File Ref.No.101084/GA - IV - J1/2019/Admn

UNIVERSITY OF CALICUT

Abstract

General & Academic IV - Faculty of Science - Scheme and Syllabus of BSc Food Technology Honours Programme-in tune with the CUFYUGP Regulations 2024, with effect from 2024 Admission onwards - Approved-Subject to ratification by the Academic Council-Implemented- Orders Issued

G & A - IV - J

U.O.No. 9923/2024/Admn Dated, Calicut University.P.O, 22.06.2024

Read:-1. U.O.No. 3103/2024/Admn dated 22/02/2024.

2. Minutes of the online meeting of the Board of Studies in Food Technology (single board held on 12/06/2024

3. Remarks of the Dean, Faculty of Science dated 20/06/2024.

4. Orders of the Vice Chancellor in the file of even No and dated 20/06/2024.

ORDER

1. The Regulations of the Calicut University Four Year UG Programmes (CUFYUGP Regulations 2024) for Affiliated Colleges, has been implemented with effect from 2024 admission onwards, vide paper read as (1).
2. The Board of Studies in Food Technology (single board) in the meeting held on 12/06/2024, vide paper read as (2), has approved the Scheme and Syllabus of BSc Food Technology Honours Programme in tune with CUFYUGP Regulations 2024, with effect from 2024 admission.
3. The Dean, Faculty of Science vide paper read as (3), has approved the minutes of the meeting of the Board of Studies in Food Technology (single board) held on 12/06/2024
4. Considering the urgency, the Vice Chancellor has approved the minutes of the meeting of Board of Studies in Food Technology (single board) held on 12/06/2024 and accorded sanction to implement the Scheme and Syllabus of BSc Food Technology Honours Programme in tune with CUFYUGP Regulations 2024 with effect from 2024 admission, subject to ratification by the Academic Council.
5. The Scheme and Syllabus of BSc Food Technology Honours Programme in tune with CUFYUGP Regulations 2024, is thus implemented with effect from 2024 admission, subject to ratification by the Academic Council.

Orders are issued accordingly. (Syllabus appended)

Ajayakumar T.K

Assistant Registrar

To

Principals of all Affiliated Colleges

Copy to: Copy to: PS to VC/PA to PVC/ PA to Registrar/PA to CE/JCE I/JCE II/JCE IV/JCE VIII/DoA/EX and EG Sections/GA I F/CHMK Library/SUVEGA/SF/DF/FC

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Section Officer

UNIVERSITY OF CALICUT

B.Sc. FOOD TECHNOLOGY HONOURS

(MAJOR AND GENERAL FOUNDATION COURSES)

SCHEME & SYLLABUS

w.e.f. 2024 admission onwards

(CUFYUGP Regulations 2024)

EXPERT COMMITTEE MEMBERS

Mr. Hasker E.
(Chairperson, Board of Studies, University of Calicut)
Assistant Professor
Dept. of Food Technology
M E S Mampad College (Autonomous)
Malappuram, Kerala - 676542

Dr. V. Chandrasekar
Associate Professor,
School of Sensory Sciences, National Institute of Food Technology, Entrepreneurship and Management, Thanjavur.

Mr. Suresh Mammen Thomas

Dairy Manager, Malanadu Milk

Malanadu Development Society,

Naranganam, Kozhencherry,

Pathanamthitta - 689642

Dr. Remya S.
Senior Scientist
ICAR-CIFT (Central Institute of Fisheries Technology)
Matsyapuri P. O., Willingdon Island,
Kochi - 682 029.

Dr. S. N. Rajakumar
Professor and Head
Department of Dairy Technology,
Verghese Kurien Institute of Dairy and Food Technology , Mannuthy

Mr. A. Jawahar
Assistant Professor
Dept. of Food Technology
M E S Mampad College (Autonomous)
Malappuram, Kerala - 676542

Smt. Alfiya P.V.
Scientist
ICAR -Indian Institute of Spices Research
Marikkunnu P O
Kozhikode - 673012

Dr. Pradeep Singh Negi
Chief Scientist,
Fruit and Vegetable Technology
CFTRI. Mysore - 570020

Dr. V.R. Sinija
Professor and Head
National Institute of Food Technology, Entrepreneurship and Management - Thanjavur (NIFTEM-T),
Pudukkottai Road, Thanjavur - 613 005,
Tamil Nadu,

Mr. Ramsheed VK
Assistant Professor
Department of Food Technology,
Silver Arts and Science College ,
Perambra

TECHNICAL SUPPORT

Mr. Navas B
Technical Assistant,
Department of Food Technology
M E S Mampad College
(Autonomous) Malappuram,
Kerala - 676542

B.Sc. FOOD TECHNOLOGY HONOURS

(MAJOR AND GENERAL FOUNDATION COURSES)

SCHEME

PROGRAMME OUTCOMES (PO):

At the end of the graduate programme at Calicut University, a student would:

PO1	Knowledge Acquisition: Demonstrate a profound understanding of knowledge trends and their impact on the chosen discipline of study.
PO2	Communication, Collaboration, Inclusiveness, and Leadership: Become a team player who drives positive change through effective communication, collaborative acumen, transformative leadership, and a dedication to inclusivity.
PO3	Professional Skills: Demonstrate professional skills to navigate diverse career paths with confidence and adaptability.
PO4	Digital Intelligence: Demonstrate proficiency in varied digital and technological tools to understand and interact with the digital world, thus effectively processing complex information.
PO5	Scientific Awareness and Critical Thinking: Emerge as an innovative problem-solver and impactful mediator, applying scientific understanding and critical thinking to address challenges and advance sustainable solutions.
PO6	Human Values, Professional Ethics, and Societal and Environmental Responsibility: Become a responsible leader, characterized by an unwavering commitment to human values, ethical conduct, and a fervent dedication to the well-being of society and the environment.
PO7	Research, Innovation, and Entrepreneurship: Emerge as a researcher and entrepreneurial leader, forging collaborative partnerships with industry, academia, and communities to contribute enduring solutions for local, regional, and global development.

PROGRAMME SPECIFIC OUTCOMES (PSO):

At the end of the BSc Food Technology Honours programme at Calicut University, a student would:

PSO1	The ability to understand physico- chemical, microbiological, sensory and nutritional aspects of foods
PSO2	Develop the skills to analyze preservation, processing, packaging and storage of foods
PSO3	Evaluate the technologies and processes for producing value added food products.
PSO4	The ability to apply and evaluate standard practices, Laws and regulation in food production
PSO5	Develop understanding of the fundamental concepts of BSc Food Technology needed for a deeper study of related fields of knowledge viz. Food Chemistry, Food Microbiology and Food Engineering etc.

PSO6	Develop the experimental and analytical skills in BSc Food Technology that can be of useful applications in allied areas of knowledge.

MINIMUM CREDIT REQUIREMENTS OF THE DIFFERENT PATHWAYS IN THE THREE-YEAR PROGRAMME IN CUFYUGP

Sl. No.	Academic Pathway	Major	Minor/ Other Disciplines	Foundation Courses AEC: 4 MDC: 3 SEC: 3 VAC: 3	Intern-ship	Total Credits	Example
		Each course has 4 credits		Each course has 3 credits			
1	Single Major (A)	68 (17 courses)	24 (6 courses)	39 (13 courses)	2	133	Major: Food Technology + six courses in different disciplines in different combinations
2	Major (A) with Multiple Disciplines (B, C)	68 (17 courses)	12 + 12 (3 + 3 = 6 courses)	39 (13 courses)	2	133	Major: Food Technology + Physics and Chemistry
3	Major (A) with Minor (B)	68 (17 courses)	24 (6 courses)	39 (13 courses)	2	133	Major: Food Technology Minor: Chemistry

BSc FOOD TECHNOLOGY HONOURS PROGRAMME

COURSE STRUCTURE FOR PATHWAYS 1 – 3

1. Single Major
2. Major with Multiple Disciplines
3. Major with Minor

Semester	Course Code	Course Title	Total Hours	Hours/ Week	Credits	Marks		
						Internal	External	Total
1	FTL1CJ 101	Core Course 1 in Major – Fundamentals of Food Technology	75	5	4	30	70	100
		Minor Course 1	60/ 75	4/ 5	4	30	70	100
		Minor Course 2	60/ 75	4/ 5	4	30	70	100
	ENG1FA 101(2)	Ability Enhancement Course 1– English	60	4	3	25	50	75
		Ability Enhancement Course 2 – Additional Language	45	3	3	25	50	75
		Multi-Disciplinary Course 1 – Other than Major	45	3	3	25	50	75
		Total		**23/ 25**	**21**			**525**
2	FTL2CJ 102	Core Course 2 in Major – Food Microbiology -I	75	5	4	30	70	100
		Minor Course 3	60/ 75	4/ 5	4	30	70	100
		Minor Course 4	60/ 75	4/ 5	4	30	70	100
	ENG2FA 103(2)	Ability Enhancement Course 3– English	60	4	3	25	50	75
		Ability Enhancement Course 4 – Additional Language	45	3	3	25	50	75
		Multi-Disciplinary Course 2 – Other than Major	45	3	3	25	50	75
		Total		**23/ 25**	**21**			**525**
3	FTL3CJ 201	Core Course 3 in Major – Nutrition Science	60	4	4	30	70	100
	FTL3CJ 202	Core Course 4 in Major – Food Chemistry	75	5	4	30	70	100
		Minor Course 5	60/ 75	4/ 5	4	30	70	100
		Minor Course 6	60/ 75	4/ 5	4	30	70	100

		Multi-Disciplinary Course 3 – Kerala Knowledge System	45	3	3	25	50	75
	ENG3FV 108(2)	Value-Added Course 1 – English	45	3	3	25	50	75
		Total		**23/ 25**	**22**			**550**
4	FTL4CJ 203	Core Course 5 in Major – Food Processing and Preservation	75	5	4	30	70	100
	FTL4CJ 204	Core Course 6 in Major – Cereals, Pulses and Oil Seeds Technology	75	5	4	30	70	100
	FTL4CJ 205	Core Course 7 in Major – Spices and Plantation Crops	75	5	4	30	70	100
	ENG4FV 109(2)	Value-Added Course 2 – English	45	3	3	25	50	75
		Value-Added Course 3 – Additional Language	45	3	3	25	50	75
	ENG4FS 111(2)	Skill Enhancement Course 1 – English	60	4	3	25	50	75
		Total		**25**	**21**			**525**
5	FTL5CJ 301	Core Course 8 in Major – Basics of Food Engineering and Packaging Technology	75	5	4	30	70	100
	FTL5CJ 302	Core Course 9 in Major – Technology of Fruits & Vegetables	75	5	4	30	70	100
	FTL5CJ 303	Core Course 10 in Major – Entrepreneurship Development	60	4	4	30	70	100
		Elective Course 1 in Major	60	4	4	30	70	100
		Elective Course 2 in Major	60	4	4	30	70	100
		Skill Enhancement Course 2	45	3	3	25	50	75
		Total		**25**	**23**			**575**
6	FTL6CJ 304	Core Course 11 in Major – Dairy Technology	75	5	4	30	70	100
	FTL6CJ 305	Core Course 12 in Major– Technology of Animal food	75	5	4	30	70	100
	FTL6CJ 306	Core Course 13 in Major – Food Safety and Food Plant Layout	60	4	4	30	70	100

		Elective Course 3 in Major	60	4	4	30	70	100
		Elective Course 4 in Major	60	4	4	30	70	100
	FTL6FS 113	Skill Enhancement Course 3 – Food Informatics	45	3	3	25	50	75
	FTL6CJ 349	Internship in Major (Credit for internship to be awarded only at the end of Semester 6)	60		2	50	-	50
		Total		**25**	**25**			**625**
Total Credits for Three Years					**133**			**3325**
7	FTL7CJ 401	Core Course 14 in Major – Food Microbiology II	75	5	4	30	70	100
	FTL7CJ 402	Core Course 15 in Major – Food Additives and New Product Development	75	5	4	30	70	100
	FTL7CJ 403	Core Course 16 in Major – Food Biochemistry and Food Biotechnology	75	5	4	30	70	100
	FTL7CJ 404	Core Course 17 in Major – Food Analysis	75	5	4	30	70	100
	FTL7CJ 405	Core Course 18 in Major – Food Industry Management and Auditing	75	5	4	30	70	100
		Total		**25**	**20**			**500**
8	FTL8CJ 406	Core Course 19 in Major – Food Process Engineering and Equipments	75	5	4	30	70	100
	FTL8CJ 407	Core Course 20 in Major –Techniques in Food Analysis	60	4	4	30	70	100
	FTL8CJ 408	Core Course 21 in Major – Food Storage and Infestation Controls	60	4	4	30	70	100
	OR (instead of Core Courses 19 – 21 in Major)							
	FTL8CJ 449	Project (in Honours programme)	360*	13*	12	90	210	300
	FTL8CJ 499	Project (in Honours with Research programme)	360*	13*	12	90	210	300
		Elective Course 5 in Major / Minor Course 7	60	4	4	30	70	100
		Elective Course 6 in Major / Minor Course 8	60	4	4	30	70	100

		Elective Course 7 in Major / Minor Course 9 / Major Course in any Other Discipline	60	4	4	30	70	100
	OR (instead of Elective Course 7 in Major, in the case of Honours with Research Programme)							
	FTL8CJ 489	Research Methodology in Food Technology	60	4	4	30	70	100
		Total		**25**	**24**			**600**
Total Credits for Four Years					**177**			**4425**

* The teacher should have 13 hrs/week of engagement (the hours corresponding to the three core courses) in the guidance of the Project(s) in Honours programme and Honours with Research programme, while each student should have 24 hrs/week of engagement in the Project work. Total hours are given based on the student's engagement.

CREDIT DISTRIBUTION FOR PATHWAYS 1 – 3

1. Single Major
2. Major with Multiple Disciplines
3. Major with Minor

Semester	Major Courses	Minor Courses	General Foundation Courses	Internship/ Project	Total
1	4	4 + 4	3 + 3 + 3	-	21
2	4	4 + 4	3 + 3 + 3	-	21
3	4 + 4	4 + 4	3 + 3	-	22
4	4 + 4 + 4	-	3 + 3 + 3	-	21
5	4 + 4 + 4 + 4 + 4	-	3	-	23
6	4 + 4 + 4 + 4 + 4	-	3	2	25
Total for Three Years	**68**	**24**	**39**	**2**	**133**
7	4 + 4 + 4 + 4 + 4	-	-	-	20
8	4 + 4 + 4	4 + 4 + 4	-	12*	24
* Instead of three Major courses					
Total for Four Years	**88 + 12 = 100**	**36**	**39**	**2**	**177**

DISTRIBUTION OF MAJOR COURSES IN FOOD TECHNOLOGY FOR PATHWAYS 1 – 3

1. Single Major
2. Major with Multiple Disciplines
3. Major with Minor

Semester	Course Code	Course Title	Hours/ Week	Credits
1	FTL1CJ 101	Core Course 1 in Major – Fundamentals of Food Technology	5	4
2	FTL2CJ 102	Core Course 2 in Major – Food Microbiology -I	5	4
3	FTL3CJ 201	Core Course 3 in Major – Nutrition Science	4	4
	FTL3CJ 202	Core Course 4 in Major – Food Chemistry	5	4
4	FTL4CJ 203	Core Course 5 in Major – Food Processing and Preservation Technology	5	4
	FTL4CJ 204	Core Course 6 in Major – Cereals, Pulses and Oil Seeds Technology	5	4
	FTL4CJ 205	Core Course 7 in Major – Spices and Plantation Crops	5	4
5	FTL5CJ 301	Core Course 8 in Major – Basics of Food Engineering and Packaging Technology	5	4
	FTL5CJ 302	Core Course 9 in Major – Technology of Fruits & Vegetables	5	4
	FTL5CJ 303	Core Course 10 in Major – Entrepreneurship Development	4	4
		Elective Course 1 in Major	4	4
		Elective Course 2 in Major	4	4
6	FTL6CJ 304	Core Course 11 in Major – Dairy Technology	5	4
	FTL6CJ 305	Core Course 12 in Major – Technology of Animal food	5	4

	FTL6CJ 306	Core Course 13 in Major – Food Safety and Food Plant Layout	4	4
		Elective Course 3 in Major	4	4
		Elective Course 4 in Major	4	4
	FTL6CJ 349	Internship in Major	-	2
Total for the Three Years				**70**
7	FTL7CJ 401	Core Course 14 in Major – Food Microbiology II	5	4
	FTL7CJ 402	Core Course 15 in Major – Food Additives and New Product Development	5	4
	FTL7CJ 403	Core Course 16 in Major – Food Biochemistry and Food Biotechnology	5	4
	FTL7CJ 404	Core Course 17 in Major – Food Analysis	5	4
	FTL7CJ 405	Core Course 18 in Major – Food Industry Management and Auditing	5	4
8	FTL8CJ 406	Core Course 19 in Major – Food Process Engineering and Equipments	5	4
	FTL8CJ 407	Core Course 20 in Major –Techniques in Food Analysis	4	4
	FTL8CJ 408	Core Course 21 in Major – Food Storage and Infestation Controls	4	4
	OR (instead of Core Courses 19 – 21 in Major)			
	FTL8CJ 449	Project (in Honours programme)	13	12
	FTL8CJ 499	Project (in Honours with Research programme)	13	12
		Elective Course 5 in Major	4	4
		Elective Course 6 in Major	4	4
		Elective Course 7 in Major	4	4
	OR (instead of Elective course 7 in Major, in Honours with Research programme)			
	FTL8CJ 489	Research Methodology in Food Technology	4	4
Total for the Four Years				**114**

ELECTIVE COURSES IN FOOD TECHNOLOGY WITH SPECIALISATION

Group No.	Sl. No.	Course Code	Title	Semester	Total Hrs	Hrs/ Week	Credits	Marks		
								Internal	External	Total
1		**FOOD SAFETY AND QUALITY MANAGEMENT**								
	1	FTL5EJ 301(1)	Food Products Standards	5	60	4	4	30	70	100
	2	FTL5EJ 302(1)	Food Plant Operations and Management	5	60	4	4	30	70	100
	3	FTL6EJ 301(1)	Food Sampling and Inspection	6	60	4	4	30	70	100
	4	FTL6EJ 302(1)	Food Industrial Waste Management	6	60	4	4	30	70	100
2		**FOOD INNOVATIONS, DESIGN AND MARKETING**								
	1	FTL5EJ 303(2)	Food Formulation and Design	5	60	4	4	30	70	100
	2	FTL5EJ 304(2)	Sensory Science	5	60	4	4	30	70	100
	3	FTL6EJ 303(2)	Food Cost Accounting	6	60	4	4	30	70	100
	4	FTL6EJ 304(2)	Food Marketing	6	60	4	4	30	70	100

ELECTIVE COURSES IN FOOD TECHNOLOGY WITH NO SPECIALISATION

Sl. No.	Course Code	Title	Semester	Total Hrs	Hrs/ Week	Credits	Marks		
							Internal	External	Total
1	FTL5EJ 305	Bakery and Confectionary Technology	5	60	4	4	30	70	100
2	FTL6EJ 306	Food Nutrition and Dietetics	6	60	4	4	30	70	100
3	FTL8EJ 401	Food Toxicology	8	60	4	4	30	70	100
4	FTL8EJ 402	Food Tourism and Food Service Management	8	60	4	4	30	70	100
5	FTL8EJ 403	Snack Food Technology	8	60	4	4	30	70	100
6	FTL8EJ 404	Nutraceuticals And Health Foods	8	60	4	4	30	70	100
7	FTL8EJ 405	Diet Therapy and Emerging Trends	8	60	4	4	30	70	100
8	FTL8EJ 406	Technology of Beverages	8	60	4	4	30	70	100

(i). Students in Single Major pathway can choose course/courses from any of the Minor/ Vocational Minor groups offered by a discipline other than their Major discipline.

(ii). Students in Major with Multiple Disciplines pathway can choose as one of the multiple disciplines, all the three courses from any one of the Minor/ Vocational Minor groups offered by any discipline, including their Major discipline. If they choose one of the Minor/ Vocational Minor groups offered by their Major discipline as the first one of the multiple disciplines, then their choice as the second one of the multiple disciplines should be any one of the Minor/ Vocational Minor groups offered by a discipline other than the Major discipline. If the students choose any one of the Minor/ Vocational Minor groups in Food Technology as given above, then the title of the group will be the title of that multiple discipline.

DISTRIBUTION OF GENERAL FOUNDATION COURSES IN FOOD TECHNOLOGY

Semester	Course Code	Course Title	Total Hours	Hours/ Week	Credits	Marks		
						Internal	External	Total
1	FTL1FM 105	Multi-Disciplinary Course 1 – Perspectives of Food Science and Technology	45	3	3	25	50	75
2	FTL2FM 106	Multi-Disciplinary Course 2 – Food and Health	45	3	3	25	50	75
5	FTL5FS 112	Skill Enhancement Course 2 – Food Laws and Regulations	45	3	3	25	50	75
6	FTL6FS 113	Skill Enhancement Course 3 – Food Informatics	45	3	3	25	50	75

EVALUATION SCHEME

1. The evaluation scheme for each course contains two parts: internal evaluation (about 30%) and external evaluation (about 70%). Each of the Major and Minor courses is of 4-credits. It is evaluated for 100 marks, out of which 30 marks is from internal evaluation and 70 marks, from external evaluation. Each of the General Foundation course is of 3-credits. It is evaluated for 75 marks, out of which 25 marks is from internal evaluation and 50 marks, from external evaluation.
2. The 4-credit Major courses are of two types: (i) courses with only theory and (ii) courses with 3-credit theory and 1-credit practical.
    - In 4-credit courses with only theory component, out of the total 5 modules of the syllabus, one open-ended module with 20% content is designed by the faculty member teaching that course, and it is internally evaluated for 10 marks. The internal evaluation of the remaining 4 theory modules is for 20 marks.
    - In 4-credit courses with 3-credit theory and 1-credit practical components, out of the total 5 modules of the syllabus, 4 modules are for theory and the fifth module is for practical. The practical component is internally evaluated for 20 marks. The internal evaluation of the 4 theory modules is for 10 marks.

3. All the 3-credit courses (General Foundational Courses) in Food Technology are with only theory component. Out of the total 5 modules of the syllabus, one open-ended module with 20% content is designed by the faculty member teaching that course, and it is internally evaluated for 5 marks. The internal evaluation of the remaining 4 theory modules is for 20 marks.

Sl. No.	Nature of the Course		Internal Evaluation in Marks (about 30% of the total)		External Exam on 4 modules (Marks)	Total Marks
			Open-ended module / Practical	On the other 4 modules		
1	4-credit course	only theory (5 modules)	10	20	70	100
2	4-credit course	Theory (4 modules) + Practical	20	10	70	100
3	3-credit course	only theory (5 modules)	5	20	50	75

1. MAJOR COURSES

1.1. INTERNAL EVALUATION OF THEORY COMPONENT

Sl. No.	Components of Internal Evaluation of Theory Part of a Major Course	Internal Marks for the Theory Part of a Major Course of 4-credits			
		Theory Only		Theory + Practical	
		4 Theory Modules	Open-ended Module	4 Theory Modules	Practical
1	Test paper/ Mid-semester Exam	10	4	5	-
2	Seminar/ Viva/ Quiz	6	4	3	-
3	Assignment	4	2	2	-
		20	10	10	20*
	Total	30		30	

* Refer the table in section 1.2 for the evaluation of practical component

1.2. EVALUATION OF PRACTICAL COMPONENT

The evaluation of practical component in Major courses is completely by internal evaluation.

- Continuous evaluation of practical by the teacher-in-charge shall carry a weightage of 50%.
- The end-semester practical examination and viva-voce, and the evaluation of practical records shall be conducted by the teacher in-charge and an internal examiner appointed by the Department Council.
- The process of continuous evaluation of practical courses shall be completed before 10 days from the commencement of the end-semester examination.
- Those who passed in continuous evaluation alone will be permitted to appear for the end-semester examination and viva-voce.

The scheme of continuous evaluation and the end-semester examination and viva-voce of practical component shall be as given below:

Sl. No.	Evaluation of Practical Component of Credit-1 in a Major Course	Marks for Practical	Weightage
1	Continuous evaluation of practical/ exercise performed in practical classes by the students	10	50%
2	End-semester examination and viva-voce to be conducted by teacher-in-charge along with an additional examiner arranged internally by the Department Council	7	35%
3	Evaluation of the Practical records submitted for the end semester viva–voce examination by the teacher-in-charge and additional examiner	3	15%
	Total Marks	20	

1.3. EXTERNAL EVALUATION OF THEORY COMPONENT

External evaluation carries 70% marks. Examinations will be conducted at the end of each semester. Individual questions are evaluated in marks and the total marks are converted into grades by the University based on 10-point grading system (refer section 5).

PATTERN OF QUESTION PAPER FOR MAJOR COURSES

Duration	Type	Total No. of Questions	No. of Questions to be Answered	Marks for Each Question	Ceiling of Marks
2 Hours	Short Answer	10	8 – 10	3	24
	Paragraph/ Problem	8	6 – 8	6	36
	Essay	2	1	10	10
				Total Marks	70

2. INTERNSHIP

- All students should undergo Internship of 2-credits during the first six semesters in a firm, industry or organization, or training in labs with faculty and researchers of their own institution or other Higher Educational Institutions (HEIs) or research institutions.
- Internship can be for enhancing the employability of the student or for developing the research aptitude.
- Internship can involve hands-on training on a particular skill/ equipment/ software. It can be a short project on a specific problem or area. Attending seminars or workshops related to an area of learning or skill can be a component of Internship.
- A faculty member/ scientist/ instructor of the respective institution, where the student does the Internship, should be the supervisor of the Internship.

2.1. GUIDELINES FOR INTERNSHIP

1. Internship can be in Food Technology or allied disciplines.
2. There should be minimum 60 hrs. of engagement from the student in the Internship.
3. Summer vacations and other holidays can be used for completing the Internship.
4. In BSc. Food Technology Honours programme, institute/ industry visit or study tour is a requirement for the completion of Internship. Visit to minimum one Food Industry/ one national research institute/ research laboratory / place of scientific importance should be part of the study tour. A brief report of the study tour has to be submitted with photos and analysis.
5. The students should make regular and detailed entries in to a personal log book through the period of Internship. The log book will be a record of the progress of the Internship and the time spent on the work, and it will be useful in writing the final report. It may

contain experimental conditions and results, ideas, mathematical expressions, rough work and calculation, computer file names etc. All entries should be dated. The Internship supervisor should periodically examine and countersign the log book.

6. The log book and the typed report must be submitted at the end of the Internship.
7. The institution at which the Internship will be carried out should be prior-approved by the Department Council of the college where the student has enrolled for the UG Honours programme.

2.2. EVALUATION OF INTERNSHIP

- The evaluation of Internship shall be done internally through continuous assessment mode by a committee internally constituted by the Department Council of the college where the student has enrolled for the UG Honours programme.
- The credits and marks for the Internship will be awarded only at the end of semester 6.
- The scheme of continuous evaluation and the end-semester viva-voce examination based on the submitted report shall be as given below:

Sl. No.	Components of Evaluation of Internship		Marks for Internship 2 Credits	Weightage
1	Continuous evaluation of internship through interim presentations and reports by the committee internally constituted by the Department Council	Acquisition of skill set	10	40%
2		Interim Presentation and Viva-voce	5	
3		Punctuality and Log Book	5	
4	Report of Institute Visit/ Study Tour		5	10%
5	End-semester viva-voce examination to be conducted by the committee internally constituted by the Department Council	Quality of the work	6	35%
6		Presentation of the work	5	
7		Viva-voce	6	
8	Evaluation of the day-to-day records, the report of internship supervisor, and final report submitted for the end semester viva–voce examination before the committee internally constituted by the Department Council		8	15%
		Total Marks	50	

3. PROJECT

3.1. PROJECT IN HONOURS PROGRAMME

- In Honours programme, the student has the option to do a Project of 12-credits instead of three Core Courses in Major in semester 8.
- The Project can be done in the same institution/ any other higher educational institution (HEI)/ research centre/ training centre.
- The Project in Honours programme can be a short research work or an extended internship or a skill-based training programme.
- A faculty member of the respective institution, where the student does the Project, should be the supervisor of the Project.

3.2. PROJECT IN HONOURS WITH RESEARCH PROGRAMME

- Students who secure 75% marks and above (equivalently, CGPA 7.5 and above) cumulatively in the first six semesters are eligible to get selected to Honours with Research stream in the fourth year.
- A relaxation of 5% in marks (equivalently, a relaxation of 0.5 grade in CGPA) is allowed for those belonging to SC/ ST/ OBC (non-creamy layer)/ Differently-Abled/ Economically Weaker Section (EWS)/ other categories of candidates as per the decision of the UGC from time to time.
- In Honours with Research programme, the student has to do a mandatory Research Project of 12-credits instead of three Core Courses in Major in semester 8.
- The approved research centres of University of Calicut or any other university/ HEI can offer the Honours with Research programme. The departments in the affiliated colleges under University of Calicut, which are not the approved research centres of the University, should get prior approval from the University to offer the Honours with Research programme. Such departments should have minimum two faculty members with Ph.D., and they should also have the necessary infrastructure to offer Honours with Research programme.
- A faculty member of the University/ College with a Ph.D. degree can supervise the research project of the students who have enrolled for Honours with Research. One such faculty member can supervise maximum five students in Honours with Research stream.

- The maximum intake of the department for Honours with Research programme is fixed by the department based on the number of faculty members eligible for project supervision, and other academic, research, and infrastructural facilities available.
- If a greater number of eligible students are opting for the Honours with Research programme than the number of available seats, then the allotment shall be based on the existing rules of reservations and merits.

3.3. GUIDELINES FOR THE PROJECT IN HONOURS PROGRAMME AND HONOURS WITH RESEARCH PROGRAMME

1. Project can be in Food Technology or allied disciplines.
2. Project should be done individually.
3. Project work can be of experimental/Product Development/ theoretical/ computational in nature.
4. There should be minimum 360 hrs. of engagement from the student in the Project work in Honours programme as well as in Honours with Research programme.
5. There should be minimum 13 hrs./week of engagement (the hours corresponding to the three core courses in Major in semester 8) from the teacher in the guidance of the Project(s) in Honours programme and Honours with Research programme.
6. The various steps in project works are the following:
    - Wide review of a topic.
    - Investigation on a problem in systematic way using appropriate techniques.
    - Systematic recording of the work.
    - Reporting the results with interpretation in a standard documented form.
    - Presenting the results before the examiners.
7. During the Project the students should make regular and detailed entries in to a personal log book through the period of investigation. The log book will be a record of the progress of the Project and the time spent on the work, and it will be useful in writing the final report. It may contain experimental conditions and results, ideas, mathematical expressions, rough work and calculation, computer file names etc. All entries should be dated. The Project supervisor should periodically examine and countersign the log book.

8. The log book and the typed report must be submitted at the end of the Project. A copy of the report should be kept for reference at the department. A soft copy of the report too should be submitted, to be sent to the external examiner in advance.
9. It is desirable, but not mandatory, to publish the results of the Project in a peer reviewed journal.
10. The project report shall have an undertaking from the student and a certificate from the research supervisor for originality of the work, stating that there is no plagiarism, and that the work has not been submitted for the award of any other degree/ diploma in the same institution or any other institution.
11. The project proposal, institution at which the project is being carried out, and the project supervisor should be prior-approved by the Department Council of the college where the student has enrolled for the UG Honours programme.

3.4. EVALUATION OF PROJECT

- The evaluation of Project will be conducted at the end of the eighth semester by both internal and external modes.
- The Project in Honours programme as well as that in Honours with Research programme will be evaluated for 300 marks. Out of this, 90 marks is from internal evaluation and 210 marks, from external evaluation.
- The internal evaluation of the Project work shall be done through continuous assessment mode by a committee internally constituted by the Department Council of the college where the student has enrolled for the UG Honours programme. 30% of the weightage shall be given through this mode.
- The remaining 70% shall be awarded by the external examiner appointed by the University.
- The scheme of continuous evaluation and the end-semester viva-voce of the Project shall be as given below:

Components of Evaluation of Project	Marks for the Project (Honours/ Honours with Research)	Weightage
Continuous evaluation of project work through interim presentations and reports by the committee internally constituted by the Department Council	90	30%

End-semester viva-voce examination to be conducted by the external examiner appointed by the university	150	50%
Evaluation of the day-to-day records and project report submitted for the end-semester viva–voce examination conducted by the external examiner	60	20%
Total Marks	300	

INTERNAL EVALUATION OF PROJECT

Sl. No	Components of Evaluation of Project	Marks for the Project (Honours/ Honours with Research)
1	Skill in doing project work	30
2	Interim Presentation and Viva-Voce	20
3	Punctuality and Log book	20
4	Scheme/ Organization of Project Report	20
	Total Marks	90

EXTERNAL EVALUATION OF PROJECT

Sl. No	Components of Evaluation of Project	Marks for the Project (Honours/ Honours with Research) 12 credits
1	Content and relevance of the Project, Methodology, Quality of analysis, and Innovations of Research	50
2	Presentation of the Project	50
3	Project Report (typed copy), Log Book and References	60
4	Viva-Voce	50
	Total Marks	210

4. GENERAL FOUNDATION COURSES

- All the General Foundation Courses (3-credits) in Food Technology are with only theory component.

4.1. INTERNAL EVALUATION

Sl. No.	Components of Internal Evaluation of a General Foundation Course in Food Technology	Internal Marks of a General Foundation Course of 3-credits in Food Technology	
		4 Theory Modules	Open-ended Module
1	Test paper/ Mid-semester Exam	10	2
2	Seminar/ Viva/ Quiz	6	2
3	Assignment	4	1
		20	5
	Total	25	

4.2. EXTERNAL EVALUATION

External evaluation carries about 70% marks. Examinations will be conducted at the end of each semester. Individual questions are evaluated in marks and the total marks are converted into grades by the University based on 10-point grading system (refer section 5).

PATTERN OF QUESTION PAPER FOR GENERAL FOUNDATION COURSES

Duration	Type	Total No. of Questions	No. of Questions to be Answered	Marks for Each Question	Ceiling of Marks
1.5 Hours	Short Answer	10	8 – 10	2	16
	Paragraph/ Problem	5	4 – 5	6	24
	Essay	2	1	10	10
				Total Marks	50

5. LETTER GRADES AND GRADE POINTS

- Mark system is followed for evaluating each question.
- For each course in the semester letter grade and grade point are introduced in 10-point indirect grading system as per guidelines given below.
- The Semester Grade Point Average (SGPA) is computed from the grades as a measure of the student's performance in a given semester.
- The Cumulative GPA (CGPA) is based on the grades in all courses taken after joining the programme of study.
- Only the weighted grade point based on marks obtained shall be displayed on the grade card issued to the students.

LETTER GRADES AND GRADE POINTS

Sl. No.	Percentage of Marks (Internal & External Put Together)	Description	Letter Grade	Grade Point	Range of Grade Points	Class
1	95% and above	Outstanding	O	10	9.50 – 10	First Class with Distinction
2	Above 85% and below 95%	Excellent	A+	9	8.50 – 9. 49	
3	75% to below 85%	Very Good	A	8	7.50 – 8.49	
4	65% to below 75%	Good	B+	7	6.50 – 7.49	First Class
5	55% to below 65%	Above Average	B	6	5.50 – 6.49	
6	45% to below 55%	Average	C	5	4.50 – 5.49	Second Class
7	35% to below 45% aggregate (internal and external put together) with a minimum of 30% in external valuation	Pass	P	4	3.50 – 4.49	Third Class
8	Below an aggregate of 35% or below 30% in external evaluation	Fail	F	0	0 – 3.49	Fail
9	Not attending the examination	Absent	Ab	0	0	Fail

- When students take audit courses, they will be given Pass (P) or Fail (F) grade without any credits.
- The successful completion of all the courses and capstone components prescribed for the three-year or four-year programme with 'P' grade shall be the minimum requirement for the award of UG Degree or UG Degree Honours or UG Degree Honours with Research, as the case may be.

5.1. COMPUTATION OF SGPA AND CGPA

- The following method shall be used to compute the Semester Grade Point Average (SGPA):

  The SGPA equals the product of the number of credits (Ci) with the grade points (Gi) scored by a student in each course in a semester, summed over all the courses taken by a student in the semester, and then divided by the total number of credits of all the courses taken by the student in the semester,

  $$\text{i.e. SGPA } (Si) = \Sigma i\ (Ci \times Gi) / \Sigma i\ (Ci)$$

where Ci is the number of credits of the i^{th} course and Gi is the grade point scored by the student in the i^{th} course in the given semester. Credit Point of a course is the value obtained by multiplying the credit (Ci) of the course by the grade point (Gi) of the course.

$$SGPA = \frac{Sum\ of\ the\ credit\ points\ of\ all\ the\ courses\ in\ a\ semester}{Total\ credits\ in\ that\ semester}$$

ILLUSTRATION – COMPUTATION OF SGPA

Semester	**Course**	**Credit**	**Letter Grade**	**Grade point**	**Credit Point** (Credit x Grade)
I	Course 1	3	A	8	3 x 8 = 24
I	Course 2	4	B+	7	4 x 7 = 28
I	Course 3	3	B	6	3 x 6 = 18
I	Course 4	3	O	10	3 x 10 = 30
I	Course 5	3	C	5	3 x 5 = 15
I	Course 6	4	B	6	4 x 6 = 24
	Total	20			139
	SGPA				139/20 = 6.950

- The Cumulative Grade Point Average (CGPA) of the student shall be calculated at the end of a programme. The CGPA of a student determines the overall academic level of the student in a programme and is the criterion for ranking the students.

  CGPA for the three-year programme in CUFYUGP shall be calculated by the following formula.

$$CGPA = \frac{Sum\ of\ the\ credit\ points\ of\ all\ the\ courses\ in\ six\ semesters}{Total\ credits\ in\ six\ semesters\ (133)}$$

  CGPA for the four-year programme in CUFYUGP shall be calculated by the following formula.

$$CGPA = \frac{Sum\ of\ the\ credit\ points\ of\ all\ the\ courses\ in\ eight\ semesters}{Total\ credits\ in\ eight\ semesters\ (177)}$$

- The SGPA and CGPA shall be rounded off to three decimal points and reported in the transcripts.
- Based on the above letter grades, grade points, SGPA and CGPA, the University shall issue the transcript for each semester and a consolidated transcript indicating the performance in all semesters.

B.Sc. FOOD TECHNOLOGY HONOURS

(MAJOR AND GENERAL FOUNDATION COURSES)

SYLLABUS

Course Title	Fundamentals of Food Technology				
Type of Course	**Major**				
Semester	1				
Academic Level	100				
Course Details	Credit	Lecture per week	Tutorial per week	Practical per week	Total Hours
	4	3	-	2	75

Course Outcomes (CO):

CO	CO Statement	Cognitive Level*	Knowledge Category#	Evaluation Tools used
CO1	Know the relationship between food, nutrition and functional foods.	U	F	▪ Quiz / Assignment/ Discussion / Seminar ▪ Midterm Exam ▪ Final Exam
CO2	To Remember the basic Food groups like cereals, pulses, oilseeds, fruits vegetables, spices, meat, fish, poultry, sea food, milk and dairy products.	R	M	
CO3	Apply the scientific method of enquiry as it relates to the measurement of sensory, chemical and physical properties of foods	Ap	P	
CO4	To develop an insight among the students about the existing modern techniques and their applications in food processing preservation.	C	C	
* - Remember (R), Understand (U), Apply (Ap), Analyse (An), Evaluate (E), Create (C) # - Factual Knowledge(F) Conceptual Knowledge (C) Procedural Knowledge (P) Metacognitive Knowledge (M)				

Detailed Syllabus:

Module	Unit	Content	Hr
1.	**Introduction to Food Science and Technology**		**12**
	1.	Definition –Food, Importance and scope of Food Science and Food Technology	2
	2.	Basic Nutrients – Functions and sources	4
	3.	Prebiotic, Probiotic.	2
	4.	Nutraceuticals and Phytonutrients.	2
	5.	Organic foods, GM foods.	2
2.	**Food Groups**		**15**
	6.	Pulses & Legumes –Types, Nutritive value	2
	7.	Nuts & Oilseeds- Types and Nutritive value	2

	8.	Fruits, Vegetables and - Classification and composition.	2
	9.	Wheat and Rice - Structure and composition.	2
	10.	Meat, Fish- composition and Nutritive value	2
	11.	Egg- Structure and Nutritive Value	2
	12	Milk- Composition and Nutritive Value	1
	13	Spices and Plantation products- Classification and importance	2
3.	**Food Processing and Safety**		**12**
	14.	Food Preservation- Principles and Types	2
	15	Food Packaging- Importance and Common materials	2
	16	Food Additives	2
	17	Major Sectors of Food Processing Industry, National and International Research Institutes	2
	18	Food Safety- Need for Food Safety. Hazards in Foods - Physical, Chemical and Biological	3
	19	FSSAI	1
4.	**Sensory Evaluation**		**6**
	20	Sensory assessment-Appearance of food- visual perception, colour of foods, smell, flavour and Taste.	2
	21	Types of panels - Laboratory Set-up and Equipments.	2
	22	Types of Sensory Evaluation and Importance.	2
5.	**Practical**		**30**
	Standardization of NaOH.		3
	Standardization of HCl		3
	Determination of Moisture using a) Hot air oven b) Distillation method c). Infrared method		6
	Determination of Acidity & pH		3
	Determination of T S S		3
	Qualitative test for carbohydrates – Molisch's test, Benedict's test, Iodine test,		3
	Anthrone test, Selivanoff's test.		3
	Qualitative Test of Proteins		3
	Practical Demonstration- Pilot / Industrial scale Food Production / Processing		3
	Industrial Visit : Food Processing Unit.		

Mapping of COs with PSOs and POs :

	PSO 1	PSO 2	PSO 3	PSO4	PSO 5	PSO6	PO1	PO2	PO3	PO4	PO5	PO6
CO 1	2	2	2	2	1	1	1	-	1	1	1	1
CO 2	2	-	-	1	2	2	2	3	2	2	2	2
CO 3	-	1	2	1	-	-	1	-	2	-	-	1
CO 4	2	2	2	2	1	2	1	1	-	1	2	1

Correlation Levels:

Level	Correlation
-	Nil
1	Slightly / Low
2	Moderate / Medium
3	Substantial / High

Assessment Rubrics:

- Quiz / Assignment/ Discussion / Seminar
- Midterm Exam
- Final Exam

Mapping of COs to Assessment Rubrics :

	Internal Exam	Assignment	Project Evaluation	End Semester Examinations
CO 1	✓			✓
CO 2	✓			✓
CO 3	✓	✓		✓
CO 4		✓	✓	✓

Course Title	Food Microbiology - I				
Type of Course	**Major**				
Semester	2				
Academic Level	100				
Course Details	Credit	Lecture per week	Tutorial per week	Practical per week	Total Hours
	4	3	-	2	75

Course Outcomes (CO):

CO	CO Statement	Cognitive Level*	Knowledge Category#	Evaluation Tools used
CO1	To know the important genera of microorganisms associated with food and their characteristics.	U	F	▪ Quiz / Assignment/Discussion / Seminar ▪ Midterm Exam ▪ Final Exam
CO2	Apply the knowledge in the laboratory techniques to detect, quantify, and identify microorganisms in foods	Ap	C	
CO3	To gain knowledge on various methods of cultivation and identification of food microbes.	Ap	M	
CO4	Develop basic laboratory skills for the isolation, identification, and quantification of microorganisms in food samples	E	P	
CO5	Establish a comprehensive understanding about the concept of growth of microbes in food	U	C	
CO6	To Understand the knowledge on history of microbiology	U	P	
* - Remember (R), Understand (U), Apply (Ap), Analyse (An), Evaluate (E), Create (C) # - Factual Knowledge(F) Conceptual Knowledge (C) Procedural Knowledge (P) Metacognitive Knowledge (M)				

Detailed Syllabus:

Module	Unit	Content	Hr
I	**Introduction to Microbiology**		**10**
	1	History and Development of Microbiology- Germ theory of disease, Koch's postulates	2
	2	Theory of spontaneous generation and biogenesis	1
	3	Microscopy – History, Parts of microscope, properties	2
	4	Types of microscopes - Light microscope (Bright field, Dark field)	2
	5	Fluorescence and Electron microscope	3
II	**Characteristics of Microorganisms in Food**		**12**
	6.	**Bacteria** -size, shape and arrangement	1
	7.	Bacteria -Structure, Morphology	2
	8.	Bacteria - Reproduction -Binary fission, Transformation, Transduction and conjugation,	2
III	9.	Fungi -Morphology, Classification, Reproduction –Sexual and Asexual.	2
	10.	Yeast -Structure, Morphology, Reproduction –Sexual and Asexual	1
	11.	Virus-Classification, Composition, Morphology	2
	12.	Replication of virus-lysogenic &lytic cycle	1
	13	Algae: Types	1
IV	**Cultivation of Micro-organisms**		**12**
	14.	Methods of isolation and cultivation, Serial dilution method.	2
	15.	Pure culture technique- streak plate, pour plate, spread plate	2
	16	Enumeration of Microorganisms qualitative and Quantitative	3
	17.	Cultural Media – classification, Selective, Differential, Enrichment Media	3
	18	Staining techniques – simple, differential staining	2
	Microbial Growth in Food		**11**
	19	Factors affecting the growth of microorganisms in food (intrinsic, extrinsic)	3
	20	Nutritional requirement of microorganisms.	3
	21	Bacterial growth curve and	3
	22	Microbial growth in food.	2
V	**Practical**		**30**
	Introduction to equipment's and glassware used in		6
	Microbiology Sterilization techniques: Dry heat and moist heat		6
	Staining reagents and procedures		4
	Staining techniques – simple staining, gram staining, negative staining.		10
	Fungal staining		4

Mapping of COs with PSOs and POs :

	PSO 1	PSO 2	PSO 3	PSO4	PSO 5	PSO6	PO1	PO2	PO3	PO4	PO5	PO6
CO 1	1	1	-	1	1	1	-	1	2	1	1	1
CO 2	2	2	3	2	2	2	1	1	-	2	2	2
CO 3	-	1	-	2	-	-	1	1	1	1	-	1
CO 4	2	1	1	-	1	1	-	1	2	1	2	1
CO 5	-	2	2	1	1	-	2	2	1	1	-	2
CO 6	1	1	-	1	1	1	1	-	1	1	1	1

Correlation Levels:s

Level	Correlation
-	Nil
1	Slightly / Low
2	Moderate / Medium
3	Substantial / High

Assessment Rubrics:

- Quiz / Assignment/Discussion / Seminar
- Midterm Exam
- Final Exam

Mapping of COs to Assessment Rubrics :

	Internal Exam	Assignment	Project Evaluation	End Semester Examinations
CO 1	✓			✓
CO 2	✓			✓
CO 3	✓			✓
CO 4		✓		✓
CO 5		✓	✓	✓
CO 6			✓	✓

Course Title	Nutrition Science				
Type of Course	**Major**				
Semester	3				
Academic Level	200				
Course Details	Credit	Lecture per week	Tutorial per week	Practical per week	Total Hours
	4	4	-	-	60

Course Outcomes (CO):

CO	CO Statement	Cognitive Level*	Knowledge Category#	Evaluation Tools used
CO1	Define the concept of health and nutrition	E	M	▪ Quiz / Assignment/ Discussion / Seminar ▪ Midterm Exam ▪ Final Exam
CO2	Discuss the microelements, macro elements, vitamins and minerals in the food	U	F	
CO3	Compare the nutrients supplied by the food	Ap	M	
CO4	Test the relationship between diet and health and to changing food and nutritional attitudes	An	C	
CO5	Developing supplementary nutrition program whenever necessary	R	P	
* - Remember (R), Understand (U), Apply (Ap), Analyse (An), Evaluate (E), Create (C) # - Factual Knowledge(F) Conceptual Knowledge (C) Procedural Knowledge (P) Metacognitive Knowledge (M)				

Detailed Syllabus: Nutrition Science

Module	Unit	Content	Hrs
I	**Health, Nutrition & Food**		**23**
	1	Physical, mental, social and spiritual health	3
	2	Determinants & indicators of health	3
	3	Nutrition & malnutrition, importance of ideal nutrition	3
	4	Balanced diet, BMI, Food guide, Pyramid and RDA	3
	5	Menu Planning, Significance of Menu Planning, Menu planning for family. Factors influencing meal planning.	3
	6	Nutrition for the normal life cycle, Nutrition during Pregnancy and Lactation.	2
	7	Nutrition for Fitness and Sports	3

	8	Nutrigenetics and Genomics	1
	9	HFSS foods	1
	10	DASH diet	1
II	**Energy**		**10**
	11	Definition, Calorie & Joule	3
	12	Measurement of Calorific values of Food	3
	13	Basal metabolism-BMR	2
	14	Energy requirements & expenditure	2
III	**Carbohydrates, Protein & Lipids**		**10**
	15	Sources	2
	16	Nutritional classification	2
	17	Digestion, Absorption and Transportation	2
	18	Health disorders due to its imbalance in the body	2
	19	Potential health benefits	2
IV	**Vitamins, Minerals, & Water**		**5**
	20	Nutritional classification and Sources	1
	21	Digestion, Absorption and Transportation	2
	22	Health benefits and disorders due to its imbalance in the body	2
	OPEN ENDED : DIET THERAPY		**12**
V			

Mapping of COs with PSOs and POs :

	PSO 1	PSO 2	PSO 3	PSO4	PSO 5	PSO6	PO1	PO2	PO3	PO4	PO5	PO6
CO 1	2	1	1	-	2	1	2	1	1	-	2	2
CO 2	-	1	2	1	3	-	-	2	1	3	1	-
CO 3	1	-	1	2	1	2	1	-	1	2	1	2
CO 4	-	2	2	1	1	-	-	2	2	1	2	-
CO 5	2	1	-	1	1	3	1	2	-	1	2	1

Correlation Levels:

Level	Correlation
-	Nil
1	Slightly / Low
2	Moderate / Medium
3	Substantial / High

Assessment Rubrics:

- Quiz / Assignment/ Discussion / Seminar
- Midterm Exam
- Final Exam

Mapping of COs to Assessment Rubrics :

	Internal Exam	Assignment	Project Evaluation	End Semester Examinations
CO 1	✓			✓
CO 2	✓	✓		✓
CO 3	✓	✓		✓
CO 4	✓	✓	✓	✓
CO 5		✓	✓	✓

Course Title	Food Chemistry				
Type of Course	**Major**				
Semester	3				
Academic Level	200				
Course Details	Credit	Lecture per week	Tutorial per week	Practical per week	Total Hours
	4	3	-	2	75

Course Outcomes (CO):

CO	CO Statement	Cognitive Level*	Knowledge Category#	Evaluation Tools used
CO1	Understand basic constituents of foods and their response to various physio-chemical alterations.	U	C	▪ Quiz / Assignment/ Discussion / Seminar ▪ Midterm Exam ▪ Final Exam
CO2	Create better understanding of food pigments and their control measurements.	C	F	
CO3	Understand the importance of enzymes from various sources for chemical modification of foods.	U	P	
CO4	Analyse the factors which influence the textural quality of foods.	An	M	
CO5	Analyse the various constituents of foods	An	F	

* - Remember (R), Understand (U), Apply (Ap), Analyse (An), Evaluate (E), Create (C)
# - Factual Knowledge(F) Conceptual Knowledge (C) Procedural Knowledge (P) Metacognitive Knowledge (M)

Detailed Syllabus:

Module	Unit	Content	Hrs
I	**Classification, structure, sources & properties of carbohydrates, proteins, lipids and water**.		**20**
	1	**Carbohydrates** Monosaccharide - Glucose, fructose and galactose. Structure, properties and reactions.	3

		Oligosaccharides - Maltose, lactose and sucrose.	
	2	Properties - crystallization, inversion, hydrolysis. Reducing and non-reducing sugars, Caramelisation and Maillard reaction.	1
	3	Polysaccharides - Starch, structure and properties of amylose and amylopectin, Gelatinisation and retrogradation, Starch modification	2
	4	Sources and properties of cellulose, hemicellulose, pectic substances, gums and dietary fibre.	2
	5	**Proteins** Structure and classification of amino acids and proteins.	2
	6	Important food proteins.	1
	7	Physiochemical properties - denaturation & reactions.	1
	8	Protein Determination methods	1
	9	**Lipids** Chemistry, Classification and Properties of Lipids and Fatty acids	1
	10	Rancidity, auto oxidation and hydrolysis, Anti-oxidants.	1
	11	**Water** Structure of water and Ice	1
	12	Physical and chemical properties.	1
	13	Free and bound water.	1
	14	Methods of moisture determination in foods, Water activity	2
II		**Pigments**.	**6**
	15	Structure, sources and properties of pigments, Chlorophyll and Carotenoids, Flavonoids and anthocyanins Anthoxanthins and myoglobin,	3
	16	Methods to prevent discoloration of natural pigments.	3
III		**Enzymes**	**9**
	17	Introduction, definition, occurrence,	2
	18	Classification and properties, Factors effecting enzyme activity	4
	19	Enzymes in food and its applications in food industry	3
IV		**Colloids**.	**10**
	20	Chemistry of colloids...	3
	21	Properties of solutions, sols, suspensions and emulsions.	3
	22	Types of emulsions and Emulsifying agents, Food colloids	4
V		**PRATICALS**	**30**
		1. Standardization of NaOH and HCl 2. Determination of moisture 3. Determination of acidity and pH 4. Qualitative test for carbohydrates and proteins. 5. Qualitative analysis of protein by colorimetry. 6. Analysis of lipids: a. Iodine value b. Free fatty acids c. Peroxide value d. Saponification value 7. Analysis of water: a. Hardness b. Alkalinity	3 3 3 3 3 6 6

		c. Acidity d. Chloride **8.** Quatitative methods---Protein,carboh,Fat… Ash, Fibre	3

Mapping of COs with PSOs and POs :

	PSO 1	PSO 2	PSO 3	PSO4	PSO 5	PSO6	PO1	PO2	PO3	PO4	PO5	PO6
CO 1	2	1	3	-	-	2	2	1	3	-	-	2
CO 2	1	2	1	2	1	-	1	2	1	2	1	-
CO 3	2	1	1	-	-	2	2	1	1	-	-	2
CO 4	-	1	1	3	1	2	-	1	1	3	1	2
CO 5	2	1	3	-	-	2	2	1	3	-	-	2

Correlation Levels:

Level	Correlation
-	Nil
1	Slightly / Low
2	Moderate / Medium
3	Substantial / High

Assessment Rubrics:

- Quiz / Assignment/ Discussion / Seminar
- Midterm Exam
- Final Exam

Mapping of COs to Assessment Rubrics :

	Internal Exam	Assignment	Project Evaluation	End Semester Examinations
CO 1	✓			✓
CO 2	✓	✓		✓
CO 3	✓			✓
CO 4	✓	✓	✓	✓
CO 5	✓	✓		✓
CO 6	✓		✓	✓

Course Title	FOOD PROCESSING AND PRESERVATION TECHNOLOGY				
Type of Course	**Major**				
Semester	4				
Academic Level	200				
Course Details	Credit	Lecture per week	Tutorial per week	Practical per week	Total Hours
	4	3	-	2	75

Course Outcomes (CO):

CO	CO Statement	Cognitive Level*	Knowledge Category#	Evaluation Tools used
CO1	Understanding of thermal processes, their industrial, and ability to apply this knowledge in various contexts.	U	C	▪ Quiz / Assignment/ Discussion / Seminar ▪ Midterm Exam ▪ Final Exam
CO2	Apply knowledge and skills related to preserving products at low temperature. Practical skills in implementing and optimizing low temperature preservation methods, along with an awareness of safety measures and quality control.	AP	P	
CO3	Apply knowledge of the biological processes and chemical methods of preservation.	AP	M	
CO4	Demonstrate knowledge of innovative preservation methods and also gain insights into sustainable practices, quality control and regulatory considerations with in the dynamic field of food science.	Ap	F	
CO5	Equip individual with the knowledge and skill to develop new product in market	Ap	C	
CO6	Create basic knowledge on recent trends in food preservation.	C	M	

* - Remember (R), Understand (U), Apply (Ap), Analyse (An), Evaluate (E), Create (C) # - Factual Knowledge(F) Conceptual Knowledge (C) Procedural Knowledge (P) Metacognitive Knowledge (M)

Detailed Syllabus:

Module	Unit	Content	Hrs
I	**THERMAL PROCESSING**		**12**
	1	Introduction: Basic principles of food preservation, methods of preservation.	2
	2	Thermal processing: blanching, pasteurization, sterilization, UHT sterilization, Aseptic processing, cooking, frying, baking, grilling, smoking	2
	3	Canning: principle, steps involved in canning, types of containers used, heat penetration into containers, pH classification of foods,, corrosion of cans.	3
	4	Drying and dehydration: Heat and mass transfer, factors affecting drying process, drying curve, evaporation, application of evaporation in food industry, drying pre-treatments, natural and Mechanical drying, merits and demerits.	3
	5	Driers in food industry: drum, spray, fluidized bed, air drier, vacuum drier, tunnel drier. Dehydrofreezing, freeze drying.	2
II	**LOW TEMPERATURE TECHNIQUES**		**7**
	6	Preservation by chilling: Low temperature preservation of fresh fruits, vegetables, meat and fish products. Chilling injury. Changes during refrigeration.	3
	7	Prservation by freezing: Principle, freezing rate, freezing methods, quick freezing, slow freezing, Quality of frozen food – Retrogradation, protein denaturation, freezer burn. Common spoilage occurs during freezing. Preservation by controlling water activity. IQF	3
	8	Thawing: Effects on food, changes during thawing, types.	1
III	**FERMENTATION AND PRESERVATIVES**		**11**
	9	Preservation by fermentation: Alcoholic, acetic acid and lactic acid fermentation, applications in food processing.	3
	10	Natural preservatives: sugar, salt, vinegar, spices, mode of action	1
	11	Chemical preservatives: Sulphur dioxide, benzoic acid, sorbates , propionates , acetic acid, mode of action , FSSAI regulations for various food products.	3
	12	Food additives: Antioxidants, Antibiotics.	2
	13	Preservation by controlling water activity: High sugar products, IMF, curing and effect of salt of food preservation.	2
IV	**RECENT TRENDS AND NPD**		**15**

	14	Non thermal technologies: Microfiltration , bactofugation , ultra high voltage electric field, Pulsed electric field	2
	15	High pressure processing : Principles applications and advantages.	1
	16	Microwave processing: Principles applications and advantages.	2
	17	Alternate thermal technologies: ohmic heating, dielectric heating infrared and induction heating.	2
	18	Nanotechnology: Principle, application and advantages.	1
	19	Hurdle technology: Principles, applications and advantages.	1
	20	Irradiation: Sources of ionization radiation, Dose and Dosimetry, Mode of action, scope of irradiation.	2
	21	NPD: Food needs, consumer preference, and market survey, Steps in new product development.	2
	22	Subjective analysis: Sensory evaluation, panel selection various methods and its relevance in new product development.	2
V	**Practical**		**30**
		Blanching of Vegetables.	2
		Dehydration of Vegetables using Cabinet drier.	3
		Determination of Moisture content	3
		Dehydration of fruits in sugar syrup	3
		Qualitative Determination of Benzoic acid & SO2	3
		Sensory Evaluation	4
		Industrial Visit to Food Processing Unit	12

Mapping of COs with PSOs and POs :

	PSO 1	PSO 2	PSO 3	PSO4	PSO 5	PSO6	PO1	PO2	PO3	PO4	PO5	PO6
CO 1	2	1	3	-	-	2	-	2	1	3	-	-
CO 2	1	2	1	2	1	-	-	1	2	1	2	1
CO 3	2	1	1	-	-	2	1	2	1	1	-	-
CO 4	2	1	3	-	-	2	2	1	3	-	-	2
CO 5	1	2	1	2	1	-	1	2	1	2	1	-
CO 6	2	1	1	-	-	2	2	1	1	-	-	2

Correlation Levels:

Level	Correlation
-	Nil
1	Slightly / Low
2	Moderate / Medium
3	Substantial / High

Assessment Rubrics:

- Quiz / Assignment/ Discussion / Seminar
- Midterm Exam
- Final Exam

Mapping of COs to Assessment Rubrics :

	Internal Exam	Assignment	Project Evaluation	End Semester Examinations
CO 1	✓			✓
CO 2	✓			✓
CO 3	✓			✓
CO 4	✓	✓	✓	✓
CO 5	✓	✓	✓	✓
CO 6	✓	✓	✓	✓

Course Title	CEREALS, PULSES AND OIL SEEDS TECHNOLOGY				
Type of Course	**Major**				
Semester	4				
Academic Level	200				
Course Details	Credit	Lecture per week	Tutorial per week	Practical per week	Total Hours
	4	3	-	2	75

Course Outcomes (CO):

CO	CO Statement	Cognitive Level*	Knowledge Category#	Evaluation Tools used
CO1	Memorise details of millet chemistry	U	C	▪ Quiz / Assignment/Discussion / Seminar ▪ Midterm Exam ▪ Final Exam
CO2	Understand the processing method of pulses, nuts and oilseeds	Ap	P	
CO3	Distinguish the baking technologies of bread, cake, biscuits and confectionary	Ap	M	
CO4	Interpret various processing technologies related to rice, wheat, millets, pulses, nuts and oil seeds	Ap	F	
CO5	Create Knowledge on processing of cereals, pulses and oil seeds	C	F	

* - Remember (R), Understand (U), Apply (Ap), Analyse (An), Evaluate (E), Create (C)
# - Factual Knowledge(F) Conceptual Knowledge (C) Procedural Knowledge (P) Metacognitive Knowledge (M)

Detailed Syllabus:

Module	Unit	Content	Hrs
I		**Technology of Wheat and Rice**	**12**
	1	Wheat: Structure, composition and verities	2
	2	Milling of wheat: unit operations and equipments	2
	3	Products and By-products of Wheat	2
	4	Rice: structure, composition and varieties Rice Quality--Physical, chemical and cooking	2
	5	Parboiling of Rice- Process, Types, advantages and disadvantages Milling of rice: Steps in Milling and factors affecting milling quality	4

		Products and By-products of rice	
II		**Bakery and Confectionary**	**12**
	6	Baking: principle of baking, classification of baked foods, baking additives	2
	7	Bread: bread making- role of ingredients, bread faults and remedies, staling of bread	2
	8	Cake: cake making, role of ingredients, types of making, cake faults and remedies	2
	9	Biscuits: Biscuits and Cookies, Crackers and Wafers Technology of Biscuit, Faults and Remedies	2
	10	FSSAI specification of Biscuit, bread, cake, and pasta goods,	2
	11	**Confectionary:** raw materials, hard candy, toffee, caramel	2
III		**Millets, Oats and Barley**	**4**
	12	Composition and types of millets, oats, corn and barley	2
	13	Important Millets and General Processing of Millets	2
IV		**Pulses, Nuts and Oil Seeds**	**17**
	Pulses		
	14	Composition and types	1
	15	Processing- soaking, germination, decortications, cooking and fermentation	2
	16	Changes during germination, Anti nutritional factors, factors affecting cooking time	3
	17	Traditional and commercial milling method	1
	18	Pre conditioning, dry milling, wet milling	2
	Nuts and Oil Seeds		
	19	Source, composition, processing of oil seeds- soyabean, coconut	1
	20	Hydrogenation, refining of fats and oils, bleaching and deodorizing, hydroxylation, shortening, margarine, protein isolates, tartarised vegetable proteins	3
	21	Milling of oil seeds: mechanical expression, super critical fluid extraction, screw press, hydrolytic press, solvent extraction methods	2
	22	Pre conditioning of oil seeds, refining of oil seeds, stabilization of rice bran, by product utilization.	2
V		**PRACTICALS**	**30**
	1	Determination of moisture	3
	2	Determination of ash	3
	3	Sedimentation value	2
	4	Determination of alcoholic acidity	2
	5	Estimation of gluten	2
	6	Determination of water absorption power	2
	7	Qualitative analysis of gluten- pelshenke value	3
	8	Determination of falling number	2
	9	Preparation of bread	3
	10	Preparation of biscuits & Cookies	3
	11	Preparation of cake	3
	12	Determination of physical parameters of wheat and rice	2

Mapping of COs with PSOs and POs :

	PSO 1	PSO 2	PSO 3	PSO4	PS O5	PSO 6	PO1	PO2	PO3	PO4	PO5	PO6
CO 1	1	-	1	1	-	-	1	-	-	1	1	-
CO 2	2	3	2	2	-	-	2	3	-	-	2	3
CO 3	-	-	1	-	1	-	2	-	-	1	-	-
CO 4	3	-	2	3	2	3	-	-	2	2	3	1
CO 5	-	1	-	-	-	-	-	1	-	-	-	-

Correlation Levels:

Level	Correlation
-	Nil
1	Slightly / Low
2	Moderate / Medium
3	Substantial / High

Assessment Rubrics:

- Quiz / Assignment/Discussion / Seminar
- Midterm Exam
- Final Exam

Mapping of COs to Assessment Rubrics :

	Internal Exam	Assignment	Project Evaluation	End Semester Examinations
CO 1	✓			✓
CO 2	✓			✓
CO 3	✓		✓	✓
CO 4		✓	✓	✓
CO 5	✓	✓		✓

Course Title	Spices and Plantation Crops				
Type of Course	**Major**				
Semester	4				
Academic Level	200				
Course Details	Credit	Lecture per week	Tutorial per week	Practical per week	Total Hours
	4	3	-	2	75

Course Outcomes (CO):

CO	CO Statement	Cognitive Level*	Knowledge Category#	Evaluation Tools used
CO1	Understanding of various processing technology in spices.	U	P	▪ Quiz / Assignment/Discussion / Seminar ▪ Midterm Exam ▪ Final Exam
CO2	Analyzing Quality attributes of spices	An	F	
CO3	Create knowledge about Chemical Composition of spices and Manufacturing technology of spice oil and oleoresin	C	P	
CO4	Evaluate proximate composition of different spices	E	C	
CO5	Understand processing of plantation crops	U	M	
CO6	Create Practical Knowledge in spice technology	C	F	
* - Remember (R), Understand (U), Apply (Ap), Analyse (An), Evaluate (E), Create (C) # - Factual Knowledge(F) Conceptual Knowledge (C) Procedural Knowledge (P) Metacognitive Knowledge (M)				

Detailed Syllabus:

Module	Unit	Content	Hrs
I	**Introduction to Spices**		**10**
	1	Spices :Definition, Classification ,Chemical composition and uses, Post harvest technology	2
	2	Quality control of spices, Standards and FSSAI specifications of Major Spices	3

	3	Therapeutic value of Major Spices and value addition in Spices, unit operations in Spices	3
	4	Spice oil and Oleoresins: Extraction Techniques	2
II	**Major Spices**		**10**
	5	**Pepper** :Refining and processing of Pepper, Pepper products:- White pepper, dehydrated green pepper, Pepper oil, Oleoresin.	3
	6	**Chilies** :Drying of chilies, quality attributes of Chilies and Paprika	2
	7	**Cardamom :** Composition, Drying of fruits, Bleaching, Grading, Cardamom products, Essential oil and Oleoresins	2
	8	**Ginger** :Curing, Bleaching, Grading Ginger Products, Ginger oils, Ginger Oleoresin, Dehydrated Ginger, Bleached Ginger **Turmeric** Curing, Grading, Turmeric powder, Essential oil, Oleoresin	3
III	**Minor spices**		**15**
	9	Processing and utilization of Minor spices-herbs, leaves and spartan seasonings	2
	10	Aniseed, Sweet basil-composition and its utilization.	2
	11	Caraway seed, cassia and cinnamon-composition and its utilization.	1
	12	Processing of Clove-stages of harvest-cleaning & drying	2
	13	Coriander-uses, harvesting, drying.	1
	14	Processing of cumin, dill seed -types, harvesting, drying. Processing of fennel seed	2
	15	Processing of Nutmeg and Mace.	1
	16	Processing of Mint-harvesting, drying, storage	1
	17	Processing of marjoram and rosemary, saffron-production flow chart.	3
IV	**Plantation crops**		**10**
	18	Plantation crops-classification-production & processing-Status and Exports.	1
	19	Processing of Tea-unit operation-flow chart and process	2
	20	Processing of coffee-Dry and wet processing-Green and cherry Coffee, Unit operation-flow charts-equipments and operation, Instant coffee powder-flow chart	3
	21	Processing of Cocoa-Important unit operation, Flow charts in Cocoa processing, Chocolate processing-flow charts.	2
	22	Processing of vanilla and Annatto-flowchart, utilization.	2
V	**PRATICALS**		**30**
		1. Determination of Moisture content in spices 2. Extraction of oil from Spices 3. Extraction of oleoresins from Spices 4.Determination of ash in spices 5. Determination of acid insoluble ash	30

		6. Determination of acid value in spices. 7. Determination of specific gravity of spices. 8. Packaging study of spices 9. Preparation of Spice Masala, Pickle Powder and Curry powders 10. Determination of Adulterants in Spices	
	2	• A visit to tea/coffee/ chocolate/ Spices and condiments industry	

Mapping of COs with PSOs and POs :

	PSO 1	PSO 2	PSO 3	PSO4	PSO 5	PSO6	PO1	PO2	PO3	PO4	PO5	PO6
CO 1	1	-	2	3	-	2	-	2	1	-	2	-
CO 2	2	3	-	-	3	-	1	-	2	3	-	-
CO 3	-	-	1	-	-	1	-	1	-	1	-	1
CO 4	1	-	2	3	-	2	-	2	-	2	-	2
CO 5	2	1	-	-	1	-	1	-	1	-	1	-
CO 6	2	-	2	3	-	2	-	2	1	-	-	2

Correlation Levels:

Level	Correlation
-	Nil
1	Slightly / Low
2	Moderate / Medium
3	Substantial / High

Assessment Rubrics:

- Quiz / Assignment/Discussion / Seminar
- Midterm Exam
- Final Exam

Mapping of COs to Assessment Rubrics :

	Internal Exam	Assignment	Project Evaluation	End Semester Examinations
CO 1	✓			✓
CO 2	✓			✓
CO 3	✓		✓	✓
CO 4	✓	✓	✓	✓
CO 5		✓	✓	✓
CO 6		✓		✓

Course Title	Basics of Food Engineering and Packaging Technology				
Type of Course	**Major**				
Semester	5				
Academic Level	300				
Course Details	Credit	Lecture per week	Tutorial per week	Practical per week	Total Hours
	4	3	-	2	75

Course Outcomes (CO):

CO	CO Statement	Cognitive Level*	Knowledge Category#	Evaluation Tools used
CO1	Understand food packaging principles, packaging materials, types related to use with various food systems and packaging permeability.	U	P	▪ Quiz ▪ Assignment ▪ Discussion ▪ Seminar ▪ Midterm Exam ▪ Final Exam
CO2	Understand about Passive and active packaging, Reuse, disposability and printing of packaging, Labelling techniques and legislative requirements for labelling food and beverage products.	An	F	
CO3	Familiarize the purpose and principles of food packaging and examine the operations involved in packaging material manufacture.	U	P	
CO4	Evaluate environmental issues, regulations and quality control associated with food packaging.	E	C	
CO5	Identify and evaluate the suitability of processing and packaging techniques for various foods.	U	M	

* - Remember (R), Understand (U), Apply (Ap), Analyse (An), Evaluate (E), Create (C)
# - Factual Knowledge(F) Conceptual Knowledge (C) Procedural Knowledge (P) Metacognitive Knowledge (M)

Detailed Syllabus:

Module	Unit	Content	Hrs
I		**Basics of Food Engineering**	
	Engineering Properties of Food Materials		**9**
	1	Physical property – Size, Shape, Density, Specific Gravity, Angle of repose. Mechanical Properties. Specific Heat, Thermal conductivity. Rheological Properties- Viscosity, Apparent viscosity- Newtonian and Non-Newtonian	2
	Unit of operations in Food Engineering		
	2	Basic Principle, Types and Applications: Blanching, Evaporation, Drying, Freezing & Chilling, Size reduction Frying -Types, Effect of heat on Fried Foods. Extrusion-Classification-Single Screw and Twin-Screw Extruder, Parts, Mechanism of Working, Applications	2
	Heat Transfer, Heat exchangers and Boilers		
	3	Mode of Heat Transfer– Conduction, Convection, Radiation. **Heat Exchangers** : Plate ,Tubular, Scraped Surface, Shell & Tube. **Boiler:** Principle, Classification and working	5
II		**Introduction to Packaging Technology**	**16**
	4	Definition, Functions of Packaging & Packaging Design Consideration	1
	Packaging materials		
	5	**Glass Packaging**: Manufacturing methods, Types of glass packages and Uses in Food industry	2
	6	**Metal packaging**: Tin plate containers, Aluminium foil, composite can.	2
	7	**Plastic films and rigid plastics:** Classification of polymers, Polymerisation process, Physical and chemical characteristics,	2
	8	LDPE, LLDPE,HDPE,PE, PP, Metallocene, EVA, EVAOH,EAA,PS(HIPS,EPS),PVOH, PVC, PVdC, PET, PEN, PC, PA, Acrylonitriles.	2
	9	Additives in plastics, Plastic manufacturing process- Injection moulding and Blow moulding. Calendaring, Lamination, Metallisation and Orientation.	2
	10	Sacks, bags, Pouches, wraps, bottles, cans, Retortable plastic can, jars, cups, tube, cartons and bulk containers. Collapsible tubes Materials. Composite containers	2
	11	**Corrugated Fiber Board (CFB):** Material, components of corrugated board, liners, fluting, adhesive. Plastic corrugated boxes, Folding cartons, set up boxes, Paper Sacks and Paper bags.	2
	12	**Wooden containers**: Wooden containers, Uses and Importance.	1
III		**Packaging Systems, Trends, Labelling and Quality Assurance**	**10**
	13	Purposes of Modified and controlled atmosphere packaging,	2
	14	Active, Intelligent packaging, Aseptic and retort pouch packaging,	2
	15	Shrink and Stretch packaging & Vacuum packaging	2
	16	Insect resistant packaging & Edible packaging	2

	17	Packaging standards, laws and regulations, Quality control Package-Product compatibility; Tainting, toxicity & migration in food packaging, Designing of Packages, Labelling requirements, Nutrition Labelling	2
IV	**Food Packaging**		**10**
	18	Fresh Fruit and Vegetables	2
	19	Meat, Fish and Poultry	2
	20	Fat And Oils, Spice Products	2
	21	Dairy Products, Beverages.	2
	22	Bakery and Confectionery	2
V	**PRACTICALS**		**30**
		• Identification of various Packaging materials. • Grammage • Water absorption - Paper & Paper board • Oil absorption – Paper & Paper board • Drop Test – Carton box • Shelf-life study of packaged foods – e.g. Bread Spoilage • Chemical and physical tests of packaging materials (Demonstration) • Bursting strength (Demonstration) • Tearing strength (Demonstration) • Puncture resistance (Demonstration) • Blockchain Technology & 3D Printing in Packaging (Concept Demonstration through Smart TV/Projector/Computer)	30

Mapping of COs with PSOs and POs :

	PSO 1	PSO 2	PSO 3	PSO4	PSO 5	PSO6	PO1	PO2	PO3	PO4	PO5	PO6
CO 1	1	-	-	1	-	2	3	-	2	-	2	3
CO 2	2	3	-	2	3	-	-	1	-	1	-	-
CO 3	-	-	1	-	1	2	-	2	-	2	-	-
CO 4	1	-	2	-	-	-	1	-	-	-	-	1
CO 5	1	1	-	-	1	2	3	-	2	-	2	3

Correlation Levels:

Level	Correlation
-	Nil
1	Slightly / Low
2	Moderate / Medium
3	Substantial / High

Assessment Rubrics:

- Quiz / Assignment/ Discussion / Seminar
- Midterm Exam
- Final Exam

Mapping of COs to Assessment Rubrics :

	Internal Exam	Assignment	Project Evaluation	End Semester Examinations
CO 1	✓			✓
CO 2	✓	✓		✓
CO 3	✓		✓	✓
CO 4	✓	✓		✓
CO 5	✓	✓		✓

Course Title	TECHNOLOGY OF FRUITS AND VEGETABLES				
Type of Course	**Major**				
Semester	5				
Academic Level	300				
Course Details	Credit	Lecture per week	Tutorial per week	Practical per week	Total Hours
	4	3	-	2	75

Course Outcomes (CO):

CO	CO Statement	Cognitive Level*	Knowledge Category#	Evaluation Tools used
CO1	Equip students with advanced knowledge of processing of fruits and vegetables	U	C	• Quiz • Assignment • Discussion • Seminar • Midterm Exam • Final Exam
CO2	Provide knowledge about various technologies used in the production and packaging of fruits and vegetables	AP	F	
CO3	Apply knowledge of preservation methods	AP	P	
CO4	Understand the preparation specification and quality control of products	AP	M	
CO5	Familiarize different aspects of post-harvest technology along with storage practices and storage disorders	AP	P	
CO6	Create basic knowledge on recent trends in processing techniques of fruits and vegetables	C	C	

* - Remember (R), Understand (U), Apply (AP), Analyse (An), Evaluate (E), Create (C)
# - Factual Knowledge(F) Conceptual Knowledge (C) Procedural Knowledge (P) Metacognitive Knowledge (M)

Detailed Syllabus:

Module	Unit	Content	Hrs
1	**POST HARVEST TECHNOLOGY OF FRUITS AND VEGETABLES**		**12**
	1	Pre- and post-harvest physiology, maturation changes and maturity indices for harvesting,	2
	2	Ripening, changes during ripening-climacteric and non-climacteric. Post harvest treatment to hasten and delay ripening.	2
	3	Post harvest handling: sorting, grading, packaging, storage and transportation	2
	4	Storage disorders: physiological disorder, chilling injury, freezing injury	2
	5	Storage practices: cold storage, controlled atmospheric & modified atmospheric storage and hypobaric storage, cellar storage, zero energy cool chamber.	2

	6	Primary processing - grading, sorting, cleaning, washing, peeling, slicing blanching, wax coating	2
II	**PECTIN, BEVERAGES AND OTHER FRUIT PRODUCTS**		**14**
	7	Frozen products: Raw materials preparation, treatment and processing methods of frozen fruits and vegetables (peas, mango pulp) and IQF. Restructured fruits and vegetables.	2
	8	Pectin: Definition of pectin, classification, pectic enzymes, properties, Jelly grade of pectin, Testing of pectin	2
	9	Processing of jam, jelly, marmalade, preserves, candy, glazed and crystallized fruits definition and it's FSSAI Specifications	2
	10	RTS, Squashes, Cordials, syrups, sherbet, crush. - Preparation and FSSAI specifications	2
	11	Fruit juice and concentrates: unit operation and equipment, aroma recovery and restoration; aroma recovery systems. fruit juices (lime, mango) and Fruit juice powder	2
	12	Pickles and chutneys: Types and production, packaging of pickles and chutneys, spoilage	2
	13	Alcoholic beverages – processing of wine, beer, arak	2
III	**PROCESSING AND PRESERVATION TECHNOLOGY OF FRUITS AND VEGETABLES**		**10**
	14	Canning: classification of canning fruits- pineapple, oranges, canning of vegetables – peas, carrots, syrups and brines for canning	3
	15	Jack fruit- value added products from Jack Fruit	2
	16	Drying and Dehydration: Enzyme inactivation, sulphuring, sun drying-grapes and dates. Dehydration of fruits and vegetables	2
	17	Browning: Enzymatic Browning, it's prevention Benefits of preserved Fruits and Vegetables	3
IV	**TOMATO, BANANA, MUSHROOM AND TUBER CROPS PRODUCTS**		**9**
	18	Tomato products: Tomato juice, Puree and Ketchup - Specifications	2
	19	Banana - Nutritional Significance and Value-added Products	1
	20	Mushroom: Nutritional Significance and Processing	2
	21	Cassava: Syrup, Dextrose, Flour Processing	2
	22	Potato -Chips, French fries, Dried Potato Slices, Dehydrated Potato Products	2
V		**PRACTICALS**	**30**
		Determination of TSS	2
		Determination of acidity in Fruit juice	2
		Lye peeling	2
		Extraction of tomato pulp and preparation of tomato paste	3
		Home Canning of fruits and vegetables	2
		Preparation of Tomato Ketchup	3
		Preparation of Jam and Jelly	2
		Preparation of Squash	2
		Dehydration of Fruits & Vegetables	2
		Determination of Rehydration ratio	2

		Preparation of Wine	2
		Determination of sulphur dioxide	2
		Determination of salt content in Pickles	2
		Estimation of vitamin C	2

Mapping of COs with PSOs and POs :

	PSO 1	PSO 2	PSO 3	PSO4	PSO 5	PSO6	PO1	PO2	PO3	PO4	PO5	PO6
CO 1	1	-	2	-	1	-	2	-	2	3	-	-
CO 2	2	3	-	-	2	3	-	3	-	-	3	-
CO 3	-	-	1	-	-	-	1	-	1	-	-	1
CO 4	-	-	2	3	-	-	2	-	2	3	-	2
CO 5	-	1	-	-	-	1	-	1	-	-	1	-
CO 6	2	-	-	3	-	-	1	-	-	2	-	-

Correlation Levels:

Level	Correlation
-	Nil
1	Slightly / Low
2	Moderate / Medium
3	Substantial / High

Assessment Rubrics:

- Quiz / Assignment / Discussion / Seminar
- Midterm Exam
- Final Exam

Mapping of COs to Assessment Rubrics :

	Internal Exam	Assignment	Project Evaluation	End Semester Examinations
CO 1	✓			✓
CO 2	✓			✓
CO 3	✓			✓
CO 4		✓		✓
CO 5		✓		✓
CO 6			✓	✓

Course Title	Entrepreneurship Development				
Type of Course	**Major**				
Semester	5				
Academic Level	300				
Course Details	Credit	Lecture per week	Tutorial per week	Practical per week	Total Hours
	4	4	-	-	60

Course Outcomes (CO):

CO	CO Statement	Cognitive Level*	Knowledge Category#	Evaluation Tools used
CO1	Equip students with knowledge of Entrepreneurial terminologies.	U	C	• Quiz • Assignment • Discussion • Seminar • Midterm Exam • Final Exam
CO2	Provide knowledge about various Agencies supporting Entrepreneurial growth of the individual	C	F	
CO3	Apply knowledge of fundamental issues of women Entrepreneurship	Ap	P	
CO4	Understand the preparation and specification of projects for various business related to food sectors.	U	M	
CO5	Familiarize different aspects of food business supporters for Entrepreneurship development.	U	P	

* - Remember (R), Understand (U), Apply (AP), Analyse (An), Evaluate (E), Create (C)
# - Factual Knowledge(F) Conceptual Knowledge (C) Procedural Knowledge (P) Metacognitive Knowledge (M)

Detailed Syllabus:

Module	Unit	Content	Hrs
1	**Module I**		**12**
	1	Concept of entrepreneur, entrepreneurship and enterprise. Entrepreneurial characteristics, Distinction between an entrepreneur and a manager. Qualities of an entrepreneur.	3
	2	Agri & Food -entrepreneurship-concept, need and scope. Innovation and entrepreneurship, Risks involved with entrepreneurship.	3
	3	Women entrepreneurship- Role, importance & problems.	2
	4	Importance of planning, budgeting, monitoring, evaluation and follow up in running an enterprise	2
	5	Environmental analysis techniques and SWOC analysis	2
II	**Module II**		**12**
	6	Generation, incubation and commercialization of ideas and innovations	2
	7	Managing Competition in modern world and Entrepreneurship Development Programmes	3
	8	Meaning and characteristics of a project, Project Life cycle, Project Management and its need- Identification, feasibility study, selection, planning, evaluation and controlling	3

	9	Project appraisal & evaluation.	2
	10	Calculation of project cost and break-even analysis.	2
III	**Module III**		**10**
	11	Government schemes and incentives for promotion of Entrepreneurship & an understanding on industries promotional institutions	2
	12	Micro, Small& medium enterprises- classification, objectives	2
	13	Characteristics of MSME's, Advantages & disadvantages of MSME's	2
	14	DIC, KVIC, SIDBI, IDBI, NABARD, MOFPI, EDII	2
	15	KITCO, KFC, SIDCO, KCIDC & KINFRA	2
IV	**Module IV**		**14**
	16	Business ethics & social responsibility of an enterprise	1
	17	Venture capital, contract farming and joint ventures	2
	18	Public- Private partnership (PPP) and its relevancy	2
	19	Overview of food industry inputs: Characteristics of Indian food processing industries and export	2
	20	Marketing strategy in Food processing industry. marketing process, overview, advertising and promotion, distribution and supply chain management channels. Direct and online marketing	3
	21	E-commerce and social media Social Entrepreneurship – Concept	2
	22	Consumer buying behaviour, sales management and sales promotion. customer relations.	2
V	**In-Plant Training in Food Processing unit (10-15 days)**		**12**
	Detailed Project Report (DPR) Preparation for three major food sectors, FSSAI Registration and licencing procedures.		

Mapping of COs with PSOs and POs :

	PSO 1	PSO 2	PSO 3	PSO4	PSO 5	PSO6	PO1	PO2	PO3	PO4	PO5	PO6
CO 1	1	-	2	-	1	-	2	-	2	3	-	1
CO 2	2	3	-	1	2	3	-	3	-	-	3	-
CO 3	-	-	1	-	1	-	1	-	1	-	2	1
CO 4	1	-	2	3	-	-	2	-	2	3	-	2
CO 5	1	1	-	1	-	1	-	1	-	2	1	-

Correlation Levels:

Level	Correlation
-	Nil
1	Slightly / Low
2	Moderate / Medium
3	Substantial / High

Assessment Rubrics:

- Quiz / Assignment / Discussion / Seminar
- Midterm Exam
- Final Exam

Mapping of COs to Assessment Rubrics :

	Internal Exam	Assignment	Project Evaluation	End Semester Examinations
CO 1	✓			✓
CO 2	✓			✓
CO 3	✓			✓
CO 4		✓	✓	✓
CO 5	✓	✓	✓	✓

Course Title	DAIRY TECHNOLOGY				
Type of Course	**Major**				
Semester	6				
Academic Level	300				
Course Details	Credit	Lecture per week	Tutorial per week	Practical per week	Total Hours
	4	3	-	2	75

Course Outcomes (CO):

CO	CO Statement	Cognitive Level*	Knowledge Category#	Evaluation Tools used
CO1	Understand the composition and nutritive value of milk and milk products.	U	C	• Quiz • Assignment • Discussion • Seminar • Midterm Exam • Final Exam
CO2	Remember the importance of physics chemical properties of milk.	R	C	
CO3	Provide the Knowledge on importance of dairy processing technologies and equipment used.	U	C	
CO4	Understand knowledge on different types of market milk and fermented milk products	U	C	
CO5	Evaluate various technologies applied in dairy processing units.	E	C	
CO6	Apply and Evaluate quality and safety regulations and its updations in dairy units.	Ap	P	

* - Remember (R), Understand (U), Apply (Ap), Analyse (An), Evaluate (E), Create (C)
# - Factual Knowledge(F) Conceptual Knowledge (C) Procedural Knowledge (P) Metacognitive Knowledge (M)

Detailed Syllabus:

Module	Unit	Content	Hrs
I	**Introduction**		**12**
	1	Composition Of Milk (Sources, Factors Affecting Composition)	2
	2	Properties (Physical and chemical properties-Flavour, Colour, Acidity , Viscosity, Specific Gravity, Freezing Point, Boiling Point, Effect Of Heat, Enzymes, Acids and Alkali.)	3
	3	Types Of Milk -Buffalo, Cow, Goat, Sheep	2
	4	Types Of Milk -Mixed, Standardized, Full Cream, Recombined, Toned, Double Toned, Skimmed Milk	5
II	**Processing of milk**		**6**
	5	Processing	2
	6	Distribution	2

	7	Storage of liquid milk	2
III	**Dairy Products – Fermented and Non- fermented**		**20**
	8	Cream, Malai,	2
	9	Dahi Or Curd, Chana or Paneer	2
	10	Cheese, Yoghurt	3
	11	Dairy based desserts/ confections -Ice Cream, Frozen Desserts, Kulfi,	2
	12	Dried Ice Cream Mix/ Dried Frozen Dessert/ Confection, Milk Ice Or Milk Lolly	1
	13	Evaporated/ Condensed Milk, Milk Powder	2
	14	Infant Milk,	2
	15	Butter, Ghee & Milk Fats	3
	16	Chakka And Shrikhand	1
	17	**Dairy By- Products**- Whey Products and Edible Casein Products	2
IV	**Dairy Plant - Maintenance and Sanitation**		**7**
	18	Cleaning And Sanitation.	2
	19	CIP	1
	20	Maintenance	1
	21	Animal and Pest Control	1
	22	Drainage and Waste Management	2
V	**Open Ended Module:**		**30**
	1	Acidity of Milk & curd	2
	2	Fat content in Milk	2
	3	Determination of total solids, SNF and specific gravity of milk	2
	4	Determination of Total ash in milk	2
	5	Acidity of butter	2
	6	Moisture content of butter	2
	7	Salt content in butter	2
	8	Preparation of Khoa, Peda	2
	9	Moisture content in Ghee	2
	10	FFA of Ghee	2
	11	Adulteration in milk	10

Mapping of COs with PSOs and POs :

	PSO 1	PSO 2	PSO 3	PSO4	PSO 5	PSO6	PO1	PO2	PO3	PO4	PO5	PO6
CO 1	1	-	2	1	-	2	-	1	-	2	-	1
CO 2	2	3	-	2	3	1	-	-	3	-	-	2
CO 3	-	1	1	-	-	2	3	-	-	1	-	-
CO 4	2	-	2	1	-	2	-	1	-	-	1	1
CO 5	1	1	-	2	3	-	-	1	3	-	-	2
CO 6	-	2	-	2	1	1	-	2	-	1	-	1

Correlation Levels:

Level	Correlation
-	Nil
1	Slightly / Low
2	Moderate / Medium
3	Substantial / High

Assessment Rubrics:

- Quiz / Assignment/Discussion / Seminar
- Midterm Exam
- Final Exam

Mapping of COs to Assessment Rubrics :

	Internal Exam	Assignment	Project Evaluation	End Semester Examinations
CO 1	✓			✓
CO 2	✓			✓
CO 3	✓			✓
CO 4		✓		✓
CO 5		✓	✓	✓
CO 6		✓	✓	✓

Course Title	TECHNOLOGY OF ANIMAL FOOD				
Type of Course	**Major**				
Semester	6				
Academic Level	300				
Course Details	Credit	Lecture per week	Tutorial per week	Practical per week	Total Hours
	4	3	-	2	75

Course Outcomes (CO):

CO	CO Statement	Cognitive Level*	Knowledge Category#	Evaluation Tools used
CO1	Solid understanding the principles and practices involved in processing animal derived foods.	U	C	• Quiz • Assignment • Discussion • Seminar • Midterm Exam • Final Exam
CO2	Provide knowledge about various technologies used in the production, preservation and packaging of animal-based products such as meat, dairy and eggs	AP	C	
CO3	Apply knowledge of slaughtering methods, substantiate curing methods.	AP	P	
CO4	Equip students with knowledge of food safety and quality control measures to animal derived products	Ap	M	
CO5	To understand the concept of meat quality, composition, nutritive value and the principle factors influencing it and how to measure the major characteristics.	Ap	F	
CO 6	Create basic knowledge on recent trends in processing techniques of meat and poultry.	C	C	

* - Remember (R), Understand (U), Apply (Ap), Analyse (An), Evaluate (E), Create (C)
# - Factual Knowledge(F) Conceptual Knowledge (C) Procedural Knowledge (P) Metacognitive Knowledge (M)

Detailed Syllabus:

Module	Unit	Content	Hrs
I	**SLAUGHTER AND INSPECTION OF MEAT**		**18**
	1	Sources and importance of meat and poultry; Status of meat and poultry in India.	1
	2	Pre slaughtering operations and slaughtering operations for animals and poultry.	2
	3	Abattoir design and layout.	2
	4	Stunning – Types	2
	5	Humane method, Inspection of meat - Ante mortem and post mortem inspection. Post mortem changes	2

	6	Slaughter of sheep, pigs, poultry	1
	7	Structure of meat, Meat tenderness, meat emulsions, factors affecting tenderness of meat,	2
	8	Effect of cooking on texture, color and flavor, Properties and shelf life of meat.	2
	9	Mechanical deboning, grading and aging. Eating and cooking quality of meat	2
	10	Introduction to safety standards in meat industry: HACCP/ISO/MFPO/FSSAI/kosher/Halal	2
II	**PRESERVATION, PRODUCTS & BYPRODUCTS OF MEAT**		**12**
	11	Preservation of meat: Chilling, Freezing, Pickling, Cooking, Smoking, Dehydration, Radiation, Chemical and Biological preservatives.	3
	12	Cured meat: Role of ingredients, methods of curing, factors affecting quality of cured meat. Processing of Ham and Bacon.	4
	13	Sausage: Classification, ground sausage processing, casings.	2
	14	Meat byproducts- Rendering, feeds, Hides, skins, Hoofs, Horns.	2
	15	Meat speciation using DNA based molecular techniques	1
III	**EGG AND PRESERVATION METHODS**		**9**
	16	Structure, Composition, Quality characteristics, Grading, changes during storage.	2
	17	Egg quality- factors affecting egg quality. Measures of egg quality. effect of cooking, factors affecting coagulation. Industrial use of egg.	3
	18	Preservation of egg: Refrigeration, Freezing,	2
	19	Thermal processing, Dehydration, coating.	2
IV	**FISH AND FISH PRODUCTS**		**6**
	20	Composition and Nutritive Value, Spoilage Indices	2
	21	Preservation: Cold Storage, Freezing, Smoking, Pickling, Canning of Fish, Drying.	2
	22	Fish Products: Fish Protein Concentrate, Fish Oils- Body Oil, Liver Oil, Fish Meal, Fish Ensilage, Chitosan, Pearl Essence, Glue, Gelatine.	2
V		**PRACTICALS**	**30**
		Study of post mortem changes	2
		Pre-slaughter operations of meat animals and poultry birds.	2
		Slaughtering and dressing of meat animals.	2
		Meat cutting and handling	2
		Preservation of meat by pickling, freezing, curing	2
		Evaluation and quality and grading of eggs	2
		Preservation of shell eggs	2
		Preparation of value-added poultry meat products	2
		Value added egg products	4
		Spoilage indices of Fish	2
		Value added Meat & Fish products	6
		Evaluation of quality of fish	2
		Industrial visit to Meat/Fish/Egg processing unit / Abattoir	

Mapping of COs with PSOs and POs :

	PSO 1	PSO 2	PSO 3	PSO4	PSO 5	PSO6	PO1	PO2	PO3	PO4	PO5	PO6
CO 1	1	-	-	1	-	2	1	-	2	1	-	2
CO 2	2	3	-	2	3	-	2	3	1	2	3	-
CO 3	-	-	1	-	1	1	-	-	2	-	1	1
CO 4	1	-	2	2	1	-	2	1	-	2	-	2
CO 5	2	3	-	-	2	3	-	2	3	1	1	-
CO 6	-	1	-	3	-	1	1	-	-	1	-	2

Correlation Levels:

Level	Correlation
-	Nil
1	Slightly / Low
2	Moderate / Medium
3	Substantial / High

Assessment Rubrics:

- Quiz / Assignment/ Discussion / Seminar
- Midterm Exam
- Final Exam

Mapping of COs to Assessment Rubrics :

	Internal Exam	Assignment	Project Evaluation	End Semester Examinations
CO 1	✓			✓
CO 2	✓			✓
CO 3	✓			✓
CO 4		✓	✓	✓
CO 5	✓	✓		✓
CO 6			✓	✓

Course Title	Food Safety and Food Plant Layout				
Type of Course	**Major**				
Semester	6				
Academic Level	300				
Course Details	Credit	Lecture per week	Tutorial per week	Practical per week	Total Hours
	4	4	-	-	60

Course Outcomes (CO):

CO	CO Statement	Cognitive Level*	Knowledge Category#	Evaluation Tools used
CO1	Foundational understanding of food safety and equipped to identify potential hazard, prevent contamination and able to maintain a safe food environment.	U	C	• Quiz • Assignment • Discussion • Seminar • Midterm Exam • Final Exam
CO2	Identify and manage risk associated with food safety and compliance with regulations.	Ap	F	
CO3	Acquire skills to design, implement and maintain effective food safety programs and understanding the principles of risk assessment.	An	P	
CO4	Evaluate food safety practices and systems and possess the skill to access risk, corrective actions and monitoring. Implement and analyse food handling, hazard analysis, hygiene practices, HACCP implementation	E	M	
* - Remember (R), Understand (U), Apply (Ap), Analyse (An), Evaluate (E), Create (C) # - Factual Knowledge(F) Conceptual Knowledge (C) Procedural Knowledge (P) Metacognitive Knowledge (M)				

Detailed Syllabus:

Module	Unit	Content	Hrs
I	**Introduction to Food Safety**		**10**
	1	Definition and importance of food safety	2
	2	Key principles of food safety	2
	3	Role of government and regulatory agencies	2
	4	Personal Hygiene - Health Status & Illness & injury , Personal Cleanliness , Personal Behavior , Workwear &grooming	3
	5	Visitors control	1
II	**Food borne pathogens, allergens and intolerances**		**15**
	6	Food spoilage and food borne pathogens	3
	7	Factors influencing microbial growth in food	2

	8	Sources of microbial contamination in food	2
	9	Emerging and zoonotic foodborne pathogens	2
	10	Common food allergens.	2
	11	Management of food allergies in the food industry	2
	12	Food intolerances; lactose and gluten	2
III	**Food safety management system**		**12**
	13	ISO22000	2
	14	FSMS	2
	15	HACCP- Prerequisite	2
	16	HACCP-Implementation	2
	17	Documentation and record keeping in FSMS	2
	18	Training programme for staff.	2
IV	**Plant– Design , Facilities and layout**		**11**
	19	Location and Surroundings	2
	20	Building design, construction & layout	4
	21	Equipment design & installation	3
	22	Facilities/Utilities	2
V	Design and draw a building plan (Top view) for a small food processing unit Design Layout of food plants (Process and machineries) – Any two processing sectors		**12**

Mapping of COs with PSOs and POs :

	PSO1	PSO2	PSO3	PSO4	PSO 5	PSO6	PO1	PO2	PO3	PO4	PO5	PO6
CO 1	1	-	2	1	1	2	-	1	-	2	-	2
CO 2	2	3	-	2	2	1	-	-	3	-	-	1
CO 3	-	1	1	-	-	2	3	-	-	1	-	2
CO 4	2	-	2	1	2	2	-	1	-	-	1	2
CO 5	1	1	-	2	1	-	-	1	3	-	-	-

Correlation Levels:

Level	Correlation
-	Nil
1	Slightly / Low
2	Moderate / Medium
3	Substantial / High

Assessment Rubrics:

- Quiz / Assignment/ Discussion / Seminar
- Midterm Exam
- Final Exam

Mapping of COs to Assessment Rubrics :

	Internal Exam	Assignment	Project Evaluation	End Semester Examinations
CO 1	✓			✓
CO 2	✓			✓
CO 3	✓	✓		✓
CO 4	✓	✓	✓	✓
CO 5	✓			✓

Course Title	Food Microbiology II				
Type of Course	**Major**				
Semester	7				
Academic Level	400				
Course Details	Credit	Lecture per week	Tutorial per week	Practical per week	Total Hours
	4	3	-	2	75

Course Outcomes (CO):

CO	CO Statement	Cognitive Level*	Knowledge Category#	Evaluation Tools used
CO1	Define the basic concepts and terminology and recall the key characteristics of common foodborne pathogens.	R	C	• Quiz • Assignment • Discussion • Seminar • Midterm Exam • Final Exam
CO2	Summarize the stages of microbial food spoilage and its impact on food quality and to interpret the significance of microbial diversity in fermented foods.	U	P	
CO3	Apply microbiological testing methods for quality control in different food product.	Ap	M	
CO4	Analyze case studies of foodborne illness outbreaks to identify root causes.	An	F	• Quiz • Assignment • Discussion • Seminar • Midterm Exam • Final Exam
CO5	Evaluate the microbiological quality of food products using appropriate criteria thus assess the reliability and validity of different microbiological testing methods	E	C	

CO6	Apply various microbiological testing methods for food and water quality determination and to analyze and interpret microbial data to assess the microbiological quality of samples.	Ap	P	

* - Remember (R), Understand (U), Apply (Ap), Analyse (An), Evaluate (E), Create (C)

\# - Factual Knowledge(F) Conceptual Knowledge (C) Procedural Knowledge (P) Metacognitive Knowledge (M)

Detailed Syllabus:

Module	Unit	Content	Hrs
I.	**Microbial Contamination, Preservation and Spoilage of different foods**		**12**
	1.	Sources of Microorganisms in foods and some important food spoilage microorganisms	1
	2	Animal food Products- Dairy-sources, spoilage, MBRT	2
	3	Meat, Fish, Poultry and Egg-sources, spoilage preservation	3
	4	Plant Food Products- Fruits, Vegetables- sources, spoilage preservation	2
	5	Sugar and Spices Bakery, Salted foods, canned foods- sources, spoilage preservation	2
	6	Advanced techniques for microbial spoilage detection of foods- DNA biosensor, nano biosensor, smartphone-based biosensor, aptasensor, and DNA microarray-based methods	2
I1	**Food born illness and intoxication**		**12**
	7	Introduction-definition and difference -Food infection and intoxication	1
	8	Major food and water borne bacteria - *S.aureus, Pseudomonas, Clostridium, Bacillus, Vibrio, E.coli, Salmonella, Shigella,* Major food and water borne Viruses-Polio virus, Rotavirus, SARS, Coronavirus, Enterovirus	3
	9	Mycotoxins-common mycotoxin producing fungi, major mycotoxins	2
	10	Food borne parasites	1
	11	Sea food toxicants and poisoning by chemicals	2
	12	Prevention and investigation of food borne outbreaks 1. Safe Food Handling Practices	3

		2. Cooking and Storage Guidelines 3. Hygiene and Sanitation Measures	
IV	**BACTERIAL CYTOLOGY, METHODS OF MICROBIAL ANALYSIS**		**13**
	13	Bacterial genome structure and replication, Genetic recombination- Site specific and Homologous recombination	2
	14	Investigation of food and water borne disease, objective of investigation, personals involved in the investigation, materials and equipment required on field investigation.	1
	15	Direct microscopic examination of food, Detection of pathogens in food and their biochemical characterization. Aerobic plate count, ATP bioluminescence, Biochemical test Rapid methods for the detection of specific organisms and toxins in foods	3
	16	Common water born bacteria, indicator organism Routine bacteriological analysis of water. .SPC. Quantitative – membrane filter technique	2
	17	Tests for coliforms –Qualitative-detection of coliforms –MPN, presumptive test, confirmed test, completed test	2
	18	Detection of viral pathogen by real time PCR, Immuno assay, ELISA, and nucleic acid probes method.	3
IV	**Uses of microorganism as food**		8
	19	Single cell protein, algae as food, and mycoprotein from fungi for use as food and feed	2
	20	Mushroom cultivation, concept of probiotics, prebiotics and synbiotics,	2
	21	Fermented foods (Sauerkraut, Sausages, Bread, Soysauce, Idli, Tempeh, Dairy products -basic concepts of all briefly	3
	22	Different microbial enzymes in industry	1
V			**30**
		Preparation of nutrient media **Culture Methods** **Staining Techniques** **Microbiological examinations of food and utensils**: **Biochemical and microbiological test for water quality determination**	

Mapping of COs with PSOs and POs :

	PSO 1	PSO 2	PSO 3	PSO4	PSO5	PSO6	PO1	PO2	PO3	PO4	PO5	PO6
CO 1	1	-	2	1	1	-	2	1	-	2	-	1
CO 2	2	3	-	2	2	3	-	2	3	1	-	2
CO 3	-	1	1	-	-	1	1	-	-	2	3	-
CO 4	2	-	2	1	2	-	2	1	-	2	-	2
CO 5	1	1	-	2	1	1	-	2	3	-	-	1
CO 6	-	2	-	2	-	2	-	2	1	1	-	-

Correlation Levels:

Level	Correlation
-	Nil
1	Slightly / Low
2	Moderate / Medium
3	Substantial / High

Assessment Rubrics:

- Quiz / Assignment/ Discussion / Seminar
- Midterm Exam
- Final Exam

Mapping of COs to Assessment Rubrics:

	Internal Exam	Assignment	Project Evaluation	End Semester Examinations
CO 1	✓			✓
CO 2	✓			✓
CO 3	✓			✓
CO 4	✓	✓		✓
CO 5		✓		✓
CO 6			✓	✓

Course Title	FOOD ADDITIVES AND NEW PRODUCT DEVELOPMENT				
Type of Course	**Major**				
Semester	7				
Academic Level	400				
Course Details	Credit	Lecture per week	Tutorial per week	Practical per week	Total Hours
	4	4	-	-	60

Course Outcomes (CO):

CO	CO Statement	Cognitive Level*	Knowledge Category#	Evaluation Tools used
CO1	Build a strong foundation in food additives. Explore the history, classification and function in food additives, gaining insights into regulatory frameworks and safety considerations	U	F	▪ Quiz / Assignment/ Discussion / Seminar ▪ Midterm Exam ▪ Final Exam
CO2	Demonstrate proficiency in classifying food additives and evaluate technological processes in colorant production and understand synergies in flavour enhancers.	An	P	
CO3	Understand the principles of new product development, including ideation, feasibility, assessment and formulation.	U	M	
CO4	Explore market trends, industry collaborations and future directions in new product development.	U	C	
CO5	Apply knowledge gained in real-world scenarios through case studies and practical applications.	Ap	F	
CO6	Be able to present a new product	Ap	C	

* - Remember (R), Understand (U), Apply (Ap), Analyse (An), Evaluate (E), Create (C)
# - Factual Knowledge(F) Conceptual Knowledge (C) Procedural Knowledge (P) Metacognitive Knowledge (M)

Detailed Syllabus:

Module	Unit	Content	Hrs
I	**Foundations of Food Additives**		**10**
	1	Introduction to Food Additives and Role/scope.	2
	2	Classifications and Functions of Food Additives	2
	3	Regulatory Frameworks and Safety Standards	2
	4	Toxicology of Additives	2
	5	INS & E – Numbering System	2
II	**Types of Food Additives**		**13**
	6	Acidity regulators and preservatives	2

	7	Emulsifiers, stabilisers and Thickeners	1
	8	Anti-oxidants, anti-caking agents and Chelating agents	2
	9	Artificial Sweeteners	1
	10	Technology of Colorants: Role, Types, Regulations and Safety Considerations, Impact of Processing on Color stability and advanced concepts and future trends	3
	11	Technology of Flavour Enhancers: MSG, Nucleotides- mechanism, regulatory guidelines, formulation, taste and aroma, Advanced Concepts and Synergies.	3
III	**Fundamentals of New Product Development**		**12**
	12	Introduction to NPD	2
	13	Feasibility Assessment for New Products	2
	14	Steps in NPD	2
	15	Ingredient Selection and Formulation	2
	16	Prototyping, Pilot Production, Scaling up and Commercialisation	2
	17	Sensory Evaluation	2
IV	**Quality and Marketing of New Products**		**10**
	18	Packaging and labelling strategies	2
	19	Quality Control and Assurance	2
	20	Market Survey, Analysis and Consumer Insights	2
	21	Costing, Pricing and Marketing	2
	22	Timeline for NPD	2
V	**PRACTICAL**		**30**
		1. New Food product development (2 Products) **2.** Project on Robotics and automation in food manufacturing.	15 15

Mapping of COs with PSOs and POs :

	PSO 1	PSO 2	PSO 3	PSO4	PSO 5	PSO6	PO1	PO2	PO3	PO4	PO5	PO6
CO 1	1	1	-	2	1	1	-	2	1	1	-	2
CO 2	2	2	3	-	2	2	3	-	2	2	3	-
CO 3	-	-	1	1	-	-	1	1	-	-	1	1
CO 4	-	2	-	2	1	2	-	2	1	2	-	2
CO 5	-	1	1	1	-	2	1	1	-	1	1	-
CO 6	-	-	-	2	3	-	2	2	3	1	-	2

Correlation Levels:

Level	Correlation
-	Nil
1	Slightly / Low
2	Moderate / Medium
3	Substantial / High

Assessment Rubrics:

- Quiz / Assignment/ Discussion / Seminar
- Midterm Exam
- Final Exam

Mapping of COs to Assessment Rubrics :

	Internal Exam	Assignment	Project Evaluation	End Semester Examinations
CO 1	✓			✓
CO 2	✓			✓
CO 3	✓			✓
CO 4		✓	✓	✓
CO 5	✓	✓	✓	✓
CO 6			✓	✓

Course Title	Food Biochemistry and Food Biotechnology				
Type of Course	**Major**				
Semester	7				
Academic Level	400				
Course Details	Credit	Lecture per week	Tutorial per week	Practical per week	Total Hours
	4	3	-	2	75

Course Outcomes (CO):

CO	CO Statement	Cognitive Level*	Knowledge Category#	Evaluation Tools used
CO1	Understanding the principles of enzymes, their structure, function, and regulation in biochemistry or related fields	U	C	▪ Quiz / Assignment/ Discussion / Seminar ▪ Midterm Exam ▪ Final Exam
CO2	Understanding of the nutritional and biochemical aspects of carbohydrates, lipids, proteins, nucleic acids, vitamins, and minerals. Applying this knowledge to assess dietary needs, recognize deficiency conditions, and understand the metabolic processes involved in maintaining overall health and well-being.	Ap	P	
CO3	Understanding and applying R-DNA technologies. Skills in gene cloning and manipulation of genetic material. Knowledge of the molecular basis of mutations and the ability to perform site-directed mutagenesis and also Understanding the ethical considerations and potential applications of genetic engineering in the food industry.	Ap	P	
CO4	Understand the principles of microbial growth kinetics. Learn techniques for the isolation, preservation, and improvement of industrially important microorganisms. Familiarity with various types of fermentation processes and their applications. Gain practical knowledge of the	U	C	

	component parts of the fermentation process, including media formulation, sterilization, inoculum preparation, and product extraction		
CO5	Comprehend the components of the fermentation process and bioreactor types. Demonstrate understanding of the production industrial products. Develop the ability to troubleshoot and optimize downstream processes to improve yields and product purity.	Ap	P
CO6	Understanding of biochemical analysis techniques, cell culture, fermentation processes, and their applications in various industries.	Ap	P

* - Remember (R), Understand (U), Apply (Ap), Analyse (An), Evaluate (E), Create (C)
# - Factual Knowledge(F) Conceptual Knowledge (C) Procedural Knowledge (P) Metacognitive Knowledge (M)

Detailed Syllabus:

Module	Unit	Content	Hrs
I		**Enzymology**	**5**
	1	Introduction to Enzyme, Apoenzymes, holoenzymes, Coenzymes and Co-factors	1
	2	Nomenclature and Classification	1
	3	Enzyme inhibition	1
	4	Enzyme Substrate complex formation	1
	5	Immobilized Enzyme Technology - Methods of enzyme immobilization – Carrier binding, Cross linking and Entrapment, Advantages and disadvantages of immobilization	1
II		**Metabolism & Nutrition**	**15**
	6	**Carbohydrates**: Nutritional and Functional aspects of carbohydrates, Role of dietary fibre and action in the GI tract	2
	7	Digestion (digestive fluids and enzymes), and Absorption of carbohydrates, Glycolysis, Krebs cycle, Hexose monophosphate shunt, Gluconeogenesis.	2
	8	**Lipids**: Functions in the body, lipid metabolism, transport storage and mobilization of fat in the body and oxidation of fatty acid.	2
	9	Biosynthesis of fatty acids, fats, phospholipids and cholesterol	1
	10	**Proteins**: Nutritional aspects of proteins, Digestion (digestive fluids and enzymes), and Absorption.	2
	11	Protein metabolism, mechanism of amino-acid metabolism, deamination, transamination, decarboxylation and amino-acid oxidation, Intermediatory metabolism of amino-acids and urea cycle, Inborn errors in amino-acid metabolism	2

	12	**Nucleic Acids**: Nucleic acids, structure of DNA and RNA	2
	13	**Vitamins & Minerals**: Absorption and utilization of Vitamins and minerals	2
III		**R-DNA Technology**	**5**
	14	R-DNA Technology- Restriction enzymes, Modifying enzymes and Ligase	3
	15	Molecular basis of mutation and its application in Food industry	2
IV		**Fermentation process**	**20**
	16	**Introduction To Fermentation**-Preservation and Improvement of industrially important microorganisms, Types of fermentation processes, their advantages and disadvantages.	2
	17	Fermentation process- Formulation and sterilization of media, Inoculum preparation and development, Extraction and purification of product	2
	18	**Bioreactors For Microbial, Plant and Animal Cell Cultures-** Define bioreactors, the basic factors involved in fermentation design, general features of an ideal industrial fermentor, aeration and agitation, foaming	2
	19	Instrumentation and process control operations of bioreactors	2
	20	**Types of Bioreactors** - Types of Batch, fed batch and continuous bioreactors. Bioreactors using in Solid State Fermentation and in immobilization technology	2
	21	**Microbial Production of Substances for Food Applications** - Amino acids & SCP: L-Glutamic acid, L-Lysine SCP Production by Bacteria, Yeast, Fungi and Algae Enzymes: General Aspects of Enzyme production- Amylases, Amyloglucosidase, Proteases, Pectinases, Lipases Organic acids: Citric acid, Lactic acid, Itaconic acid, Acetic acid and Gluconic acid Food additives and Microbial Fat Polysaccharides: Xanthan, Pullulan, Dextran and Gellan Vitamins: B12, B2, C Mycoprotein, Baker's yeast, Ethanol Antibiotics- Penicillin, Streptomycin, Cephalosporin	6
	22	**Down Stream Processing of Biological Materials** - Removal of microbial cells and other solid matter, foam separation, centrifugation, precipitation, Cell disruption - physico-mechanical method and chemical method, liquid-liquid extraction, chromatography, membrane process, drying, crystallization	4
V		**Practicals, Case Study and Course Project**	**30**
	1	Estimation of glucose in blood	2
	2	Estimation of cholesterol level in blood.	2
	3	Estimation of protein content in food	2
	4	Estimation of total sugar in food.	2
	5	Separation of amino acids -Paper chromatography	2
	6	Estimation of Ascorbic Acid	2
	7	Estimation of calcium,	2
	8	Estimation of chloride	2
	9	Estimation of crude fibre in food	2
	10	Enzyme immobilisation-Yeast (Demonstration)	2
	11	Measurement of COD and BOD	2
	12	Preparation of fermented foods & drinks	8

Mapping of COs with PSOs and POs :

	PSO 1	PSO 2	PSO 3	PSO4	PSO 5	PSO6	PO1	PO2	PO3	PO4	PO5	PO6
CO 1	1	1	-	2	1	1	-	1	1	-	2	1
CO 2	2	2	3	-	2	2	3	2	2	3	-	2
CO 3	-	-	1	1	-	-	1	-	-	1	1	-
CO 4	1	1	-	2	1	2	-	-	2	-	2	1
CO 5	2	2	3	1	-	2	1	-	1	1	1	-
CO 6	-	-	1	2	3	-	2	-	-	-	2	3

Correlation Levels:

Level	Correlation
-	Nil
1	Slightly / Low
2	Moderate / Medium
3	Substantial / High

Assessment Rubrics:

- Quiz / Assignment/ Discussion / Seminar
- Midterm Exam
- Final Exam

Mapping of COs to Assessment Rubrics :

	Internal Exam	Assignment	Project Evaluation	End Semester Examinations
CO 1	✓			✓
CO 2	✓			✓
CO 3	✓	✓	✓	✓
CO 4		✓		✓
CO 5	✓	✓	✓	✓
CO 6			✓	✓

Course Title	Food Analysis				
Type of Course	**Major**				
Semester	7				
Academic Level	400				
Course Details	Credit	Lecture per week	Tutorial per week	Practical per week	Total Hours
	4	3	-	2	75

Course Outcomes (CO):

CO	CO Statement	Cognitive Level*	Knowledge Category#	Evaluation Tools used
CO1	Deep understanding of different analytical applications and equipments in food laboratories	U	F	• Quiz • Assignment • Discussion • Seminar • Midterm Exam • Final Exam
CO2	Provide students with knowledge and skills in quality testing of food materials	AP	P	
CO3	Thorough Understanding of FSSAI specified quality parameters on important foods and their analysis.	AP	M	
CO4	Demonstrate knowledge on physical, chemical and microbiological analysis of foods by performing various experiments.	Ap	C	
CO5	Equip individual to use the instruments and equipments in interpreting the quality of foods practically.	Ap	P	

* - Remember (R), Understand (U), Apply (Ap), Analyse (An), Evaluate (E), Create (C)
# - Factual Knowledge(F) Conceptual Knowledge (C) Procedural Knowledge (P) Metacognitive Knowledge (M)

Detailed Syllabus:

Module	Unit	Content	Hrs
I	1	Determination of reducing sugar, total reducing sugar in honey/ jaggery / sugar (Lane &Eynone Method).	**2**
	2	Determination of Fructose: glucose ratio in honey (Iodiometry).	**2**
	3	Determination of Gum Base Content in Bubble gum/ chewing gum/ Cocoa butter (soxhlet extraction method)	**2**
II	4	Detection and identification of synthetic food colours (Paper chromatographic method/ TLC)	**2**
	5	Determination of Fat content in cocoa butter	**2**

	6	Determination of acidity of extracted fat in cashewnuts / biscuts (Soxhlet extraction method)	**3**
	7	Estimation of crude fibre in fruits	**2**
III	8	Estimation of starch content in vegetables	**2**
	9	Estimation of Protein (Colorimetric method) content in food	**2**
	10	Estimation of invert sugar in Jaggery / Honey	**2**
	11	Test for chicory in coffee	**2**
	12	Determination of Peroxidase enzyme	**2**
	13	Rehydration ratio of dried foods	**2**
IV	14	Analysis Portable Water : Color-Visual Examination	**2**
	15	Water - sediments	**2**
	16	Acidity in water	**2**
	17	Alkalinity of water	**2**
	18	Hardness of water	**2**
	19	Chlorides in water	**2**
	20	Quality analysis of honey	**2**
	21	Detection of Food color in Jaggery	**2**
	22	Estimation of alcohol content in food	**2**
V	**Practicals**		**30**
		Analysis of Quality Parameters (FSSAI) of Foods	
		Analysis of Water	

Mapping of COs with PSOs and POs :

	PSO 1	PSO 2	PSO 3	PSO4	PSO 5	PSO6	PO1	PO2	PO3	PO4	PO5	PO6
CO 1	1	-	-	-	1	-	2	1	-	2	1	1
CO 2	2	3	-	-	2	3	-	2	3	-	2	2
CO 3	-	-	1	-	-	1	1	-	1	1	-	-
CO 4	-	-	2	3	2	-	2	2	-	2	1	2
CO 5	-	1	-	-	1	1	-	1	1	-	2	1

Correlation Levels:

Level	Correlation
-	Nil
1	Slightly / Low
2	Moderate / Medium
3	Substantial / High

Assessment Rubrics:

- Quiz / Assignment/ Discussion / Seminar
- Midterm Exam
- Final Exam

Mapping of COs to Assessment Rubrics :

	Internal Exam	Assignment	Project Evaluation	End Semester Examinations
CO 1	✓			✓
CO 2	✓			✓
CO 3	✓	✓		✓
CO 4	✓	✓		✓
CO 5		✓	✓	✓

Course Title	FOOD INDUSTRY MANAGEMENT AND AUDITING				
Type of Course	**Major**				
Semester	7				
Academic Level	400				
Course Details	Credit	Lecture per week	Tutorial per week	Practical per week	Total Hours
	4	3	-	2	75

Course Outcomes (CO):

CO	CO Statement	Cognitive Level*	Knowledge Category#	Evaluation Tools used
CO1	Build fundamental knowledge on total quality management and detailed knowledge of the role of Quality Management (QM) in modern management. To realize the significance of TQM especially in food industries and focus towards more on the same.	U	C	▪ Viva Voce Quiz / Assignment/ Discussion / Seminar ▪ Midterm Exam ▪ Final Exam
CO2	Demonstrate knowledge of quality management systems, their implementation and the practical steps needed for implementation. Demonstrate the ability to produce a quality manual. To build capability of preparing Quality management documents to get certifications.	Ap	P	
CO3	Have detailed knowledge of certification and accreditation. Knowledge and insight of different quality management systems i.e. product quality management, safety and environmental management.	Ap	P	
CO4	Build eco-friendly culture in current generation. Minimize all resource wastages and support growth of company.	U	C	
CO5	Provide an opportunity to learn food safety and quality auditing programme. Conduct quality auditing in the food industries.	Ap	P	
CO6	Conduct and evaluate risk assessments on food safety problems in food industries.	Ap	P	
* - Remember (R), Understand (U), Apply (Ap), Analyse (An), Evaluate (E), Create (C)				

- Factual Knowledge(F) Conceptual Knowledge (C) Procedural Knowledge (P) Metacognitive Knowledge (M)

Detailed Syllabus:

Module	Unit	Content	Hrs
I	**Total Quality Management and Food Safety Management System in Food Industry**		**15**
	1	Food Quality Assurance program, Quality Control, Quality evaluation.	3
	2	ISO 9000 series, ISO 14000:2018, ISO 17025:2005	4
	3	ISO 22000:2018 (Food Safety Management System),	3
	4	FSSC 22000 (Food Safety System Certification - PRP and FSSC additional requirements)	2
	5	HACCP System, GMP, GHP, SSOP, GLP.	3
II	**Food Business Management**		**10**
	6	Introduction, Theories and Functions,	1
	7	Food Industry management	2
	8	Marketing management	2
	9	Personal Management	1
	10	Human resource development	2
	11	Consumer behavior towards food consumption, Sectors in the food industry, and Scale of operations	2
III	**Product Pricing and Cost**		**12**
	12	Break even analysis	1
	13	Store Procedures	1
	14	Process costing	2
	15	Job costing	2
	16	Product costing	1
	17	Cost Factors in Fixation of Prices.	2
	18	Cost Control	2
	19	MSDS	1
IV	**Food Industry Audits**		**8**
	20	Audit. Types of Audits (Internal Audit, Certification Audit Regulatory Authority Audit/Inspection, Supplier Audit)	3
	21	Audit checklist	3
	22	Guidelines for Auditing Management System (ISO 19011:2018).	2
V	**mplementation of HACCP system in food industry.**		**30**
	1	**Case studies** 1. HACCP work sheet plan in a food industry 2. CCP decision tree preparation 3 Record keeping procedures Student-led research on Risk assessment and risk management. Presentation and discussion of findings. **Group Assignment:** Preparation of HACCP based SOP check list in different food industry (E.g., Personal hygiene, Cleaning and disinfection, Food Processing (Receiving, Storages, Preparation, Cooking, Cooling,	

		Reheating, Hot and cold holding, Serving, Delivery), Pest Control, Equipment Checks, etc.)	

Mapping of COs with PSOs and POs :

	PSO 1	PSO 2	PSO 3	PSO4	PSO 5	PSO6	PO1	PO2	PO3	PO4	PO5	PO6
CO 1	1	2	2	3	2	1	1	1	-	2	1	1
CO 2	2	-	-	1	-	2	2	2	3	-	2	2
CO 3	-	1	1	-	1	1	-	-	1	1	-	-
CO 4	2	2	2	3	2	2	1	1	-	2	1	2
CO 5	-	2	2	3	1	-	2	2	3	1	-	2
CO 6	-	-	-	3	-	-						

Correlation Levels:

Level	Correlation
-	Nil
1	Slightly / Low
2	Moderate / Medium
3	Substantial / High

Assessment Rubrics:

- Quiz / Assignment/ Discussion / Seminar
- Midterm Exam
- Final Exam

Mapping of COs to Assessment Rubrics :

	Internal Exam	Assignment	Project Evaluation	End Semester Examinations
CO 1	✓			✓
CO 2	✓			✓
CO 3	✓			✓
CO 4		✓	✓	✓
CO 5	✓	✓		✓
CO 6			✓	✓

Course Title	FOOD PROCESS ENGINEERING AND EQUIPMENTS				
Type of Course	**Major**				
Semester	8				
Academic Level	400				
Course Details	Credit	Lecture per week	Tutorial per week	Practical per week	Total Hours
	4	3	-	2	75

Course Outcomes (CO):

CO	CO Statement	Cognitive Level*	Knowledge Category#	Evaluation Tools used
CO1	Deep understanding of different thermal operations, their applications, equipments used and ability to apply this knowledge in various contexts.	U	F	▪ Quiz / Assignment/Discussion / Seminar ▪ Midterm Exam ▪ Final Exam
CO2	Provide students with knowledge and skills related to low temperature operations. Practical skills in implementing and optimizing low temperature applications	AP	C	
CO3	Thorough Understanding of different non-thermal engineering operations in food industry. It will enhance their basic knowledge with advanced novel techniques	AP	P	
CO4	Demonstrate knowledge of innovative filtration and separation methods in food industry. Equip the students to handle novel technologies in food industry	Ap	M	
CO5	Equip individual to use the artificial intelligence and other digital systems to reduce the load and improve the efficiency and accuracy of work	Ap	P	

* - Remember (R), Understand (U), Apply (Ap), Analyse (An), Evaluate (E), Create (C) # - Factual Knowledge(F) Conceptual Knowledge (C) Procedural Knowledge (P) Metacognitive Knowledge (M)

Detailed Syllabus:

Module	Unit	Content	Hrs
I	**THERMAL OPERATIONS**		**20**
	1	**Pasteurization** – Types, Equipments used, Advantages and Application	2
	2	**Sterilization** - methods of sterilization, equipments and Applications	3
	3	**Evaporation:** Properties of liquids, heat and. mass balance in single effect and multiple effect evaporator, aroma recovery, equipments and applications	4
	4	**Drying:** Rates, equipments for solid, liquid and semi-solid material and their applications	6
	5	**Extrusion:** Theory, equipments, applications.	3
	6	Trends in thermal processing	2
II	**LOW TEMPERATURE TECHNIQUES**		**10**
	7	**Refrigeration and Chilling -** Refrigeration cycles, components of vapour compression refrigeration system, different refrigeration systems for ultra-low refrigeration.	3
	8	**Freezing:** Freezing curves, freezing time calculations, equipments, Freezing point depression, freezing point curves, phase diagrams, Ice crystal formation, Enthalpy change during freezing, Plank's equation rate of freezing; Cryogenic freezing and IQF	6
	9	**Thawing:** Principle, effects on food, changes during thawing, types	1
III	**NON-THERMAL OPERATIONS**		**12**
	10	**Microwave** – Mechanism, Applications and Advantages	2
	11	**Irradiation** – Source, Mechanism, Applications	2
	12	**Ultrasonic processing**- Properties of ultrasonic, equipment, application	2
	13	**Dielectric and Ohmic heating**	2
	14	**Pulsed electric field** – Concept, Mechanism and Applications	2
	15	**Hydrostatic pressure technique** – Theory, Equipment design, Mechanism and Applications, Advantages	2
IV	**MEMBRANE TECHNOLOGY**		**16**
	16	Introduction to pressure activated membrane processes	2
	17	Types of membrane and configuration	2
	18	Membrane Processes: Micro- filtration, UF, NF, RO	4
	19	Electro-dialysis and their industrial applications in Food Industry.	2
	20	Supercritical fluid extraction.	1

	21	**Separation**: Mechanical filtration, membrane separation, principles, equipments and applications	3
	22	Centrifugation, principles, equipments and applications	2
V	**PRACTICALS**		**30**
		1) Determination of volume and density of fruits or vegetable by platform scale method 2) Determination of surface area of fruit or vegetable 3) Determination of bulk density, true density and porosity 4) Determination of angle of repose of grain 5) Determination of average size of particle in ground food grains by sieve analysis or screen analysis 6) Determination of physical properties of grain 7) Determination of roundness and sphericity of grains 8) Draw the drying characteristics of biological materials using cabinet dryer **DRAWING:** 1) Geometrical constructions 2) Projection of points 3) Projection of straight line 4) Projection of solids 5) Development of surfaces 6) Section of solids 7) Plan and elevation (Food processing unit)	

Mapping of COs with PSOs and POs :

	PSO 1	PSO 2	PSO 3	PSO4	PSO 5	PSO6	PO1	PO2	PO3	PO4	PO5	PO6
CO 1	1	1	-	2	1	1	-	1	1	-	2	1
CO 2	2	2	3	-	2	2	3	2	2	3	-	2
CO 3	-	-	1	1	-	-	1	-	-	1	1	-
CO 4	1	1	-	2	1	2	-	-	2	-	2	1
CO 5	2	2	3	1	-	2	1	-	1	1	1	2

Correlation Levels:

Level	Correlation
-	Nil
1	Slightly / Low
2	Moderate / Medium
3	Substantial / High

Assessment Rubrics:

- Quiz / Assignment/Discussion / Seminar
- Midterm Exam
- Final Exam

Mapping of COs to Assessment Rubrics :

	Internal Exam	Assignment	Project Evaluation	End Semester Examinations
CO 1	✓			✓
CO 2	✓			✓
CO 3	✓			✓
CO 4	✓	✓		✓
CO 5	✓	✓		✓
CO 6			✓	✓

Course Title	Techniques in Food Analysis				
Type of Course	**Major**				
Semester	8				
Academic Level	400				
Course Details	Credit	Lecture per week	Tutorial per week	Practical per week	Total Hours
	4	4	-	-	60

Course Outcomes (CO):

CO	CO Statement	Cognitive Level*	Knowledge Category#	Evaluation Tools used
CO1	Deep understanding of different analytical applications and equipments in food laboratories	U	C	▪ Quiz / Assignment/ Discussion / Seminar ▪ Midterm Exam ▪ Final Exam
CO2	Provide students with knowledge and skills in quality testing of food materials	Ap	P	
CO3	Thorough Understanding of FSSAI specified quality parameters on important foods and their analysis.	Ap	P	
CO4	Demonstrate knowledge on physical, chemical and microbiological analysis of foods by performing various experiments.	E	M	
CO5	Equip individual to use the instruments and equipments in interpreting the quality of foods practically.	Ap	P	

* - Remember (R), Understand (U), Apply (Ap), Analyse (An), Evaluate (E), Create (C)
# - Factual Knowledge(F) Conceptual Knowledge (C) Procedural Knowledge (P) Metacognitive Knowledge (M)

Detailed Syllabus:

Module	Unit	Content	Hrs
I	**Fundamentals of Instrumental Food Analysis**		**13**
	1	Basics of Spectroscopic methods in food analysis – Vis, UV-Vis spectroscopy	3
	2	Basics and types of chromatographic techniques – paper, TLC	3

	3	Basics in Separation techniques – Sedimentation, ultrafiltration, centrifugation	3
	4	Basics and types of Extraction techniques – solid-solid, solid-liquid, solvent extraction, Soxhlet extraction, heat treatment, maceration, cold pressing	4
II	**Spectroscopic Techniques**		**14**
	5	Infra Red Spectroscopy	2
	6	Near-infrared (NIR) Spectroscopy	2
	7	Nuclear Magnetic Resonance Spectroscopy	2
	8	Fourier Transform Infrared (FTIR) Spectroscopy	2
	9	Atomic Absorption Spectroscopy	2
	10	Inductively coupled plasma mass spectrometry (ICP-MS)	2
	11	ICP-OES (Inductively coupled plasma - optical emission spectrometry)	2
III	**Chromatographic Techniques**		**12**
	12	Gas Chromatography	2
	13	Ion Chomatography	2
	14	Super Critical Fluid Chromatography	2
	15	High Performance Liquid Chromatography	2
	16	GC MSMS	2
	17	LC MSMS	2
IV	**Separation & Extraction Techniques**		**9**
	18	Electrophoresis	1
	19	Dialysis	2
	20	Micro-extraction	2
	21	Supercritical Fluid Extraction	2
	22	Ultrasound-Assisted Extraction	2
V			**12**
		A visit to Food Analytical Laboratory / Food Industry Lab/ Food processing unit	12

Mapping of COs with PSOs and POs :

	PSO 1	PSO 2	PSO 3	PSO4	PS O5	PSO 6	PO1	PO2	PO3	PO4	PO5	PO6
CO 1	1	1	-	2	1	1	-	1	1	-	1	-
CO 2	2	2	3	-	2	2	3	2	2	3	2	3
CO 3	1	-	1	1	-	1	-	2	1	1	-	1
CO 4	2	3	-	2	1	2	3	-	2	-	1	-
CO 5	-	1	-	2	1	-	1	1	-	-	1	-

Correlation Levels:

Level	Correlation
-	Nil
1	Slightly / Low
2	Moderate / Medium
3	Substantial / High

Assessment Rubrics:

- Quiz / Assignment/ Discussion / Seminar
- Midterm Exam
- Final Exam

Mapping of COs to Assessment Rubrics :

	Internal Exam	Assignment	Project Evaluation	End Semester Examinations
CO 1	✓		✓	✓
CO 2	✓			✓
CO 3	✓		✓	✓
CO 4	✓	✓	✓	✓
CO 5	✓	✓		✓

Course Title	Food Storage and Infestation control				
Type of Course	**Major**				
Semester	8				
Academic Level	400				
Course Details	Credit	Lecture per week	Tutorial per week	Practical per week	Total Hours
	4	4	-	-	60

Course Outcomes (CO):

CO	CO Statement	Cognitive Level*	Knowledge Category#	Evaluation Tools used
CO1	Understand the fundamental principles of food storage and recognize the diverse types of pests that can impact the integrity of stored food products.	U	C	▪ Quiz / Assignment/ Discussion / Seminar ▪ Midterm Exam ▪ Final Exam
CO2	Apply knowledge of the biology and behavior of common storage pests to implement effective monitoring and inspection techniques.	Ap	P	
CO3	Demonstrate proficiency in the identification and classification of pests, enabling timely response to potential infestations.	Ap	P	
CO4	Develop and implement preventive and control measures, utilizing integrated pest management (IPM) strategies to ensure food storage facilities meet regulatory standards	E	M	
CO5	Establish a comprehensive understanding of sanitation practices, emphasizing the importance of maintaining a clean and safe environment to prevent pest infestation.	Ap	P	
CO6	Evaluate and adhere to relevant regulations and compliance standards, ensuring the successful implementation of pest control measures in food storage premises.	Ap	P	

* - Remember (R), Understand (U), Apply (Ap), Analyse (An), Evaluate (E), Create (C)
# - Factual Knowledge(F) Conceptual Knowledge (C) Procedural Knowledge (P) Metacognitive Knowledge (M)

Detailed Syllabus:

Module	Unit	Content	Hrs
I	**MODULE I**		**10**
	1	Types of damage & spoilages on stored foods	2
	2	Microbial spoilage, Enzymatic spoilage, spoilage by insect, parasites & rodents, mechanical spoilage, chemical spoilage, physical damage.	4
	3	Factors affecting the storage commodity	2
	4	Sources of infestation-cross, horizontal, vertical, latent infestation.	2
II	**MODULE II**		**20**
	5	Food storage-Significance	2
	6	Issues and problems in food storage	2
	7	Common stored grain pests	2
	8	Classification of common stored grain pests	2
	9	Identification of major insect pests in stored grains	3
	10	Pesticides-classification	2
	11	Tools and Techniques in pesticide application	2
	12	Safety measures in pesticide application	3
	13	Advantages and Disadvantages of pesticide applications	2
III	**MODULE III**		**10**
	14	Importance of regular inspection	2
	15	Rodent, other Vertebrate & non Vertebrate-Types,	2
	16	Damage, detection, sources, control measures	2
	17	Physical, chemical, biological and cultural control methods of Rodent, other Vertebrate pests	2
	18	Integrated pest management (IPM)	2
IV	**MODULE IV**		**8**
	19	FSSAI Guidelines for GMP -food grain storage	2
	20	Pest control documentation	2
	21	Auditing and certification process	2
	22	Layout of a ware house, food corporations of India (FCI) godowns,	2

V	**1. Identification of important stored grain pest 2. Fumigation**		**12**

Mapping of COs with PSOs and POs :

	PSO 1	PSO 2	PSO 3	PSO4	PS O5	PSO 6	PO1	PO2	PO3	PO4	PO5	PO6
CO 1	1	-	2	1	1	-	1	1	-	1	-	2
CO 2	2	3	-	2	2	3	2	2	3	2	3	-
CO 3	-	1	1	-	1	-	2	1	1	-	1	1
CO 4	3	-	2	1	2	3	-	2	-	3	-	2
CO 5	1	-	2	1	-	1	1	-	-	1	-	2
CO 6	1	-	2	1	1	-	1	1	-	1	-	2

Correlation Levels:

Level	Correlation
-	Nil
1	Slightly / Low
2	Moderate / Medium
3	Substantial / High

Assessment Rubrics:

- Quiz / Assignment/ Discussion / Seminar
- Midterm Exam
- Final Exam

Mapping of Cos to Assessment Rubrics :

	Internal Exam	Assignment	Project Evaluation	End Semester Examinations
CO 1	✓			✓
CO 2	✓		✓	✓
CO 3	✓			✓
CO 4		✓	✓	✓
CO 5	✓	✓		✓
CO 6				✓

Course Title	Research Methodology in Food Technology				
Type of Course	**Major**				
Semester	8				
Academic Level	400				
Course Details	Credit	Lecture per week	Tutorial per week	Practical per week	Total Hours
	4	4	-	-	60

Course Outcomes (CO):

CO	CO Statement	Cognitive Level*	Knowledge Category#	Evaluation Tools used
CO1	Develop proficiency in articulating and formulating well-defined research problems with explicit objectives, incorporating crucial elements such as research design, hypothesis construction, error analysis, and variable classification. Acquire mastery in employing effective organizational techniques while cultivating critical thinking and analytical skills.	U	F	▪ Quiz / Assignment/Discussion / Seminar ▪ Midterm Exam ▪ Final Exam
CO2	Empower students with a solid foundation in data collection and analysis, enabling them to approach complex problems with a systematic and statistically sound methodology.	Ap	C	
CO3	Equip with the essential skills to produce high-quality research documents effectively communicate the findings and formulate proposals for acquiring grants.	Ap	M	

CO4	Cultivate an understanding of the ethical aspects involved in scholarly publishing, including plagiarism, proper citation practices, and understanding the profound respect for intellectual property rights.	U	P
CO5	Utilizing reference management software such as Zotero and Mendeley to efficiently organize and cite sources in academic research and demonstrating effective communication of ideas, potentially leading to successful publication	C	F
* - Remember (R), Understand (U), Apply (Ap), Analyse (An), Evaluate (E), Create (C) # - Factual Knowledge(F) Conceptual Knowledge (C) Procedural Knowledge (P) Metacognitive Knowledge (M)			

Detailed Syllabus:

Module	Unit	Content	Hrs
I	**Introduction to research methodology**		**16**
	1	Importance of food research	1
	2	Types of food research	2
	3	Research process and its components	2
	4	Research problem- Characteristics of a good research problem, its formulation and objectives	2
	5	Research design -Features – Inductive, Deductive and Development of models	2
	6	Research Hypothesis, Errors, Variables – Function, Significance and types. Development of Working Hypothesis, Null hypothesis	4
	7	Review of Literature – Importance, Organizing, Sources.	3
II	**Data Collection and Analysis**		**15**
	8	Types and methods of data collection	2
	9	Sampling methods	2

	10	Hypothesis testing.	2
	11	Data processing and analysis with statistical tools like mean, median, mode and presenting data graphically.	2
	12	Coefficient of variation, Correlation and Regression Analysis.	3
	13	Chi-square test, F test, t test, z test, ANOVA one way and two way	4
III	**Scientific writing**		**10**
	14	Structure and components of Scientific Reports, Types of Report, Technical Reports and Thesis, Significance, Different steps in the preparation	2
	15	Structure of an abstract and keywords. Design of paper using TEMPLATE, Calculations of Impact factor of a journal, citation Index, ISBN & ISSN.	1
	16	Referencing styles and bibliography	1
	17	Types of presentations	2
	18	Framing proposals for acquiring grants and its budgeting	2
	19	Major funding agencies and pilot study in food research	2
IV	**Ethics in Research**		**7**
	20	Ethical Committees	1
	21	Copy right, Trademark, Intellectual Property rights. Patents	3
	22	Ethical issues related to publishing, Plagiarism, Citation and Acknowledgement	3
V	**Open Ended Module: Research Methodology in Food Technology**		**12**
		SPSS	
		Paper publication	

Mapping of COs with PSOs and POs :

	PSO 1	PSO 2	PSO 3	PSO4	PSO 5	PSO6	PO1	PO2	PO3	PO4	PO5	PO6
CO 1	1	1	-	2	1	1	-	1	1	-	1	1
CO 2	2	2	3	-	2	2	3	2	2	3	2	2
CO 3	1	-	1	1	-	1	-	2	1	1	-	1
CO 4	2	3	-	2	1	2	3	-	2	-	1	2
CO 5	1	-	1	-	2	1	1	1	-	1	-	2

Correlation Levels:

Level	Correlation
-	Nil
1	Slightly / Low
2	Moderate / Medium
3	Substantial / High

Assessment Rubrics:

- Quiz / Assignment/Discussion / Seminar
- Midterm Exam
- Final Exam

Mapping of COs to Assessment Rubrics :

	Internal Exam	Assignment	Project Evaluation	End Semester Examinations
CO 1	✓			✓
CO 2	✓		✓	✓
CO 3	✓		✓	✓
CO 4		✓		✓
CO 5	✓	✓		✓

Course Title	FOOD PRODUCTS STANDARDS.				
Type of Course	**Elective**				
Semester	5				
Academic Level	300				
Course Details	Credit	Lecture per week	Tutorial per week	Practical per week	Total Hours
	4	4	-	-	60

Course Outcomes (CO):

CO	CO Statement	Cognitive Level*	Knowledge Category#	Evaluation Tools used
CO1	Develop essential knowledge of FSSAI and Indian food legislation, as well as food-related organizations.	U	C	• Quiz • Assignment • Discussion • Seminar • Midterm Exam • Final Exam
CO2	Help understand the numerous food regulations of Indian food laws.	Ap	P	
CO3	Gain in-depth understanding of international food regulatory authorities.	Ap	P	
CO4	Awareness of laws related to marketing and patents.	U	C	
CO5	Gain an understanding of updates and amendments related to food laws	Ap	P	

* - Remember (R), Understand (U), Apply (Ap), Analyse (An), Evaluate (E), Create (C)
# - Factual Knowledge(F) Conceptual Knowledge (C) Procedural Knowledge (P) Metacognitive Knowledge (M)

Detailed Syllabus:

Module	Unit	Content	Hrs
I	**Product Standards**		**15**
	1	Food Safety and Standards (Food Products Standards And Food Additives) Regulations, 2011	3
	2	Milk & Boiled Milk	3
	3	Mixed Milk & Standardized Milk	3
	4	Food Grains- Wheat & Rice	3
	5	Colouring Matter- colours and common names	3
II	**Health Supplements and Proprietary Food**		**15**
	6	Health Supplements	2
	7	Proprietary Food	2
	8	INS Numbering of Food Additives	2
	9	Food Recall Procedure) Regulation, 2017	1

	10	Import Regulation, 2017	2
	11	Fortification of Food Regulation 2018	1
	12	Advertising and Claims Regulation- 2018,	1
	13	Food Safety and Standards (Packaging) Regulation, 2018	2
	14	Vegan Foods Regulations 2022, Vegan and Organic Food	2
III	**Regulatory Bodies**		**10**
	15	ISO, FAO, WHO, WTO.CODEX Alimentarious Commission	3
	16	Advisory mechanisms: JECFA, JEMRA, JMPR	2
	17	GCC Food laws	2
	18	USFDA ,EPA Regulations and European Union food regulation	1
	19	Export Regulations and Export promotion bodies	2
IV	**Registration, Licensing and Patent**		**8**
	20	FSSAI Registration and licensing	2
	21	National and international patent	3
	22	Copyright. Terms of patents, Trademark	3
V	**Open Ended Module: FSSAI Updations and Initiatives**		**12**
	1	**Case studies** 1- Latest Amendments of FSSAI rules and regulations 2 - Various initiatives of FSSAI (e.g. Eat Right India, Food Fortification, Clean Street Food Hub, Hygienic rating)	12

Mapping of COs with PSOs and POs :

	PSO 1	PSO 2	PSO 3	PSO4	PSO 5	PSO6	PO1	PO2	PO3	PO4	PO5	PO6
CO 1	1	1	-	2	1	1	-	1	1	1	-	2
CO 2	2	2	3	-	2	2	3	2	2	2	3	-
CO 3	-	-	1	1	-	1	-	2	1	-	-	1
CO 4	1	3	-	2	1	2	3	-	2	-	-	2
CO 5	2	-	1	-	2	1	1	1	-	1	-	-

Correlation Levels:

Level	Correlation
-	Nil
1	Slightly / Low
2	Moderate / Medium
3	Substantial / High

Assessment Rubrics:

- Quiz / Assignment/ Discussion / Seminar
- Midterm Exam
- Programming Assignments
- Final Exam

Mapping of COs to Assessment Rubrics :

	Internal Exam	Assignment	Project Evaluation	End Semester Examinations
CO 1	✓			✓
CO 2	✓		✓	✓
CO 3	✓	✓		✓
CO 4		✓	✓	✓
CO 5		✓		✓

Course Title	FOOD PLANT OPERATIONS AND MANAGEMENT				
Type of Course	**Elective**				
Semester	5				
Academic Level	300				
Course Details	Credit	Lecture per week	Tutorial per week	Practical per week	Total Hours
	4	4	-	-	60

Course Outcomes (CO):

CO	CO Statement	Cognitive Level*	Knowledge Category#	Evaluation Tools used
CO1	Develop essential knowledge of FSSAI and Indian food legislation, as well as food-related organizations.	U	C	• Quiz • Assignment • Discussion • Seminar • Midterm Exam • Final Exam
CO2	Help understand the numerous food regulations of Indian food laws.	Ap	P	
CO3	Gain in-depth understanding of international food regulatory authorities.	Ap	P	
CO4	Awareness of laws related to marketing and patents.	U	C	
CO5	Gain an understanding of updates and amendments related to food laws	Ap	P	

* - Remember (R), Understand (U), Apply (Ap), Analyse (An), Evaluate (E), Create (C)
# - Factual Knowledge(F) Conceptual Knowledge (C) Procedural Knowledge (P) Metacognitive Knowledge (M)

Detailed Syllabus:

Module	Unit	Content	Hrs
I	**UNIT -I**		**12**
	1	Scope for Food Business	2
	2	Consumer market and product survey	3
	3	Location and layout of food plants – Selection Factors, Regulatory requirements of food industries.	4
	4	Selection of Machineries and raw materials.	3
II	**UNIT -II**		**10**
	5	Forms of business organization – sole proprietorship – partnership	3
	6	Private and public limited	2
	7	Cooperative unit	2
	8	Small Farmers Agri Business Consortium, Farmers Producer Company	**3**
IV	**UNIT -III**		**14**
	9	FBO (Food Business Operator)	2

	10	SWOC Analysis of Food Industry	3
	11	Estimation of Cost of production	2
	12	Break-even Analysis	2
	13	Supply chain Management in Food Industries	3
	14	Online Marketing	2
	15	Direct Marketing	
III	**UNIT -IV**		**12**
	16	Food Plant Operations - Role of management in planning, organising and controlling	3
	17	Purchase Department	2
	18	Production Department, Quality Assurance / Control	3
	19	Sales	1
	20	Distribution and Marketing	1
	21	Production Schedule	1
	22	Staffing	1
V	**Open Ended Module**		**12**
		Food Business and SWOC Analysis	

Mapping of COs with PSOs and POs :

	PSO 1	PSO 2	PSO 3	PSO4	PSO 5	PSO6	PO1	PO2	PO3	PO4	PO5	PO6
CO 1	1	-	1	-	2	1	1	-	1	1	-	2
CO 2	2	3	2	3	-	2	2	3	2	2	3	-
CO 3	-	-	-	1	1	-	1	-	2	-	-	1
CO 4	1	-	3	-	2	1	2	3	-	-	-	2
CO 5	2	1	-	1	-	2	1	1	1	1	-	-

Correlation Levels:

Level	Correlation
-	Nil
1	Slightly / Low
2	Moderate / Medium
3	Substantial / High

Assessment Rubrics:

- Quiz / Assignment/ Discussion / Seminar
- Midterm Exam
- Programming Assignments
- Final Exam

Mapping of COs to Assessment Rubrics :

	Internal Exam	Assignment	Project Evaluation	End Semester Examinations
CO 1	✓			✓
CO 2	✓			✓
CO 3	✓			✓
CO 4		✓		✓
CO 5		✓	✓	✓

Course Title	FOOD SAMPLING AND INSPECTION				
Type of Course	**Elective**				
Semester	6				
Academic Level	300				
Course Details	Credit	Lecture per week	Tutorial per week	Practical per week	Total Hours
	4	4	-	-	60

Course Outcomes (CO):

CO	CO Statement	Cognitive Level*	Knowledge Category#	Evaluation Tools used
CO1	Develop essential knowledge of FSSAI and Indian food legislation, as well as food-related organizations.	U	C	• Quiz • Assignment • Discussion • Seminar • Midterm Exam • Final Exam
CO2	Help understand the numerous food regulations of Indian food laws.	Ap	P	
CO3	Gain in-depth understanding of international food regulatory authorities.	Ap	P	
CO4	Awareness of laws related to marketing and patents.	U	C	
CO5	Gain an understanding of updates and amendments related to food laws	Ap	P	

* - Remember (R), Understand (U), Apply (Ap), Analyse (An), Evaluate (E), Create (C)
# - Factual Knowledge(F) Conceptual Knowledge (C) Procedural Knowledge (P) Metacognitive Knowledge (M)

Detailed Syllabus:

Module	Unit	Content	Hrs
I	**CHAPTER 1**		**10**
	1	Objective and Types of sampling	2
	2	Circumstances for Drawing Sample	2
	3	Procedure for taking samples for analysis	2
	4	Sample Size	2
	5	Statistical design for sampling	2
II	**CHAPTER 2**		**12**
	6	Types of sampling plans	2
	7	Two & Three class attributes plan for microbial assessment	2
	8	Suitable container	2
	9	Documentation	2
	10	Analysis of food samples by Food Analyst	2

	11	Food Laboratories, Function and Indian Food Laboratory Network	2
III	**CHAPTER 3**		**13**
	12	Inspection in Food Establishments	3
	13	Code of Ethics, Type of Inspections	2
	14	Procedure of Inspection, Documents to be Inspected	3
	15	Risk based Inspection System (RBIS), Product Risk Ranking	2
	16	Food Safety Compliance through regular inspections and sampling	3
IV	**CHAPTER 4**		**13**
	17	General Manufacturing	2
	18	Milk and Milk Product Processing	3
	19	Catering	2
	20	Meat Processing and Slaughter house	2
	21	Storage & Warehouses	2
	22	Transport and Retail	2
V			**12**
	1	Documentation – Food sampling and inspection	12

Mapping of COs with PSOs and POs :

	PSO 1	PSO 2	PSO 3	PSO4	PSO 5	PSO6	PO1	PO2	PO3	PO4	PO5	PO6
CO 1	1	1	-	2	1	1	-	1	1	-	1	1
CO 2	2	2	3	-	2	2	3	2	2	3	2	2
CO 3	-	-	1	1	-	1	-	2	1	1	-	-
CO 4	1	3	-	2	1	2	3	-	2	-	1	3
CO 5	2	-	1	-	2	1	1	1	-	1	-	-

Correlation Levels:

Level	Correlation
-	Nil
1	Slightly / Low
2	Moderate / Medium
3	Substantial / High

Assessment Rubrics:

- Quiz / Assignment/ Discussion / Seminar
- Midterm Exam
- Programming Assignments
- Final Exam

Mapping of COs to Assessment Rubrics :

	Internal Exam	Assignment	Project Evaluation	End Semester Examinations
CO 1	✓			✓
CO 2	✓			✓
CO 3	✓			✓
CO 4		✓		✓
CO 5		✓	✓	✓

Course Title	Food Industrial Waste Management				
Type of Course	**Elective**				
Semester	6				
Academic Level	300				
Course Details	Credit	Lecture per week	Tutorial per week	Practical per week	Total Hours
	4	4	-	-	60

Course Outcomes (CO):

CO	CO Statement	Cognitive Level*	Knowledge Category#	Evaluation Tools used
CO1	Understand the basic principle basic principle of waste management to food processing industry	U	C	• Quiz • Assignment • Discussion • Seminar • Midterm Exam • Final Exam
CO2	Awareness of importance in treating waste product from food industry	Ap	P	
CO3	Understand recycling &utilization of waste product from food industry to waste management & disposal	Ap	P	
CO4	Understand the by-product associated with various type of food processing industry	U	C	

* - Remember (R), Understand (U), Apply (Ap), Analyse (An), Evaluate (E), Create (C)
# - Factual Knowledge(F) Conceptual Knowledge (C) Procedural Knowledge (P) Metacognitive Knowledge (M)

Detailed Syllabus:

Module	Unit	Content	Hrs
I	**1**	**Classification and characterization of food industry waste**	**10**
	1	Definition and source of waste from food processing	2
	2	Classification and characterization waste from various food industries	3
	3	Need for treating waste from various food industries	2
	4	Waste generation from food processing industries in India and its impact on environment.	3
II	**Treatment method of waste from food industry and pollution control**		**15**
	5	Treatment method of liquid waste from food industry	1
	6	Design of activated sludge process	2
	7	Bioremediation	2
	8	Trickling filter process and anaerobic digestion treatment methods for solid waste from food industry	1
	9	Drying, Incineration and Design of solid waste management	2
	10	Air standards for cities and industrial area.	2

	11	Water standard for portable and agricultural.	2
	12	Treatment of water from fruit & vegetable processing industry	1
	13	Necessity of efficient management of food industry waste	1
	14	Primary secondary and tertiary treatment including anaerobic waste	2
	15	Water treatment system like micro strainers, filters, ultrafiltration and reverse osmosis .	2
III	**Recycling & utilization of waste product from food industry**		**15**
	16	Treatment of water from food industry. Recovery of protein from potato starch plant,	3
	17	BOD, COD	2
	18	Recovery of protein from potato starch plant,	3
	19	Utilization of molasses	3
	20	utilization of waste from meat & fish for livestock and poultry	2
IV	**By product from food processing industry waste**		**8**
	21	Characterization of waste from food processing industry for making of by-products	2
	22	Process of important by product from wastes of processing industries for fruits & vegetables Food grains, milk & milk products and meat Fish and poultry products etc	6
V	**Open Ended Module**		**12**
		Case study – waste managementSe	

Mapping of COs with PSOs and POs :

	PSO 1	PSO 2	PSO 3	PSO4	PSO 5	PSO6	PO1	PO2	PO3	PO4	PO5	PO6
CO 1	1	-	2	1	1	-	1	1	-	1	1	-
CO 2	2	3	-	2	2	3	2	2	3	2	2	3
CO 3	-	1	1	-	1	-	2	1	1	-	-	1
CO 4	3	-	2	1	2	3	-	2	-	1	3	-

Correlation Levels:

Level	Correlation
-	Nil
1	Slightly / Low
2	Moderate / Medium
3	Substantial / High

Assessment Rubrics:

- Quiz / Assignment/Discussion / Seminar
- Midterm Exam
- Final Exam

Mapping of COs to Assessment Rubrics :

	Internal Exam	Assignment	Project Evaluation	End Semester Examinations
CO 1	✓			✓
CO 2	✓			✓
CO 3	✓			✓
CO 4		✓	✓	✓

Course Title	Food Formulation and Desigin				
Type of Course	**Elective**				
Semester	5				
Academic Level	300				
Course Details	Credit	Lecture per week	Tutorial per week	Practical per week	Total Hours
	4	4	-	-	60

Course Outcomes (CO):

CO	CO Statement	Cognitive Level*	Knowledge Category#	Evaluation Tools used
CO1	Implement and maintain proper food safety and sanitation practices in compliance with industry regulation	Ap	P	• Quiz • Assignment • Discussion • Seminar • Midterm Exam • Final Exam
CO2	Create well-balanced menus considering nutritional requirements, cost constraints, and customer preferences.	C	P	
CO3	Understand procurement processes, negotiate with suppliers, and manage inventory efficiently to control costs.	U	C	
CO4	Develop new marketable, nutritionally and economically viable food products, Develop entrepreneurship skills for setting up small scale food industries, Understand packaging of different food products	Ap	M	
CO5	Demonstrate proficiency in fundamental culinary techniques and food preparation.\Menu Planning and Design:	E	P	

CO6	Understand the cultural significance of different cuisines and culinary traditions, and Preserve and promote traditional culinary practices to enhance cultural tourism.	U	C	

* - Remember (R), Understand (U), Apply (Ap), Analyse (An), Evaluate (E), Create (C)

- Factual Knowledge(F) Conceptual Knowledge (C) Procedural Knowledge (P) Metacognitive Knowledge (M)

Detailed Syllabus:

Module	Unit	Content	Hrs
I.	**INNOVATIONS IN PRODUCT DEVELOPMENT**		**15**
	1.	Definition and Need for Product Development, Phases in Food Product Development	2
	2	Factors affecting Food Product Development – corporate factors, market factors,	2
	3	Technological pressures, government issues and legislations.	1
	4	Impact of technology and market place influence	1
	5	Social concerns, health concerns,	1
	6	Generation of New Product Ideas: Internal sources of idea, External sources of ideas and market place analysis	2
	7	Classes and Characteristics of New Food Products	2
	8	Line Extensions and Repositioning of Existing Products	2
	9	Reformulations	2
I1	**DESIGNING**		**8**
	10	Stages/ Phases of New Product Development – idea generation	2
	11	Screening of the ideas: Team approach and involvement of various departments, objectives of screening, criteria for screening ideas	3
	12	Feasibility studies, consumer research, financial review, product design and formulation	3
III	**PHASES IN FOOD PRODUCT DEVELOPMENT**		**15**
	13	Prototype preparation	2
	14	Standardization of model produced	2

	15	Sensory Evaluation done for acceptancy: sensory methods and acceptance test.	3
	16	Shelf-life testing- types of shelf-life testing mode of food deterioration.	3
	17	Technical development –recipe development and scale up.	3
	18	Product integrity and conformance to standards	2
IV	**Food service operation and Management**		**10**
	19	Process Development – scale-up process	2
	20	Product and Process Designs	2
	21	General and Specific Design and Layout Considerations	4
	22	Selection of Equipment	2
V	**OPEN ENDED MODULE:**		**12**
		1. Selection of product by Market survey/assigned by company/R&D assignment/consultancy 2 Product Formulation & Designing: Trail & Error method/ Reference from Journal & Article/book reference etc., 3 Standardisations by sensory evaluation methods and laboratory test: physical and chemical analysis and shelf-life test: microbiological study and sensory test 4: Consumer acceptancy study	

Mapping of COs with PSOs and POs :

	PSO 1	PSO 2	PSO 3	PSO4	PSO 5	PSO6	PO1	PO2	PO3	PO4	PO5	PO6
CO 1	1	1	-	2	1	1	-	1	1	1	-	2
CO 2	2	2	3	-	2	2	3	2	2	2	3	-
CO 3	-	-	1	1	-	1	-	2	-	-	1	1
CO 4	1	3	-	2	1	2	3	-	1	3	-	2
CO 5	2	-	1	-	2	1	1	1	2	-	1	-
CO 6	1	3	-	2	1	2	3	-	1	3	-	1

Correlation Levels:

Level	Correlation
-	Nil
1	Slightly / Low
2	Moderate / Medium
3	Substantial / High

Assessment Rubrics:

- Quiz / Assignment/Discussion / Seminar
- Midterm Exam
- Final Exam

Mapping of COs to Assessment Rubrics:

	Internal Exam	Assignment	Project Evaluation	End Semester Examinations
CO 1	✓			✓
CO 2	✓			✓
CO 3	✓			✓
CO 4		✓		✓
CO 5	✓	✓		✓
CO 6			✓	✓

Course Title	**SENSORY SCIENCE**				
Type of Course	**Elective**				
Semester	5				
Academic Level	300				
Course Details	Credit	Lecture per week	Tutorial per week	Practical per week	Total Hours
	4	4	-	-	60

Course Outcomes (CO):

CO	CO Statement	Cognitive Level*	Knowledge Category#	Evaluation Tools used
CO1	Describe sensory analysis in general, the most common methods, and know when to use them	U	C	• Quiz • Assignment • Discussion • Seminar • Midterm Exam • Final Exam
CO2	Understand the effect of the setting on sensory evaluation	Ap	M	
CO3	Understand panel recruitment, selection and training	An	P	
CO4	Describe the human perception processes	E	F	
CO5	Understand the anatomy and physiology of the human senses	Ap	C	

* - Remember (R), Understand (U), Apply (Ap), Analyse (An), Evaluate (E), Create (C)
# - Factual Knowledge(F) Conceptual Knowledge (C) Procedural Knowledge (P) Metacognitive Knowledge (M)

Detailed Syllabus:

Module	Unit	Content	Hrs
I	**INTRODUCTION TO SENSORY SCIENCE**		**9**
	1	Introduction to Sensory Science - definition, history, the senses, methods, and differences from other research methods.	3
	2	Basic Sensory Research (medical, categories, nutrition, communication between processors).	3
	3	Roles of Sensory Science in marketing, product development, quality assurance, etc	3
II	**ORGANS INVOLVED AND THEIR MECHANISM**		**18**
	4	Sensory Assessment of food quality Appearance of food – visual perception, colour of foods, Flavour, Taste, Odour & Aroma – perception of odour, sniffing, van Sramik test. Texture	4

	5	Taste-Gustation**:** Gustation (Taste) - primary tastes, anatomy, physiology, and chemistry of taste.; taste modifiers; adaptation of taste.	3
	6	Olfaction and Tactile:3.1 Olfaction (Smell) - anatomy, physiology and chemistry of smell, transduction, adaptation, classification systems, illusions.	4
	7	Tactile (Touch) - tactile sensations, temperature, mouth feel, pungency, heat, trigeminal pain.	3
	8	Vision and Audition: Vision (Seeing) - eyes: design and anatomy	2
	9	Audition (Hearing) - mechanisms, anatomy	2
III	**ORGANOLEPTIC EVALUATIONS**		**15**
	10	Definition of sensory evaluation	1
	11	Importance of sensory evaluation Factors affecting food acceptance, sensory psychological & physiological	2
	12	General testing conditions	1
	13	Testing area	1
	14	Testing setup	1
	15	Lighting setup	1
	16	Testing schedule	1
	17	Preparation of Samples: Coding and order of presentation	1
	18	Types of panels-trained and consumer panels	1
	19	Evaluation card preparation.	1
	20	Selection of sensory panellists; Factors influencing sensory measurements;	2
	21	Sensory quality parameters -Size and shape, texture, flavour, aroma, taste, colour, temperature sensation	2
IV	**SENSORY ANALYSIS METHODS**		**6**
	22	Threshold tests, Difference tests, Ranking tests, Scoring – Numerical, Hedonic tests, Acceptance and preference tests, Scoring test, Sensitivity tests	6
V	**OPEN ENDED MODULE:**		**12**
	1	Sensory analysis	12

Mapping of COs with PSOs and POs :

	PSO 1	PSO 2	PSO 3	PSO4	PSO 5	PSO6	PO1	PO2	PO3	PO4	PO5	PO6
CO 1	2	2	1	1	-	1	1	2	1	1	-	1
CO 2	-	-	2	2	3	2	2	-	2	2	3	2
CO 3	1	1	-	1	-	2	-	1	-	1	-	2
CO 4	2	2	1	2	3	-	1	2	1	2	3	-
CO 5	2	2	1	1	-	1	1	2	1	1	-	1

Correlation Levels:

Level	Correlation
-	Nil
1	Slightly / Low
2	Moderate / Medium
3	Substantial / High

Assessment Rubrics:

- Quiz / Assignment/ Discussion / Seminar
- Midterm Exam
- Final Exam

Mapping of COs to Assessment Rubrics :

	Internal Exam	Assignment	Project Evaluation	End Semester Examinations
CO 1	✓			✓
CO 2	✓			✓
CO 3	✓			✓
CO 4		✓		✓
CO 5		✓	✓	✓

Course Title	**FOOD COST ACCOUNTING**				
Type of Course	**Elective**				
Semester	6				
Academic Level	300				
Course Details	Credit	Lecture per week	Tutorial per week	Practical per week	Total Hours
	4	4	-	-	60

Course Outcomes (CO):

CO	**CO Statement**	**Cognitive Level***	**Knowledge Category#**	**Evaluation Tools used**
CO1	Implement and maintain proper food safety and sanitation practices in compliance with industry regulation	Ap	P	• Quiz • Assignment • Discussion • Seminar • Midterm Exam • Final Exam
CO2	Create well-balanced menus considering nutritional requirements, cost constraints, and customer preferences.	C	P	
CO3	Understand procurement processes, negotiate with suppliers, and manage inventory efficiently to control costs.	U	C	
CO4	Develop new marketable, nutritionally and economically viable food products, develop entrepreneurship skills for setting up small scale food industries, Understand packaging of different food products	Ap	M	
CO5	Demonstrate proficiency in fundamental culinary techniques and food preparation.\Menu Planning and Design:	E	P	

CO6	Understand the cultural significance of different cuisines and culinary traditions, and preserve and promote traditional culinary practices to enhance cultural tourism.	U	C

* - Remember (R), Understand (U), Apply (Ap), Analyse (An), Evaluate (E), Create (C)

- Factual Knowledge(F) Conceptual Knowledge (C) Procedural Knowledge (P) Metacognitive Knowledge (M)

Detailed Syllabus:

Module	Unit	Content	Hrs
I	**FOOD COSTING**		**9**
	1.	Food costing: Costing: meaning	2
	2	Importance of costing	2
	3	Methods of costing, cost centre, cost unit and cost control	3
	4	Elements of cost: Materials	2
	5	Machines	
	6	Labour	
	7	Overheads	
I1	**MATERIAL COSTING**		**14**
	8	Materials: concept, types of materials,	3
	9	Material control- purchase of materials, receipts & inspection of materials,	4
	10	Storage of materials and issue of materials	3
	11	Levels of materials: minimum level, maximum level,re-order level, danger level, economic order quantity	4
III	**OTHER COST**		**14**
	12	Cost of labour: concept time keeping,	2
	13	Methods of wage payment-time wage	2
	14	Piece wage	1
	15	Halsey plan	1
	16	Rowan plan	1
	17	Labour turnover	1
	18	Overheads: concept, functional classification: manufacturing, administration,selling and distribution overhead.	3

	19	Behaviour wise classification: fixed cost, variable cost andsemi-variable cost	3
IV	**MANAGEMENT ACCOUNTING:**		**11**
	20	Accounting ratios: meaning and importance of accounting Ratios.	3
	21	Profitability ratios, liquidity ratios, activity ratios withSimple workouts.	4
	22	Break-even analysis: break even point (BEP), contribution,margin of safety, profit-volume ratio with simple workouts	4
V	**OPEN ENDED MODULE:**		**12**
		Work out the new product sample produced at your laboratory and see the breakeven point	

Mapping of COs with PSOs and POs :

	PSO 1	PSO 2	PSO 3	PSO4	PSO 5	PSO6	PO1	PO2	PO3	PO4	PO5	PO6
CO 1	2	2	1	1	-	1	1	2	2	2	1	1
CO 2	-	1	2	2	3	2	2	-	1	-	2	2
CO 3	1	1	-	1	-	2	-	1	1	1	-	1
CO 4	2	2	1	2	3	-	1	2	2	2	1	2
CO 5	2	2	1	1	-	1	1	2	2	2	1	1
CO 6	1	-	2	2	3	2	2	-	1	-	2	2

Correlation Levels:

Level	Correlation
-	Nil
1	Slightly / Low
2	Moderate / Medium
3	Substantial / High

Assessment Rubrics:

- Quiz / Assignment/Discussion / Seminar
- Midterm Exam
- Final Exam

Mapping of COs to Assessment Rubrics:

	Internal Exam	Assignment	Project Evaluation	End Semester Examinations
CO 1	✓			✓
CO 2	✓			✓
CO 3	✓			✓
CO 4		✓		✓
CO 5		✓		✓
CO 6			✓	✓

Course Title	**FOOD MARKETING**				
Type of Course	**Elective**				
Semester	6				
Academic Level	300				
Course Details	Credit	Lecture per week	Tutorial per week	Practical per week	Total Hours
	4	4	-	-	60

Course Outcomes (CO):

CO	CO Statement	Cognitive Level*	Knowledge Category#	Evaluation Tools used
CO1	Implement and maintain proper food safety and sanitation practices in compliance with industry regulation	Ap	P	• Quiz • Assignment • Discussion • Seminar • Midterm Exam • Final Exam
CO2	Create well-balanced menus considering nutritional requirements, cost constraints, and customer preferences.	C	P	
CO3	Understand procurement processes, negotiate with suppliers, and manage inventory efficiently to control costs.	U	C	
CO4	Develop new marketable, nutritionally and economically viable food products, develop entrepreneurship skills for setting up small scale food industries, Understand packaging of different food products	Ap	M	
CO5	Demonstrate proficiency in fundamental culinary techniques and food preparation.\Menu Planning and Design:	E	P	

CO6	Understand the cultural significance of different cuisines and culinary traditions, and preserve and promote traditional culinary practices to enhance cultural tourism.	U	C

* - Remember (R), Understand (U), Apply (Ap), Analyse (An), Evaluate (E), Create (C)

- Factual Knowledge(F) Conceptual Knowledge (C) Procedural Knowledge (P) Metacognitive Knowledge (M)

Detailed Syllabus:

Module	Unit	Content	Hrs
I	**MARKETING**		**9**
	1.	Concept of market and marketing	2
	2	Market structure, market efficiency and market integration	2
	3	Food marketing evolution (transaction cost framework, resource dependency theory, resource-based approach)	3
	4	Role of government in promoting agricultural & processed food marketing	2
I1	**MARKETING MIX**		**11**
	5	Definition, scope, understanding the 4Ps – (Product, Price, Place, Promotion)	4
	6	Marketing techniques, Food marketing channel organisation and management (power-dependence, conflict, co-operation and co-ordination)	4
	7	Marketing and distribution of processed products.	3
III	**MARKETING MANAGEMENT**		**14**
	8	Functions of Marketing	2
	9	Market Intelligence - survey techniques, demand & supply	2
	10	Market Forecasting – consumer behaviour and trends	2
	11	Segmentation, Targeting and Positioning	2
	12	Marketing Network	2
	13	E-Marketing and E-Procuring	2
	14	supply chain management	2
IV	**ADVERTISING AND COMMERCIALIZATION**		**14**

	15	Objectives of Advertising	2
	16	Advertising Message	2
	17	Budgeting	2
	18	Media Selection	2
	19	Personal Selling	2
	20	Publicity	1
	21	Sales Promotion	1
	22	Brand management strategies in the food sector	2
V	**OPEN ENDED MODULE:**		**12**
		Food Marketing Case study	

Mapping of COs with PSOs and POs :

	PSO 1	PSO 2	PSO 3	PSO4	PSO 5	PSO6	PO1	PO2	PO3	PO4	PO5	PO6
CO 1	1	-	1	-	1	1	2	1	-	1	1	2
CO 2	2	3	2	3	2	2	-	2	3	2	2	-
CO 3	2	3	1	-	2	-	1	1	-	2	-	1
CO 4	-	-	2	3	-	1	2	2	3	-	1	2
CO 5	2	-	1	-	1	1	2	1	-	1	1	2
CO 6	2	3	-	1	-	-	1	1	-	1	1	2

Correlation Levels:

Level	Correlation
-	Nil
1	Slightly / Low
2	Moderate / Medium
3	Substantial / High

Assessment Rubrics:

- Quiz / Assignment/Discussion / Seminar
- Midterm Exam
- Final Exam

Mapping of COs to Assessment Rubrics:

	Internal Exam	Assignment	Project Evaluation	End Semester Examinations
CO 1	✓		✓	✓
CO 2	✓			✓
CO 3	✓			✓
CO 4	✓	✓	✓	✓
CO 5	✓	✓		✓
CO 6		✓		✓

Course Title	Bakery and Confectionary Technology				
Type of Course	**Elective**				
Semester	5				
Academic Level	300				
Course Details	Credit	Lecture per week	Tutorial per week	Practical per week	Total Hours
	4	4	-	-	60

Course Outcomes (CO):

CO	CO Statement	Cognitive Level*	Knowledge Category#	Evaluation Tools used
CO1	Understand the fundamentals of baking and confectionary technology. Analyse the factors influencing each stage of the baking process.	U	C	• Quiz • Assignment • Discussion • Seminar • Midterm Exam • Final Exam
CO2	Explore the types of ingredients and analyse the impact of each ingredient on baking process.	C	P	
CO3	Understand the methods of bakery production and analyse the changes occur during bakig process.	U	M	
CO4	Analyze the role of ingredients in sugar confections and evaluate factors affecting the quality of confections. Assess the technology of chocolate processing, including refining, conching, tempering, and enrobing.	An	F	
CO5	Critique the development of bakery and confectionery products using novel ingredients, considering taste, texture, and market feasibility.	E	M	
CO6	Demonstrate the understanding of technology in the production of various bakery products, including bread, quick bread, cakes, biscuits, and cookies. Apply principles of baking to troubleshoot faults and prevent spoilage. Utilize FSSAI standards and specifications to assess sugar and confectionery products.	Ap	C	

* - Remember (R), Understand (U), Apply (Ap), Analyse (An), Evaluate (E), Create (C)
# - Factual Knowledge(F) Conceptual Knowledge (C) Procedural Knowledge (P) Metacognitive Knowledge (M)

Detailed Syllabus:

Module	Unit	Content	Hrs
I		**INTRODUCTION TO BAKING TECHNOLOGY**	**14**
	1	Classification of bakery products.	1
	2	Role of ingredients in baking technology : major and minor ingredients.	3
	3	Leavening agents : Physical leavening agents. Biological leavening agents : composition and production of active dried yeast and compressed yeast. Chemical leavening agents : types, chemical reactions.	4
	4	Principles of baking : Dough mixing, makeup, fermentation, Baking	2
	5	Factors affecting baking. Changes during baking : Oven spring, Gelatinization of starch, Caramalaistion, Maillard reaction, Protein denaturation, Evaporation of water, Cell structure formation, Enzyme activities.	4
II		**TECHNOLOGY OF BAKERY PRODUCTS**	**11**
	6	Bread : methods of bread making, faults and remedies of bread, spoilage and its prevention. Quick bread.	4
	7	Cake : types of cake, methods of cake making, faults and remedies.	3
	8	Biscuit and cookies ; methods of biscuit making-wire cutting, rotary moulding, extrusion. Faults and remedies.	4
III		**INTRODUCTION TO CONFECTIONARY**	**12**
	9	Sources of sugar manufacture.	1
	10	Methods of manufacture of sugar from sugar beet and sugar cane.	2
	11	By-products of sugar processing and its utilization : molasses,, bagasse, filter muds, cane top.	2
	12	Types of sugar : white sugar, refined sugar, crystalline sugar, brown sugar	1
	13	Forms of sugar : Beet sugar, liquid sweetener, Cane sugar, cane syrup, corn syrup, fructose syrup, maple syrup, honey.	2
	14	Natural and artificial sweeteners	2
	15	Sugar substitute.	1
	16	Dextrose equivalence.	1
IV		**TECHNOLOGY OF CONFECTIONARY PRODUCTS**	**11**
	17	Classification of confections : Sugar confections, Flour confections, Chocolate confections, other confections	1
	18	Role of ingredients in sugar confections.	2
	19	Factors affecting quality of confections : Equilibrium relative humidity, Sugar solubility, Sugar boiling, Crystallisation, Aeration.	1
	20	Confectionary production processes : Cooking, Drop rolling, Moulding, Extrusion, Plastic forming, Wet crystallisation, Panning.	2
	21	Technology of confectionary products : Toffee, Caramel, Fudge, Fondant, Hard boiled candy, Gelatine sweets.	3

	22	Technology of chocolate processing : Role of ingredients, Types of chocolate, Processing of chocolate : Refining, Conching, Tempering, Enrobing. Chocolate quality and defects.	2
V	**Open Ended Module:**		**12**
		Visit to confectionary industry Conduct an assignment on FSSAI standards and specification on sugar and confectionary products. Development of bakery and confectionary products using novel ingredients.	12

Mapping of COs with PSOs and POs :

	PSO 1	PSO 2	PSO 3	PSO4	PS O5	PSO 6	PO1	PO2	PO3	PO4	PO5	PO6
CO 1	1	2	2	3	2	1	2	2	3	2	2	1
CO 2	1	-	1	-	2	1	-	1	-	2	-	1
CO 3	2	1	2	3	-	2	1	2	3	-	1	2
CO 4	2	1	1	-	1	2	1	1	-	1	1	2
CO 5	-	2	2	3	2	-	2	2	3	2	2	-
CO 6	1	2	2	3	2	1	2	2	3	2	2	1

Correlation Levels:

Level	Correlation
-	Nil
1	Slightly / Low
2	Moderate / Medium
3	Substantial / High

Assessment Rubrics:

- Quiz / Assignment/ Discussion / Seminar
- Midterm Exam
- Final Exam

Mapping of COs to Assessment Rubrics :

	Internal Exam	Assignment	Project Evaluation	End Semester Examinations
CO 1	✓			✓
CO 2	✓			✓
CO 3	✓			✓
CO 4	✓	✓		✓
CO 5	✓	✓		✓
CO 6			✓	✓

Course Title	Food Nutrition and Dietetics				
Type of Course	**Elective**				
Semester	6				
Academic Level	300				
Course Details	Credit	Lecture per week	Tutorial per week	Practical per week	Total Hours
	4	4	-	-	60

Course Outcomes (CO):

CO	CO Statement	Cognitive Level*	Knowledge Category#	Evaluation Tools used
CO1	Explain different terms related to nutrtion and able to identify and analyze national and international agencies, institutions, programs, and campaigns related to nutrition.	U	C	• Quiz • Assignment • Discussion • Seminar • Midterm Exam • Final Exam
CO2	calculate energy requirements using various methods, understand basal metabolic rate, and explain the specific dynamic action of food.	Ap	M	
CO3	Able to analyze and apply nutritional requirements and Recommended Dietary Allowances (RDAs) for different age groups, with a focus on guidelines for Indians.	An	P	
CO4	Identify, analyze, and evaluate major and minor nutritional problems, including their causes, manifestations, diagnostic techniques, and preventive measures.	E	F	
CO5	Apply various techniques for assessing nutritional status, including anthropometric measurements, clinical examination, biochemical estimations, and dietary surveys.	Ap	C	
CO6	Able to formulate nutritional plans for different categories, dietary management in various diseases and conditions and those in special conditions. Able to conduct case studies, analyze market surveys	C	P	

* - Remember (R), Understand (U), Apply (Ap), Analyse (An), Evaluate (E), Create (C)
# - Factual Knowledge(F) Conceptual Knowledge (C) Procedural Knowledge (P) Metacognitive Knowledge (M)

Detailed Syllabus:

Module	Unit	Content	Hrs
I		**FUNDAMENTALS OF NUTRITION**	**10**
	1	Introduction - Energy value of food and energy requirements, Optimum nutrition, Balanced diet, reference man, reference woman	2
	2	Agencies, Institutions, programs and campaigns (National & International)	2
	3	Energy – Introduction, basal metabolic rate, calculating energy requirements, energy expenditure using bomb calorimeter, indirect calorimeter etc, specific dynamic action of food	3
	4	Nutritional requirements & recommended dietary allowances for energy for different age groups, Recommended dietary allowances & guidelines for Indians	3
II		**PROBLEMS IN HUMAN NUTRITION AND THEIR ASSESSMENT**	**12**
	5	Major Nutritional problems- Protein energy malnutrition, kwashiorkor, marasmus, anaemia, vitamin A deficiency, Iodine deficiency disorder. Minor Nutritional Problems- scurvy, beri- beri, pellagra, rickets, osteomalacia, osteoporosis, zinc deficiency & fluorosis - Their Cause, biochemical & clinical menifestations, diagnostic techniques, preventive & therapeutic measures	4
	6	Assessment of Nutritional Status, Various techniques for assessment of nutritional status: Anthropometric measurements: Definition, measurements, tools/instruments. Use of anthropometry for onetime assessment, growth monitoring and emergency situation. Clinical examination. Biochemical estimations. Dietary survey	4
	7	Naturally occuring toxins & antinutritional factors present in foods & complications occuring due to them	2
	8	Food faddism and faulty food habits	2
III		**HUMAN NUTRITION REQUIREMENTS**	**14**
	9	Nutrition of pregnant and lactating mother	2
	10	Nutrition of infant, preschool children, school children and adolescents	2
	11	Nutrition of industrial workers	1
	12	Geriatric nutrition	2
	13	Sports nutrition	3
	14	Community Nutrition	2
	15	Nutrition in Special Conditions: Space Travel, High Altitudes, Low Temperature, Submarines	2
IV		**NUTRITION IN DIFFERENT DISEASE CONDITION**	**12**
	16	Principles of clinical nutrition –. Diet therapy and types of therapeutic diets, Role of dietitian and Indian Dietetic Association. Special Feeding Method: Intravenous feeding, tube feeding, gastrostomy, jejunostomy.	2
	17	Nutrition for weight management(Obesity, Underweight/Excessive Leanness/ Undernutrition)	2

	18	Eating disorders: Anorexia nervosa, bulimia nervosa, binge eating disorder – History, etiology, clinical features, epidemiology and nutritional management.	2
	19	Infection and fevers – Defence mechanisms in the body, Role of Nutrition in Infections, effects of infection on body mechanisms, effects of infection on nutrition, definition of fever, nutritional modification in infection and fever	2
	20	Metabolic disorder: Diabetes Mellitus – Introduction, types, pathophysiology of insulin resistance, symptoms, biochemical tests, complications, hypoglycemic drugs, dietary management, patient education, the diabetic association of India.	2
	21	Gastro intestinal tract disorders: Dyspepsia, peptic ulcer, diarrhoea, constipation, inflammatory bowel disease – definition, epidemiology, pathogenesis, clinical features and diagnosis, dietary management.	2
	22	Diseases of Liver - Hepatitis, (A, B, and C), Cirrhosis - Causes, symptoms, dietary management and Prevention.	2
V	**Open Ended Module:**		**12**
	1	**Case studies:** 1) Market survey of commercial nutritional supplements and nutritional support substrates **Nutritional management** i) Diet planning for Type1, Type2 diabetes mellitus ii) For Special conditions a) Pregnancy b) Elderly c) Surgery d) Illness e) Physical activities, Diet In Weight Imbalance And Counseling: To plan a diet for Obesity, To plan a diet for Underweight Planning of Pre-game and post-game meals	12

Mapping of COs with PSOs and POs :

	PSO 1	PSO 2	PSO 3	PSO4	PSO 5	PSO6	PO1	PO2	PO3	PO4	PO5	PO6
CO 1	2	2	3	2	1	2	2	2	3	2	1	2
CO 2	-	1	-	2	1	-	-	1	-	2	1	-
CO 3	1	2	3	-	2	1	1	2	3	-	2	1
CO 4	1	1	-	1	2	1	1	1	-	1	2	1
CO 5	2	2	3	2	-	2	2	2	3	2	-	2
CO 6	2	2	3	2	1	2	2	2	3	2	1	2

Correlation Levels:

Level	Correlation
-	Nil
1	Slightly / Low
2	Moderate / Medium
3	Substantial / High

Assessment Rubrics:

- Quiz / Assignment/ Discussion / Seminar
- Midterm Exam
- Final Exam

Mapping of COs to Assessment Rubrics :

	Internal Exam	Assignment	Project Evaluation	End Semester Examinations
CO 1	✓			✓
CO 2	✓			✓
CO 3	✓			✓
CO 4		✓		✓
CO 5	✓	✓		✓
CO 6			✓	✓

Course Title	FOOD TOXICOLOGY				
Type of Course	**Major**				
Semester	8				
Academic Level	400				
Course Details	Credit	Lecture per week	Tutorial per week	Practical per week	Total Hours
	4	4	-	-	60

Course Outcomes (CO):

CO	CO Statement	Cognitive Level*	Knowledge Category#	Evaluation Tools used
CO1	Acquire knowledge about the injurious effects on living systems of chemicals present in foods through various ways.	U	C	Instructor-created exams / Quiz
CO2	Familiar with the basic chemical and biological aspects of toxins duringprocessing.	Ap	P	Practical Assignment / Observation of Practical Skills
CO3	Develop an understanding of the chemical and biological principles thatdetermines toxicity.	Ap	P	Seminar Presentation / Group Tutorial Work
CO4	The Awareness on the concept "food processing as a toxin generator".	U	C	Instructor-created exams / Home Assignments
CO5	Familiar with their properties, modes of action of toxins.	Ap	P	One Minute Reflection Writing assignments
* - Remember (R), Understand (U), Apply (Ap), Analyse (An), Evaluate (E), Create (C) # - Factual Knowledge(F) Conceptual Knowledge (C) Procedural Knowledge (P) Metacognitive Knowledge (M)				

Detailed Syllabus:

Module	Unit	Content	Hrs
I	**Definition scope and general principles of food toxicology**		**14**
	1	Toxic, Toxicity, Toxicants, Toxicology, Disciplines of toxicology, Food Toxicology.	2
	2	Principles of Toxicology (Dose, dose response curve, ADME-Absorption, digestion, metabolism, excretion, Daily intake).	2

	3	Toxic symptoms & toxic effects;	2
	4	Toxic exposure- Route of exposures (inhale, ingestion, injection, dermal), Factors effecting exposures, ways of exposures- Accidental, experimental, intentional, chronic & acute exposures.	2
	5	Classification of food toxicants	2
	6	Factors affecting toxicity of compounds	1
	7	Safety evaluation- risk assessments (risk, hazard, steps, purpose)	3
II	**Toxicants in Foods**		**10**
	8	From plants (Glycoalkaloids, cyanogenic glycosides, Saponins, lectin, gossypol)	2
	9	From animals- zootoxins, Prions	1
	10	From marine, algae and Mushroom	3
	11	Microbial toxins- bacterial and mycotoxin.	2
	12	Food Poisoning; Food borne infections and disease.	2
III	**Derived Food toxicants**		**8**
	13	Toxicants generated during food processing such as nitrosamines, acrylamide, benzene, dioxins and furans.	5
	14	Carcinogens in smoked food.	2
	15	Autoxidation products.	1
IV	**Toxicants in Chemicals**		**16**
	16	Toxicity of intentional food additives.	1
	17	Toxicological aspects of nutrient supplements- Vita A toxicity	2
	18	Chemicals from processing such as fumigants	2
	19	Chemicals from chlorinated solvents	2
	20	Argo chemicals- pesticides	3
	21	Persistence of organic pollutants (POP- dirty dozen, DDT, HCB, PCB and prevention of POP contamination.	3
	22	Heavy metals	3
V	**Open Ended Module**		**12**
		Food toxin – case study / project / group discussion	12

Mapping of COs with PSOs and POs :

	PSO 1	PSO 2	PSO 3	PSO4	PSO 5	PSO6	PO1	PO2	PO3	PO4	PO5	PO6
CO 1	2	2	1	1	-	1	1	2	1	1	-	1
CO 2	-	-	2	2	3	2	2	-	2	2	3	2
CO 3	1	1	-	1	-	2	-	1	-	1	-	2
CO 4	2	2	1	2	3	-	1	2	1	2	3	-
CO 5	2	2	1	1	-	1	1	2	1	1	-	1

Correlation Levels:

Level	Correlation
-	Nil
1	Slightly / Low
2	Moderate / Medium
3	Substantial / High

Assessment Rubrics:

- Quiz / Assignment/ Discussion / Seminar
- Midterm Exam
- Final Exam

Mapping of COs to Assessment Rubrics :

	Internal Exam	Assignment	Project Evaluation	End Semester Examinations
CO 1	✓			✓
CO 2	✓			✓
CO 3	✓			✓
CO 4		✓		✓
CO 5		✓	✓	✓

Course Title	Food Tourism and Food Service Management				
Type of Course	**Elective**				
Semester	8				
Academic Level	400				
Course Details	Credit	Lecture per week	Tutorial per week	Practical per week	Total Hours
	4	4	-	-	60

Course Outcomes (CO):

CO	**CO Statement**	**Cognitive Level***	**Knowledge Category#**	**Evaluation Tools used**
CO1	Implement and maintain proper food safety and sanitation practices in compliance with industry regulation	Ap	P	• Quiz • Assignment • Discussion • Seminar • Midterm Exam • Final Exam
CO2	Create well-balanced menus considering nutritional requirements, cost constraints, and customer preferences.	C	P	
CO3	Understand procurement processes, negotiate with suppliers, and manage inventory efficiently to control costs.	U	C	
CO4	Develop new marketable, nutritionally and economically viable food products, Develop entrepreneurship skills for setting up small scale food industries, Understand packaging of different food products	Ap	M	
CO5	Demonstrate proficiency in fundamental culinary techniques and food preparation.\Menu Planning and Design:	E	P	

CO6	Understand the cultural significance of different cuisines and culinary traditions, and Preserve and promote traditional culinary practices to enhance cultural tourism.	U	C	

* - Remember (R), Understand (U), Apply (Ap), Analyse (An), Evaluate (E), Create (C)

- Factual Knowledge(F) Conceptual Knowledge (C) Procedural Knowledge (P) Metacognitive Knowledge (M)

Detailed Syllabus:

Module	Unit	Content	Hrs
II.	**Introduction to Food tourism**		**10**
	1.	Introduction to basics of tourism :Meaning, Nature and scope of Tourism and Components of Tourism.Attractions, accommodations and associability (Transportations)	2
	2	Types and forms of Tourism. Relationship between Leisure, recreation and Tourism. Outbound and Inbound Tourism trends.	2
	3	Food Tourism: Definition and significance of culinary tourism. Food Marketing and Promotion: Strategies to promote food tourism destinations and experiences.	2
	4	Food Tourism Experience Design: Creating immersive food-related experiences for tourists.Culinary Entrepreneurship: Exploring business opportunities in food tourism, such as food tours, restaurants, and events.	2
	5	Tourism Management in india:Infrastructure of Tourism in India Accommodation sector Transportation- Land, Air, Water Tourism	1
	6	Policies in india - National Actional plan 1992, National tourism policy 2002	1
I1	**FOOD PRODUCTION**		**15**
	7	To Introduce the Historical progression leading to modern cookery - History of cooking , Aims & Objective ,Cooking –art or science	2
	8	To impart knowledge about different kitchen equipment Heavy and Light equipment -Utensils & Knives , Care & maintenance and Use	2
	9	To impart Knowledge of various culinary terms, level of skill, attitude towards work-behaviour & personal hygiene ,Western & Culinary terms , Personal grooming, hygiene & uniform	2

	10	To understand the functioning of Food Production Dept - Organizational structure ,Layout ,Duties & responsibilities and Interdepartmental relations	3
	11	Foundation ingredients & their role in F.P -Composition of different ingredients & the action of heat on fat, carbohydrates, proteins, vitamins & minerals. Classification of cooking factors	3
	12	Regional cookery • North & South Indian • Mughlai • Bengali , Goanese & Marathi • Chinese • Mexican • Italian • Menu Examples and Methods of cooking	3
III	**Meal planning and kithen planning**		**11**
	13	Menu Planning -Definition, Functions	1
	14	Menu planner -foods,food preparation and service methods ,Aesthetic preparation and costomer	2
	15	Factors considered in menuplanning,Menu format and menu display	2
	16	Types of menus and presentation	2
	17	Kitchen Planning • Area Selection / Space requirement • Policy formulation	2
	18	Setting of equipments and Maintenance	2
IV	**Food service operation and Management**		**12**
	19	Introduction to food service industry -Definition, Scope of food service Management	3
	20	Food service operation -Commercial food service operation Cafeteria,CoffeeShop,Kiosk,MealsonWheels,Airport Lounge,Family Restaurant,Fast Food Outlets,Food Court,Theme Restaurant,Robot Theme Restaurant.	4
	21	Non commercial -Welfare catering and industrial catering	2
	22	Management -Definition, priciples of Management, Functions of Management	3
V	**OPEN ENDED MODULE:**		**12**
		Food tourism innovative thoughts and case studies	

Mapping of COs with PSOs and POs :

	PSO 1	PSO 2	PSO 3	PSO4	PSO 5	PSO6	PO1	PO2	PO3	PO4	PO5	PO6
CO 1	1	1	-	1	1	2	1	1	1	1	-	1
CO 2	2	2	3	2	2	-	2	2	2	2	3	2
CO 3	-	1	-	2	-	1	-	1	-	1	-	2
CO 4	1	2	3	-	1	2	1	2	1	2	3	-
CO 5	1	1	-	1	1	2	1	1	1	1	-	1
CO 6	1	1	-	1	1	2	1	1	1	1	-	1

Correlation Levels:

Level	**Correlation**
-	Nil
1	Slightly / Low
2	Moderate / Medium
3	Substantial / High

Assessment Rubrics:

- Quiz / Assignment/Discussion / Seminar
- Midterm Exam
- Final Exam

Mapping of COs to Assessment Rubrics:

	Internal Exam	Assignment	Project Evaluation	End Semester Examinations
CO 1	✓			✓
CO 2	✓			✓
CO 3	✓			✓
CO 4		✓		✓
CO 5		✓		✓
CO 6			✓	✓

Course Title	**Snack Food Technology**				
Type of Course	**Elective**				
Semester	8				
Academic Level	400				
Course Details	Credit	Lecture per week	Tutorial per week	Practical per week	Total Hours
	4	4	-	-	60

Course Outcomes (CO):

CO	CO Statement	Cognitive Level*	Knowledge Category#	Evaluation Tools used
CO1	Deep understanding of different thermal operations, their applications, equipments used and ability to apply this knowledge in various contexts.	U	F	▪ Quiz / Assignment/ Discussion / Seminar ▪ Midterm Exam ▪ Final Exam
CO2	Provide students with knowledge and skills related to low temperature operations. Practical skills in implementing and optimizing low temperature applications	An	C	
CO3	Thorough Understanding of different non-thermal engineering operations in food industry. It will enhance their basic knowledge with advanced novel techniques	Ap	P	
CO4	Demonstrate knowledge of innovative filtration and separation methods in food industry. Equip the students to handle novel technologies in food industry	E	M	
CO5	Equip individual to use the artificial intelligence and other digital systems to reduce the load and improve the efficiency and accuracy of work	C	P	
* - Remember (R), Understand (U), Apply (Ap), Analyse (An), Evaluate (E), Create (C) # - Factual Knowledge(F) Conceptual Knowledge (C) Procedural Knowledge (P) Metacognitive Knowledge (M)				

Detailed Syllabus:

Module	Unit	Content	Hrs
I	**GRAIN-BASED SNACKS**		**15**
	1	Technology for Whole Grains Snacks – roasted, toasted, puffed, popped,flaked	3
	2	Technology for Coated Grain Snacks – salted, spiced, sweetened	2
	3	Technology for Batter-Based and Dough-Based Products	2
	TECHNOLOGY FOR FORMULATED PRODUCTS		
	4	Chips	2
	5	Wafers	2
	6	Papads	2
	7	Instant premixes	2
II	**HORTICULTURE PRODUCE-BASED SNACKS**		**9**
	8	Technology for Fruit-Based Snacks	3
	9	Technology for Vegetable-Based Snacks	3
	10	Technology for Coated Nuts	3
III	**EXTRUDED SNACKS**		**12**
	11	Formulation and Processing Technology	3
	12	Colouring and Flavouring	3
	13	Packaging	3
	14	Machinery and Equipment, Use, and Care	3
IV	**Machinery and Equipment**		**12**
	15	Frying	2
	16	Baking	2
	17	Drying	2
	18	Toasting & Roasting	2
	19	Flaking	1
	20	Blending	1
	21	Coating	1
	22	Popping	1
V	**Open ended**		
	Innovative and heritage snack foods		

Mapping of COs with PSOs and POs :

	PSO 1	PSO 2	PSO 3	PSO4	PSO 5	PSO6	PO1	PO2	PO3	PO4	PO5	PO6
CO 1	1	1	-	1	1	2	1	1	1	-	1	1
CO 2	2	2	3	2	2	-	2	2	2	3	2	2
CO 3	-	1	-	2	-	1	-	-	1	-	2	-
CO 4	1	2	3	-	1	2	1	1	2	3	-	1
CO 5	1	1	-	1	1	2	1	1	1	-	1	1

Correlation Levels:

Level	Correlation
-	Nil
1	Slightly / Low
2	Moderate / Medium
3	Substantial / High

Assessment Rubrics:

- Quiz / Assignment/ Discussion / Seminar
- Midterm Exam
- Final Exam

Mapping of COs to Assessment Rubrics :

	Internal Exam	Assignment	Project Evaluation	End Semester Examinations
CO 1	✓			✓
CO 2	✓			✓
CO 3	✓			✓
CO 4	✓	✓		✓
CO 5		✓	✓	✓

Course Title	NUTRACEUTICALS AND HEALTH FOODS				
Type of Course	**Elective**				
Semester	8				
Academic Level	400				
Course Details	Credit	Lecture per week	Tutorial per week	Practical per week	Total Hours
	4	5	-	-	60

Course Outcomes (CO):

CO	CO Statement	Cognitive Level*	Knowledge Category#	Evaluation Tools used
CO1	Deep understanding of different thermal operations, their applications, equipments used and ability to apply this knowledge in various contexts.	U	F	▪ Quiz / Assignment/ Discussion / Seminar ▪ Midterm Exam ▪ Final Exam
CO2	Provide students with knowledge and skills related to low temperature operations. Practical skills in implementing and optimizing low temperature applications	AP	C	
CO3	Thorough Understanding of different non-thermal engineering operations in food industry. It will enhance their basic knowledge with advanced novel techniques	AP	M	
CO4	Demonstrate knowledge of innovative filtration and separation methods in food industry. Equip the students to handle novel technologies in food industry	Ap	P	
CO5	Equip individual to use the artificial intelligence and other digital systems to reduce the load and improve the efficiency and accuracy of work	Ap	C	

* - Remember (R), Understand (U), Apply (Ap), Analyse (An), Evaluate (E), Create (C)
# - Factual Knowledge(F) Conceptual Knowledge (C) Procedural Knowledge (P) Metacognitive Knowledge (M)

Detailed Syllabus:

Module	Unit	Content	Hrs
I	**INTRODUCTION TO NUTRACEUTICALS**		**10**
	1	Definition and Basic – nutraceuticals, health foods, functional foods	2
	2	Regulatory Issues for Nutraceuticals and Health Foods including CODEX	3
	3	Cereal and Dairy Products as Nutraceuticals	2
	4	Present and Future Prospects of Nutraceuticals – Nutraceuticals as a bridge between foods and drugs	3
II	**MANUFACTURE OF NUTRACEUTICALS**		**20**
	5	Flora, Fauna, and Microbes as a source for the Production of Nutraceuticals	2
	6	Production of Nutraceuticals - Isoflavonoids, Prebiotics and Probiotics, Glucosamine, Phytosterols,	3
	7	Vitamins (carotenoids,tocopherols, folic acid, ascorbic acid) ,	3
	8	MUFA, PUFA, ω-3 Fatty Acids	2
	9	Formulation of Functional Foods containing Nutraceuticals – stability and analytical issues, labelling issues	3
	10	Nutrigenomics – Golden Rice, Quality Protein Maize (QPM)	3
	11	Clinical Testing of Nutraceuticals and Health Foods	2
	12	Opportunities of nutraceuticals industries in India	2
III	**CLINICAL ROLE OF NUTRACEUTICALS**		**10**
	13	Nutraceutical use in disease and disorder – cardiovascular disease, cancer, diabetes, hypercholesterolemia, obesity, immunity, joint pain,	2
	14	Nutraceutical use in disease and disorder – age-related macular degeneration, osteoporosis, gastrointestinal disturbances, menopause, mood disorders.	2
	15	Nutraceuticals for Sports Performance	2
	16	Mechanism of their Action, Dosage, Contraindications, and Toxicity	2
	17	Interactions between Nutraceuticals and Prescription Drugs	2
IV	**STANDARDS FOR HEALTH SUPPLEMENTS AND NUTRACEUTICALS – FSSAI STANDARDS AND REGULATIONS.**		**8**
	18	Health Supplements	1
	19	Nutraceuticals	1
	20	Food for Special Dietary Use	2
	21	Food for Special Medical Purpose,	2
	22	Functional Food, and Novel Food	2
V	Open end : Health foods and FSSAI		**12**

Mapping of COs with PSOs and POs :

	PSO 1	PSO 2	PSO 3	PSO4	PSO 5	PSO6	PO1	PO2	PO3	PO4	PO5	PO6
CO 1	1	1	2	1	1	1	-	1	1	2	1	1
CO 2	2	2	-	2	2	2	3	2	2	-	2	2
CO 3	2	-	1	-	-	1	-	2	-	1	-	-
CO 4	-	1	2	1	1	2	3	-	1	2	1	1
CO 5	1	1	2	1	1	1	-	1	1	2	1	1

Correlation Levels:

Level	Correlation
-	Nil
1	Slightly / Low
2	Moderate / Medium
3	Substantial / High

Assessment Rubrics:

- Quiz / Assignment/ Discussion / Seminar
- Midterm Exam
- Final Exam

Mapping of COs to Assessment Rubrics :

	Internal Exam	Assignment	Project Evaluation	End Semester Examinations
CO 1	✓			✓
CO 2	✓			✓
CO 3	✓			✓
CO 4		✓		✓
CO 5		✓	✓	✓

Course Title	Diet Therapy and Emerging Trends				
Type of Course	**Elective**				
Semester	8				
Academic Level	400				
Course Details	Credit	Lecture per week	Tutorial per week	Practical per week	Total Hours
	4	4	-	-	60

Course Outcomes (CO):

CO	CO Statement	Cognitive Level*	Knowledge Category#	Evaluation Tools used
CO1	Understand the promotive and therapeutic role of diet and nutritional care With reference to weight management, fevers& infections and diseases of the gastrointestinal tract and hepatobiliary system	U	F	▪ Quiz / Assignment/ Discussion / Seminar ▪ Midterm Exam ▪ Final Exam
CO2	Understand the etiology, physiologic and metabolic anomalies of acute and chronic diseases and patient needs	AP	P	
CO3	Know the effect of the various diseases on nutritional status and nutritional and dietary requirements.	AP	M	
CO4	Able to recommend and provide appropriate nutritional care based on pathophysiology, prevention/ and treatment of the various diet-related disorders/ diseases.	Ap	M	
CO5	Be able to use different nutritional support systems to nourish the patient	Ap	C	

* - Remember (R), Understand (U), Apply (Ap), Analyse (An), Evaluate (E), Create (C)
# - Factual Knowledge(F) Conceptual Knowledge (C) Procedural Knowledge (P) Metacognitive Knowledge (M)

Detailed Syllabus:

Module	Unit	Content	Hrs
I	**DIET THERAPY**		**10**
	1	Definition and Principles;	2
	2	Scope of Dietetics; Responsibilities of a Dietitian	3
	3	Progression of Hospital Diets	2
	4	Enteral and Parenteral Nutrition	3
II	**NUTRITION THROUGH THE YEARS**		**10**
	5	Nutrient Requirements of Infants, Pre-Schoolers, School Children, Adolescents, Adults, and the Elderly – dietary issues and special formulations	4
	6	Dietary Recommendations during Pregnancy and Lactation	3
	7	Nutritional Care of the Low Birth Weight and Pre-term Infant & Children with Special Needs	3
III	**DIET THERAPY FOR CLINICAL CONDITIONS**		**15**
	8	Overweight, Obesity, and Underweight	2
	9	Diabetes (IDDM, NIDDM, and Gestational Diabetes)	2
	10	Cardiovascular Disease (Hypertension and Atherosclerosis)	2
	11	Hepatic Disease (Hepatitis, Cirrhosis, Gall Bladder Disease)	2
	12	Renal Disorders (Glomerulonephritis, Nephrotic Syndrome, Urinary Calculi, ESRD)	2
	13	Gastrointestinal Disorders (Peptic Ulcers, Diarrhoea, Constipation, Irritable Bowel Syndrome)	2
	14	Cancer	2
	15	Osteoporosis	1
IV	**EMERGING NUTRITIONAL NEEDS**		**13**
	16	Allergies and Intolerances	2
	17	Sports Nutrition	1
	18	Nutrition at High Altitudes	2
	19	Nutrition in Space	2
	20	Ergogenic Aids	2
	21	Nutrigenetics & Nutrigenomics	2
	22	Geriatric Nutrition	2
V	Diet Therapy assignment		**12**

Mapping of COs with PSOs and POs :

	PSO 1	PSO 2	PSO 3	PSO4	PSO 5	PSO6	PO1	PO2	PO3	PO4	PO5	PO6
CO 1	1	1	1	1	-	1	1	2	1	1	1	1
CO 2	2	2	2	2	3	2	2	-	2	2	2	2
CO 3	2	-	-	1	-	2	-	1	2	-	-	1
CO 4	1	1	2	1	1	-	1	2	1	1	2	1
CO 5	2	2	-	2	2	1	1	2	2	2	-	2

Correlation Levels:

Level	Correlation
-	Nil
1	Slightly / Low
2	Moderate / Medium
3	Substantial / High

Assessment Rubrics:

- Quiz / Assignment/ Discussion / Seminar
- Midterm Exam
- Final Exam

Mapping of COs to Assessment Rubrics :

	Internal Exam	Assignment	Project Evaluation	End Semester Examinations
CO 1	✓			✓
CO 2	✓			✓
CO 3	✓			✓
CO 4		✓		✓
CO 5		✓		✓
CO 6		✓	✓	✓

Course Title	**Technology of Beverages**				
Type of Course	**Elective**				
Semester	8				
Academic Level	400				
Course Details	Credit	Lecture per week	Tutorial per week	Practical per week	Total Hours
	4	4	-	-	60

Course Outcomes (CO):

CO	**CO Statement**	**Cognitive Level***	**Knowledge Category#**	**Evaluation Tools used**
CO1	Implement and maintain proper food safety and sanitation practices in compliance with industry regulation	Ap	P	• Quiz • Assignment • Discussion • Seminar • Midterm Exam • Final Exam
CO2	Create well-balanced menus considering nutritional requirements, cost constraints, and customer preferences.	C	P	
CO3	Understand procurement processes, negotiate with suppliers, and manage inventory efficiently to control costs.	U	C	
CO4	Develop new marketable, nutritionally and economically viable food products, Develop entrepreneurship skills for setting up small scale food industries, Understand packaging of different food products	Ap	M	
CO5	Demonstrate proficiency in fundamental culinary techniques and food preparation.\Menu Planning and Design:	E	P	

CO6	Understand the cultural significance of different cuisines and culinary traditions, and Preserve and promote traditional culinary practices to enhance cultural tourism.	U	C

* - Remember (R), Understand (U), Apply (Ap), Analyse (An), Evaluate (E), Create (C)

- Factual Knowledge(F) Conceptual Knowledge (C) Procedural Knowledge (P) Metacognitive Knowledge (M)

Detailed Syllabus:

Module	Unit	Content	Hrs
III.	**Unit I**		**10**
	1.	Types of beverages and their importance; status of beverage industry in India;.	2
	2	Manufacturing technology for juice-based beverages;	2
	3	Synthetic beverages; technology of still, carbonated, low-calorie and dry beverages , Isotonic and sports drinks;	4
	4	Role of various ingredients of soft drinks, carbonation of soft drinks	2
I1	**Unit II**		**11**
	5	Specialty beverages based on tea, coffee & cocoa	3
	6	Spices, plant extracts & herbs	2
	7	Fruit Beverages (Non-Alcoholic)	2
	8	Nuts, dairy and imitation dairy-based beverages.	2
	9	International Society of Beverage Technologists (ISBT)	2
III	**Unit III**		**12**
	10	Alcoholic beverages- types, manufacture and quality evaluation;	3
	11	The role of yeast in beer and other alcoholic beverages, ale type beer, lager type beer	3
	12	Technology of brewing process, equipments used for brewing and distillation	3
	13	Wine and related beverages, distilled spirits.	3
IV	**Unit IV**		**15**
	14	Packaged drinking water- definition, types	2
	15	Manufacturing processes	2
	16	Quality evaluation	2
	17	BIS quality standards of Packaged drinking water;	3
	18	Methods of water treatment	2
	19	Mineral water	1
	20	Packaged drinking water	1
	21	Flavoured water	1

	22	Carbonated water	1
V	**OPEN ENDED MODULE:**		**12**
		Beverages for new generation	

Mapping of COs with PSOs and POs :

	PSO 1	PSO 2	PSO 3	PSO4	PSO 5	PSO6	PO1	PO2	PO3	PO4	PO5	PO6
CO 1	1	-	2	1	-	2	1	-	2	-	1	-
CO 2	2	3	-	2	3	-	2	3	-	-	2	3
CO 3	1	-	2	1	-	1	-	1	1	1	-	2
CO 4	2	3	-	2	-	2	2	-	2	3	2	-
CO 5	-	-	1	2	1	-	-	1	-	-	-	1
CO 6	2	-	2	1	-	3	1	-	1	3	1	-

Correlation Levels:

Level	**Correlation**
-	Nil
1	Slightly / Low
2	Moderate / Medium
3	Substantial / High

Assessment Rubrics:

- Quiz / Assignment/Discussion / Seminar
- Midterm Exam
- Final Exam

Mapping of COs to Assessment Rubrics:

	Internal Exam	Assignment	Project Evaluation	End Semester Examinations
CO 1	✓			✓
CO 2	✓			✓
CO 3	✓			✓
CO 4	✓	✓		✓
CO 5		✓		✓
CO 6			✓	✓

Course Title	**Perspectives of Food Science and Technology**				
Type of Course	**MDC**				
Semester	1				
Academic Level	100				
Course Details	Credit	Lecture per week	Tutorial per week	Practical per week	Total Hours
	3	3	-	-	45

Course Outcomes (CO):

CO	CO Statement	Cognitive Level*	Knowledge Category#	Evaluation Tools used
CO1	Understand the components of food and their significance.	U	C	▪ Quiz / Assignment/ Discussion / Seminar ▪ Midterm Exam ▪ Final Exam
CO2	Evaluate the impact of diet on health, considering both macro and micronutrients.	E	C	
CO3	Recognise different types of food adulteration,Food allergens , food poison and understand detection methods.	Ap	P	
CO4	Grasp the concepts of sustainable food practices and their environmental impact	U	F	
CO5	Stay updated on the latest research in nutritional science and Apply knowledge gained to make informed dietary choices.	Ap	M	

* - Remember (R), Understand (U), Apply (Ap), Analyse (An), Evaluate (E), Create (C)
# - Factual Knowledge(F) Conceptual Knowledge (C) Procedural Knowledge (P) Metacognitive Knowledge (M)

Detailed Syllabus:

Module	Unit	Content	Hrs
I	**Introduction, Composition and Nutritive Value of Foods**		**18**
	1	Scope of Food Science and Technology.	2

	2	Functions of food.	1
	3	Major Nutrients: Carbohydrates, Proteins, Lipids, Water.	2
	4	Minor Nutrients : Vitamins , Minerals	2
	5	Composition and Nutritive Value of Pulses, Legumes, Nuts & Oilseeds	3
	6	Composition and Nutritive Value of Meat, Fish, Egg and Milk	3
	7	Composition of Wheat and Rice.	2
	8	Classification and Composition of Fruits, Vegetables and Spices.	3
II	**Introduction to Food Additives**		**8**
	9	INS and E .Numbering	1
	10	Preservatives, Colouring agents, Flavour and Flavour enhancer	2
	11	Anti-oxidants, Artificial sweeteners, Stabilizers.	2
	12	Thickening agents, Anticaking agents,	1
	13	Flour improvers , Leavening agents,	2
III	**Food Adulteration and detection**		**4**
	14	Food Adulteration: Definition , common adulterants found in food.	2
	15	Methods of detection of common Food Adulterants.	2
IV	**Food Processing, Food Safety and Food Quality Assessment**		**6**
	16	Various sectors in Food Processing.	2
	17	Food Safety and Standard act 2006, FSSAI	1
	18	Need for food safety , Hazards in Food - Physical, Chemical and biological.	2
	19	Food Quality Assessment - Nutritional and Sensory	1
V	**Open Ended Module: Potential of Food Technology and innovative foods**		**9**

Mapping of COs with PSOs and POs :

	PSO 1	PSO 2	PSO 3	PSO4	PSO 5	PSO6	PO1	PO2	PO3	PO4	PO5	PO6
CO 1	1	1	2	1	1	1	-	1	1	2	1	1
CO 2	2	2	-	2	2	2	3	2	2	-	2	2
CO 3	2	-	1	-	-	1	-	2	-	1	-	-
CO 4	-	1	2	1	1	2	3	-	1	2	1	1
CO 5	1	1	2	1	1	1	-	1	1	2	1	1

Correlation Levels:

Level	Correlation
-	Nil
1	Slightly / Low
2	Moderate / Medium
3	Substantial / High

Assessment Rubrics:

- Quiz / Assignment/ Discussion / Seminar
- Midterm Exam
- Final Exam

Mapping of COs to Assessment Rubrics :

	Internal Exam	Assignment	Project Evaluation	End Semester Examinations
CO 1	✓			✓
CO 2	✓			✓
CO 3	✓			✓
CO 4	✓	✓		✓
CO 5		✓		✓
CO 6			✓	✓

Course Title	FOOD AND HEALTH				
Type of Course	**MDC**				
Semester	2				
Academic Level	100				
Course Details	Credit	Lecture per week	Tutorial per week	Practical per week	Total Hours
	3	3	-	-	45

Course Outcomes (CO):

CO	CO Statement	Cognitive Level*	Knowledge Category #	Evaluation Tools used
CO1	Understand the components of food and their significance.	U	C	▪ Quiz / Assignment/ Discussion / Seminar ▪ Midterm Exam ▪ Final Exam
CO2	Evaluate the impact of diet on health, considering both macro and micronutrients.	E	C	
CO3	Recognise different types of food adulteration,Food allergens , food poison and understand detection methods.	Ap	P	
CO4	Grasp the concepts of sustainable food practices and their environmental impact	U	F	
CO5	Stay updated on the latest research in nutritional science and Apply knowledge gained to make informed dietary choices.	Ap	M	

* - Remember (R), Understand (U), Apply (Ap), Analyse (An), Evaluate (E), Create (C)
# - Factual Knowledge(F) Conceptual Knowledge (C) Procedural Knowledge (P) Metacognitive Knowledge (M)

Detailed Syllabus:

Module	Unit	Content	Hrs
I	**Health and Nutrition**		**9**

	1	Definition of physical health, mental health, social health and spiritual health-	**2**
	2	Determinants of health	**1**
	3	Definition of terms: Nutrition, under Nutrition and Malnutrition	**1**
	4	Health & Nutritional status – adequate, optimum & good nutrition.	**2**
	5	Food Groups, Food Pyramid	**2**
	6	Balanced diet and BMI	**1**
II	**Food Concepts**		**8**
	7	Functional Foods, Prebiotics, Probiotics, Nutraceuticals.	2
	8	Organic Foods, GM Foods and their Advantages and Disadvantages	3
	9	Fortified Food	1
	10	Heritage Foods	1
	11	Nutrigenetics and Nutrigenomics	1
III	**Food Allergy and Food Poisoning.**		**8**
	12	Food allergy , symptoms and Common food allergens.	2
	13	Anti nutritional factors in foods:	2
	14	Food poisoning: food infection and intoxication : Sources, symptoms, preventive measures	4
IV	**Lifestyle and Food Related Diseases.**		**11**
	15	Obesity, diabetics, Hypertension, CVD and Constipation - Causes, symptoms and prevention	5
	16	HFSS foods and its impact on health	2
	17	Types of diets :Low-carbohydrate diet and low-fat diet, Mediterranean diet, DASH diet	2
	18	Diet therapy	1

	19	Physical Activity and Health- Importance of exercise for overall well-being.	1
V	**Open Ended Module:**		**9**
		Healthy food for wealthy nation	

Mapping of COs with PSOs and POs :

	PSO 1	PSO 2	PSO 3	PSO4	PSO 5	PSO6	PO1	PO2	PO3	PO4	PO5	PO6
CO 1	1	-	1	1	1	1	-	1	1	2	1	1
CO 2	2	3	2	2	2	2	3	2	2	-	2	2
CO 3	1	-	2	-	-	1	-	2	-	1	-	-
CO 4	1	-	1	1	2	1	1	-	1	2	1	1
CO 5	2	3	2	2	-	2	2	1	1	2	1	1

Correlation Levels:

Level	Correlation
-	Nil
1	Slightly / Low
2	Moderate / Medium
3	Substantial / High

Assessment Rubrics:

- Quiz / Assignment/ Discussion / Seminar
- Midterm Exam
- Final Exam

Mapping of COs to Assessment Rubrics :

	Internal Exam	Assignment	Project Evaluation	End Semester Examinations
CO 1	✓			✓
CO 2	✓			✓
CO 3	✓			✓
CO 4		✓		✓
CO 5	✓	✓		✓
CO 6			✓	✓

Course Title	FOOD LAWS AND REGULATIONS				
Type of Course	**SEC**				
Semester	5				
Academic Level	300				
Course Details	Credit	Lecture per week	Tutorial per week	Practical per week	Total Hours
	3	3	-	-	45

Course Outcomes (CO):

CO	CO Statement	Cognitive Level*	Knowledge Category#	Evaluation Tools used
CO1	Develop essential knowledge of FSSAI and Indian food legislation, as well as food-related organizations.	U	C	• Quiz • Assignment • Discussion • Seminar • Midterm Exam • Final Exam
CO2	Help understand the numerous food regulations of Indian food laws.	Ap	P	
CO3	Gain in-depth understanding of international food regulatory authorities.	Ap	P	
CO4	Awareness of laws related to marketing and patents.	U	C	
CO5	Gain an understanding of updates and amendments related to food laws	Ap	P	
* - Remember (R), Understand (U), Apply (Ap), Analyse (An), Evaluate (E), Create (C) # - Factual Knowledge(F) Conceptual Knowledge (C) Procedural Knowledge (P) Metacognitive Knowledge (M)				

Detailed Syllabus:

Module	Unit	Content	Hrs
I	**INDIAN FOOD LAWS**		**12**
	1	Evolution in Food laws and regulations-(PFA to FSSA)	2
	2	Food Safety and Standards Act of India, 2006	3
	3	FSSAI, Structure and Functions	2
	4	APEDA, BIS ,EIC, MPEDA, Spice Board	2
	5	a) Agricultural Produce Act, 1937 (Grading and Marketing) b) Export (Quality Control & Inspection), Act, 1963 and Rules c) Bureau of Indian Standards	3
II	**FSSAI Rules and Regulations**		**13**

	6	Salient features of Food Safety and Standards (Licensing and Registration of Food Businesses) Regulation, 2011	2
	7	Food Safety and Standards (Food Products Standards and Food Additives) Regulation,	2
	8	Prohibition and Restriction of Sales Regulation, 2011	2
	9	Food Recall Procedure) Regulation, 2017	1
	10	Import Regulation, 2017	2
	11	Fortification of Food Regulation 2018	1
	12	Advertising and Claims Regulation- 2018,	1
	13	Food Safety and Standards (Packaging) Regulation, 2018	1
	14	Vegan Foods Regulations, 2022	1
III	**International Agencies in Food Regulation**		**6**
	15	ISO, FAO, WHO, WTO.CODEX Alimentarious Commission	3
	16	GCC Food laws	2
	17	USFDA ,EPA Regulations and European Union food regulation	1
IV	**REGISTRATION, LICENSING AND PATENT**		**5**
	18	FSSAI Registration and licensing	2
	19	Patents and Trademark	3
V	**Open Ended Module: FSSAI Website**		**9**

Mapping of COs with PSOs and POs :

	PSO 1	PSO 2	PSO 3	PSO4	PSO 5	PSO6	PO1	PO2	PO3	PO4	PO5	PO6
CO 1	1	-	2	-	1	-	-	3	-	-	1	-
CO 2	2	-	1	-	2	3	-	2	1	-	2	1
CO 3	-	-	1	1	-	-	1	-	-	1	-	-
CO 4	2	-	2	2	3	-	2	3	-	2	3	-
CO 5	-	1	-	3	-	2	-	-	1	-	-	1
CO 6	1	-	-	1	-	-	3	-	-	1	-	2

Correlation Levels:

Level	Correlation
-	Nil
1	Slightly / Low
2	Moderate / Medium
3	Substantial / High

Assessment Rubrics:

- Quiz / Assignment/Discussion / Seminar
- Midterm Exam
- Final Exam

Mapping of COs to Assessment Rubrics :

	Internal Exam	Assignment	Project Evaluation	End Semester Examinations
CO 1	✓			✓
CO 2	✓			✓
CO 3	✓			✓
CO 4		✓		✓
CO 5		✓	✓	✓

Course Title	FOOD INFORMATICS				
Type of Course	**SEC**				
Semester	6				
Academic Level	300				
Course Details	Credit	Lecture per week	Tutorial per week	Practical per week	Total Hours
	3	3	-	-	45

Course Outcomes (CO):

CO	CO Statement	Cognitive Level*	Knowledge Category#	Evaluation Tools used
CO1	Develop essential knowledge of FSSAI and Indian food legislation, as well as food-related organizations.	U	C	• Quiz • Assignment • Discussion • Seminar • Midterm Exam • Final Exam
CO2	Help understand the numerous food regulations of Indian food laws.	Ap	P	
CO3	Gain in-depth understanding of international food regulatory authorities.	Ap	P	
CO4	Awareness of laws related to marketing and patents.	U	C	
CO5	Gain an understanding of updates and amendments related to food laws	Ap	P	

* - Remember (R), Understand (U), Apply (Ap), Analyse (An), Evaluate (E), Create (C)
# - Factual Knowledge(F) Conceptual Knowledge (C) Procedural Knowledge (P) Metacognitive Knowledge (M)

Detailed Syllabus:

Module	Unit	Content	Hrs
I	**Introduction**		**8**
	1	Data collection - primary and secondary data	2
	2	Methods of collection - census and sampling methods.	2
	3	Classification and tabulation. Diagrammatic and Graphic presentation - bar, pie, histogram, frequency polygon, frequency curve and ogives	4
II	**Food Commodity Authorities and Boards**		**9**
	4	Kerala Cashew Board	1
	5	Coconut Development Board	1
	6	Tea Board of India	1
	7	Coffee Board	1
	8	Spices Board of India	1

	9	National Institutes for Various Food Commodities. e.g. National Research Centre for Banana (NRCB)	4
III	**Food Business Promotion – Social Media**		**8**
	10	Branding, brand building, positioning, marketing strategy, competition analysis	2
	11	Social media for promotion of products – Face book, Twitter, Blogs etc.	2
	12	Search engine optimization & Web designing	2
	13	Graphics, animation and Apps	2
IV	**Trends and Updations**		**11**
	14	Application of data Science in Food and Nutrition Industries.	2
	15	Applications of Artificial Intelligence in Food Processing	2
	16	Nano technology-Application in food industry	2
	17	Sustainable Food and Agriculture – Green Food Processing	2
	18	3D Printing	1
	19	Alternative Proteins- Lab-grown meat	2
V	**Open Ended Module: Computer Lab** Computer Skills for Food Industries		**9**

Mapping of COs with PSOs and POs :

	PSO 1	PSO 2	PSO 3	PSO4	PSO 5	PSO6	PO1	PO2	PO3	PO4	PO5	PO6
CO 1	1	-	2	-	1	-	-	3	-	-	1	-
CO 2	2	-	1	-	2	3	-	2	1	-	2	1
CO 3	-	-	1	1	-	-	1	-	-	1	-	-
CO 4	2	-	2	2	3	-	2	3	-	2	3	-
CO 5	-	1	-	3	-	2	-	-	1	-	-	1
CO 6	1	-	-	1	-	-	3	-	-	1	-	2

Correlation Levels:

Level	Correlation
-	Nil
1	Slightly / Low
2	Moderate / Medium
3	Substantial / High

Assessment Rubrics:

- Quiz / Assignment/Discussion / Seminar
- Midterm Exam
- Final Exam

Mapping of COs to Assessment Rubrics :

	Internal Exam	Assignment	Project Evaluation	End Semester Examinations
CO 1	✓			✓
CO 2	✓			✓
CO 3	✓			✓
CO 4		✓		✓
CO 5		✓	✓	✓

Format of the Question Paper Type I for Major Courses

I Semester B.Sc. (CUFYUGP) Degree Examinations October 2024

FTL1CJ101: <Title of the Major Course>

(credits: 4)

Maximum Time: 2 hours **Maximum Marks: 70**

Section A

[Answer All. Each question carries 3 marks] (Ceiling: 24 Marks)

1.
2.
3.
4.
5.
6.
7.
8.
9.
10.

Section B

[Answer All. Each question carries 6 marks] (Ceiling: 36 Marks)

11.
12.
13.
14.
15.
16.
17.
18.

Section C

[Answer any one. Each question carries 10 marks] (1x10=10marks)

19.
20.

Format of the Question Paper Type II for General Foundation Courses

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I Semester B.Sc. (CUFYUGP) Degree Examinations October 2024

FTL1FM105: <Title of the MDC Course>

(credits: 3)

Maximum Time: 1.5 hours **Maximum Marks: 50**

Section A

[Answer All. Each question carries 2 marks] (Ceiling 16 marks)

1.
2.
3.
4.
5.
6.
7.
8.
9.
10.

Section B

[Answer All. Each question carries 6 marks] (Ceiling 24 marks)

11.
12.
13.
14.
15.

Section C

[Answer any one. Each question carries 10 marks] (1x10=10 marks)

16.
17.
