Program and Course Structure

School of Engineering Technology

B. Tech – Food Process Technology

Batch: 2020-24

1.1 Vision, Mission and Core Values of the University

Vision of the University

To serve the society by being a global University of higher learning in pursuit of academic excellence, innovation and nurturing entrepreneurship.

Mission of the University

1. Transformative educational experience
2. Enrichment by educational initiatives that encourage global outlook
3. Develop research, support disruptive innovations and accelerate entrepreneurship
4. Seeking beyond boundaries

Core Values

- Integrity
- Leadership
- Diversity
- Community

Vision of the School

To become a globally acclaimed institution of higher learning in engineering and technology promoting excellence in research, innovation and entrepreneurship to provide sustainable solution to the needs of the society

Mission of the School

1. To impart quality education with strong industry & academic connectivity in the expanding fields of Engineering and Technology in a conducive and enriching learning environment.
2. To produce technocrats equipped with technical & soft skills and experiential learning required to stay current with the modern tools in emerging technologies to fulfill professional responsibilities and uphold ethical values.
3. To inculcate a culture of interdisciplinary research, innovation and entrepreneurship to provide sustainable solutions to meet the growing challenges and societal needs.
4. To foster collaborative learning and to play adaptive leadership role in professional career and pursuit of higher education through effective mentoring and counseling.

Core Values

- Integrity
- Leadership
- Diversity
- Community

1.2.1Vision and Mission of the Department

Vision of the Department

To serve the society by being a global centre of higher learning in pursuit of academic excellence, innovation and nurturing entrepreneurship to cater to the needs of biotechnology in health, agriculture and environment sectors.

Mission of the Department

M1: To conduct cutting-edge multidisciplinary original research in plant, animal, medical, industrial and environmental biotechnology.

M2: To train and transform students into thinking bioengineers, and scientists who are able to integrate theoretical knowledge with practical applications in diverse areas of Biotechnology

M3: To adapt and update with rapidly changing technologies through self-improvement with continuous learning and education, without compromising with moral and professional ethics.

M4: To provide opportunities for collaborative-learning beyond classrooms, in the broader community- across the diverse spectrum of disciplines**.**

Core Values

- Integrity
- Leadership
- Diversity
- Community

1.3 Program Educational Objectives (PEO)

PEO1: Graduates will be able to integrate the physical, biological and mathematical sciences with engineering principles for the study of food systems and human well being.

PEO2: Graduates will demonstrate the applications of food processing and food engineering principles through development of appropriate equipment, processes and entrepreneurship that are of societal and industrial importance.

PEO3: Graduates will adapt to and update with rapidly changing food processing ecosystem through self-improvement with continuous learning about the impact of technology and engineering solutions on the sustainability of human nutrition and environment.

PEO4: Graduates will develop communication skills and demonstrate independent thinking, analytical and problem solving skills, self-management and function effectively in team-oriented and open-ended activities in an industrial or academic environment.

PEO5: Graduates will develop leadership skills at levels appropriate to their experience and perform ethically and professionally in business, academia, industry and society.

1.3.3 Program Outcomes (PO's)

PO1: **Engineering knowledge**: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.

PO2: **Problem analysis**: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.

PO3: **Design/development of solutions**: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.

PO4: **Conduct investigations of complex problems**: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.

PO5: **Modern tool usage**: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modelling to complex engineering activities with an understanding of the limitations.

PO6: **The engineer and society**: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.

PO7: **Environment and sustainability**: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.

PO8: **Ethics**: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.

PO9: **Individual and team work**: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

PO10: **Communication**: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.

PO11: **Project management and finance**: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.

PO12: **Life-long learning**: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

PSO1: Acquire practical knowledge of food science and engineering techniques to identify, quantify and characterize appropriate food raw materials, processes and products critical for sustaining life processes and also for industrial applications.

PSO2: Ability to unravel basic principles and methods related to human food nutrition leading to individual and social well being in a sustainable environment safety and ethics.

PSO3: Develop management and communication skills through team work and self learning for healthy and sustainable food systems.

1.3.5 The components of the curriculum

Course Component	Curriculum Content (% of total number of credits of the program)	Total number of contact hours	Total number of credits
Basic Sciences	3.75%	6	6
Engineering Sciences	9.06%	22	14.5
Humanities and Social sciences	3.12%	5	5
Technical and communications skills	10%	29	16
Sciences	13.4%	26	21.5
Program Core	27.5%	51	44
Program Electives	13.1%	21	21
Open Electives	6.8%	11	11
Project(s)	13.1%	36	21

School of Engineering and Technology
B.Tech-Food Process Technology
Batch: 2020-2024
TERM: I

S. No.	Course Code	Course	Teaching Load			Credits	Type of course 1. CC 2. AECC 3. SEC 4. DSE
			L	T	P		
THEORY SUBJECTS							
1.	BTY114	Introduction to Biotechnology Engineering	0	0	2	1	CC
2.	CSE113	Programming for Problem Solving	3	0	0	3	AECC
3.	EVS112	Environmental Studies	3	0	0	3	AECC
4.	MTH114	Maths I	3	1	0	4	AECC
5.	ARP101	Communicative English	1	0	2	2	SEC
6.	PHY121	Thermodynamics	2	1	0	3	AECC
7.	EEE112	Principles of Electrical and Electronics Engineering	2	1	0	3	AECC
PRACTICAL							
8.	CSP113	Programming for Problem Solving Lab	0	0	2	1	SEC
9.	EEP112	Principles of Electrical and Electronics Engineering Lab	0	0	2	1	SEC
10.	MEP106	Computer Aided Design & Drafting	0	0	3	1.5	SEC
11.	PHY162	Physics Lab 2	0	0	2	1	SEC

TOTAL CREDITS	23.5

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B.Tech- Food Process Technology
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TERM: II

S. No.	Course Code	Course	Teaching Load			Credits	Type of Course
			L	T	P		
THEORY SUBJECTS							
1.	CHY110	Physical Chemistry	3	0	0	3	AECC
2.	CSE114	Application based Programming in Python	3	0	0	3	AECC
3.	FEN102/ FEN104	Functional English Beginners 2/ Functional English Intermediate 2	1	0	0	1	SEC
4.	HMM111	Value Ethics	2	0	0	2	SEC
5.	PHY122	Thermodynamics	2	1	0	3	AECC
6.	MTH215	Biostatistics	3	1	0	4	AECC
PRACTICAL							
7.	BTY115	Design/Creativity based course	0	0	2	1	CC
8.	CHY152	Physical Chemistry Lab	0	0	2	1	SEC
9.	CSP114	Application based Programming in Python Lab	0	0	2	1	SEC
10.	ENP103	Functional English Lab II	0	0	2	1	SEC
11.	MEP105	Mechanical Workshop	0	0	3	1.5	SEC
12.	PHY161	Physics Lab	0	0	2	1	SEC
Summer Internship (0-0-2)1 for II term to be evaluated in III term							
TOTAL CREDITS							**22.5**

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TERM: III

S. No.	Course Code	Course	Teaching Load			Credits	Type of Course
			L	T	P		
THEORY SUBJECTS							
1.	HMM305	Management for Engineers	3	0	0	3	AECC
2.	FPE201	Food Chemistry	3	0	0	3	AECC
3.	FPE202	Food Microbiology	3	0	0	3	CC
4.	FPE203	Heat and Mass Transfer	3	1	0	4	CC
5.		Computer Based Numerical methods	2	0	0	2	CC
PRACTICAL							
6.	ARP203	Aptitude Reasoning and Business Communication Skills-Basic	0	0	4	2	SEC
7.	FPP201	Food Chemistry Lab	0	0	2	1	SEC
8.	FPP202	Food Microbiology Lab	0	0	2	1	CC
9.	FPP251	Project Based Learning (PBL) -1	0	0	2	1	SEC
10.	FPP294	Summer Internship	0	0	2	1	SEC
TOTAL CREDITS							**21**

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TERM: IV

S. No.	Course Code	Course	Teaching Load			Credits	Type of Course
			L	T	P		
THEORY SUBJECTS							
1.	ARP204	Aptitude Reasoning and Business Communication Skills-Intermediate	0	0	4	2	CC
2.	FPE205	Dairy Engineering	3	0	0	3	CC
3.	FPE207	Unit Operations in Food Processing	3	0	0	3	CC
4.	FPE209	Program Elective 1 (Post harvest and storage engineering)	2	1	0	3	DSE
5.	FPE208	Engineering Properties of Food	2	1	0	3	AECC
6.	FPE206	Food Preservation	3	0	0	3	
7.	NBT002	Open Elective 1 (Entrepreneurship Essentials) NPTEL	3	0	0	3	
PRACTICAL							
8.	FPP205	Dairy Engineering Lab	0	0	2	1	CC
9.	FPP206	Food Preservation Lab	0	0	2	1	CC
10.	FPP252	Project Based Learning (PBL) -2	0	0	2	1	SEC
11.							SEC
Summer Internship (0-0-2)1 for IV term to be evaluated in V term							

TOTAL CREDITS	23

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TERM: V

S. No.	Course Code	Course	Teaching Load			Credits	Type of Course
			L	T	P		
THEORY SUBJECTS							
1.	FPE301	Instrumentation for Food Quality Analysis	3	0	0	3	CC
2.	FPE302	Technology of Meat, Marine and Poultry Products	3	0	0	3	CC
3.	FPE303	Food Safety	2	0	0	2	DSE
4.		Program Elective 2	3	0	0	3	AECC
5.		Open Elective 2	3	0	0	3	
PRACTICAL							
6.	FPP302	Technology of Meat, Marine and Poultry Products Lab	0	0	2	1	CC
		Intrumentation for food quality analysis lab	0	0	2	1	
8.		Technical Skill Enhancement Course-1	0	0	2	1	SEC
9.	FPP351	Project Based Learning (PBL) -3	0	0	2	1	SEC
10.	ARP301	Quantitative Aptitude Behavioral and Interpersonal Skills	0	0	4	2	SEC
11.	FPP394	Summer Internship	-	-	-	1	SEC
12.	CCU101	Community Connect	0	0	2	2	SEC
Total Credits							**23**

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TERM: VI

S. No.	Course Code	Course	Teaching Load			Credits	Type of Course
			L	T	P		
THEORY SUBJECTS							
1.	FPE304	Modelling and Simulation in Food Process operations	2	1	0	3	CC
2.	FPE305	Advanced Food Process Engineering	3	1	0	4	CC
3.		Program Elective-3	2	0	0	2	DSE
4.		Program Elective-4	2	1	0	3	DSE
5.		Open Elective – 3	3	0	0	3	AECC
PRACTICAL							
6.	FPP301	Technology of Cereals, Pulses and Oilseeds Lab	0	0	2	1	CC
7.	FPP352	Project Based Learning (PBL) -4	0	0	2	1	SEC
8.		Technical Skill Enhancement Course-2	0	0	2	1	SEC
9.	ARP302	Higher Order Mathematics and Advanced People Skills	0	0	4	2	SEC
Summer Internship (0-0-2)1 for VI term to be evaluated in VII term							
TOTAL CREDITS							**20**

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TERM: VII

S. No.	Course Code	Course	Teaching Load			Credits	Type of Course
			L	T	P		
THEORY SUBJECTS							
1.	FPE401	Food Packaging Technology	3	0	0	3	CC
2.	FPE402	Intellectual property and patenting	3	0	0	3	CC
3.		Program Elective-5	2	0	0	2	DSE
4.		Program Elective-6	2	1	0	3	DSE
5.		Open Elective – 4	3	0	0	3	AECC
PRACTICAL							
6.	FPP401	Food Packaging Technology Lab	0	0	2	1	CC
	FPP402	Applied Nutrition and Biochemistry Lab	0	0	2	1	
7.	FPP451	Major Project- 1	-	-	-	2	SEC
9.	FPP494	Summer Internship	-	-	-	1	SEC
11.	SC22	Comprehensive Examination	-	-	-	0	CC
TOTAL CREDITS							**20**

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TERM: VIII

S. No.	Course Code	Course	Teaching Load			Credits	Type of Course
			L	T	P		
PRACTICAL							
1.	FPP452	Major Project – 2	-	-	-	08	SEC
TOTAL CREDITS							**08**

Syllabus

BTY114: Introduction to Biotechnology Engineering

School: SET		**Batch : 2020-24**
Program: B. Tech.		**Current Academic Year: 2020-21**
Branch: FPT		**Semester: 1**
1	Course Code	BTY114
2	Course Title	Introduction to Biotechnology Engineering
3	Credits	2
4	Contact Hours (L-T-P)	2-0-0
	Course Status	Compulsory
5	Course Objective	To provide a foundation in biotechnology with engineering of living systems and to apply various tools of traditional engineering fields such as mechanical, material, electrical and chemical to understand and solve biomedical and biological problems and harness potential of living systems for the benefit of human mankind.
6	Course Outcomes	After the successful completion of this course students will be able to: CO1: Recognize the scope, concepts, and terminology of biotechnology CO2: Analyze current events and advances in biotechnology CO3: Identify interdisciplinary nature of Biotechnology CO4: Describe techniques involving the manipulation of DNA CO5: Discover applications of biotechnology in various fields CO6: Recall basic and applied biotechnology and its applications for human benefit
7	Course Description	The 'Introduction to Biotechnology Engineering' involves study of biotechnology, its history, evolution and applications during course of human history. It encompasses detailed procedure of biotechnological techniques like recombinant DNA technology. It also involves the use of biotechnology for mankind, creation of transgenic plants and animals.
8	Outline syllabus	
	Unit 1	**Introduction to Biotechnology**
	A	History and origin of Biotechnology
	B	Traditional and Modern Biotechnology
	C	Important events in history of biotechnology
	Unit 2	**Scope of Biotechnology**
	A	Areas of Biotechnology
	B	Medicine and health care
	C	Agriculture and industrial biotechnology

	Unit 3	**Biotechnology as interdisciplinary science**		
	A	Introduction to Bioinformatics and Computational Biology		
	B	Role of Biotechnology in maintaining sustainable environment		
	C	Basics of Convergence of biotechnology and electronics		
	Unit 4	**Basics of Gene Technology**		
	A	DNA as blue print of life		
	B	Introduction to rDNA Technology		
	C	Transgenesis and Cisgenesis		
	Unit 5	**Applications**		
	A	Introduction to Stem cells		
	B	Tissue engineering		
	C	Gene therapy		
	Mode of examination	Theory		
	Weightage Distribution	CA	MTE	ETE
		30%	20%	50%
	Text book/s*	Smith J. E., **Biotechnology**, 3rd Edition, Cambridge University Press (2006)		
	Other References	1. **Molecular biology of the Gene (4th Edition).** J .D. Watson, N. H. Hopkins, J. W. Roberts,J.A. Steitz and A.M. 2. Ravi, Indu, Baunthiyal, Mamta, Saxena, Jyoti. **Advances in Biotechnology,** Springer 2014.		

BTY115: Design/Creativity based course

School: SET		**Batch: 2020-2024**
Program: B. Tech		**Current Academic Year: 2020-21**
Branch: FPT		**Semester: Even (2nd)**
1	Course Code	BTY115
2	Course Title	Design/Creativity based course
3	Credits	1
4	Contact Hours (L-T-P)	0-0-2
	Course Status	Compulsory
5	Course Objective	• To explain the principles of physical and chemical methods used in Biotechnology. • To explain the different biological processes used in biotechnology. • To explain the structural morphology of cells and biomolecules. • To develop creative skills to build models using the available knowledge.
6	Course Outcomes	After successfully completion of this course students will be able to: CO1: Students will learn about the structure and functions of some important biomolecules. CO2: Students will be able to identify and differentiate between Eukaryotic and Prokaryotic cells. CO3: Students will learn about different important biochemical processes in Biotechnology. CO4: Students will learn about the different instruments used in Biotechnology. CO5: Students will learn about biological processes including genetic engineering. CO6: Students will be able to represent different concepts/cells/biomolecules/instruments in creative way apart from learning the basics.
7	Course Description	In this course, students will learn about different features and processes in Biotechnology. Students will also learn to recreate the model from their theoretical knowledge.
8	Outline syllabus	
	Unit 1	**Biomolecule**
		Sub unit - a, b and c detailed in Instructional Plan
	Unit 2	**Cell Biology**
		Sub unit - a, b and c detailed in Instructional Plan
	Unit 3	**Biochemical processes**
		Sub unit - a, b and c detailed in Instructional Plan
	Unit 4	**Biological Equipment**
		Sub unit - a, b and c detailed in Instructional Plan
	Unit 5	**Bioengineering**

		Sub unit - a, b and c detailed in Instructional Plan		
	Mode of examination	Creative model design and Viva		
	Weightage Distribution	CA	MTE	ETE
		60%	0%	40%
	Text book/s*	1. Smith J. E., Biotechnology, 3rd Edition, Cambridge University Press (2006) 2. Molecular Biology Lab Fax. T.A. Brown (Ed.), bios Scientific Publishers Ltds., Oxford, 1991		
	Other References	1. Bioprocess Engineering (Basic Concepts) by M. L. Shuler & F. Kargi, Prentice Hall of India.		

HMM305: Management for Engineers

School: School of Business Studies		**Batch: 2020-2024**
Program: B. Tech		**Current Academic Year: 2021-22**
Branch: FPT		**Semester: Odd (3rd)**
1	Course Code	HMM305
2	Course Title	Management for Engineers
3	Credits	03
4	Contact Hours (L-T-P)	3-0-0
	Course Type	Compulsory
5	Course Objective	The objective of this course is to expose the students to understand the basics of Management Foundations. The students will be given a detailed grounding for the theories and cases related to the general management. The aim of the course is to orient the students in theories and practices of Management so as to apply the acquired knowledge in actual business practices. This is a gateway to the real world of management and decision-making.
6	Course Outcomes	The student will be able to **CO1**: **Define** basic principles and concepts related to management in an organisation including the functions, different theories of management and roles they play in an organization. **CO2: Explain** the primary function Planning with its process. Also, how forecasting is done in organizations with various techniques are used. **CO3**: **Use** of organizing by studying different types of organization and also using decentralisation and span of control in organizations**.** **CO4**: **Analyse** jobs, recruitment process, manpower planning, job rotation, trainings and rewards in various organizations. **CO5**: **Measure** motivation and management control concepts to obtain effective controlling in management system in organizations. **CO6**: **Develop** proper system in an organization by using all the functions of management.
7	Course Description	This course gives an overview of engineering management and help to understand the various functions of management used in an organization. The focus of the course is the development of individual skills and team work.
8	Outline syllabus	
	Unit 1	**Introduction of Management & Organisation**
	A	Management-Definition of Management & Organisation

	B	Concept, Nature, Scope and Functions of Management, Levels of Management, Management Theories - Taylors principle, Fayol's Principles, Hawthorne Studies, Systems Approach and Contingency Approach to Management.		
	C	Mintzberg's Managerial Roles, Skills of Manager		
	D	Functions of management		
	Unit 2	**Management Planning Process**		
	A	Planning objectives and characteristics.		
	B	Hierarchies of planning.		
	C	The concept and techniques of forecasting.		
	Unit 3	**Organizing**		
	A	3.1 Meaning, Importance and Principles,		
	B	3.2 Departmentalization, Span of Control,		
	C	3.3 Types of Organization,		
		Authority, Delegation of Authority.		
	Unit 4	**Staffing**		
	A	4.1 Meaning, Job analysis		
	B	4.2 Manpower planning, Recruitment, Transfers and Promotions		
	C	4.3 Appraisals, Management Development, Job Rotation, Training, Rewards and Recognition,		
	Unit 5	**Directing & Controlling**		
	A	Motivation, Co-ordination, Communication,		
	B	Directing and Management Control, Decision Making,		
	C	Management by objectives (MBO) the concept and relevance. Objectives and Process of Management Control		
	Mode of examination	Theory		
	Weightage Distribution	CA	MTE	ETE
		30%	20%	50%
	Text book/s*	• Principles & practice of Mgmt., L.M. Prasad		
	Other References	• Management Today, Burton & Thakur • Principles & Practices of Mgmt., C.B. Gupta • Understanding Management, Richard L. Daft • Management, Stoner, Freemand & Gilbert • Essential of Management, Koontz O' Donnel		

FPE201: Food Chemistry

School: SET		**Batch: 2020-2024**
Program: B. Tech.		**Current Academic Year: 2021-22**
Branch: FPE		**Semester: 03**
1	Course Code	**FPE201**
2	Course Title	**Food Chemistry**
3	Credits	4
4	Contact Hours (L-T-P)	3-0-2
	Course Status	**Compulsory**
5	Course Objective	1. Acquire knowledge of principle and techniques involved in food chemistry. 2. Analyze the basic strategies of food chemistry and how it can be applied for human benefit. 3. Explain proximate analysis of carbohydrates, lipids, fats and minerals.
6	Course Outcomes	CO1: Demonstrate depth and breadth of knowledge in food chemistry by demonstrating knowledge of, and applying, the principles and concepts of chemistry as they apply to food systems. CO2: Develop an understanding of the principles of carbohydrates whereby food molecules can be selected for use as ingredients in food formulations and the related factors that might be controlled during to enhance product quality. CO3: Investigate and solve qualitative and quantitative problems in food chemistry, both individually and in teams, by synthesizing and evaluating information from a range of sources, including traditional and emerging technologies. CO4: Calculate, evaluate, interpret and present analytical results obtained during practical food analysis. CO5: Discuss the various aspects of minerals and vitamins. CO6: Investigate the role of food chemistry in food engineering.
7	Course Description	The course will deal with the chemistry of the principal components of foods, their properties and interactions, and the changes that occur during processing, storage, and utilization. Emphasis will be on evidence derived from original research literature, interpretation of research findings, and problem solving based on the scientific principles of food chemistry.
8	Outline syllabus	

	Unit 1	**Introduction**		
	A	Introduction to different food groups and importance of food chemistry		
	B	Water in foods and its properties		
	C	**Proximate analysis in foods**		
	Unit 2	**Carbohydrates**		
	A	Carbohydrate: Sources of food carbohydrates		
	B	Physico-chemical and functional properties		
	C	chemistry and structure of homosachharides and heterosachharides.		
	Unit 3	**Proteins**		
	A	Proteins: Sources and physico-chemical and functional properties; Purification of proteins		
	B	Changes in protein during processing, protein determination methods.		
	C	Proteins from plant and animal sources.		
	Unit 4	Fats		
	A	Fats: Sources and physico chemical and functional properties; PUFA [Poly-unsaturated Fatty Acids] hydrogenation and rancidity;		
	B	Saponification number, iodine value, Reichert-Meissl number, Polenske value;		
	C	Lipids of biological importance like cholesterol and phospholipids. Changes during food processing.		
	Unit 5	Minerals and Vitamins		
	A	Minerals and Vitamins: Sources and structures of minerals & vitamins;		
	B	Effect of processing and storage of vitamins, Pro vitamins A & D; Vitamins as antioxidants;		
	C	Food Pigments & Flavouring Agents: Importance, types and sources of pigments - their changes during processing and storages.		
	Mode of examination			
	Weightage Distribution	CA	MTE	ETE
		30%	20%	50%
	Text book/s*	1. Essentials of Food & Nutrition by Swaminathan, Vol. 1 & 2		
	Other References	2. Food Chemistry by L. H. Muyer 3. Hand Book of Analysis of fruits & vegetables by S. Ranganna 4. Food Chemistry by Linhinger		

		5. Chemical changes in food during processing by Richardson

FPE202: Food Microbiology

School: SET		**Batch : 2020-2024**
Program: B Tech		**Current Academic Year: 2021-22**
Branch: FPE		**Semester: 03**
1	Course Code	**FPE202**
2	Course Title	**Food Microbiology**
3	Credits	4
4	Contact Hours (L-T-P)	3-0-2
	Course Status	**Compulsory**
5	Course Objective	The course is designed to prepare students with a basic understanding of the microbes involved in biological processes such as fermentation and spoilage. The course provides a foundation for careers in microbiology, food engineering, or research in all branches of food sciences and technology.
6	Course Outcomes	CO1: Describe the role and significance of intrinsic (i.e. aw, pH, etc.) and extrinsic (gases in the environment, etc.), factors in the growth and response of microorganisms. CO2: Identification of the important pathogens and spoilage mechanisms in foods. CO3: Discuss the principles of food preservations and to describe the different food preservation methods. CO4: Analyze the role of fermentation and preservation in food science. CO5: Understand the basic practices and importance of cleaning and sanitation in food processing operations. CO6: Describe the principles and current practices of processing techniques and how they can impact food safety and food quality.
7	Course Description	This course covers the characteristic of microbial growth, intrinsic and extrinsic factors and their relationship to microbial growth; the principles of food fermentation and the role of beneficial microbes; the role of microorganisms and food spoilage; pathogenic microorganisms, infection and intoxication, mycotoxin, viruses and parasites; the principles to control microbial growth; as well as qualitative and quantitative microbiological analysis.
8	Outline syllabus	
	Unit 1	**Microorganisms in food**

	A	Importance of microorganisms in food , History of Microorganisms in Food Developments		
	B	Intrinsic and extrinsic parameters of food affecting microbial growth		
	C	Types of microorganisms in foods like meats, poultry, seafood, vegetables, dairy products, fruits and vegetables.		
	Unit 2	**Microbial spoilage**		
	A	Principles and types of spoilage ,Microbial spoilage of spoilage of fruits and vegetables, fresh and processed meats.		
	B	Microbial spoilage of poultry, sea foods, cereals, flour, dough, bakery products ,dairy products and canned foods.		
	C	Assessing microbial load in foods – microscopic, cultural, physical, chemical and immunological methods.		
	Unit 3	**Preservation of foods**		
	A	Food preservation principles , Factors affecting preservation–		
	B	Food preservation using temperature low temperature food preservation high temperature food preservation		
	C	Preservation of foods by drying, chemicals and radiation with limitations and commercial applications.		
	Unit 4	**Fermented and microbial foods**		
	A	Fermented foods-vegetables, Fruits ,Dairy products.		
	B	Fermented meat and fish products ,alcoholic and non alchoholic fermented drinks		
	C	Oriental Foods, Probiotics and Prebiotic		
	Unit 5	**Food borne diseases and safety**		
	A	Food borne infections and intoxications– food poisoning-botulism – salmonellosis – gastroenteritis, food borne pathogens – *Clostridium, Bacillus ceres, Staphylococcus aureus, Vibrio, Campylobacter, Yersinia* .		
	B	Indicators of food safety food processing plant sanitation		
	C	Food and plant , Microbiological standards and guidelines		
	Mode of examination			
	Weightage Distribution	CA	MTE	ETE
		30%	20%	50%
	Text book/s*	1. Jay, J.M. 1996. Modern food microbiology. CBS Publishers & Distributors, New Delhi.		
	Other References	1. Frazier, W.C. and Westhoff, 1983. Food microbiology. Tata McGraw Hill Publishing Co. Ltd., New Delhi		

		2. Gould, G.W. 1996. New methods of food preservation. Blackie academic & professional, Madras. 3. King R.D. and P.S.J. Cheetham, 1986. Food biotechnology Elsevier Applied Science, New York.
		http://www.cdc.gov http://www.ucfoodsafety.ucdavis.edu/ http://www.extension.iastate.edu/foodsafety http://www.wfpha.org

FPE203: Heat and Mass Transfer

School: SET		**Batch : 2020-2024**
Program: B. Tech		**Current Academic Year: 2021-22**
Branch: FPE		**Semester: Odd (3rd)**
1	Course Code	**FPE203**
2	Course Title	**Heat and Mass Transfer**
3	Credits	4
4	Contact Hours (L-T-P)	3-1-0
	Course Status	**Compulsory**
5	Course Objective	This course covers the information on mechanism of conductive/convective heat transfer, including heat transfer with heat exchangers. It will impart the knowledge of mass transfer. Thermal conductivity and mass diffusivity in food processing operations will also be discussed.
6	Course Outcomes	After the successful completion of this course students will be able: CO1: To know conductive heat transfer, conductivity and types of heat transfer and conduction through pipes. CO2: To know convective heat transfer with dimensional analysis CO3: To know radiation heat transfer with heat exchangers CO4: To have knowledge of mass transfer equilibra. CO5: To be acquainted with mass transfer in food and handling equipment. CO6: Get knowledge of heat and mass transfer and its applications in food industry.
7	Course Description	The '**Heat and Mass Transfer'** course outlines the different methods of heat and mass transfer in foods, like heat transfer through conductive, convective and radiation and mass transfer by different ways and to discuss heat and mass transfer diffusivity.
8	Outline syllabus	
	Unit 1	**Conductive heat transfer**
	A	General equations, thermal conductivity,
	B	Steady and unsteady state heat transfer
	C	Conduction through pipes
	Unit 2	**Convective transfer**
	A	Dimensionless analysis
	B	Free and force convection heat transfer coeff.,
	C	Condensation: Condensation heat transfer, film condensation on vertical plates, boiling and Evaporation-Types,capacity,Single and multiple effect
	Unit 3	**Radiation heat transfer and heat exchangers**
	A	Black and grey body radiation

	B	Heat exchangers types, heat transfer coeff.,, heat exchanger mean temperature difference, effectiveness and numbers of units		
	C	Radiative exchanges between bodies		
	Unit 4	**Equilibrium mass transfer**		
	A	Phase equilibria, diffusion		
	B	Diffusivity in solids		
	C	Interphase mass transfer		
	Unit 5	**Mass Transfer**		
	A	Moisture transport		
	B	Diffusion Steady and unsteady state		
	C	Convective mass transfer, Simultaneous heat and mass transfer		
	Mode of examination	Theory		
	Weightage Distribution	CA	MTE	ETE
		30%	20%	50%
	Text book/s*	• Ashim K Datta.2002. Biological and bioenvironmental Heat and mass transfer.MercelDekkar, Inc New York • Theodore L Bergman, Adrinene S Lavine, Frank P Incropera andDavid P Dewitt.2011. Fundamentals of Heat and Mass transfer. John wiley and Sons Inc. USA		
	Other References	• Theodorosvarzakas and constantinaTzia. 2015. Food Engineering Hand Book. CRC Press Taylor		

FPE204: Computer Based Numerical Analysis

School: SET		**Batch : 2020-24**
Program: B. Tech		**Current Academic Year: 2021-22**
Branch: Food Process Engineering		**Semester: 3**
1	Course Code	**FPE204**
2	Course Title	**Computer based Numerical analysis**
3	Credits	2
4	Contact Hours (L-T-P)	2-0-0
	Course Status	Compulsory
5	Course Objective	To provide a foundation to the basic concepts and techniques of numerical solution for algebraic equations, mathematical problems using computational methods and their inter relation with engineering of food systems and computational oriented problems.
6	Course Outcomes	After the successful completion of this course students will be able to: 1. Understand numerical methods and computer applications using different software with the basic concepts of error, convergence and roots of equations. 2. Apply appropriate numerical formulas to solve various numerical integration and differentiation problems. 3. Analyze numerical problems related to regression and interpolation . 4. Recall numerical solutions to linear, algebraic and differential equations using computational methods. 5. Solve various types of partial differential equations and problems related to finite element method. 6. Recall different mathematical and computational tools for numerical problem solving and analysis.
	Course Description	This course provides a broad overview of mathematical equations and computational analysis for problem solving. The course includes description of error analysis, numerical integrations and differentiations, curve fitting equations, numerical solutions to linear, algebraic and differential equations using computational tools.
8	Outline syllabus	
	Unit 1	**Problem solving on computer**
	A	Introduction to problem solving Software- Mat lab
	B	Error analysis- Definitions, Rounding off
	C	Error analysis - propagation
	Unit 2	**Numerical Integrations**
	A	Integration formulas - Trapezoidal rules
	B	Integration formulas: Simpson rule unequal segment and multiple

		integrals	
C	Integration of equations-Algorithm for equations		
Unit 3	**Curve Fitting**		
A	Least square regression-linear, polynomial		
B	Least square regression : multiple and General and non-linear regression		
C	Interpolation-Newton's divided difference, Language interpolation		
Unit 4	**Numerical Methods:**		
A	Numerical solution of a system of linear equations-Gauss elimination method		
B	Numerical solution of Algebraic equation-Bisection method		
C	Numerical solution of ordinary differential equation- Runge-Kutte methods		
Unit 5	**Partial differential Equations**		
A	Finite difference Elliptical equations		
B	Finite Difference – Parabolic equations		
C	Finite Element methods- one dimensional		
Mode of examination	Theory		
Weight age Distribution	CA	MTE	ETE
	30%	20%	50%
Text book/s*	• Chapra Steven C.,and Raymond P. Canale.2015. Numerical methods for engineers. McGraw-Hill Education, 2 Penn Plaza, New York, NY 10121		
Other References	• Sastry S,. 2012. Introductory methods of numerical analysis. Published by PHI Learning Pvt Ltd New Delhi-1		

FPP201: Food Chemistry Lab

School: SET		**Batch: 2020-24**		
Program: B. Tech		**Current Academic Year: 2021-22**		
Branch: FPT		**Semester: Odd (3rd)**		
1	Course Code	FPP201		
2	Course Title	Food Chemistry Lab		
3	Credits	1		
4	Contact Hours (L-T-P)	0-0-2		
	Course Status	Compulsory		
5	Course Objective			
6	Course Outcomes	After finishing the course the students will be able to CO1: Discuss carbohydrates and their estimation techniques in foods CO2: Understand the techniques for lipid estimation. CO3: Elaborate the concept of proximate analysis of foods. CO4: Explain the methods for estimation of common adulterants in foods. CO5: Apply the concept of chemical preservative mechanism of action. CO6: Understand the concept of major and micro nutrients analysis in foods.		
7	Course Description			
8	Outline syllabus			
	Unit 1	**Practical based on estimation of carbohydrates**		
		Sub unit – a ,b.c		
	Unit 2	**Practical related to lipid estimation**		
		Sub unit –c		
	Unit 3	**Practical based on protein estimation**		
		Sub unit – a		
	Unit 4	**Practical based upon adulterants in foods**		
		Sub unit – c		
	Unit 5	**Practical related to permissible limit of chemical preservatives**		
		Sub unit - a		
	Mode of examination	Practical/Viva		
	Weightage Distribution	CA	MTE	ETE
		60%	0%	40%
	Text book/s*	-		
	Other References			

FPP202: Food Microbiology Lab

School: SET		**Batch : 2020-24**
Program: B. Tech		**Current Academic Year: 2021-22**
Branch: FPP		**Semester: 3rd**
1	Course Code	FPP202
2	Course Title	Food Microbiology Lab
3	Credits	3
4	Contact Hours (L-T-P)	3-0-0
	Course Status	Compulsory
5	Course Objective	• To identify the basic instruments used in microbiology and biotechnology lab and their functions • To isolate and characterize microorganisms associated with different food products • To identify the presence of foreign DNA in food samples. • To develop a knowledge of the use of microbiological techniques in identification and enumeration of bacteria
6	Course Outcomes	After finishing the course the students will be able to: CO1: Demonstrate common aseptic techniques used in the microbiology laboratory. CO2: Illustrate the ubiquitous nature of microorganisms and how they can be isolated for study. CO3: Describe basic principles of food microbiology and media preparation. CO4: Understand basic techniques used in the observation and identification of microorganisms. CO5: Recognize various biotechniques in enumeration of different compounds. CO6 : Discuss the importance and concept of food microbiology in the food systems.
7	Course Description	The course will introduce students to methods used in microbiological examination of foods. Students will be exposed to practical training on isolating, purifying and identification of microorganisms in different foods.
8	Outline syllabus	
	Unit 1	**Practical based on understanding of various safety and sterilization techniques in food microbiology**
		Sub unit - a, b and c detailed in Instructional Plan
	Unit 2	**Practical related to preparation of culture media.**
		Sub unit - a, b and c detailed in Instructional Plan
	Unit 3	**Practical related to quantitate DNA in food sample.**
		Sub unit - a, b and c detailed in Instructional Plan
	Unit 4	**Practical based on microscopic estimation of yeast, mold and bacteria.**
		Sub unit - a, b and c detailed in Instructional Plan

	Unit 5	**Practical based on bacteriological examinations in various food samples.**
		Sub unit - a, b and c detailed in Instructional Plan
	Mode of examination	Jury/Practical/Viva
	Weight age Distribution	CA
		60%
	Text book/s*	Rhea, F. (2009). Microbiology Handbook – Meat Products. Published by Leatherhead Publishing, UK.
	Other References	1. Nollet, L.M.L. (2006). Handbook of Water Analysis. 2nd edition. Taylor and Francis Group, London. 2. Downes , F.P. and Ito, K. (2001). Compendium of Methods for the Microbiological Examination of Foods. Published by American Public Health Association, Washington, DC.

FPE205: Dairy Engineering

School: SET		**Batch : 2020-2024**
Program: B. Tech		**Current Academic Year: 2022-2023**
Branch: FPE		**Semester: 04**
1	Course Code	FPE205
2	Course Title	**Dairy Engineering**
3	Credits	0
4	Contact Hours (L-T-P)	3-0-0
	Course Status	**Compulsory**
5	Course Objective	To introduce students to an understanding of milk constituents with various dairy engineering operations such as homogenization, pasteurization, thermal processing, evaporation, freezing and drying of milk.
6	Course Outcomes	By the end of this course, students should be able to: CO1: Describe the composition of milk, identify the approximate content of individual types present, and describe physicochemical characteristics of the main components. CO2: Outline the responsibilities of food handlers regarding food safety including their legal responsibilities CO3: Review potential applications and efficiency of various equipments used in dairy products processing. CO4: Understand the production of milk products substitutes. CO5: Explain key functions in production steps , standards and defects of various dairy products. CO6: Integrate their knowledge of food chemistry/engineering/microbiology and physical properties of foods to understand the processing of dairy products.
7	Course Description	Dairy Engineering deals with the processing of milk and its products. This field involves the use of "Technology and Engineering" to make the dairy products and processing more advanced and useful.

8	Outline syllabus			
	Unit 1	**Pasteurization**		
	A	Milk-physical, chemical and functional properties-composition - reception and storage-testing—milk grading and defects-cooling of milk.		
	B	Pasteurization – principles, objectives and methods. LTLT/holding pasteurization-types, advantages and disadvantages. HTST pasteurization- functions of HTST pasteurizer, advantages and disadvantages		
	C	Clean- in- Place process		
	Unit 2	**Sterilization and Homogenization**		
	A	Sterilization-In bottle sterilization, UHT processing-advantages-difficulties, Indirect heating systems using plate heat exchangers, Direct heating-Fouling of heat exchangers. -		
	B	Homogenization theory, mechanism, factors influencing homogenization , merits and demerits.		
	C	Aseptic filling systems : cartons, plastic pouches, plastic bottles		
	Unit 3	**Centrifugation, Bactofugation and Membrane separation**		
	A	Principles of Centrifugation, clarification, standardisation. Components of cream separators, factors affecting fat percentage in cream ,fat loss in skim milk.		
	B	Membrane processing-principles of -Reverse osmosis - Ultra filtration and Electro dialysis.		
	C	Bactofuge treatment, Factors affecting bactofugation and its application.		
	Unit 4	**Manufacturing of milk products and substitutes**		
	A	Technology of condensed and evaporated milk		
	B	Casein, Lactose, Whey protein concentrates and isolates		
	C	Milk powder – Whole Milk Powder and Skim Milk Powder ,Spray dryer construction and powder recovery system.		
	Unit 5	**Manufacturing of dairy based products**		
	A	Yogurt,Butter, Buttermilk and Ice cream manufacturing		
	B	Cream ,Cheese, Khoa, barfi, kalakand and gulabjamun		
	C	Rosogolla, srikhand,channa and paneer with their defects, standards and packaging.		
	Mode of examination			
	Weightage	CA	MTE	ETE

	Distribution	30%	20%	50%
	Text book	1. Ananthakrishnan,C.P. and M.N.Sinha.1987. Technology and engineering of dairy plant operations. Laxmi Publications, New Delhi. 2. Ahmed Tufail.1999. Dairy Plant Engineering and management. Kitab Mahal, Allahabad. 3. De Sukumar . 2002 .Outlines of Dairy Technology, Oxford University press, New Delhi RE		
	References	1. Farrall,A.W. 1963. Engineering for dairy and food products. John Wiley and Sons, New York. 2. Hall,C.W and T.J. Hedrick. 1971. Drying of milk and milk products. AVI Publishing Co., West Port, Connecticut. 3. Kessler, H.G.1981. Food engineering and dairy technology. Verlag A.Kessler, Freising. 4. Robinson, R.K.1986. Modern dairy technology Vol.I Advances in Milk processing. Elsevier Applied Science Publishes, London.		

FPE207: Unit Operations in Food Processing

School: SET		**Batch : 2020-2024**
Program: B. Tech		**Current Academic Year: 2022-23**
Branch: FPE		**Semester: Even (4th)**
1	Course Code	**FPE207**
2	Course Title	Unit Operations in Food Processing
3	Credits	3
4	Contact Hours (L-T-P)	3-0-0
	Course Status	**Compulsory**
5	Course Objective	The '**Unit Operation in Food Processing**' course will provide knowledge of unit operations like size reduction and mixing, distillations, filtrations, extractions, adsorptions, separations and crystallizations, evaporations, drying and cooling processes.
6	Course Outcomes	After the successful completion of this course students will be able to: CO1: Illustrate basics of unit operation and all basic food processing operations and transport phenomena. CO2. Explain details about the size reduction and mixing including emulsification. CO3: Apply distillation, filtrations and extraction in food processing applications. CO4: Discuss absorption/adsorption, separations and crystallization. CO5:Apply evaporation/concentration, drying and cooling processes important food processes. CO6: Recall unit operations which are used in food processing like size reduction and mixing, separations, dispersion, filtration, evaporation, absorption, extraction, fluidization, distillation, freezing, cooling and dehydration.
7	Course Description	This course is related to basics as well as different unit operations used in food processing. Generally in all operations size reduction, mixing, distillation absorption etc are used. These all operations will be discussed
8	Outline syllabus	
	Unit 1	**Basics of unit operations**
	A	Unit operations classifications
	B	Material and energy balance
	C	Fluid flow theory and applications
	Unit 2	**Size reduction, mixing and emulsification**
	A	Size reduction- Grinding/cutting, Energy used, Equipments
	B	Mixing-Measurement, Energy used, mixing equipments
	C	Emulsification-dispersion/continuous phase, emulsifying agents, homogenization,

	Unit 3	**Distillation, filtration and extraction**		
	A	Distillation-Equilibrium relationships, types and equipments		
	B	Filtrations-rates and cake resistance of filter, filtration equipments		
	C	Extractions -extraction and washing equipments, Rate, stage and equipments		
	Unit 4	**Absorption, separation and crystallization**		
	A	Absorptions-gas absorption, rate, stage and equipments of absorption		
	B	Separations- Sedimentation, flotation, types of separations, and equipments, Sieving classifications, membrane separations		
	C	Crystallizations –geometry, principles equipments and application		
	Unit 5	**Evaporation, drying and cooling**		
	A	Evaporations and concentration-single effect evaporator, Multiple effect and evaporation equipments and concentrators		
	B	Drying and dehydration-basic theory, heat requirements, dryer efficiencies, Mass transfer, psychrometry and equipments		
	C	Food freezing and cooling-Freezing and cooling temperature, thermal properties, freezing/cooling time, design of systems and equipments		
	Mode of examination	Theory/Practicals		
	Weightage Distribution	CA	MTE	ETE
		30%	20%	50%
	Text book/s*	• Warren L. McCabe, Julian C Smith and peter Harriot. 1993. Unit operations of chemical Engineering. McGraw Hill Book Co. Singapore • E R Earle and M D Earle. 1983.Unit operations in Food Engineering. Web edition. Published by the New Zealand institute of Food science and Technology(Inc).		
	Other References	• Albert Ibarz and Gustavo v Barbosa-Canovs. 2003. Unit operations in Food Engineering. RC Press, Boca Ratan London.		

FPE208 :Engineering properties of Food Materials

School: SET		**Batch : 2020-24**
Program: B. Tech		**Current Academic Year: 2021-22**
Branch: FPE		**Semester:4**
1	Course Code	**FPE208**
2	Course Title	**Engineering properties of food materials**
3	Credits	3
4	Contact Hours (L-T-P)	2-1-0
	Course Status	Compulsory
5	Course Objective	The aim of '**Engineering properties of food materials**' course is to introduce and explain different properties of food, describe surface properties of foods, explain thermodynamic and thermal properties of foods, describe rheological, electrical and textural properties of foods.
6	Course Outcomes	After the successful completion of this course students will be able to: CO1: Understand properties of food materials. CO2: Explain surface properties of foods like surface tension, foaming, wett ability and solubility CO3: Learn thermodynamic and thermal properties of foods. CO4: Analyze rheology and texture properties of foods which play a very important role. CO5: Recall electrical properties like dielectric properties. CO6: Discuss engineering properties of food materials
7	Course Description	The '**Engineering properties of food materials**' course outlines the different properties of foods, like physico-chemical, surface properties, thermodynamic and thermal, rheological, textural and electrical properties and study of energy and mass balance, surface tension, foaming, thermal conductivity and diffusivity, viscoelastic behavior.
8	Outline syllabus	
	Unit 1	**Properties of food materials**
	A	Energy and mass balances in operations
	B	Physico-chemical properties of foods
	C	Other properties of foods
	Unit 2	**Surface Properties of Food**
	A	Surface tension, temperature effects
	B	Emulsions
	C	Foaming, wettability and solubility
	Unit 3	**Thermodynamic and thermal properties of foods**
	A	Thermal properties of foods
	B	Thermal conductivity and diffusivity
	C	Thermodynamic properties
	Unit 4	**Food Rheology and Texture**
	A	Fundamental deformation and flow properties ,
	B	Viscosity and viscoelastic behaviour

	C	Gelation and food texture		
	Unit 5	**Electrical properties**		
	A	Electrical properties		
	B	Dielectric properties		
	C	Microwave related properties		
	Mode of examination	Theory		
	Weightage Distribution	CA	MTE	ETE
		30%	20%	50%
	Text book/s*	M A Rao and SSH Rizvi. 1986.Engineering properties of foods. Marcel Dekker inc. New York.		
	Other References	Theodorosvarzakas and constantinaTzia. 2015. Food Engineering Hand Book. CRC Press Taylor & Francis Group Boca Raton.		

FPE206 :Food Preservation

School: SET		**Batch : 2020-24**
Program: B. Tech		**Current Academic Year: 2022-23**
Branch: FPE		**Semester: 4**
1	Course Code	**FPE206**
2	Course Title	**Food Preservation**
3	Credits	4
4	Contact Hours (L-T-P)	3-0-0
	Course Status	Compulsory
5	Course Objective	The aim of 'Food **Preservation**' course is to provide knowledge about different food processing methods of preservation like low processing techniques, high temperature processing, hurdle technology, novel thermal and non-thermal techniques of processing. It will also impart indirect preservation techniques like packaging, GMP and GHP.
6	Course Outcomes	After the successful completion of this course students will be able to: CO1:Identify the low temperature processing techniques CO2.Describe high temperature processing techniques. CO3: Apply different methods of hurdle technologies to preserve the food. CO4: Describe Novel thermal and non-thermal processing techniques. CO5:Discuss indirect preservation techniques like packaging, GMP and GHP CO6: Recall all the techniques for food preservation
7	Course Description	This course is related to basic and advance techniques of food preservation so that the shelf life of the product can be enhanced. Low temperature and high temperature processing methods are well known to preserve the foods but novel food preservation methods and hurdle and indirect techniques are equally important for food preservation, This course will give details of such techniques.
8	Outline syllabus	
	Unit 1	**Low Thermal Preservation**
	A	Chilling
	B	Refrigeration
	C	Freezing
	Unit 2	**High thermal Preservation**
	A	Pasteurization
	B	Canning & Sterilization
	C	Ultra high temp preservation
	Unit 3	**Hurdle technology**
	A	Moisture & pH control
	B	MAP, CAP and surface treatments

	C	Using antioxidants, nitrites and antimicrobials,coatings		
	Unit 4	**Novel preservation methods**		
	A	Ohmic, Radio frequency and microwave		
	B	High hydrostatic pressure, irradiation		
	C	PEF, PL ,ultrasound and, ozonation		
	Unit 5	**Indirect food preservation**		
	A	Packaging		
	B	HACCP		
	C	Good Hygiene and manufacturing practices		
	Mode of examination	Theory/Practicals		
	Weightage Distribution	CA	MTE	ETE
		30%	20%	50%
	Text book/s*	• Peter Zeuthen and Leif Bùgh-Sùrensen.2003.Food preservation techniques.Published by Woodhead Publishing Limited Abington Hall, Abington Cambridge CB1 6AH England • Sivasankar, B. 2002. Food processing and preservation. Prentice ands hall of India. Pvt ltd., New Delhi.		
	Other References	• ShafiurRahman M(ed). 2007. Handbook of food preservation. CRC Press Taylor & Francis Group 6000 Broken Sound Parkway NW, Suite 300 Boca Raton		

School: SET		**Batch: 2019-23**
Program: B.Tech		**Current Academic Year: 2021-22**
Branch: FPP		**Semester: Even (4th)**
1	Course Code	FPP205
2	Course Title	**Dairy Engineering Lab**
3	Credits	1
4	Contact Hours (L-T-P)	0-0-2
	Course Status	**Compulsory**/Elective
5	Course Objective	To identify the basic instruments used in dairy technology and their importance. To isolate and characterize microorganisms associated with different milk products To identify the presence of foreign adulterants in milk samples. To develop a knowledge of the use of microbiological techniques in identification and enumeration of bacteria in dairy products
6	Course Outcomes	After finishing the course the students will be able to: CO1: Demonstrate common aseptic techniques used in the dairy technology. CO2: Illustrate the importance of milk sample preparation. CO3: Understand the importance for checking of adulterants in milk and products. CO4: Understand basic techniques used in the estimation of platform tests. CO5: Explain adulterants and their effects on human well being. CO6: Recognize various techniques for preparation of different milk products.
7	Course Description	The course will introduce students to methods used in chemical examination of milk products. Students will be exposed to practical training on chemical testing of milk based products.
8.	**Unit 1**	**Practical based on understanding of various safety and sterilization techniques in dairy technology**
		Sub unit - a, b and c detailed in Instructional Plan
	Unit 2	**Practical related to platform test.**
		Sub unit - a, b and c detailed in Instructional Plan
	Unit 3	**Practical related to check adulteration in raw milk.**
		Sub unit - a, b and c detailed in Instructional Plan
	Unit 4	**Practical based on preparation of various milk products.**
		Sub unit - a, b and c detailed in Instructional Plan
	Unit 5	**Practical based on detection of adulteration in ghee**

Mode of examination	Jury/Practical/Viva		
Weight age Distribution	CA	MTE	ETE
	60%	0%	40%
Text book/s*	FSSAI Manual for Analysis for Food Products.		
Other References			

FPP206: Food Preservation Lab

School: SET		**Batch: 2020-24**
Program: B. Tech		**Current Academic Year: 2022-23**
Branch: FPP		**Semester: Even (4th)**
1	Course Code	FPP206
2	Course	
3	Credits	1
4	Contact Hours (L-T-P)	0-0-2
	Course Status	Compulsory
5	Course Objective	1. To identify the basic techniques of food preparation for increasing the shelf life of fruits and vegetables. 2. To analyze the use of chemical preservatives in food. 3. Identify the impact of certain technological operations and parameters on the success of fruit and vegetable processing and on certain properties of final product. 4. To develop a knowledge of new product development and waste reduction.
6	Course Outcomes	CO1: Demonstrate common post harvest management and grading techniques. . CO2: Explain the importance of various chemicals preservatives in preservation. CO3: Understand basic techniques used in the estimation of lycopene . CO4: Recognize the importance of microbiological analysis in fruits and vegetables. CO5: Identify the importance of the chemical composition of different varieties of fruits and vegetables intended for processing and processing conditions to the composition and properties of the product. CO6: Correlate and apply techniques learnt to resolve practical problems in varied food systems.
7	Course Description	The course will introduce students to methods used in preparation, preservation and microbiological examination of fruits and vegetable based processed foods. Students will be exposed to practical training on preparation, and analysis of increased shelf life by using preservatives.
8	Outline syllabus	
	Unit 1	**Practical based on post harvest management and grading of foods.**
	A	Sub unit - a, b and c detailed in Instructional Plan
	B	Sub unit - a, b and c detailed in Instructional Plan
	C	Sub unit - a, b and c detailed in Instructional Plan

	Unit 2	**Practical related to preservation of fruits by different methods.**		
	A	Sub unit - a, b and c detailed in Instructional Plan		
	B	Sub unit - a, b and c detailed in Instructional Plan		
	C	Sub unit - a, b and c detailed in Instructional Plan		
	Unit 3	**Practical related to estimation of different antioxidants**		
	A	Sub unit - a, b and c detailed in Instructional Plan		
	B	Sub unit - a, b and c detailed in Instructional Plan		
	C	Sub unit - a, b and c detailed in Instructional Plan		
	Unit 4	**Practical related to oxidative rancidity.**		
	A	Sub unit - a, b and c detailed in Instructional Plan		
	B	Sub unit - a, b and c detailed in Instructional Plan		
	C	Sub unit - a, b and c detailed in Instructional Plan		
	Unit 5	**Practical related to development of value added new product**		
	A	Fruit based product		
	B	Vegetable based product		
	C	Preservation using salt and sugar		
	Mode of examination	Practical and/or Viva		
	Weightage Distribution	CA	MTE	ETE
		60%	0%	40%
	Text book/s	Laboratory Manual in Food Preservation byMarion L. Fields, Avi Publishing Co Inc.; New edition edition (December 1983)		
	Other References	FSSAI laboratory manual		

FPE301: Instrumentation for Food Quality Analysis

School: SET		**Batch : 2020-24**
Program: B. Tech		**Current Academic Year: 2022-23**
Branch: FPE		**Semester: Odd (5th)**
1	Course Code	FPE301
2	Course Title	Instrumentation for Food Quality Analysis
3	Credits	3
4	Contact Hours (L-T-P)	3-0-0
	Course Status	Compulsory
5	Course Objective	The course is designed to introduce and describe instruments for analyzing rheological properties of food, spectroscopic instruments used for analysis of foods and their scope. The course will also describe chromatographical techniques used in sensory analysis of foods.
6	Course Outcomes	After the successful completion of this course students will be able to: CO1: Comprehend the basic concept of food quality assessment and the requirements necessary for its application. CO2: Develop an idea for the appropriate methodologies types of techniques for food quality evaluation purpose. CO3: Describe instruments to find thermodynamic and thermal properties of food. CO4: Demonstrate experimentally among various scales used for sensory evaluation. CO5: Discuss about sensory analysis of foods. CO6: Analyze the difference between various instruments used in quality analysis and their applications.
7	Course Description	The '**Instrumentation for food quality analysis**' course outlines the different instrumental techniques for food analysis, for thermodynamic, thermal, rheological, textural and sensory properties and to use chromatographic and spectroscopic techniques.
8	Outline syllabus	
	Unit 1	**Food rheology analysis**
	A	Viscometers
	B	Powder Rheometers
	C	Rheometers
	Unit 2	**Spectroscopic instruments**
	A	UV visible spectroscopy
	B	Atomic absorption Spectroscopy
	C	FT-IR, NMR and ICPi

	Unit 3	**Thermal methods of analysis**		
	A	Thermogravimetry		
	B	Differential thermal analysis		
	C	Scanning Electron microscope		
	Unit 4	**Chromatographic techniques**		
	A	Gas chromatography		
	B	Liquid chromatography		
	C	High performance thin layer chromatography		
	Unit 5	**Sensory analysis**		
	A	Electronic nose		
	B	Colorimeter		
	C	Texture analyzer		
	Mode of examination	Theory/Practical		
	Weightage Distribution	CA	MTE	ETE
		30%	20%	50%
	Text book/s*	1.Ibtisam E. Tothill.2003. Rapid and on-line instrumentation for food quality assurance Published by Woodhead Publishing Limited Abington Hall, Abington Cambridge CB1 6AH England 2.Semih Ötles.2012. Methods of Analysis of Food Components and Additives. CRC Press Taylor & Francis Group 6000 Broken Sound Parkway NW, Suite 300 Boca Raton, FL 33487-2742		
	Other References	David Kilcast. 2013.Instrumental Assessment of food sensory quality. Published by Woodhead Publishing Limited, 80 High Street, Sawston, Cambridge CB22 3HJ, UK		

FPE302: Technology of Meat, Marine and Poultry Products

School: SET		**Batch : 2020-2024**
Program: B. Tech		**Current Academic Year: 2022-23**
Branch: FPE		**Semester: Odd (5th)**
1	Course Code	**FPE302**
2	Course Title	Technology of Meat, Marine and Poultry Products
3	Credits	3
4	Contact Hours (L-T-P)	3-0-0
	Course Status	Compulsory
5	Course Objective	The course is designed to prepare students with a basic understanding of the steps involved in processing of meat, marine and poultry products. . The course provides a foundation for careers in poultry and meat industry.
6	Course Outcomes	CO1: Understand the current market scenario of meat, marine and poultry industry. CO2: Analyze the role of pre and post handling systems for better meat quality . CO3: Identification of the important techniques and processes in shelf life extension of meat and meat based products. CO4: Discuss the composition and quality parameters of egg and poultry products. CO5: Learn the basic handling practices and processing of fish based products. CO6: Describe the principles and current practices of processing techniques and how they can impact food safety and food quality in meat industry.
7	Course Description	In this course, students will acquire a survey of knowledge of processing of slaughter animals, their quality classification and handling of animal. This course deals with the processing of marine and poultry products.
8	Outline syllabus	
	Unit 1	**Pre treatment of meat**
	A	Status of meat poultry and fish industry in India; Sources and importance of meat, poultry and fish.
	B	Structure and composition of muscle, types, classification and composition of fish. Pre-slaughter operations and slaughtering operations for animals and poultry.

	C	Abattoir design and layout		
	Unit 2	**Post slaughter treatment**		
	A	Post slaughter care,post mortem and rigour mortis .		
	B	Biochemical changes in meat.		
	C	Tenderization of meat by natural or artificial enzymes.		
	Unit 3	**Meat preservation**		
	A	Traditional methods for meat preservation		
	B	Novel methods for meat preservation (Low dose irradiation, hurdle concept and high pressure treatment)		
	C	Preparation, preservation and equipment for manufacture of meat sausages and dehydrated meat products .		
	Unit 4	**Egg and Poultry Processing**		
	A	Eggs: Structure, composition, quality characteristics, processing, preservation of eggs.		
	B	Manufacturing of egg powder, frozen egg.		
	C	Dressing , grading, laughtering ,scalding, Mechanical defeathering ,eviscerating, preservation,Quality control and standardization of poultry meat.		
	Unit 5	**Marine Processing**		
	A	Sea foods nutritional composition, fishing resources transportation of fish, grading		
	B	sea food products and processing , preservation methods		
	C	Surumi process, Quality control in fish processing.		
	Mode of examination			
	Weightage Distribution	CA	MTE	ETE
		30%	20%	50%
	Text book/s*	1.Vikas Nanda. 2014. Meat, Egg and Poultry Science & Technology. I.K. International Publishing House Pvt. Ltd., New Delhi. 2. ‘ Meat Processing of poultry’1989.		
	Other References	3.B.D. Sharma and Kinshuki Sharma. 2011. Outlines of Meat Science and Technology. Jaypee Brothers Medical Publishers Pvt. Ltd., New Delhi.		

FPE303: Food Safety

School: SET		**Batch: 2020-24**
Program: B. Tech		**Current Academic Year: 2022-23**
Branch: FPE		**Semester: Odd (5th)**
1	Course Code	FPE303
2	Course Title	Food Safety
3	Credits	2
4	Contact Hours (L-T-P)	2-0-0
	Course Status	**Compulsory**
5	Course Objective	The course is designed to prepare students with a basic understanding and importance of food safety involved in food processing and spoilage. The course provides a foundation for careers in total quality management and national and international regulations.
6	Course Outcomes	After successfully completion of this course students will be able to: CO1: Recognize and identify the food contaminants influencing the safety of agricultural products. CO2: Outline the responsibilities of food handlers regarding food safety including their legal responsibilities CO3: Explain the importance of food safety management systems and different regulatory frameworks across the globe. CO4: Identify and apply requirements for completing documentation for implementing a prerequisite program. CO5: Understand and apply properly the national and international legislation/ regulation CO6: Describe the principles and current practices of processing techniques and how they can impact food safety and food quality.
7	Course Description	To provide the students with an understanding of food contaminants and how to control the factors influencing the safety of agricultural products, and also to implement management system to ensure the safety of agricultural products.
8	Outline syllabus	

	Unit 1	**Introduction to Food Safety**		
	A	Definitions - food safety and quality, General principles of food safety and quality. Hazards - physical, chemical and biological, Role of Cross contamination.		
	B	Limits for pesticide residues in foods		
	C	Metal contamination of food		
	Unit 2	**Management of hazards**		
	A	Need of controlling of critical parameters ,Design of food plant, Temperature Danger Zone and Storage of Food .		
	B	Role of Handler , Personnel Hygiene of Handler ,Quality of Water and its analysis, Hygiene and Sanitation in Food Service Establishments.		
	C	Methods of Rodent Control.		
	Unit 3	**Role of Quality Assurance and Control**		
	A	Quality Control, Quality Assurance, Concepts of quality control and quality assurance functions in food industries.		
	B	Quality Improvement Total Quality management: Quality evolution, defining TQM, principals of TQM, stages in implementation, TQM road map.		
	C	Quality improvement tools, customer focus, cost of quality.		
	Unit 4	**International standards and organizations**		
	A	Food and Drug Administration Act (FDA), International Organization for Standards (ISO) and its implication, European Council (EU) .		
	B	Codex *Alimentarius* Commission (CAC), Total Quality Management (TQM), Good Manufacturing Practices(GMP).		
	C	Good Agricultural Practices (GAP), and Good Hygienic Practices (GHP), Hazard Analysis Critical Control Point (HACCP).		
	Unit 5	**Indian laws and Standards**		
	A	National Food Regulation-FSSA and important regulatory Agencies (FSSAI), Prevention of Food Adulteration Act (PFA) and Food safety standards bill ,Fruit Products Order (FPO).		
	B	Bureau of Indian Standards (BIS), Agricultural Grading and Marketing (AGMARK).		
	C	The Agricultural and Processed Food Product Export Development Authority (APEDA).		
	Mode of examination	Theory/Jury/Practical/Viva		
	Weightage Distribution	CA	MTE	ETE
		30%	20%	50%
	Text book/s*	1. Lawley, R., Curtis L. and Davis,J. The Food Safety Hazard Guidebook , RSC publishing, 2004.		
	Other	2. De Vries. Food Safety and Toxicity, CRC, New York, 1997		

	References	3. Marriott, Norman G. Principles of Food Sanitation, AVI, New York, 1985 4. Pieternel A, Luning, Willem J. Marcelis, Food Quality Management Technological and Managerial principles and practices, Wageningen,2009.

FPP302: Technology of Meat, Marine and Poultry Products Lab

School: SET		**Batch: 2020-24**		
Program: B. Tech		**Current Academic Year: 2022-23**		
Branch: FPP		**Semester: Odd (5th)**		
1	Course Code	FPP302		
2	Course Title	Technology of Meat, Marine and Poultry Products Lab		
3	Credits	1		
4	Contact Hours (L-T-P)	0-0-2		
	Course Status	Compulsory		
5	Course Objective	This course will develop the importance of meat and poultry industry in nation's economy. The students shall gain knowledge of the processing and preservation of meat, poultry and seafoods.		
6	Course Outcomes	After successfully completion of this course students will be able to: CO1 : Learn safety measures required in modern abattoir. CO2 : Understand various techniques for meat handling to work in contamination free environment. CO3 : Prepare media for culturing spoiling microorganism prevalent in meat supply chain. CO4 : Demonstrate preservation techniques for meat preservation. CO5 : Develop meat and marine based new product with extended shelf life. CO6 : Learn various methods to isolate, handle, store and work with various micro-organisms under aseptic conditions		
7	Course Description	This course is been designed to make student understand the processing and preservation technologies for meat, poultry and marine foods.		
8	Outline syllabus			
	Unit 1	**Practical based on safety measures in modern and traditional abattoir.**		
		Sub unit - a, b and c detailed in Instructional Plan		
	Unit 2	**Practical related to Meat handling**		
		Sub unit - a, b and c detailed in Instructional Plan		
	Unit 3	**Practical related to culturing media for spoilage causing micro organisms**		
		Sub unit - a, b and c detailed in Instructional Plan		
	Unit 4	**Practical related to meat preservation**		
		Sub unit - a, b and c detailed in Instructional Plan		
	Unit 5	**Practical related to shelf life extension in novel meat products**		
		Sub unit - a, b and c detailed in Instructional Plan		
	Mode of examination	Jury/Practical/Viva		
	Weightage	CA	MTE	ETE

	Distribution	60%	0%	40%
	Text book/s*	Practical Manual of Meat and Meat Products by FSSAI.		

FPE304: Modelling and Simulation in Food Process Operations

School: SET		**Batch: 2020-24**
Program: B. Tech		**Current Academic Year: 2022-23**
Branch: FPE		**Semester: 6**
1	Course Code	FPE304
2	Course Title	Modeling and Simulation in Food Process Operations
3	Credits	3
4	Contact Hours (L-T-P)	2-1-0
	Course Status	Compulsory
5	Course Objective	This course has been designed to make student understand the processing and preservation technology for meat, poultry and seafoods.
6	Course Outcomes	After the successful completion of this course students will be able to: CO1: Lean the concept of modeling and simulation in food processing CO2: Apply modeling and simulation in novel thermal food processes CO3: Describe modeling of cooling processes in foods. CO4: Apply modeling and simulation of novel thermal food processes. CO5: Discuss modeling and simulation of novel non-thermal food processes. CO6: Recall applications of modelling and simulation in all food processing operations
7	Course Description	The '**Modelling and simulation in food processing**' course outlines application of modelling and simulation techniques in different food processing operations whether thermal or non-thermal processing and novel processes. This will provide predictions in food processes.
8	Outline syllabus	
	Unit 1	**Modelling/simulation of food processes**
	A	Introduction to modelling and numerical simulation
	B	Kinetic modelling of inactivation
	C	Computer simulation approaches
	Unit 2	**Modelling of heating processes**
	A	Modelling of drying process
	B	Modelling of Pasteurization & Sterilization
	C	Modelling of frying and baking
	Unit 3	**Modelling of cooling processes**
	A	Chilled and frozen food modelling
	B	Cold food chain modelling
	C	Modelling food storage

	Unit 4	**Modelling and simulation of novel thermal processes**		
	A	Ohmic heating and Radiofrequency processing		
	B	Microwave and infrared processing		
	C	Pulse light processing		
	Unit 5	**Modelling and simulation of Non thermal processes**		
	A	Hydrostatic pressure processing		
	B	Pulse electric field processing		
	C	Irradiation processing		
	Mode of examination	Theory		
	Weightage Distribution	CA	MTE	ETE
		30%	20%	50%
	Text book/s*	1.Soojin Jun. 2009. Food Processing operations modelling- design and analysis. CRC Press Taylor & Francis Group 6000 Broken Sound Parkway NW, Suite 300 Boca Raton, FL 33487-2742 2.SerafimBakalis, Kai Knoerzer and Peter J. Fryer. 2015. Modelling food processing operations. Woodhead Publishing is an imprint of Elsevier 80 High Street, Sawston, Cambridge, CB22 3HJ, UK 225 Wyman Street, Waltham, MA 02451, USA		
	Other References	3.Josheph Irudayaraj. 2002.Food Processing operations modelling-Design and analysis. Marcel Dekker AG, Inc. 270 maison Avenue, New yark NY 10016		

FPE305: Advanced Food Processing Engineering

School: SET		**Batch : 2020-24**
Program: B. Tech		**Current Academic Year: 2022-23**
Branch: FPE		**Semester: 6**
1	Course Code	**FPE305**
2	Course Title	**Advanced Food Process Engineering**
3	Credits	4
4	Contact Hours (L-T-P)	3-1-0
	Course Status	Compulsory
5	Course Objective	The '**Food Process Engineering**' aimed to provide theories and principles of high and low thermal processing techniques like drying and dehydration, chilling and freezing, frying, baking and roasting
6	Course Outcomes	After the successful completion of this course students will be able to: CO1: Identify need for thermal processing for food. CO2: Describe drying and dehydration theory . CO3: Describe theory of refrigeration, chilling and freezing of foods. CO4: Discuss freeze drying theory and equipment used CO5: Understand principles of frying, baking and roasting of foods. CO6: Explain working principles and theory of different thermal processes used in food processing..
7	Course Description	The '**Food Process Engineering'** course outlines the theories and working principle in different food processing operations like drying and dehydration, Chilling and freezing , freeze drying, frying, baking and roasting etc
8	Outline syllabus	
	Unit 1	**Thermal processing**
	A	Kinetics of thermal inactivation of microorganism
	B	Lethality in thermal processes, heat transfer
	C	Methods and equipments
	Unit 2	**Drying and dehydration**
	A	Basic drying theory,
	B	calculation of drying times, dryer efficiencies
	C	classification and selection of dryers
	Unit 3	**Refrigeration, chilling and freezing**
	A	Effect of temperature
	B	Freezing, freezing kinetics
	C	Effect of freezing on product quality

	Unit 4	**Freeze drying**		
	A	Sublimation of water, heat and mass transfer		
	B	Freeze drying in practice		
	C	Freeze concentration		
	Unit 5	**Frying baking and roasting**		
	A	Frying kinetics		
	B	Baking		
	C	Roasting		
	Mode of examination	**Theory**		
	Weightage Distribution	CA	MTE	ETE
		30%	20%	50%
	Text book/s*	Zeki Berk.2009.Food process Engineering and Technology. Academic press inc. Burlington.		
	Other References	George D. Saravacos and Athanasios E. Kostaropoulos. 2002. Handbook of Food Processing Equipment. Springer Science+Business Media, New York, USA		

FPP301: Technology of Cereals, Pulses and Oilseeds Lab

School: SET		**Batch: 2020-24**
Program: B. Tech		**Current Academic Year: 2022-23**
Branch: FPP		**Semester: 6th (Even)**
1	Course Code	FPP301
2	Course Title	**Technology of cereals, pulses and oilseeds lab**
3	Credits	1
4	Contact Hours (L-T-P)	0-0-2
	Course Status	Compulsory
5	Course Objective	1. To enable students bridge the gap between theoretical concepts and practical aspects in industrial settings. 2. In-depth knowledge of laboratory/industrial skills required for employment or for creation of employment in cereal processing. 3. Knowledge to develop industrial process to produce gluten free products.
6	Course Outcomes	After successful completion of this course students will be able to: CO1: Explain the concept of baking. CO2: Understand the different types of oilseeds and their advantages and disadvantages. CO3: Understand the use of chemical preservative permissible limit in bakery and pulse industry. CO4: Estimate the carbohydrate, lipids, proteins and enzyme activity in baked goods. CO5: Apply protocols for testing rheological properties of dough. CO6: Discuss the on field application of cereal, pulses and oilseed industry.
7	Course Description	This deals with the design and development of baking processes and SOPs for the manufacturing of novel food products with pulses and cereal grains.
8	Outline syllabus	
	Unit 1	**Baking concept** Demonstration of working of baking unit Time and temperature combinations and their roles in baking
	Unit 2	**Oilseeds** Oilseed extraction Concept of purification
	Unit 3	**Chemical preservation in baking** Leaveners Permissible limits of Preservatives

	Unit 4	**Analytical techniques**		
		Estimation of carbohydrates, fats and lipids.		
	Unit 5	**Rheological properties of dough**		
		Different instruments		
		Demonstrations		
	Mode of examination	Practical/Viva		
	Weightage Distribution	CA	MTE	ETE
		60%	0%	40%
	Text book/s*	-		
	Other References			

FPE401: Food Packaging Technology

School: SET		**Batch : 2020-2024**
Program: B. Tech		**Current Academic Year: 2022-23**
Branch: FPE		**Semester: 07**
1	Course Code	**FPE401**
2	Course Title	**Food Packaging Technology**
3	Credits	3
4	Contact hours (L-T-P)	3-0-0
	Course Status	Compulsory
5	Course Objective	The aim of 'Food **Packaging Technology**' course is to describe packaging materials and their properties including shelf life of packaging materials. The course is also intended for importance of labelling in packaging and regularity aspects also.
6	Course Outcomes	After the successful completion of this course students will be able to: CO1:Identify the packaging materials and their properties. CO2:Describe shelf life of the food with different packaging techniques. CO3: Understand the concept of high moisture foods and their packaging techniques to enhance their shelf life. CO4: Explain packaging of low moisture foods like cereals and pulses, oils and fats. CO5: Learn importance of labeling in packaging and regulatory aspects. CO6: Analyze suitability of packaging materials with respect to perishable and non-perishable food products, different techniques for enhancing shelf life of products, precautions for high moisture foods, labelling on packaging and regulations.
7	Course Description	The '**Food Packaging Technology**' course outlines the different packaging materials of foods and their properties, packaging of high and low moisture foods and finally importance of labelling in packaging and regularity aspects.
8	Outline syllabus	
	Unit 1	**Introduction to Food packaging**
	A	Food packaging materials
	B	Properties of Food packaging materials
	C	Packaging selection criteria
	Unit 2	**Food packaging and shelf life**
	A	Shelf life testing methods
	B	Active and intelligent packaging
	C	Smart packaging, MAP,CAP, Aseptic packaging

	Unit 3	**Packaging of high moisture food products**		
	A	Packaging of dairy products		
	B	Packaging of meat and Fish		
	C	Packaging of fruit and vegetables		
	Unit 4	**Packaging of low moisture food product**		
	A	Food packaging grains and pulses		
	B	Packaging of oils and fats		
	C	Packaging of snacks etc		
	Unit 5	**Food labelling and Regulations**		
	A	Food labelling		
	B	Food Packaging and labelling Regulatory Issues		
	C	Food packaging and Food safety		
	Mode of examination	Theory		
	Weightage Distribution	CA	MTE	ETE
		30%	20%	50%
	Text book/s*	• Richards Coles, Derek Mcdowell, Mark J Kirwan.2003. Food packaging Technology, Blackwell Publishing Ltd		
	Other References	• Gordon L Robertson.2010.Food packaging and Shelf life-a practical guide. CRC Press Taylor& Francis Group 6000 Broken Sound Parkway NW, Suite 300 Boca Raton, FL 33487-2742		

FPP401: Food Packaging Technology Lab

School: SET		**Batch: 2020-24**		
Program: B. Tech		**Current Academic Year: 2023-24**		
Branch: FPP		**Semester: Odd (7th)**		
1	Course Code	**FPP401**		
2	Course Title	**Food Packaging Technology Lab**		
3	Credits	1		
4	Contact Hours (L-T-P)	0-0-2		
	Course Status	**Compulsory**/Elective		
5	Course Objective	To introduce the technicalities of food packaging and its industrial application. To develop the ability and knowledge for selecting appropriate packaging materials of different foods.		
6	Course Outcomes	CO1: Comprehend the basic concept of packaging materials and the requirements necessary for its application. CO2. Illustrate the idea for selecting packaging materials for industries. CO3. Review new and exciting developments that have taken place in the field of packaging materials like MAP and CAP. CO4. Describe the role of strength of materials in packaging. CO5. Analyze recently developed packaging techniques. CO6. Demonstrate various packaging material applications.		
7	Course Description	The course will provide an overview of food packaging material with focus on industrial applications.		
8	Outline syllabus			
	Unit 1	**Practical based on different packaging materials**		
		Sub unit - a, b and c detailed in Instructional Plan		
	Unit 2	**Practical related to dairy industry packaging materials**		
		Sub unit - a, b and c detailed in Instructional Plan		
	Unit 3	**Practical related to CAP and MAP**		
		Sub unit - a, b and c detailed in Instructional Plan		
	Unit 4	**Practical related to strength of materials used in food packets**		
		Sub unit - a, b and c detailed in Instructional Plan		
	Unit 5	**Practical related to recently developed packaging techniques.**		
		Sub unit - a, b and c detailed in Instructional Plan		
	Mode of examination	Jury/Practical/Viva		
	Weightage Distribution	CA	MTE	ETE
		60%	0%	40%
	Text book/s*	-		
	Other References			

FPP402: Applied Nutrition and Biochemistry Lab

School: SET		**Batch: 2020-24**
Program: B. Tech		**Current Academic Year: 2023-24**
Branch: FPP		**Semester: Odd (7th)**
1	Course Code	**FPP402**
2	Course Title	**Applied Nutrition and Biochemistry Lab**
3	Credits	1
4	Contact Hours (L-T-P)	0-0-2
	Course Status	**Compulsory**/Elective
5	Course Objective	The course is designed to prepare students with a basic understanding of food nutrition and importance of biochemistry involved in food sciences. The course provides a foundation for introduction of various important topics of food nutrition.
6	Course Outcomes	After the successful completion of this course students will be able to: CO1.Recognize the importance of nutritional comparison of different foods. CO2.Demonstrate common food testing techniques for the nutritional composition of cereals, pulses, milk and meat products. CO3.Recognize the thermal and non-thermal methods of food processing and their effects on nutrition. CO4.Analyze the role of energy calculation in foods . CO5.Describe the concept of deficiency and toxicity of minerals in humans. CO6. Explain the processing, nutritional values and packaging of food products.
7	Course Description	The course will provide an overview of food nutrition and its role in energy value of different food products in humans.
8	Outline syllabus	
	Unit 1	**Practical based on comparison of nutritional values in different foods.**
		Sub unit - a, b and c detailed in Instructional Plan
	Unit 2	**Practical related to food testing techniques for analyzing nutritional composition of foods.**
		Sub unit - a, b and c detailed in Instructional Plan
	Unit 3	**Practical related to effects of processing on nutrition of foods.**

		Sub unit - a, b and c detailed in Instructional Plan		
	Unit 4	**Practical related to energy value calculation and its roles.**		
		Sub unit - a, b and c detailed in Instructional Plan		
	Unit 5	**Practical related to assessment of different conditions for toxicity and deficiency of macro and micro elements.**		
		Sub unit - a, b and c detailed in Instructional Plan		
	Mode of examination	Jury/Practical/Viva		
	Weightage Distribution	CA	MTE	ETE
		60%	0%	40%
	Text book/s*	-		
	Other References			

PROGRAM ELECTIVE

Post Harvest and Storage Engineering

School:		**Batch : 2020-2024**
Program: B.Tech		**Current Academic Year: 2020-2024**
Branch: FPE		**Semester: IV**
1	Course Code	FPE
2	Course Title	**Post Harvest and Storage Engineering**
3	Credits	3
4	Contact Hours (L-T-P)	2-1-0
	Course Status	Department Elective
5	Course Objective	The aim of the course is to understand structure of grains, fruits and vegetable harvesting and processing, Different methods to collect and process milk, meat products and other post-harvest operations along with storage aspects for such foods.
6	Course Outcomes	After successful completion of this course students will be able to: CO1: Identify the grain harvesting and processing. CO2.Describe fruits and vegetable harvesting and processing techniques CO3: Apply different methods to collect and process milk and meat products CO4: Describe how storage of grain and oil seeds can be stored safely. CO5:Understand storage of perishable products like meats, fresh fruits and vegetable in different storage conditions CO6: Explain the concept of post-harvest techniques as storage conditions for different type of food products.
7	Course Description	The '**Post-harvest and Storage engineering**' course outlines the different Post harvest processing techniques for cereals, pulses, fruits, vegetables, milk and meat products along with the storage requirements of such products in different conditions.
8	Outline syllabus	
	Unit 1	**Grain harvesting and processing**
	A	Post- harvest technology overview
	B	Decorticating, Shelling and Milling
	C	Material handling systems
	Unit 2	**Fruit and vegetables Harvesting and processing**
	A	Harvesting
	B	Processing of Fruits
	C	Processing of vegetables
	Unit 3	**Milk and Meat processing**
	A	Milk collection and processing
	B	Meat and poultry processing

	C	Fish processing		
	Unit 4	**Storage of grain and oil seeds**		
	A	Types of products and storage requirements		
	B	Storage techniques and load calculations		
	C	Shelf life during storage and precautions		
	Unit 5	**Storage of perishable products**		
	A	Storage techniques for perishables		
	B	Storage techniques and load calculations		
	C	Shelf life and economics		
	Mode of examination	Theory		ETE
		30%	20%	50%
	Text book/s*	• ChakravertyAmalendu and Singh R. Paul. 2014. Postharvest Technology and Food Process Engineering.CRC Press ,Taylor & Francis Group 6000 Broken Sound Parkway NW, Suite 300, Boca Raton, FL 33487-2742		
	Other References	• Culbertson, J D etc 2006.Handbook of Food science, Technology, and Engineering. CRC Press Taylor & Francis Group, 6000 Broken Sound Parkway NW, Suite 300,Boca Raton, FL 33487-2742		

Technology of Fruits, Vegetables and Plantation Crops

School: SET		**Batch : 2020-2024**
Program: B.Tech		**Current Academic Year:**
Branch: FPE		**Semester: V**
1	Course Code	FPE
2	Course Title	**Technology of Fruits, Vegetables and Plantation Crops**
3	Credits	3
4	Contact Hours (L-T-P)	3-0-0
	Course Status	Elective/Open Elective
5	Course Objective	The objective of this subject is to introduce students to the science and technology associated with fruits and vegetables and their transformation into food products and ingredients.
6	Course Outcomes	After completion of the course students will be able to: CO1: Explain the structure and composition of fruits and vegetables and their role in nutrition. CO2: Discuss preservation and processing technologies applied to fruits and vegetables. CO3: Describe the physiological changes occurring to fruit and vegetables during harvesting and storage CO4: Understand the possible preventive measure to control or even enhance the stability and shelf life of the processed fruits and vegetables by dehydration process. CO5: Recommend appropriate technological process for plantation crops, from the selection of raw materials to final product. CO6: Identify the impact of certain technological operations and parameters on the success of fruit and vegetable processing and on certain properties of the final product.
7	Course Description	
8	Outline syllabus	
	Unit 1	
	A	Importance of fruits and vegetable ,history and need of preservation; Method of preservation
	B	Canning and bottling of fruits and vegetables ;process of canning; factors affecting the process- time and temperature; lacquering syrups and brines for canning
	C	Spoilage in canned foods, containers of packing.

	Unit 2	**Processing of fruits and related products**
	A	Processing of fruit juices (selection, juice extraction, deaeration, straining, filtration and clarification), Preservation of fruit juices.
	B	Jam: Constituents, selection of fruits, processing & technology. Jelly, Constituents (Role of pectin ratio), Theory of jelly formation, Processing & technology, Defects in jelly.
	C	Marmalade : Types, processing and defects. Processing of squashes, cordials, nectars, concentrates and powder.
	Unit 3	**Processing of Vegetables**
	A	Pickles: Types, Processing, Spoilage
	B	Processing of chutneys and sauces.
	C	Processing of tomato juice, tomato puree, paste, ketchup, sauce and soup.
	Unit 4	**Dehydration**
	A	Sun drying: Working and construction of equipments with advantages and disadvantages.
	B	Mechanical dehydration: Types, Working and Construction of equipment.
	C	Effects of processing on fruits and vegetables, Packing and Storage.
	Unit 5	**Plantation Crops**
	A	Introduction, principles and practices of post harvest technology of plantation crops.
	B	Processing of major produce from Tea, Cocoa, Rubber, Coffee and Coconut.
	C	Value addition, grading, packing and storage of plantation crop

	Mode of examination	Theory/Jury/Practical/Viva		
	Weightage Distribution	CA	MTE	ETE
		30%	20%	50%
	Text book/s*	1.Girdharilal, Siddappaa, G.S and Tandon, G.L., Preservation of fruits & Vegetables, ICAR, New Delhi, 1998. 2. W.B Crusess. Commercial Unit and Vegetable Products, W.V. Special Indian Edition, Pub: Agrobios India. 3. Manay, S. & Shadaksharaswami, M., Foods: Facts and Principles, New Age Publishers, 2004 4. Kadar, A. A. 1992. Postharvest Technology of Horticultural Crops. 2nd Ed. University of California.		
	Other References	1.Arsdel W.B., Copley, M.J. and Morgen, A.I. 1973. Food Dehydration, 2nd Edn. (2 vol. Set). AVI, Westport.		

Technology of Cereal, Pulses and Oilseeds

School:		**Batch : 2020-2024**
Program: B.Tech		**Current Academic Year:**
Branch: FPE		**Semester: VI**
1	Course Code	FPE
2	Course Title	**Technology of Cereals, Pulses and Oilseeds**
3	Credits	2
4	Contact Hours (L-T-P)	2-0-0
	Course Status	Department Elective
5	Course Objective	To provide the students an opportunity to gain knowledge about the storage procedure of different cereals, legumes, oilseeds and to help students to understanding the different procedure of production of various cereal based processed products.
6	Course Outcomes	After completion of this course student will be able to: CO1: Acquaint with production trends, structure, composition, quality evaluation and processing . CO2: Understand the uniqueness of wheat as a cereal grain in the world food supply and the scientific nature of the functionality and inter-relationships of the key constituents in wheat for food utilization . CO3: Identify the problems associated with milling of paddy and their solution. CO4: Identify technologies for product development and value addition of various cereals, pulses and oilseeds. CO5: Discuss the processing of legumes and oilseeds. CO6: Development of competency to critically evaluate quality of finished cereal, legume products in terms of underlying properties of flour, dough/batter, ingredient function, product formulation and processing.
7	Course Description	This course deals with the structure, composition and utilization of rice, wheat and other cereal grains for the production of starches, flours, milling by-products, and cereal-based human food products; cereal processing technologies such as dry and wet milling, baking, extrusion cooking, breakfast cereals and noodle and pasta manufacturing.
8	Outline syllabus	

	Unit 1	**Introduction to Food Grains**		
	A	Present status and future prospects of cereals and millets		
	B	Structure and composition of common cereals, legumes and oilseeds.		
	C	Supply chain of food grains		
	Unit 2	**Processing of wheat**		
	A	Wheat: Types and physicochemical characteristics; wheat milling - products and by products; factors affecting quality parameters; physical, chemical and rheological tests on wheat flour.		
	B	Manufacture of whole wheat atta, blended flour and fortified flour.		
	C	Pasta products and various processed cereal-based foods.		
	Unit 3	**Rice Processing**		
	A	Rice: Classification, physicochemical characteristics; cooking quality; rice milling technology; by products of rice milling and their utilization; Rice bran stabilization, oil extraction and refining.		
	B	Parboiling methods of rice, criteria of quality of rice,aging of rice,quality changes.		
	C	Processed products based on rice		
	Unit 4	**Products and Byproduct processing of corn ,barley and oats.**		
	A	Corn: Types and nutritive value; dry and wet milling, processing of corn in breakfast cereals, snacks, tortilla .		
	B	Barley: composition, milling, malting of barley, chemical and enzymatic changes during malting, uses of malt.		
	C	Oat: composition, processing of oat, byproducts of oatmeal milling.		
	Unit 5	**Legumes and Oilseeds**		
	A	Legumes and oilseeds: composition, anti-nutritional factors, processing and storage.		
	B	Processing for production of edible oil, meal, flour, protein concentrates and isolates		
	C	Oil extraction process: Mechanism, solvent, SCE, oil refining, utilization of by products of oil milling.		
	Mode of examination	Theory		ETE
		30%	20%	50%
	Text book/s*	1.Chakraverty, A. 2000. Third Edition. Post Harvest Technology of cereals, pulses and oilseeds. Oxford & IBH publishing & Co. Pvt. Ltd., New Delhi.		
	Other References	1. Kent, Technology of Cereal, 5th Ed. Pergamon Press, 2003 Gould, G.W. 1996. 2. Marshall, Rice Science and Technology, Wadsworth Ed., Marcel Dekker, New York, 1994. 3.Champagne, E. T. 2004. Rice: Chemistry and Technology, 3rd Ed., AACC International, Inc., St. Paul, MN, USA.		

Process and Equipment Design

School:		**Batch : : 2020-2024**
Program: B.Tech		**Current Academic Year:**
Branch: FPE		**Semester: VI**
1	Course Code	FPE
2	Course Title	**Process and Equipment Design**
3	Credits	3
4	Contact Hours (L-T-P)	2-1-0
	Course Status	Department Elective
5	Course Objective	Aim of this course is to give detailed understanding for designing of different thermal, non-thermal processes and equipment. This is also intended for plant design and layout and packaging food processing equipment. This course also describe mechanical transport and storage.
6	Course Outcomes	By the end of this course students will be able to: CO1:Describe designing of different thermal and packaging food processing equipments. CO2: Understand designing of food processing equipments for mechanical transport and storage CO3: Explain the designing of mechanical processing operations and equipments. CO4: Discuss designing of food dehydrators, freezing and cooling equipments. CO5:Identify food process and equipment. CO6: Designing different food processing equipments and storage equipments
7	Course Description	This course is related to process equipment and plant design. In this course, equipment which are used for processing of food will be discussed and their in details with their working principles and their design parameters. This also includes designing food plant in which process and equipment designing will be discussed.
8	Outline syllabus	
	Unit 1	**Designing equipments**
	A	Thermal processing equipments
	B	Heat and mass transfer equipments
	C	Packaging equipments
	Unit 2	**Mechanical transport and storage equipments**
	A	Mechanical transport
	B	Conveyor, belts and fluid transport

	C	Food storage equipment design		
	Unit 3	**Mechanical processing equipment**		
	A	Size reduction, mixing and Homogenization equipments		
	B	Separation equipment		
	C	Evaporation equipment		
	Unit 4	**Other Food processing equipments**		
	A	Food dehydrator		
	B	Freezing and cooling equipment design		
	C	Novel food processing equipments		
	Unit 5	**Food process plant**		
	A	Process design		
	B	Plant layout and Design equipments		
	C	Hygiene design		
	Mode of examination Weightage Distribution	Theory		ETE
		CA	MTE	ETE
		30%		
	Text book/s*	George Saravacos Athanasios E. Kostaropoulos.2016. Hand book of food processing Equipments. Springer Cham Heidelberg New York Dordrecht London		
	Other References	Antonio López-Gómez and Gustavo V. Barbosa-Cánovas.2005. Food Plant Design.CRC Press Taylor & Francis Group 6000 Broken Sound Parkway NW, Suite 300 Boca Raton, FL 33487-2742		

Refrigeration and Cold Chain Management

School:		**Batch : : 2020-2024**
Program: B. Tech		**Current Academic Year:**
Branch: FPE		**Semester: VII**
1	Course Code	FPE
2	Course Title	**Refrigeration and Cold Chain Management**
3	Credits	4
4	Contact Hours (L-T-P)	3-1-0
	Course Status	Department Elective
5	Course Objective	The '**Refrigeration and cold chain management**' course will provide knowledge of refrigeration and cold chain management, cooling load calculations, design of cold storage plant and other food plants. This will also provide knowledge refrigerated transport.
6	Course Outcomes	After the successful completion of this course students will be able to: CO1: Discuss refrigeration and freezing principles. CO2:Explain air conditioning requirements and principles for food processing operations. CO3: Understand cooling load in refrigeration operations. CO4: Compare designs of refrigerated plants. CO5: Analyze different strategies for ice manufacturing. CO6: Describe the need for cold chain management and air conditioning.
7	Course Description	This course is related to basic principles of refrigeration, air conditioning, cooling load calculations, refrigerated plant designs and refrigerated will be discussed.
8	Outline syllabus	
	Unit 1	**Principle of refrigeration**
	A	Second Law of thermodynamics, refrigeration
	B	Working of carnot cycle, vapour refrigeration
	C	Refrigerants and their properties
	Unit 2	**Air conditioning**
	A	Classifications , sensible heat factor
	B	Unitary air conditioning systems
	C	Design of complete air condition system
	Unit 3	**Cooling load calculation**
	A	Product load calculations
	B	Other load calculations
	C	Total load calculation
	Unit 4	**Refrigerated plant design**
	A	Cold storages
	B	Ice manufacture plant

	C	Freezer plant		
	Unit 5	**Refrigerated transport**		
	A	Handling and distribution,		
	B	Refrigerated vans		
	C	Cold chain management		
	Mode of examination	Theory		ETE
		30%	20%	50%
	Text book/s*	• William C. Whitman, William M. Johnson, John A. Tomczyk and Eugene Silberstein. 2009. Refrigeration & Air Conditioning Technology, 6th Ed. Delmar, Cengage Learning, NY, USA. • C.P. Arora. 2000. Refrigeration and Air Conditioning, 2nd Ed. Tata McGraw-Hill Publishing Co. Ltd., New Delhi		
	Other References	• W.F. Stoecker and J.W. Jones.1982.Refrigeration and Air Conditioning, 2nd Ed. McGraw-Hill Book Co., New York, USA. • Ashrae Handbook, 2006: Refrigeration		

FPT :Applied Nutrition and Biochemistry

School: SET		**Batch : : 2020-2024**
Program: B. Tech		**Current Academic Year:**
Branch: Food Process Technology		**Semester: 7**
1	Course Code	**FPE**
2	Course Title	**Applied Nutrition and Biochemistry**
3	Credits	2
4	Contact Hours (L-T-P)	2-0-2
	Course Status	Compulsory
5	Course Objective	To provide knowledge of nutrition and energy frommacronutrients and micronutrients, dietary nutrition, physiological biochemistry and metabolism and clinical biochemistry
6	Course Outcomes	After the successful completion of this course students will be able to: CO1:To know basics of nutrition and energy metabolism. CO2: Provide an overview of the major macro and micronutrients relevant to human health. CO3: Understand the importance of food composition and food regulatory issues. CO4: Discuss the scientific rationale for defining nutritional requirements in healthy individuals and populations, with reference to biochemistry and metabolism. CO5: Describe the role of hormones in clinical biochemistry. CO6: Identify and understand the role of nutritional elements, dietary standards, biochemistry and nutritional related regulations.
7	Course Description	The '**Applied Nutrition and Biochemistry**' course outlines introduction to nutrition, energy from foods, balance diet, nutrition and metabolism, physiological and clinical biochemistry
8	**Outline syllabus**	
	Unit 1	**Introduction to Nutrition**
	A	Global perspective on food and nutrition
	B	Human Nutrition
	C	Energy from foods
	Unit 2	**Nutrition and metabolism**
	A	Protein and amino acids
	B	Carbohydrates, lipids
	C	Vitamins minerals and trace materials
	Unit 3	**Dietary Nutrition**
	A	Dietary standard, Food Composition
	B	Food safety and public health Issues

	C	Regularity issues		
	Unit 4	**Physiological biochemistry**		
	A	Digestion and absorption		
	B	Biological oxidation		
	C	Metabolism of biomolecules		
	Unit 5	**Clinical biochemistry**		
	A	Hormones and organ function test and Nutrition		
	B	Tissue protein and body fluid		
	C	Water electrolytes and acid base balance		
	Mode of examination	Theory/Practicals		
	Weightage Distribution	CA	MTE	ETE
		30%	20%	50%
	Text book/s*	• Michael J Gibney, Susan A Lanham-New, edin Cassidy and Hester H Vorster, A John.2009. Introduction to Human Nutrition, (2nd Ed): . Wiley and Sons publication, Wiley Blackwell UK • U Stayanarayana and U Chakrapanai.. 2007.Biochemistry. ArunabhaSen, Books and Allied, (P), Ltd Kolkatta.		
	Other References	• Janice Thompson and Melinda Manore.2012. Nutrition an applied approach., Pearson Education, Inc., publishing as Pearson Benjamin Cummings, 1301 Sansome St., San Francisco, CA 9411		

PROGRAM ELECTIVES

School: SET		Batch : : 2020-2024
Program:		B. Tech
Branch: Food Process Technology		Semester:
1	Course Code	
2	Course Title	Bakery, Confectionery and Snack products
3	Credits	3
4	Contact Hours (L-T-P)	
	Course Status	
5	Course Objectives	1. To develop industrial approach in students for bakery, chocolate and confectionary industry. 2. To develop the expertise for new techniques for snack food.
6	Course Outcomes	After successfully completion of this course students will be able to: **CO1.**Understand the functions of bakery ingredients, machineries and various rheological testing of dough. **CO2.**Understand the technology and manufacture of bakery products and losses in bakery. **CO3.**Perform the analysis of bakery ingredients and manufacture various bakery products and chocolate with maintaining safety and hygiene of bakery plants. **CO4.**Understand the technology and manufacture of confectionery. Products with standards and regulations for confectionary **CO5.**Understand about extrusion cooking, machineries and products. **CO6.**Understand the processing technology of bakery,confectionery and extruded products.
7	Course Description	Today's life depends very much upon not only bread and snack foods but also chocolates and confectionary. This course demonstrates broad knowledge about bakery, confectionary and extruded products development and machineries related to the products. Hygiene is also important factor for the same and this course provides the knowledge about bakery plant safety with hygiene. This course will be helpful for joining industry as well as setting up one's own industry.

8	Outline syllabus	
	Unit 1	**Introduction to baking**
	A	Introduction to baking; Bakery ingredients and their functions; Machines and equipment for batch and continuous processing of bakery products
B	Dough development; methods of dough mixing; dough chemistry	
C	Rheological testing of dough-Farinograph, Mixograph, Extensograph, Amylograph / Rapid ViscoAnalyzer, Falling number, Hosney's dough stickiness tester	
Unit 2	**Manufacturing of bakery products**	
A	Technology for the manufacture of bakery products-bread, biscuits, cakes	
B	Effect of variations in formulation and process parameters on the quality of the finished product	
C	Quality consideration and parameters; Staling and losses in baking	
Unit 3	**Analysis of bakery products**	
A	Testing of flour; Cake icing techniques, wafer manufacture, cookies, crackers, dusting or breading	
B	Manufacture of bread rolls, sweet yeast dough products, cake specialties, pies and pastries, doughnuts, chocolates and candies	
C	Coating or enrobing of chocolate (including pan-coating); Maintenance, safety and hygiene of bakery plants.	
Unit 4	**Quality characteristics of confectionery ingredients**	
A	Quality characteristics of confectionery ingredients; technology for manufacture of flour, fruit, milk, sugar, chocolate, and special confectionery products	
B	Colour, flavour and texture of confectionery; standards and regulations	
C	Machineries used in confectionery industry	
Unit 5	**Extrusion**	
A	Importance and applications of extrusion in food processing; Pre and post extrusion treatments	
B	Manufacturing process of extruded products	
C	Change of functional properties of food components during extrusion.	
Mode of examination	Theory	
Weightage Distribution	CA: 30%	MTE: 20% / ETE: 50%
Text book/s*	**1.**Extrusion of Food, Vol 2; Harper JM; 1981, CRC Press.	
Other	1.Bakery Technology & Engineering; Matz SA; 1960; AVI Pub.	

References	2.Up to-date Bread Making; Fance WJ &Wrogg BH; 1968, Maclasen& Sons Ltd.

School: SET		**Batch : : 2020-2024**
Program: B. Tech		**Current Academic Year:**
Branch: Food Process Engineering		**Semester:**
1	Course Code	**OPE**
2	Course Title	**Food Additives and flavour Technology**
3	Credits	3
4	Contact Hours (L-T-P)	3-0-2
	Course Status	Open elective
5	Course Objective	The aim of this course is to identify the food additives, flouring agent, enhancers and sweeteners, Food colorants used, Describe anti-oxidants like enzymes, antioxidants from different food sourceand to take safety measures in food additive including regulatory aspects..
6	Course Outcomes	After the successful completion of this course students will be able to: CO1:Explain basics about food additives. CO2Understand role of flavouring agents, enhancers and sweetener CO3: Apply food colorants in different food preparations CO4: Identify anti-oxidants like enzymes, antioxidants from different food source. CO5: Discuss safety measures in food additive including regulatory aspects CO6: Elaborate the use of additives along with merit and demerits with respect to food safety.
7	Course Description	The '**Food Additives and flavour technology**' course outlines the different Food additives their role and sensitivity, different flouring agents, colouring agent, and anti-oxidants and their utility.This course also provides information about safety & regulatory aspects in using these additives.
8	Outline syllabus	
	Unit 1	**Introduction to food additives**
	A	Role of food additives
	B	Nutrition in food additives
	C	Food additive and hypersensitivity
	Unit 2	**Food Flavours**
	A	Flavouring agents
	B	Flavour enhancers
	C	Sweeteners

	Unit 3	**Food colorants**		
	A	Food synthetic colours		
	B	Food natural colours		
	C	Anti browning agents		
	Unit 4	**Food Antioxidants**		
	A	Food enzymes		
	B	Antioxidant and antimicrobial additives		
	C	Acidulants and food phosphates		
	Unit 5	**Food Additive Safety**		
	A	Food Safety		
	B	Regulatory Issues		
	C	Food Toxicity		
	Mode of examination	Theory/Practical		
	Weightage Distribution	CA	MTE	ETE
		30%	20%	50%
	Text book/s*	• A Larry Branen, P Michael Davidson, seppoSalminen and John H Thorngate. 2002. Food Additives. Mercel Dekker Inc., New York		
	Other References	• Michael and Irene Ash. 2008. Handbook of Food Additives (Third Edition), Synapse Information Resources, Inc.1247 Taft Ave.Endicott, NY 13760		

School: SET		**Batch : : 2020-2024**
Program: B. Tech		**Current Academic Year:**
Branch: Food Process Technology		**Semester: 6**
1	Course Code	**OPE**
2	Course Title	**Functional food and Nutraceutical**
3	Credits	3
4	Contact Hours (L-T-P)	3-0-0
	Course Status	Open elective
5	Course Objective	The aim of '**Functional food and Nutraceutical**' course is to provide awareness about bioactive carbohydrates, bioactive lipids like medium and long chain fatty acids and bioactive peptides. It will also impart knowledge of bioactive polyphenol and carotenoids besides different functional components from different foods.
6	Course Outcomes	By the end of this course students will be able to: CO1:. Explain the role of bioactives compounds CO2: Describe bioactive lipids like medium and long chain fatty acids CO3: Provide information about bioactive peptides CO4: Identify bioactive polyphenol and carotenoids. CO5:Understand the role of functional foods and their derivation from foods CO6: 6. Disucss the role of functional foods and neutraceuticals.
7	Course Description	This course is related to basics functional foods and nutraceutical, in which different bioactive compounds like lipids, peptides, polyphenols and carotenoids and functional components of foods..
8	Outline syllabus	
	Unit 1	**Bioactive carbohydrates**
	A	Soluble and insoluble fibre
	B	Resistant Starch and slow digestible starch
	C	Prebiotic foods
	Unit 2	**Bioactive lipids**
	A	Introduction
	B	Medium chain fatty acids
	C	Long chain fatty acids
	Unit 3	**Bioactive peptide**
	A	Production of bioactive peptides
	B	Hydrolysis of protein
	C	Protein derived bioactives
	Unit 4	**Bioactive polyphenol and carotenoids**

	A	Structure function considerations		
	B	Bioactive Polyphenol		
	C	Bioactive carotenoids		
	Unit 5	**Functional Foods components**		
	A	Cereals grains		
	B	Fruits and vegetables		
	C	Animal products		
	Mode of examination	Theory/Practicals		
	Weightage Distribution	CA	MTE	ETE
		30%	20%	50%
	Text book/s*	• Aluko, Rotimi E.2012. Functional Foods and Nutraceuticals. Springer Dordrecht Heidelberg London		
	Other References	• Glenn R. Gibson and Christine M. Williams. 2000. Functional foods Concept to product. Wood head Publishing Limited,Abington Hall, Abington, Cambridge CB1 6AH, England		

School:		Batch : : 2020-2024
Program: B.Tech		**Current Academic Year:**
Branch: FE		**Semester:**
1	Course Code	
2	Course Title	New Product Development
3	Credits	
4	Contact Hours (L-T-P)	
	Course Status	**Compulsory**
5	Course Objective	The course is designed to give an understanding of the following: 1. Gain an understanding of the processes involved in the invention process, formulation, and development of new food products. 2. Develop an appreciation of the food industry and how innovation is critical to the industry. 3. Cultivate basic food science principles to problem solve during product development.
6	Course Outcomes	After completion of the course students will be able to: CO1: Learn to produce food prototypes or food concepts. CO2: Create and present effective product development communication materials and planning of trails. CO3: Understand the use of statistical methods like ANOVA, RSS and SPSS in new product development. CO4: Develop formulations to meet cost targets, ingredient statement, nutrition profile and sensory attributes of desired product. CO5: Develop and enhance team cooperation and communication skills. CO6: Integrate the knowledge acquired from previous academic courses and apply it to the real life project of developing a new food product.
7	Course	This course is designed to provide students with a basic understanding of

	Description	the product development process in the commercial food industry. Through lectures, and hands-on formulation activities, students will learn how to successfully initiate, organize, and carry out a product development project.		
8	Outline syllabus			
	Unit 1	**Introduction of New Product Development**		
	A	Definition and importance of New Product Development		
	B	Steps of Product Development		
	C	Product development tools and reasons for failure.		
	Unit 2	**Development process for trails**		
	A	Development of process and planning for production trials. Planning the test market. Actual production trials and test marketing.		
	B	Evaluation of test results. Launching of the product.		
	C	Advertising and marketing plans. Suggestions for improving success.		
	Unit 3	**Statistical methods in Food Product Development**		
	A	Introduction to Consumer Survey, market Survey.		
	B	Development of New Product by Using Statistical Software likes Design Matrix, Full.		
	C	Factorial Design, RSM, SPSS, One way ANOVA and Two way ANOVA.		
	Unit 4	**Market Survey**		
	A	Market and literature survey to identify the concepts of new products based on special dietary requirements, functionality, convenience and improvisation of existing traditional Indian foods.		
	B	Screening of product concept on the basis of techno-economic feasibility.		
	C	Development of prototype product and Standardization of formulation process.		
	Unit 5	**Case Studies**		
	A	Proximate Analysis of New Product		
	B	Packaging, labelling and shelf-life studies		
	C	Cost analysis and Final Project Report **Each team/group of students would develop a food product on the basis of above mentioned lines /steps and would submit a project report.**		
	Mode of examination			
	Weightage Distribution	CA	MTE	ETE
		30%	20%	50%
	Text book/s*	4. Fuller, Gordon W, New Product Development From Concept to Marketplace, CRC Press,2004.		

	Other References	2. Anil Kumar, S., Poornima, S.C., Abraham, M.K.& Jayashree, K.2004. Entrepreneurship Development. New Age International Publishers. 3.Moskowitz, Howard and Saguy ,R. I. Sam 2009. An Integrated Approach to New Food Product , CRC Press.

School: SET		**Batch : : 2020-2024**
Program: B.Tech		**Current Academic Year:**
Branch: Food Process Technology		
1	Course Code	
2	Course Title	Technology of spices
3	Credits	
4	Contact Hours (L-T-P)	
	Course Status	**Compulsory**
5	Course Objective	The course will cover study of the types of spices, their origin , functions and processing techniques . Introduction to medicinal foods and their extraction procedures.
6	Course Outcomes	Upon completion of this course, students are expected to be able to: CO1. Recognize and describe the processing conditions of major spices. CO2. Analyze the role and significance of minor spices . CO3. Describe processing of medicinal crops . CO4. . CO5 Describe the scope of legal standards in spices. CO6. Discover, and apply the theories of spices in practical, real-world situations and problems.
7	Course Description	This course has been designed to make student understand the processing technology used for manufacturing of Spices and Plantation crops and the role of them in nutraceuticals.
8	Outline syllabus	
	Unit 1	**Major spices**
	A	Production and processing scenario of spice, flavour and its scope
	B	Major spices: Post harvest technology, composition

	C	Processed products of spices: Ginger, chilli, turmeric, onion and garlic, pepper, cardamom.		
	Unit 2	**Minor spices**		
	A	Minor spices: Herbs, leaves and spartan seasonings and their processing and utilization;		
	B	All spice, Annie seed, sweet basil; Caraway seed, cassia, cinnamon Clove, coriander, cumin, dill seed; Fennel seed, nutmeg, mace, mint marjoram. Rosemary, saffron, sage; Savory, thyme, ajowan; Asafetida, curry leaves		
	C	Vanilla and annatto processing		
	Unit 3	**Processing of medicinal crops**		
	A	Importance of medicinal crops , production and export status		
	B	Processing of medicinal crops ,equipments, principles and operations		
	C	Active principles in various medicinal plants ,application and expression methods		
	Unit 4			
	A	Spice Essential oil and oleoresin		
	B	Extraction techniques; Super critical fluid extraction of spices		
	C	Equipment for cryogenic grinding		
	Unit 5	**Legal standards for spices**		
	A	Standard specification of spices; Standards like ESA, ASTA, FSSAI and maintenance of quality by fumigation, CAS and ETO sterilization		
	B	Functional packaging of spices and spice products		
	C	By-products of plantation crops and spices		
	Mode of examination			
	Weightage Distribution	CA	MTE	ETE
		30%	20%	50%
	Text book/s*	1. Pandey, P. H. 2002. Post Harvest Engineering of Horticultural Crops through Objectives. Saroj Prakasam, Allahabad. 2. Pruthi, J.S. 1998. Major Spices of India – Crop Management and Post Harvest Technology. Indian Council of Agricultural Research, Krishi Anusandhan Bhavan, Pusa, New Delhi. PP. 514.		
	Other References	1. ASTA, 1997. Official analytical methods of the American Spice Trade Association, Fourth Edition. 2. Purseglove, J.W., E.G.Brown, G.L.Green and S.R.J.Robbins. 1981. Cardamom – Chemistry. Spices, Vol. I, Tropical Agricultural Series, Longman, London, 1: 605. 3. Pruthi, J.S. 1980. Spices and Condiments: Chemistry, Microbiology and Technology. First Edition. Academic Press Inc., New York, USA. pp.		

		1-450.

School:		**Batch : : 2020-2024**
Program: B.Tech		**Current Academic Year:**
Branch: FE		**Semester:**
1	Course Code	
2	Course Title	Enzymes in Food Processing
3	Credits	
4	Contact Hours (L-T-P)	
	Course Status	
5	Course Objective	1. To introduce the subject Food Enzymology and its industrial application. 2. To develop the knowledge of Food Enzymes. 3. To set up appropriate examples for enzymes used as chemistry in terms of food product development. 4.To develop the knowledge of chemistry behind enzymes
6	Course Outcomes	After successfully completion of this course students will be able to: CO1: Comprehend the basic chemistry concept of enzymes and their role. CO2: Analyze the role of enzymes in baking industry . CO3:Learn different parameters use to evaluate enzyme activity in carbohydrates, proteins and fat. CO4: Describe enzymes and their role in food flavors. CO5: Recognize the importance of regulation in synthesis of new enzymes. CO6: Recall the concepts of food enzymology.
7	Course Description	Food Enzymology is an application of various enzymes found in food and their end use in new product development. The types of molecules from plant after fermentation introduce beneficial as additives in food preservation. In the future Food Enzymology offer foods with higher vitamin levels, longer shelf lives or the ability to retain as fresh even in the face of climate change. In this course, students will learn about the different bimolecular and techniques/ methods used as ingredients/ material and their use.
8	Outline syllabus	

	Unit 1	**Enzymes**
	A	Introduction, Definition and functions
	B	characterization, kinetics and immobilization; fermentative production of enzymes (amylases, proteases, cellulases, pectinases, xylanases, lipases)
	C	Enzymes used in food industry and their downstream processing.

Unit 2	**Enzymes in processing of food**		
A	Role of enzymes in baking (fungal α-amylase for bread making; maltogenic α-amylases for anti-staling; xylanses and pentosanases as dough conditioners		
B	lipases or dough conditioning; oxidases as replacers of chemical oxidants; synergistic effect of enzymes);		
C	Enzymes in meat processing (meat tenderization) and egg processing.		
Unit 3	**Role of enzymes in fruit juices**		
A	Liquefaction, clarification, peeling, de bittering, decolourization		
B	Enzymes in brewing: Enzymes in malting and mashing, Enzymes for process improvement, starch- haze removal		
C	Applications of enzymes: protein cross-linking and oil degumming enzymatic approach to tailor- made fats.		
Unit 4	Enzyme processing for flavours		
A	Enzyme-aided extraction of plant materials for production of flavours		
B	Production of flavour enhancers such as nucleotides; flavours from hydrolyzed animal/vegetable protein		
C	Role of enzymes in cheese making, whey processing.		
Unit 5	Other applications		
A	Enzymes for production of protein hydrolysates and bioactive peptides		
B	Enzyme safety and regulations		
C	Regulations of enzyme products		
Mode of examination			
Weightage Distribution	CA	MTE	ETE
	30%	20%	50%
Text book/s*	1) A Wiley- Inter Science Publ. Kruger JE. et al. 1987. Enzymes and their Role in Cereal Technology. American Association of Cereal Chemists Inc. 2) Nagodawithana T & Reed G. 1993. Enzymes in Food Processing. Academic Press. Tucker GA & Woods LFJ. 1991. Enzymes in Food Processing.		
Other	3) Whitehurst R & Law B. 2002. Enzymes in Food Technology. Blackwell		

References	Publ. 4) Handbook of Food Enzymology Ed. by John R. Whitaker, Marcel Dekker, 2003 5) Enzymes in Industry; Product & Applications Ed. by Wolfgang Aehle, Wiley-VCH, 2004

Food Industry Waste Management

School: SET		Batch : **: 2020-2024**
Program: B. Tech		Current Academic Year:
Branch: Food Process Technology		Semester:
1	Course Code	
2	Course Title	Food industry waste management
3	Credits	3
4	Contact Hours (L-T-P)	3-0-0
	Course Status	Compulsory
5	Course Objective	1. Understanding about food industry waste. 2. Importance and need of management the industrial waste. 3. Various treatment methods available for food waste. 4. Types, availability and utilization of by-products from waste. 5. Biomethanation and bio composting technology for organic waste utilization

		6.Industrial waste treatments and ways for waste disposal method. 7.Food Additives; Food Adulteration
6	Course Outcomes	After successfully completion of this course students will be able to: CO1: Comprehend the basic concept of waste and types. CO2:Waste Disposal method. Recognize the importance and utility of waste from food Industry CO3: Treatment of plant waste by physical, chemical and biological methods, Effluent treatment plants, Use of waste and waste water. Various hazards and their control measures. CO4: Types, availability and utilization of by-products of cereals, legumes & oilseeds, Utilization of by-products from food processing Industries. CO5:Status and utilization of dairy by-products. Industrial waste management CO6: Case study.
7	Course Description	Food waste management is an application of utilization food waste. The types of treatment applied during processing identification are beneficial as by product recovery. In the future waste management could offer more depth knowledge with its applicable techniques. In this course, students

		will learn about the different treatments required in food manufacturing.		
8	Outline syllabus	CO Mapping		
	Unit 1	**INTRODUCTION**		
	A	Waste and its consequences in pollution and global warming.		
	B	Types of food processing wastes & their present disposal methods.		
	C	Identification of waste.		
	Unit 2	**Treatment methods for liquid wastes**		
	A	Treatment of plant waste by physical, chemical and biological methods.		
	B	Solid and liquid waste.		
	C	Use of waste and waste water.		
	Unit 3	**Treatment methods of solid wastes**		
	A	Types, availability and utilization of by-products		
	B	Vermin composting		
	C	Utilization of by-products from sugar and agro based industries, and brewery & distillery waste.		
	Unit 4	**Bio filters and bio clarifiers**		
	A	Type of Filters used in Waste Water Treatment.		
	B	Drinking Water treatment		
	C	Recovery of useful materials from effluents by different methods.		
	Unit 5	**Case Studies**		
	A	Sugar Cane Industry		
	B	Meat Industry		
	C	Milk Industry Case studies.		
	Mode of examination	Theory		
	Weightage Distribution	CA	MTE	ETE
		30%	20%	50%
	Text book/s*	1) Beggs C. Energy Management and Conservation. Elsevier Publ. Chaturvedi P. 2000.		
Other References		2) Energy Conservation through Waste Utilization. American Society of Mechanical Engineers, New York. Kreit F & Goswami DY. 2008. 3) Energy Management and Conservation Handbook. CRC Press. 4) Murphy WR & Mckay G. 1982. Energy Management. BS Publ. Patrick DR.		

	1982..