SEMESTER I

Semester-I **Course Type:** Discipline Specific Course (DSC) **Course Code:** U25MFT101T **Course Title:** Food Chemistry **Category:** Theory **Mode:** Lectures (L) **Hours/week:4** **Credits: 4** **Examination Duration:** 3hrs	**Course Assessment Methods:** ***Note for Paper Setters***: **Max. Marks: 100 (Internal: 30; External: 70)** Two mid-term exams, each of 15 marks, will be conducted for the internal assessment, and the marks of the best one will be considered. Weightage for assignment and class participation will be 10 and 05 marks, respectively. **Note**: The end semester examination will be of 70 marks. The examiner is required to set nine questions in all. The first question will be compulsory, consisting of seven short questions covering the entire syllabus, carrying 2 marks each. In addition to that, eight more questions will be set, two questions from each unit. The students shall be required to attempt five questions in all, selecting one question from each unit in addition to compulsory Question No. 01. All questions shall carry equal marks, i.e., 14 marks.

Course Objectives: To understand the basic properties of different food constituents and chemical changes during food processing.

UNIT-I

Definition, Scope, and Importance of Food Chemistry. Water in food: physical properties, concept of water activity, relation of water activity and preservation. Carbohydrates-Classification, Chemical, physical, and functional properties. Important chemical reactions-Gelatinization, Retrogradation, Dextrinization, Annealing, Caramelization, and Maillard reaction. Glycolysis.

UNIT-II

Lipids: Classification, Chemical, physical, and functional properties of fats and oils. Concept of oxidative and hydrolytic rancidity, reversion, saponification, hydrogenation. β-oxidation of fats, Changes in fats and oils during heating.

UNIT-III

Proteins & Amino Acids: Classification, Chemical, physical, and functional properties. Different sources of proteins. Protein Quality (BV, NPU, PER). Overview of protein synthesis. Enzymes- enzyme kinetics, enzymatic reactions in different food systems.

UNIT-IV

Vitamins: Water-soluble and fat-soluble vitamins, nutritional significance Minerals- Macro, micro minerals and trace elements, nutritional significance. Plant pigments: Chlorophyll, anthocyanins, carotenoids.

Recommended Readings

1. Belitz, H.-D., Grosch, Werner, Schieberle & Peter (2009). Food Chemistry. Singapore: Springer International Publishing AG.
2. Fennema, O.R. (2017). Food Chemistry (5th Ed.). 270 Madison Avenue, New York 10016, Marcel Dekker, Inc.
3. deMan, J.M. (2018). Principles of Food Chemistry (4th Ed.). Maryland, Inc., Gaithersburg: Aspen Publishers.
4. Manay, N.S. &Shadak saraswamy, M. (2008). Food - facts and principles (3rd Revised Ed.). India: New Age International (P) Ltd., Publishers.

Course Outcomes: After the completion of the course, the students will be able to:

RBT Level	**Course Outcomes**
L2	CO1: **Understand** the important properties of the major food components (proteins, carbohydrates, and lipids)
L3	CO2: **Illustrate** the major chemical changes in food constituents during processing
L4	CO3: **Apply** knowledge to predict the processing conditions that are likely to change the reactivity of food components
L5	CO4: **Evaluate** the compositional changes of food constituents for storage stability
L6	CO5: **Develop** innovative food products using knowledge of the chemistry of food constituents

Semester-I **Course Type**: Discipline Specific Course **Course Code**: U25MFT102T **Course Title**: Food Processing and Preservation **Category**: Theory **Mode**: Lectures (L) **Hours/week**: 4 **Credits**: 4 **Examination Duration**: 3 hrs	**Course Assessment Methods:** ***Note for Paper Setters***: Max. Marks: 100 (Internal: 30; External: 70) Two mid-term exams, each of 15 marks, will be conducted for the internal assessment, and the marks of the best one will be considered. Weightage for assignment and class participation will be 10 and 05 marks, respectively. **Note**: The end semester examination will be of 70 marks. The examiner is required to set nine questions in all. The first question will be compulsory, consisting of seven short questions covering the entire syllabus, carrying 2 marks each. In addition to that, eight more questions will be set, two questions from each unit. The students shall be required to attempt five questions in all, selecting one question from each unit in addition to compulsory Question No. 01. All questions shall carry equal marks, i.e., 14 marks.

Course Objectives: To acquaint the students with in-depth understanding of principles and methods of food processing and preservation.

UNIT-I

Scope and importance and historical developments in food processing and preservation. Types of foods and causes of food spoilages (microbial, physical and chemical), general principles of food preservation. Processing and preservation by heat: Heat penetration, heat resistance of microorganisms, thermal death curve, types of heat treatments and effects on foods: extrusion cooking, baking, roasting and frying.

UNIT-II

Processing and preservation by low temperature: difference between chilling, refrigeration, and freezing, refrigeration, components and requirements of a refrigerator, and changes in food during refrigerated storage. Freezing: principles, freezing curves, factors determining freezing rate, types of freezing systems and methods, dehydro-freezing, freeze drying, changes in food during freezing.

UNIT-III

Processing and preservation by reducing moisture: Drying, dehydration, and concentration: Drying-water activity, factors affecting drying rate, Sun drying and solar dehydration, drying curves, drying methods, and types of dryers; their advantages and disadvantages. Intermediate moisture foods (IMF)- principle, characteristics, advantages and problems of IMF foods.

UNIT-IV

Food concentration- methods of food concentration, liquid food concentrates, changes in food during dehydration and concentration. Introduction to novel food processing techniques and

their applications. Chemical Preservatives: Preservation of foods by use of class I and class II preservatives, antibiotics, and smoking.

Recommended Readings

1. Sivasankar, B. (2014). Food processing and preservation: Hall of India Pvt., New Delhi.
2. Fellows, P. J. (2022). Food Processing Technology: Principles and Practice ((5^{th} ed.). Woodhead Publishing.
3. Brennan, J. G. (2012). Food Processing Handbook, Wiley-VCH.
4. Kapoor, S., & Kumar, D. (2024). Engineering Techniques for Food Processing and preservation, Springer.
5. Naik, R. M., & Amin, M. (2022). Food Processing and Preservation. Biotech Books.
6. Potter, N., (2022). Food Science (7^{th} ed.). McGrill Hill.

Course Outcomes: After the completion of the course, the students will be able to:

RBT Level	**Course Outcomes**
L1	CO1: **Understand** the scope, importance, and historical developments in food processing and preservation, and identify the causes of food spoilage (microbial, physical, chemical) while applying general principles of food preservation
L2	CO2: **Evaluate** the effects of heat treatments on food, including heat penetration, heat resistance of microorganisms, and thermal death curves**;** and compare different methods of heat processing (e.g., extrusion cooking, baking, roasting, frying, canning).
L3	CO3: **Apply** refrigeration, freezing, and drying techniques to preserve different food products, and analyze the effects of low temperatures and dehydration on food quality and microbial safety.
L4	CO4: **Analyze** the mechanisms and effects of advanced food preservation technologies, including microwave processing, food irradiation, and freeze-drying, focusing on their impact on food safety, nutrients, and microorganisms
L5	CO5: **Design** integrated food preservation strategies using physical (heat, cold, drying) and chemical methods (preservatives, antibiotics, smoking) to enhance shelf life and ensure food safety.

Semester-I **Course Type:** Discipline Specific Course **Course Code:** U25MFT103T **Course Title:** Food Microbiology **Category:** Theory **Mode:** Lectures (L) **Hours per week:4** **Credits:** 4 **Examination Duration:** **3** hrs	**Course Assessment Methods:** ***Note for Paper Setters:*** **Max. Marks: 100 (Internal: 30; External: 70)** Two mid-term exams each of 15 marks will be conducted for the internal assessment and marks of the best one will be considered. Weightage for assignment and class participation will be 10 and 05 marks, respectively. ***Note:***The end semester examination will be of 70 marks. The examiner is required to set nine questions in all. The first question will be compulsory consisting of consisting of seven short questions covering the entire syllabus consisting of 2 marks each. In addition to that eight more questions will be set, two questions from each unit. The students shall be required to attempt five questions in all selecting one question from each unit in addition to compulsory Question No. 01. All questions shall carry equal marks i.e. 14 marks.

Course Objectives: The course aims to provide essential knowledge about the role of microorganisms in food systems, food spoilage, preservation methods, and industry-relevant applications.

UNIT–I

Food Microbiology: History, Introduction, Significance, and Future. Microorganisms: Bacteria, yeast, mold, viruses, protozoa, and algae. Microbial cell structure and function. Prokaryotes and Eukaryotes. Classification and nomenclature of microorganisms. Microbial nutrition and growth. Reproduction in microorganisms. Sources of microorganisms in foods.

UNIT–II

Factors affecting microbial growth in food: intrinsic and extrinsic. Biochemical changes in food during microbial growth. Food spoilage: types and mechanisms. Microbial spoilage of different food products: milk and milk products, fruits and vegetables, meat, fish, poultry, and other food products. Methods of food preservation: thermal processing, refrigeration, freezing, drying, chemical preservation, irradiation, and hurdle technology.

UNIT–III

Microbial fermentation and fermented foods: significance and classification. Fermented milk products: yoghurt, cheese, Indian curd, buttermilk, kefir, kumis. Fermented fruits and vegetables: sauerkraut, kimchi, olives, pickles, etc. Fermented beverages: wine, beer, vinegar, and other alcoholic beverages. Fermented meat and fish. Traditional Indian fermented food products: vegetables, meat, and fish. Single-cell proteins. Importance of Saccharomyces cerevisiae and lactic acid bacteria in the industry.

UNIT–IV

Detection and enumeration of microorganisms in food products: sample collection and preservation. Direct plating methods, physical methods, chemical methods, biological

methods, and sensor-based methods. Rapid detection tools. Foodborne diseases: definitions, characteristics, and mechanisms. Food infections: E. coli, Salmonella, Shigella, Vibrio, etc. Food intoxications: Clostridium botulinum and Staphylococcus food poisoning. Food toxico-infections. Toxins: types and sources. Introduction to food safety regulations and standards (FSSAI, ISO, Codex). Microbiological criteria and HACCP.

Recommended Readings:

1. Frazier, W. C. and Westhoff, D. C. (2015). Food Microbiology. Tata McGraw Hill, New Delhi.
2. Adams, M. R. & Moss, M. O. (2008). Food Microbiology. Royal Society of Chemistry, Cambridge.
3. Jay, J. M. (2005). Modern Food Microbiology (5th ed.). CBS Publishers, New Delhi.
4. Ray, B. (2004). Fundamental Food Microbiology. CRC Press.
5. Stanier, R.Y. et al. (1996). General Microbiology. MacMillan.
6. Lund, B. M., Baird-Parker, T. C., & Gould, G. W. (2000). The Microbiological Safety and Quality of Food. Aspen Publishers.

Course Outcomes: After the completion of the course, the students will be able to:

RBT Level	Course Outcomes
L1	**CO1:** Define key terms related to food microbiology, such as microorganisms, spoilage, and foodborne illness.
L2	**CO2:** Explain the significance of microorganisms in food production and processing, including both beneficial and detrimental roles.
L3	**CO3:** Apply knowledge of microbial growth conditions to control food spoilage and prevent foodborne illnesses in a practical setting, such as a food processing plant or a restaurant.
L4	**CO4:** Evaluate the effectiveness of different food preservation methods in controlling microbial growth
L5	**CO5:** Design and implement a microbiological analysis protocol to assess the safety and quality of a food product

Semester-I **Course Type:** Discipline Elective Course (DEC) **Course Code:** U25MFT111T **Course Title:** Technology of Beverages **Category:** Theory **Mode:** Lectures **Hours/week:**4 **Credits:** 4 **Examination Duration:** 3 hrs	**Course Assessment Methods:** ***Note for Paper Setters*:** **Max. Marks: 100 (Internal: 30; External: 70)** Two mid-term exams each of 15 marks will be conducted for the internal assessment and marks of the best one will be considered. Weightage for assignment and class participation will be 10 and 05 marks, respectively. ***Note:*** The end semester examination will be of 70 marks. The examiner is required to set nine questions in all. The first question will be compulsory consisting of consisting of seven short questions covering the entire syllabus consisting of 2 marks each. In addition to that eight more questions will be set, two questions from each unit. The students shall be required to attempt five questions in all selecting one question from each unit in addition to compulsory Question No. 01. All questions shall carry equal marks i.e. 14 marks.

Course Objective: The course aims to impart comprehensive knowledge about the processing, quality assessment and technological advancements of various beverages.

UNIT-I

Introduction and Classification of Beverages: Definition, Classification and Importance of beverages. Present status and scope of beverage industry. Water for beverage production: Sources, pretreatments, processing, quality analysis and specifications. Types and quality standards of Bottled/packaged water- Mineral water, Spring water, carbonated water. Overview and functionality of beverage additives and preservatives.

UNIT-II

Types, manufacturing process, chemistry, quality assessment and specifications of beverages: Fruit and Vegetable -based beverages: juices, nectars, squashes, cordial, syrup, RTS and concentrates**.** Carbonated beverages: manufacturing process, technology of carbonation and quality analysis. Alcoholic beverages: beer, wine, and distilled spirits**.**

UNIT-III

Functional beverages: Types, chemistry, manufacturing process, quality assessment and specifications of tea, coffee, and other functional beverages: Health drinks, energy drinks, sports drinks, whey drinks and plant-based milks.

UNIT-IV

Advances in Beverage Processing and Quality Management: Quality Assurance and quality control in the beverage industry**,** Legal regulations and safety aspects in beverage production (alcoholic)**,**

Advances in beverage processing: Non-thermal processing, Robotics and automation and packaging aspects.

Course Outcomes: After the completion of the course, the students will be able to:

RBT Level	Course Outcomes
L2	**CO1: Explain** the classification, importance, and global scope of the beverage industry along with the role of water quality, additives, and preservatives in beverage production.
L3	**CO2: Demonstrate** the processing methods and quality assessment of fruit-based and non-alcoholic beverages including juices, soft drinks, tea, coffee, and cocoa.
L4	**CO3: Analyze** the formulation, nutritional role, and quality evaluation of functional and fortified beverages such as energy drinks, whey beverages, and plant-based milks.
L5	**CO4: Assess** different types, production techniques, and quality parameters of alcoholic beverages like beer, wine, and distilled spirits, considering safety and legal aspects.
L6	**CO5: Design** a basic beverage processing and quality management plan incorporating filtration, carbonation, pasteurization, packaging, and regulatory requirements with consideration of modern technological advancements**.**

Recommended Books:

1. Mudgil D., and Barak S., (2018) Beverages: Processing and technology, Scientific Publisher, India.
2. Varnam A.L., and Sutherland J.M., (2012) Beverages: Technology, Chemistry and Microbiology, An Aspen Publication, USA.
3. Aguilo-Aguayo I., and Plaza L. (2017) Innovative Technologies in Beverage processing, Wiley Blackwell publisher.
4. Ashurst P.R. (1995) Production and packaging of non-carbonated fruit juices and fruit beverages, Springer Science business media.
5. Foster T. and Vasavada P.C. (2003) Beverage Quality and Safety, CRC Press, Taylor and Francis Group, New York.

SEMESTER-I **Course Type: Discipline Elective Course (DEC)** **Course Code:** U25MFT112T **Course Title:** Technology of Fermented Foods **Category:** Theory **Mode:** Lectures (L) **Hours/week: 04** **Credits: 04** **Examination Duration:** 03 hrs	**Course Assessment Methods:** ***Note for Paper Setters***: ***Max. Marks*: 100 (Internal: 30; External: 70)** Two mid-term exams, each of 15 marks, will be conducted for the internal assessment, and the marks of the best one will be considered. Weightage for assignment and class participation will be 10 and 05 marks, respectively. **Note**: The end semester examination will be of 70 marks. The examiner is required to set nine questions in all. The first question will be compulsory, consisting of seven short questions covering the entire syllabus, carrying 2 marks each. In addition to that, eight more questions will be set, two questions from each unit. The students shall be required to attempt five questions in all, selecting one question from each unit in addition to compulsory Question No. 01. All questions shall carry equal marks, i.e., 14 marks.

Course Objective: This course provides a comprehensive understanding of the science and technology behind fermented foods which covers the principles of fermentation, the role of microorganisms, process optimization, product development, quality control, and the health benefits of fermented foods.

UNIT-I

Introduction to Fermentation: Definition, historical perspective, global diversity of fermented foods, economic and nutritional significance. Microbiology of Fermented Foods: Lactic Acid Bacteria, Yeasts, Acetic Acid Bacteria. Metabolic Pathways: Glycolysis, Pentose Phosphate Pathway, Entner-Doudoroff pathway, Fermentation pathways. Role of Starter Cultures: Types, selection, propagation, and maintenance. Factors Affecting Fermentation: Temperature, pH, water activity, nutrient availability, oxygen tension, presence of inhibitors.

UNIT-II

Types of Fermentation Processes: Batch, Fed-batch, Continuous fermentation, Solid-state fermentation (SSF) vs. Submerged fermentation (SmF). Immobilized cell systems in food fermentation. Bioreactor Design, operation and types of bioreactors sterilization techniques (in-situ, clean-in-place). Process Control and Optimization: Monitoring and control parameters. Mass and heat transfer in bioreactors. Kinetics of microbial growth and product formation. Downstream Processing in fermented foods. Product recovery and purification (extraction, distillation, chromatography). Concentration and drying techniques.

UNIT-III

Technology of Specific Fermented Food Products: Fermented Dairy Products: Yogurt, Kefir, Kumiss, Buttermilk. Cheese: Different types, cheese making principles, ripening process. Probiotic dairy products. Fermented Cereal Products: Bread: Sourdough, yeast-leavened bread. Overview of processing beer, wine, traditional alcoholic beverages (e.g., Sake, toddy). Other cereal fermentations: Idli, Dosa, Tempeh, Miso, Natto. Fermented Fruit and Vegetable Products: Pickles (Sauerkraut, Kimchi, Cucumber pickles). Vinegar production. Fermented Meat and Fish Products (Fish sauce, paste and pickle).

UNIT-IV

Quality Control, Safety, and Health Aspects of Fermented Foods. Microbiological, Chemical, Physical and Sensory quality parameters of fermented products. Good Manufacturing Practices (GMP), Good Hygiene Practices (GHP), Hazard Analysis and Critical Control Points (HACCP) plan in fermented food industry. Strategies for ensuring safety (starter culture selection, process control, hygiene). Food regulations and standards for fermented foods. Nutritional and Health Benefits: Enhanced nutrient bioavailability, Production of bioactive compounds (vitamins, short-chain fatty acids, peptides), Impact on gut microbiome and human health. Probiotics, prebiotics and synbiotics in fermented foods. Emerging Trends and Future of Fermented Foods**.**

Recommended readings

1. Hutkins, R. W. (2018). Microbiology and technology of fermented foods (2nd ed.). Wiley-Blackwell.
2. Katz, S. E. (2012). The art of fermentation: An in-depth exploration of essential concepts and processes from around the world. Chelsea Green Publishing.
3. Mitchell, D. A., Krieger, N., & Berović, M. (Eds.). (2006). Solid-state fermentation bioreactors: Fundamentals of design and operation. Springer.
4. Potter, N. N., & Hotchkiss, J. H. (Current Edition). Food science (5th ed.). Springer.
5. Stanbury, P. F., Whitaker, A., & Hall, S. J. (2017). Principles of fermentation technology (3rd ed.). Elsevier Science & Technology.
6. Cruger W., and Kruger (2002), Biotechnology –A Textbook of Industrial Microbiology, 2ndEdition, Panima Publishing Corporation, New Delhi

Course Outcomes: After the completion of the course, the students will be able to:

RBT Level	Course Outcomes
L1	**CO1**: **List** the key microbial groups (e.g., Lactic Acid Bacteria, yeasts) and their distinguishing characteristics involved in various traditional fermented food products.
L2	**CO2: Explain** the biochemical pathways (e.g., glycolysis, fermentation pathways) and the role of starter cultures in shaping the sensory and preservative qualities of fermented foods.

L3	**CO3**: **Utilize** the principles of bioreactor operation and process control to design a basic fermentation process for a specific fermented food product, considering parameters like temperature and pH.
L4	**CO4**: **Differentiate** and critically evaluate the impact of different downstream processing techniques (e.g., extraction, drying) on the yield, purity, and quality of bioactive compounds from fermented foods.
L5	CO5: **Assess** the effectiveness of various quality control measures (e.g., HACCP, GMP) and food safety strategies in ensuring the microbiological safety and nutritional value of novel fermented food products.

Semester-I **Course Type: Elective Course (DEC)** **Course Code:** U25MFT113T **Course Title:** Technology of Confectionery Products **Category:** Theory **Mode:** Lectures (L) **Hours/week:4** **Credits: 4** **Examination Duration:** 3 hrs	**Course Assessment Methods:** ***Note for Paper Setters***: ***Max. Marks*: 100 (Internal: 30; External: 70)** Two mid-term exams, each of 15 marks, will be conducted for the internal assessment, and the marks of the best one will be considered. Weightage for assignment and class participation will be 10 and 05 marks, respectively. **Note**: The end semester examination will be of 70 marks. The examiner is required to set nine questions in all. The first question will be compulsory, consisting of seven short questions covering the entire syllabus, carrying 2 marks each. In addition to that, eight more questions will be set, two questions from each unit. The students shall be required to attempt five questions in all, selecting one question from each unit in addition to compulsory Question No. 01. All questions shall carry equal marks, i.e., 14 marks.

COURSE OBJECTIVE: To impart comprehensive knowledge and technical skills related to the formulation, processing, quality control, and packaging of various confectionery products.

UNIT-I

Definition and classification of confectionery products (sugar-based and chocolate-based), Status of the confectionery industry. Composition and functional role of ingredients: sugars, sweeteners, acids, fats, milk solids, gums, etc. Physical and chemical properties of sugars and their behavior in confectionery systems (crystallization, inversion, Maillard reaction, caramelization). Types of equipment used in the processing of confectionery products.

UNIT-II

Process technology of Hard candies (boiled sweets); Toffees and caramels, Fondants and fudges; Jellies and gums; Lozenges and marshmallows. Sugar Panned confectionery products. Chewing and bubble gum. Defects in sugar confectionery and their control.

UNIT-III

Cocoa bean processing: Cocoa mass, cocoa butter, and cocoa powder. Types of chocolates: dark, milk, white, compound, and couverture. Chocolate processing: mixing, refining, conching, tempering, molding, enrobing. Chocolate Panning. Quality defects in chocolate and control measures.

UNIT-IV

Quality parameters of confectionery products: texture, moisture content, viscosity, and shelf life. Packaging requirements and types of packaging for confectionery products. Regulatory standards for confectionery products. Trends and innovations: sugar-free, herbal confectionery(lozenges).

Recommended readings

1. Hartel, R. W., von Elbe, J. H., &Hofberger, R. (2018). Confectionery science and technology.
2. Minifie, B. (2012). Chocolate, cocoa and confectionery: science and technology. Springer Science & Business Media.
3. Lees, R. (2012). Sugar confectionery and chocolate manufacture. Springer Science & Business Media.

Course Outcomes: After the completion of the course, the students will be able to:

RBT Level	**Course Outcomes**
L2	CO1: **Identify** the basic ingredients, classifications, and processing terminology related to sugar and chocolate-based confectionery products.
L3	CO2: **Explain** the physicochemical changes and role of ingredients during the manufacturing of various confectionery products
L4	CO3: **Demonstrate** the process operations and equipment used in the preparation of sugar and chocolate confectionery products through practical lab or pilot-scale trials
L5	CO4: **Analyze** the causes of common quality defects in confectionery products and suggest appropriate control strategies during processing and packaging
L6	CO5: **Design** innovative products/technology by modifying processing methods, considering current market trends and food safety regulations

Semester-I **Course Type: Practicum (PC-I)** **Course Code:** U25MFT104P **Course Title:** Composition and Microbiological Analysis of Foods Lab **Category:** Lab **Mode:** Practical (P) **Hours/week: 6** **Credits: 3** **Examination Duration:** 6 Hours	**Course Assessment Methods:** ***Note for Paper Setters***: **Max. Marks: 75 (Internal:25; External: 50)** The internal assessment will be based on internal assessment test (10 Marks), assignment/quiz/class test etc. (10 Marks) and class participation of 05 marks. External evaluation will be based on submission of practical records (10 Marks), viva-voce (10Marks) and written exam with lab performance (30 Marks). The internal examination will be conducted by the course coordinator. The external examination will be conducted by external examiner appointed by the Controller of Examination in association with the internal examiner appointed by the Chairperson of the Department.

Course objective: To provide hands-on training in the basic analysis of food constituents and equip students with skills to detect, enumerate, and characterize microorganisms in various food products using microbiological techniques.

List of Practicals:

1. Preparation of standard solutions.
2. Determination of moisture content by hot air oven/Vacuum oven/ Karl-Fischer titration method
3. Estimation of crude fat content using the Soxhlet extraction method
4. Estimation of protein content by using the Kjeldahl method/Lowry's method/ Dumas method
5. Determination of total ash content (dry & wet ashing), acid-insoluble ash, sulphated ash
6. Estimation of total carbohydrates by Molisch test and anthrone reagent method.
7. Estimation of crude fibre content by acid & basic hydrolysis.
8. Determination of pH and Titratable acidity in food samples
9. Estimation of total soluble solids in different food samples using refractometer.
10. Estimation of total sugars (anthrone reagent method), reducing (Fehling reagent test), and non-reducing sugars (benedicts reagent test) content.
11. Estimation of starch content in food samples by iodine test, anthrone reagent method.
12. Estimation of minerals using Atomic Absorption Spectrophotometer.
13. Estimation of Iodine value, free fatty acids, acid value, peroxide value, and rancidity for fats and oils
14. Introduction to Good Laboratory Practices in Microbiology. Introduction to safety rules and lab equipments.
15. Gram Staining
16. Preparation and Sterilization of Media
17. To Estimate the Total Bacterial Count of Soil Sample

18. To Determine Yeast and Mold Count of Soil Sample (Colony Count)
19. MPN Method for Testing of Water
20. Direct Microscopic Count of Microorganisms
21. Isolation of Microorganisms by Serial Dilution and Streak Plating
22. Preservation of Pure Culture
23. Microbiological Testing of Food Products
24. MBRT (Methylene Blue Reduction Test) for Microbiological Quality of Milk
25. Detection of pathogens in food.

Course Outcomes: After the completion of the course, the students will be able to:

RBT Level	**Course Outcomes**
L2	CO1: **List** the standard protocols and reagents used for proximate composition and microbiological testing of food samples.
L3	CO2: **Explain** the principles behind analytical techniques and colony counting for microbial enumeration
L4	CO3: **Perform** accurate estimation of food components (e.g., moisture, protein, fat) and basic microbial tests like plate count, MPN, and serial dilution
L5	CO4: **Interpret** the results of composition and microbial analyses to assess food quality, spoilage, or safety issues
L6	CO5: **Evaluate** the microbiological quality of food samples using standard methods and suggest corrective actions if required

Semester-I **Course Type: Practicum (PC-II)** **Course Code:** U25MFT114P **Course Title:** Technology of Beverages Lab **Category:** Lab **Mode:** Practical (P) **Hours/week: 6** **Credits: 3** **Examination Duration:** 6 Hours	**Course Assessment Methods:** ***Note for Paper Setters***: **Max. Marks: 75 (Internal:25; External: 50)** The internal assessment will be based on internal assessment exam (10 Marks), assignment/quiz/class test etc. (10 Marks) and class participation of 05 marks. External evaluation will be based on submission of practical records (10 Marks), viva-voce (10Marks) and written exam with lab performance (30 Marks). The internal examination will be conducted by the course coordinator. The external examination will be conducted by external examiner appointed by the Controller of Examination in association with the internal examiner appointed by the Chairperson of the Department.

Course objective: To provide hands-on training in formulation, processing, quality evaluation, and packaging of various beverages, integrating theoretical knowledge with industrial practices.

List of Practicals

1. Analysis of water quality (pH, TDS, hardness) for beverage production
2. Identification/Qualitative and quantitative evaluation of common additives and preservatives in beverages (e.g citric acid, benzoates, colors).
3. Identification and classification of Marketed beverages (fruit-based, carbonated, alcoholic, stimulating etc.)
4. Sensory evaluation techniques in beverage testing like fruit juices, tea, coffee, and cocoa based beverages.
5. Preparation of fresh fruit juice and its TSS and acidity evaluation.
6. Formulation, evaluation (TSS, acidity) and preservation of seasonal fruit squash.
7. Preparation and evaluation of Ready-to-Serve RTS Beverage.
8. Processing and sensory evaluation of carbonated soft drinks.
9. Comparative assessment of different commercially available tea.
10. Formulation of functional health drinks (e.g. vitamin enriched fruit blend, antioxidant rich juice), whey-based beverages (fruits-based whey beverages)
11. Formulation of Plant-based beverages (e.g. soy milk, oat milk)
12. Demonstration of fermentation and preparation of grape wine (seasonal fruit wine) or malt and beer production.
13. Study of packaging and Labeling of Beverages as per FSSAI guidelines.
14. Cap leakage testing in bottled beverage.
15. Visit to a beverage processing Unit.

Recommended Books:

1. Mudgil D., and Barak S., (2018) Beverages: Processing and technology, Scientific Publisher, India.
2. Varnam A.L., and Sutherland J.M., (2012) Beverages: Technology, Chemistry and Microbiology, An Aspen Publication, USA.
3. Aguilo-Aguayo I., and Plaza L. (2017) Innovative Technologies in Beverage processing, Wiley Blackwell publisher.
4. Ashurst P.R. (1995) Production and packaging of non-carbonated fruit juices and fruit beverages, Springer Science business media.
5. Foster T. and Vasavada P.C. (2003) Beverage Quality and Safety, CRC Press, Taylor and Francis Group, New York.

Course Outcomes: After the completion of the course, the students will be able to:

RBT Level	**Course Outcomes**
L2	CO1: **Explain** the importance of water quality, food additives, preservatives, and beverage classification in beverage processing.
L3	CO2: **Demonstrate** the preparation and preservation of various fruit-based and functional beverages (juices, squashes, RTS, whey, and plant-based drinks) and assess their quality.
L4	CO3: **Analyze** sensory, physical, and chemical properties of different beverages including tea, coffee, cocoa, and carbonated drinks.
L5	CO4: **Evaluate** beverage processing techniques such as fermentation, clarification, filtration, and carbonation for alcoholic and non-alcoholic beverages.
L6	CO5: **Design** appropriate packaging, labeling, and premix formulations of beverages in compliance with FSSAI guidelines and industrial standards.

Semester-I **Course Type: Practicum (PC-II)** **Course Code:** U25MFT115P **Course Title:** Technology of Fermented Foods Lab **Category:** Lab **Mode:** Practical (P) **Hours/week: 6** **Credits: 3** **Examination Duration:** 6 hrs	**Course Assessment Methods:** ***Note for Paper Setters***: **Max. Marks: 75 (Internal:25; External: 50)** The internal assessment will be based on internal assessment exam (10 Marks), assignment/quiz/class test etc. (10 Marks) and class participation of 05 marks. External evaluation will be based on submission of practical records (10 Marks), viva-voce (10Marks) and written exam with lab performance (30 Marks). The internal examination will be conducted by the course coordinator. The external examination will be conducted by external examiner appointed by the Controller of Examination in association with the internal examiner appointed by the Chairperson of the Department.

Course Objectives: To understand the principles of fermentation: Explain the biochemical and microbiological principles underlying fermentation processes

List of Practicals:

1. Prepare yogurt using different types of milk and bacterial cultures.
2. Investigate the effect of different fermentation conditions on sauerkraut quality.
3. Prepare kimchi using different ingredients and fermentation conditions.
4. Study the fermentation process of idli/dosa batter and its effect on texture and flavor.
5. Prepare cheese using different types of milk and bacterial cultures.
6. Investigate the effect of different fermentation conditions on kombucha quality.
7. Prepare sourdough bread using different types of starter cultures.
8. Prepare miso using different ingredients and fermentation conditions.
9. Preparation of wine.
10. Isolate and characterize probiotic microorganisms from fermented foods.
12. Evaluate the safety of fermented foods by testing for pathogens and toxins.
13. Conduct sensory evaluation of different fermented foods.
14. Investigate the effect of packaging materials on fermented food quality and shelf life.
15. Scale up the production of a fermented food product and evaluate its quality.

Course Outcomes: After the completion of the course, the students will be able to:

RBT Level	Course Outcomes
L2	CO1: **Explain** the principles of fermentation and its application in food production.
L3	CO2: **Demonstrate** the preparation of various fermented foods.
L4	CO3: **Analyse** the quality and safety of fermented foods
L5	CO4: **Apply** knowledge of fermentation kinetics and microbiology to optimize fermented food production
L6	CO5: **Design and develop** different types of fermented foods using various microorganisms and fermentation conditions.

Semester-I **Course Type: Practicum (PC-II)** **Course Code:** U25MFT116P **Course Title:** Technology of Confectionery Products Lab **Category:** Lab **Mode:** Practical (P) **Hours/week: 6** **Credits: 3** **Examination Duration:** 6 hrs	**Course Assessment Methods:** ***Note for Paper Setters***: **Max. Marks: 75 (Internal:25; External: 50)** The internal assessment will be based on internal assessment exam (10 Marks), assignment/quiz/class test etc. (10 Marks) and class participation of 05 marks. External evaluation will be based on submission of practical records (10 Marks), viva-voce (10Marks) and written exam with lab performance (30 Marks). The internal examination will be conducted by the course coordinator. The external examination will be conducted by external examiner appointed by the Controller of Examination in association with the internal examiner appointed by the Chairperson of the Department.

Course Objective: To develop practical skills in the formulation, processing and quality evaluation of various confectionery products

List of practicals

1.Preparation of sugar solutions of different concentrations and estimation of their strength using a refractometer.

2. Quality evaluation of sugar, jaggery and honey

3. Determination of thread, soft ball, hard ball, soft crack, and hard crack stages in cooking of sugar

4. Preparation of invert sugar

5. Preparation of fondant or fudge

6. Preparation of different types of toffee and candies

7. Preparation of dry and wet caramel

8. Preparation of fruit jellies or gummies using pectin, agar, or gelatin

9. Preparation of candies using artificial and natural sweeteners

10. Development of herbal confectionery or lozenges

11. Preparation of chocolate and chocolate-coated products

12. Quality evaluation tests of developed confectionery products- Moisture content, color, pH, TSS, and sensory evaluation

13. Collection of packaging materials of different confectionery products to understand the properties of packaging materials in preventing the spoilage of contained products

14. Visit to the confectionery manufacturing unit

Course Outcomes: After the completion of the course, the students will be able to:

RBT Level	**Course Outcomes**
L2	CO1: **Identify** the basic ingredients, classifications, and processing terminology related to sugar and chocolate-based confectionery products.
L3	CO2: **Analyze** the ingredients and formulations used in confectionery products
L4	CO3: **Demonstrate** processing techniques for preparing confectionery products
L5	CO4: **Evaluate** the quality and texture of confectionery products
L6	CO5: **Design and develop** new confectionery products using various ingredients and techniques

Semester-I **Course Type: Value Added Course (VAC)** **Course Code:** U25VAC116T **Course Title:** Indian Traditional Foods **Category:** Theory **Mode:** Lectures (L) **Hours/week:**2 **Credits:** 2 **Examination Duration:** 3 hrs	**Course Assessment Methods:** ***Note for Paper Setters***: **Max. Marks**: 50 (Internal: 15; External: 35) Two mid-term exams each of 10marks will be conducted for the internal assessment and marks of the best one will be considered. Weightage for class participation will be 05 marks. **Note:** The end semester examination will be of 35 marks. The examiner is required to set five questions in all. The first question will be compulsory consisting of five short questions covering the entire syllabus consisting of 3 marks each. In addition to that four more questions will be set, with two questions from each unit. The students shall be required to attempt three questions in all, selecting one question from each unit carrying 10 marks each, in addition to compulsory Question No. 01 carrying 15 marks.

Course Objective: The course aims to acquaint the students about cultural, nutritional and functional significance of traditional Indian foods.

UNIT-I

Traditional Indian Food Systems and Processes: Overview of traditional Indian diets and culinary heritage. Classification of traditional Indian foods: fermented, non-fermented, dairy-based, grain-based, and fermented beverages. Traditional methods of food processing and preservation such as sun drying, pickling, fermentation, etc. Examples include fermented rice-lentil batters (Idli, Dosa – South India), pickled mango and lemon (North India), sun-dried vegetables and papads (Western India), fermented milk products (Dahi, Chhach – Pan India). Scientific logic: fermentation enhances bioavailability of nutrients; pickling preserves microbial balance. Role of traditional Indian ingredients like turmeric, ginger, garlic in modern food systems.

UNIT-II

Traditional Knowledge and Functional Aspects of Indian Foods: Significance of traditional knowledge in food preparation and preservation. Nutritional and health benefits of traditional Indian foods. Functional foods and bioactive compounds in traditional recipes. Scientific validation and standardization of traditional methods. Opportunities and limitations in adapting traditional practices to contemporary food technology. Examples include the use of moringa leaves in South India, bajra and jowar in Rajasthan, sattu in Bihar, and bamboo shoot recipes in Northeast India – each with cultural logic and nutritional rationale.

Recommended Readings:

- Kurien, V. (Ed.). (2004). Traditional Foods of India. ICAR.

- Riar, C. S., & Saxena, D. C. (2014). Traditional Indian Foods: A Comprehensive Review. Springer.
- Sethi, S. (2018). Fermented Foods and Beverages of India: Science History and Culture. CRC Press.
- Joshi, V.K. (2016). Indigenous Fermented Foods of South Asia. CRC Press.
- Ray, R.C., & Montet, D. (2014). Microorganisms and Fermentation of Traditional Foods. CRC Press.

Course Outcomes: After the completion of the course, the students will be able to:

RBT Level	**Course Outcomes**
L2	CO1: **Explain** the diversity and classification of traditional Indian foods.
L3	CO2: **Illustrate** traditional processing and preservation techniques.
L4	CO3: **Analyze** the nutritional and functional aspects of traditional Indian recipes.
L5	CO4: **Evaluate** the scientific basis and health benefits of traditional practices.
L6	CO5: **Develop** innovative food concepts using traditional Indian knowledge.

SEMESTER-II

Semester-II **Course Type:** Discipline Specific Course **Course Code:** U25MFT201T **Course Title:** Technology of Cereals, Pulses & Oilseeds **Category:** Theory **Mode:** Lectures (L) **Hours/week:4** **Credits: 4** **Examination Duration:** 3 Hours	**Course Assessment Methods:** ***Note for Paper Setters***: **Max. Marks**: 100 (Internal: 30; External: 70) Two mid-term exams each of 15 marks will be conducted for the internal assessment and marks of the best one will be considered. Weightage for assignment and class participation will be 10 and 05 marks, respectively. **Note**: The end semester examination will be of 70 marks. The examiner is required to set nine questions in all. The first question will be compulsory consisting of seven short questions covering the entire syllabus carrying of 2 marks each. In addition to that eight more questions will be set, two questions from each unit. The students shall be required to attempt five questions in all, selecting one question from each unit in addition to compulsory Question No. 01. All questions shall carry equal marks i.e. 14 marks.

Course Objective: The course aims to acquaint the students about detailed manufacturing process technologies of cereals, pulses and oilseeds in food industries.

UNIT-I

History, Introduction, Production and Utilization trends of different cereals, pulses and oilseeds; Structure and composition of wheat, Physico-chemical quality attributes of wheat, Wheat milling – general principle, cleaning, conditioning and milling systems. Dough rheology and dough testing apparatus. Technology of bread, biscuit, cake, cookie and cracker manufacture. Wheat flour constituents and their role in product quality, Durum wheat-chemistry, quality and technology of pasta products.

UNIT-II

Rice grain structure and chemical composition. Rice milling unit operations – dehusking, paddy separation, polishing and grading. Factors affecting rice yield during milling. By-products of rice milling and their utilization. Parboiling of rice- principle, techniques and importance. Composition, milling & processing of sorghum, oats and millets. Wet and dry milling of corn.

UNIT-III

Pluses composition & milling, Nutritional composition, Anti-nutritional factors in pulses, methods to reduce the anti-nutritional factors, Present status of pulse milling industry in India; Modern techniques in dal mills; Cooking quality of dhal, Pulses by products utilization.

UNIT-IV

Oilseeds composition & milling, Importance of oilseeds processing industry in India. Preconditioning of oilseeds for improving extraction efficiency. Expeller and solvent extraction process and equipment. preparation of protein concentrate, isolates and their use in high protein foods.

Recommended Readings

1. Tiwari, B. K., Gowen, A., & McKenna, B. (Eds.) (2020). Pulse foods: processing, quality and nutraceutical applications. Academic Press.
2. Owens, G., (2015). Cereals Processing Technology, Bio-green Elsevier.
3. Chakraborth A. (2008). Post-Harvest Technology of Cereals, Pulses and Oil seeds, 3rd Edition, Oxford &lbh Publishing Co. Pvt. Ltd.
4. Kulp K. & Ponte J. G. (2014). Handbook of Cereal Science & Technology, 2nd edition: CRC press.
5. Wrigley C.W. & Batey I. L. (2010). Cereal grains, assessing and managing quality, CRC press.

Course Outcomes: After the completion of the course, the students will be able to:

RBT Level	Course Outcomes
L2	CO1: **Review** the recent advancement in the quality of major cereal, pulses and oilseed grains
L3	CO2: **Demonstrate** the mechanism underlying the interaction of various flour components and their role in end use quality.
L4	CO3: **Appraise** the basic and advanced milling methods for wheat, rice, maize and pulses.
L5	CO4: **Evaluate** the performance of oil and protein extraction methods
L6	CO5: **Development** of value-added products from cereals, pulses & oilseed

Semester-II **Course Type**: DSC **Course Code**: U25MFT202T **Course Title**: **Post-Harvest Technology of Fruits and Vegetables** **Category**: Theory **Mode**: Lectures (L) **Hours/week**: 4 **Credits**: 4 **Examination Duration**: 3 hrs	**Course Assessment Methods:** ***Note for Paper Setters***: **Max. Marks**: 100 (Internal: 30; External: 70) Two mid-term exams each of 15 marks will be conducted for the internal assessment and marks of the best one will be considered. Weightage for assignment and class participation will be 10 and 05 marks, respectively. **Note**: The end semester examination will be of 70 marks. The examiner is required to set nine questions in all. The first question will be compulsory consisting of seven short questions covering the entire syllabus carrying of 2 marks each. In addition to that eight more questions will be set, two questions from each unit. The students shall be required to attempt five questions in all, selecting one question from each unit in addition to compulsory Question No. 01. All questions shall carry equal marks i.e. 14 marks.

Course objectives: To acquaint the students with post-harvest physiology, biochemical changes, and proper post-harvest handling methods of fruits and vegetables, and to understand various technological aspects of fruit and vegetable processing and preservation, along with waste utilization techniques.

UNIT-I

Scope and importance of fruits and vegetables processing in India: classification, composition and nutritional significance of fruits and vegetables, pre and post-harvest losses, factors influencing post-harvest physiology, respiration quotient (RQ), climacteric phenomena, physical and chemical indices of crop maturity and ripening (role of ethylene), maturity standards, biochemical changes during maturation and ripening. De-greening and artificial ripening.

UNIT-II

Post-harvest treatments and handling methods; conditions for transportation and storage, cold chain, and commercial cooling systems, methods of storage: refrigerated, controlled atmosphere and hypobaric storage. Types of packaging of fruits and vegetables, modified atmosphere packaging- role of gases, and influence of MAP on microorganisms, advantages and disadvantages, designing of MAP system based on RQ. Pre-processing operations: washing, blanching, peeling, sorting and grading of raw materials.

UNIT-III

Technology of production of jam, jellies and marmalades, specifications, role of pectin and theories of gel formation. Fruit and vegetables juices: preparation of juice, (juice extraction and clarification methods), syrups, squashes, cordials and nectars, fruit juice concentrates and powders, their specifications and packaging. Tomato products, preserved and candied fruits, pickles and chutneys, dehydrated fruit products.

UNIT-IV

Canning and bottling of fruits and vegetables: preparation of syrups and brines, can reforming and can seaming. Stages of new product development (NPD), by-products from fruit and vegetable wastes, utilization and disposal of fruit industry wastes, Minimal processing of fruits and vegetables, quality factors for processing.

Recommended Readings:

1. Girdhari Lal, Siddappa and Tandon, G.L. (2009). Preservation of Fruits and Vegetables. Bombay Popular Prakashan.
2. John, P. J. (2024). Handbook on Post Harvest Management of Fruits and Vegetables. Daya Publishing House.
3. Srivastava, R. P. & Kumar, S. (2019). Fruit and Vegetable Preservation– Principles and Practices (3rd ed.): International Book distributing Co., Lucknow (India).
4. Bhardwaj, R. L., Sharma, Y.K., &Vyas, L. (2022). Post-harvest Handling of Horticultural Crops. CRC Press.
5. Joshi, V.K. (2021). Post harvest Management of Fruits and Vegetables. NIPA publishers.

Course Outcomes: After the completion of the course, the students will be able to:

RBT Level	Course Outcomes
L4	CO1: **Analyze** the scope, importance, and physiological aspects of post-harvest technology in fruits and vegetables.
L5	CO2: **Evaluate** post-harvest handling practices, storage systems, and packaging methods for ensuring quality retention in fruits and vegetables**.**
L3	CO3: **Apply** appropriate processing techniques for manufacturing various fruit and vegetable-based products, including beverages, preserves, and canned goods.
L6	CO4: **Design** new products and processes using post-harvest produce with emphasis on waste utilization and sustainability**.**
L6	CO5: **Assess** minimal processing and quality standards including legal frameworks like FPO for processed fruit and vegetable products.

SEMESTER-II **Course Type: Discipline Specific Course** **Course Code:** U25MFT203T **Course Title: Food Engineering** **Category:** Theory **Mode:** Lectures (L) **Hours/week: 4** **Credits: 4** **Examination Duration: 3** hrs	**Course Assessment Methods:** ***Note for Paper Setters:*** **Max. Marks**: 100 (Internal: 30; External: 70) Two mid-term exams each of 15 marks will be conducted for the internal assessment and marks of the best one will be considered. Weightage for assignment and class participation will be 10 and 05 marks, respectively. **Note**: The end semester examination will be of 70 marks. The examiner is required to set nine questions in all. The first question will be compulsory consisting of seven short questions covering the entire syllabus carrying of 2 marks each. In addition to that eight more questions will be set, two questions from each unit. The students shall be required to attempt five questions in all, selecting one question from each unit in addition to compulsory Question No. 01. All questions shall carry equal marks i.e. 14 marks.

Course Objective: To provide the fundamental knowledge of physical, thermal and rheological aspects of food engineering for efficient food processing.

UNIT-I

Introduction to physical properties (size, shape, porosity, bulk density etc.) of the food material. Rheological properties of solid and liquid; fluid static and dynamic, thermal properties, electrical properties, optical properties, hydro and aerodynamic properties. etc, Mass and energy balance.

UNIT-II

Different unit operations in food processing (size separation, size reduction, mixing, concentrations, centrifugation, extraction, distillation etc.). Development of specifications for various unit operations of process foods.

UNIT-III

Psychrometry and its applications, Refrigeration operation, principle of heat transfer (steady state and unsteady state), types of evaporators. Freezing: theory, freezing curve.

UNIT-IV

Simultaneous heat and mass transfer during drying and dehydration. Freeze drying, spray drying, phase and state transfer, glass transition temperature and its application.

Recommended Readings:

1. Fellow P.J. (2000) Food processing technology, Principles and practice 2nd Edition, CRC.
2. Earle R. L. (1983). Unit Operations in Food Processing, 2nd Edition, Pergamon Press.
3. Singh R. P. & Heldman D. R. (1984). Introduction to Food Engineering, Academic Press.
4. Singh R.P and Heldman, D.R. (2009). Introduction to Food Engineering 4th Edition. Elsevier Publication.
5. Toledo, R.T. (2007). Fundamentals of Food Process Engineering. 3rd Edition. Springer Publication.

Course Outcomes: After the completion of the course, the students will be able to:

RBT Level	Course Outcomes
L1	CO1: **Describe** the basic principle and significance of different unit operations in food processing.
L2	CO2: **Explain** the unit operation concepts and laws associated with the food processing operations.
L3	CO3: **Interpret** the relationship between different processing methods and their effects on the food quality.
L4	CO4: **Examine** the suitability of food processing operations in food production systems.
L5	CO5: **Formulate** safe food handling practices for efficient processing operations.

Semester- II **Course Type: DEC** **Course Code:** U25MFT211T **Course Title:** Nutrition & Dietetics **Category:** Theory **Mode:** Lectures (L) **Hours/week:**4 **Credits:** 4 **Examination Duration:** 3 hrs	**Course Assessment Methods:** ***Note for Paper Setters***: **Max. Marks**: 100 (Internal: 30; External: 70) Two mid-term exams each of 15 marks will be conducted for the internal assessment and marks of the best one will be considered. Weightage for assignment and class participation will be 10 and 05 marks, respectively. **Note**: The end semester examination will be of 70 marks. The examiner is required to set nine questions in all. The first question will be compulsory consisting of seven short questions covering the entire syllabus carrying of 2 marks each. In addition to that eight more questions will be set, two questions from each unit. The students shall be required to attempt five questions in all, selecting one question from each unit in addition to compulsory Question No. 01. All questions shall carry equal marks i.e. 14 marks.

Course Objective: The course aims to acquaint the students about the importance of nutrition, health and the effectiveness with the curation of various diseased health conditions.

UNIT-I

Introduction to nutrition - Food as source of nutrients, functions of food, definition of nutrition, nutrients & energy, adequate, optimum & good nutrition, malnutrition. Nutrition - Fitness, Athletics & Sports. Food guide - Basic five food groups. How to use food guide (according to R.D.A.)

UNIT-II

Role of macronutrients, macronutrients, water and fibres in human nutrition. Interrelationship between nutrition & health. Food Metabolism- digestion, absorption and bioavailability of nutrients.

UNIT-III

Basic concepts of diet therapy. Principles of diet therapy & therapeutic nutrition for changing needs. Adaptation of normal diet for changing needs. Patient specified diets - Regular diet, light diet, full liquid and tube feeding. Modification of diet - Febrile conditions, infections and surgical conditions. Diet for obesity and cardiovascular disorders.

UNIT-IV

Therapeutic Diets: Basic Concept, Therapeutic Adaptation of Normal Diet, Factors Considered, Routine Hospital Diets, Mode of feeding methods, Role of dietitian in the Hospital and Community, Patient Care and Counselling. Basic concepts of diet therapy. Principles of diet therapy & therapeutic nutrition for changing needs. Adaptation of normal diet for changing needs. Diet in Diseases of Gastro Intestinal Tract, Diet in Fevers, Anaemia, Food Intolerances and Food Allergy, Treatment and Management.

Recommended Readings:

1. Raghuvanshi, R.S. and Mittal, M. (2014). Food Nutrition and Diet Therapy. Westvills Publication Delhi.
2. Agarwal, A and Udipi, S. (2014). Text Book of Human Nutrition. Jaypee Medical Publication Delhi.
3. Robinson. Basic Nutrition and Diet Therapy (8th Edition).
4. Mahan L. K., Escott- Stump, S. and Raymond J. L. (2012): "Krause's Food and the Nutrition Care Process", 13th Edition, Elsevier.

Course Outcomes: After the completion of the course, the students will be able to:

RBT Level	**Course Outcomes**
L2	CO1: **Explain** the importance of nutrients and nutritional requirements in general and specific health conditions.
L3	CO2: **Illustrate** the concepts of therapeutic diets and their types
L4	CO3: **Analyze** the nutritional and functional aspects of traditional Indian recipes.
L5	CO4: **Evaluate** the diets planned in specific health conditions
L6	CO5: **Develop** innovative diet concepts using dietetic knowledge.

Semester- II **Course Type: DEC** **Course Code:** U25MFT212T **Course Title:** Technology of Animal derived Foods **Category:** Theory **Mode:** Lectures (L) **Hours/week:**4 **Credits:** 4 **Examination Duration:** 3 hrs	**Course Assessment Methods:** ***Note for Paper Setters***: **Max. Marks**: 100 (Internal: 30; External: 70) Two mid-term exams each of 15 marks will be conducted for the internal assessment and marks of the best one will be considered. Weightage for assignment and class participation will be 10 and 05 marks, respectively. **Note**: The end semester examination will be of 70 marks. The examiner is required to set nine questions in all. The first question will be compulsory consisting of seven short questions covering the entire syllabus carrying of 2 marks each. In addition to that eight more questions will be set, two questions from each unit. The students shall be required to attempt five questions in all, selecting one question from each unit in addition to compulsory Question No. 01. All questions shall carry equal marks i.e. 14 marks.

Course Objective: To acquaint students with the knowledge and skills to handle, process, preserve, and utilize animal products ensuring quality and safety for both domestic and export markets.

UNIT-I

Dairy industry in India: scope, strengths and opportunities for dairy industry. Milk: definition, composition, nutritive value, factors affecting composition of milk. Physico-chemical properties. Processing of fluid milk: pasteurization, sterilization, homogenization and UHT processing.

UNIT-II

Manufacturing of condensed and evaporated milk. Cheese: Classification and manufacturing technology. Technology of ice cream manufacturing. Indigenous milk products. By-product utilization. Dairy plant sanitation.

UNIT-III

Status and scope of meat and poultry industry in India. Muscle: structure, chemical composition and physicochemical properties of meat muscle, nutritive value, conversion of muscle into meat. Slaughtering of animals and poultry. Preservation of meat: application of various methods for meat preservation. Meat plant sanitation and waste disposal.

UNIT-IV

Poultry products: types, chemical composition and nutritive value of poultry meat. Egg: structure, composition and nutritive value, storage, grading of eggs and preservation. Quality evaluation of eggs. Egg products. Fish Processing and Fish Products.

Recommended Readings:

1. Ahmed, Tufail (1997) "Dairy Plant Engineering and Management", Kitab Mahal, Allahabad.
2. Spreer E. (1998) Milk and dairy product technology, Marcel Dekker Inc.
3. Smit G. (2003) Dairy processing - improving quality, Woodhead Publishing.

4. Rajagopal, Roy, S.K. (2014) Milk & milk products technology, BS Publishers.
5. Mead G. (2004) Poultry Meat Processing and Quality, Woodhead Publishers.
6. Panda P. C. (1992) Text Book on Egg and Poultry Technology, Vikas Publishers.
7. Sahoo J. & Chatli M. K. (2016) Textbook on Meat, Poultry and Fish Technology, Daya Publishing House.

Course Outcomes: After the completion of the course, the students will be able to:

RBT Level	Course Outcomes
L1	**CO1: Describe** the composition, properties and processing methods of milk and dairy products.
L2	CO2: **Explain** manufacturing technology and quality aspects of various dairy products.
L3	CO3: **Illustrate** structure, composition and processing of meat and poultry products.
L4	CO4: **Assess** quality and preservation techniques of eggs and fish products.
L5	CO5: **Evaluate** sanitation, safety and by-product utilization in dairy and meat industry.

Semester-II **Course Type:** Discipline Elective Course (DEC) **Course Code:** U25MFT213T **Course Title:** Technology of Specialty Foods **Category:** Theory **Mode:** Lectures (L) **Hours/week:**4 **Credits:** 4 **Examination Duration:** 3 hrs	**Course Assessment Methods:** ***Note for Paper Setters***: **Max. Marks**: 100 (Internal: 30; External: 70) Two mid-term exams each of 15 marks will be conducted for the internal assessment and marks of the best one will be considered. Weightage for assignment and class participation will be 10 and 05 marks, respectively. **Note:** The end semester examination will be of 70 marks. The examiner is required to set nine questions in all. The first question will be compulsory consisting of seven short questions covering the entire syllabus consisting of 2 marks each. In addition to that eight more questions will be set, with two questions from each unit. The students shall be required to attempt five questions in all, selecting one question from each unit carrying 14 marks each, in addition to compulsory Question No. 01 carrying 14 marks.

Course Objective: The course aims to acquaint the students with the skills to classify, evaluate, and design specialty food products that meet diverse nutritional, functional, and market requirements.

UNIT-I

Introduction and Classification of Specialty Foods: Need and scope of specialty foods: ease in preparation, cost, health, nutritional status, medical benefits. Consumer demand and market dynamics of specialty foods. Classification of specialty foods (ingredient, functional, therapeutic, organic, origin, fortified, allergen-free, gluten-free, lactose-free, vegan), Specialty foods in modern diets and global trends, Comparison of specialty and conventional foods.

UNIT-II

Specialty food based on active functional ingredients: prebiotics, probiotics, texturization and stabilization, fat-replacer, antioxidants, omega-3s, polyphenols, dietary fiber. Specialty food based on technology: texturized vegetable proteins, biotechnological interventions (Genetically modified foods), specialized package, encapsulation, 3-D printing.

UNIT-III

Therapeutic foods: Modification of diets as per disorders/disease related to different organs (Diabetics, Cardiovascular Disorder, Digestive related disorder, renal issues, obesity, autoimmune disorders, neurological disorders). Specific consumer oriented foods: army personnel, space/astronaut, high altitude mountain climbers, geriatrics, pregnant and lactating mothers. Foods for disaster situation.

UNIT-IV

Regulatory, Safety, and Entrepreneurial Aspects: Regulatory frameworks (FSSAI, Codex, FDA, EFSA), Food labeling and certification systems (organic, GI tags, vegan, halal), Food safety and risk assessment in specialty foods. Entrepreneurship and commercialization of specialty foods, branding in specialty foods.

Recommended Readings:

1. Zhao, Y. (Ed.). (2012). *Specialty foods: processing technology, quality, and safety*. CRC Press.
2. Press, C. R. C. (2002). *Handbook of nutraceuticals and functional foods*. CRC Press.
3. Saarela, M. (Ed.). (2011). *Functional foods: Concept to product*. Elsevier.
4. Grumezescu, A. M., & Holban, A. M. (Eds.). (2017). *Therapeutic Foods* (Vol. 8). Academic Press.
5. Ghosh, D., Das, S., Bagchi, D., & Smarta, R. B. (Eds.). (2012). *Innovation in healthy and functional foods*. CRC press.
6. Chhikara, N., Panghal, A., & Chaudhary, G. (Eds.). (2022). *Functional Foods*. John Wiley & Sons.

Course Outcomes: After the completion of the course, the students will be able to:

RBT Level	Course Outcomes
L1	CO1: **Remember** the definitions, and classifications of specialty foods, and explain their nutritional, healthcare, and market dynamics in comparison to conventional foods.
L2	CO2: **Demonstrate** the ability to identify and classify food products into their respective specialty categories based on compositional and processing criteria.
L3	CO3: **Examine** the role of key bioactive and functional components in specialty foods.
L4	CO4: **Evaluate** the design and formulation of targeted food systems and evaluate their effectiveness for specific physiological and medical needs.
L5	CO5: **Design** and propose an innovative specialty food product, integrating principles of functional components, regulatory standards, and market considerations.

Semester-II **Course Type:** Practicum Course (PC I) **Course Code:** U25MFT204P **Course Title:** Processing of Plant-based Products Lab **Category:** Practicum **Mode:** Practical (PC I) **Hours/week:** 6 **Credits: 30** **Examination Duration:** 6 hrs	**Course Assessment Methods:** **Max. Marks: 75 (Internal:25; External: 50)** ***Note for Paper Setters:*** The internal assessment will be based on internal assessment exam (10 Marks), assignment/quiz/class test etc. (10 Marks) and class participation of 05 marks. External evaluation will be based on submission of practical records (10 Marks), viva-voce (10Marks) and written exam with lab performance (30 Marks). The internal examination will be conducted by the course coordinator. The external examination will be conducted by external examiner appointed by the Controller of Examination in association with the internal examiner appointed by the Chairperson of the Department.

Course Objective: The course aims to acquaint the students about the development & quality evaluation of plant & animal-based foods.

List of Practicals:

1. Familiarize students about various types of cereals, pulses & oilseeds.
2. Evaluate the physical quality characteristics of given grain sample.
3. Determination of gluten quantity and quality of given flour sample.
4. Dough raising capacity of the given sample.
5. To evaluate the amylases present in flour sample.
6. Milling quality evaluation of wheat grains.
7. Parboiling of paddy.
8. Milling of pulses and determination of dehusking efficiency.
9. Oil extraction from the given oilseed sample.
10. Protein isolation from de-oiled oilseed meal.
11. Preparation of different baked products and their quality evaluation.
12. Preparation of extruded products and quality evaluation.
13. Adequacy of blanching in given sample.
14. Different methods of peeling.
15. Minimal processing of fruits & vegetables.
16. Value-added products from fruits & vegetables.
17. Preparation of jam, jelly & marmalade.
18. Quality evaluation of fruits & vegetables.

19. Estimation of pectin to check its suitability for product formulation.
20. Evaluate nutritional and functional quality of given sample.

Recommended Readings

1. Tiwari, B. K., Gowen, A., & McKenna, B. (Eds.) (2020). Pulse foods: processing, quality and nutraceutical applications. Academic Press.
2. Owens, G., (2015). Cereals Processing Technology, Bio-green Elsevier.
3. Girdhari Lal, Siddappa and Tandon, G.L. (2009). Preservation of Fruits and Vegetables. Bombay Popular Prakashan.
4. 2. John, P. J. (2024). Handbook on Post Harvest Management of Fruits and Vegetables. Daya Publishing House.
5. 3. Srivastava, R. P. & Kumar, S. (2019). Fruit and Vegetable Preservation– Principles and Practices (3rd ed.): International Book distributing Co., Lucknow (India).

Course Outcomes: After the completion of the course, the students will be able to:

RBT Level	Course Outcomes
L1	CO1: **Identify** various cereals, pulses, oilseeds, fruits, vegetables, and milk-based raw materials
L3	CO2: **Evaluate** the physical, chemical, and functional properties of grains, oilseeds, milk, and plant-based materials.
L5	CO3: **Demonstrate** unit operations such as milling, oil extraction, protein isolation, blanching, peeling, fermentation, pasteurization, and extrusion
L6	CO4: **Development** of value-added products from plant and animal based raw material.

SEMESTER II **Course Type:** Practicum **Course Code:** U25MFT214P **Course Title:** Nutrition & Dietetics Lab **Category:** Practicum **Mode:** Practical (PC II) **Hours/week** 3 **Credits:** 3 **Examination Duration: 6** hrs	**Course Assessment Methods:** **Max. Marks: 75 (Internal:25; External: 50)** ***Note for Paper Setters:*** The internal assessment will be based on internal assessment exam (10 Marks), assignment/quiz/class test etc. (10 Marks) and class participation of 05 marks. External evaluation will be based on submission of practical records (10 Marks), viva-voce (10Marks) and written exam with lab performance (30 Marks). The internal examination will be conducted by the course coordinator. The external examination will be conducted by external examiner appointed by the Controller of Examination in association with the internal examiner appointed by the Chairperson of the Department.

Course Objective: The course aims to acquaint the students about the application of knowledge of nutrition in formulation of therapeutic diets for health and disease management.

List of Experiments

1. Calorific value of foods
2. Study of RDA Tables and calculations
3. Nutritional status by Clinical assessment of diseased patient
4. Biochemical analysis of blood glucose levels, serum protein and urine analysis of glucose and albumin
5. Sensory evaluation of prepared diets
6. Menu planning for reference male & females
7. Formulation of normal diet, basic therapeutic diets for different diseased conditions: High and Low-calorie diet, High and Low Protein Diet, Low fat and Low Cholesterol Diet, High and Low Fiber Diet, Sodium Restricted Diet
8. Planning and preparation of diets for Diabetes- Type-I, II, Gestational Diabetes
9. Planning and preparation of diets for Overweight and Obesity
10. Diets in diseases of GI Tract
11. Visit to dietary department of any hospital
12. Preparation of case study analysis and reports
13. Assessment of Nutritional Status using Anthropometry
14. Assessment of Nutritional Status using Dietary method
15. Planning of Diets for Different Nutritional Deficiencies like PEM, Anemia, Vit-A.

Recommended Readings:

1. Ranjana Mahna & Seema Puri Kumud Khanna, Sharda Gupta, Santosh Jain Passi, Rama Seth .2016. Text Book of Nutrition and Dietetics. Elite Publishing House.
2. Textbook Of Nutrition And Dietetics ForBsc Nursing Students 3e Based On Inc Syllabus 2021-22 Semester Ii (PB) By Sharma M. CBS Publishers & Distributors
3. Surjanta Chanu . A Comprehensive Text Book of Applied Nutrition and Dietetics. Edition: 1st, 2023. JBD Publications
4. Applied Nutrition and Dietetics by Dr. S Kamalam. 2022 1st Edition. Allwin Medical Books Publishers
5. Antia F P. 2002. Clinical Dietetics & Dietetics 4th Edition. Oxford University Press
6. Mahan, L.K. and Escott-Stump, S. (2000): Krause's Food, Nutrition and Diet Therapy, 10th Edition, W.B. Saunders Ltd.

Course Outcomes: After the completion of the course, the students will be able to:

RBT Level	Course Outcomes
L2	CO1: **Understand** the concepts of nutrition and its relation to health
L3	CO2: **Illustrate** the concepts of therapeutic diets and their types
L4	CO3: **Analyze** the nutritional and functional aspects of traditional Indian recipes
L5	CO4: **Evaluate** the diets planned in specific health conditions
L6	CO5: **Develop** innovative diets using dietetic knowledge and prepare diet for different diseases conditions

Course objective: To familiarize students with practical experience in the handling, processing, and quality control of animal products.

Semester-II **Course Type:** Practicum (PC II) **Course Code:** U25MFT215P **Course Title: Technology of Animal Derived Foods Lab** **Category:** Practicum **Mode:** Practical (PC II) **Hours per week:** 6 **Credits:** 3 **Examination Duration:** 6 hrs	**Course Assessment Methods:** **Max. Marks: 75 (Internal:25; External: 50)** ***Note for Paper Setters:*** The internal assessment will be based on internal assessment exam (10 Marks), assignment/quiz/class test etc. (10 Marks) and class participation of 05 marks. External evaluation will be based on submission of practical records (10 Marks), viva-voce (10Marks) and written exam with lab performance (30 Marks). The internal examination will be conducted by the course coordinator. The external examination will be conducted by external examiner appointed by the Controller of Examination in association with the internal examiner appointed by the Chairperson of the Department.

List of Practicals:

1. Sampling of milk and milk products
2. Platform tests of milk: Organoleptic test, Sediment test, COB test, Alcohol test, Alcohol-Alizarin test, Titratable acidity and pH milk
3. Determination of specific gravity of milk, total solids and solid-not-fat using lactometer
4. Detection of milk adulterants: added water, starch, cane sugar, neutralizers and preservatives (formalin and hydrogen peroxide), synthetic milk (urea test, detergent test, common salt)
5. Test for Presence of Anionic Detergent and added skim milk powder in Milk
6. Alkaline phosphatase test to determine adequacy of pasteurization
7. Turbidity Test for Checking Efficiency of Sterilization in Liquid Milk
8. Fat estimation in milk using gerber and rose-gottlieb method
9. Testing of butter: Moisture in butter (Dean and Stark distillation), curd and salt content in butter
10. Testing of ghee: Reichert-Meissel number and Polenske value, Peroxide value, Iodine value of ghee, Acid value of ghee, Saponification value of ghee
11. Determination of solubility index in milk powder
12. Determination of Weight per Unit Volume or Over-run in Ice Cream

13. Separation of cream using cream separator
14. Development of some indigenous dairy products- Standardization and preparation of khoa/ice cream/Rasogulla
15. Visit to a dairy plant/milk-based industry

Recommended Readings:

- FSSAI (2022). Manual of Methods of Analysis of Food Products Dairy and Dairy Products.
- Gandhi, K., Sharma, R., Gautam, P. B., & Mann, B. (2020). Chemical quality assurance of milk and milk products (p. 202). Singapore: Springer.
- Farrington, E. H., & Woll, F. W. (2010). Testing milk and its products. Agrobios (India).
- Khamrui, K. (2012). Practical manual on traditional Indian dairy products.

RBT Level	**Course Outcomes:** After the completion of the course, the students will be able to:
L2	**CO1: Demonstrate** procedures and analytical techniques for animal-based product testing
L3	**CO2: Judge** quality of animal-based products as prescribed by legal authorities
L4	**CO3: Detect** the presence of inferior quality material in animal-based products
L5	**CO4: Assess** method for quality assurance of animal-based products
L6	**CO5: Formulate** animal-based products with enhanced quality characteristics and nutritional value

Semester-II **Course Type:** Practicum (PC II) **Course Code:** U25MFT216P **Course Title:** Technology of Specialty Foods Lab **Category:** Practicum **Mode:** Practical (PCII) **Hours/week:** 6 **Credits:** 3 **Examination Duration:** 6 hrs	**Course Assessment Methods:** **Max. Marks: 75 (Internal:25; External: 50)** ***Note for Paper Setters:*** The internal assessment will be based on internal assessment exam (10 Marks), assignment/quiz/class test etc. (10 Marks) and class participation of 05 marks. External evaluation will be based on submission of practical records (10 Marks), viva-voce (10Marks) and written exam with lab performance (30 Marks). The internal examination will be conducted by the course coordinator. The external examination will be conducted by external examiner appointed by the Controller of Examination in association with the internal examiner appointed by the Chairperson of the Department.

Course Objective: The course aims to acquaint the students with practical knowledge and skills for developing, processing, and evaluating various specialty foods.

List of Practicals:

1. Development of Gluten-Free Bread Using Alternative Flours
2. Comparative Analysis of Nutritional Content in Organic vs Conventional Vegetables
3. Preparation of Probiotic foods.
4. Preparation and Sensory Evaluation of Allergen-Free Food Products
5. Determination of Antioxidant Activity in Functional Foods
6. Fortification of Fruit Juice with Iron and Vitamin C
7. Development of Lactose-Free Ice Cream Using Enzymatic Treatment
8. Assessment of Shelf-Life in Encapsulated Nutraceutical Powders
9. Processing of Vegan Cheese from Plant-Based Ingredients
10. Formulation of High-Protein Bars for Athletes and Climbers
11. Development of Therapeutic Foods for Diabetic Patients
12. Evaluation of Consumer Acceptability of Millet-Based Specialty Foods
13. Preparation of Space Food Using Dehydration and Vacuum Sealing
14. Development of a Functional Smoothie Enriched with Prebiotics and Fiber
15. Nutritional Profiling of Fortified Cereals for School Nutrition Programs
16. Labeling and Certification Study of Marketed Organic Specialty Products

17. Preparation of Disaster Relief Foods with Extended Shelf-Life
18. Sensory and Textural Evaluation of Ethnic Specialty Foods with Modern Twists

Course Outcomes: After the completion of the course, the students will be able to:

RBT Level	**Course Outcomes**
L1	CO1: **Describe** the basic concepts, types, and nutritional importance of specialty foods.
L3	CO2: **Apply** appropriate methods to prepare and process various specialty food products.
L5	CO3: **Evaluate** the quality, nutritional content, and sensory properties of specialty food products.
L6	CO4: **Design** and develop innovative specialty food products for specific dietary needs or target groups.

Semester-II **Course Type:** Credit Seminar (S) **Course Code**: U25MFT205S **Course Title**: Credit Seminar **Category**: Seminar **Hours/week**: 02 **Credits**: 02 **Examination Duration**: 02 hrs.	**Course Assessment Methods:** **Max. Marks: 50** **Evaluation Criteria:** Evaluation will be carried out by a three- member internal committee comprising of Seminar Coordinator, Supervisor and one faculty member constituted by the Chairperson. Student will present the topic via presentation and submit the report for the same.

Course Objective: To equip students with the skills to conduct in-depth research, critically analyze findings, and effectively communicate complex ideas through a well-structured and engaging seminar presentation.

Course Outcomes: After the completion of the course, the students will be able to:

RBT Level	Course Outcomes
L2	CO1: **Acquire** hands-on skills directly useful for future careers, enhancing job readiness and employability.
L3	CO2: **Learn** skills and knowledge necessary to enter the job market with confidence.
L5	CO3: **Identify** the problems and formulate sustainable solutions.
L6	CO4: **Develop** a professional attitude, including work ethics, organizational skills, and technical competence.

-.

- *

Semester-II **Course Type**: Internship **Course Code:** U25MFT206I **Course Title:** Internship **Category:** Training **Hours/week**: 120 **Credits:** 4 **Examination Duration:** 3 hrs	**Course Assessment Methods**: **Max. Marks: 100** **Evaluation Criteria:** In the end of 2nd Semetser, Student have to undergo an industrial training of 4-6 weeks. The evaluation for the same will be carried out in 3rd Semester a three-member internal committee comprising of Seminar Coordinator, Supervisor and one faculty member constituted by the Chairperson. Student will present the topic via presentation, and submit the report for the same.

Course Objective: To acquaint the students with hands-on experience in food industry operations, enabling them to apply theoretical knowledge in practical settings and develop essential skills in food processing, quality control, and management.

Course Outcomes: After the completion of the course, the students will be able to:

RBT Level	**Course Outcomes**
L1	CO1: **Understand** the main points and supporting details in articles.
L2	CO2: **Explain** the findings and implications of the study.
L4	CO3: **Apply** different the tools for presentation and compilation.
L5	CO4: **Develop** thought provoking questions, discussions and recommendations.