



UNIVERSITY OF CALICUT

Abstract

General and Academic – Faculty of Science - Modified Scheme and Syllabus of B.Voc Food Technology (Food Processing & Safety Management), incorporating corrections, in tune with the CUFYVP Regulations 2025, with effect from 2025 Admission onwards - Approved u/s 10(13) of CU Act 1975- Orders Issued

G & A - I - F

U.O.No. 13084/2026/Admn

Dated, Calicut University.P.O, 24.09.2026

- Read:-*1. U.O.No. 14335/2025/Admn, dated 14.10.2025.
2. U.O.No. 17240/2025/Admn, dated 15.12.2025.
3. Remarks of the Chairperson, BoS in Food Technology (SB), dated 18.09.2026.
4. Remarks of the Dean, Faculty of Science, dated 22.09.2026.

ORDER

1. The Regulations of the B.Voc Programmes (CUFYVP Regulations 2025), were implemented with effect from 2025 admission onwards, vide paper read as (1) above.
2. The Scheme and Syllabus of B.Voc Food Technology (Food Processing & Safety Management) Programme were implemented, vide paper read as (2) above
3. The Chairperson, Board of Studies in Food Technology (SB), vide paper read as (3) above, approved the modified Scheme and Syllabus for B.Voc Food Technology (Food Processing & Safety Management) Programme in tune with CUFYVP Regulations 2025 with effect from 2025 Admission onwards, after incorporating the following corrections in the syllabus;

- The course code of the following courses are changed as follows;
VAC 1 - FTV3FV108, VAC 2 - FTV4FV109, VAC 3 - FTV5FV110, MDC 1 - FTV1FM105, MDC 2 - FTV2FM106, SEC 1 - FTV1FS111, SEC 2 - FTV4FS112, SEC 3 - FTV5FS113
- The course codes in the Table No. 13 for various courses are corrected as follows;
AEC 2 - XXX2FA120(2), MDC 1 - XXXFM105, MDC 2 - XX2FM106, MDC 3 (KS) - XXX3FM107(2)
- For the course Introduction to Food Technology (FTV1CJ101) - The topic Food Types from module V is distributed into Module 1 Unit 2 and Module 3 Unit 9.
- The term "Hydroxylation" in Module IV, Unit 11, of course Cereals, Pulses & Oil seeds Technology (FTV1CJ102) is replaced with "Hydrogenation".
- For the course Food Facts and Principle (FTV1FM105), The topic from Module V has been redistributed to Module I, Unit 2.
- For the course Basic Food Processing & Preservation (FTV2FM106) The topics covered

under Module V (Nanotechnology) have been incorporated into Module IV.

- For the course Food Packaging Technology (FTV3CJ209) The topics from Module V have been split and incorporated into Module I, Unit 2 and Module IV, Units 13 and 14.
- For the course Basic Numerical Skills, Systems and Methodologies (FTV3FV108), The topics from Module V have been redistributed to Module IV, Units 14, 15, and 16.
- For the course Internal Auditing Food Processing (FTV4FV109), The topics from Module V have been redistributed to Module IV, Units 9, 10, and 11.
- For the course Food Toxicology (FTV5FV110), The topics from Module V have been redistributed to Module IV, Units 11, 12, and 13.
- The academic level range mentioned in the detailed syllabus portion of all the courses has been modified.
- The course title in the detailed syllabus portion for FTV4FV109 - is corrected as "Internal Auditing Food Processing".
- The title of the programme is corrected as "B.Voc Food Technology (Food Processing & Safety Management)".

4. The Dean, Faculty of Science vide paper read as (4) above, approved the recommendation of the Chairperson, Board of Studies in Food Technology (SB).
5. Considering the urgency, the Vice Chancellor has approved the recommendation of the Board of Studies in Food Technology (SB) and accorded sanction to implement the modified Scheme and Syllabus of B.Voc Food Technology (Food Processing & Safety Management) Programme, incorporating corrections, in tune with the CUFYVP Regulations 2025, with effect from 2025 Admission onwards, u/s 10(13) of CU Act 1975.
6. The modified Scheme and Syllabus of B.Voc Food Technology (Food Processing & Safety Management) Programme, incorporating corrections, in tune with the CUFYVP Regulations 2025 are therefore implemented with effect from 2025 Admission onwards. (Syllabus appended)

Ajayakumar T.K

Assistant Registrar

To

The Colleges concerned.

Copy to: PS to VC/PA to PVC/PA to Registrar/PA to CE/JCE I/JCE III /EX and EG Sections/FYUGP Cell/SF/DF/FC.

Forwarded / By Order

Section Officer

UNIVERSITY OF CALICUT



(CUFYVP Regulations 2025)

Name of the Programme: B.Voc Food Technology (Food Processing and Safety Management)	
Awarding Faculty	Faculty of Science
Board of Studies	Board of Studies in Food Technology, University of Calicut
Regulation Followed	CUFYVP Regulations 2025
Pattern of the Programme	CUFYVP
Whether Programme required Approval from a Regulatory Council	Not required

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1.REGULATIONS

The existing regulations of Choice-Based Credit Semester System (UO No. 8018/ 2025/ Admn. Dated 29-05-2025) which are applicable for CUFYVP Regulations 2025 are applicable for this programme with the following exceptions.

Objectives

- 1.1 To equip students with a strong foundation in food science and technology, enabling them to understand and apply the principles of food processing, preservation, quality control, and safety.
- 1.2 To develop skilled graduates capable of addressing current and future challenges in the food industry through innovation, research, ethical practices, and sustainable solutions.

Rules and regulations applicable only to the B. Voc. Food Technology programme (if any).

2.PROGRAMME OUTCOMES (PO)

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

PO No.	Graduate Attributes	PO Statement
PO1	Knowledge and Technical Expertise	Apply fundamental and advanced knowledge of food science and technology to solve problems related to food processing, safety, and quality.
PO2	Problem Solving and Innovation	Identify, analyze, and develop innovative solutions for challenges in food product development, preservation, and packaging.
PO3	Research and Analytical Skills	Design experiments, analyze data, and interpret results to address real-world issues in food technology and quality assurance.
PO4	Environment and Sustainability	Demonstrate awareness of environmental, health, and sustainability issues related to food production and adopt ecofriendly technologies.
PO5	Ethics and Professionalism	Uphold ethical practices, food laws, and safety regulations in all aspects of food technology and industrial practices.
PO6	Communication and Teamwork	Communicate effectively and work collaboratively in multidisciplinary teams within food industries and research settings.
PO7	Lifelong Learning and Adaptability	Engage in continuous learning to stay updated with advancements in food science, technology, and related regulatory frameworks.

3.PROGRAMME SPECIFIC OUTCOMES

PSO No.	PSO Statement
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

4.ELIGIBILITY FOR ADMISSION

Candidates who have passed (Eligible for Higher Studies) the HSE of the Kerala State Board of Higher Secondary Examination or any other examination recognized as equivalent thereto with Science and Mathematics/Computer Science/Vocational courses like Agriculture, Dairy Science etc. are eligible for admission.

5.QUALIFICATION PACKS (QPs)

Sl. No.	Semester	Sector Skill Council (SSC)	QP Code	Job Role
Under graduate Certificate (NSQF level 4.5)				
QP1	1	FICSI – Sector Skill Council for Food Processing Industries	FIC/Q5001	Plant Baker
	2	SSC – Food Processing (FICSI)	FIC/Q1002	Milling Technician/ Supervisor
Under Graduate Diploma (NSQF level 5.0)				
	3	SSC – Food Processing (FICSI)	FIC/Q7602	Artisanal Wine Maker

	4	SSC – Food Processing (FICSI)	FIC/Q7603	Supervisor-Fruits and Vegetables
B. Voc. Degree (NSQF level 5.5)				
	5	SSC – Food Processing (FICSI)	FIC/Q7608	Quality Assurance Manager
	6	SSC – Food Processing (FICSI)	FIC/Q9002	Food Microbiologist/ Internal Auditor
PG Diploma (NSQF level 6.0)				
	7 & 8	SSC – Food Processing (FICSI)	FIC/Q9003	Production Manager/ Food Regulatory Affairs Manager

6. PROGRAMME STRUCTURE

The B.Voc. curriculum comprises two key components: General Education Components (GEC) and Skill Development Components (SDC). Each academic year integrates both to ensure a well-rounded learning experience. SDC accounts for a minimum of 60% and a maximum of 70% of the total credits, while GEC comprises the remaining portion. To graduate with a B.Voc. degree, students must earn 140 credits over three years. Additionally, they may complete a one-year apprenticeship / internship / project work, along with three online courses of four credits each from either the major or minor pathway, to earn 40 additional credits, leading to a Post Graduate Diploma.

6.1.General Education Components

Title	Course Type	Credit	No. of Courses	Total Credits
Foundation Courses	Ability Enhancement Course (AEC)	3	3	9
	Multi-Disciplinary Course (MDC)	3	3	9
	Value Added Course (VAC)	3	1	3
	Skill Enhancement Course (SEC)	3	1	3
Discipline Specific Courses	Minor Pathway Courses (DSC)	4	6 + 3*	24 + 12*
Total Credit for GEC				48 + 12*

6.2.Skill Development Components

Title	Course Type	Credit	No. of Courses	Total Credits
Foundation Courses	Value Added Course (VAC)	3	2	6
	Skill Enhancement Paper (SEC)	3	2	6
	Major pathway Courses (DSE)	4	17 + 3*	68 + 12*
Discipline Specific Courses	Internship / Apprenticeship / Project Work	-	-	40
	On Job Training (OJT)	60 Hours Mandatory		
Total Credit for SDC				120 + 12*

*Three online Discipline-Specific Courses (DSC), approved by the Board of Studies, may be studied in either the major or minor discipline.

Students may choose a minor pathway from the discipline-specific options listed below. The degree awarded will correspond to the selected minor pathway.

- Major with Minor – All six (6) minor courses from same discipline *Eg. B. Voc. Food Technology with minor in Microbiology*
- Major with Vocational Minor – All six (6) minor course from same vocational discipline
Eg. B. Voc. Food Technology with Vocation Minor Nutrition Science and Dietetics
- Major with Multiple discipline – Out of Six (6) minor courses, two groups of three (3) courses from two (2) different disciplines
Eg. B. Voc. Food Technology with Microbiology and Biochemistry
- Single Major – Any six (6) minor courses from different disciplines *Eg. B. Voc. Food Technology*

1. MINIMUM CREDIT REQUIREMENTS

Duration	General Education Components (GEC)						Skill Development Component (SDC)				Total Credits
Undergraduate Certificate (1 Years)	MDC	AEC	VAC	SEC	Minor	Total GEC	SEC	VAC	Major	Total SDC	Total GEC + SDC
	6	9	-	-	8	23	3	-	24	27	50
Exit with Undergraduate Certificate (requires two additional 4-credit SDC online courses and 30 hours of mandatory onthe-job training (OJT)).											

Duration	General Education Components (GEC)						Skill Development Component (SDC)				Total Credits
Undergraduate Diploma (2 Years)	MDC	AEC			Minor	Total GEC	SEC	VAC	Major	Total SDC	Total GEC + SDC
	9	9			20	38	6	6	52	64	102
Exit with Undergraduate Diploma (requires two additional 4-credit SDC online courses and 60 hours of mandatory on-the-job training (OJT))											

Duration	General Education Components (GEC)	Skill Development Component (SDC)	Total Credits

Duration	General Education Components (GEC)						Skill Development Component (SDC)				Total Credits
B. Voc. Degree (3 Years)	MDC	AEC			Minor	Total GEC	SEC	VAC	Major	Total SDC	Total GEC + SDC
	9	9			24	42	9	9	68 +12*	98	140
Exit with a B. Voc. Degree with 140 credits or proceed to the PG Diploma. 60 hours on-the-job training (OJT) is mandatory.											

* Internship/ Apprenticeship/ Project Work

Duration	Major (SDC) / Minor (GEC) Components	Internship/ Apprenticeship/ Project (SDC)	Total
PG Diploma (4th Year)	3 Online Courses of 4 Credits each (12 Credits)	28	40

Exit with B. Voc. Degree + PG Diploma (180 credits) 60
hours on-the-job training (OJT) is mandatory

8.SEMESTER WISE COURSE DISTRIBUTION

Semester	Course Type	Credits	Theory Hours	Practical Hours	Internal	External	Total Marks	Total Credits	Total Hours / Week or Semester	Total Marks
1	Major 1	4	3	2	40	60	100	25	27/29	625
	Major 2	4	3	2	40	60	100			
	Major 3	4	4		40	60	100			
	Minor 1	4	3 / 4	2/0	30	70	100			
	AEC 1	3	2	2	25	50	75			
	SEC 1	3	3		25	50	75			
	MDC 1	3	3		25	50	75			
2	Major 4	4	3	2	40	60	100	25	27/29	625
	Major 5	4	3	2	40	60	100			
	Major 6	4	4		40	60	100			
	Minor 2	4	3 / 4	2/0	30	70	100			
	AEC 2	3	3		25	50	75			
	AEC 3	3	2	2	25	50	75			
	MDC 2	3	3		25	50	75			
	OJT	-	-	30*	-	-	-			
3	Major 7	4	3	2	40	60	100	26	26/28/30	650
	Major 8	4	3	2	40	60	100			
	Major 9	4	4		40	60	100			
	Minor 3	4	3 / 4	2/0	30	70	100			
	Minor 4	4	3 / 4	2/0	30	70	100			
	VAC 1	3	3		25	50	75			
	MDC 3	3	3		25	50	75			
4	Major 10	4	3	2	40	60	100	26	28/30	650
	Major 11	4	3	2	40	60	100			
	Major 12	4	4		40	60	100			
	Elective 1	4	4		40	60	100			
	Minor 5	4	3 / 4	2/0	30	70	100			
	VAC 2	3	3		25	50	75			
	SEC 2	3	3		25	50	75			
	OJT	-	-	30*	-					
5	Major 13	4	3	2	40	60	100	26	27/29	650
	Major 14	4	3	2	40	60	100			
	Major 15	4	4		40	60	100			
	Elective 2	4	4		40	60	100			
	Minor 6	4	3 / 4	2/0	30	70	100			
	VAC 3	3	3		25	50	75			

	SEC 3	3	3		25	50	75			
6	I/A/P	12			120	180	300	12	500	300
7 & 8	Online 1	4					100	40	1000	1000
	Online 2	4					100			
	Online 3	4					100			
	I/A/P	28			100	600	700			

*Number of learning hours per semester

9.LIST OF MAJOR COURSES OFFERED

Semester	Course Type	Course Code	Course Title	Credits	Theory Hours	Practical Hours	Internal	External	Total Marks
1	Major 1	FTV1CJ101	Introduction to Food Technology	4	3	2	40	60	100
	Major 2	FTV1CJ102	Cereals, Pulses & Oilseeds Technology	4	3	2	40	60	100
	Major 3	FTV1CJ103	Food Chemistry	4	4	0	40	60	100
2	Major 4	FTV2CJ104	Food Microbiology	4	3	2	40	60	100
	Major 5	FTV2CJ105	Technology of Fruits and Vegetables Processing	4	3	2	40	60	100
	Major 6	FTV2CJ106	Food Processing and Preservation	4	4		40	60	100
	Audit	FTV2CJ150	OJT/Skill Development Training	-	-	30#	-	-	-
3	Major 7	FTV3CJ207	Spices & Plantation Products Technology	4	3	2	40	60	100
	Major 8	FTV3CJ208	Dairy Technology	4	3	2	40	60	100
	Major 9	FTV3CJ209	Food Packaging Technology	4	4		40	60	100
4	Major 10	FTV4CJ210	Technology of Animal Foods	4	3	2	40	60	100
	Major 11	FTV4CJ211	Nutrition and Health	4	3	2	40	60	100
	Major 12	FTV4CJ212	Food Engineering	4	4		40	60	100
	Elective 1	FTV4EJ201/ FTV4EJ202/ FTV4EJ203	Beverage Technology / Confectionery Technology/ Food Extrusion Technology	4	4		40	60	100
	Audit	FTV4CJ250	OJT/ Skill Development Training	-	-	30#	-	-	-
5	Major 13	FTV5CJ313	Food Production Management	4	3	2	40	60	100
	Major 14	FTV5CJ314	Analysis of Foods	4	3	2	40	60	100

	Major 15	FTV5CJ315	Food Regulatory Affairs Management- Quality Assurance	4	4		40	60	100
	Elective 2	FTV5EJ301/ FTV5EJ302/ FTV5EJ303	Food Biotechnology/Food Enzyme Technology/ Food Fermentation Technology	4	4		40	60	100
6	I/A/P	FTV6CJ300	Internship/ Apprenticeship/ Project Work	12			120	180	300
7 & 8	Online 1	FTV8CJ401	NPTEL-Food Oils and Fats: Chemistry and Technology	4*					100*
	Online 2	FTV8CJ402	NPTEL- Post-Harvest Operations and Processing of Fruits, Vegetables, Spices and Plantation Crop Products	4*					100*
	Online 3	FTV8CJ403	NPTEL- Fundamentals of Food Process Engineering	4*					100*
	I/A/P	FTV8CJ400	Internship/ Apprenticeship/ Project Work	28			280	420	700
TOTAL				108 / 120*			2700 / 3000*		
* Credits and Total Marks depend on the course chosen from the major or minor pathway in the fourth year. # Number of learning hours per semester									

10. LIST OF ELECTIVE COURSES OFFERED

Semester	Course Type	Course Code	Course Title	Credits	Theory Hours	Internal	External	Total Marks
4	Elective 1 (Any one)	FTV4EJ201	Beverage Technology	4	4	40	60	100
		FTV4EJ202	Confectionery Technology	4	4	40	60	100
		FTV4EJ203	Food Extrusion Technology	4	4	40	60	100
5	Elective 2 (Any one)	FTV5EJ301	Food Biotechnology	4	4	40	60	100
		FTV5EJ302	Food Enzyme Technology	4	4	40	60	100
		FTV5EJ303	Food Fermentation Technology	4	4	40	60	100

11. LIST OF ONLINE COURSES OFFERED

Semester	Course Title	Platform	Course details	Mark

12. LIST OF FOUNDATION COURSES OFFERED

Semester	Course Type	Course Code	Course Title	Credits	Theory Hours	Internal	External	Total Marks
1	SEC 1 - SDC	FTV1FS111	Basic Food Quality and Safety	3	3	25	50	75
1	MDC 1-GEC (Other Dept)	FTV1FM105	Food Facts and Principle	3	3	25	50	75
2	MDC 2 -GEC (Other Dept)	FTV2FM106	Basic Food Processing & Preservation	3	3	25	50	75
3	VAC 1-SDC	FTV3FV108	Basic Numerical Skills, Systems and Methodologies	3	3	25	50	75
4	SEC 2- SDC	FTV4FS112	Food Storage and Infestation Controls	3	3	25	50	75
4	VAC 2- SDC	FTV4FV109	Internal Auditing Food Processing	3	3	25	50	75
5	VAC 3- SDC	FTV5FV110	Food Toxicology	3	3	25	50	75
5	SEC 3- SDC	FTV5FS113	Instrumental Food Analysis & Techniques	3	3	25	50	75

13. FOUNDATION COURSES FROM OTHER DEPARTMENTS

Sem.	Course Code	Code	Department
1	AEC1	ENG1FA101(2)	English
	MDC1	XXXFM105	
2	AEC2	XXX2FA120(2)	Additional language
	AEC3	ENG2FA103(2)	English
	MDC2	XX2FM106	
3	MDC3(KS)	XXX3FM107(2)	Language

14. GROUPING OF VOCATIONAL MINOR COURSES

Minor Title: Applied Microbiology & Advanced Food Chemistry

Groups 1 and 2 may be offered to students from any discipline other than their major.

Group 3 is available exclusively to B. Voc. students from other disciplines.

Group 1 Title - Applied Food Microbiology									
Semester	Course Type	Course Code	Course Title	Credits	Theory Hours	Practical Hours	Internal	External	Total Marks
1	Minor 1	FTV1VN101	Basic Food Microbiology	4	3	2	30	70	100
2	Minor 2	FTV2VN102	Microbial Food Safety and Public Health	4	3	2	30	70	100
3	Minor 3	FTV3VN203	Industrial Food Microbiology	4	3	2	30	70	100

Group 2 Title – Advanced Food Chemistry									
Semester	Course Type	Course Code	Course Title	Credits	Theory Hours	Practical Hours	Internal	External	Total Marks
3	Minor 4	FTV3VN204	Chemistry of Food Additives	4	3	2	30	70	100
4	Minor 5	FTV4VN205	Functional Foods & Nutraceuticals	4	3	2	30	70	100
5	Minor 6	FTV5VN306	Food Enzymology	4	3	2	30	70	100

15. SCHEME OF EVALUATION

Major Pathway Courses (Vocational)						
4 Credit course with Open Module (60 CSE + 40 ECS)						
External (60)	Internal (30)			Open Ended Module - Internal(10)		
End Sem Examination	Mid Sem	Assignment	Seminar	Test	Rubrics 1	Rubrics 2
60	20	5	5	5	3	2
4 Credit course with Practical / Practicum (60 CSE + 40 ECS)						
External (60)	Internal (10)			Practical / Practicum - Internal (30)		
End Sem Examination	Mid Sem	Assignment	Seminar	practical/exercise	Exam/Viva	Record
60	5	3	2	15	10	5

Minor Pathway Courses						
4 Credit Courses with Open Ended Module (70 ESE + 30 CES)						
External (70)	Internal (20)			Open Ended Module -Internal (10)		
End Semester Examination	Mid Sem	Seminar / Viva / Quiz	Assignment	Test	Seminar / Viva / Quiz	Assignment
70	10	6	4	4	4	2
4 Credit Courses with Practical / Practicum (70 ESE +30 CES)						
External (70)	Internal (10)			Practical / Practicum - Internal (20)		
End Semester Examination	Mid Sem	Seminar / Viva / Quiz	Assignment	Practical/Exercise	Exam/Viva	Record
70	5	3	2	10	7	3

Suggested methods of Open-Ended Module Assessment (Rubrics 1 & 2) include:

Note: Any pedagogical approach specifically designed for course evaluation as proposed by the Board of Studies (BOS) or Expert Committee.

16. GUIDELINES FOR OJT / INTERNSHIP / APPRENTICESHIP / PROJECT WORK

a. On Job Training (OJT)

Students shall undertake mandatory On-the-Job Training (OJT) for a minimum duration of thirty (30) hours in both Semester II and Semester IV. These skill development components shall be designated as audit courses.

To be eligible for a 'Pass' in an audit course, students are required to achieve a minimum of seventy-five percent (75%) attendance. Students who fulfil this attendance requirement are exempt from participation in continuous assessment for the audit course. Notwithstanding the foregoing, a student who does not meet the attendance requirement shall be required to undergo a prescribed evaluation to satisfy the course requirements.

Successful completion of an audit course, evidenced by meeting the attendance requirement or, where applicable, by successfully passing the prescribed evaluation, shall result in a 'Pass' grade with zero (0) academic credits.

16.2. Internship / Apprenticeship / Project Work (I/A/P)

Internship, Apprenticeship, or Project work constitute a critical capstone component of the B.Voc. programme. This component provides students with structured opportunities to apply theoretical knowledge in real-world settings, develop domain-specific competencies, promote workplace readiness, and align learning outcomes with industry standards and expectations.

I/A/P may be completed in any recognised industry, organisation, start-up, research laboratory, or field site. Each student shall be assigned a faculty supervisor by the parent department and, where applicable, shall be supported by an industrial mentor. A learning agreement shall be signed by the student, faculty supervisor, and the host institution / industry prior to the commencement of the I/A/P.

I/A/P Report

Upon successful completion of the I/A/P, each student shall prepare a comprehensive report detailing the observations made and knowledge gained during the training period. Students are advised to consult their industrial mentor or faculty supervisor for the assignment of specific topics or problems upon which the final report shall be based. Maintaining a daily diary throughout the I/A/P is mandatory, as it shall serve as a valuable resource for compiling the final report by systematically incorporating daily learning and experiences. The final report must be duly signed by both the industrial mentor and faculty supervisor to be considered valid.

The evaluation of the report shall be based on the following criteria:

Sl.	Criteria	Description
1	Originality	Uniqueness and independent thought demonstrated in the report.
2	Content Adequacy and Relevance	Thoroughness, coherence, and purposefulness of the write-up
3	Presentation Quality	Organisation, adherence to specified format, clarity of visual aids (drawings, sketches), writing style, and language
4	Learning Experience	Breadth, depth, and relevance of the practical learning acquired during the I/A/P
	Application and Theory Linkage	Demonstration of practical applications and the clear connection to basic theoretical concepts taught in the academic curriculum

Evaluation Process

A minimum of three (3) internal reviews shall be conducted to evaluate progress during the I/A/P. Internal evaluation shall be conducted jointly by the faculty supervisor and the industrial mentor, while the final evaluation shall be carried out by an evaluation panel

comprising: one (1) external examiner from the University-approved panel, one (1) internal faculty member from the college, and one (1) industry representative.

Students shall be required to submit the following documents at the time of the evaluation: an internship completion certificate, an attendance statement and an I/A/P report. Each student shall present their work and participate in a viva voce before the evaluation panel. To be eligible for a 'Pass', students must obtain a minimum of fifty percent (50%) marks in the I/A/P.

Internship - Evaluation Components

Sl. No.	Components of Evaluation of Internship / Apprentice	Type	Marks of Evaluation (300)	Marks of Evaluation (700)
1.	Attendance	Internal Evaluation (120 / 280)	20	40
2.	Team work evaluation		20	40
3.	Log book		20	50
4.	Reviews (3)		60	150
5.	Internship Report	External Evaluation (180 / 420)	60	140
6.	Presentation		60	140
7.	Viva Voce		60	140
	Total		300	700

Apprenticeship - Evaluation Components

Sl. No.	Components of Evaluation of Apprenticeship	Type	Marks of Evaluation (300)	Marks of Evaluation (700)
1.	Attendance	Internal Evaluation (120 / 280)	20	40
2.	Skill proficiency evaluation		20	40
3.	Log book		20	50
4.	Reviews (3)		60	150
5.	Work Report	External Evaluation (180 / 420)	60	140
6.	Presentation		60	140
7.	Viva Voce		60	140
	Total		300	700

Project Work - Evaluation Components

Sl. No	Component of External Evaluation	Type	Marks of External Evaluation (300)	Marks of External Evaluation (700)
1	Project Proposal and Planning	Internal	15	25
	Objectives and Problem Definition		15	25

	Literature Review / Background Work	Evaluation (120 / 280)	15	80
	Methodology / System Design		15	30
2	Reviews (3)		60	120
4	Project Report	External Evaluation (180 /420)	60	120
5	Project Demonstration		60	150
6	Viva Voce		60	150
Total Marks			300	700

17. LETTER GRADES AND GRADE POINTS

Letter Grade	Grade Point	Percentage of Marks (Internal & External Put Together)	Class
O (Outstanding)	10	95 % and above	First Class with Distinction
A+ (Excellent)	9	Above 85% and below 95%	
A (Very Good)	8	75% to below 85%	
B+ (Good)	7	65 % to below 75%	First
B (Above Average)	6	55 % to below 65%	
C (Average)	5	45 % to below 55%	Second
P (Pass)	4	35 % to below 45% aggregate (Internal + External) with a minimum of 30 % in the external valuation	Third
F (Fail)	0	Below an aggregate of 35% or below 30% in external evaluation	Fail
Ab (Absent)	0	-	Fail

Sum of the credit points of all the courses in a semester

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

Sum of the credit points of all the courses in all the semesters

$$CGPA = \frac{\text{Sum of the credit points of all the courses in all the semesters}}{\text{Total credits in all semesters}}$$

18. DETAILED SYLLABUS OF MAJOR COURSES

Course Code & Title	FTV1CJ101	Introduction to Food Technology			
Type of Course	Major	Semester	1	Academic Level	100-199
Course Details	Credit	Lecture per week	Tutorial per week	Practical per week	Total Hours
	4	3		2	60
Pre-requisites	Basic understanding of biology and chemistry. Helpful for grasping concepts like food composition, nutrition, spoilage, and processing.				
Course Summary	Provides a foundational understanding of the food science and technology field.				

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/ Seminar/ Discussion/ Mid-term exam
CO2	To Remember the basic Food groups like cereals, pulses, oilseeds, fruits vegetables, spices, meat, fish, poultry, seafood, 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	
CO5	Describe the principles and methods of food preservation and evaluate their impact on food quality and safety	U	F	
CO6	Explain the role of food regulatory bodies and assess the importance of food laws and labeling in ensuring consumer protection.	E	P	
* - Remember (R), Understand (U), Apply (Ap), Analyze (An), Evaluate (E), Create (C) # - Factual Knowledge(F) Conceptual Knowledge (C) Procedural Knowledge (P) Metacognitive Knowledge (M)				

Detailed Syllabus:

Module	Unit	Content	Hours	Marks
I	Introduction		10	16
	1	Scope of Food Science and Technology.	3	3
	2	Definition and Function of food. Types of food- Healthy foods, functional foods, Probiotics, Prebiotics, Nutraceuticals, organic foods, GM foods.	3	6
	3	Definition, classification, function and sources of - Water, Carbohydrates, Proteins, Lipids, Vitamins and Minerals	9	7
II	Composition and nutritive value		12	14
	4	Pulses & Legumes, Nuts & Oilseeds, Meat, Fish, Egg and Milk	4	5
	5	Structure and composition of Wheat and Rice.	4	5
	6	Classification and Composition of Fruits, Vegetables and Spices	7	4
III	Food Quality Assessment		8	11
	7	Sensory assessment	3	3
	8	Appearance of food -Visual perception, color of foods, smell, flavor and taste.	2	3
	9	Threshold tests, difference tests, ranking test & hedonic scale. Major food Research centers in India. CFTRI, DFRL, NIFTEM, IIFPT & CIFT. Major Food Industries in India. Journals of Food Science & Technology, Indian Food Industry, Beverage Food World, Indian Food Packer, AFST (I)	5	5
IV	Food Additives		18	19
	10	Food additives- definition and classification.	3	3
	11	Preservatives, coloring agents, flavoring agents and flavor enhancer	5	5
	12	Antioxidants, Artificial sweeteners, stabilizers, thickening agents, anticaking agents, bleaching and maturing agents. Flour improvers, leavening agents, surface active agents	10	11
V	Practicals		30	30
	13	Standardization of NaOH & HCl		
		Determination of moisture		
		Determination of acidity and pH		
		Qualitative test for carbohydrates and proteins		
		Qualitative analysis of protein by colorimetry		
		Analysis of lipids: Iodine value		

	Free fatty acids Peroxide value Saponification value		
	Analysis of water: Hardness Alkalinity Acidity Chloride		
	Qualitative methods – protein, carbohydrate, fat ash & fibre		
	Microbiological tests of water and milk		

References:

1. Potter NN, Hotchkiss JH. Food Science. CBS publishers and distributors
2. S. Manany, N S. Swamy Food Facts and Principles. New Age International Publishers
3. Murano, Peter S. Understanding Food Science and Technology. Thomson
4. Sumati R Mudambi, Rajagopal M V. Fundamentals of Food and Nutrition. New Age International Publishers
5. Shubhangini A Joshi. Nutrition and Dietics. Tata McGraw Hill Education Private Limited
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Mapping of CO's with:

	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6
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

Mapping of CO's to Assessment Rubrics:

	Rubrics 1	Rubrics 2	Rubrics 3	Rubrics 4
CO 1	✓			✓
CO 2	✓			✓
CO 3	✓			✓
CO 4		✓		✓
CO 5		✓	✓	✓
CO 6			✓	✓

Course Code & Title	FTV1CJ102	Cereals, Pulses & Oilseeds Technology			
Type of Course	Major	Semester	1	Academic Level	100-199
Course Details	Credit	Lecture per week	Tutorial per week	Practical per week	Total Hours
	4	3		2	60
Pre-requisites	Foundational knowledge in basic food science and related subjects like food science, food chemistry, food microbiology etc.				
Course Summary	It will develop a critical understanding of the uniqueness of wheat as a cereal grain in the world food supply. Students will learn to appreciate the complex nature of flour and the complexity of modern baking technology. Students will develop competency to critically evaluate quality of product formulation and processing,				

Course Outcomes (CO):

CO	CO Statement	Cognitive Level*	Knowledge Category#	Evaluation Tools used
CO1	Memorise details of millet chemistry	U	C	Quiz/ Assignment/
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	Seminar/ Discussion/ Mid-term exam
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	Hours	Marks
I	Technology of Wheat and Rice		15	16
	1	Wheat	5	
		Structure of Wheat, Gluten, Milling of wheat, by-products – Whole wheat flour, Maida, semolina, Gluten.		
	2	Rice Milling of rice, by-products of rice milling – Husk, Bran, Broken rice Parboiling-Merits and demerits, Curing, ageing of rice, Rice products – Flaked rice, Puffed rice.	10	
II	Technology of Bakery products		15	15
	3	Introduction and principles of bread baking.	2	
	4	Bread making Role of ingredients, Bread faults & remedies, staling of bread.	5	
	5	Cake making, Role of ingredients, Types of making, cake faults and remedies.	4	
	6	Biscuits & Cookies, their ingredients technology of Crackers and Wafers, technology of Biscuits.	4	
III	Millets & Pulses		15	14
	7	Pearl millet, Finger millet: Nutritive value and composition. Processing and utilization of ragi.	5	
	8	Pulses-Processing- Soaking, Germination, Decortication, Cooking and Fermentation.	5	

	9	Antinutritional factors, Factors affecting cooking quality and time.	5	
IV	Nuts & Oil seeds		15	15
	10	Sources, Composition and nutritive value of oils. Processing of oil seeds – Soya bean, coconut.	7	
	11	Process of oil refining-bleaching, de-odorizing, hydrogenation, shortening, margarine.	4	
	12	Protein isolates, Texturized vegetable protein	4	
V	Practical		30	30
	13	1.Determination of moisture 2 Determination of ash 3 Sedimentation value 4 Determination of alcoholic acidity 5 Estimation of gluten 6 Determination of water absorption power 7 Qualitative analysis of gluten- Pelshenke value 8 Determination of falling number		
		9 Preparation of bread 10 Preparation of biscuits & Cookies 11 Preparation of cake 12 Determination of physical parameters of wheat and rice		

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- 1.Hui, Y.H, Bakery products, Science and Technology, Black Well publishing, 2006
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4. Dendy D A V & Dobraszczyk BJ Cereals and cereal products, Aspen
5. Kent NL 1983 Technology of cereals Pergamon press
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8. Faridi H. Science of Cookie & Cracker Production.
9. S. Manany, N S. Swamy Food Facts and Principles. New Age International Publishers.
10. Srivastava RP & Kumar S .2003 Fruit and Vegetable preservation Principles and Practices. Interntional Book Distributors

Mapping of CO's with:

	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6
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

Mapping of CO's to Assessment Rubrics:

	Rubrics 1	Rubrics 2	Rubrics 3	Rubrics 4
CO 1	✓			✓
CO 2	✓			✓
CO 3	✓			✓
CO 4		✓		✓
CO 5		✓	✓	✓
CO 6			✓	✓

Course Code & Title	FTV1CJ103	Food Chemistry			
Type of Course	Major	Semester	1	Academic Level	100-199
Course Details	Credit	Lecture per week	Tutorial per week	Practical per week	Total Hours
	4	4		0	75
Pre-requisites	Basic understanding of general and organic chemistry, biomolecules (like carbohydrates, proteins, and fats), and introductory food science. Helpful for understanding the chemical composition of food, behavior of nutrients, role of food additives like emulsifiers and preservatives, as well as concepts like colloids, pigments, and browning reactions.				
Course Summary	Introduces the chemical composition of food and the role of nutrients like carbohydrates, proteins, lipids, vitamins, and minerals. Covers the behavior of these components during processing, storage, and cooking. Includes study of food additives, pigments, enzymes, emulsifiers, and browning reactions. Emphasizes the chemical changes that affect food quality, safety, and nutritional value.				

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/ Seminar/ Discussion/ Mid-term 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	Analyze the factors which influence the textural quality of foods	An	M	
CO5	Analyze the various constituents of foods	An	F	
* - Remember (R), Understand (U), Apply (Ap), Analyze (An), Evaluate (E), Create (C) # - Factual Knowledge(F) Conceptual Knowledge (C) Procedural Knowledge (P) Metacognitive Knowledge (M)				

Detailed Syllabus:

Module	Unit	Content	Hours	Marks
I	Classification, Structure, Sources & Properties of Carbohydrates, Proteins, Lipids and Water		14	25
	1	Classification, structure, sources & properties of Carbohydrates.	3	
	2	Classification, structure, sources & properties of proteins	3	
	3	Classification, structure, sources & properties of Lipids.	3	
	4	Classification, sources, properties & deficiency disorders of minor nutrients (Vitamins, Minerals)	3	
	5	Water: Structure, Physical and chemical properties of ice and water. Free and bound water. Methods of moisture determination in foods, Water activity	2	
II	Pigments		8	8
	6	Structure, sources and properties of pigments, Chlorophyll and Carotenoids, Flavonoids and anthocyanins, Anthoxanthins and myoglobin,	4	

III	7	Methods to prevent discoloration of natural pigments.	2	
	Enzymes		14	15
	8	Introduction, definition, occurrence	3	
	9	Classification and properties, Factors effecting enzyme activity.	6	
	10	Enzymes in food and its applications in food industry	5	
IV	Colloids		9	12
	11	Chemistry of colloids	3	
	12	Properties of solutions, sols, suspensions and emulsions	3	
	13	Types of emulsions and emulsifying agents, food colloids	3	
	Open Ended Module		7	
V	Natural food pigments and their application.			

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1. Food and Nutrition M. Swaminathan
 2. Fundamentals of Food & Nutrition S R. Mudambi, M.V. Rajagopal
 3. Handbook of Food and Nutrition M Swaminathan
 4. Food Chemistry O R. Fennema
 5. Food Chemistry L H Meyer
 6. Foods Facts and Principles N. Shakuntalamanay& M. Shadaksharaswamy
 7. Food Science Norman N. Potter
 8. Hand book of Analysis and Quality Control of Fruits & Vegetable Products S. Ranganna
- Mapping of COs with PSOs and POs**

COs	PS O 1	PS O 2	PS O 3	PS O 4	PS O 5	PS O 6	P O 1	P O 2	P O 3	P O 4	P O 5	P O 6
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

Mapping of CO's to Assessment Rubrics

COs	Rubrics 1	Rubrics 2	Rubrics 3	Rubrics 4
CO1	✓			✓
CO2	✓			✓
CO3	✓			✓
CO4		✓		✓
CO5		✓		✓

Course Code & Title	FTV2CJ104	Food Microbiology			
Type of Course	Major	Semester	2	Academic Level	100-199
Course Details	Credit	Lecture per week	Tutorial per week	Practical per week	Total Hours
	4	3		2	75
Pre-requisites	Foundational knowledge and skills are necessary to understand microbiological concepts in the context of food science.				
Course Summary	Provides foundational knowledge of microorganisms relevant to food systems, emphasizing their roles in food spoilage, foodborne illnesses, fermentation, and food safety. Students will explore the morphology, physiology, and classification of bacteria, yeasts, molds, and viruses associated with food. The course also covers microbial growth factors, spoilage mechanisms, preservation techniques, and methods for detecting and controlling microorganisms in food products.				

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/ Seminar/ Discussion/
CO2	Apply the knowledge in the laboratory Final Exam 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	Mid-term exam
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), Analyze (An), Evaluate (E), Create (C) # - Factual Knowledge(F) Conceptual Knowledge (C) Procedural Knowledge (P) Metacognitive Knowledge (M)				

Detailed Syllabus:

Module	Unit	Content	Hours	Marks
I	Evolution		10	15
	1	History of Microbiology, - Theory of spontaneous generation, Germ theory of disease, Koch's postulates, Pure culture concept.	4	
	2	Theory of spontaneous generation, Germ theory of disease,	3	
	3	Koch's postulates, Pure culture concept	3	
II	Microscopy		10	10
	4	Parts of microscope, Resolving power, Limits of resolution, Refractive index, Magnification.	4	
	5	Light microscope – Bright field, Dark field. Electron microscope	3	
	6	Transmission Electron microscope, Scanning electron microscope.	3	
III	Microbes		15	20
	7	Bacteria -Structure, Morphology, Physical condition required for growth, growth curve. Reproduction – Binary fission, Transformation, Transduction and Conjugation. Nutritional requirements. Phototrophs, Chemotrophs, Autotrophs, Heterotrophs.	5	

	8	Fungi-Morphology, Classification, Phycomycetes, Ascomycetes, Basidiomycetes. Yeasts structure, Morphology, Reproduction – Budding. Deuteromycetes Reproduction-Sexual and Asexual	5	
	9	Virus- Classification, Composition, Morphology, Replication of virus	5	
IV	Food Intoxication and Infection		10	15
	10	Definition, Exotoxin, Endotoxin, intoxications and infections – sources, symptoms.	2	
	11	Methods of Prevention and investigation of food borne disease outbreak	3	
	12	Microbes in fermented foods -Fermented vegetable products, Sauer Kraut, pickles, soy sauces, idli. Fermented dairy products – Cheese, yoghurt	5	
V	Practical		30	
	13	Preparation of nutrient media Streak culture method Staining Techniques: Gram staining Microbial analysis of Milk: MBRT Microbial analysis of Water: MPN		

References:

1. Banwart GJ ,1989. Basic Food Microbiology. AVI publishers
2. Jay JM, Loessner MJ & Golden D A,2005. Modern Food Microbiology. Springer Verlag
3. Ananthanarayanan R JayaramPaniker CK ,2009 Text book of microbiology. University Press Pvt Ltd, Hyderabad
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5. Frazier J&Westhoff DC,1988. Food Microbiology. McGraw Hill, New York.
6. Pelczar JM & Reid RD. Microbiology. Tata McGraw Hill
7. Stainer R. General Microbiology. MacMillan
8. Black, JG. Microbiology. Principles and Explorations John Wiley Mapping of CO's with:

	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6
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

Mapping of CO's to Assessment Rubrics:

	Rubrics 1	Rubrics 2	Rubrics 3	Rubrics 4
CO 1	✓			✓
CO 2	✓			✓
CO 3	✓			✓
CO 4		✓		✓
CO 5		✓	✓	✓
CO 6			✓	✓

Course Code & Title	FTV2CJ105	Technology of Fruits and Vegetables Processing			
Type of Course	Major	Semester	2	Academic Level	100-199
Course Details	Credit	Lecture per week	Tutorial per week	Practical per week	Total Hours
	4	3		2	75
Pre-requisites	Basic understanding of plant anatomy and basic botany, basic chemistry and introductory food science. Helpful for grasping concepts like food composition, nutrition, spoilage, processing and preservation.				
Course Summary	Provides foundational knowledge and practical understanding of the processing, preservation, and quality assessment of various plant-derived foods including cereals, pulses, fruits, vegetables. It covers the principles of post-harvest handling, storage, minimal processing, and value addition with an emphasis on maintaining nutritional quality and food safety.				

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/ Seminar/ Discussion/ Mid-term exam
CO2	Provide knowledge about various technologies used in 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), Analyze (An), Evaluate (E), Create (C) # - Factual Knowledge(F) Conceptual Knowledge (C) Procedural Knowledge (P) Metacognitive Knowledge (M)				

Detailed Syllabus:

Module	Unit	Content	Hours	Mark s
I	Post-Harvest Technology of Fruits and Vegetables		10	15
	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. Storage disorders: physiological disorder, chilling injury, freezing injury.	3	
	4	Storage practices: cold storage, controlled atmospheric & modified atmospheric storage and hypobaric storage, cellar storage, zero energy cool chamber. Primary processing - grading, sorting, cleaning, washing, peeling, slicing blanching, wax coating.	3	
II	Fruit Products		15	18

	5	Frozen products: Raw materials preparation, treatment and processing methods of frozen fruits and vegetables (peas, mango pulp) and IQF. Restructured fruits and vegetables. Pectin: Definition of pectin, classification, pectic enzymes, properties, Jelly grade of pectin, Testing of pectin	5	
	6	Processing of jam, jelly, marmalade, preserves, candy, glazed and crystallized fruits definition and it's FSSAI Specifications. RTS, Squashes, Cordials, syrups, sherbet, crush. - Preparation and FSSAI specifications.	5	
	7	Fruit juice and concentrates: unit operation and equipment, aroma recovery and restoration; aroma recovery systems. fruit juices (lime, mango) and Fruit juice powder. Pickles and chutneys: Types and production, packaging of pickles and chutneys, spoilage.	5	
III	Processing and Preservation of Fruits and Vegetables.		10	18
	8	Canning: classification of canning fruits- pineapple, oranges, canning of vegetables – peas, carrots, syrups and brines for canning.	2	
	9	Jack fruit- value added products from Jack Fruit.	2	
	10	Drying and Dehydration: Enzyme inactivation, sulphuring, sun drying grapes and dates. Dehydration of fruits and vegetables.	3	
	11	Browning: Enzymatic Browning, it's prevention Benefits of preserved Fruits and Vegetables.	3	
IV	Tomato, Banana, Mushroom and Tuber Crops Products		10	10
	10	Tomato products: Tomato juice, Puree and Ketchup – Specifications. Mushroom: Nutritional Significance and Processing.	4	
	11	Banana - Nutritional Significance and Value-added Products	3	
	12.	Cassava: Syrup, Dextrose, Flour Processing. Potato -Chips, French fries, Dried Potato Slices, Dehydrated Potato Products.	3	
V	Practical		30	

	13	Determination of TSS Determination of acidity in Fruit juice Lye peeling Extraction of tomato pulp and preparation of tomato paste Home Canning of fruits and vegetables Preparation of Tomato Ketchup Preparation of Jam and Jelly Preparation of Squash Dehydration of Fruits & Vegetables Determination of Rehydration ratio Determination of Sulphur dioxide Determination of salt content in Pickles Estimation of vitamin C Estimation of Gluten Determination of Water absorption power Qualitative analysis of gluten – Belshanke value Determination of falling number Preparation of Bread Preparation of Biscuit Preparation of Cake Determination of Physical parameters of wheat and rice Industrial Visit- Bakery Unit		

References:

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2. Lal G, Siddappa GS & Tandon GL.1986. Preservation of Fruits and Vegetables. ICAR.
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6. Verma LR. & Joshi VK. 2000. Post-Harvest Technology of Fruits and Vegetables. Indus Publ.
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and Practices. International Book Distributors.

13. Verma LR & Joshi VK. 2000. Post-Harvest Technology of Fruits and
Vegetables. Indus Publ.

Mapping of CO's with:

	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6
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

Mapping of COs to Assessment Rubrics:

	Rubrics 1	Rubrics 2	Rubrics 3	Rubrics 4
CO 1	✓			✓
CO 2	✓			✓
CO 3	✓			✓
CO 4		✓		✓
CO 5		✓	✓	✓
CO 6			✓	✓

Course Code & Title	FTV2CJ106	Food Processing and Preservation			
Type of Course	Major	Semester	2	Academic Level	100-199
Course Details	Credit	Lecture per week	Tutorial per week	Practical per week	Total Hours
	4	4			60
Pre-requisites	Basic understanding of food science. Helpful for grasping concepts like food composition, nutrition, spoilage, processing and preservation.				
Course Summary	Provides a foundational understanding of the food processing and preservation techniques.				

Course Outcomes (CO):

CO	CO Statement	Cognitive Level*	Knowledge Category#	Evaluation Tools used
CO1	Understand the principles of food preservation techniques. Gain knowledge of traditional and modern methods of food preservation such as thermal processing, refrigeration, dehydration, fermentation, and use of preservatives.	U	F	Quiz/ Assignment/ Seminar/ Discussion/ Mid-term exam
CO2	Analyze the effects of processing on food quality and safety. Evaluate how various preservation and processing techniques impact the nutritional, sensory, and microbiological quality of food.	An	M	
CO3	Identify spoilage mechanisms and control methods. Understand the causes of food spoilage by microorganisms, enzymes, and environmental factors, and suggest appropriate preservation strategies.	Ap	P	
CO4	Apply food processing technologies to extend shelf life. Learn to apply unit operations such as drying, canning, freezing, and pasteurization in practical settings to enhance food stability and longevity.	Ap	C	
CO5	Demonstrate knowledge of packaging, storage, and logistics. Understand the role of packaging materials and systems, storage conditions, and supply chain considerations in maintaining food quality.	E	F	
CO6	Become familiar with food laws, safety standards (e.g., FSSAI, Codex, HACCP), and the importance of Good Manufacturing Practices (GMP)	U	P	

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

Detailed Syllabus:

Module	Unit	Content	Hours	Marks
I	Thermal Processing		10	15
	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	3	
	3	Canning: principle, steps involved in canning, types of containers used, heat penetration into containers, pH classification of foods, corrosion of cans.	2	
	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	
II	Low Temperature Technique		12	15
	5	Preservation by chilling: Low temperature preservation of fresh fruits, vegetables, meat and fish products. Chilling injury. Changes during refrigeration.	4	
	6	Preservation 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	4	
	7	Thawing: Effects on food, changes during thawing, types.	2	
III	Fermentation and Preservatives		14	15
	8	Preservation by fermentation: Alcoholic, acetic acid and lactic acid fermentation, applications in food processing	3	
	9	Natural preservatives: sugar, salt, vinegar, spices, mode of action.	2	

	10	Chemical preservatives: Sulphur dioxide, benzoic acid, sorbates, propionates, acetic acid, mode of action, FSSAI regulations for various food products.	2	
	11	Food additives: Antioxidants, Antibiotics.	2	
	12	Preservation by controlling water activity: High sugar products, IMF, curing and effect of salt of food preservation	5	
IV	Recent Trends		12	15
	13	Non thermal technologies: Microfiltration, bacto-fugation, ultrahigh voltage electric field, Pulsed electric field. High pressure processing: Principles, applications and advantages. Microwave processing: Principles, applications and advantages. Alternate thermal technologies: ohmic heating, dielectric heating infrared and induction heating.	5	
	14	Nanotechnology: Principle, application and advantages. Hurdle technology: Principles, applications and advantages. Irradiation: Sources of ionization radiation, Dose and Dosimetry, Mode of action, scope of irradiation.	10	
V	Open Ended module			
	New product Development (NPD)			

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3. Khader, Vijaya Textbook on Food Storage and Preservation Kalyani Publishers
4. Pruthi JS Quick Freezing Preservation of Foods Allied publishers Limited
5. Potter N N.& Hotchkiss 1997 Food Science CBS Publishers
6. Desrosier NW James N, 1977 Technology of Food Preservation CBS Publishers
7. Arti Sanhla Food Preservation. Principles and practices
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Mapping of CO's with:

	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6
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

Mapping of CO's to Assessment Rubrics:

	Rubrics 1	Rubrics 2	Rubrics 3	Rubrics 4
CO 1	✓			✓
CO 2	✓			✓
CO 3	✓			✓
CO 4		✓		✓
CO 5		✓	✓	✓
CO 6			✓	✓

Course Code & Title	FTV3CJ207	Spices & Plantation Products Technology			
Type of Course	Major	Semester	3	Academic Level	200-299
Course Details	Credit	Lecture per week	Tutorial per week	Practical per week	Total Hours
	4	3		2	75
Pre-requisites	Basic knowledge of plant parts, simple chemistry, and introductory food science. Helpful for understanding the processing, preservation, and uses of spices and plantation crops like tea, coffee, and cocoa.				
Course Summary	Provides foundational knowledge and practical understanding of the processing, preservation, and quality assessment of spices and plantation products. It covers the principles of harvesting, curing, drying, grading, storage, and value addition of spices, tea, coffee, and cocoa, with an emphasis on maintaining flavors, aroma, safety, and quality standards.				

Course Outcomes (CO):

CO	CO Statement	Cognitive Level*	Knowledge Category#	Evaluation Tools used
CO1	Understand the composition, characteristics, and importance of major spices and plantation crops	U	C	Quiz/ Assignment/ Seminar/ Discussion/ Mid-term exam
CO2	Provide knowledge about harvesting, curing, drying, and preservation methods of spices and plantation products	Ap	F	
CO3	Apply techniques used in the processing and value addition of spices, tea, coffee, and cocoa	Ap	P	
CO4	Understand hygiene, safety, and sanitation practices in spice and plantation product processing	Ap	M	
CO5	Familiarize with quality standards, grading, packaging, and storage methods of spices and plantation products.	Ap	P	
CO6	Develop awareness about recent trends and innovations in spice and plantation product technology	C	C	
* - Remember (R), Understand (U), Apply (Ap), Analyze (An), Evaluate (E), Create (C) # - Factual Knowledge(F) Conceptual Knowledge (C) Procedural Knowledge (P) Metacognitive Knowledge (M)				

Detailed Syllabus:

Module	Unit	Content	Hours	Marks
I	Major and minor spices		15	24
	1	Introduction to Spices – Definition, classification, chemical composition, and uses, Chemistry of Volatiles in Spices – Volatile compounds and their role in aroma and flavor	2	
	2	Processing of Pepper & Pepper Products – Cleaning, grading, drying, value-added forms	2	
	3	Processing of Turmeric and Ginger – Curing, drying, polishing, storage, and quality	2	
	4	Processing of Chilies and Cardamom – Drying, grading, packaging, and quality parameters	2	
	5	Spice Oils and Oleoresins – Definition, importance, method of manufacture, and applications	1	

	6	Fumigation and Irradiation of Spices – Purpose, methods, and safety	1	
	7	Minor spices: Cumin, coriander, cinnamon, clove, Fenugreek, garlic, mace, mint & vanilla – composition uses and processing	5	
II	Chemistry and processing of Coffee		12	16
	8	Occurrence and Chemical Constituents – Coffee species, bioactive compounds, aroma precursors, Quality Grading of Coffee – Sensory and physical parameters	3	
	9	Harvesting and Fermentation of Coffee Beans – Methods and microbial activity, Changes During Fermentation and Drying – Biochemical and physical changes	2	
	10	Roasting – Stages, chemical reactions (Maillard, caramelization), equipment used	2	
	11	Process Flow Sheet for Coffee Powder and Instant Coffee – Steps and types	2	
	12	Types of Coffee – Drip, percolator, vacuum, instant, decaffeinated	2	
	13	Chicory Chemistry and Use in Coffee Blends	1	
III	Chemistry and processing of Tea		10	12
	14	Occurrence and Chemistry of Constituents – Types of compounds (polyphenols, caffeine, etc.) Quality Evaluation and Grading of Tea – Organoleptic, physical, and chemical tests	3	
	15	Harvesting and Types of Tea – Green, oolong, black, CTC, instant tea; differences and characteristics, Chemistry, processing technology, and advantages	5	
	16	Specialty Teas – Bio-tea, spiced tea, iced tea: definitions, processing basics, and trends	2	
IV	Chemistry and processing of Cocoa		8	8
	17	Occurrence and Chemistry of Cocoa Beans – Constituents like theobromine, fats, polyphenols, Composition and Fermentation of Cocoa Beans – Biochemical changes and flavor development	3	
	18	Processing of Cocoa Beans – Drying, roasting, winnowing, Manufacture of Cocoa Products – Cocoa powder, butter, and liquor	2	

	19	Chocolate – Types, Chemistry, and Manufacturing Technology – Dark, milk, white, compound, Quality Control of Chocolates – Sensory, physical, and chemical parameters	3	
V	20	Practical	30	
		1. Extraction of different spice oleoresins 2. Extraction of essential oils from different spices 3. Analysis of Spices and plantation products		

References

1. Pruthi JS Major Spices of India
2. Pruthi JS Quality Assurance in Spices and Spice Products
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7. S. Manany, N S. Swamy Food Facts and Principles. New Age International Publishers
8. Sanjeev Kumar Sharma, MadhavaNaidu M. Science of Coca Processing. Jain Brothers
9. NIIR. 2004. Handbook on Spices. National Institute of Industrial Research
10. Board, Asia Pacific Business Press Inc.
11. H Panda, Hand Book on Spices and Condiments, Asia Pacific Business Press Inc

Mapping of CO's with:

	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6
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

Mapping of CO's to Assessment Rubrics:

	Rubrics 1	Rubrics 2	Rubrics 3	Rubrics 4
CO 1	✓			✓
CO 2	✓			✓
CO 3	✓			✓
CO 4		✓		✓
CO 5		✓	✓	✓
CO 6			✓	✓

Course Code & Title	FTV3CJ208	Dairy Technology			
Type of Course	Major	Semester	3	Academic Level	200-299
Course Details	Credit	Lecture per week	Tutorial per week	Practical per week	Total Hours
	4	3		2	75
Pre-requisites	Basic understanding of animal physiology (especially milk production), basic chemistry, and introductory food science. Helpful for understanding milk composition, microbial quality, processing methods, preservation techniques, and the development of various dairy products.				
Course Summary	Provides foundational knowledge and practical understanding of the processing, preservation, and quality assessment of milk and milk-based products. It covers the principles of milk composition, handling, pasteurization, fermentation, storage, and product development with an emphasis on hygiene, safety standards, and maintaining nutritional and sensory quality.				

Course Outcomes (CO):

CO	CO Statement	Cognitive Level*	Knowledge Category#	Evaluation Tools used
CO1	Understand the composition, properties, and nutritive value of milk	U	C	Quiz/ Assignment/ Seminar/ Discussion/ Mid-term exam
CO2	Provide knowledge about the principles and methods of milk processing and preservation	Ap	F	
CO3	Apply various techniques in the production of dairy products such as cream, butter, cheese, and fermented products	Ap	P	
CO4	Understand hygiene and sanitation practices in dairy processing	Ap	M	
CO5	Familiarize different aspects of quality standards, packaging, storage methods of milk and dairy products.	Ap	P	

CO6	Develop awareness about recent trends and innovations in dairy technology	C	C
* - Remember (R), Understand (U), Apply (Ap), Analyze (An), Evaluate (E), Create (C) # - Factual Knowledge(F) Conceptual Knowledge (C) Procedural Knowledge (P) Metacognitive Knowledge (M)			

Detailed Syllabus:

Module	Unit	Content	Hours	Marks
I	Composition and Processing of Milk		17	20
	1	Composition of milk from various sources (cow, buffalo, goat, etc.)	2	
	2	Factors affecting the composition of milk	1	
	3	Properties of milk – Physical and Chemical (flavor, color, acidity, viscosity, specific gravity, freezing point, boiling point)	5	
	4	Effect of heat, enzymes, acids, and alkalis on milk	2	
	5	Processing of Milk (includes receiving, clarification, separation, standardization, pasteurization, homogenization, storage, distribution)	7	
II	Types of milk		10	11
	6	Toned and Double Toned Milk – Definition, processing, nutritional aspects, and standards	4	
	7	Standardized and Homogenized Milk – Concept, processing techniques, quality, and standards	4	
	8	Recombined Milk – Need, process, composition, and regulatory standards	2	
III	Technology of Dairy Products and Byproducts of Dairy Industry		15	20
	9	Cream and Butter – Composition, processing, and technology	3	
	10	Ice Cream and Frozen Desserts – Ingredients, formulation, freezing, hardening, storage, distribution, and common defects	2	
	11	Cheese – Introduction, classification, and processing (Cottage & Cheddar).	2	
	12	Fermented Milk Products – Curd, yoghurt, acidophilus milk, kefir, kumiss, probiotic drinks	3	
	13	Milk Powders – Whole milk, skim milk, and instant milk powders	2	

	14	Dairy By-products – Technology of whey and whey protein products	3	
IV	Dairy Plant Sanitation		7	9
	15	Sanitation-objectives, Importance, scope, and goals of sanitation in dairy industry, Sanitizers – Types (chemical, physical), mode of action, application, safety, and effectiveness	3	
	16	Cleaning-In-Place (CIP) – Principles, methods, equipment, cleaning agents, and practices	4	
V	Practical		30	
	1. Analysis of Milk 2. Analysis of milk products 3. Preparation of milk products			

References

1. Sukumar D E. Outlines of Dairy Technology, Oxford University Press.
2. Johnson, Webb. Fundamentals of Dairy Chemistry. CBS Publishers and Distributors
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4. Kurmann, Joseph A. Encyclopaedia of Fermented Fresh Milk Products, CBS Publishers and Distributors
5. Atherton, Henry V. Chemistry and Testing of Dairy Products CBS Publishers and Distributors
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8. Walstra P, Geurts T. Dairy Technology. Marcel Dekker
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	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6
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

Mapping of CO's to Assessment Rubrics:

	Rubrics 1	Rubrics 2	Rubrics 3	Rubrics 4
CO 1	✓			✓
CO 2	✓			✓
CO 3	✓			✓
CO 4		✓		✓
CO 5		✓	✓	✓
CO 6			✓	✓

Course Code & Title	FTV3CJ209	Food Packaging Technology			
Type of Course	Major	Semester	3	Academic Level	200-299
Course Details	Credit	Lecture per week	Tutorial per week	Practical per week	Total Hours
	4	4			60
Pre-requisites	Understand food packaging principles, packaging materials, types related to use with various food systems and packaging permeability.				
Course Summary	Provides a foundational understanding of the food packaging science and technology field.				

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/ Seminar/ Discussion/ Mid-term 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	Evaluate environmental issues, regulations and quality control associated with food packaging.	U	P	
CO4	Familiarize the purpose and principles of food packaging and examine the operations involved in packaging material manufacture.	C	C	

CO5	Identify and evaluate the suitability of processing and packaging techniques for various foods.	U	M
* - Remember (R), Understand (U), Apply (Ap), Analyze (An), Evaluate (E), Create (C) # - Factual Knowledge(F) Conceptual Knowledge (C) Procedural Knowledge (P) Metacognitive Knowledge (M)			

Detailed Syllabus:

Module	Unit	Content	Hours	Marks
I	Introduction		10	18
	1	Introduction to Food packaging.	3	
	2	Definition, functions & properties of packaging technology and materials. Food Labelling- Packaging symbols, Nutrition labelling	3	
II	Classification		12	10
	3	Classification of Packaging - Primary Secondary and Tertiary packaging.	4	
	4	Flexible, rigid and semi rigid packaging Materials.	4	
III	Types of Packages		8	11
	5	Different forms of food containers- Boxes, Jars, Bottles, Cans, Metal cans, glass containers, plastic containers,	3	
	6	Boxes, Jars, Bottles, Cans, Metal cans, glass containers, plastic containers.	2	
	7	Pouches, Retort pouches, paper and paperboard. Films and Laminates, Edible films in packaging	5	
IV	Packing Technologies		18	21
	8	Aseptic, Retort, Vacuum, Inert gas, Form –Fill – Seal, Active, Controlled Atmosphere & Modified Atmosphere packaging	5	
	9	Form –Fill – Seal, Active, Controlled Atmosphere & Modified Atmosphere packaging.	10	
	10	Shelf-Life Estimation of packaged foods- oxygen transmission & water transmission. Standard Weights and Measures Act, Packaging Commodity Regulatory Order for food commodities.	3	
V	Open Ended Module			
	Packaging innovations in food technology			

References

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Ltd and CRC press, ISBN-9781845691943, 2008.
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Professional Publisher, London, 2012.
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- Davis, E.G Evaluation of tin & plastic containers for foods, CBS publishers New Delhi
- Mathlouthi, M Food Packaging and Preservation. Aspen
- Larousse, Jean Food Canning Technology Wiley-VCH
- Mahadevia M &Gowramma RV 1996 Food Packaging Materials. Tata McGraw Hill

Mapping of CO's with:

	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6
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

Mapping of CO's to Assessment Rubrics:

	Rubrics 1	Rubrics 2	Rubrics 3	Rubrics 4
CO 1	✓			✓
CO 2	✓			✓
CO 3	✓			✓
CO 4		✓		✓
CO 5		✓	✓	✓
CO 6			✓	✓

Course Code & Title	FTV4CJ210	Technology of Animal Foods			
Type of Course	Major	Semester	4	Academic Level	200-299
Course Details	Credit	Lecture per week	Tutorial per week	Practical per week	Total Hours
	4	3		2	75
Pre-requisites	Basic understanding of animal physiology, microbiology, and introductory biochemistry. Helpful for understanding the composition, spoilage, processing, and preservation of meat, fish, and egg products.				
Course Summary	Provides foundational knowledge and practical understanding of the processing, preservation, and quality evaluation of meat, fish, and egg products. It covers the principles of post-mortem changes, handling, storage, and value addition, with an emphasis on hygiene, safety standards, and maintaining nutritional and sensory quality of animal-derived foods.				

Course Outcomes (CO):

CO	CO Statement	Cognitive Level*	Knowledge Category#	Evaluation Tools used
CO1	Understand the composition and nutritional value of meat, fish, and egg products	U	C	Quiz/ Assignment/ Seminar/ Discussion/ Mid-term exam
CO2	Gain knowledge about post-mortem changes, spoilage, and preservation methods of animal products	Ap	F	
CO3	Apply various processing techniques for meat, fish, and egg-based product development	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	P	
CO6	Develop awareness about emerging technologies and regulatory standards in animal product processing	C	C	
* - Remember (R), Understand (U), Apply (Ap), Analyze (An), Evaluate (E), Create (C) # - Factual Knowledge(F) Conceptual Knowledge (C) Procedural Knowledge (P) Metacognitive Knowledge (M)				

Detailed Syllabus:

Module	Unit	Content	Hours	Marks
I	Slaughtering and inspection of meat		18	24
	1	Structure of Meat – Muscle fiber structure, connective tissue	2	
	2	Humane Method of Slaughter – Principles and importance	3	
	3	Meat Inspection – Ante-mortem and post-mortem procedures and objectives	3	
	4	Slaughter Methods – Slaughter of sheep, pigs, and poultry	3	
	5	Post-mortem Changes and Ageing – Rigor mortis, resolution, and impact on quality	3	
	6	Factors Affecting Tenderness of Meat – Intrinsic and extrinsic factors	2	
	7	Effect of Cooking – Changes in texture, color, and flavor during cooking	2	
II	Preservation and By-products of meat industry		12	16
	8	Cured Meat – Role of ingredients, methods of curing, and smoking techniques, Factors Affecting Quality of Cured Meats	4	
	9	Processing of Ham and Bacon – Steps and principles	2	
	10	Sausages – Classification (emulsion-type, ground-type), processing, and casings	3	
	11	By-products – Rendering, and utilization in feeds, hides, skins, hoofs, and horns	3	
III	Egg and preservation methods		9	12
	12	Egg Grading and Changes During Storage – Internal and external changes	2	
	13	Egg Quality – Factors affecting quality, measures (Haugh unit, candling, etc.)	2	
	14	Effect of Cooking and Factors Affecting Coagulation – Functional changes during heating	2	
	15	Industrial Uses of Egg – Use in bakery, emulsifiers, foaming agents, etc.	1	
	16	Preservation of Eggs – Refrigeration, freezing, thermal processing, dehydration, coating	2	
IV	Technology of fish and fish products		6	8

V	17	Introduction and Spoilage Indices – Characteristics, causes, and indicators of spoilage	1	
	18	Preservation Methods – Cold storage, freezing, smoking, pickling, canning, drying	2	
	19	Fish Products: Fish protein concentrate, fish oils (body and liver oils), Fish meal, ensilage, chitosan, pearl essence, glue, gelatin	3	
	Practical		30	
	20	Acidity of Milk & curd		
	21	Fat content in milk		
	22	Determination of total solids, SNF and specific gravity of milk		
	23	Determination of total ash in milk		
	24	Acidity of butter		
	25	Moisture content of butter		
	26	Salt content in butter		
	27	Adulteration in milk		
	28	Preparation of Khoa, Peda		
	29	Moisture content in ghee		
	30	Internal & external quality of egg		

References

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2. Person AM Gillet T A Processed Meats. CBS publishers
3. Lawrie R A Lawries Meat Science Tata McGraw Hill
4. Mountney T. Carmen G Prakhurst R Poultry Products Technology CBS Publishers
5. Ockerman HW Hancen CL Animal By-product Processing Elis Horwood
6. Gopakumar K Tropical Fishery Products Oxford
7. Jhingran VG Fish & Fisheries of India Hindustan Publishing Company
8. Biswas KP A Text Book of Fish and Fisheries Technology Tata McGraw hill
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10. Parkhurst, Carmen R. Poultry Meat and Egg Production. CBS

CO's with:

	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6
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

Mapping of CO's to Assessment Rubrics:

	Rubrics 1	Rubrics 2	Rubrics 3	Rubrics 4
CO 1	✓			✓
CO 2	✓			✓
CO 3	✓			✓
CO 4		✓		✓
CO 5		✓	✓	✓
CO 6			✓	✓

Course Code & Title	FTV4CJ211	Nutrition and Health			
Type of Course	Major	Semester	4	Academic Level	200-299
Course Details	Credit	Lecture per week	Tutorial per week	Practical per week	Total Hours
	4	3		2	75
Pre-requisites	Familiarity with food composition (carbohydrates, proteins, fats, vitamins, minerals). Awareness of food sources and functions of nutrients. Chemical properties of nutrients				
Course Summary	Introduces students to the fundamental concepts of human nutrition and its critical role in promoting overall health and preventing disease. It focuses on the relationship between food, nutrients, and physiological well-being across various life stages.				

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/ Seminar/ Discussion/ Mid-term 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), Analyze (An), Evaluate (E), Create (C) # - Factual Knowledge(F) Conceptual Knowledge (C) Procedural Knowledge (P) Metacognitive Knowledge (M)				

Detailed Syllabus:

Module	Unit	Content	Hours	Marks
I	Health, Nutrition & Food		10	18
	1	Physical, mental, social and spiritual health, determinants & indicators of health, Nutrition & malnutrition, importance of ideal nutrition.	3	
	2	Balanced diet, BMI, Food guide, Pyramid and RDA. Nutrition for the normal life cycle, Nutrition during Pregnancy and Lactation. Nutrition for Fitness and Sports	2	
	3	Nutrigenetics and Genomics. HFSS foods & DASH foods.	2	
II	Energy		10	15
	4	Definition, Calorie & Joule	3	
	5	Measurement of Calorific values of Food	3	
	6	Basal metabolism-BMR	3	
	7	Energy requirements & expenditure	3	
III	Macro-nutrients		12	10

	8	Sources & Nutritional classifications of carbohydrates, fat and proteins	7	
	9	Digestion, Absorption and Transportation	4	
	10	Health disorders due to their imbalance in the body	4	
IV	Micronutrients		13	10
	11	Nutritional classification and Sources of Vitamins and Minerals	5	
	12	Digestion, Absorption and Transportation. Health benefits and disorders due to its imbalance in the body	5	
	13	Menu Planning, Significance of Menu Planning, Menu planning for family. Factors influencing meal planning.	8	
V	Practical		30	
	14	Recipe development or healthy/nutritious products. BMI of different aged males and females. As per the faculty decides.		

References

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- A text book of Foods, Nutrition and Dietetics- Begum, R.
- Understanding Nutrition -Whitney P.N. and Roes S.R., West Publication Co, 1996.
- Nutrition Science- Srilakshmi, B
- Education planning group. Food & Nutrition, 1980. Arya publishing group, New Delhi
- Srilakshmi, B, Nutrition Science, New age international (P) Ltd publishers, New Delhi, 2006.
- Handbook of Food and Nutrition M Swaminathan
- Nutrition Science- Srilakshmi, B
- Essential of food & Nutrition –Vol. 1 M. Swaminathan, Bappco, Bangalore.
- Essential of food & Nutrition –Vol. 1 M. Swaminathan
- Essential of food & Nutrition –Vol. 1 M. Swaminathan
- Essential of food & Nutrition –Vol. 1 M. Swaminathan
- Nutrition Science- Srilakshmi, B
- Nutrition Science- Srilakshmi, B

Mapping of CO's with:

	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6
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

Mapping of CO's to Assessment Rubrics:

	Rubrics 1	Rubrics 2	Rubrics 3	Rubrics 4
CO 1	✓			✓
CO 2	✓			✓
CO 3	✓			✓
CO 4		✓		✓
CO 5		✓	✓	✓
CO 6			✓	✓

Course Code & Title	FTV4CJ212	FOOD ENGINEERING			
Type of Course	Major	Semester	4	Academic Level	200-299
Course Details	Credit	Lecture per week	Tutorial per week	Practical per week	Total Hours
	4	4			60
Pre-requisites	To introduce the basic principles and applications of food engineering with emphasis on heat transfer, thermal processing, refrigeration, drying, and rheology of food materials.				
Course Summary	Provides an overview of fundamental food engineering principles, focusing on heat transfer, thermal processing equipment, refrigeration, drying, and rheological behavior of foods.				

Course Outcomes (CO):

CO	CO Statement	Cognitive Level*	Knowledge Category#	Evaluation Tools used
CO1	Understand the applications and fundamental concepts of food engineering	U	C	Quiz/ Assignment/ Seminar/ Discussion/ Mid-term exam
CO2	Explain and analyze different modes of heat transfer operations and their relevance in food processing applications.	U	C	
CO3	Understand and interpret rheological properties of food materials and their influence on processing and product quality.	U	C	
CO4	Understand the working knowledge of key thermal processing equipment's	U	F&P	
CO5	Understand the principles of refrigeration, freezing, and pasteurization techniques in food preservation and safety.	U	C&P	
* - Remember (R), Understand (U), Apply (Ap), Analyze (An), Evaluate (E), Create (C) # - Factual Knowledge(F) Conceptual Knowledge (C) Procedural Knowledge (P) Metacognitive Knowledge (M)				

Detailed syllabus:

Module	Unit	Content	Hours	Marks
I	Thermal Principles and Pasteurization		17	21
	1	Unit operations & Heat transfer Mode of heat transfer– Conduction, Convection, Radiation	3	
	2	Heat exchanger-Classification, contact type heat exchange - Immersion, Non-contact type heat exchanger, Plate Heat exchanger	6	
	3	Scraped surface Heat exchanger, Tubular Heat exchanger, Double & Triple tube Heat exchanger, Shell & Tube Heat exchanger	6	
	4	Pasteurization: LTLT, HTST, UHT, Pasteurizing equipment's	4	
II	Refrigeration & freezing		8	12
	5	Refrigeration Principle of refrigeration, Vapor compression refrigeration cycle.	5	
	6	Freezing Principle of freezing & freezing rate.	4	

III	Evaporation and type of evaporators		10	14
	7	Evaporation-Principle, single effect evaporation, multiple effect evaporation.	5	
	8	Types of evaporators - Horizontal tube, Vertical tube, falling film evaporator, Raising film Evaporator.	7	
IV	Driers, Boilers and rheology of food materials		18	13
	9	Driers Principle, constant rate & falling rate of period of drying.	5	
	10	Types of driers –working principles-types-Drum drier, Cabinet drier, Tunnel drier, Spray drier, Fluidized bed drier.	6	
	11	Boiler- Principle, working of water tube & fire tube boiler.	4	
	12	Rheology Definition, Rheological characteristics of foods, viscosity, apparent viscosity- Newtonian and Non-Newtonian	5	
V	Open ended module		7	
		Emerging food processing technology	7	

References:

1. Rao D G. Fundamentals of Food Engineering. PHI learning private limited
2. Sahay KM &. Singh KK, 1994. Unit operations of Agricultural processing Vikas Publishing House
3. R S Khurmi& J K Gupta, A Textbook of Refrigeration & Air conditioning, S Chand
4. Singh RP, Heldman DR1993 Introduction to Food Engineering Academic Press
5. Romeo. Toledo T Fundamentals Food Process Engineering CBS Publishers
6. Charm SE, Macabe, WL Smith JC &Harriot P 1993. Unit Operations of Chemical

Engineering. McGraw Hills. **Mapping of CO's with:**

	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6
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

Mapping of CO's to Assessment Rubrics:

	Rubrics 1	Rubrics 2	Rubrics 3	Rubrics 4
CO 1	✓			✓
CO 2	✓			✓
CO 3	✓			✓
CO 4		✓		✓
CO 5		✓	✓	✓
CO 6			✓	✓

Course Code & Title	FTV5CJ313	Food Production Management			
Type of Course	Major	Semester	5	Academic Level	300-399
Course Details	Credit	Lecture per week	Tutorial per week	Practical per week	Total Hours
	4	3		2	75
Pre-requisites	Understanding basic food science, basic food microbiology, food processing principles and preservation, food safety and communication skills etc.				
Course Summary	Introduces students to the principles and practices involved in planning, organizing, and managing food production operations. The course bridges technical food processing knowledge with industrial management strategies to optimize productivity, quality, cost-efficiency, and food safety in various food manufacturing environments.				

Course Outcomes (CO):

CO	CO Statement	Cognitive Level*	Knowledge Category#	Evaluation Tools used
CO1	Describe the principles and components of food production systems and their roles in industry.	U	F	Quiz/ Assignment/ Seminar/ Discussion/ Mid-term exam
CO2	Explain the concepts of production planning, process flow, and plant layout in food manufacturing.	U	C	
CO3	Apply scheduling, forecasting, and inventory control techniques in a food production context.	Ap	P	
CO4	Analyze critical control points and quality assurance systems in production management.	An	C	

CO5	Evaluate the effectiveness of production systems using KPIs such as efficiency and cost control.	E	P
CO6	Develop a basic production plan incorporating safety, sustainability, and resource optimization.	C	M
* - Remember (R), Understand (U), Apply (Ap), Analyze (An), Evaluate (E), Create (C) # - Factual Knowledge(F) Conceptual Knowledge (C) Procedural Knowledge (P) Metacognitive Knowledge (M)			

Detailed Syllabus:

Module	Unit	Content	Hours	Marks
I	Introduction to Food Production Systems		15	15
	1	Overview of food production: Definition, scope, types	2	
	2	Industrial food production vs. commercial foodservice production, centralized, commissary, and decentralized food production systems. Production flowchart – from raw material to finished product.	3	
	3	Factors affecting menu planning: Nutritional, operational, customer preference, budget. Recipe formulation and standardize. Factors affecting menu planning: Nutritional, operational, customer preference, budget.	3	
II	Menu Planning and Recipe Standardization		10	15
	4	Importance of menu in food production.	4	
	5	Types of menus: A la carte, Table d'hôte, Cyclic, Static	2	
	6	Factors affecting menu planning: Nutritional, operational, customer preference, budget.	3	
	7	Recipe formulation and standardization. Portion control and yield testing.	3	
III	Production Planning and Control		10	15
	8	Food production scheduling	2	
	9	Kitchen workflow and job allocation. Production forecasting: Importance and methods.	2	
	10	Procurement planning and inventory management	2	
	11	Equipment selection and maintenance planning	1	

IV	Food Costing and Waste Management		10	15
	12	Basic concepts of food costing. Factors affecting food cost: Purchase, preparation, wastage.	1	
	13	Food cost control measures: Standard purchase and issue specifications. Yield management and cost-volume-profit analysis.	2	
	14	Kitchen waste types and management strategies. Sustainable practices in food production.	3	
V	Practical		30	
	15	Visit/report on an industrial/institutional food production unit. Recipe standardization and yield calculation Menu design for a food production unit Cost calculation and food budgeting exercises Layout design for a small-scale production kitchen		

References:

1. MohiniSethi (2021). *Institutional Food Management*. New Age International Publishers.
2. Focuses on food service operations in Indian institutions and menu planning.
3. SunetraRoday (2011). *Food Hygiene and Sanitation*. McGraw Hill Education.
4. Covers hygiene and sanitation practices applicable in Indian food industries and food service systems.
5. G. Subbulakshmi&Shobha A. Udipi (2012). *Food Processing and Preservation*. New Age International.
6. Useful for understanding Indian food processing and storage relevant to food production.
7. Neelam Khetarpaul (2015). *Food Service Management: An Indian Perspective*. Daya Publishing.
8. Marriott, B. (2017). *Principles of Food Production Operations*. Springer.
9. Singh, Y. (2018). *Fundamentals of Food Production Operations*. Oxford University Press.
10. Kotas, R. (2011). *The Management of Hotel and Catering Operations*. Cengage Learning.

11. Mapping of CO's with:

	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6
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

Mapping of CO's to Assessment Rubrics:

	Rubrics 1	Rubrics 2	Rubrics 3	Rubrics 4
CO 1	✓			✓
CO 2	✓			✓
CO 3	✓			✓
CO 4		✓		✓
CO 5		✓	✓	✓
CO 6			✓	✓

Course Code & Title	FTV5CJ314	ANALYSIS OF FOODS			
Type of Course	Major	Semester	5	Academic Level	300-399
Course Details	Credit	Lecture per week	Tutorial per week	Practical per week	Total Hours
	4	3		2	75
Pre-requisites	Students are expected to have a foundational understanding of basic food science, general chemistry, and laboratory safety practices to effectively perform and interpret fundamental food analysis techniques and experiments.				
Course Summary	This course offers hands-on training in fundamental food analysis techniques, enabling students to develop practical skills in assessing the quality, composition, and safety of food products through basic chemical, physical, and instrumental methods, while fostering analytical thinking aligned with food industry standards and regulations.				

Course Outcomes (CO):

CO	CO Statement	Cognitive Level*	Knowledge Category#	Evaluation Tools used
CO1	Identify and describe the basic principles and significance of food analysis techniques used to determine nutrient composition and food quality.	R	F	Quiz/ Assignment/ Seminar/ Discussion/ Mid-term exam
CO2	Explain the methods used for the determination of moisture, ash, protein, fat, fiber, sugar, and other common food constituents.	U	C	
CO3	Apply standard procedures for the estimation of carbohydrates, proteins, fats, and other components in various food matrices using basic laboratory equipment.	Ap	P	
CO4	Analyze food samples to detect adulterants and assess food safety using simple chromatographic and chemical tests.	An	C	
CO5	Evaluate the accuracy and reliability of experimental results through calculation, record maintenance, and interpretation of observations.	E	M	
CO6	Develop basic food analysis reports and participate in mini-projects or presentations to communicate findings related to food quality and standards.	C	P	
* - Remember (R), Understand (U), Apply (Ap), Analyze (An), Evaluate (E), Create (C) # - Factual Knowledge(F) Conceptual Knowledge (C) Procedural Knowledge (P) Metacognitive Knowledge (M)				

Detailed Syllabus:

Module	Unit	Content	Hours	Mark s
I	Carbohydrate and Sugar Analysis		10	15
	1	Introduction to carbohydrates: types and relevance in food	1	
	2	Lane & Eynon method	1	
	3	Reducing sugar in honey/jaggery	1	
	4	Invert sugar in jaggery/honey – chemistry	2	
	5	Fructose: Glucose ratio – Iodometry	1	

	6	Starch analysis in vegetables	2	
	7	Detection of chicory in coffee – chemical basis and demonstration	2	
II	Protein, Fiber & Enzyme Analysis		10	15
	8	Role of proteins and fibers in food	1	
	9	Principles of colorimetric methods for protein estimation	1	
	10	Estimation of protein (Colorimetric method)	1	
	11	Estimation of crude fiber – principle	1	
	12	Peroxidase enzyme: presence and role in food spoilage	1	
	13	Demonstration of peroxidase activity in vegetables/fruits	1	
	14	Rehydration ratio: importance in dried foods and calculation	2	
III	Fat & Lipid Content Analysis		15	15
	15	Role of fats in food and nutrition	1	
	16	Soxhlet extraction: principle	2	
	17	Determination of fat in cocoa butter	2	
	18	Determination of gum base in bubble gum/cocoa butter	2	
	19	Acidity of extracted fats in biscuits/cashews	2	
	20	Good laboratory practices: weighing, extraction, labelling	2	
	21	Report writing and result calculation	1	
IV	Adulteration, Additives & Basic Instrumentation		10	15
	22	Introduction to food adulteration and safety	1	
	23	Common adulterants in Indian foods and their health impact	2	
	24	Paper chromatography/TLC: principle and procedure	2	
	25	Detection of synthetic food colors (chromatographic method)	1	
	26	Estimation of salt in food by titration (simple method)	2	
	27	Use of tintometer or color standards (demonstration)	2	
V	Practical		30	
	Lane & Eynon method Estimation of reducing and total reducing sugar in honey/jaggery. Estimation of invert sugar in jaggery/honey Detection of Chicory Iodine test Chromatography Detection of synthetic food colors etc.			

References:

1. Ranganna S 2001. Handbook of analysis and quality control of fruits and vegetable products Tata- McGraw- Hill.
2. Nielson S 1994 Introduction to Chemical Analysis of Foods Jones & Bartlett
3. Pomrenz Y& Meloan CE 1996 Food Analysis Theory and Practice CBS
4. Food Safety Standard authority of India site manual

Mapping of CO's with:

	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6
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

Mapping of CO's to Assessment Rubrics:

	Rubrics 1	Rubrics 2	Rubrics 3	Rubrics 4
CO 1	✓			✓
CO 2	✓			✓
CO 3	✓			✓
CO 4		✓		✓
CO 5		✓	✓	✓
CO 6			✓	✓

Course Code & Title	FTV5CJ315	Food Regulatory Affairs Management- Quality Assurance			
Type of Course	Major	Semester	5	Academic Level	300-399
Course Details	Credit	Lecture per week	Tutorial per week	Practical per week	Total Hours
	4	4			60
Pre-requisites	Understanding fundamental food components, Awareness of food groups, dietary guidelines, and nutritional labelling, Basic knowledge of foodborne pathogens, spoilage organisms, and hygiene practices. Basic ability to read and interpret scientific regulations and technical standards.				
Course Summary	Introduces students to the foundational principles and frameworks governing food regulations, compliance, and quality assurance in the food industry. It covers national and international food laws, standards, and regulatory bodies such as FSSAI, Codex Alimentarius, WHO, and FDA. Students gain insight into food safety management systems, labeling requirements, import-export regulations, and the role of documentation and audits in maintaining food quality.				

Course Outcomes (CO):

CO	CO Statement	Cognitive Level*	Knowledge Category#	Evaluation Tools used
CO1	Explain the principles, scope, and importance of food regulatory frameworks at national and international levels.	U	C	Quiz/ Assignment/ Seminar/ Discussion/ Mid-term exam
CO2	EFSA) and their impact on food safety and	odies (e.g., FS	F	
CO3	Apply food quality and safety management systems (e.g., HACCP, ISO 22000) to food industry scenarios.	Ap	P	
CO4	Analyze food labelling, claims, and traceability regulations as per FSSAI and international norms.	An	C	
CO5	Evaluate case studies related to food regulatory non-compliance, recalls, and quality failures.	E	P	
CO6	requirements.	hecklist aligni	P	
* - Remember (R), Understand (U), Apply (Ap), Analyze (An), Evaluate (E), Create (C) # - Factual Knowledge(F) Conceptual Knowledge (C) Procedural Knowledge (P) Metacognitive Knowledge (M)				

Detailed Syllabus:

Module	Unit	Content	Hours	Marks
I	Introduction to Food Regulations		10	15
	1	Definition and importance of food regulatory affairs.	1	
	2	Objectives and scope of food laws	1	
	3	Role and functions of FSSAI	1	
	4	Overview of national food laws: Food Safety and Standards Act (FSSA) 2006	2	
	5	Licensing and registration of food businesses	1	
	6	Food product approval system in India	2	
II	International Food Regulations and Codex		10	15
	7	Codex Alimentarius Commission: Structure, functions, and standards	1	
	8	WTO agreements: SPS (Sanitary and Phytosanitary), TBT (Technical Barriers to Trade)	1	
	9	Regulatory bodies: US FDA, EFSA (Europe), CFIA (Canada), AQIS (Australia)	1	
	10	Import/export regulations and documentation	1	
	11	Food labeling and claims: Nutrition, health, and ingredient claims	1	
III IV	Quality Assurance in Food Industry		15	15
	12	Principles of quality assurance and quality control	1	
	13	Good Manufacturing Practices (GMP), Good Hygiene Practices (GHP)	2	
	14	Quality Management Systems (QMS): ISO 9001, ISO 22000	2	
	15	HACCP: Principles and implementation steps	2	
	16	Internal audits and third-party audits	2	
	Regulatory Compliance and Documentation		10	15
	17	Food safety audits and inspection procedures	1	
	18	Risk analysis: Risk assessment, management, and communication	2	
	19	Traceability and recall procedures	2	
	20	Documentation and record-keeping in QA	1	
V	Open-ended module		15	
	Emerging trends in food safety and regulatory compliance			

References:

1. FSSAI (2021) – *Food Safety and Standards Act & Rules*, Government of India.
2. Fortin, N.D. (2016) – *Food Regulation: Law, Science, Policy, and Practice* (2nd Ed.). Wiley-Blackwell.
3. ISBN: 978-1118210425 Sharma, P. & Jaiswal, A.K. (2020) – *Food Safety and Quality Control* (1st Ed.). Studium Press (India).
4. ISBN: 9789385046471 Jongen, W.M.F. (2005) – *Food Supply Chain Management*. Woodhead Publishing.
5. ISBN: 9781855739623 CAC (Codex Alimentarius Commission) – *Codex Guidelines and Standards*. FAO/WHO.

19.DETAILED SYLLABUS OF THE ELECTIVE COURSES (MAJOR)

Course Code & Title	FTV4EJ201	BEVERAGE TECHNOLOGY			
Type of Course	Elective Major	Semester	4	Academic Level	200-299
Course Details	Credit	Lecture per week	Tutorial per week	Practical per week	Total Hours
	4	4			60
Pre-requisites	Basic knowledge of food science, microbiology, and food processing techniques is recommended. Familiarity with food safety and hygiene standards will aid in understanding beverage manufacturing processes.				
Course Summary	facilitate students with industrial knowledge in beverage technology and to understand various processing technologies in alcoholic and nonalcoholic beverages.				

Course Outcomes (CO):

CO	CO Statement	Cognitive Level*	Knowledge Category#	Evaluation Tools used
CO1	Ability to understand the science and technology for processing different types of beverages.	U	C	Quiz/ Assignment/ Seminar/ Discussion/ Mid-term exam
CO2	Ability to explain processing of fruit juice beverages, carbonated beverages, citrus beverages, tea and coffee	U	F	
CO3	Understanding of permitted additives in beverages.	U	M	
CO4	Ability to understand the impact of processing on quality of beverage	U	M	
CO5	Investigate and interpret current industry trends, case studies, and innovations through open-ended projects and demonstrate creativity in beverage product development or problem-solving.	C	P	

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

Detailed Syllabus:

Module	Unit	Content	Hours	Marks
I	Introduction to Beverages & Nonalcoholic Beverages		15	15
	1	Classification and Importance of Beverages	2	
	2	Status of Beverage Industry in India	1	
	3	Types and Manufacturing of Fruit Juice Beverages (squash, cordial, RTS, etc.)	4	
	4	Synthetic, Carbonated, Low-calorie, Dry & Sports Drinks	5	
	5	Additives and Adulterants in Beverages	3	
II	Alcoholic and Fermented Beverages		15	15
	6	Classification of Alcoholic Beverages	1	
	7	Role of Yeast in Alcohol Production	1	
	8	Wine: Types and Manufacturing Technology	3	
	9	Beer: Brewing Technology and classification of beer	4	
	10	Distilled Spirits: Technology and Equipment	4	
	11	Compound Beverages & Basic Regulatory Overview	2	
III	Packaged Drinking Water & Plant-Based Beverages		15	15
	12	Packaged Drinking Water: Types & Manufacturing	4	
	13	Quality parameters and evaluation of water	3	
	14	Tea Processing: Soluble, Instant, Flavored, Decaffeinated	3	
	15	Coffee Processing: Soluble, Decaffeinated, Brew Concentrates	3	
	16	Cocoa Processing and Cocoa Beverage Production	2	
IV	Equipment, Bottling & Processing Technologies		10	15
	17	Equipment for Juice Pressing, Brewing, Distillation	3	
	18	Bottling and Packaging Methods	3	
	19	Juice Clarification and Debittering Techniques	4	
V	Open-Ended Module – Novel Non- Alcoholic Beverages		5	

References

1. Hardwick WA. 1995. Handbook of Brewing. Marcel Dekker.
2. Hui YH. et al 2004. Handbook of Food and Beverage Fermentation Technology. Marcel Dekker.
3. Priest FG & Stewart GG. 2006. Handbook of Brewing. 2nd Ed. CRC.
4. Richard P Vine. 1981. Commercial Wine Making - Processing and Controls. AVI Publ.
5. Varnam AH & Sutherland JP. 1994. Beverages: Technology, Chemistry and Microbiology. Chapman & Hall.
6. Woodroof JG & Phillips GF. 1974. Beverages: Carbonated and non-carbonated. AVI Publ.

Mapping of CO's with:

	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6
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

Mapping of CO's to Assessment Rubrics:

	Rubrics 1	Rubrics 2	Rubrics 3	Rubrics 4
CO 1	✓			✓
CO 2	✓			✓
CO 3	✓			✓
CO 4		✓		✓
CO 5		✓	✓	✓
CO 6			✓	✓

Course Code & Title	FTV4EJ202	CONFECTIONARY TECHNOLOGY			
Type of Course	Elective Major	Semester	4	Academic Level	200-299
Course Details	Credit	Lecture per week	Tutorial per week	Practical per week	Total Hours
	4	4			60
Pre-requisites	Students are expected to have a foundational understanding of food science, including basic concepts of food chemistry, unit operations, and principles of food processing, to effectively grasp the technical aspects of sugar and confectionery technology.				
Course Summary	This course offers an in-depth exploration of sugar and confectionery technology, covering the sources and processing of various sugars, principles and techniques involved in manufacturing sugar-boiled and aerated confectioneries, gums, jellies, and chocolate products, along with an understanding of ingredient functionality, processing equipment, and quality control essential for product development in the confectionery industry.				

Course Outcomes (CO):

CO	CO Statement	Cognitive Level*	Knowledge Category#	Evaluation Tools used
CO1	Identify sources of sugar and describe the manufacturing process of table sugar and byproducts like molasses.	R	F	Quiz/ Assignment/ Seminar/ Discussion/ Mid-term exam
CO2	Classify different types and forms of sugars used in the food industry and their specific characteristics.	U	C	
CO3	Differentiate between crystalline and amorphous sugar-boiled confectionery and outline their production processes.	An	C	
CO4	Apply knowledge of hydrocolloid chemistry in the preparation of gums, jellies, and specialty pastes.	Ap	P	
CO5	Examine the role of key ingredients in chocolate processing and explain tempering and enrobing technologies.	U	C	
CO6	Develop or improve a confectionery or chocolate-based product based on industry trends and technical feasibility.	C	M	
* - Remember (R), Understand (U), Apply (Ap), Analyze (An), Evaluate (E), Create (C) # - Factual Knowledge(F) Conceptual Knowledge (C) Procedural Knowledge (P) Metacognitive Knowledge (M)				

Detailed Syllabus:

Module	Unit	Content	Hours	Marks
		Sugar Sources, Types, and Manufacturing	18	18
I	1	Sources of sugar manufacture & chemical composition of sugarcane	4	
	2	Manufacture of table sugar & double sulfitation process	5	
	3	Molasses: production and utilization	3	
	4	Types of sugar – white, refined, gur, khandsari, crystalline sugar	3	
	5	Forms of sugar – cane, beet, cane syrup, corn syrup, fructose syrup, maple syrup, honey, liquid sweeteners	3	
II		Sugar Boiled Confectionery and Classification	12	12
	6	Classification of confectionery	3	
	7	Sugar boiled confectionery – crystalline and amorphous types	3	
	8	Rock candy, hard candy, lemon drop, China balls, soft candy	3	
	9	Lollipop, marshmallows, fudge, cream, caramel, toffee, lozenges, gumdrops, honeycomb candy	3	
III		Gums, Jellies and Specialty Confectionery	13	15
	10	Chemistry and technology of hydrocolloids	3	
	11	Hydrocolloid pre-treatment, liquor preparation, shaping, drying, finishing	3	
	12	Rework, common faults, causes and remedies	2	
	13	Liquor ice paste – ingredients and manufacture	2	
	14	Cream paste – ingredients, manufacture, extrusion	2	
	15	Aerated confectionery	1	
IV		Chocolate and Candy Bar Technology	12	15
	16	Ingredients – cocoa, sugar, dried milk, special fats, emulsifiers, nuts, alcohols	3	
	17	Production of cocoa liqueur; manufacturing dark, milk, white chocolate	3	
	18	Chocolate mass, compound coatings, candy bars	2	
	19	Tempering, chocolate shells, hollow figures, enrobing technology	2	
	20	Vegetable fats and chocolate bar formulation	2	

V	Open-Ended Module: Innovations and Emerging Trends in Confectionery Technology	5	
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References:

1. Sugar Confectionery Manufacture E.B. Jackson, 2nd edition, 1995 Blackie Academic and Professional, Glasgow.
2. Sugar Confectionery and Chocolate Manufacture: R.Lees 197 Leonard Hill Books, International Text Book Company Limited.
3. Meade-Chen Cae Sugar Handbook: Chen, JCPO,11th edition,1985John Wiley and Sons,
4. Sugar Technology for Students Lionnet, G R E, 1999 Lang Fred, Durban, S. Africa 5. Minifie, Bernard W..Chocolate, Cocoa, and Confectionery Science and Technology.
5. CBS
6. Beckett, Stephen T .The Science of Chocolate.. RS.C.
7. BernadVM.1989. Chocolate, Cocoa and confectionery , science and Technology. Avi publications.
8. Bernad , Minfie., Chocolate, cocoa & confectionery Science & Technology. Advnce Books , Jaipur
9. Lee R and EB Jackson ,1973,. Sugar, confectionery and Chocolate manufacture.
10. Leonard Hill Books
11. Jackson R Sugar confectionery marketing

Mapping of CO's with:

	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6
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

Mapping of COs to Assessment Rubrics:

	Rubrics 1	Rubrics 2	Rubrics 3	Rubrics 4
CO 1	✓			✓
CO 2	✓			✓
CO 3	✓			✓
CO 4		✓		✓
CO 5		✓	✓	✓
CO 6			✓	✓

Course Code & Title	FTV4EJ203	FOOD EXTRUSION TECHNOLOGY			
Type of Course	Elective Major	Semester	4	Academic Level	200-299
Course Details	Credit	Lecture per week	Tutorial per week	Practical per week	Total Hours
	4	4			60
Pre-requisites	Basic knowledge of food science, food processing principles, and microbiology is recommended for understanding food extrusion technology.				
Course Summary	This course provides comprehensive knowledge of food extrusion technology, including types of extruders, processing principles, product applications, and recent advancements in the field.				

Course Outcomes (CO):

CO	CO Statement	Cognitive Level*	Knowledge Category#	Evaluation Tools used
CO1	Define and classify food extrusion systems and describe their importance in food processing.	U	C	Quiz/ Assignment/ Seminar/ Discussion/ Mid-term exam
CO2	Apply knowledge of rheological and process parameters to control extrusion operations for desired food quality.	Ap	P	
CO3	Explain the working principles of single and twin-screw extruders and compare their applications in food manufacturing.	An	C/P	
CO4	Identify chemical and nutritional changes occurring during extrusion and suggest methods to minimize quality losses.	An	C/P	
CO5	Evaluate suitable packaging systems and process parameters for various extruded products like breakfast cereals and TVP.	E	P	
CO6	Investigate and critically assess recent advancements such as non-thermal and gas assisted extrusion technologies in the context of functional food development.	C	M/P	
* - Remember (R), Understand (U), Apply (Ap), Analyze (An), Evaluate (E), Create (C) # - Factual Knowledge(F) Conceptual Knowledge (C) Procedural Knowledge (P) Metacognitive Knowledge (M)				

Detailed Syllabus:

Module	Unit	Content	Hours	Marks
I	Fundamentals of Food Extrusion		8	8
	1	Definition and importance of food extrusion	1	
	2	Principles and types of extruders	3	
	3	Applications of extrusion in the food industry	2	
	4	Pre-conditioning of raw materials used in extrusion	2	
II	Extruders		22	22
	5	Extruder selection, design, and operation	3	
	6	Single screw extruder: working principle, net flow, pasta & vermicelli production	4	
	7	Twin screw extruders: co-rotating and counter-rotating types	4	
	8	Process characteristics of twin screw extruders	4	
	9	Rheological properties of materials during extrusion	4	
	10	Advantages and comparison of twin screw with single screw systems	3	
III	Product Characteristics and Applications		15	15
	11	Chemical and nutritional changes during extrusion	3	
	12	Factors affecting extrusion; net flow and residence time	3	
	13	Packaging materials for extruded products	2	
	14	Breakfast cereals: classification, raw materials, process	4	
	15	TVP: definition, manufacturing process, and quality parameters	3	
IV	Advanced and Emerging Extrusion Technologies		11	15
	16	Carbon dioxide and nitrogen-assisted extrusion	3	
	17	Extrusion in confectionery technology	4	
	18	Non-thermal extrusion of protein-rich products	2	
	19	Recent trends and innovations in extrusion technology	2	
V	Open-Ended Module: Emerging Trends and Innovations in Food Extrusion Technology		4	

References:

- 1 Extruded food by S. Matza Publisher Springer
- 2 Technology of Extrusion Cooking by N.D. Frame Publisher Springer
- 3 Extruders in Food Application by Riaz M.N. Publisher CRC Press
- 4 Extrusion of Foods by J.M. Harper Publisher CRC Press
- 5 Advances in Food Extrusion Technology by Maskan and Altan Publisher CRC Press

Mapping of COs with PSOs and POs

COs	PS O 1	PS O 2	PS O 3	PS O 4	PS O 5	PS O 6	P O 1	P O 2	P O 3	P O 4	P O 5	P O 6
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

Mapping of CO's to Assessment Rubrics

COs	Rubrics 1	Rubrics 2	Rubrics 3	Rubrics 4
CO1	✓			✓
CO2	✓			✓
CO3	✓			✓
CO4		✓		✓
CO5		✓	✓	✓
CO6			✓	✓

Course Code & Title	FTV5EJ301	FOOD BIOTECHNOLOGY			
Type of Course	Elective Major	Semester	5	Academic Level	300-399
Course Details	Credit	Lecture per week	Tutorial per week	Practical per week	Total Hours
	4	4			60
Pre-requisites	To acquaint with the fundamentals and application of biotechnology in relation to raw materials for food processing, nutrition, food fermentations, waste utilization and use better genetic resources.				
Course Summary	Provides a foundational understanding of Biotechnology in animal, plant and food production				

Course Outcomes (CO):

CO	CO Statement	Cognitive Level*	Knowledge Category#	Evaluation Tools used
CO1	Have developed an understanding of the application of biotechnology in animal, plant and food production.	U	F	Quiz/ Assignment/ Seminar/ Discussion/ Mid-term exam
CO2	Understand the principles of fermentation	U	F	
CO3	Understand how different biotechnology processes are applied to food product development	U	M	
CO4	Recognize the impact of biotechnological applications on food supply and consumer acceptance of food products.	A	M	
CO5	Apply microbiological and molecular biological techniques in food testing.	A	C	
* - Remember (R), Understand (U), Apply (Ap), Analyze (An), Evaluate (E), Create (C) # - Factual Knowledge(F) Conceptual Knowledge (C) Procedural Knowledge (P) Metacognitive Knowledge (M)				

Detailed Syllabus:

Module	Unit	Content	Hours	Marks
I	Fundamentals of Biotechnology & Enzyme Applications		12	15
	1	Definition, scope, and applications of biotechnology. Applications in food industries, pharmaceuticals, and agriculture	3	
	2	Food plant waste utilization, biogas plants	3	

	3	Role of biotechnology in fermented food products (dairy, meat, vegetables), Starter culture development	4	
	4	Role of enzymes in baking, meat and meat processing. Enzymic processing of fruit juices	2	
II	Genetics & Molecular Biology		14	15
	5	Introduction to Genetics, Mendelian genetics. Population & Evolutionary genetics	4	
	6	Gene Mapping. Microbial gene transfer mechanisms	5	
	7	Mutation: types, molecular mechanisms, and applications. DNA repair mechanisms	5	
III	Genetic Engineering & Industrial Applications		10	15
	8	Genetic recombination mechanisms. Plasmids and cloning	4	
	9	Genetic control mechanisms in industrial fermentation (induction, manipulation, recombination)	6	
IV	Advanced Topics & Bioethics		20	15
	10	Cell and tissue culture, Micro-propagation. Continuous cultures	5	
	11	Secondary metabolite synthesis	2	
	12	Ethical issues concerning GM foods.	7	
	13	Biosafety, risk assessment and management. Public perception of GM foods	6	
V	Open Ended Module - Emerging Trends and Innovations in Food Biotechnology		4	

References:

1. Bains W. 1993. Biotechnology from A to Z. Oxford Univ. Press.
2. Joshi VK & Pandey A. 1999. Biotechnology: Food Fermentation. Vols. I, II. Education Publ.
3. Knorr D. 1982. Food Biotechnology. Marcel Dekker.
4. Lee BH. 1996. Fundamentals of Food Biotechnology. VCH.
5. Perlman D. 1977-1979. Annual Reports of Fermentation Processes.
6. Prescott SC & Dunn CG. 1959. Industrial Microbiology. McGraw Hill.
7. Ward OP. 1989. Fermentation Biotechnology. Prentice Hall.

Mapping of COs with PSOs and POs

COs	PS O 1	PS O 2	PS O 3	PS O 4	PS O 5	PS O 6	P O 1	P O 2	P O 3	P O 4	P O 5	P O 6
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

Mapping of CO's to Assessment Rubrics

COs	Rubrics 1	Rubrics 2	Rubrics 3	Rubrics 4
CO1	✓			✓
CO2	✓			✓
CO3	✓			✓
CO4		✓		✓
CO5		✓	✓	✓
CO6			✓	✓

Course Code & Title	FTV5EJ302	FOOD ENZYME TECHNOLOGY			
Type of Course	Elective Major	Semester	5	Academic Level	300-399
Course Details	Credit	Lecture per week	Tutorial per week	Practical per week	Total Hours
	4	4			60
Pre-requisites	To acquaint with the fundamentals and application of enzyme technology in relation to biochemistry, microbiology, and cell biology, with a basic understanding of enzyme structure and function.				
Course Summary	Provides a comprehensive understanding of enzyme technology, covering enzyme structure, function, production, purification, immobilization techniques, and diverse industrial applications in food and bioprocessing sectors.				

Course Outcomes (CO):

CO	CO Statement	Cognitive Level*	Knowledge Category#	Evaluation Tools used
CO1	Recall the classification, structure, and basic components of enzymes, including their cofactors and active sites.	R	F	Quiz/ Assignment/ Seminar/ Discussion/ Mid-term exam
CO2	Explain the mechanism of enzyme action and factors influencing enzyme activity such as pH, temperature, and substrate concentration.	U	C	
CO3	Apply suitable fermentation and downstream processing techniques for the production and purification of enzymes from various sources.	A	P	
CO4	Analyze the effectiveness of different enzyme immobilization methods and evaluate their advantages and limitations in industrial applications.	A	P	
CO5	Assess the role and suitability of specific enzymes in various food processing industries such as dairy, meat, fish, egg, and flavor production.	E	M	
* - Remember (R), Understand (U), Apply (Ap), Analyze (An), Evaluate (E), Create (C) # - Factual Knowledge(F) Conceptual Knowledge (C) Procedural Knowledge (P) Metacognitive Knowledge (M)				

Detailed Syllabus:

Module	Unit	Content	Hours	Marks
I	Fundamentals of Enzymology		15	15
	1	Introduction to enzymes: Definition, classification (IUB system)	3	
	2	Enzyme structure: Active site, apoenzyme, cofactor, coenzyme, prosthetic group.	3	
	3	Mechanism of enzyme action	4	
	4	Factors affecting enzyme activity (pH, temperature, substrate concentration, inhibitors)	5	
II	Enzyme Production and Purification		16	15
	5	Sources of enzymes: Plants, animals, microorganisms. Isolation and extraction of enzymes	3	
	6	Enzyme production: Fermentation strategies (submerged & solid-state)	3	

	7	Downstream processing: Cell disruption, filtration, centrifugation	5	
	8	Enzyme purification techniques: Precipitation, chromatography (ion exchange, affinity, gel filtration)	5	
III	Enzyme Immobilization		10	15
	9	Immobilization techniques: Adsorption, covalent binding, entrapment, encapsulation, cross-linking	4	
	10	Advantages and disadvantages of immobilized enzymes	2	
	11	Industrial reactors for immobilized enzymes (Packed bed, fluidized bed)	4	
IV	Enzymes as processing aids		15	15
	12	Role of enzymes in Dairy processing (cheese making and whey processing).	4	
	13	Role of enzymes in meat processing (tenderization and flavor development) and fish processing (De-skinning, collagen extraction etc.,)	4	
	14	Role of enzymes in Egg processing	3	
	15	Role of enzymes in the production of flavors	4	
V	Open Ended Module - Applications of Enzyme Technology		4	

References:

1. Trevor Palmer – *Enzymes: Biochemistry, Biotechnology and Clinical Chemistry*
2. Nicholas Price & Lewis Stevens – *Fundamentals of Enzymology*
3. Chaplin and Bucke – *Enzyme Technology*
4. Harvey W. Blanch & Douglas S. Clark – *Biochemical Engineering*
5. Wiseman, A. – *Handbook of Enzyme Biotechnology*
6. Whitehurst, R.J. & Van-Oort, M., (2010), *Enzymes in Food technology*, Second edition, Blackwell Publishing Ltd
7. Aehle, W. (2007) *Enzymes in Industry: Production and application*. Wiley-VCH Verlag GmbH & Co. KGaA, Weinheim
8. Rastall, R (2007) *Novel enzyme technology for food applications* Woodhead Publishing Limited, Abington Hall, Abington, Cambridge CB21 6AH, England
9. Kalaichelvan, P.T., (2002), *Bio process technology*, MJP publishers, Chennai

Mapping of COs with PSOs and POs

COs	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6
CO1	1	1	-	1	1	1	-	1	2	1	1	1
CO2	2	2	3	2	2	2	1	1	-	2	2	2
CO3	-	1	-	2	-	-	1	1	1	1	-	1
CO4	2	1	1	-	1	1	-	1	2	1	2	1
CO5	-	2	2	1	1	-	2	2	1	1	-	2
CO6	1	1	-	1	1	1	1	-	1	1	1	1

Mapping of CO's to Assessment Rubrics

COs	Rubrics 1	Rubrics 2	Rubrics 3	Rubrics 4
CO1	✓			✓
CO2	✓			✓
CO3	✓			✓
CO4		✓		✓
CO5		✓	✓	✓
CO6			✓	✓

Course Code & Title	FTV5EJ303	FOOD FERMENTATION TECHNOLOGY			
Type of Course	Elective Major	Semester	5	Academic Level	300-399
Course Details	Credit	Lecture per week	Tutorial per week	Practical per week	Total Hours
	4	4			60
Pre-requisites	A fundamental understanding of microbiology, biochemistry, and food science is essential as a prerequisite for studying food fermentation technology.				
Course Summary	Food Fermentation Technology explores the principles, microorganisms, processes, and applications involved in the production of fermented foods and beverages.				

Course Outcomes (CO):

CO	CO Statement	Cognitive Level*	Knowledge Category#	Evaluation Tools used
CO1	Understand the fundamentals of microbial fermentation and the role of microorganisms in the production of fermented foods.	C	C	Quiz/ Assignment/ Seminar/ Discussion/ Mid-term exam
CO2	Demonstrate knowledge of the equipment and process parameters used in industrial scale fermentation.	C	F	
CO3	Design a basic fermentation protocol for the production of selected fermented food products with appropriate microbial strains and conditions.	C	P	
CO4	Understand the formulation of fermentation media including nutrient requirements and additives.	U	C	
CO5	Analyze the production methods and characteristics of fermented dairy, meat, fish, vegetable, cereal, and pulse-based food products.	An	P	
* - Remember (R), Understand (U), Apply (Ap), Analyze (An), Evaluate (E), Create (C) # - Factual Knowledge(F) Conceptual Knowledge (C) Procedural Knowledge (P) Metacognitive Knowledge (M)				

Detailed Syllabus:

Module	Unit	Content	Hours	Marks
I	Fundamentals of Fermentation and Microorganisms		12	15
	1	Introduction to food fermentation: Definition, history, and scope. Types of fermentation: alcoholic, lactic acid, acetic acid, etc.	4	
	2	Microorganisms involved in fermentation (bacteria, yeast, molds). Characteristics of starter cultures	4	
	3	Factors affecting fermentation: pH, temperature, oxygen, substrate concentration	4	
II	Fermented Foods and Beverages		15	15
	4	Cereal-based fermented foods: idly, dosa, bread, beer. Legume-based fermented foods: soy sauce, miso, tempeh	4	
	5	Vegetable fermentation: sauerkraut, kimchi, pickles Dairy fermentation: yogurt, cheese, kefir	4	

	6	Meat and fish fermentations: salami, fermented fish sauces Fermented beverages: wine, beer, kombucha	4	
	7	Health benefits and probiotic effects of fermented foods	3	
III	Fermenter		13	15
	8	Fermenter design	2	
	9	Types of fermenters (Shake flask, Batch/stir tank, Continuous, Bubble column, airlift and Tower fermenter)	6	
	10	Types of fermentation processes, aeration and agitation	3	
	11	Instrumentation and control	2	
IV	Industrial Fermentation Process and Technology		15	15
	12	Downstream processing: centrifugation, filtration, distillation, drying	6	
	13	Process optimization and scale-up techniques	3	
	14	Quality control and hygiene in fermentation industries	3	
	15	Use of immobilized cells and enzymes in fermentation	3	
V	Open Ended module- Fermentation technology for alternative protein production.			

References:

- Shikha, K Tiwari, Brijesh K (Eds.). 2016. Novel Food Fermentation Technologies Springer International Publishing
- Stanbury, P.F., A. Whitaker and S.J. Hall.,2016, Principles of Fermentation Technology Butterworth Heinemann, Elsevier publishers
- Vogel, H.C. and C.L. Todaro, 2005 Fermentation and Biochemical Engineering Handbook: Principles, Process Design and Equipment, 2nd Edition, Standard Publishers.
- El-Mansi, E.M.T, 2007, Fermentation Microbiology and Biotechnology 2nd Edition, CRC / Taylor & Francis.
- Joshi, V.K. and Ashok Pandey, 1999, Biotechnology: Food Fermentation, Microbiology, Biochemistry and Technology, Vol. I & vol. II Educational Publisher.
- Peppler, H.J. and D. Perlman, 2004, Microbial Technology: Fermentation Technology, 2nd Edition, Vol. II Academic Press / Elsevier

Mapping of CO's with:

	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6
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

Mapping of CO's to Assessment Rubrics:

	Rubrics 1	Rubrics 2	Rubrics 3	Rubrics 4
CO 1	✓			✓
CO 2	✓			✓
CO 3	✓			✓
CO 4		✓		✓
CO 5		✓	✓	✓
CO 6			✓	✓

20.DETAILED SYLLABUS OF THE FOUNDATION COURSES

Course Code & Title	FTV1FM105	Food Facts and Principle			
Type of Course	MDC	Semester	1	Academic Level	100-199
Course Details	Credit	Lecture per week	Tutorial per week	Practical per week	Total Hours
	3	3			45
Pre-requisites	Basic understanding of biology and chemistry. Helpful for grasping concepts like food composition, nutrition, spoilage, and processing.				
Course Summary	Provides a foundational understanding of the food science and technology field.				

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/ Seminar/ Discussion/ Mid-term exam
CO2	To Remember the basic Food groups like cereals, pulses, oilseeds, fruits vegetables, spices, meat, fish, poultry, seafood, 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	
CO5	Describe the principles and methods of food preservation and evaluate their impact on food quality and safety	U	F	
CO6	Explain the role of food regulatory bodies and assess the importance of food laws and labelling in ensuring consumer protection.	E	P	
* - Remember (R), Understand (U), Apply (Ap), Analyze (An), Evaluate (E), Create (C) # - Factual Knowledge(F) Conceptual Knowledge (C) Procedural Knowledge (P) Metacognitive Knowledge (M)				

Detailed Syllabus:

Module	Unit	Content	Hours	Marks
I	Introduction		9	17
	1	Scope of Food Science and Technology.	2	2
	2	Definition and Function of food. Definition - Healthy foods, Functional foods. Prebiotics, Probiotics, Nutraceuticals, organic foods, GM foods	2	5
	3	Definition, classification, function and sources of - Water, Carbohydrates, Proteins, Lipids, Vitamins and Minerals	5	10
II	Food Quality Assessment		11	12
	4	Sensory assessment-Appearance of food.	3	3
	5	Visual perception, color of foods, smell, flavor and taste.	4	4
	6	Threshold tests, difference tests, ranking test & hedonic scale	4	5
III	Food Additives		9	18
	7	Food additives- definition and classification.	2	3
	8	Preservatives, coloring agents, flavoring agents and flavor enhancer	3	5
	9	Antioxidants, Artificial sweeteners, stabilizers, thickening agents, anticaking agents, bleaching and maturing agents. Flour improvers, leavening agents, surface active agents	4	10
IV	Food Adulteration		7	8
	10	Food adulteration – definition and types	3	4
	11	Test for adulteration	4	4
V	Open Ended			
	Novel food processing Technology			

References:

1. Potter NN, Hotchkiss JH. Food Science. CBS publishers and distributors
2. S. Manany, N S. Swamy Food Facts and Principles. New Age International Publishers
3. Murano, Peter S. Understanding Food Science and Technology. Thomson
4. Sumati R Mudambi, Rajagopal M V. Fundamentals of Food and Nutrition. New Age International Publishers
5. Shubhangini A Joshi. Nutrition and Dietics. Tata McGraw Hill Education Private Limited
6. VijayaKhader. Text Book of Food Science and Technology. ICAR
7. Swaminathan M. Food Science Chemistry and Experimental Foods. Bappco

Mapping of CO's with:

	PS O 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6
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

Mapping of CO's to Assessment Rubrics:

	Rubrics 1	Rubrics 2	Rubrics 3	Rubrics 4
CO 1	✓			✓
CO 2	✓			✓
CO 3	✓			✓
CO 4		✓		✓
CO 5		✓	✓	✓
CO 6			✓	✓

Course Code & Title	FTV2FM106	Basic Food Processing & Preservation			
Type of Course	MDC	Semester	2	Academic Level	100-199
Course Details	Credit	Lecture per week	Tutorial per week	Practical per week	Total Hours
	3	3			45
Pre-requisites	Basic understanding of food science. Helpful for grasping concepts like food composition, nutrition, spoilage, processing and preservation.				
Course Summary	Provides a foundational understanding of food processing and preservation techniques.				

Course Outcomes (CO):

CO	CO Statement	Cognitive Level*	Knowledge Category#	Evaluation Tools used
CO1	Understand the principles of food preservation techniques. Gain knowledge of traditional and modern methods of food preservation such as thermal processing, refrigeration, dehydration, fermentation, and use of preservatives.	U	F	Quiz/ Assignment/ Seminar/ Discussion/ Mid-term exam
CO2	Analyze the effects of processing on food quality and safety. Evaluate how various preservation and processing techniques impact the nutritional, sensory, and microbiological quality of food.	An	M	
CO3	Identify spoilage mechanisms and control methods. Understand the causes of food spoilage by microorganisms, enzymes, and environmental factors, and suggest appropriate preservation strategies.	Ap	P	
CO4	Apply food processing technologies to extend shelf life. Learn to apply unit operations such as drying, canning, freezing, and pasteurization in practical settings to enhance food stability and longevity.	Ap	C	
CO5	Demonstrate knowledge of packaging, storage, and logistics. Understand the role of packaging materials and systems, storage conditions, and supply chain considerations in maintaining food quality.	E	F	
* - Remember (R), Understand (U), Apply (Ap), Analyze (An), Evaluate (E), Create (C) # - Factual Knowledge(F) Conceptual Knowledge (C) Procedural Knowledge (P) Metacognitive Knowledge (M)				

Detailed Syllabus:

Module	Unit	Content	Hours	Marks
I	Thermal Processing		10	13
	1	Introduction: Basic principles of food preservation, methods of preservation.	2	2
	2	Thermal processing: blanching, pasteurization, sterilization, UHT sterilization, Aseptic processing, cooking, frying, baking, grilling, smoking	3	3
	3	Canning: principle, steps involved in canning, types of containers used, heat penetration into containers, pH classification of foods, corrosion of cans.	2	3
	4	Drying and dehydration: Heat and mass transfer, factors affecting drying process, drying curve, evaporation, application of evaporation in food industry.	3	5
II	Low Temperature Technique		10	13
	5	Preservation by chilling: Low temperature preservation of fresh fruits, vegetables, meat and fish products. Chilling injury. Changes during refrigeration.	4	5
	6	Preservation 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. IQF	4	5
	7	Thawing: Effects on food, changes during thawing, types.	2	3
III	Fermentation and Preservatives		15	16
	8	Preservation by fermentation: Alcoholic, acetic acid and lactic acid fermentation, applications in food processing	4	3
	9	Natural preservatives: sugar, salt, vinegar, spices, mode of action.	3	3
	10	Chemical preservatives: Sulphur dioxide, benzoic acid, sorbates, propionates, acetic acid, mode of action, FSSAI regulations for various food products.	4	4
	11	Food additives: Antioxidants, Antibiotics.	2	3
	12	Preservation by controlling water activity: High sugar products, IMF, curing and effect of salt of food preservation	2	3
IV	Recent Trends		5	8

	13	Non thermal technologies: Microfiltration, bacto-fugation, ultrahigh voltage electric field, Pulsed electric field. High pressure processing: Principles applications and advantages. Microwave processing: Principles applications and advantages. Alternate thermal technologies: ohmic heating, dielectric heating infrared and induction heating. Nanotechnology: Principle, application and advantages. Hurdle technology: Principles, applications and advantages. Irradiation. Food needs, consumer preference, and market survey, Steps in new product development.	5	8
V	Open Ended			
	Advanced food processing technology			

References:

1. Fennema Owen R. Principles of food Science. Marcel Dekker, Inc
2. Murano, Peter S. Understanding Food Science and Technology. Thomson
3. Khader, Vijaya Textbook on Food Storage and Preservation Kalyani Publishers
4. Pruthi JS Quick Freezing Preservation of Foods Allied publishers Limited
5. Potter N N.& Hotchkiss 1997 Food Science CBS Publishers
6. Desrosier NW James N, 1977 Technology of Food Preservation CBS Publishers
7. Arti Sanhla Food Preservation. Principles and practices
8. Manay, N.S, Shadaksharaswamy, M. Foods: New Age international (P) publishers, New Delhi 2004
9. Shafiur Rahman M., 1999, Hand book of food preservation. Marcel Dekker, Inc, New York.
10. Subbulakshmi G and Udippi S.A Food Processing and Preservation. Foods: New Age international (P) publishers, New Delhi 2001

Mapping of CO's with:

	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6
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

Mapping of CO's to Assessment Rubrics:

	Rubrics 1	Rubrics 2	Rubrics 3	Rubrics 4
CO 1	✓			✓
CO 2	✓			✓
CO 3	✓			✓
CO 4		✓		✓
CO 5		✓	✓	✓
CO 6			✓	✓

Course Code & Title	FTV1FS111	Basic Food Quality and Safety			
Type of Course	SEC	Semester	1	Academic Level	100-199
Course Details	Credit	Lecture per week	Tutorial per week	Practical per week	Total Hours
	3	3			45
Pre-requisites	Basic understanding of basic chemistry, biology and mathematics. Helpful for grasping concepts like food composition, structure etc.				
Course Summary	Upon completion of this course students will be able to understand the importance of food safety and hygiene and can apply it at industrial level.				

Course Outcomes (CO):

CO	CO Statement	Cognitive Level*	Knowledge Category#	Evaluation Tools used
CO1	Foundational understanding of food quality parameters and safety equipped to identify potential hazard, prevent contamination and able to maintain a safe food environment.	U	C	Quiz/ Assignment/ Seminar/
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 analyze food handling, hazard analysis, hygiene practices, HACCP implementation	E	M	Discussion/ Mid-term exam
* - Remember (R), Understand (U), Apply (Ap), Analyze (An), Evaluate (E), Create (C) # - Factual Knowledge(F) Conceptual Knowledge (C) Procedural Knowledge (P) Metacognitive Knowledge (M)				

Detailed Syllabus:

Module	Unit	Content	Hours	Marks
I	Concept of Quality		10	10
	1	Quality attributes- physical, chemical, nutritional, microbial, and sensory and their measurement and evaluation, Sensory and instrumental analysis methods for testing quality.	6	
	2	Food safety and Quality Assurance: Quality control of raw materials, in – process food control, quality control of finished products	4	
II	Food Safety		12	10
	4	Importance of Food Safety, Food Hygiene, High risk food, Low risk food, Danger Zone, Personal hygiene.	8	
	5	intrinsic and extrinsic factors affecting the growth of microorganisms in food.	4	
III	Sanitation		13	16
	6	Food Sanitation and safety: Factors contributing to physical, chemical and biological contamination in food chain, prevention and control of food borne hazards	5	
	7	Definition and regulation of food sanitation, sources of contamination, personal hygiene-food handlers.	2	
	8	cleaning compounds, sanitation methods, waste disposal strategy (solid and liquid waste) and pest control	3	
IV	Food Adulteration and additives		10	14
	9	Common adulterants, simple tests for detection of adulteration, types of adulteration and recent trends in food adulteration.	8	
	10	Food additives- classification, functional role and safety issues	2	
V	Open ended module- HACCP implementation in food industry.			

References:

1. Early, R. (2006) Guide to Quality Management Systems for the Food Industry, Blackie, Academic and professional, London.
2. Gould, W.A and Gould, R.W. (2005) Total Quality Assurance for the Food Industries, CTI Publications Inc. Baltimore.
3. Pomeraz, Y. and McLoari, C.E. (2008) Food Analysis: Theory and Practice, CBS publishers and Distributor, New Delhi.
4. Bryan, F.L. (2007) Hazard Analysis Critical Control Point Evaluations A Guide to Identifying Hazards and Assessing Risks Associated with Food Preparation and Storage. World Health Organization, Geneva.
5. Kirk, R.S and Sawyer, R. (2005) Pearson's Composition and Analysis of Foods, Longman Scientific and Technical. 9th Edition, England.
7. FAO (2006) Manuals of Food Quality Control. 2-Additives Contaminants Techniques, Rome.

Mapping of CO's with:

C O s	P O 1	P O 2	P O 3	P O 4	P O 5	P O 6	P O 7	P O 8	P O 9	PO 10	PO 11	PO 12	PS O1	PS O2	PS O3	PS O4	PS O5
C O 1	3	3	2	2	1	2	2	2	1	1	2	2	3	2	2	1	2
C O 2	2	3	3	3	2	2	2	2	1	2	2	3	3	3	2	1	3
C O 3	2	3	3	3	2	3	2	2	2	3	2	3	3	3	3	2	3
C O 4	2	3	3	3	2	3	3	3	2	3	3	3	3	3	3	2	3

Mapping of CO's to Assessment Rubrics:

CO	Rubrics 1	Rubrics 2	Rubrics 3	Rubrics 4
CO1				
CO2				
CO3				
CO4				

Course Code & Title	FTV4FS112	Food Storage and Infestation Controls			
Type of Course	SEC	Semester	4	Academic Level	100-199
Course Details	Credit	Lecture per week	Tutorial per week	Practical per week	Total Hours
	3	3			45
Pre-requisites	Students should have a basic understanding of food chemistry, microbiology, and post-harvest physiology to grasp the principles of food deterioration and preservation. They should also be familiar with fundamental concepts of storage structures, environmental control, and pest biology to effectively learn infestation prevention and management strategies.				
Course Summary	Focuses on principles and practices for safe storage of food commodities, emphasizing physical, chemical, and biological factors affecting quality and shelf life. It covers methods for monitoring, preventing, and controlling insect, rodent, and microbial infestations to ensure food safety and minimize post-harvest losses.				

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/ Seminar/ Discussion/ Mid-term 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	
* - Remember (R), Understand (U), Apply (Ap), Analyze (An), Evaluate (E), Create (C) # - Factual Knowledge(F) Conceptual Knowledge (C) Procedural Knowledge (P) Metacognitive Knowledge (M)				

Detailed Syllabus:

Module	Unit	Content	Hours	Marks
I	Fundamentals of Food Storage		12	12
	1	Importance of food storage in supply chain and food security. Factors affecting storage life of foods (temperature, humidity, atmosphere, light, microbial load).	2	
	2	Classification of Stored Foods-Perishable, semi-perishable, and non-perishable foods – examples and characteristics. Storage Structures -Godowns, bins, silos, refrigerated warehouses, insulated containers.	3	
	3	Types of storage (ambient, refrigerated, controlled atmosphere, frozen, modified atmosphere)	5	
II	Food Deterioration and Infestation		13	13
	4	Causes of Deterioration -Microbial spoilage (bacteria, yeasts, molds) Enzymatic changes in stored foods-Physical & chemical deterioration (oxidation, staling, moisture migration).	3	
	5	Infestation in Stored Foods -Common storage pests: insects, rodents, birds, mites – identification and damage caused	4	
	6	Signs and Detection of Infestation Visual, sensory, and laboratory methods for infestation detection Sampling methods and inspection protocols	4	
III	Infestation Control Methods		13	12
	7	Preventive Measures Sanitation and hygiene practices in storage Pest-proofing of storage structures Grain cleaning and drying prior to storage	3	
	8	Control Methods Physical methods: heat, cold, radiation, hermetic storage Chemical methods: fumigation (phosphine, methyl bromide, controlled use & safety), insecticides and rodenticides Biological control methods: natural predators and parasitoids.	3	

	9	Integrated Pest Management (IPM) in food storage • Concept, components, and application in storage facilities	2	
IV	Legal, Safety, and Quality Aspects in Food Storage		12	13
	10	Regulatory Aspects FSSAI standards for storage hygiene BIS codes and recommendations for godowns and cold storage International standards (Codex Alimentarius, FAO recommendations)	3	5
	11	Safety in Storage Operations Safe handling of fumigants and chemicals Worker safety and PPE usage	4	4
	12	Quality Control during Storage Periodic sampling and quality checks Record keeping, stock rotation (FIFO, FEFO)	2	4
V	Open-Ended Module: Visiting Food storage warehouse			

References:

1. Hall, D. W. (1970). *Handling and Storage of Food Grains in Tropical and Subtropical Areas*. FAO, Rome.
2. Comprehensive guide on storage conditions, pest control, and grain preservation under tropical climates.
3. Bhattacharya, K. R. (2010). *Rice Quality: A Guide to Rice Properties and Analysis*. Woodhead Publishing, UK.
4. Includes storage effects on rice quality and infestation prevention methods.
5. FAO (2011). *Prevention of Post-Harvest Food Losses: A Training Manual*. Food and Agriculture Organization of the United Nations, Rome.
6. Practical guidelines for minimizing losses during storage.
7. Champ, B. R., Highley, E., & Banks, H. J. (Eds.). (1990). *Pest Control in Stored Grain: Integrated Management and Pest Control*. ACIAR, Canberra.
8. Covers integrated pest management techniques for stored grain.
9. Hodges, R. J., Farrell, G., & Mitchell, S. (1994). *Insect Pests of Stored Grain: A Pocket Reference*. Natural Resources Institute, UK.
10. Field-level quick reference for identifying and managing storage pests
11. Mulder, J. C., & Calverley, D. J. (1995). *Fumigation: A Guide for the Control of Insects in Stored Grain*. FAO Plant Production and Protection Paper 54. FAO, Rome.
12. Detailed fumigation practices and safety procedures.

Mapping of COs to POs and PSOs

		Program Specific Outcomes (PSO)												Program Outcomes (PO)												Course Outcomes
		PSO	PSO	PSO	PSO	PSO	PSO	PSO	PSO	PSO	PSO	PSO	PSO	PO	PO	PO	PO	PO	PO	PO	PO	PO	PO	PO		
		1	2	3	4	5	6	1	2	3	4	5	6	CO 1	1	1	1	1	1	1	1	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	2	1	2					1		
CO 5	-			2	2										2	2	1	1	-					2		

Note: The correlation levels are indicated as: **1** = Low correlation, **2** = Medium correlation, **3** = High correlation, **-** = No correlation

Mapping of Course Outcomes to Assessment Rubrics

Course Outcomes	Rubrics 1	Rubrics 2	Rubrics 3	Rubrics 4
CO 1	✓	✓		
CO 2	✓		✓	
CO 3		✓		✓
CO 4			✓	✓
CO 5	✓			✓

Course Code & Title	FTV5FS113	Instrumental Food Analysis & Techniques			
Type of Course	SEC	Semester	5	Academic Level	100-199
Course Details	Credit	Lecture per week	Tutorial per week	Practical per week	Total Hours
	3	3			45
Pre-requisites	Basic knowledge in food science concepts				
Course Summary	Provides a foundational understanding of instruments and techniques used in food analysis				

Course Outcomes (CO):

CO	CO Statement	Cognitive Level*	Knowledge Category#	Evaluation Tools used
CO1	Understand various Instrumental analysis of foods which needed for statutory requirements	U	F	Quiz/ Assignment/ Seminar/ Discussion/ Mid-term exam
CO2	Understand the relevance of each technique in the various types of food.	U	C	
CO3	Understand the operation and analysis through sophisticated instruments in the field of food processing to develop a better food analyst.	U	P	
CO4	Understand the principles and working of Instruments for food analysis	U	M	
CO5	Understand the basic concepts of food analysis	U	F	
* - Remember (R), Understand (U), Apply (Ap), Analyze (An), Evaluate (E), Create (C) # - Factual Knowledge(F) Conceptual Knowledge (C) Procedural Knowledge (P) Metacognitive Knowledge (M)				

Detailed Syllabus:

Module	Unit	Content	Hours	Marks
I	Introduction to sampling and instrumentation in food analysis		5	7
	1	Sampling techniques	1	
	2	Water activity, its measurements and significance in food quality	2	
	3	Calibration and standardization of different instruments	2	
II	Spectroscopic and microscopic techniques in food analysis		8	10
	4	Spectroscopic techniques using UV/Vis, fluorescence, IR, NMR, atomic absorption, polarimetry, refractometry	8	
	5	Microscopic techniques (light microscopy, particle size analysis, image analysis etc.)	2	
III	Chromatographic techniques		8	13
	6	Chromatographic techniques: Adsorption, column, partition, affinity, ion exchange	5	

	7	Chromatographic techniques: size exclusion, GC, HPLC, GCMS, LCMS.	5	
IV	Separation techniques and other special techniques		18	20
	8	Gel filtration, dialysis, electrophoresis, sedimentation, ultrafiltration and ultracentrifugation	5	
	9	Solid phase extraction, supercritical fluid extraction, isoelectric focusing, isotopic techniques, manometric techniques	5	
	10	Immunoassay techniques; Isotopic, non-isotopic and enzyme immunoassays	5	
	11	Surface tension; enzymatic methods of food analysis; thermal methods in food analysis	5	
V	Open Ended Module		6	
	12	Fingerprinting Food: Instrumental Detection & Measurement	6	

References:

1. AOAC International. 2003. Official methods of analysis of AOAC International. 17th Ed. Gaithersburg, MD, USA, Association of Analytical Communities.
2. Kirk RS & Sawyer R. 1991. Pearson's Chemical Analysis of Foods. 9th Ed. Longman Scientific & Technical.
3. Leo ML. 2004. Handbook of Food Analysis. 2nd Ed. Vols. I-III. Linden G. 1996. Analytical Techniques for Foods and Agricultural Products. VCH.
4. Macleod AJ. 1973. Instrumental Methods of Food Analysis. Elek Sci. Marcel Dekker.
5. Nielsen S. (Eds.). 1994. Introduction to Chemical Analysis of Foods. Jones & Bartlett.
6. Pomrenz Y & Meloan CE. 1996. Food Analysis - Theory and Practice. 3rd Ed. CBS.
7. Ranganna S. 2001. Handbook of Analysis and Quality Control for Fruit and Vegetable Products. 2nd Ed. Tata-McGraw-Hill.
8. Robinson JW. 1970. Undergraduate Instrumental Analysis. Marcel Dekker. **Mapping of**

CO's with:

	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6
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

Mapping of CO's to Assessment Rubrics:

	Rubrics 1	Rubrics 2	Rubrics 3	Rubrics 4
CO 1	✓			✓
CO 2	✓			✓
CO 3	✓			✓
CO 4		✓		✓
CO 5		✓	✓	✓

Course Code & Title	FTV3FV108	Basic Numerical Skills, Systems and Methodologies			
Type of Course	VAC	Semester	3	Academic Level	100-199
Course Details	Credit	Lecture per week	Tutorial per week	Practical per week	Total Hours
	3	4			45
Pre-requisites	Basic knowledge of high school mathematics and fundamental arithmetic operations is required.				
Course Summary	This course equips students with essential mathematical and statistical tools, including equations, progressions, data analysis, and process improvement techniques, for effective problem-solving in business and industrial applications.				

Course Outcomes (CO):

CO	CO Statement	Cognitive Level*	Knowledge Category#	Evaluation Tools used
CO1	Solve linear, simultaneous, and quadratic equations using appropriate algebraic methods.	Ap	P	Quiz/ Assignment/ Seminar/ Discussion/ Mid-term exam
CO2	Determine terms and sums in arithmetic and geometric progressions and apply them in business contexts.	Ap	P	
CO3	Interpret and present statistical data using frequency distributions, diagrams, and graphs.	Ap	P	
CO4	Compute and compare measures of central tendency and dispersion to analyze datasets.	An	C&P	
CO5	Apply quality tools and improvement techniques like flowcharts, fishbone diagrams, and 5S to analyze and enhance business processes.	Ap	C&P	
* - Remember (R), Understand (U), Apply (Ap), Analyze (An), Evaluate (E), Create (C) # - Factual Knowledge(F) Conceptual Knowledge (C) Procedural Knowledge (P) Metacognitive Knowledge (M)				

Detailed syllabus:

Module	Unit	Content	Hours	Marks
I	Equations		9	10
	1	Theory of Equations: Meaning - types of equations	1	
	2	Simple linear and Simultaneous equations (only two variables) eliminations and substitution method only	3	
	3	Quadratic equation factorization and formula method ($ax^2 + bx + c = 0$ form only)	3	
	4	Problems on business applications	2	
II	Progressions		9	11
	5	Arithmetic Progressions, Arithmetic mean	3	
	6	Geometric Progression	3	
	7	Mathematics of Finance - Simple and compound interest (Simple problems only)	3	
III	Statistics		9	8
	8	Meaning and Definition of Statistics - Scope and limitations	3	

	9	Statistical enquiries -Scope of the problem - Methods to be employed - Types of enquiries	3	
	10	Presentation of data by Diagrammatic and Graphical Method - Formation of Frequency Distribution	3	
IV	Statistical Measures and Analysis		9	21
	11	Measures of Central Tendency - Arithmetic Mean - Median - Mode - Geometric and Harmonic Mean	3	
	12	Measures of variation and standard, mean and quartile deviations -Skewness and Kurtosis - Lorenz curve	3	
	13	Analysis of Time Series: Methods of measuring - Trend and Seasonal variations - Index number - Unweighted indices Consumer price and cost of living indices.	3	
	14	Visualization and Mapping Tools- (Flow Charts, Value Stream Mapping)	3	
	15	Analytical and Problem-Solving Techniques- (Check Sheets, Histograms, Pareto Charts, Fishbone Diagrams, Root Cause Analysis (RCA), 5 Whys Technique, PDCA Cycle)	3	
	16	Process Improvement Techniques- (Kaizen, 5S Methodology, Lean Manufacturing)	3	
V	Open Ended module			
	Artificial intelligence and digital transformation in business.			

References:

1. Sundaresan and Jayaseelan - An Introduction to Business Mathematics and Statistical Methods.
2. Dr. A K Arte & R V Prabhakar - A Text Book of Business Mathematics.
3. Sanchethi and Kapoor- Business Mathematics.
4. Gupta S.P- Statistical Methods
5. Navaneethan P- Business Mathematics
6. R.S.N. Pillai, Mrs. Bhagavathi – Statistics
7. P.R. Vittal - Business Mathematics and Statistics.

Mapping of COs with PSOs and POs

COs	PS O 1	PS O 2	PS O 3	PS O 4	PS O 5	PS O 6	P O 1	P O 2	P O 3	P O 4	P O 5	P O 6
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

Mapping of COs to Assessment Rubrics

COs	Rubrics 1	Rubrics 2	Rubrics 3	Rubrics 4
CO1	✓			✓
CO2	✓			✓
CO3	✓			✓
CO4		✓		✓
CO5		✓	✓	✓

Course Code & Title	FTV4FV109	Internal Auditing Food Processing			
Type of Course	VAC	Semester	4	Academic Level	100-199
Course Details	Credit	Lecture per week	Tutorial per week	Practical per week	Total Hours
	3	3			45
Pre-requisites	Basic knowledge of food safety standards (HACCP, ISO 22000), food processing operations, and quality assurance principles.				
Course Summary	This course provides students with foundational knowledge and practical skills in conducting internal audits, specifically in the food processing sector. It emphasizes the principles, techniques, and procedures of internal auditing as a tool to ensure compliance with food safety management systems (FSMS), quality assurance protocols, and regulatory standards such as FSSAI, ISO 22000, HACCP, and GMP/GHP.				

CO	CO Statement	Cognitive Level*	Knowledge Category#	Evaluation Tools used
CO1	Explain the principles, objectives, and types of internal audits in food processing industries.	U	C	Quiz/ Assignment/ Seminar/ Discussion/ Mid-term exam
CO2	Identify key components of food safety management systems and relevant ISO standards (e.g., ISO 22000, FSSC 22000).	R	F	
CO3	Apply auditing techniques such as checklist preparation, document review, and on-site observation in a food processing unit.	Ap	P	
CO4	Analyze non-conformities and evaluate corrective and preventive actions in internal audit findings.	An	P	
CO5	Develop and document an internal audit plan and audit processing base scenario.	C	M	
* - Remember (R), Understand (U), Apply (Ap), Analyze (An), Evaluate (E), Create (C) # - Factual Knowledge(F) Conceptual Knowledge (C) Procedural Knowledge (P) Metacognitive Knowledge (M)				

Detailed Syllabus:

Module	Unit	Content	Hours	Marks
I	Introduction to Internal Auditing		5	13
	1	Definition, objectives, and scope of internal auditing.	1	
	2	Types of audits: system, process, product, compliance. Role of internal audits in Food Safety Management Systems (FSMS). Basic auditing terms and definitions (non-conformity, corrective action, preventive action)	2	
	3	Competence and responsibilities of auditors and auditees. Auditor ethics and code of conduct	2	
II	Food Safety		8	13
	4	Food Safety Regulations and Standards.	8	
	5	Overview of national and international food safety standards: FSSAI Act and regulations ISO 22000:2018 Codex Alimentarius GMP/GHP, BRC, FSSC 22000	2	
III	Audit Planning and Preparation		8	7

	6	Steps in audit planning. Preparing audit schedules and checklists Understanding process flow charts and hazard identification in food processing. Collecting and reviewing background information. Opening meetings and communication during audits.	5	
IV	Conducting the Audit		18	17
	7	On-site audit process: observation, questioning, sampling, and verification.	5	
	8	Identifying and classifying non-conformities	5	
	9	Documentation and evidence collection techniques.	5	
	10	Time management during audits. Closing meeting and audit summary	5	
	11	☐ Audit report writing: structure, clarity, and factual accuracy ☐ Communicating findings and recommendations ☐ Corrective and preventive action (CAPA) planning ☐ Follow-up audits and continual improvement ☐ Audit record-keeping and confidentiality	6	
V	Open Ended module- Food fraud and food defence			

References:

1. ISO 19011:2018 – *Guidelines for auditing management systems*
2. ISO 22000:2018 – *Food safety management systems – Requirements*
3. FSSAI Manuals and Guidance Notes
4. Vasconcellos, J.A. (2018). *Quality Audits for Improved Performance*
5. Wallace, C. A., Sperber, W. H., & Mortimore, S. E. (2018). *Food Safety for the 21st Century: Managing HACCP and Food Safety Throughout the Global Supply Chain*

Mapping of CO's with:

	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6
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

Mapping of CO's to Assessment Rubrics:

	Rubrics 1	Rubrics 2	Rubrics 3	Rubrics 4
CO 1	✓			✓
CO 2	✓			✓
CO 3	✓			✓
CO 4		✓		✓
CO 5		✓	✓	✓

Course Code & Title	FTV5FV110	Food Toxicology			
Type of Course	VAC	Semester	5	Academic Level	100-199
Course Details	Credit	Lecture per week	Tutorial per week	Practical per week	Total Hours
	3	3			45
Pre-requisites	Prior knowledge and background of basic biology and human physiology. Helps understand how toxins are absorbed, metabolized (biotransformation), and excreted from the body. General academic skills.				
Course Summary	Provides a comprehensive understanding of the harmful effects of chemical, biological, and physical agents present in food on human health. The course explores the nature, mechanisms, sources, risk assessment, and regulatory control of foodborne toxicants. Students gain insights into naturally occurring toxins, environmental contaminants, food additives, and the toxicological impact of food processing.				

Course Outcomes (CO):

CO	CO Statement	Cognitive Level*	Knowledge Category#	Evaluation Tools used
CO1	Understand the basic principles of toxicology and the classification of food toxins.	U	C	Quiz/ Assignment/ Seminar/ Discussion/ Mid-term exam
CO2	Identify natural and synthetic toxicants in foods and their mechanisms of action.	R	F	
CO3	Analyze the risk assessment process in food safety.	An	P	
CO4	Interpret national and international food safety regulations related to toxic substances.	Ap	C	
CO5	Apply knowledge of food toxicology in evaluating and ensuring food safety in the food industry.	Ap	P	
* - Remember (R), Understand (U), Apply (Ap), Analyze (An), Evaluate (E), Create (C) # - Factual Knowledge(F) Conceptual Knowledge (C) Procedural Knowledge (P) Metacognitive Knowledge (M)				

Detailed Syllabus:

Module	Unit	Content	Hours	Marks
I	Definition & Scope		10	17
	1	Definition scope and general principles of food toxicology	4	
	2	Manifestation of toxic effects; classification of food toxicants	3	
	3	Factors affecting toxicity of compounds; methods used in safety evaluation-risk assessments.	3	
II	Toxicants & Allergens		8	7
	4	Toxicants and allergens in foods derived from plants, animals, marine, algae & mushroom;	5	
	5	Microbial toxins; Food Poisoning; Food borne infections and diseases.	3	
III	Derived Food toxins		10	11
	7	Derived Food toxicants- Processing & Packaging	5	
	8	Toxicants generated during food processing such as nitrosamines, acrylamide, benzene, dioxins and furans	3	
	9	Persistent organic pollutants.	2	
IV	Toxicology and Additives		8	15
	10	Toxicology & food additives; Toxicological aspects of nutrient supplements.	8	
	11	Chemicals from processing such as fumigants, chlorinated solvents.	3	
	12	Autoxidation products, carcinogens in smoked foods and pyrolysis	3	
	13	Agrochemicals; heavy metals; intentional and unintentional additives.	3	
V	Open Ended module - Modern techniques in food toxicology			

References:

1. Branen AL, Davidson PM & Salminen S. 1990. Food Additives. Marcel Dekker.
2. Condon JM. 1988. Food Toxicology - Principles & Concepts. Marcel Dekker.
3. Hathcock JN. (Ed.). 1982. Nutritional Toxicology. Vol. I. Academic Press.
4. Recheigl M Jr. 1983. (Ed.). Handbook of Naturally Occurring Food Toxicants. CRC Press.
5. Shabbir S. 2007. Food Borne Diseases. Humana Press.
6. Steven T. 1989. Food Toxicology: A Perspective on Relative Risks.

Tweedy BG. 1991. Pesticide Residues and Food Safety. Royal Society of

Chemistry Mapping of CO's with:

	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6
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

Mapping of CO's to Assessment Rubrics:

	Rubrics 1	Rubrics 2	Rubrics 3	Rubrics 4
CO 1	✓			✓
CO 2	✓			✓
CO 3	✓			✓
CO 4		✓		✓
CO 5		✓	✓	✓

21.DETAILED SYLLABUS OF VOCATIONAL MINOR COURSES

Course Code & Title	FTV1VN101	BASIC FOOD MICROBIOLOGY			
Type of Course	Minor	Semester	1	Academic Level	100-199
Course Details	Credit	Lecture per week	Tutorial per week	Practical per week	Total Hours
	4	3		2	75
Pre-requisites	Foundational knowledge and skills are necessary to understand microbiological concepts in the context of food science.				
Course Summary	Provides foundational knowledge of microorganisms relevant to food systems, emphasizing their roles in food spoilage, foodborne illnesses, fermentation, and food safety. Students will explore the morphology, physiology, and classification of bacteria, yeasts, molds, and viruses associated with food. The course also covers microbial growth factors, spoilage mechanisms, preservation techniques, and methods for detecting and controlling microorganisms in food products.				

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/ Seminar/ Discussion/ Mid-term exam
CO2	Apply the knowledge in the laboratory Final Exam 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 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), Analyze (An), Evaluate (E), Create (C)
 # - Factual Knowledge(F) Conceptual Knowledge (C) Procedural Knowledge (P) Metacognitive Knowledge (M)

Detailed Syllabus:

Module	Unit	Content	Hours	Marks
I	Introduction to Food Microbiology		10	20
	1	History of Microbiology	3	
	2	Microscopy (Bright field, Dark field and Electron microscope)	3	
	3	Microorganisms (bacteria, yeasts, molds and viruses)	2	
	4	Culture Media	2	
II	Food Spoilage and Pathogenic Microorganisms		10	20
	5	Types and causes of food spoilage: microbial, physical, and chemical	5	
	6	Spoilage of different food groups:(Milk, Meat, poultry, Fruits and vegetables, Cereal)	5	
	7	Food infection and intoxication	5	
III	Microbial Control in Food Processing		15	18
	8	Physical agents – high temperature, low temperature, desiccation, osmotic pressure radiation, filtration.	8	
	9	Chemical agents - Alcohols, Aldehydes, Dyes, Halogens, Phenols, Acids, Alkalis	7	
IV	Microbes in fermented foods		10	12
	10	Fermented vegetable products, Sauer Kraut, pickles, soy sauces etc.	5	
	11	Fermented dairy products – Cheese, yoghurt etc.	5	
V	Practical		30	
	12	Practical demonstration Bacterial/Fungal culturing Microbial staining		

References:

1. Banwart GJ ,1989. Basic Food Microbiology. AVI publishers
2. Jay JM, Loessner MJ & Golden D A,2005. Modern Food Microbiology. Springer Verlag
3. Ananthanarayanan R JayaramPaniker CK ,2009 microbiology. University Press Pvt Ltd, Hyderabad Text book of
4. Prescott, L.M, Harley, J.P and Klein, D.A Microbiology. McGraw Hill New York
5. Frazier J&Westhoff DC,1988. Food Microbiology. McGraw Hill, New York.

6. Pelczar JM & Reid RD. Microbiology. Tata McGraw Hill
7. Stainer R. General Microbiology. MacMillan
8. Black, JG. Microbiology. Principles and Explorations John Wiley

Mapping of CO's with:

	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6
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

Mapping of CO's to Assessment Rubrics:

	Rubrics 1	Rubrics 2	Rubrics 3	Rubrics 4
CO 1	✓			✓
CO 2	✓			✓
CO 3	✓			✓
CO 4		✓		✓
CO 5		✓	✓	✓
CO 6			✓	✓

Course Code & Title	FTV2VN102	Microbial Food Safety and Public Health			
Type of Course	Minor	Semester	2	Academic Level	100-199
Course Details	Credit	Lecture per week	Tutorial per week	Practical per week	Total Hours
	4	3		2	75
Pre-requisites	Should have completed a foundational course in General Microbiology or Food Microbiology , covering microbial classification, growth, and control. Basic knowledge of foodborne pathogens and hygiene practices is essential for understanding the principles of microbial food safety and its impact on public health.				

Course Summary	introduces students to the role of foodborne microorganisms in public health, focusing on the detection, control, and prevention of microbial hazards in food systems. It emphasizes the epidemiology of foodborne illnesses, risk assessment, and regulatory frameworks ensuring microbial food safety.
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Course Outcomes (CO):

CO	CO Statement	Cognitive Level*	Knowledge Category#	Evaluation Tools used
CO1	Describe the types of foodborne microorganisms and their growth factors	R	F	Quiz/ Assignment/ Seminar/ Discussion/ Mid-term exam
CO2	Explain the mechanisms of foodborne diseases and their public health implications.	U	C	
CO3	Identify microbial hazards in different food commodities.	Ap	P	
CO4	Analyze routes of contamination and transmission of pathogens in food systems.	An	C	
CO5	Evaluate food safety practices like GMP, GHP, and sanitation in preventing outbreaks.	E	P	
CO6	Develop microbial risk assessment plans for selected foodborne pathogens.	C	M	
* - Remember (R), Understand (U), Apply (Ap), Analyze (An), Evaluate (E), Create (C) # - Factual Knowledge(F) Conceptual Knowledge (C) Procedural Knowledge (P) Metacognitive Knowledge (M)				

Detailed Syllabus:

Module	Unit	Content	Hours	Marks
I	Introduction to Foodborne Microorganisms and Public Health		13	16
	1	Importance of microbial food safety in public health	4	
	2	Overview of foodborne diseases and outbreaks. Classification of microorganisms in foods: pathogens, spoilage organisms, beneficial microbes.	5	

	3	Sources and routes of microbial contamination (water, raw materials, handlers, environment). Concept of infectious dose and virulence.	4	
II	Major Foodborne Pathogens		15	19
	4	Bacterial pathogens: <i>Salmonella</i> spp., <i>Listeria monocytogenes</i> , <i>Escherichia coli</i> O157:H7, <i>Clostridium botulinum</i> , <i>Staphylococcus aureus</i> , <i>Campylobacter jejuni</i> . Viral pathogens: Norovirus, Hepatitis A	7	
	5	Fungal and parasitic pathogens: <i>Aspergillus</i> spp. (mycotoxins), <i>Toxoplasma gondii</i> , <i>Giardia</i> . Modes of transmission, pathogenesis, symptoms, and associated foods	8	
III	Spoilage Microorganisms and Microbial Indicators		12	20
	6	Microbial spoilage of different food groups (meat, dairy, cereals, fruits, vegetables)	4	
	7	Role of molds, yeasts, and bacteria in spoilage. Indicators of microbial quality and safety: Total Plate Count, Coliforms, <i>E. coli</i> , Enterococci	4	
	8	Rapid detection techniques: PCR, ELISA, biosensors	4	
IV	Control of Microbial Hazards in Foods		10	15
	9	Hygienic design and sanitation practices (GHP, GMP) Thermal and non-thermal microbial control methods (pasteurization, irradiation, HPP, pulsed light)	5	
	10	Role of preservatives (natural and chemical) Use of bacteriocins and protective cultures Principles of food storage, packaging, and shelf-life extension Surveillance, Regulations, and Emerging Concerns	5	
V	Practical		10	
	11	Foodborne disease surveillance systems (FSSAI, CDC, WHO, INFOSAN) Food safety laws and microbiological standards (FSSAI, Codex, ISO) Microbial risk assessment and management Emerging pathogens and antimicrobial resistance (AMR) Climate change and its impact on microbial food safety		

References:

1. Jay, J. M., Loessner, M. J., & Golden, D. A. (2018). *Modern Food Microbiology* (8th Ed.). Springer.
2. Doyle, M. P., & Buchanan, R. L. (Eds.). (2013). *Food Microbiology: Fundamentals and Frontiers*. ASM Press.
3. FSSAI (2021). *Manual of Methods of Analysis of Foods – Microbiological Testing*.
4. Adams, M. R., & Moss, M. O. (2016). *Food Microbiology* (4th Ed.). RSC Publishing.
5. ICMSF. (2011). *Microorganisms in Foods 8: Use of Data for Assessing Process Control and Product Acceptance*. Springer.
6. WHO/FAO. (2019). *Foodborne Disease Surveillance Guidelines*. FAO-WHO Codex Resources.

Mapping of CO's with:

	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6
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

Mapping of CO's to Assessment Rubrics:

	Rubrics 1	Rubrics 2	Rubrics 3	Rubrics 4
CO 1	✓			✓
CO 2	✓			✓
CO 3	✓			✓
CO 4		✓		✓
CO 5		✓	✓	✓
CO 6			✓	✓

Course Code & Title	FTV3VN203	INDUSTRIAL FOOD MICROBIOLOGY			
Type of Course	Minor	Semester	3	Academic Level	200-299
Course Details	Credit	Lecture per week	Tutorial per week	Practical per week	Total Hours
	4	3		2	75
Pre-requisites	Should have a foundational understanding of basic microbiology and general food science . Prior completion of a first-level course in Microbiology is essential to grasp microbial structure, growth, and classification. Additionally, knowledge of Introductory Food Chemistry and Food Hygiene and Sanitation will support comprehension of microbial interactions in food systems, spoilage mechanisms, and contamination control.				
Course Summary	This course explores the role of microorganisms in food processing, fermentation, spoilage, and safety. It emphasizes industrial applications of microbes, hygienic practices, and microbial quality control in food production.				

Course Outcomes (CO):

CO	CO Statement	Cognitive Level*	Knowledge Category#	Evaluation Tools used
CO1	Describe the roles of microorganisms in food processing, spoilage, and preservation.	U	F	Quiz/ Assignment/ Seminar/ Discussion/ Mid-term exam
CO2	Explain the microbial ecology of fermented food and industrial fermentations.	U	C	
CO3	Apply microbial enumeration and identification techniques in industrial settings.	Ap	P	
CO4	Analyze the impact of intrinsic and extrinsic factors on microbial growth in food systems.	An	C	
CO5	Evaluate microbiological quality and safety standards for processed foods.	E	M	
CO6	Design microbial control strategies in food industries using sanitation and predictive tools.	C	P	
* - Remember (R), Understand (U), Apply (Ap), Analyze (An), Evaluate (E), Create (C) # - Factual Knowledge(F) Conceptual Knowledge (C) Procedural Knowledge (P) Metacognitive Knowledge (M)				

Detailed Syllabus:

Module	Unit	Content	Hours	Marks
		Basic Concepts of Fermentations	13	16
I	1	Introduction to Fermentations	4	
	2	Fermentor design – parts & their functions.	5	
	3	Types of fermentors – Batch, Continuous, Dual and Multiple.	4	
II		Design of fermentation media	10	14
	4	Water, carbon and nitrogen source, growth factors, precursors, buffers, aeration and antifoam agents	7	
	5	Factors affecting fermentation process like sterilization, aeration, agitation, pH, temperature, foam and oxygen	8	
III		Downstream processing of biological materials	12	20
	6	Cell Disruption and Solid-Liquid Separation	4	
	7	Product Concentration Techniques	4	
	8	Purification of products	4	
IV		Fermented foods and Beverages	10	20
	9	Fermented Dairy products, Bread, Sauerkraut, Wine and Beer	5	
	10	SCP production	5	
V		Practical	30	
	11	Fermented food products preparation.		

References:

1. Industrial Microbiology by Prescott and Dunns.
2. Principles of Fermentation Technology. Manual of Industrial Microbiology and Biotechnology by Demain and Devis.
3. Principles of Fermentation Technology by Stanbury and Whitaker.
4. Text book of Biotechnology by Cruger and Cruger.
5. Comprehensive Biotechnology by Murray and Moo Yung.
6. Patel, AH 2004. Industrial Microbiology. Macmillan India Ltd
7. Casida LE, Industrial Microbiology New Age international Publishers
8. Whitaker, Stanbury Principles of fermentation technology 2nd edition Butterworth Heinemann
9. JoshyVK, Pandey. A 1999. Biotechnology: Food Fermentation Vols. I & II. Panima publications
10. WulfCrueger&AnnelieseCrueger. Biotechnology: A text book of Industrial Microbiology.

Mapping of CO's with:

	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6
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

Mapping of CO's to Assessment Rubrics:

	Rubrics 1	Rubrics 2	Rubrics 3	Rubrics 4
CO 1	✓			✓
CO 2	✓			✓
CO 3	✓			✓
CO 4		✓		✓
CO 5		✓	✓	✓
CO 6			✓	✓

Course Code & Title	FTV3VN204	Chemistry of Food Additives			
Type of Course	Minor	Semester	3	Academic Level	200-299
Course Details	Credit	Lecture per week	Tutorial per week	Practical per week	Total Hours
	4	3		2	75
Pre-requisites	Basic knowledge of organic chemistry and fundamentals of food chemistry is essential to understand the chemical nature, functionality, and interactions of food additives.				
Course Summary	Introduces the chemical nature, functional roles, and regulatory aspects of food additives used in modern food processing. It explores classes such as preservatives, antioxidants, emulsifiers, colorants, and flavor enhancers. Emphasis is placed on their mechanisms, safety, and impact on food quality and consumer health.				

Course Outcomes (CO):

CO	CO Statement	Cognitive Level*	Knowledge Category#	Evaluation Tools used
CO1	List and classify various food additives based on their function and chemical nature.	R	F	Quiz/ Assignment/ Seminar/ Discussion/ Mid-term exam
CO2	the chemical structure, function, and mode of action of major classes of food	U	C	
CO3	principles of food chemistry to evaluate the suitability and stability of additives	Ap	P	
CO4	Analyze the interaction of food additives with food components and processing conditions.	An	P	
CO5	evaluate the regulatory aspects and toxicological limits of permitted food additives as per national and international standards (e.g., FSSAI, Codex).	E	M	
* - Remember (R), Understand (U), Apply (Ap), Analyze (An), Evaluate (E), Create (C) # - Factual Knowledge(F) Conceptual Knowledge (C) Procedural Knowledge (P) Metacognitive Knowledge (M)				

Detailed Syllabus:

Module	Unit	Content	Hours	Marks
		Introduction to Food Additives	10	20

I	1	Definition, historical perspective, need for food additives and Classification: based on function and origin	3	
	2	Classification: based on function and origin	3	
	3	General principles governing their use. Natural vs synthetic additives: sources and differences	2	
II	Preservatives, Antioxidants, and Antimicrobials		15	20
	4	Common preservatives: benzoates, sorbates, nitrites, sulphites – mode of action and limits.	5	

	5	Antioxidants: BHA, BHT, ascorbates, tocopherols – mechanism and stability. Chelating agents and synergists	5	
	6	Natural vs synthetic antimicrobials	5	
III	Sensory Additives		15	18
	7	Flavor enhancers: MSG, nucleotides, yeast extracts. Sweeteners: natural (stevia, honey), artificial (aspartame, sucralose) – chemistry and metabolic aspects. Colorants: permitted synthetic and natural (curcumin, anthocyanins, chlorophylls, carotenoids). Emulsifiers, stabilizers, and thickeners	8	
	8	Colorants: permitted synthetic and natural (curcumin, anthocyanins, chlorophylls, carotenoids). Emulsifiers, stabilizers, and thickeners	7	
IV	Functional and Processing Aids		5	12
	9	pH control agents, sequestrants, anti-caking agents, firming agents. Enzyme preparations, bleaching and maturing agents	3	
	10	Additives used in packaging and shelf-life extension. Food fortificants and carriers	2	
V	Practical		30	
	11	Safety, Regulatory Aspects & Innovations		
	12	Biopolymer-based additives and uses		

References:

1. Brannen, A. L., Davidson, P. M., & Salminen, S. (2001). *Food Additives*. CRC Press.
2. Coultate, T. (2016). *Food: The Chemistry of Its Components*. Royal Society of Chemistry.
3. FSSAI Manual on Food Additives
4. Codex Alimentarius: General Standard for Food Additives (GSFA)
5. ACS Symposium Series – *Natural Food Additives, Ingredients and Flavourings*
6. Bhat, R., & Marthandam, R. (2017). *Chemistry of Food Additives and Preservatives*. Wiley.

Mapping of COs with PSOs and POs

COs	PS O 1	PS O 2	PS O 3	PS O 4	PS O 5	PS O 6	P O 1	P O 2	P O 3	P O 4	P O 5	P O 6
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

1.

Mapping of CO's to Assessment Rubrics

COs	Rubrics 1	Rubrics 2	Rubrics 3	Rubrics 4
CO1	✓			✓
CO2	✓			✓
CO3	✓			✓
CO4		✓		✓
CO5		✓	✓	✓

Course Code & Title	FTV4VN205	Functional Foods & Nutraceuticals			
Type of Course	Minor	Semester	4	Academic Level	200-299
Course Details	Credit	Lecture per week	Tutorial per week	Practical per week	Total Hours
	4	3		2	75
Pre-requisites	Knowledge of food composition, food groups, and food functions. Familiarity with food classification and common processing methods. Understanding of human body systems and basic nutritional requirements. Awareness of the role of macro- and micronutrients in health and disease prevention. Basic concepts of organic and inorganic chemistry. Understanding of chemical reactions, biomolecules, and pH.				
Course Summary	Introduces students to the concept of functional foods and nutraceuticals and their role in promoting health beyond basic nutrition. It covers bioactive compounds, natural health products, and the scientific basis of how certain foods can help prevent or manage chronic diseases. Students will explore sources, mechanisms of action, and regulatory aspects of nutraceuticals, as well as recent trends in functional food development.				

Course Outcomes (CO):

CO	CO Statement	Cognitive Level*	Knowledge Category#	Evaluation Tools used
CO1	Define and explain the concepts of functional foods and nutraceuticals.	R	F	Quiz/ Assignment/ Seminar/ Discussion/ Mid-term exam
CO2	Identify the bioactive components in foods and their physiological effects on human health.	U	C	
CO3	Analyze the health benefits of specific functional foods and their role in disease prevention.	An	C	
CO4	Evaluate regulatory and safety aspects of functional food product development.	E	P	
CO5	Design a basic prototype or concept for a functional food or nutraceutical product.	C	P	
* - Remember (R), Understand (U), Apply (Ap), Analyze (An), Evaluate (E), Create (C) # - Factual Knowledge(F) Conceptual Knowledge (C) Procedural Knowledge (P) Metacognitive Knowledge (M)				

Detailed Syllabus:

Module	Unit	Content	Hours	Marks
I		Introduction to Functional Foods and Nutraceuticals	10	20
	1	Definitions and differences: Functional foods, nutraceuticals, dietary supplements. Historical perspective and evolution of the concepts.	3	
	2	Classification based on source and health benefits. Regulatory perspectives (India – FSSAI, USA – FDA, etc.)	3	
	3	Market trends and consumer perception	2	
II		Bioactive Components in Functional Foods	10	20
	4	Phytochemicals: Polyphenols, flavonoids, carotenoids. Prebiotics and probiotics. Dietary fibers and resistant starch. Plant sterols and stanols. Omega-3 fatty acids, antioxidants, and peptides.	5	
	5	Dietary fibers and resistant starch. Plant sterols and stanols	5	

	6	Omega-3 fatty acids, antioxidants, and peptides	5	
III	Functional Foods in Health and Disease Management		15	18
	7	Role in prevention/management of: Cardiovascular diseases Diabetes Obesity Cancer Gastrointestinal health	8	
	8	Mechanisms of action of functional components. Nutrigenomics: Introduction and relevance.	7	
IV	Processing and Formulation of Functional Foods		10	12
	9	Stability of bioactive components during processing. Techniques for microencapsulation and targeted delivery. Fortification and enrichment practices.	5	
	10	Functional beverages, bars, cereals, dairy products. Labeling and claims (health claims vs. structure-function claims).	5	
V	Practical		30	
	11	Seminar or poster presentation. Develop a prototype of a functional snack or beverage. Field visit to a nutraceutical/functional food manufacturing unit or any other as per the faculty in-charge		

References:

- 1 Wildman, R.E.C. (Ed.)
Handbook of Nutraceuticals and Functional Foods, 2nd Edition Publisher: CRC Press, 2006
- Gibson, G.R., & Williams, C.M.
Functional Foods: Concept to Product
 Publisher: CRC Press, 2000
- Ghosh, D., Das, S., Bagchi, D., & Smarta, R.B.
Innovation in Healthy and Functional Foods
 Publisher: CRC Press, 2010
- Shi, J., Ho, C.T., & Shahidi, F. (Eds.)
Functional Foods of the East Publisher: CRC Press, 2010

Mapping of COs to PSOs and POs

Course Outcomes	Program Specific Outcomes (PSO)						Program Outcomes (PO)					
	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6
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

Mapping of COs to Assessment Rubrics

Course Outcomes	Rubrics 1	Rubrics 2	Rubrics 3	Rubrics 4
CO 1	✓	✓		
CO 2	✓	✓		
CO 3	✓	✓		
CO 4	✓	✓		
CO 5		✓	✓	✓

Course Code & Title	FTV5VN306	Food Enzymology			
Type of Course	Minor	Semester	5	Academic Level	300-399
Course Details	Credit	Lecture per week	Tutorial per week	Practical per week	Total Hours
	4	3		2	75
Pre-requisites	Basics of Biochemistry and Food Chemistry				
Course Summary	Introduces the chemical nature, functional roles, and regulatory aspects of food additives used in modern food processing. It explores classes such as preservatives, antioxidants, emulsifiers, colorants, and flavor enhancers. Emphasis is placed on their mechanisms, safety, and impact on food quality and consumer health.				

Course Outcomes (CO):

CO	CO Statement	Cognitive Level*	Knowledge Category#	Evaluation Tools used
CO1	Describe enzyme structures, properties, and classifications.	R	F	Quiz/ Assignment/ Seminar/ Discussion/ Mid-term exam
CO2	Explain enzyme kinetics, mechanisms, and factors affecting activity	U	C	
CO3	Apply enzyme usage in various food processing operations	Ap	P	
CO4	Analyze the role of enzymes in improving food quality and shelf life.	An	P	
CO5	Evaluate enzyme inactivation techniques and stability under processing.	E	C	
* - Remember (R), Understand (U), Apply (Ap), Analyze (An), Evaluate (E), Create (C) # - Factual Knowledge(F) Conceptual Knowledge (C) Procedural Knowledge (P) Metacognitive Knowledge (M)				

Detailed Syllabus:

Module	Unit	Content	Hours	Marks
I	Introduction to Enzymes		10	20
	1	Definition, history, and significance of enzymes in food processing. Enzyme nomenclature and classification (IUB system).	3	
	2	Structure and general properties of enzymes. Enzyme-substrate complex and active sites.		
	3	Enzyme nomenclature and classification (IUB system).	3	
	4	Structure and general properties of enzymes	2	
	5	Enzyme-substrate complex and active sites.		
II	Enzyme Kinetics and Mechanism		13	20
	4	Enzyme kinetics: Michaelis-Menten equation and Lineweaver-Burk plot. Factors affecting enzyme activity: pH, temperature, inhibitors. Types of enzyme inhibition – competitive, non-competitive, uncompetitive. Mechanism of enzyme catalysis.	5	
	5	Factors affecting enzyme activity: pH, temperature, inhibitors.	5	

	6	Mechanism of enzyme catalysis.	5	
III	Enzyme Technology in Food Processing		12	18
	7	Immobilized enzymes: methods and applications. Use of enzymes in juice clarification, cheese making, baking, brewing, meat tenderization, starch hydrolysis.	10	
	8	Genetically modified enzymes and recombinant technology. Enzyme engineering: brief overview.	5	
IV	Enzyme Stability and Inactivation		10	12
	9	Thermal and non-thermal inactivation of enzymes. Effect of food processing operations on enzyme activity.	5	
	10	Role of inhibitors and preservatives. Storage and formulation stability of enzymes	5	
V	Practical		30	
	11	Mini project or literature review on selected enzyme-based food process / Novel enzyme applications: biosensors, nutraceuticals, waste valorization.	15	

References:

1. Palmer, T. *Enzymes: Biochemistry, Biotechnology, Clinical Chemistry*
2. Trevan, M.D. *Enzyme Biotechnology*
3. Whitaker, J.R. *Principles of Enzymology for Food Sciences*
4. Bamforth, C.W. *Food, Fermentation and Micro-organism*
5. Price, N.C. & Stevens, L. *Fundamentals of Enzymology*

Mapping of COs to PSOs and POs

Course Outcomes	Program Specific Outcomes (PSO)						Program Outcomes (PO)					
	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6
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

Mapping of COs to Assessment Rubrics

Course Outcomes	Rubrics 1	Rubrics 2	Rubrics 3	Rubrics 4
CO 1	✓	✓		
CO 2	✓	✓		
CO 3	✓	✓		
CO 4	✓	✓		
CO 5		✓	✓	✓

22.MODEL QUESTION PAPERS

1st Semester B. Voc. Degree Examinations – October 2025

Course Code: FTV1FM105

Course Title: Food Facts and Principles

(Credits: 3)

Maximum Time: 1:30 Hours

Maximum Marks: 50

Course Outcomes (COs)

CO #	CO Statement
CO1	Know the relationship between food, nutrition and functional foods.
CO2	Remember the basic Food groups like cereals, pulses, oilseeds, fruits, vegetables, spices, meat, fish, poultry, seafood, milk and dairy products.
CO3	Apply the scientific method of enquiry as it relates to the measurement of sensory, chemical and physical properties of foods.
CO4	Develop an insight about the existing modern techniques and their applications in food processing preservation.
CO5	Describe the principles and methods of food preservation and evaluate their impact on food quality and safety.
CO6	Explain the role of food regulatory bodies and assess the importance of food laws and labelling in ensuring consumer protection.

Section A

[Answer all questions. Each question carries 2 marks] (Ceiling: 16 Marks)

1. Define functional foods with one example. (CO1)
2. List two important functions of proteins in the body. (CO1)
3. Name two oilseeds and their major nutrients. (CO2)
4. Mention the composition of wheat grain. (CO2)
5. What is a threshold test in sensory evaluation? (CO3)
6. Give two examples of food preservatives. (CO4)
7. Define probiotics with one example. (CO5)
8. What is the main function of the Food Safety and Standards Authority of India (FSSAI)? (CO6)
9. Name any two major food research centers in India. (CO6)
10. Give two examples of artificial sweeteners. (CO4)

Section B

[Answer all questions. Each question carries 6 marks] (Ceiling: 24 Marks)

11. Explain the relationship between food, nutrition, and health with suitable examples. (CO1)
12. Write short notes on the nutritive value of pulses and milk. (CO2)
13. Explain the different methods used in sensory evaluation of food quality. (CO3)
14. Discuss the role of antioxidants and stabilizers in food processing. (CO4)
15. Explain prebiotics, probiotics, and nutraceuticals with examples. (CO5)

Section C

[Answer any ONE. Each question carries 10 marks]

16. a) Describe the principles and methods of food preservation. Discuss their effect on food quality and safety. (CO5)
OR
b) Explain the role of food laws and labelling in consumer protection, with reference to Indian and international standards. (CO6)

I Semester B. Voc. Degree Examinations – October 2025

Course Code: FTV1CJ103

Course Title: Food Chemistry

(Credits: 4)

Maximum Time: 2 Hours

Maximum Marks: 60

Course Outcomes (COs)

CO #	CO Statement
CO1	Understand basic constituents of foods and their response to various physiochemical alterations.
CO2	Create better understanding of food pigments and their control measurements.
CO3	Understand the importance of enzymes from various sources for chemical modification of foods.
CO4	Analyze the factors which influence the textural quality of foods.
CO5	Analyze the various constituents of foods.

Section A

[Answer all questions. Each question carries 2 marks] (Ceiling: 20 Marks)

1. Define water activity and its significance in food stability. (CO1)
2. Name two deficiency disorders related to minerals. (CO1)
3. What are flavonoids? Give one example. (CO2)
4. State two methods to prevent pigment discoloration. (CO2)
5. Define enzymes and give one example from plant source. (CO3)
6. List two factors affecting enzyme activity. (CO3)
7. Define emulsion with one food example. (CO4)
8. Name two types of emulsifying agents. (CO4)
9. Mention two qualitative tests for proteins. (CO5)
10. What is iodine value? (CO5)
11. State one use of carotenoids in food. (CO2)
12. Name two microbiological tests for milk. (CO5)

Section B

[Answer all questions. Each question carries 6 marks] (Ceiling: 30 Marks)

13. Explain the classification and properties of carbohydrates. (CO1)
14. Describe the structure, sources, and properties of chlorophyll and carotenoids. (CO2)
15. Discuss the classification and properties of enzymes. (CO3)
16. Explain the properties of sols, suspensions, and emulsions. (CO4)
17. Describe the qualitative methods for estimation of protein, carbohydrate, fat, ash, and fiber. (CO5)
18. Write notes on methods of moisture determination and its importance in foods. (CO1)

Section C

[Answer any ONE. Each question carries 10 marks]

19. a) Discuss the role of enzymes in food and their applications in the food industry. (CO3)
OR
b) Explain the chemistry of colloids and the types of emulsions with suitable examples. (CO4)

I Semester B. Voc. Degree Examinations – October 2025

Course Code: FTV1VN101

Course Title: Basic Food Microbiology

(Credits: 4)

Maximum Time: 2 Hours

Maximum Marks: 70

Course Outcomes (COs)

CO #	CO Statement
CO1	Know the important genera of microorganisms associated with food and their characteristics.
CO2	Apply laboratory techniques to detect, quantify, and identify microorganisms in foods.
CO3	Gain knowledge on various methods of cultivation and identification of food microbes.
CO4	Develop basic laboratory skills for isolation, identification, and quantification of microorganisms in food samples.
CO5	Establish a comprehensive understanding about the concept of growth of microbes in food.
CO6	Understand the history of microbiology.

Section A

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

1. Define food microbiology and mention any two important genera of bacteria in food. (CO1)
 2. Give two characteristics of molds associated with food. (CO1)
 3. List any three common culture media used in food microbiology. (CO2)
 4. State two physical agents used in microbial control. (CO2)
 5. Mention three causes of food spoilage. (CO3)
 6. List any three methods for identifying foodborne pathogens. (CO3)
 7. State any three chemical agents used in microbial control. (CO4)
 8. List three fermented dairy products and the microorganisms used. (CO4)
 9. Define microbial growth and name the phases of the growth curve. (CO5)
 10. Name two scientists and their contributions to microbiology. (CO6)

Section B

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

11. Describe the morphology and physiology of bacteria, yeasts, and molds. (CO1)
12. Explain the preparation and use of culture media in microbiology laboratories. (CO2)
 13. Discuss the spoilage of milk, meat, and fruits with examples. (CO3)
14. Explain the mechanism of action of heat and low temperature in microbial control. (CO4)
15. Discuss the preparation and properties of sauerkraut and yoghurt. (CO4)

16. Explain the factors affecting the growth of microorganisms in food. (CO5)
17. Write a short note on food infection and food intoxication. (CO3)
18. Discuss the contributions of Louis Pasteur and Robert Koch to microbiology. (CO6)

Section C

[Answer any one. Each question carries 10 marks]

19. a) Describe the physical and chemical agents used for controlling microorganisms in food processing. (CO4)
- OR
- b) Explain in detail the spoilage of different food groups and the microorganisms involved. (CO3)

APPENDICES

UNIVERSITY OF CALICUT

Minor in Applied Microbiology & Advanced Food Chemistry Offered by Board of Studies in Food Technology

FOUR-YEAR UNDERGRADUATE PROGRAMME

2025-26 ADMISSION ONWARDS (CUFYVP Regulations 2025)

GROUPING OF MINOR COURSES

Minor Title: Applied Food Microbiology

Group 1 may be offered to all students, whereas Group 2 is reserved for students enrolled in the vocational discipline.

Semester	Course Code	Course Title	Credit	Theory hrs	Practical hrs	Internal	External	Total marks
1	FTV1VN101	Basic Food Microbiology	4	3	2	30	70	100
2	FTV2VN102	Microbial Food Safety and Public Health	4	3	2	30	70	100
3	FTV3VN203	Industrial Food Microbiology	4	3	2	30	70	100

Minor Title: Advanced Food Chemistry

Semester	Course Code	Course Title	Credit	Theory hrs	Practical hrs	Internal	External	Total marks
3	FTV3VN204	Chemistry of Food Additives	4	3	2	30	70	100
4	FTV4VN205	Functional Foods & Nutraceuticals	4	3	2	30	70	100
5	FTV5VN306	Food Enzymology	4	3	2	30	70	100