



Two-Year Postgraduate Programme

Master of Food Technology M.Sc. FT Academic Year

Faculty of Applied Sciences

Parul University

Vadodara, Gujarat, India

Faculty of Applied Sciences

Master of Food Technology

1. Vision of the Department

To be an excellent department in educating and training students to become professional Food Technologist who is technically capable of working in Food Nutrition, Food Processing, Food Quality and Safety and Food Operation sectors.

2. Mission of the Department

M1	To upgrade the scientific knowledge in the areas of food science, food processing and safety for the development of food products through quality research.
M2	Develop knowledgeable critical thinkers who contribute to the food community through leadership, service and lifelong learning.
M3	To provide students with leadership quality and also to handle all the problems relating food industry.

3. Program Educational Objectives

The statements below indicate the career and professional achievements that the M.Sc. FoodTechnology curriculum enables graduates to attain.

PEO 1	List the methods of preservation and techniques to prevent spoilage of contamination offoods.
PEO 2	Identify the role of food Technologist in food industry & Government sectors
PEO 3	Design strategies for food access, procurement, preparation, and safety for individuals,families.
PEO 4	Develop research attitude in the field of Food technology

4. Program Learning Outcomes

Program Learning outcomes are statements conveying the intent of a program of study.

PLO 1	Disciplinary Knowledge	Execute strong theoretical and practical understanding generatedfrom the specific programme in the area of work.
PLO 2	Critical Thinking and Problem Solving	Identify the problem by observing the situation closely, takeactions and analytical skills to design the solutions.
PLO 3	Social Competence	Exhibit thoughts and ideas effectively, build effective interactive and presenting skills to meet global competencies.

PLO 4	Research-related Skills and Scientific Temper	Infer scientific literature, build sense of enquiry and identify and consult relevant sources to find answers.
PLO 5	Trans-disciplinary Knowledge	Create new conceptual, theoretical and specific approaches to address a common problem.
PLO 6	Personal and Professional Competence	Execute interpersonal relationships, self-motivation and adaptability skills and commit to professional ethics.
PLO 7	Effective Citizenship and Ethics	Demonstrate empathetic social to professional ethics and responsibility.
PLO 8	Environment and Sustainability	Understand the impact of the scientific solutions in societal and environmental contexts.
PLO 9	Self-directed and Life-long learning	Acquire the ability to engage in independent and life-long learning in the broadest context of socio-technological changes.

5. Program Specific Learning Outcomes

PSO 1	Recent Research trends	Evaluate and analyze current trends and recent developments in the food technology industry. Assess market demands for various food products, considering factors such as consumer preferences, health trends, and technological advancements. Design and develop innovative food products based on emerging trends and consumer demands.
PSO 2	Software Skill	Acquire advanced software skills relevant to food technology applications. Demonstrate competence in utilizing software tools for food product design, process optimization, quality control, and data analysis. Apply software skills to enhance efficiency and accuracy in various aspects of food technology, including research, development, and quality assurance.

6. Credit Framework

Semester wise Credit distribution of the programme		Category wise Credit distribution of the programme	
Category	Credit	Category	Credit
Semester-1	29	Major Core	84
Semester-2	26	Minor Stream	00
Semester-3	29	Multidisciplinary	00
Semester-4	18	Research	18
Total Credits: 102		Total Credits: 102	

Semester 1						
Sr. No.	Subject Code	Subject Name	Credit	Lect	Lab	Tut
1	11213101	Principle of Food processing and preservation	4	4	0	0
2	11213102	Biochemistry and Nutrition	4	4	0	0
3	11213103	Food Microbiology	4	4	0	0
4	11213104	Lab-I Food Microbiology Laboratory	3	0	6	0
5	11213105	Food Chemistry	4	4	0	0
6	11213106	Food Chemistry Laboratory	3	0	6	0
7	11213107	Food Packaging and Supply Chain	4	4	0	0
8	11213108	Lab-II Principle of Food processing and preservation	3	0	6	0
Total			29	20	18	0
Semester 2						
Sr. No.	Subject Code	Subject Name	Credit	Lect	Lab	Tut
9	11213151	Principles of Food Engineering	4	4	0	0
10	11213152	Cereal and Legume Technology	4	4	0	0
11	11213153	Lab- I Cereal and Legume Technology	3	0	6	0
12	11213154	Fruit and Vegetable Technology	4	4	0	0
13	11213155	Lab-II Fruit and Vegetable Technology	3	0	6	0
14	11213156	Fermentation Technology	4	4	0	0
15	11213157	Research Methodology	4	4	0	0
Total			26	20	12	0
Semester 3						

16	11213201	Technology of Meat, Fish and Poultry Products.	4	4	0	0
17	11213202	Lab-I Technology of Meat, Fish and Poultry Products	3	0	6	0
18	11213203	Technology of Milk and Milk Products	4	4	0	0
19	11213204	Lab-II Technology of Milk and Milk Products	3	0	6	0
20	11213205	Food Quality and Safety Management	4	4	0	0
21	11213206	Food Additives and Contaminants	4	4	0	0
22	11213208	Lab-III Food Quality and Safety Management	3	0	6	0
23	11213209	Research Writing and Statistical Analysis	4	4	0	0
Total			29	20	18	0
Semester 4						
Sr. No.	Subject Code	Subject Name	Credit	Lect	Lab	Tut
20	11213252	Dissertation	18	0	36	0
Total			18	0	36	0
Sr. No.	Subject Code	Subject Name	Credit	Lect	Lab	Tut

8. Detailed Syllabus

Semester 1

(1)

- a. **Course Name:** Principle of Food processing and preservation
- b. **Course Code:** 11213101
- c. **Prerequisite:** Should be familiar about Food processing and preservation techniques
- d. **Rationale:** Acquire knowledge about Food processing and preservation techniques
- e. **Course Learning Objective:**

CLOBJ 1	Understand the Fundamental Principles of Food Processing and developing a comprehensive understanding of the basic principles underlying food processing, including heat transfer, mass transfer, and fluid flow.
CLOBJ 2	Apply Thermal Processing Techniques to Gain practical knowledge and skills in applying thermal processing techniques such as pasteurization and sterilization to ensure the safety and shelf-life of food products.
CLOBJ 3	Explore various food preservation methods, including refrigeration, freezing, dehydration, and fermentation, and understand their effects on food quality and safety. Learn to assess and control the quality attributes of processed foods, considering factors such as texture, flavor, color, and nutritional content.
CLOBJ 4	Analyze Emerging Technologies in Food Processing and Stay updated on emerging technologies in food processing, including high-pressure processing, pulsed electric fields, and non-thermal methods, and evaluate their applications and impacts.
CLOBJ 5	Integrate Food Safety Practices into Processing and Emphasize the importance of food safety throughout the processing chain, from raw material handling to the final product, and implement good manufacturing practices (GMPs) and hazard analysis critical control points (HACCP) principles.

f. Course Learning Outcomes

CLO 1	Demonstrate Understanding of Food Processing Principles: Students can articulate the fundamental principles of food processing, explaining the scientific basis behind various unit operations.
CLO 2	Apply Thermal Processing Techniques Effectively, design and implement thermal processing methods, demonstrating competence in selecting appropriate heat treatments for different food products.
CLO 3	Implement Diverse Preservation Methods, choose and apply suitable preservation methods based on the characteristics of food products, ensuring both microbial safety and product quality.

CLO 4	Evaluate and Control Quality Attributes. Analyze and control the quality attributes of processed foods, identifying critical factors that influence sensory and nutritional properties. Informed on Emerging Technologies in food processing, and they can evaluate their potential benefits and limitations
CLO 5	Integrate Food Safety Practices into Processing Operations. Implementing effective measures to prevent contamination and ensure the production of safe and high-quality food products.

g. Teaching & Examination Scheme:

Teaching Scheme				Evaluation Scheme					
L	T	P	C	Internal Evaluation			ESE		Total
				MSE	CE	P	Theory	P	
4	-	0	4	20	20	-	60	-	100

L- Lectures; **T-** Tutorial; **P-** Practical; **C-** Credit; **MSE-** Mid-Semester Evaluation, **CE-** Continuous Evaluation, **ESE-** End Semester Examination

h. Course Content:

Sr.No	Content	Weightage	Teaching Hours
1	Unit 1: 1. Scope and importance of food processing: national and international perspectives. Food processing techniques and types of processed products (Minimally Processed and Highly Processed Food Products) Principles of preservation methods. Chemical preservations of foods	25%	15
2	Unit 2- Preservation by Low Temperature: 1. Food preservation by low-temp: Cold Storage, Chilling and super chilling, Refrigeration, Freezing and Freeze-drying. Cryogenic preservation. 2. Advantages and disadvantages of low temperature preservation techniques	25%	15
3	Unit 3: Preservation by Heating: 1. Food preservation by heating: Drying, Dehydration, Osmotic Dehydration. 2. Blanching, Cooking, Canning,	25%	15

	Pasteurization, Sterilization, Baking and Extrusion cooking.		
4	Unit 4: Non-thermal Preservation: 1. Non-thermal preservation: 2. Hydrostatic pressure, Dielectric heating, Ohmic Heating, Radiofrequency heating, 3. Microwave processing, Irradiation, Membrane technology and Hurdle technology.	25%	15
	Total	100%	60

i. Text Book and Reference Book:

- a. Food Processing and Preservation by B. SIVASANKAR
Handbook of Food Processing and preservation

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- a. **Course Name: Biochemistry and Nutrition**
- b. **Course Code: 11213102**
- c. **Prerequisite:** Should be familiar about Biochemistry of food and Nutrition
- d. **Rationale:** Acquire knowledge Biochemistry of food and Nutrition

CLOBJ 1	Understand the basic principles and concepts of biochemistry, including the structure and function of biomolecules, enzyme kinetics, and metabolic pathways.
CLOBJ 2	Analyze the relationship between biochemistry and nutrition, recognizing how biochemical processes in the human body contribute to nutrient metabolism, absorption, and utilization.

e. Course Learning Objective

CLOBJ 3	Apply biochemistry concepts to address nutritional challenges, evaluating the impact of various diets, deficiencies, and excesses on biochemical pathways and overall health.
CLOBJ 4	Investigate and comprehend the molecular mechanisms underlying nutrition-related diseases, such as metabolic disorders, and critically assess potential nutritional interventions..
CLOBJ 5	Develop laboratory skills for biochemical analysis, including experimental techniques for studying bio molecules, enzymatic reactions, and nutritional components, fostering a hands-on understanding of the subject matter.

f. Course Learning Outcomes:

CLO 1	Comprehend the Fundamentals of Nutrition and Human Physiology and demonstrate an understanding of nutrition, human physiology, blood, and various biochemical tests, applying this knowledge to assess and analyze nutritional aspects.
CLO 2	Evaluate, analyze and explain the biochemical functions and roles of vitamins and minerals in the human body, considering their impact on health and well being.
CLO 3	Evaluate the Energy Value of Foods, Nutraceuticals, and Functional Foods. Assess and calculate the energy content of different foods, examine the concepts of nutraceuticals and functional foods, and understand their significance in promoting health and preventing diseases.
CLO 4	Apply Biochemical Principles to Assess Nutritional Status, utilizing different biochemical tests to assess nutrient levels in the body.
CLO 5	Integrate their understanding of biochemistry and nutrition to formulate dietary recommendations, considering individual nutritional needs and health goals.

g. Teaching & Examination Scheme:

Teaching Scheme				Evaluation Scheme					
L	T	P	C	Internal Evaluation			ESE		Total
				MSE	CE	P	Theory	P	
4	-	0	4	20	20	-	60	-	100

L- Lectures; **T-** Tutorial; **P-** Practical; **C-** Credit; **MSE-** Mid-Semester Evaluation, **CE-** Continuous Evaluation, **ESE-** End Semester Examination

h. Course Content:

Sr. no.	Content	Weightage %	Teaching hours
1	Unit 1:- Concept and scope of Nutrition and Health Metabolic Rate, Nutritional Requirement and RDA. Human Physiology: Respiratory System, Gastrointestinal System and	25%	15

	Excretory System. Blood and blood composition. Nutritional assessment of human: nutritionalanthropometry and biochemical tests		
2	Unit 2 - Nutritional Biochemistry: Carbohydrate Metabolism: Digestion and absorption of carbohydrates. Glycolysis, TCA cycle & energy generation, gluconeogenesis, glycogenesis, glycogenolysis. Blood sugar regulation. Disorders of carbohydrate metabolism. Lipid Metabolism: triacylglycerol, adipose tissue, ketone bodies, cholesterolOxidation and biosynthesisof fatty acids. Lipid storage disorders and metabolic syndromes.	25%	15
3	Unit 3- Protein Metabolism: Digestion and absorption of Protein. Urea cycle. Biosynthesis of nonessential amino acids. Biochemical role of Vitamins and Minerals. Deficiencydisorders.	25%	15
4	Unit 4- Nutrition of Dietary Fibers.: Formulation of diets and food products for specificneeds. Energy value of foods. Protein quality: PER, NPU and BV. Nutraceuticals and functional foods.	25%	15
	Total	100%	60

i. Text Book and Reference Book:

1. The Biochemistry of Human Nutrition
by Sareen Gropper
2. Nutrition and Dietetics: A Manual for Medical and Allied Health Sciences"
byKumud Khanna

(3)

a. Course Name: Food Microbiology

b. Course Code: 11213103

c. Prerequisite: Should be familiar about Food Microbiology

d. Rationale: Acquire knowledge about Food Microbiology

e. Course Learning Objective:

CLOBJ 1	Explore the dynamic interactions between microorganisms and the food environment, impact of fermentation on food production, analyzing its effects on the microbiological quality and overall status of the food product.
CLOBJ 2	Acquire knowledge on various clinically significant microorganisms, including bacteria, viruses, protozoa, and fungi, and their roles in causing diseases.

CLOBJ 3	Examine the microbiological composition of different types of food commodities, assessing their unique microbial profiles. Evaluate the rationale behind the utilization of standard methods and procedures for the microbiological analysis of food, emphasizing the importance of consistency and accuracy.
CLOBJ 4	Articulate the necessity of microbiological quality control programs in food production, outlining their role in ensuring the safety and integrity of food products.
CLOBJ 5	Delve into the microbiological aspects of quality control in food, exploring methods to maintain and enhance the microbiological quality of food products. Analyze safety concerns in the dairy and food technology industry, focusing on the implementation of Hazard Analysis and Critical Control Points (HACCP) and effective management strategies to ensure product safety.

f. Course Learning Outcomes:

CLO 1	Advanced Understanding of Microbial Ecology in Food Systems and an in-depth understanding of the interactions between microorganisms and various food matrices, including the impact of environmental factors on microbial growth, survival, and spoilage.
CLO 2	Expertise in Fermentation Processes and advanced knowledge about fermentation processes used in food production, emphasizing the role of microorganisms in shaping the sensory, nutritional, and safety aspects of fermented food products.
CLO 3	Proficiency in Identifying and Managing Foodborne Pathogens and specialized knowledge about clinically significant bacteria, viruses, protozoa, and fungi associated with foodborne illnesses. Demonstrate the ability to employ advanced techniques for the detection, identification, and control of foodborne pathogens.
CLO 4	Mastery of Analytical Techniques for Microbiological Quality Control and proficiency in various diagnostic tests and analytical methods employed in the microbial analysis of food, including molecular techniques, microscopy, and biochemical assays. Apply these methods to assess and ensure the microbiological safety of food products.
CLO 5	Application of Microbiological Concepts in Food Safety Management and develop the skills to design and implement effective microbiological quality control programs in food production, emphasizing the importance of adherence to standard methods and procedures. Understand the rationale behind quality control measures and their contribution to overall food safety.

g. Teaching & Examination Scheme:

Teaching Scheme				Evaluation Scheme					
L	T	P	C	Internal Evaluation			ESE		Total
				MSE	CE	P	Theory	P	
4	-	0	4	20	20	-	60	-	100

L- Lectures; **T-** Tutorial; **P-** Practical; **C-** Credit; **MSE-** Mid-Semester Evaluation, **CE-** Continuous Evaluation, **ESE-** End Semester Examination

h. Course Content:

Sr. No	Content	Weightage %	Teaching Hours
1	Unit 1- Scope of Food Microbiology: History and scope of food microbiology. Types of micro- organism normally associated with food- bacteria, yeast and mold. Diversity of Habitat. Microbial growth pattern. Intrinsic and extrinsic factors affecting growth of micro-organisms.	25%	15
2	Unit 2- Contaminants of foods: 1. Micro-organisms in natural food products and their control. Biochemical changes caused by micro- organisms, deterioration and spoilage of various types of food products, microbial food fermentation. 2. Contaminants of foods-stuffs, vegetables, cereals, pulses, oilseeds, milk and meat during handling and processing.	25%	15
3	Unit 3- Food Poisoning: 1. Microbial quality control and microbial standards for foods. 2. Food microbiology and public health. Food borne diseases and food born illness. Food poisoning and microbial toxins. Food borne intoxicants and mycotoxins	25%	15
4	Unit 4- Microbiological Examination of Food.: 1) Direct examination, Culture Techniques, Enumeration methods – Plate count and Most probable number count. Rapid detection techniques for spoilage micro-organisms and toxins.	25%	15
	Total	100%	60

i. Text Book and Reference Book:

1. 1st edition Molecular food microbiology by Dongyou Liu
2. Food Microbiology by Frazier, William C.
3. Garg N, Garg KL, and Mukerji KG. 2010. Laboratory Manual of Food Microbiology

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a. Course Name: Lab -1 Food Microbiology Laboratory

b. Course Code: 11213104

c. Prerequisite: Should be familiar with basic of Food micro Rationale

d. Rationale: Acquire knowledge about the Food microbiology.

e. Course Learning Objective:

CLOBJ 1	Understand various laboratory techniques to identify and characterize microorganisms commonly found in food, including bacteria, yeast, and molds.
CLOBJ 2	Develop skills in detecting and isolating foodborne pathogens, such as Salmonella, Escherichia coli, and Listeria, using appropriate microbiological methods.
CLOBJ 3	Understand and apply quality control measures to assess the microbial quality of food products, ensuring compliance with safety standards and regulations.
CLOBJ 4	Gain proficiency in culturing and maintaining microbial cultures, including pure cultures, to study their growth patterns and metabolic activities.
CLOBJ 5	Learn to identify and analyze the causes of food spoilage by microorganisms, including sensory evaluation and the role of specific microbes in product deterioration.

f. Course Learning Outcomes:

CLO 1	Hands-on Proficiency in fundamental microbiological techniques, including aseptic handling, culturing, and microscopy.
CLO 2	Microbial Identification Proficiency by successfully identify and characterize various foodborne microorganisms using appropriate laboratory methods.
CLO 3	Critical Thinking Skills to assess and address microbiological challenges in foodsafety, spoilage, and preservation.

CLO 4	Compliance with Standards understanding and apply food safety regulations, ensuring compliance with microbial quality standards in the food industry.
CLO 5	Critically evaluate various food preservation methods, understanding their microbial implications and their role in maintaining the safety and shelf-life of food products.

g. Teaching & Examination Scheme:

Teaching Scheme				Evaluation Scheme					
L	T	P	C	Internal Evaluation			ESE		Total
				T	CE	P	T	P	
-	-	6	3	-	-	40	-	60	100

u- Lectures; **T-** Tutorial; **P-** Practical; **C-** Credit; **MSE-** Mid-Semester Evaluation, **CE-** Continuous Evaluation, **ESE-** End Semester Examination

h. Text Book and Reference Book:

1. 1st edition Molecular food microbiology by Dongyou Liu
2. Food Microbiology by Frazier, William C.
3. Garg N, Garg KL, and Mukerji KG. 2010. Laboratory Manual of Food Microbiology

i. Experiment List

Exp No.	Name of the Experiment
1	Study of Microscope
2	Preparation of nutrient media
3	Sterilization of media and utensils
4	Determination of Total Plate Count
5	Determination of Yeast and Mold Count
6	Isolation of pure culture by Streak plate technique
7	Study of Gram staining techniques
8	Study of Monochrome staining techniques
9	Study of Negative staining techniques
10	Visit to Analytical Lab/Pathological Lab

- a. **Course Name: Food Chemistry**
- b. **Course Code: 11213105**
- c. **Prerequisite:** Should be familiar with basic of Food Chemistry
- d. **Rationale:** Acquire knowledge about the Food Chemistry
- e. **Course Learning Objective:**

CLOBJ 1	Understand Fundamental Principles of Food Chemistry. Articulate the basic principles and concepts underlying food chemistry, including the composition and structure of major food components. Describe the chemical reactions involved in food processing and transformation.
CLOBJ 2	Apply chemical principles to analyze the composition of various food components, including proteins, lipids, carbohydrates, vitamins, and minerals. Demonstrate the ability to interpret chemical analyses of food products.
CLOBJ 3	Evaluate the Impact of Processing on Food Chemistry. Analyze the chemical changes that occur during food processing, assessing the impact on nutritional content, flavor, and safety. Evaluate the role of chemical reactions in food preservation and shelf-life extension.
CLOBJ 4	Apply molecular concepts to understand the chemical reactions occurring in food systems, including Maillard browning, lipid oxidation, and enzymatic reactions. Demonstrate the application of molecular knowledge in troubleshooting food quality issues.
CLOBJ 5	Synthesize knowledge of food chemistry principles to design and develop new food products. Integrate chemical concepts into the formulation of innovative and safe food products.

f. Course Learning Outcomes:

CLO 1	Comprehensive understanding of the chemistry underlying different food compositions. This includes knowledge of the chemical properties and interactions of various food components, providing a solid foundation for the analysis and manipulation of food systems.
CLO 2	Application of Chemical principles to elucidate the behavior of food components in different environments. This involves connecting theoretical knowledge to practical scenarios, fostering critical thinking in the context of food chemistry.
CLO 3	Evaluative understanding of Food Reactivity, how alterations in overall food composition influence the reactivity of individual food components. This

	involves the ability to analyze and interpret the potential chemical changes that may occur in various food matrices based on their overall composition.
CLO 4	Application of Food Analysis Techniques, ability to comprehend, plan, execute, and analyze a variety of chemical investigations, with a specific focus on food analysis. This includes proficiency in employing relevant laboratory techniques and instrumentation for the accurate assessment of food composition.
CLO 5	Influence of effective Communication of Analytical Results. This includes presenting and interpreting analytical results in a clear and concise manner, both in written reports and oral presentations. Emphasis will be placed on communicating scientific information to diverse audiences, including those without a strong background in chemistry.

g. Teaching & Examination Scheme:

Teaching Scheme				Evaluation Scheme					
L	T	P	C	Internal Evaluation			ESE		Total
				MSE	CE	P	Theory	P	
4	-	0	4	20	20	-	60	-	100

L- Lectures; **T-** Tutorial; **P-** Practical; **C-** Credit; **MSE-** Mid-Semester Evaluation, **CE-** Continuous Evaluation, **ESE-** End Semester Examination

a. Course Content:

Sr. No	Content	Weightage%	Teaching Hours
1	Unit 1: Introduction to Food Chemistry: 1. Food chemistry-definition and importance. Water in food. Structure of water and ice. Phase diagram of water. Sorption isotherm. Water activity and shelf life of food. 2. Chemistry and classification of Lipids. Nomenclature of fatty acids. Physical and chemical properties of lipids. Use of lipids in foods and effects of processing on functional properties	25%	15
2	Unit 2: Classification of Carbohydrates.: 1. Structure and nomenclature of carbohydrates. Chemical reactions of carbohydrates. Functional properties and preparation of sugars, polysaccharides.	25%	15
	Total	100%	60

b. Text Book and Reference Book:

1. Food chemistry By Fennema O.R.
2. Food chemistry By Mayer L.H.
3. Principles of food chemistry By John M. deMan, John W. Finley

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a. Course Name: Food Chemistry Laboratory

b. Course Code: 11213106

c. Rationale: Acquire knowledge about the Food Chemistry

d. Prerequisite: Should be familiar with basic of Food Chemistry

e. Course Learning Objective:

CLOBJ 1	Apply appropriate laboratory techniques to analyze the composition of food components, including proteins, lipids, carbohydrates, vitamins, and minerals. Demonstrate proficiency in using analytical instruments for accurate and precise measurements.
CLOBJ 2	Apply chemical principles to analyze the composition of various food components, including proteins, lipids, carbohydrates, vitamins, and minerals. Demonstrate the ability to interpret chemical analyses of food

	products.
CLOBJ 3	Analyze the chemical changes that occur during food processing, assessing the impact on nutritional content, flavor, and safety. Evaluate the role of chemical reactions in food preservation and shelf-life extension.
CLOBJ 4	Apply molecular concepts to understand the chemical reactions occurring in foodsystems, including Maillard browning, lipid oxidation, and enzymatic reactions.
	Demonstrate the application of molecular knowledge in troubleshooting foodquality issues.
CLOBJ 5	Synthesize knowledge of food chemistry principles to design and develop new food products. Integrate chemical concepts into the formulation of innovative and safe food products.

f. Course Learning Outcomes:

CLO 1	Understanding of Food Chemistry Principles, articulate fundamental principles of food chemistry, including the composition and structural characteristics of major food components.
CLO 2	Applied Chemical Knowledge to Analyze composition of divers food components and interpret analytical results effectively.
CLO 3	Evaluated the Impact of Processing on Food Chemistry, can analyze chemical changes during food processing, evaluating their effects on nutritional content,flavor, and safety.
CLO 4	Applied Molecular Concepts to Understand Food Reactions, comprehend complex food reactions, addressing challenges related to Maillard browning, lipid oxidation, and enzymatic reactions.
CLO 5	Food Product Development from synthesize knowledge of food chemistry principles which is innovative and safe food products, integrating chemical concepts into the product development process.

g. Teaching & Examination Scheme:

Teaching Scheme				Evaluation Scheme					
L	T	P	C	Internal Evaluation			ESE		Total
				MSE	CE	P	Theory	P	

-	-	6	3	-	-	40	-	60	100
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L- Lectures; **T-** Tutorial; **P-** Practical; **C-** Credit; **MSE-** Mid-Semester Evaluation, **CE-** Continuous Evaluation, **ESE-** End Semester Examination

h. Experiment List

Exp No.	Name of the Experiment
1	Study of laboratory instruments/equipments
2	Determination of moisture content of given food sample
3	Determination of fat content by soxhlet method
4	Determination of protein by kjeldahl's method
5	Determination of ash content from given food sample
6	Determination of Iron
7	Determination of Calcium
8	Estimation of reducing sugar by fehling solution method
9	Determination of Daily energy requirement of body
10	Study of Balanced Diet Plan

i. Text Book and Reference Book:

1. Food chemistry By Fennema O.R.
2. Food chemistry By Mayer L.H.
3. Principles of food chemistry By John M. deMan, John W. Finley,

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a. Course Name: Food Packaging and Supply Chain

b. Course Code: 11213107

c. Prerequisite: Should be familiar with basic of Food Packaging and Supply Chain

d. Rationale: Acquire knowledge about the Food Packaging and Supply Chain

e. Course Learning Objective:

CLOBJ 1	Understand Fundamental Principles of f Food Packaging and Supply Chain. Articulate the basic principles and concepts underlying food chemistry, including the composition and structure of major food components. Describe the chemical reactions involved in food processing and transformation.
CLOBJ 2	Apply chemical principles to analyze the composition of various food components, including proteins, lipids, carbohydrates, vitamins, and minerals. Demonstrate the ability to interpret chemical analyses of food products.
CLOBJ 3	Evaluate the Impact of Processing on f Food Packaging and Supply Chain. Analyze the chemical changes that occur during food processing, assessing the impact on nutritional content, flavor, and safety. Evaluate the role of chemical reactions in food preservation and shelf-life extension.

CLOBJ 4	Apply molecular concepts to understand the chemical reactions occurring in food systems, including Maillard browning, lipid oxidation, and enzymatic reactions. Demonstrate the application of molecular knowledge in troubleshooting food quality issues.
CLOBJ 5	Synthesize knowledge of Food Packaging and Supply Chain principles to design and develop new food products. Integrate chemical concepts into the formulation of innovative and safe food products.

f. Course Learning Outcomes:

CLO1	Understanding of Packaging Materials and Technologies
CLO2	Impart knowledge of various areas related to food processing and packaging.
CLO3	Evaluate suitable packaging materials for a certain type of food products.
CLO4	Understanding Supply Chain Management.
CLO5	knowledge of various types of packaging materials, their properties, advantages, disadvantages and applications.

g. Teaching & Examination Scheme:

Teaching Scheme				Evaluation Scheme					
L	T	P	C	Internal Evaluation			ESE		Total
				MSE	CE	P	Theory	P	
4	-	0	4	20	20	-	60	-	100

L- Lectures; **T-** Tutorial; **P-** Practical; **C-** Credit; **MSE-** Mid-Semester Evaluation, **CE-** Continuous Evaluation, **ESE-** End Semester Examination

h. Course Content:

Sr. No.	Content	Weightage%	Teaching Hours

1	Unit 1. Introduction to Packaging 1.Introduction of packaging. Types of packaging materials, packaging systems - socio economic,technologies and the environment, Package forms, packaging development principles. 2.Packaging Requirements for Various Foods	25 %	15
2	Unit 2 . Packaging material Science and Properties: 1. Introduction toward food packaging, Barrier Mechanical and Thermal properties of the packaging materials. 2. Smart, Active and speciality Packaging for foods.	25%	15
3	Unit 3. Polymer packaging and processing 1.Basic Concepts of Polymers, Advantage and Disadvantage of Plastics. Food Packaging Polymers and Recycling Symbols. 2.Extrusion, Coextrusion, CastFilm Extrusion, Blown Film Extrusion, Injection Molding, Blow Molding, Extrusion Coating, Extrusion Lamination, Adhesive Lamination. Thermoforming, Vacuum Metallization.	25%	15
4	Unit 4. Shelf Life of Packaged Food Products and supply chain management . 1. Basic Concepts and Factors Affecting on Shelf Life,of Packaged Foods, Kinetics of Food Deterioration Arrhenius and Shelf-Life Plots, Moisture, Oxygen and Environmental Factors Affecting Shelf Life, Shelf-Life Studies Under Different Conditions. 2. Supply Chain Management: Scope, and Significance of supply chain management. Farm to fork and Warehouse management. Containerization Export & import packaging. Post- Harvest and Supply Chain Management. Cold chain technologies. Information technology in Supply Chain Management Bar-coding, RFID and E- Procurement	25%	15
	Total	100%	60

i. Text Book and Reference Book:

1. Food Packaging: Principles and Practice. By By: Gordon L. Robertson
2. Food Packaging Technology Handbook (3rd Revised Edition). By By: NIIR Board of ConsultantsEngineers
3. Supply Chain Management: Strategy, Planning, and Operation. By By: Sunil Chopra, Dharam VirKalra and Gourav Dwivedi

(8)

a. Course Name: Lab-I Principle of Food processing and preservation

b. Course Code: 11213108

c. Prerequisite: Should be familiar with basic of Food preservation

d. Rationale: Acquire knowledge about the Food preservation

e. Course Learning Objective:

CLOBJ 1	Apply appropriate laboratory techniques to analyze the composition of food components, including proteins, lipids, carbohydrates, vitamins, and minerals. Demonstrate proficiency in using analytical instruments for accurate and precise measurements.
CLOBJ 2	Apply chemical principles to analyze the composition of various food components, including proteins, lipids, carbohydrates, vitamins, and minerals. Demonstrate the ability to interpret chemical analyses of food products.
CLOBJ 3	Analyze the chemical changes that occur during food processing, assessing the impact on nutritional content, flavor, and safety. Evaluate the role of chemical reactions in food preservation and shelf-life extension.
CLOBJ 4	Apply molecular concepts to understand the chemical reactions occurring in foodsystems, including Maillard browning, lipid oxidation, and enzymatic reactions.
	Demonstrate the application of molecular knowledge in troubleshooting foodquality issues.
CLOBJ 5	Synthesize knowledge of food chemistry principles to design and develop new food products. Integrate chemical concepts into the formulation of innovative and safe food products.

f. Course Learning Outcomes:

CLO 1	Understanding of Food Chemistry Principles, articulate fundamental principles of food chemistry, including the composition and structural characteristics of major food components.
CLO 2	Applied Chemical Knowledge to Analyze composition of diverse food components and interpret analytical results effectively.
CLO 3	Evaluated the Impact of Processing on Food Chemistry, can analyze chemical changes during food processing, evaluating their effects on nutritional content,flavor, and safety.

CLO 4	Applied Molecular Concepts to Understand Food Reactions, comprehend complex food reactions, addressing challenges related to Maillard browning, lipid oxidation, and enzymatic reactions.
CLO 5	Food Product Development from synthesized knowledge of food chemistry principles which is innovative and safe food products, integrating chemical concepts into the product development process.

g. Teaching & Examination Scheme:

Teaching Scheme				Evaluation Scheme					
L	T	P	C	Internal Evaluation			ESE		Total
				MSE	CE	P	Theory	P	
-	-	6	3	-	-	40	-	60	100

L- Lectures; T- Tutorial; P- Practical; C- Credit; MSE- Mid-Semester Evaluation, CE- Continuous Evaluation, ESE- End Semester Examination

h. Experiment List

Exp No.	Name of the Experiment
1	Real time application of removing or inactivating microorganisms
2	Osmotic dehydration of the certain fruits and vegetables by sugar and salt solution.
3	Study different during processing of rice e.g. cooking time, %elongation, %width, expansion, % water uptake.
4	Preservation of vegetables with the help of fermentation technique like sauerkraut.
5	Carry out the shelf-life study of the fruit/vegetable by different non thermal preservation method.
6	Carry of the shelf-life study of the chicken meat by different packaging materials
7	Examination of canned fruits
8	Preservation of perishable food product by low temperature.
9	Preservation of fruits and vegetable by pickling
10	Asses the adequacy of blanching

i. Text Book and Reference Book:

1. Food Packaging: Principles and Practice. By By: Gordon L. Robertson
2. Fruits and vegetable preservation principles and practice By R P Srivastava
3. Retail Logistics- Fresh Food Packaging, By Kerstin Gustafsson

(1)

- a) **Course Name: Principles of Food Engineering**
- b) **Course Code: 11213151**
- c) **Prerequisite:** The student should be aware of the food processing Equipment's and their principles and their basic market uses.
- d) **Rationale:** To enable the students to understand food processing equipment's, their working principles etc.
- e) **Course Learning Objective:**

CLOBJ 1	Understand Fundamental Principles of Heat Transfer in Food Engineering. Articulate the fundamental principles of heat transfer in food engineering, including conduction, convection, and radiation mechanisms.
CLOBJ 2	Apply mass transfer principles to food processing operations, demonstrating an understanding of diffusion and the role of mass transfer in various unit operations.
CLOBJ 3	Analyze fluid flow within food processing equipment, considering factors such as viscosity, turbulence, and pressure drop.
CLOBJ 4	Demonstrate knowledge of common food engineering unit operations, including mixing, separation, and size reduction.
CLOBJ 5	Apply Principles of Food Engineering in Problem-Solving, solve real-world problems in food processing and preservation.

f. Course Learning Outcomes:

CLO 1	Demonstrated Understanding of Heat Transfer Principles, including conduction, convection, and radiation, in the context of food engineering.
CLO 2	Applied Mass Transfer Principles in Food Processing to various food processing operations, showcasing their ability to understand and implement diffusion concepts.
CLO 3	Analyze fluid flow within food processing equipment, considering factors such as viscosity, turbulence, and pressure drop.
CLO 4	Knowledge of common food engineering unit operations, including mixing, separation, sedimentation, centrifugation and size reduction.
CLO 5	Applied principles learned in food engineering to solve practical problems encountered in food processing and preservation.

g. Teaching & Examination Scheme:

Teaching Scheme			Credit	Examination Scheme					Total
Lect Hrs / Week	Tut Hrs / Week	Lab Hrs / Week		External		Internal			
				T	P	T	CE	P	
4	-	-	4	60	-	20	20	-	100

L- Lectures; T- Tutorial; P- Practical; C- Credit; MSE- Mid-Semester Evaluation, CE- Continuous Evaluation, ESE- End Semester Examination

h. Course Content:

Sr.	Topic	Weightage %	TeachingHrs.
1	Unit 1: Unit Operation In Food Engineering: Definitions of Velocity and Speed, Acceleration, Force and Momentum, Weight, Pressure, Work and Energy, Power. Unit operation in food engineering. Heat transfer-modes of heat transfer, conduction, convection and radiation. Heat exchangers and their designs. Heat processing of foods:- Evaporation and Concentration, Dehydration and Drying, Boiling and Condensation, Blanching, Pasteurization, Sterilization and crystallization.	25%	15
2	Unit 2: Unit operation in Mass and Energy Balance: Mass and energy balance. Fick's law of diffusion. Theories and unit operations of mass transfer. Fluid flow, fluid statics, fluid dynamics, fluid flow applications. Newton's Law of Rheology. Freezing operations and Planck's Equation. Freezing curve	25%	15
3	Unit 3: Mechanical separation: Mechanical separation-filtration, membrane concentration, sieving, centrifugation, sedimentation, Mechanical handling-conveying and elevation. Size mixing, kneading, blending.	25%	15

4	Unit 4: Vapour Compression Refrigeration System,: Components of vapour compression refrigeration system, evaporator, compressor, condenser and expansion valve (VCR .System) Problems on degree Celsius to Kelvin, rankine,Fahrenheit, Celsius	25%	15
	Total	100%	60

i. Text Book and Reference Book:

1. Food Engineering Principles and Practices Sanjaya K. Dash, PitamChandra, Abhijit Kar (CRC press)
2. Microwave Processing of Foods: Challenges, Advances and Prospects Microwaves and Food, Anubhav Pratap Singh, Ferruh Erdogdu, ShaojinWang, Hosahalli S. Ramaswamy. Springer.

(2)

a. Course Name: Cereal and Legume Technology

b. Course Code: 11213152

c. Prerequisite: The student should be aware of the major agricultural crops of India and their basic market uses.

d. Rationale: To enable the students to understand food composition and its physicochemical, nutritional, microbiological and sensory aspects.

e. Course Learning Objective:

CLOBJ 1	Understand the botanical characteristics and nutritional profiles of cereals and legumes, highlighting their importance in the human diet.
CLOBJ 2	Apply processing techniques, such as milling, extrusion, and heat treatment, to transform raw cereals and legumes into value-added food products.
CLOBJ 3	Analyze and assess the impact of various processing methods on the nutritional quality of cereal and legume products, considering factors like micronutrient retention and bio-availability.
CLOBJ 4	Demonstrate the ability to conduct quality assessments, including sensory evaluation and laboratory analyses, to ensure the quality and safety of cereal and legume-based food products.
CLOBJ 5	Synthesize knowledge of sustainable practices and apply them to the processing of cereals and legumes, considering environmental, social, and economic aspects.

f. Course Learning Outcomes:

CLO 1	Apply various processing techniques involved in the production of cereals and legumes, including methods such as milling, extrusion, and roasting.
CLO 2	Assessing the quality parameters of cereals and legumes, and implementing quality control measures to ensure the production of safe and nutritious food products.
CLO 3	Analyze the nutritional content of cereals and legumes, and develop strategies to enhance nutritional value through fortification or other methods.
CLO 4	Develop and implement innovative technologies in cereal and legume processing, with an emphasis on sustainable practices and minimizing environmental impact.
CLO 5	Evaluate and apply them to the processing of cereals and legumes, demonstrating an understanding of environmental, social, and economic considerations in food production.

g. Teaching & Examination Scheme:

Teaching Scheme			Credit	Examination Scheme					Total
Lect Hrs /week	Tut Hrs /week	Lab Hrs /week		External		Internal			
				T	P	T	CE	P	
4	-	-	4	60	-	20	20	-	100

L- Lectures; **T-** Tutorial; **P-** Practical; **C-** Credit; **MSE-** Mid-Semester Evaluation, **CE-** Continuous Evaluation, **ESE-** End Semester Examination

h. Course Content:

Sr.	Topic	Weightage %	Teaching /Hrs.
1	Unit 1: Introduction to Cereals: - Introduction to cereals, production trends, structure and nutrient distribution in cereals. - Wheat types, milling of wheat, quality of flour and flour treatment. - Technology of bread, biscuits, cakes, durum wheat, breakfast cereals and extruded products.	25	15

2	Unit 2: Milling: • Corn-wet milling and dry milling. Corn starch and its hydrolyzed syrups. Corn flakes and Popcorn. • Rice milling, milling machines, effect of different factors on milling yield and rice quality, parboiling of rice, and rice products. Minor cereals processing	25	15
3	Unit 3: Introduction To Legumes: • Introduction to legumes, production trends, structure and nutrient distribution in legumes. • Dhal milling and processing of pulses. Post harvest processing of legume and pulses. Types of milling. Pre milling treatments. • Milling of individual pulses: Pigeonpea, Chickpea, Urdbean, Mungbean, Lentils etc	25	15
4	Unit 4: Cereal and Legume Based Products.: • Technology of cereal and legume based products. • Traditional fermented cereal and legume based food products: Milk Substitute, Meat Analogue, Tofu, Miso, Tempeh, Soy sauce, idli and dosa, dhokala. Instant food and premix.	25	15
	Total	100%	60

It consists of Assignments/Seminars/Presentations/Quizzes/Surprise Tests (Summative/MCQ) etc.

i. Text Book and Reference Book:

1. Cereal Grains, Legumes, and Oilseeds, Norman potter & Joseph Hotchkiss (Springer)
2. Chakrabarty MM. 2003. Chemistry and Technology of Oils and Fats. Prentice Hall.
3. Kent NL. 1983. Technology of Cereals. Fourth Edition. Pergamon Press
4. Lorenz KL.1991. Handbook of Cereal Science and Technology. Marcel Dekker
5. Paquot C. 1979. Standard Methods of Analysis of Oils, Fats and Derivatives. Pergamon Press.

(2)

a. Course Name: Lab- I Cereal and Legume Technology

b. Course Code: 11213153

c. Prerequisite: The student should be aware of the major agricultural crops of India and their basic market uses.

d. Rationale: To enable the students to understand food composition and its physicochemical, nutritional, microbiological and sensory aspects.

e. Course Learning Objective:

CLOBJ 1	Knowledge of the fundamental principles underlying the preparation and analysis of cereal and legume-based products. Explore the key components and processes involved in the production of bread, biscuits, cookies, cake, soymilk, tofu, idli, dhokala, and popped cereals.
CLOBJ 2	Develop Practical Skills in Food Processing, preparation of various cereal and legume-based products such as bread, biscuits, cookies, cake, soymilk, tofu, idli, dhokala, and popped cereals. Learn the proper techniques and methods involved in each stage of food processing, from ingredient selection to final product analysis.
CLOBJ 3	Understand the principles and practices of quality control in food processing. Develop proficiency in analytical techniques for assessing the quality and characteristics of cereal and legume-based products through sensory evaluation and laboratory testing.
CLOBJ 4	Explore the science behind baking and its application in the production of bread, biscuits, cookies, and cake. Gain insights into the role of ingredients, leavening agents, and temperature control in achieving desired product attributes.
CLOBJ 5	Enhance understanding of real-world applications by visiting a bakery industry. Observe and analyze industrial-scale processes, quality control measures, and technological advancements in the field of cereal and legume-based product manufacturing.

f. Course Learning Outcomes:

CLO 1	Apply theoretical principles to create high-quality bakery products such as bread, biscuits, cookies, cake, soymilk, tofu, idli, dhokala, and popped cereals
CLO 2	Produce High-Quality Bakery products with specified taste, texture, and appearance, demonstrating mastery in the preparation of various cereal and legume-based items.
CLO 3	Produce High-Quality Bakery Products: Create bakery products with specified taste, texture, and appearance, demonstrating mastery in the preparation of various cereal and legume-based items.
CLO 4	Understanding of the science behind baking through the successful preparation of bread, biscuits, cookies, and cake with desirable attributes
CLO 5	Synthesize Practical and Industry Knowledge. Integrate practical skills acquired in the laboratory with insights gained during the bakery industry visit, demonstrating a holistic understanding of cereal and legume technology.

f. Teaching & Examination Scheme:

Teaching Scheme				Evaluation Scheme					
L	T	P	C	Internal Evaluation			ESE		Total
				MSE	CE	P	Theory	P	

0	-	6	3	-	-	40	-	60	100
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L- Lectures; **T-** Tutorial; **P-** Practical; **C-** Credit; **MSE-** Mid-Semester Evaluation, **CE-** Continuous Evaluation, **ESE-** End Semester Examination

g. Text Book and Reference Book:

1. Chakrabarty MM. 2003. Chemistry and Technology of Oils and Fats. Prentice Hall.
2. Kent NL. 1983. Technology of Cereals. Fourth Edition. Pergamon Press
3. Lorenz KL.1991. Handbook of Cereal Science and Technology. Marcel Dekker
4. Paquot C. 1979. Standard Methods of Analysis of Oils, Fats and Derivatives. Pergamon Press.
5. Swern D. 1964. Bailey's Industrial Oil and Fat Products. InterSci.

h. List of Experiment

Exp No.	Name of the Experiment
1	Preparation and analysis of Bread
2	Preparation and analysis of Biscuits
3	Preparation and analysis of Cookies
4	Preparation and analysis of Cake
5	Preparation and analysis of Soymilk
6	Preparation and analysis of Tofu
7	Preparation and analysis of Idli
8	Preparation and analysis of Dhokala
9	Preparation and analysis of Popped Cereals
10	Visit to Bakery Industry

(3)

a. Course Name: Fruit and Vegetable Technology

b. Course Code: 11213154

c. Prerequisite: knowledge of preparation of products from food and vegetable upto 12th standard

d. Rationale: The student should have theoretical knowledge regarding food preparation and quality

e. Course Learning Objective:

CLOBJ 1	Demonstrate knowledge of various processing techniques used in the food industry for fruits and vegetables.
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CLOBJ 2	Analyze and apply principles of quality control to ensure the safety, freshness, and nutritional value of processed fruits and vegetables.
CLOBJ 3	Explore and evaluate the latest technological advancements in food preservation methods specifically related to fruits and vegetables.
CLOBJ 4	Understand the intricacies of supply chain management in the context of the fruit and vegetable industry, from farm to processing to distribution.
CLOBJ 5	Familiarize oneself with and adhere to regulatory standards and guidelines governing the processing and production of fruit and vegetable products.

f. Course Learning Outcomes:

CLO 1	Apply theoretical knowledge to analyze and contribute to the fruits and vegetable processing industry.
CLO 2	Demonstrate technical skills in post-harvest techniques, preservation, and storage of fruits and vegetables.
CLO 3	Utilize advanced techniques in freezing, freeze-drying, irradiation, and canning for fruit and vegetable preservation.
CLO 4	Develop and create various by-products such as juices, syrups, cordials, nectars, preserves, candies, and crystallized fruits.
CLO 5	Implement quality control measures in the processing of beverages, including alcoholic, non-alcoholic, and carbonated drinks, ensuring adherence to standards.

g. Teaching & Examination Scheme:

Teaching Scheme			Credit	Examination Scheme					Total
Lect Hrs/ Wee k	Tut Hrs/ Wee k	Lab Hrs/ Wee k		External		Internal			
				T	P	T	CE	P	
4	-	-	4	60	-	20	20	-	100

M- Lectures; T- Tutorial; P- Practical; C- Credit; **MSE**- Mid-Semester Evaluation, **CE**- Continuous Evaluation, **ESE**- End Semester Examination

h. Course Content:

Sr.	Topic	Weightage %	Teaching Hrs.
1	Unit 1: Introduction to Fruits and Vegetable: • Introduction to fruits and vegetable processing industry and market statistics. Structure, cellular components and composition of fruits and vegetables. • Post-harvest technology of fruits and vegetables:Harvesting, Handling, Processing. • Principles and methods of fruit and vegetable preservation. • Principles and methods of storage: natural, ventilated,low temperature storage, MAP, CAP.	25	15
2	Unit 2: Preservation By Freezing, Drying & Irradiation: • Freezing and freeze-drying of fruits and vegetables. • Drying and dehydration of fruits and vegetables. • Irradiation of fruits and vegetables. Commercial canning offruits and vegetables	25	15
3	Unit 3: Fruits & Vegetable their by Products: • Fruit and Vegetable Juices, Fruit Syrups, Cordials and Nectars. • Fruit preserve, Candies, Crystallized fruits and vegetables. • Jams, Jellies, Marmalades. Pickles, Chutney, Sauces andKetchup. Pectin and related compounds.	25	15
4	Unit 4: Beverage Technology: • Beverage technology: Alcoholic, Non-alcoholic andcarbonated beverages. • Utilization of fruits and vegetable waste. Processing of mineral water and water standards for food processing plants. Fruit product order and quality control	25	15
	Total	100%	60

It consists of Assignments/Seminars/Presentations/Quizzes/Surprise Tests (Summative/MCQ) etc.

i. Text Book and Reference Book:

1. Modern Technology of Agro Processing & Agricultural Waste Products [NI11] by NIIR Board,
2. Handbook on Fruits, Vegetables & Food Processing with Canning & Preservation (3rdEdition) [NI19] by NPCS Board,
3. The Complete Technology Book on Processing, Dehydration, Canning, Preservation of Fruits & Vegetables (Processed Food Industries)4th Revised Edition [NI65] by NIIR Board of Consultants & Engineers,
4. Modern Technology on Food Preservation (2nd Edition) [NI88] by NPCS Board,

5. Handbook on Citrus Fruits Cultivation and Oil Extraction [NI223] by NPCS Board of Consultants & Engineers,
6. Fruits, Vegetables, Corn and Oilseeds Processing Handbook [NI226] by H. Panda.

(4)

- a. **Course Name: Lab-II Fruit and Vegetable Technology**
- b. **Course Code: 11213155**
- c. **Prerequisite:** knowledge of preparation of products from food and vegetable
- d. **Rationale:** The student should have theoretical knowledge regarding food preparation and quality
- e. **Course Learning Objective:**

CLOBJ 1	Gain practical experience and proficiency in using various processing equipment employed in fruit and vegetable technology.
CLOBJ 2	Apply preservation techniques studied in the theoretical part of the course to actual fruits and vegetables in a laboratory setting.
CLOBJ 3	Learn and practice quality control measures, including sensory evaluation and laboratory tests, to assess the quality of processed fruit and vegetable products.
CLOBJ 4	Develop skills in identifying and troubleshooting common issues that may arise during fruit and vegetable processing, finding practical solutions in a laboratory context.
CLOBJ 5	Implement quality control measures in the processing of beverages, including alcoholic, non-alcoholic, and carbonated drinks, ensuring adherence to standards.

- f. **Course Learning Outcomes:**

CLO 1	Demonstrate proficiency in operating processing equipment such as blanchers, peelers, cutters, and other relevant machinery used in fruit and vegetable technology.
CLO 2	Apply preservation techniques, including freezing, drying, and canning, to process a variety of fruits and vegetables, showcasing practical competence.
CLO 3	Conduct sensory evaluations and laboratory tests to assess and assure the quality of processed fruit and vegetable products, demonstrating analytical skills.
CLO 4	Gain hands on experienced knowledge about about role of endogenous enzymes in maturation and ripening, methods to control different enzymatic reactions

CLO 5	Identify and resolve issues that may arise during processing, showcasing problem-solving abilities and adapting to practical challenges in real-time while manufacturing fruits and vegetable based products.
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g. Teaching & Examination Scheme:

Teaching Scheme				Evaluation Scheme					
L	T	P	C	Internal Evaluation			ESE		Total
				MSE	CE	P	Theory	P	
0	-	6	3	-	-	40	-	60	100

L- Lectures; **T-** Tutorial; **P-** Practical; **C-** Credit; **MSE-** Mid-Semester Evaluation, **CE-** Continuous Evaluation, **ESE-** End Semester Examination

h. Text Book and Reference Book:

1. Thompson AK. 1995. Post-Harvest Technology of Fruits and Vegetables. BlackwellSci
2. Pantastico B. 1975. Post-Harvest Physiology, Handling and Utilization of Tropical and Subtropical Fruits and Vegetables. AVI Publ
3. Lal G, Siddapa GS and Tandon GL. 1986. Preservation of Fruits and Vegetables. ICAR.

i. List of Experiment

Exp No.	Name of the Experiment
1	Study of Hand Refractometer & Preparation degree Brix solution
2	Preparation and analysis of fruit juice
3	Preparation and analysis of Jam
4	Preparation and analysis of Jelly
5	Preparation and analysis of Marmalade
6	Preparation and analysis of Tomato Sauce /Tomato Ketchup
7	Preparation and analysis of Amla Candy / Hard Boiled Candy
8	Preparation and analysis of pomegranate juice
9	Preparation and analysis of Squash
10	Visit to canning industry

b. Course Code: 11213156

c. Prerequisite: knowledge of preparation of fermented products.

d. Rationale: The student should have theoretical knowledge regarding food preparation and quality of fermented products.

e. Course Learning Objective:

CLOBJ 1	Develop a comprehensive understanding of the origin, history, and various aspects of food fermentation processes, including microbial growth kinetics and different types of fermentation.
CLOBJ 2	Acquire proficiency in fermenter design, encompassing body construction, ports, sensor probes, valves, aeration, agitation systems, impellers, baffles, spargers, and sterilization procedures.
CLOBJ 3	Gain knowledge and skills in operational measurements, quality control, and the principles of downstream processes, including product recovery and effluent treatment in food fermentation.
CLOBJ 4	Understand the commercial production processes involved in the fermentation of beer, wine, vinegar, and traditional fermented foods. Explore the production of alcohols, organic acids, enzymes, colors, and flavors.
CLOBJ 5	Grasp the economic aspects of fermentation, including an understanding of fermentation economics and its relevance to the production of fermented foods.

f. Course Learning Outcomes:

CLO 1	Apply theoretical knowledge of fermentation principles to practical scenarios, demonstrating the ability to design and execute fermentation processes.
CLO 2	Demonstrate proficiency in executing various fermentation techniques, including starter culture preparation, inoculation, and monitoring of fermentation parameters.
CLO 3	Analyze and select appropriate microbial strains for specific fermentation applications, considering factors such as substrate compatibility, fermentation conditions, and end-product characteristics.
CLO 4	Analyze and implement quality control measures throughout the fermentation process, ensuring the production of safe and high-quality fermented food products.
CLO 5	Understand and apply knowledge of current industry trends, innovations, and research in food fermentation technology, fostering an awareness of the dynamic nature of the field.

g. Teaching & Examination

Scheme:

Teaching Scheme			Credit	Examination Scheme					Total
				External		Internal			
Lect Hrs / Week	Tut Hrs / Week	Lab Hrs / Week		T	P	T	CE	P	
4	-	-	4	60	-	20	20	-	100

L- Lectures; **T-** Tutorial; **P-** Practical; **C-** Credit; **MSE-** Mid-Semester Evaluation, **CE-** Continuous Evaluation, **ESE-** End Semester Examination

h. Course Content:

Sr.	Topic	Weightage %	Teaching Hrs.
1	Unit 1: Food Fermentation: - Origin and history of food fermentation. Range of fermentation process: biomass, enzymes, metabolites, colours and flavours - Microbial growth kinetics: Batch Culture, Continuous Culture and Fedbatch Culture - Types of fermentation sub-merged/solid state, Batch /continuous fermentation	25	15
2	Unit 2: Fermenter Design: - Fermenter design. Body construction, Ports, SensorProbe, Valves Aeration and agitation system. - Impellers, Baffels and Spargers. Sterilization of Fermenter, Air, Media and Exhaust gas	25	15
3	Unit 3: Fermentation and Methods: - Operational measurement and quality control. - Principles of downstream processes and product recovery. Effluent treatment	25	15
4	Unit 4: Fermented Foods.: - Commercial production process for beer, wine and vinegar. Traditional fermented foods. - Production of alcohols, organic acids, enzymes, colours and flavours. Fermentation economics	25	15
	Total	100%	60

It consists of Assignments/Seminars/Presentations/Quizzes/Surprise Tests (Summative/MCQ) etc.

i. Text Book and Reference Book:

1. Computer Applications in Fermentation Technology: Modelling and Control of Biotechnological Processes", N M Fish
2. Fermentation Technologies: Industrial applications", P L Yu
3. Microorganisms and Fermentation of Traditional Foods (Food Biology Series)" by Ramesh C Ray and Montet Didier
4. The Art of Fermentation: An In-depth Exploration of Essential Concepts and Processes from Around the World" Sandor Ellix Katz.

(6)

a. Course Name: Research Methodology

b. Course Code: 11213157

c. Prerequisite: knowledge of preparation of fermented products

d. Rationale: The student should have theoretical knowledge regarding Research Methodology.

e. Course Learning Objective:

CLOBJ 1	Develop a comprehensive understanding of the origin, history, and various aspects of food research processes, including microbial growth kinetics and different types of research methodology.
CLOBJ 2	Acquire proficiency in research design, encompassing body construction, ports, sensor probes, valves.
CLOBJ 3	Gain knowledge and skills in operational measurements, quality control, and the principles of downstream processes, including product recovery and effluent treatment in food research trends.
CLOBJ 4	Understand the commercial production processes involved in the fermentation of beer, wine, vinegar, and traditional fermented foods. Explore the production of alcohols, organic acids, enzymes, colors, and flavors.
CLOBJ 5	Grasp the economic aspects of fermentation, including an understanding of fermentation economics and its relevance to the production of fermented foods.

f. Course Learning Outcomes:

CLO 1	Understanding Research Design.
CLO 2	Understanding of Data Collection and Analysis Skills.
CLO 3	Knowledge of Critical Evaluation of Research Literature.
CLO 4	Ethical Considerations in Research..
CLO 5	Effective Communication of Research Findings.

g. Teaching & Examination scheme:

Teaching Scheme			Credit	Examination Scheme					Total
				External		Internal			
Lect Hrs / Week	Tut Hrs / Week	Lab Hrs / Week		T	P	T	CE	P	
4	-	-	4	60	-	20	20	-	100

h. Course Content:

Sr.	Topic	Weightage%	Teaching Hrs.
1	Unit .1Safety and Behavior at Workspace, Laboratory and Institutional Campus How to start the research and literature studies	25	15
2	Unit -2Research Problem Identification and Research Design/Plan Gap finding in the research	25	15
3	Unit 3Good Experimental, Observational and Data Analysis including Computer Applications. Intellectual Property, Patent Database Search and Patent Writing	25	15
4	Unit 4Writing & Communication of Research Results and Inferences Ethics in Research and in Governance	25	15
	Total	100%	60

It consists of Assignments/Seminars/Presentations/Quizzes/Surprise Tests (Summative/MCQ) etc.

i. Text Book and Reference Book:

1. Research Methodology methods and Techniques (Second revised edition) By By: R C Kothari

**Semester 3
(1)**

- a. Course Name: Technology of Meat, Fish and Poultry Products
- b. Course Code: 11213201

- c. **Prerequisite:** The student should be aware of the contribution of flesh foods to human nutrition
- d. **Rationale:** Acquire knowledge about the flesh food, meat and poultry
- e. **Course Learning Objective:**

CLOBJ 1	Understand the composition and role of microorganisms in meat.
CLOBJ 2	Select Slaughtering, carcass processing methods and equipment used for processing meat.
CLOBJ 3	Classify the HACCP and GMP of meat processing.
CLOBJ 4	Understand the role of microorganisms in spoilage, biochemistry, preservation and fishery products.
CLOBJ 5	Evaluate the processing of poultry meat, meat products and egg products.

f. **Course Learning Outcomes:**

CLO 1	Identify different types of meat, fish, and poultry products and Understand the characteristics, composition, and quality attributes of these products.
CLO 2	Learn various processing techniques for meat, fish, and poultry, including butchering, filleting, and bonding.
CLO 3	Develop knowledge of food safety practices and hygiene standards applicable to meat, fish, and poultry processing and Implement measures to prevent contamination and ensure the safety of the final products.
CLO 4	Understand the environmental and ethical considerations in the meat, fish, and poultry industry.
CLO 5	Explore innovations and emerging technologies in the field and sustainable practices and their implications for the industry.

h. **Teaching & Examination Scheme:**

Teaching Scheme				Evaluation Scheme					
L	T	P	C	Internal Evaluation			ESE		Total
				MSE	CE	P	Theor y	P	
4	-	0	4	20	20	-	60	-	100

L- Lectures; **T-** Tutorial; **P-** Practical; **C-** Credit; **MSE-** Mid-Semester Evaluation, **CE-** Continuous Evaluation, **ESE-** End Semester Examination

i. Course Content:

Sr. No.	Content	Weightage %	Teaching Hours
1	Unit.1: Sources of meat and meat products in India, its importance in national economy. Chemical composition and microscopic structure of meat. Effect of feed, breed and management on meat production and quality. Slaughtering of animals and poultry, inspection and grading of meat.	25	15
2	Unit.2: Factors affecting post-mortem changes, properties and shelf-life of meat. Meat quality evaluation. Mechanical deboning, meat tenderization. Aging, pickling and smoking of meat. Meat plant sanitation and safety, Byproduct utilization. Poultry: classification, composition, preservation methods and processing.	25	15
3	Unit.3: Structure, composition, nutritive value and functional properties of eggs and its preservation by different methods. Processing of egg products. Factor affecting egg quality and measures of egg quality.	25	15
4	Unit.4: Types of fish, composition, structure, post-mortem changes in fish. Handling of fresh water fish. Canning, smoking, freezing and dehydration of fish. Preparation of fish products, fish sausage and home makings	25	15
	Total	100%	60

j. Text Book and Reference Book:

1. Forrest JC. 1975. Principles of Meat Science. Freeman.
2. Govindan TK. 1985. Fish Processing Technology. Oxford & IBH.
3. Hui YH. 2001. Meat Science and Applications. Marcel Dekker.
4. Kerry J. et al. 2002. Meat Processing. Woodhead Publ. CRC Press
5. Levie A. 1984. Meat Hand Book. Fourth Edition. AVI Publ.
6. Mead M. 2004. Poultry Meat Processing and Quality. Woodhead Publ.
7. Mead GC. 1989. Processing of Poultry. Elsevier

- a. **Course Name:** Lab-I Technology of Meat, Fish and Poultry Products
- b. **Course Code:** 11213202
- c. **Prerequisite:** The student should be aware of the contribution of flesh foods to human nutrition
- d. **Rationale:** Acquire knowledge about the flesh food, meat and poultry
- e. **Course Learning Objective:**

CLOBJ 1	Distinguish how individual food components contributes to the overall quality offoods.
CLOBJ 2	Classify types and grades of meat, poultry, and sea foods
CLOBJ 3	Interpret processing techniques used for the production of commercial meat,poultry, and sea foods

f. **Course Learning Outcomes:**

CLO 1	Elaborate proficiency in hands-on techniques for processing meat, fish, and poultry products and Acquire skills in butchering, filleting, bonding, and other relevant processing methods.
CLO 2	Justify quality assessments of raw and processed meat, fish, and poultry products and Use appropriate methods and tools to evaluate texture, flavor, color, and overall product quality.
CLO 3	Implement and adhere to hygiene and sanitation practices in the laboratory setting with Understand and follow protocols to prevent cross-contamination and ensure food safety.

g. **Teaching & Examination Scheme:**

Teaching Scheme				Evaluation Scheme					
L	T	P	C	Internal Evaluation			ESE		Total
				MSE	CE	P	Theory	P	
-	-	6	3	-	-	40	-	60	100

L- Lectures; **T-** Tutorial; **P-** Practical; **C-** Credit; **MSE-** Mid-Semester Evaluation, **CE-** Continuous Evaluation, **ESE-** End Semester Examination

h. **Text Book and Reference Book:**

- Forrest JC. 1975. Principles of Meat Science. Freeman.
- Govindan TK. 1985. Fish Processing Technology. Oxford & IBH.
- Hui YH. 2001. Meat Science and Applications. Marcel Dekker.
- Kerry J. et al. 2002. Meat Processing. Woodhead Publ. CRC Press
- Levie A. 1984. Meat Hand Book. Fourth Edition. AVI Publ.
- Mead M. 2004. Poultry Meat Processing and Quality. Woodhead Publ.

7. Mead GC. 1989. Processing of Poultry. Elsevier

2. List of Experiment

Exp .No.	Name of the Experiment
1	Study of post-mortem changes.
2	Meat cutting and handling. Evaluation of meat quality.
3	Preservation of meat by different methods
4	Evaluation of quality and grading of eggs.
5	Experiments in by-products utilization.
6	Processing of meat and fish, freezing, canning, curing, smoking, drying and pickling.
7	Evaluation of quality and grading of eggs, preparation of egg-products.
8	Visit to slaughter house

(2)

a. **Course Name: Technology of Milk and Milk Products**

b. **Course Code: 11213203**

c. **Prerequisite:** The student should be aware of the contribution of milk composition and products

d. **Rationale:** Acquire knowledge about the milk food

e. **Course Learning Objective:**

CLOBJ 1	Distinguish how individual food components contributes to the overall quality offoods.
CLOBJ 2	Discover new trends with the types of dairy products
CLOBJ 3	Motive processing techniques specific to the dairy industry

f. **Course Learning Outcomes:**

CLO 1	Analyze knowledge on milk source and composition
CLO 2	Explain the various milk processing methods
CLO 3	Evaluate the safety and quality factors that determine the acceptability of the dairy products by consumers

g. **Teaching & Examination Scheme:**

Teaching Scheme				Evaluation Scheme		
				Internal Evaluation	ESE	

L	T	P	C	MSE	CE	P	Theory	P	Total
4	-	0	4	20	20	-	60	-	100

L- Lectures; **T-** Tutorial; **P-** Practical; **C-** Credit; **MSE-** Mid-Semester Evaluation, **CE-** Continuous Evaluation, **ESE-** End Semester Examination

h. Course Content:

Sr. No.	Content	Weightage%	Teaching Hours
1	unit.1: Sources, and composition of milk, processing of market milk, standardization of milk, transportation and distribution of milk.	25	15
	unit.2: Milk product processing-cream, butter, , condensed milk,evaporated milk, whole and skimmed milk powder.	25	15
3	unit.3: standardization of milk and milk products, ice cream, khoa, channa, paneer, milk sweets. Judging and grading of milk and its products.	25	15
4	unit.4: Fermented milk products. cheese, cheese spread, Youghurt, dahi shrikhand and similar products. Dairy equipments and sanitization	25	15
	Total	100%	60

i. Text Book and Reference Book:

1. De S.1980. Outlines of Dairy Technology. Oxford Univ. Press.
2. Henderson JL. 1971. Fluid Milk Industry. AVI Publ. Rathore NS et al. 2008.
3. Fundamentals of Dairy Technology- Theory & Practices. HimanshuPubl Spreer E. 1993.
4. Milk and Dairy Products. Marcel Dekker.
5. Walstra P. 1999. Dairy Technology. Marcel Dekker.
6. Walstra P. (Ed.). 2006. Dairy Science and Technology.
7. Second Edition. Taylor & Francis. Web BH, Johnson AH and Lansford JA. 1987.
8. Fundamentals of Dairy Chemistry. Third Edition. AVI Publ.

a. Course Name: Lab-II Technology of Milk and Milk Products

b. Course Code: 11213204

c. Prerequisite: The student should be aware of the contribution of milk composition and products

d. Rationale: Acquire knowledge about the milk food

e. Course Learning Objective:

CLOBJ 1	Distinguish how individual food components contributes to the overall quality offoods.
CLOBJ 2	Discover new trends with the types of dairy products
CLOBJ 3	Motive processing techniques specific to the dairy industry

f. Course Learning Outcomes:

CLO 1	Distinguish how individual food components contributes to the overall quality offoods.
CLO 2	Discover new trends with the types of dairy products
CLO 3	Motive processing techniques specific to the dairy industry

g. Teaching & Examination Scheme:

Teaching Scheme				Evaluation Scheme					
L	T	P	C	Internal Evaluation			ESE		Total
				MSE	CE	P	Theory	P	
-	-	6	3	-	-	40	-	60	100

L- Lectures; **T-** Tutorial; **P-** Practical; **C-** Credit; **MSE-** Mid-Semester Evaluation, **CE-** Continuous Evaluation, **ESE-** End Semester Examination

h. Experiment List

Exp . No.	Name of the Experiment
1	Sampling and analysis of milk, Sp.gravity, physico chemical properties andcomposition
2	Standardization of milk for markets

3	Clarification and separation of milk
4	Heat processing of milk ±Pasteurization
5	Preparation of Dahi, Shrikhand, Lassi
6	Preparation of khoa and khoa based sweets
7	Preparation of channa, paneer and chana based sweets.
8	Visit to Dairy plant

(3)

a. **Course Name: Food Quality and Safety Management**

b. **Course Code: 11213205**

c. **Prerequisite:** The student should be aware of the Food Quality and Safety Management System

d. **Rationale:** Acquire knowledge about Food Quality and Safety Management

e. **Course Learning Objective:**

CLOBJ 1	Understand various qualitative and quantitative analyses
CLOBJ 2	Discuss knowledge about various food quality control techniques
CLOBJ 3	Identify the different parameters of food products

f. **Course Learning Outcomes:**

CLO 1	Construct various qualitative and quantitative analyses
CLO 2	Discover knowledge gained can be used for food quality control
CLO 3	Apply various qualitative and quantitative analysis methods.

g. **Teaching & Examination Scheme:**

Teaching Scheme				Evaluation Scheme					
L	T	P	C	Internal Evaluation			ESE		Total
				MSE	CE	P	Theory	P	
4	-	0	4	20	20	-	60	-	100

L- Lectures; **T-** Tutorial; **P-** Practical; **C-** Credit; **MSE-** Mid-Semester Evaluation, **CE-** Continuous Evaluation, **ESE-** End Semester Examination

h. **Course Content:**

Sr. No.	Content	Weightage	Teaching Hours
1	Unit.1: Objectives, importance and functions of quality control. Methods of quality, assessment of food materials-fruits, vegetables, cereals, dairy products, meat, poultry, egg and processed food products.	25%	15
2	Unit.2: Sanitation and hygiene, GMP, GLP, Statistical quality control. Food laws and standard, PFA, AGMARK.	25%	15
3	Unit.3: Sampling and specification of raw materials and finished products, Concept of Codex Alimentarius/ /USFDA/ISO 9000 series, rules and regulations for waste disposals	25%	15
4	Unit.4: Food adulteration and food safety. HACCP, Sensory evaluation- introduction, panel screening, Sensory and instrumental analysis in quality control, IPR and patents.	25%	15
	Total	100%	60

i. Text Book and Reference Book:

1. Food Safety and Quality Management, Third Edition by Ronald F. Cichy, Ph.D. and JaeMin Cha
2. Food quality management by Pieter A. Luning and Willem J. Marceli

a. Course Name: Lab-II Food Quality and Safety Management

b. Course Code: 11213208

c. Prerequisite: The student should be aware of Food Quality and Safety Management.

d. Rationale: Acquire knowledge about the Food Quality and Safety Management.

e. Course Learning Objective:

CLOBJ 1	Distinguish how individual food components contribute to the overall quality of foods.
CLOBJ 2	Discover new trends with the types of dairy products quality
CLOBJ 3	Motive processing techniques specific to the dairy industry safety

f. Course Learning Outcomes:

CLO 1	Comprehensive Understanding of Food Safety Regulations.
CLO 2	Knowledge of Implementation of Quality Assurance Systems
CLO 3	Understanding of Sustainability and Ethical Considerations in Food Safety.

g. Teaching & Examination Scheme:

Teaching Scheme				Evaluation Scheme					
L	T	P	C	Internal Evaluation			ESE		Total
				MSE	CE	P	Theory	P	
-	-	6	3	-	-	40	-	60	100

L- Lectures; **T-** Tutorial; **P-** Practical; **C-** Credit; **MSE-** Mid-Semester Evaluation, **CE-** Continuous Evaluation, **ESE-** End Semester Examination

h. Experiment List

Exp No.	Name of the Experiment
1	Assessment of the personal hygiene
2	Microbial examination of the different foods
3	Bacterial analysis of water
4	Assessment of surface sanitation by swab/rinse method
5	Quality analysis of milk sample
6	Sensory tests of food product: Including triangle tests and preference tests on competitor and prototype products
7	Adulteration identification of food sample
8	Quality evaluation of local street food
9	Implementation of HACCP
10	FSSAI License reverification/study for campus food outlets.

i. Text Book and Reference Book:

1. Food Quality and Sensory Evaluation By Mr. V.R. Chavan, Dr. M.D. Sontakke and Dr. R.V. Kal

(4)

- a. **Course Name: Food Additives and Contaminants**
- b. **Course Code: 11213206**
- c. **Prerequisite:** The student should be aware of the Additives and contaminants of Food
- d. **Rationale:** Acquire knowledge about the Additives and contaminants of Food
- e. **Course Learning Objective:**

CLOBJ 1	Understanding different additives and contaminants as per food.
CLOBJ 2	Understanding different methods to detect food additives and contaminants.
CLOBJ 3	Understanding toxicity level and standards of food additives and contaminants as per regulations and regulatory bodies.
CLOBJ 4	Identify and design newer products, with better quality using additives which are economical and safe
CLOBJ 5	Describe the applications of food additives and how to study the toxicity of food additives.

f. **Course Learning Outcomes:**

CLO 1	Discover the importance of additives in maintaining or improving food quality
CLO 2	Describe the applications of food additives and how to study the toxicity of food additives.
CLO 3	Describe the properties, levels of addition and toxicity data of various food additives
CLO 4	Identify and design newer products, with better quality using additives which are economical and safe
CLO 5	Identify the importance of additives in maintaining or improving food quality

g. **Teaching & Examination Scheme:**

Teaching Scheme				Evaluation Scheme		
				Internal Evaluation	ESE	

L	T	P	C	MSE	CE	P	Theory	P	Total
4	-	0	4	20	20	-	60	-	100

L- Lectures; **T-** Tutorial; **P-** Practical; **C-** Credit; **MSE-** Mid-Semester Evaluation, **CE-** Continuous Evaluation, **ESE-** End Semester Examination

h. Course Content:

Sr. no.	Content	Weightage	Teaching hours
1	Unit.1: Additives in food processing and preservation. Their functions and safety. Safety and quality evaluation of additives. Acute and chronic studies. LD50. Analytical methods: chemical and instrumental.	25	15
2	Unit.2: Various additives such as preservatives, antioxidants, emulsifiers, sequesterants, humectants, stabilizers with respect to chemistry, food uses and functions in formulations.	25	15
3	Unit.3: Colours, flavours, sweeteners, acidulants with respect to chemistry, food uses and functions in formulations, indirect food additives.	25	15
4	Unit.4: Food contaminants, physical, chemical, microbial and other contaminants; food toxicants	25	15
	Total	100%	60

i. Text Book and Reference Book:

1. A Guide to Food Additives and Contaminants by K. T. H. Farrer
2. Food Quality and consumer value

- a. **Course Name:** Research Writing and Statistical Analysis
- b. **Course Code:** 11213209
- c. **Prerequisite:** The student should be aware of Research Writing and Statistical Analysis.
- d. **Rationale:** Acquire knowledge about the Research Writing and Statistical Analysis.
- e. **Course Learning Objective:**

CLOBJ 1	Understanding different additives and contaminants as per food.
CLOBJ 2	Understanding different methods to detect food additives and contaminants.
CLOBJ 3	Understanding toxicity level and standards of food additives and contaminants as per regulations and regulatory bodies.
CLOBJ 4	Identify and design newer products, with better quality using additives which are economical and safe
CLOBJ 5	Describe the applications of food additives and how to study the toxicity of food additives.

f. **Course Learning Outcomes:**

CLO 1	Understanding Research Design
CLO 2	Understanding of Data Collection and Analysis Skills.
CLO 3	Knowledge of Critical Evaluation of Research Literature
CLO 4	Ethical Considerations in Research.
CLO 5	Effective Communication of Research Findings.

g. **Teaching & Examination Scheme:**

Teaching Scheme				Evaluation Scheme					
L	T	P	C	Internal Evaluation			ESE		Total
				MSE	CE	P	Theory	P	
4	-	0	4	20	20	-	60	-	100

h. Course Content:

Sr. No	Content	Weightage%	Teaching Hours
1	Unit 1 .1.Philosophy and Ethics in research field: Introduction to philosophy: definition, nature and scope, concept, branches 2. Introduction to research: What is the necessity of research, and how to conduct targeted literature searches.	25%	15
2	Unit 2 .1.Research paper outline: How to write an abstract, an introduction, and a methodology section 2.Publication Ethics: Ethics, stakeholders in research, and ethical issues concerning participants.	25%	15
3	Unit 3 .1.Statistical analysis: Data management, data analysis, and data interpretation. 2. Research design: How to write hypotheses and plan your research design.	25%	15
4	Unit 4.1.Thesis writing: Introduction, Review of literature, Methodology, Results, conclusion and References. 2. Power Point Presentation Skills	25%	15
	Total	100%	60

i. Reference Book:

1. A Guide to Food Additives and Contaminants by K. T. H. Farrer
2. Food Quality and consumer value

Semester – 4

a. Course Name: Dissertation

b. Course Code: 11213252

c. Prerequisite: The student should be aware of the contribution of flesh foods to human nutrition

d. Rationale: Acquire knowledge about the flesh food, meat and poultry

e. Course Learning Objective:

CLOBJ 1	Explore, independently, topics of research importance related to the food industry
CLOBJ 2	Design a research study based on the principles of scientific research

CLOBJ 3	Interpreting, analyzing, and reporting collated data related to a topic of study
CLOBJ 4	Development of skills required for scientific writing and publication

f. Course Learning Outcomes:

CLO 1	Make up plan and execute experiments or undertake literature surveys independently.
CLO 2	Develop the skills to design experiments for solving problems in food research.
CLO 3	Modify their own food products.
CLO 4	Maximize knowledge in marketing and managing the sale of their product

g. Teaching & Examination Scheme:

Teaching Scheme				Evaluation Scheme					
L	T	P	C	Internal Evaluation			ESE		Total
				MSE	CE	P	Theory	P	
-	-	36	18	-	-	200	-	400	600

L- Lectures; **T-** Tutorial; **P-** Practical; **C-** Credit; **MSE-** Mid-Semester Evaluation, **CE-** Continuous Evaluation, **ESE-** End Semester Examination

h. List of Experiment

Exp. No.	Name of the Experiment
1	1. Name of Topic 2. Aim and objective 3. Materials and Methods 4. Analysis 5. Result 6. Future Scope 7. Reference