO)						
		PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**
Course Outcome (CO)	**CO1**	3	3	1	1	1	2	3
	CO2	3	3	1	1	1	1	2
	CO3	3	3	1	1	1	1	3
	CO4	3	3	1	1	1	2	3
	CO5	3	3	2	1	1	2	3
Average		3	3	1.2	1	1	1.6	2.8

UNIT	CONTENTS	LECTURES
I	**Introduction:** Importance of biomolecules in the body, Process of digestion, and absorption of food and its nutrients	8
	Malnutrition and Health: Role of dietary fiber and another unavailable carbohydrate in the body, protein efficiency ratio, digestibility coefficient, biological value, net protein utilization and net protein ratio, balanced diet, inadequate/excessive intake of nutrients and common health problems, nutrition label, Minimum nutritional requirement and RDA	12
II	**Food allergens** Food as allergens, Food allergy and its classification, characteristic of allergic reactions.	6
	Food Processing Effect of processing on nutrients such as carbohydrate, protein, fats, vitamins and minerals	6
	Nutrition Estimation techniques (an overview) The five domains of nutrition assessment outlined in the NCP include 1) food or nutrition-related history, 2) biochemical data, medical tests, and procedures, 3) anthropometric measurements, 4) nutrition-focused physical findings, and 5) client history.	6
	TOTAL	38

Semester-V							
Sl. No	**Code No.**	**Course Title**	**Hours per week**			**Hours**	**Credits**
			L	**T**	**P**		
2.	**PCFT-301**	**Technology of Meat, Fish, and Poultry Processing**	3	0	0	3	3

Course Objectives:

Objective of this course is to impart knowledge about

- Biochemical and structural changes take place during the conversion of muscle to meat.
- Preservation techniques of meat, fish, and poultry products
- Processing techniques of the meat, poultry, and fish

Course Outcomes:

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

CO1	Describe the role of various chemical constituents in the development of various meat, poultry, and fish products	Understanding
CO2	Discuss slaughter techniques and postmortem changes occurring in meat	Understanding
CO3	Explain the preservation of meat, fish, and poultry products.	Understanding
CO4	Discuss the structure and composition of egg	Understanding
CO5	Explain the processing of meat, fish, and poultry into various products.	Understanding

<u>Mapping of Course Outcome and Program Outcome:</u>

CO/PO Mapping: Technology of Meat, Fish, and Poultry Processing (Strong(3) / Medium(2) / Weak(1) indicates strength of correlation):								
PO/CO		Program Outcome (PO)						
		PO1	PO2	PO3	PO4	PO5	PO6	PO7
Course Outcome (CO)	CO1	3	3	2	1	1	2	3
	CO2	3	3	2	2	2	2	3
	CO3	3	3	2	2	1	2	3
	CO4	3	3	1	1	1	2	2
	CO5	3	3	2	2	2	2	2
Average		3	3	1.8	1.6	1.4	2	2.6

UNIT	CONTENTS	LECTURES
I	**Introduction:** Definition; sources of meat, fish, and poultry	**5**
	Animal Tissues and its conversion to meat: Anti-mortem inspection, slaughtering methods, evisceration, meat cuts, postmortem changes in meat and its effects on meat quality	**9**
	Meat Preservation: Curing, smoking, chilling, freezing, canning, and pickling	**8**
II	**Egg Processing:** Structure and composition of egg; egg quality; grading; preservation by pickling and storage	**4**
	Poultry Processing Kind of poultry; different types of slaughtering methods; singeing; evisceration; washing; cooling and storage	**6**
	Fish Processing Classification of fishes; composition, processing, preservation and spoilage of fish	**8**
	Total	**40**

RECOMMENDED BOOKS:

Authors	Title	Publishers
Lawrie	Meat Science	CBS
Stadelman	Egg Science and Technology	
Borgstron	Fish as Food. Vol. I to IV	AP

Semester-V							
Sl. No	**Code No.**	**Course Title**	**Hours per week**			**Hours**	**Credits**
			L	**T**	**P**		
6.	**PCFT305**	**Technology of Meat, Fish, and Poultry Processing Lab**	0	0	2	2	1

Course Objectives:

Objective of this course is to impart knowledge about

- Preparation of various meat and poultry-related food products.
- Effect of temperature on the coagulation of egg proteins.
- Physicochemical analysis of meat and eggs, fish, and its products.

Course Outcomes:

On successful completion of the subject, the students will be able to do

CO1	Physicochemical analysis of meat and poultry and fish	Analyzing
CO2	Performing the slaughtering and dressing of animals and fish	Applying
CO3	Quality evaluation of prepared meat products	Applying
CO4	Quality evaluation of prepared egg products/by products	Applying
CO5	Quality evaluation of prepared fish products	Applying

Mapping of Course Outcome and Program Outcome:

CO/PO Mapping: Technology of Meat, Fish, and Poultry Processing Lab (Strong(3) / Medium(2) / Weak(1) indicates strength of correlation):								
PO/CO		Program Outcome (PO)						
		PO1	PO2	PO3	PO4	PO5	PO6	PO7
Course Outcome (CO)	CO1	3	3	2	1	1	2	2
	CO2	3	3	2	2	2	2	2
	CO3	3	3	2	2	1	2	3
	CO4	3	3	2	2	1	2	3
	CO5	3	3	2	1	1	2	3
Average		3	3	2	1.6	1.2	2	2.6

List of practical:

1. Slaughter and dressing of animals/poultry
2. Retails cutting of dressed chicken
3. Preparation of ready to cook poultry
4. Preparation of fried chicken
5. Microwave cooking of chicken
6. Preparation of tandoori chicken
7. Determine the internal quality of the eggs
8. Determine the external quality of the eggs
9. Determination of proximate composition of egg components
10. Determine the effect of temperature on the coagulation of egg protein
11. Preparation of fish, meat, and eggs pickle
12. Fish filleting and steaking
13. Preparation of fish patties
14. Study of preservative techniques of meat and egg.

Semester-V							
Sl. No	**Code No.**	**Course Title**	**Hours per week**			**Hours**	**Credits**
			L	**T**	**P**		
3.	**PCFT-303**	**Bakery and Confectionery Technology**	3	0	0	3	3

Course Objectives:

Objective of this course is to impart knowledge about

- Various raw material and their functions in bakery products.
- Different methods and process involved in preparation of bakery and confectionery products.
- Different hygiene practices and their importance in bakery and confectionery industries.

Course Outcomes:

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

CO1	Understand the importance of raw material in bakery foods.	Understanding
CO2	Explain the basic functions of raw material in bakery foods.	Understanding
CO3	Describe the various process techniques for the preparation of bakery products.	Understanding
CO4	Explain the different quality parameters confectionery products	Understanding
CO5	Explain the Importance of hygiene in bakery and confectionery industries	Understanding

Mapping of Course Outcome and Program Outcome:

CO/PO Mapping: Bakery and Confectionery Technology
(Strong(3) / Medium(2) / Weak(1) indicates strength of correlation):

PO/CO		Program Outcome (PO)						
		PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**
Course Outcome (CO)	**CO1**	3	3	2	1	1	2	3
	CO2	3	3	2	2	1	2	2
	CO3	3	3	2	2	2	2	3
	CO4	3	3	2	2	1	2	3
	CO5	3	3	2	1	1	2	3
Average		3	3	2	1.6	1.2	2	2.8

UNIT	MAIN TOPICS	DETAILED CONTENTS	LECTURES
I	**Introduction**	Definition of bakery products; Raw materials for bakery products and their functions in bread, biscuits, cake, pastry, buns, and traditional products	12
	Bakery Products	Flow sheet with brief description of common Products like bread, biscuits, cake, pastry, and buns	14
II	**Confectionery products**	Raw materials for confectionery products Types of confectionery, Flow diagram and brief description of hard, boiled candies, fruit candies, toffees and chocolates processing, packaging of confectionery products, related confectionery making equipment	8
	Hygiene Practices	Importance of hygiene in bakery and confectionery plants, various cleaning agents and disinfectants	8
		TOTAL	42

RECOMMENDED BOOKS:

Authors	Title	Publishers
SB Arora	Hand Book of Bakery Products	SIRI
Matz	Bakery Technology and Engineering	AVI

Semester-V							
Sl. No	**Code No.**	**Course Title**	**Hours per week**			**Hours**	**Credits**
			L	**T**	**P**		
4.	**PEFT-301**	**Elective -II**	3	0	0	3	3
		PEFT-301a (Food Flavors)					

Course Objectives:

Objective of this course is to impart knowledge about

1. Flavoring materials and classification based on origin, and physical characteristics.
2. Flavor development process and sensory evaluation
3. Various analytical techniques for flavor evaluation

Course Outcomes:

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

CO1	Describe source of flavor compounds and basic components of flavor	Understanding
CO2	Explain theory of taste and their perception	Understanding
CO3	Discuss flavour developments process	Understanding
CO4	Explain the development of flavors during food processing and by biogenesis	Understanding
CO5	Discuss various flavor analysis techniques	Understanding

Mapping of Course Outcome and Program Outcome:

CO/PO Mapping: Food Flavors (Strong(3) / Medium(2) / Weak(1) indicates strength of correlation):								
PO/CO		Program Outcome (PO)						
		PO1	PO2	PO3	PO4	PO5	PO6	PO7
Course Outcome (CO)	CO1	3	3	2	1	1	2	3
	CO2	3	3	2	1	1	2	2
	CO3	3	3	2	2	2	2	3
	CO4	3	3	2	1	1	2	2
	CO5	3	3	2	2	2	2	3
Average		3	3	2	1.4	1.4	2	2.6

UNIT	CONTENTS	LECTURES
I	**Introduction** Definition of Flavour, Classification of Food Flavours, Chemical compounds of flavors, Natural vs Artificial flavours	**6**
	Anatomy of flavor Perception of taste and aroma, Gustation and Olfaction, gustatory receptors, Types of taste and their perception, perception of odour in mouth and nose	**12**
II	**Biogenesis of flavors** Flavour development during biogenesis, flavour development during food processing. Use of biotechnology to develop flavours.	**10**
	Flavour Analysis Subjective versus Objective methods of analysis, psychophysics, and sensory evaluation. Instrumental analysis, sample handling and artifacts.	**8**
	Total	**36**

Semester-V							
Sl. No	**Code No.**	**Course Title**	**Hours per week**			**Hours**	**Credits**
			L	**T**	**P**		
4.	**PEFT-301**	**Elective -II**	3	0	0	3	3
		PEFT-301b (Technology of Fermented Foods)					

Course Objectives:

Objective of this course is to impart knowledge about

- Principles of food fermentation technology.
- Various operations and methods involved in the fermentation process.
- Processing of various fermented food products.

Course Outcomes:

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

CO1	Explain the basic principles of fermentation, types, and operations.	Understanding
CO2	Explain the types of fermenters and their working.	Understanding
CO3	Describe the methods for evaluating fermented food products.	Understanding
CO4	Explain the different media and starters used in the fermentation of foods.	Understanding
CO5	Explain the process involved in the development of various fermented food products.	Understanding

Mapping of Course Outcome and Program Outcome:

CO/PO Mapping: Technology of Fermented Foods (Strong(3) / Medium(2) / Weak(1) indicates strength of correlation):								
PO/CO		Program Outcome (PO)						
		PO1	PO2	PO3	PO4	PO5	PO6	PO7
Course Outcome (CO)	CO1	3	3	2	1	1	2	3
	CO2	3	3	2	2	1	2	2
	CO3	3	3	2	2	2	3	3
	CO4	3	3	2	2	1	3	2
	CO5	3	3	3	3	2	2	3
Average		3	3	1.2	2	1.4	2.4	2.6

UNIT	CONTENTS	LECTURES
I	**Introduction** Fermentation, basis and principles of fermentation and operations. Types of fermentation, Industrial fermentation in food technology	**5**
	Fermentation systems Types of fermentation: submerged and solid state, batch and continuous system, Types of fermenters: working principles	**7**
	Fermented Fruit and Vegetable Products Sauerkraut, Preparation of vegetables pickles. Preparation of dill pickles, fermentation of fruits an overview	**8**
II	**Fermented Cereal products.** Production of bread, Beer, Miso, Temph, Idli, Dosa	**8**
	Fermented dairy and meat products Production of curd, yoghurt, cheese, and meat sausages and other meat products	**10**
	TOTAL	**38**

Semester-V							
Sl. No	**Code No.**	**Course Title**	**Hours per week**			**Hours**	**Credits**
			L	**T**	**P**		
4.	**PEFT-301**	**Elective -II**	3	0	0	3	3
		PEFT-301c (Refrigeration and Cold Storage)					

Course Objectives:

Objective of this course is to impart knowledge about

- The principles of Refrigeration and characteristics of different refrigeration
- The components and construction of a refrigeration system and cold storage.
- The optimum temperatures of storage for different food materials.

Course Outcomes:

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

CO1	Describe the principles of Refrigeration and characteristics of different refrigeration	Understanding
CO2	Discuss the components of a Refrigeration system	Understanding
CO3	Describe the design and Construction of cold storage.	Understanding
CO4	Discuss the optimum temperatures of storage for different food materials.	Understanding
CO5	Discuss the chilling equipment for liquid foods.	Understanding

Mapping of Course Outcome and Program Outcome:

CO/PO Mapping: Refrigeration and Cold Storage
(Strong(3) / Medium(2) / Weak(1) indicates strength of correlation):

PO/CO		Program Outcome (PO)						
		PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**
Course Outcome (CO)	**CO1**	3	3	2	2	2	2	3
	CO2	3	3	2	2	2	2	2
	CO3	3	3	3	3	3	3	2
	CO4	3	3	2	3	3	2	3
	CO5	3	3	2	2	2	2	3
Average		3	3	2.2	2.4	2.4	2.2	2.6

UNIT	CONTENTS	LECTURES
I	**Introduction** Principles of Refrigeration, Refrigeration cycles, refrigerants, characteristics of different refrigeration's, ozone-depletion potentials, green house potential refrigerants, use of non-polluting refrigerants, ton of refrigeration.	**8**
	Refrigeration system Components of a Refrigeration system: compressor, condenser, Evaporator, Expansion valves piping and different controls. Atmospheric air and its properties, Psychometrics	**12**
II	**Cold storage** Design and Construction, Small and large commercial storages, Cold Room temperatures, Insulation, Properties of insulating materials, Doors and other openings. Cold load estimation; prefabricated systems, Freezer Storages, Freezer room temperatures, insulation of freezer rooms: Pre-cooling and pre freezing. Cold storage practice, Optimum temperatures of storage for different food materials.	**12**
	Chilling of Foods Chilling equipment for liquid foods. Secondary refrigerants and direct expansion techniques in chilling. Chilled foods transport and display cabinets –Hygienic design considerations for chillers and chilled storages. Cool storage and their applications.	**8**
	TOTAL	**40**

Semester-V							
Sl. No	**Code No.**	**Course Title**	**Hours per week**			**Hours**	**Credits**
			L	**T**	**P**		
5.	**OEFT-301**	**Technology of Fermented Beverages**	3	0	0	3	3

Course Objectives:

Objective of this course is to impart knowledge about

- Importance of beverage and status of the beverage industry in India
- The process involved in the fermentation beverage technology
- Different types of fermented beverages and their formulation.

Course Outcomes:

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

CO1	Describe the status of different fermented beverage industry	Understanding
CO2	Explain the different raw materials used in different alcoholic beverages	Understanding
CO3	Explain the involved technologies in the production of alcoholic beverages	Understanding
CO4	Examine the physical, chemical changes occurring in the processing and storage of alcoholic beverages.	Understanding
CO5	Discuss the defects and spoilage of the fermented beverages	Understanding

Mapping of Course Outcome and Program Outcome:

CO/PO Mapping: Technology of Fermented Beverages (Strong(3) / Medium(2) / Weak(1) indicates strength of correlation):								
PO/CO		Program Outcome (PO)						
		PO1	PO2	PO3	PO4	PO5	PO6	PO7
Course Outcome (CO)	CO1	2	2	1	1	1	2	3
	CO2	3	3	2	1	1	2	2
	CO3	3	3	3	2	2	2	2
	CO4	3	2	2	1	1	2	2
	CO5	2	3	2	1	1	2	2
Average		2.6	2.6	2	1.2	1.2	2	2.2

Unit	Contents	Lectures
I	**Introduction** Fermented beverages and their importance; the status of the beverage industry in India	6
	Microorganisms/starters used in Alcoholic Beverages Role of various microorganisms in the process of fermentation and production of fermented beverages, biochemistry of fermentation, role of yeast cultures and lactic acid bacteria, Types of fermented beverages	10
II	**Non-Distilled Alcoholic Beverages** Raw materials, starters, Ingredients (Malt, hops, adjuncts, water) and their role in the production of Wine, Beer, their types, spoilage and beer defects	10
	Distilled Alcoholic Beverages Raw materials, starters, and their role in the production of whisky, brandy, gin and vodka, aging and maturation of Distilled Alcoholic Beverages.	10
	TOTAL	36

Semester-V							
Sl. No	**Code No.**	**Course Title**	**Hours per week**			**Hours**	**Credits**
			L	**T**	**P**		
8.	PRFT-301	Minor Project	0	0	4	4	2

Guidelines for Minor Project

Semester-VI							
Sl. No	**Code No.**	**Course Title**	**Hours per week**			**Hours**	**Credits**
			L	**T**	**P**		
2.	**PCFT-302**	**Food Analysis and Quality Control**	3	0	0	3	3

Course Objectives:

Objective of this course is to impart knowledge about

1. the quality, quality control, and their applications in food industry.
2. various physicochemical, microbiological, and sensory analysis of food products.
3. different types of food adulterations, their harmful effects and methods for their detection.

Course Outcomes:

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

CO1	Discuss quality control and its significance in processing.	Understanding
CO2	Explain the quality characteristics of the raw and processed food products	Understanding
CO3	Explain various physicochemical, microbiological, and sensory analysis of food products	Applying
CO4	Demonstrate food analytical techniques operations	Understanding
CO5	Explain different types of food adulterations, their harmful effects, and methods for their detection	Applying

Mapping of Course Outcome and Program Outcome:

CO/PO Mapping: Food Analysis and Quality Control
(Strong(3) / Medium(2) / Weak(1) indicates strength of correlation):

PO/CO		Program Outcome (PO)						
		PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**
Course Outcome (CO)	**CO1**	2	2	2	1	1	2	3
	CO2	3	3	2	2	1	2	2
	CO3	3	3	3	2	2	2	2
	CO4	3	2	2	2	2	3	3
	CO5	2	3	2	1	1	2	3
Average		2.6	2.6	2.2	1.6	2.4	2.2	2.6

UNIT	CONTENTS	LECTURES
I	**Introduction** Food quality, objective, importance, and basic criteria	**4**
	Quality characteristics Characteristics of raw and processed products based on physical, chemical, microbiological and sensory parameters	**8**
	Food analytical techniques pH meter, spectrophotometry, colorimetry, gravimetry, titrimetery	**8**
II	**Physicochemical analysis** pH, moisture, crude fiber, ash content, specific gravity, protein, fats, acidity, sugar, TSS etc.	**6**
	Microbiological analysis Total count, Standard plate count, yeast and mould count, coliform count	**4**
	Sensory analysis Criteria for selection of panelist, classification of panel and methods of panel selection and sensory evaluation	**5**
	Food adulteration Definition, types, different types of adulterants in various foods and their harmful effects. Methods of their detection	**8**
	TOTAL	**43**

Recommended Books

S No.	Name	Author	Publisher
1	Handbook of Analysis and Quality Control for Fruit and Vegetable	S. Ranganna 2nd Edition	McGraw Hill Education
2	Food Safety And Quality Control	Mathur Pulkit	Orient Blackswan Pvt Ltd
3	Quality Control For The Food Industry Fundamentals & Applications:	Amihud Kramer, Bernard A. Twigg	Medtech

Semester-VI							
Sl. No	**Code No.**	**Course Title**	**Hours per week**			**Hours**	**Credits**
			L	**T**	**P**		
6.	PCFT-304	**Food Analysis and Quality Control LAB**	0	0	2	2	1

Course Objectives:

Objective of this course is to impart knowledge about

1. Carrying out analysis of the different types of food materials.
2. Qualitative detection of the adulterants in the food.
3. Determination of extent of adulteration in food.

Course Outcomes:

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

CO1	Examine the presence of extraneous material in the powdered food items	Analyzing
CO2	Determine the quality of milk using organoleptic tests	Analyzing
CO3	Examine the marked samples for presence of adulteration	Analyzing
CO4	Determine the presence of adulterants in oils, spices, and coffee powders	Analyzing
CO5	Examine the preservatives and stabilizers in the milk	Analyzing

Mapping of Course Outcome and Program Outcome:

CO/PO Mapping: Food Analysis and Quality Control Lab
(Strong(3) / Medium(2) / Weak(1) indicates strength of correlation):

PO/CO		Program Outcome (PO)						
		PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**
Course Outcome (CO)	**CO1**	3	3	2	2	1	2	3
	CO2	3	3	2	3	1	2	3
	CO3	3	3	2	2	1	2	3
	CO4	3	3	2	3	1	2	3
	CO5	3	3	2	2	1	2	3
Average		3	3	2	2.4	1	2	3

LIST OF PRACTICALS:

1. Detection of Argemone Oil
2. Detection of oil soluble coal tar dies in oil
3. Detection of extraneous sand and silica in ground spices
4. Detection of extraneous sand and silica in atta/maida.
5. Detection of metanil yellow in sweets, ice-cream and pulses
6. Detection of roasted chicory in coffee powder
7. Analysis of the milk using organoleptic tests
8. Detection of preservatives in milk
9. Detection of stabilizers in milk
10. Detection of khesari dhal in pulses/Besan
11. Detection of non-tender stalk and stems in tea
12. Observation of rancidity in Biscuits
13. Detection of coal tar dies in spices containing fast natural colour (like turmeric)
14. Detection of papaya seeds in black peeper
15. Detection of powdered bran and sawdust in spices (ground)
16. Detection of brick powder, sand dirt in chilies

Semester-VI							
Sl. No	Code No.	Course Title	Hours per week			Hours	Credits
			L	T	P		
3.	PEFT-302	Elective -III	2	0	0	2	2
		PEFT302a (Post-Harvest Technology)					

Course Objectives:

Objective of this course is to impart knowledge about

- Handling and storage of the agricultural product after harvesting
- Different types of handling equipment for granular and powdered materials.
- Factors affecting the post-harvest handling of perishable and non-perishable food products

Course Outcomes:

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

CO1	Describe the importance of handling and storage of the food products	Understanding
CO2	Explain the factors affecting the post-harvest losses	Understanding
CO3	Describe the types and operational principles of various food handling equipment.	Understanding
CO4	Explain the storage conditions for the perishable and non-perishable food products	Understanding
CO5	Explain the causes of food spoilage during storage and their prevention.	Understanding

Mapping of Course Outcome and Program Outcome:

CO/PO Mapping: Post-Harvest Technology
(Strong(3) / Medium(2) / Weak(1) indicates strength of correlation):

PO/CO		Program Outcome (PO)						
		PO1	PO2	PO3	PO4	PO5	PO6	PO7
Course Outcome (CO)	CO1	3	3	2	2	2	2	3
	CO2	3	3	2	3	2	2	2
	CO3	3	3	2	2	3	2	3
	CO4	3	3	2	3	3	2	2
	CO5	3	3	2	2	2	2	3
Average		3	3	2	2.4	2.4	2	2.6

UNIT	CONTENTS	LECTURES
I	**Introduction** Importance of handling and storage of food and food products; Post-harvest losses of fruits, vegetables and grains in India; prevention of losses; storage and its benefits.	**10**
	Handling Equipment Types and operational principles of handling equipment: conveyors (belt, screw and pneumatic), elevators, pumps; weighing, packaging and sealing machines for granular and powdered materials.	**12**
II	**Post-harvest handling of fruits and vegetable** Low temperature storage of fruits and vegetables; storage requirements and types of storages structures e.g. modifiedatmospheric storage; controlled atmospheric storage, spoilage during storage of fruits and vegetables and their prevention.	**12**
	Post-harvest handling of foodgrains Factors affecting quality of grain during storage; types of storage structures for small, medium and large quantities; causes of spoilage during storage and their prevention.	**9**
	TOTAL	**43**

BOOKS ECOMMENDED:

Authors	Title	Publisher
Sinha R.N. and W.E. Muir	Handling and Storage of Food grains in Tropical and Subtropical Areas	Hall, C.W.
Volkind and Roslov	Grain storage - Part of a System Modern Potato and Vegetable storage	Hall, C.W.

Semester-VI							
Sl. No	**Code No.**	**Course Title**	**Hours per week**			**Hours**	**Credits**
			L	**T**	**P**		
3.	**PEFT-302**	**Elective -III**	2	0	0	2	2
		PEFT302b (Technology of Extruded Products)					

Course Objectives:

Objective of this course is to impart knowledge about:

- Working and maintenance of different types of extruders.
- Manufacturing of various extruded food products.
- Physicochemical and nutritional characteristics of extruded food products

Course Outcomes:

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

CO1	Describe the use of extrusion in the food industry.	Understanding
CO2	Explain the working and maintenance of different types of extruders and their advantages.	Understanding
CO3	Describe the processing and manufacturing of various extruded food products.	Understanding
CO4	Explain the physicochemical and nutritional aspects of food during extrusion	Understanding
CO5	Explain the factors affecting the extrusion of the food products	Understanding

Mapping of Course Outcome and Program Outcome:

CO/PO Mapping: Technology of Extruded Products (Strong(3) / Medium(2) / Weak(1) indicates strength of correlation):								
PO/CO		Program Outcome (PO)						
		PO1	PO2	PO3	PO4	PO5	PO6	PO7
Course Outcome (CO)	CO1	3	3	2	3	2	2	3
	CO2	3	3	3	3	3	2	2
	CO3	3	3	3	3	3	2	3
	CO4	3	3	2	2	2	2	3
	CO5	3	3	2	2	2	3	3
Average		3	3	2.4		2.4	2.2	2.8

UNIT	CONTENTS	LECTURES
I	**Introduction** Food Extrusion: Definition, introduction to extruders, principles and types, Uses of extruders in the food industry, Pre-conditioning of raw materials used in extrusion process, Extruder Selection, Operation for Different Food Applications	**8**
	Types of extruders *Single screw extruder*: Principle of working, Net Flow, Operations, *Twin screw extruder*: Counter rotating and co-rotating twin screw extruder, Process characteristics of the twin screw extruder, Rheological Properties of Materials During the Extrusion Process, Advantages of Twin Screw Extruder	**10**
II	**Extruded products** *Breakfast cereals by extrusion technology*: Classification of Breakfast cereals: Raw materials, process, and quality testing for Ready to eat breakfast cereals, manufacturing of pasta and vermicelli	**10**
	Effect of extrusion on food products Chemical and nutritional changes in food during extrusion, factors affecting extrusion of food products	**8**
	TOTAL	**36**

Semester-VI							
Sl. No	**Code No.**	**Course Title**	**Hours per week**			**Hours**	**Credits**
			L	**T**	**P**		
3.	**PEFT-302**	**Elective -III**	2	0	0	2	2
		PEFT302c (Food By-product and Waste Utilization)					

Course Objectives:

Objective of this course is to impart knowledge about

- The importance of waste utilization from different food processing industries.
- The concept of by-product Management, Minimization, and Utilization
- Waste utilization into value-added products

Course Outcomes:

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

CO1	Describe the types of waste and byproducts	Understanding
CO2	Discuss the byproducts obtained from various food processing industries	Understanding
CO3	Describe the various ways of transforming food waste into value-added products	Understanding
CO4	Discuss the storage and disposal of solid and liquid wastes generated form food industries	Understanding
CO5	Discuss the unit operations involved in effluent treatment operations using physical, chemical, and biological methods	Understanding

Mapping of Course Outcome and Program Outcome:

CO/PO Mapping: Food By-products and Waste Utilization (Strong(3) / Medium(2) / Weak(1) indicates strength of correlation):								
PO/CO		Program Outcome (PO)						
		PO1	PO2	PO3	PO4	PO5	PO6	PO7
Course Outcome (CO)	CO1	3	3	2	1	1	2	3
	CO2	3	3	1	1	1	2	2
	CO3	3	3	3	2	2	3	3
	CO4	3	3	2	2	2	3	3
	CO5	3	3	3	2	2	3	3
Average		3	3	2.2	1.6	1.6	2.6	2.8

Unit	Contents	Lectures
I	**Introduction** Definition, origin and type of waste and by-products, their identification.	**8**
	By-products Classification, composition and characterization, need for treatment and utilization, impact on environment; Types and availability of by-products of cereals, legumes, oilseeds, fruits and vegetables processing, meat, poultry, fish processing industries.	**12**
II	**Utilization** Waste utilization into value added products; pectin, food colorants, antioxidants from fruit peels (citrus, mango, pomegranate), Lycopene from tomato peels. Utilization of mango, citrus, apple, guava, grape waste in vinegar production. Utilization of plant by products for the recovery of proteins, dietary fibers, anti-oxidants and their use as nutraceuticals and colorants.	**12**
	Disposal Storage and disposal of solid waste in land-filling, burial, incineration, recycling.	**4**
	Treatments Storage and disposal of liquid waste. Effluent treatment basic unit operations and treatment of effluents by physical, chemical and biological methods	**6**
	TOTAL	**42**

Recommended Books

1. Ioannis S. Arvanitoyannis, Waste Management for the Food Industries, Elsevier Inc, USA.
2. Sean X. Liu, Food and Agricultural Wastewater Utilization and Treatment, Blackwell Publishing,USA.

5. Chakravarthy & De, Agricultural Waste and By Product Utilization.

3. Loannis S. and Arvanitoyannis, Waste Management in Food Industry, Academic Press
4. Vasso Oreopoulou and Winfried Russ, Utilization of byproducts and treatments of waste in FoodIndustry, Springer.

Semester-IV							
Sl. No	**Code No.**	**Course Title**	**Hours per week**			**Hours**	**Credits**
			L	**T**	**P**		
4.	**PEFT-202**	**Elective-IV**	3	0	0	3	3
		PEFT-304a (Food Laws and Quality Assurance)					

Course Objectives:

Objective of this course is to impart knowledge about

- The food quality control during processing, storage, distribution, and adulteration
- Different food laws and standards in India and their requirements and importance in controlling the quality
- Different types of sampling techniques for food testing and Sensory quality control

Course Outcomes:

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

CO1	Explain the principles and functions of food quality control	Understanding
CO2	Describe the objectives and importance of food laws and standards	Understanding
CO3	Discuss the various food regulations and certifications	Understanding
CO4	Implement various sampling techniques for the food testing operations	Applying
CO5	Determine the presence of adulterants in the food products and carry out sensory evaluation of food products	Applying

Mapping of Course Outcome and Program Outcome:

CO/PO Mapping: Food Laws and Quality Assurance (Strong(3) / Medium(2) / Weak(1) indicates strength of correlation):								
PO/CO		Program Outcome (PO)						
		PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**
Course Outcome (CO)	**CO1**	3	3	2	1	1	2	3
	CO2	3	3	2	1	1	2	2
	CO3	3	3	1	1	1	2	3
	CO4	3	3	2	2	2	2	3
	CO5	3	3	2	2	2	3	3
Average		3	3	1.8	1.4	1.4	2.2	2.8

UNIT	CONTENTS	LECTURES
I	**Introduction** Food laws and regulations: Needs, Benefits, Objectives, requirements. Mandatory andoptional food laws/standards	**8**
	Food regulations and Certifications Implementation, regulations of FSSAI, BIS, AGMARK	**6**
	Quality control Concept of quality and quality control; Principles and functions of quality control, quality attributes (qualitative, hidden and sensory), Subjective and objective qualitycontrol	**6**
II	**Sampling techniques and food analysis** Definition of sampling, purpose, sampling techniques, requirements and sampling procedures for liquid, powdered and granular material Objective and purpose of food analysis; food adulteration; purpose, classification, kinds	**8**
	Physico-chemical and mechanical properties Colour, gloss, flavour, consistency, viscosity, texture and their relationship with food quality	**7**
	Sensory quality control Definition, objectives, panel selection, sensorytechniques, Interpretation of sensory results instatistical quality control.	**7**
	Total	**42**

RECOMMENDED BOOKS:

Title	Authors	Publishers
Food Analysis: Theory and Practices	Pomeranz and Meloan	CBS
Handbook of Analysis of Fruit and Vegetable Products	Ranganna	Tata Mc-Graw-Hill
Food Analysis and Quality Control	Gupta Charu, Prakash Dhan, Gupta Sneh	Lambert Academic Publishing

Semester-VI							
Sl. No	**Code No.**	**Course Title**	**Hours per week**			**Hours**	**Credits**
			L	**T**	**P**		
4.	**PEFT-304**	**Elective-IV**	3	0	0	3	3
		PEFT-304b (Technology of Functional Foods)					

Course Objectives:

Objective of this course is to impart knowledge about

- The important of functional food in human nutrition and food industry.
- Food attributes which exhibit the functional properties.
- Food processing and its effect on the functional characteristics.

Course Outcomes:

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

CO1	Describe the role and application of functional food in the human diet and food processing industry.	Understanding
CO2	Discuss various food attributes exhibits functional properties such as Dietary fiber, bioactive components (Phenols, Flavonoids), Protein, Amino acids, Vitamins, Minerals, starch, probiotics, and Prebiotics.	Understanding
CO3	Explain the impact of functional food attributes on the human health.	Understanding
CO4	Discuss the effect of different food processing methods on the functionality of food.	Understanding
CO5	Explain the different processing methods employed for development of functional foods.	Understanding

Mapping of Course Outcome and Program Outcome:

CO/PO Mapping: Food Chemistry (Strong(3) / Medium(2) / Weak(1) indicates strength of correlation):								
PO/CO		Program Outcome (PO)						
		PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**
Course Outcome (CO)	**CO1**	3	3	1	2	1	1	2
	CO2	3	3	1	2	2	2	2
	CO3	2	3	2	1	1	2	3
	CO4	2	3	1	2	2	3	3
	CO5	2	3	2	2	1	3	3
Average		2.4	3	1.4	1.8	1.4	2.2	2.6

UNIT	CONTENTS	LECTURES
I	**Introduction** The definition of Functional Foods, scope, and application in food industry.	**5**
	Food attributes exhibiting functional properties. Dietary fiber, bioactive components (Phenols, Flavonoids), Protein, Amino acids, Vitamins, Minerals, starch, probiotics, and Prebiotics	**10**
II	**Health attribute of Functional foods** Dietary fiber, bioactive components (Phenols, Flavonoids), Protein, Amino acids, Vitamins, Minerals, starch, probiotics, and Prebiotics for human health.	**10**
	Industrial application of Functional Foods Processing of functional food (methods), factors effecting the functionality of the food products (Temperature, Methods of processing, Pressure and food ingredients).	**10**
	TOTAL	**35**

Semester-VI							
Sl. No	**Code No.**	**Course Title**	**Hours per week**			**Hours**	**Credits**
			L	**T**	**P**		
4.	**PEFT-304**	**Elective-IV**	3	0	0	3	3
		PEFT304c (Technology of Oils and Fats)					

Course Objectives:

Objective of this course is to impart knowledge about

- Composition of fats/oils and their importance and in diet and food processing.
- Different methods of extraction and refining of fat/oil and different types of extractors.
- Application of fats and oils and quality parameters to control the quality of different fats.

Course Outcomes:

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

CO1	Discuss the importance and functions of fats and oils in foods	Understanding
CO2	Explain the basic extraction methods by using different Fats and Oils extractors	Understanding
CO3	Describe the various oil/ fat refining techniques	Understanding
CO4	Describe the process involved in the development of various fat and oil products	Understanding
CO5	Explain the different quality parameters of fats and oils	Understanding

Mapping of Course Outcome and Program Outcome:

CO/PO Mapping: Technology of Oils and Fats (Strong(3) / Medium(2) / Weak(1) indicates strength of correlation):								
PO/CO		Program Outcome (PO)						
		PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**
Course Outcome (CO)	**CO1**	3	3	1	2	1	1	2
	CO2	3	3	2	2	2	2	2
	CO3	2	3	2	3	2	1	3
	CO4	2	3	3	2	2	3	3
	CO5	2	3	2	2	1	3	3
Average		2.4	3	2	2.2	1.6	2	2.6

UNIT	CONTENTS	LECTURES
I	**Introduction** Nutritional aspects of fats and oils, Importance and functions of fats and oils in foods, composition of fats/oils from different animal sources and oilseeds.	**6**
	Oil extraction methods Different methods of oil extraction, Important characteristics of oils and oil expression from oilseeds like, mustard/rapeseed, coconut, sunflower, groundnut, sesame, cotton. Machines (Mechanical expellers and solvent extractors) used in the expression of oil	**10**
II	**Oil/ Fat purification methods** Refining techniques: clarification, degumming, neutralization, bleaching, refining losses and deodorization, Batch and continuous refining and losses	**10**
	Technology of individual fat products Butter, Margarine, dressings for food (Mayonnaise and Salad dressings, pourable - type dressings, reduced calorie dressing), Shortening, Lard, Salad, cooking and frying oil. Blending and enrichment of edible oils	**8**
	Quality parameters Physical characteristics of oils/ fats, chemical characteristics such as Free fatty acids, acid value, tests for determination of fresh ness of oils, Peroxide value, Saponification value, Iodine value, Adulteration in oils and fats and its detection.	**4**
	TOTAL	**38**

Semester-VI							
Sl. No	**Code No.**	**Course Title**	**Hours per week**			**Hours**	**Credits**
			L	**T**	**P**		
5.	OEFT-302	**Chocolate and Candy Manufacturing**	3	0	0	3	3

Course Objectives:

Objective of this course is to impart knowledge about

- The provide general overview on confectionery.
- An overview on chocolate manufacturing from cocoa farm to a Choco bar.
- An overview on candy manufacturing.

Course Outcomes:

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

CO1	Discuses various changes during of postharvest handling of cocoa beans.	Understanding
CO2	Explain various methods of cocoa bean processing	Understanding
CO3	Explain various methods for chocolate processing from processed cocoa beans	Understanding
CO4	Discuses various sugar confectionary items such as Sugar candy; Fondant, Fudge, Caramel, Toffee, Butterscotch, Sugar panning, Hard boiled candy.	Understanding
CO5	Brief note on spoilage of chocolate and candy	Understanding

Mapping of Course Outcome and Program Outcome:

CO/PO Mapping: Chocolate and Candy Manufacturing
(Strong(3) / Medium(2) / Weak(1) indicates strength of correlation):

PO/CO		Program Outcome (PO)						
		PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**
Course Outcome (CO)	**CO1**	3	3	2	2	1	1	2
	CO2	3	3	2	2	1	2	2
	CO3	2	3	2	2	2	1	3
	CO4	2	3	2	2	2	3	3
	CO5	2	3	2	2	1	3	3
Average		2.4	3	2	2	1.4	2	2.6

UNIT	CONTENTS	LECTURES
I	**Introduction** Definition of Confectionery, Chocolate; history; cocoa beans and production. Chemical and microbial changes during fermentation during handling of cocoa bean throughout supply chain.	**5**
	Processing of Cocoa beans Cleaning, roasting and winnowing; grinding of nib, production of cocoa butter and cocoa powder.	**8**
	Chocolate processing Refining and couching of chocolate, Tempering, Molding, Enrobing and Panning. Packaging of chocolate.	**7**
II	**Candy manufacturing** Definition and Classification of candy. Sugar candy; Fondant, Fudge, Caramel, Toffee, Butterscotch, Sugar panning, Hard boiled candy.	**10**
	Defects and Spoilage of chocolate and candy products: Manufacturing defects such as with Fat Bloom, Sugar Bloom, Odor, Quality & Freshness, Taste and Tempering defects. Emulsion break etc, microbial spoilage,	**8**
	TOTAL	**38**

Semester-VI							
Sl. No	**Code No.**	**Course Title**	**Hours per week**			**Hours**	**Credits**
			L	**T**	**P**		
7.	PEFT-310	**Major Project**	0	0	8	8	4

Major Project Guidelines

Semester-VI							
Sl. No	Code No.	Course Title	Hours per week			Hours	Credits
			L	T	P		
8.	SEFT-302	Seminar	1	0	0	1	1

Seminar Guidelines