SNDT Women's University, Mumbai

Bachelor of Science

Food Science & Quality Control

B.Sc. (FSQC)

As per NEP 2020

Semester – III & IV

(w.e.f. Academic Year 2025-26)

Structure with Course Titles

SN	Courses	Type of Course	Credits	Marks	Int	Ext
Semester III						
30130311	Biochemistry (2 Th + 2 Pr)	Major (Core)	4	100	50	50
30130312	Food Science and Chemistry (2 Th + 2 Pr)	Major (Core)	4	100	50	50
30130313	Food Processing Technology-I (Th)	Major (Core)	4	100	50	50
30330311	Basic Food Science (Th)	Minor stream	2	50	0	50
30430321/ 30430322	Basics of Food Processing (Pr)/ Basic Biochemistry (Pr)	OEC	2	50	0	50
		AEC	2	50	50	0
31330301	Market surveys of Food commodities (Pr.)	FP	2	50	50	0
		CC	2	50	50	0
			22	**550**	**300**	**250**

SN	Courses	Type of Course	Credits	Marks	Int	Ext
Semester IV						
40130311	Design Thinking & Innovation in Food Processing (2 Th+2 Pr.)	Major (Core)	4	100	50	50
40130312	Food Processing Technology II (Th)	Major (Core)	4	100	50	50
40130313	Food Packaging and Labelling (2 Th + 2 Pr)	Major (Core)	4	100	50	50
40430311	Food Labels (Th)	OEC	2	50	0	50
40730321	Sensory Evaluation (Pr)	SEC	2	50	0	50
		AEC	2	50	0	50
41730301	Food Adulteration (Pr)	CEP	2	50	50	0
		CC	2	50	50	0
			22	**550**	**250**	**300**

Exit with UG Diploma with 10 extra credits (44 + 10 credits)

Syllabus Contents

Semester: III

3.1 Major (Core)

Course Title	**Biochemistry (2Th+2Pr)**
Course Credits	**4**
Course Outcomes	After going through the course, learners will be able to
	1. Explain the basics of biological chemistry, including the structure and function of biomolecules and enzymes, to understand the fundamental metabolic pathways and processes that sustain life. 2. Analyze the integration and significance of various metabolic pathways and evaluate their physiological relevance processes and pathways. 3. Apply knowledge of metabolic processes to explain their significance in various physiological and pathological conditions. 4. Demonstrate proficiency in the qualitative and quantitative identification of biomolecules by applying appropriate analytical techniques. 5. Evaluate enzyme activity and inhibition by assessing the effects of temperature and pH on enzyme function. 6. Analyze and interpret simulated metabolic disorders through the qualitative and quantitative estimation of normal and abnormal constituents in urine and blood.
Module 1(Credit 1 Th)	**Biomolecules**
Learning Outcomes	After learning the module, learners will be able to
	1. Describe the fundamentals of carbohydrates and explain their importance in biological systems. 2. Explain the significance of lipids and analyze their roles in maintaining biological functions. 3. Describe the chemical structure and properties of proteins and nucleic acids. 4. Identify the role of enzymes in biochemical reactions and evaluate the factors affecting enzyme activity. 5. Analyze the major metabolic pathways of carbohydrates and evaluate their regulatory mechanisms.
Content Outline	1. **Carbohydrate**: Definition, Formula, Classification, structures, Physio -chemical reactions and uses of Monosaccharide, Disaccharide and Polysaccharide. **2. Lipids:** Definition and Introduction, Structural Formula, Difference between Saturated and Unsaturated Fatty acids, Purity of Oils, TAG,Sterols- Structure and Function of Cholesterol, & 7-Dehydro-Cholesterol. **3. Protein:**

	Classification of Amino-acids with Structure, Structure of proteins (Primary, Secondary, Tertiary and Quaternary Structure), Precipitation, denaturation of proteins **4. Nucleic acid Structures and Enzymes:** Structures of Nucleic acids and Enzymes Definition, Nomenclature, Classification, Specificity, Mechanism of enzyme action, Coenzymes, Co-Factors, Factors effecting Enzyme activity, Enzyme Inhibitors
Module 2(Credit 1 Th)	**Bioenergetics and Metabolism of Macro molecules**
Learning Outcomes	After learning the module, learners will be able to: 1. Explain the utilization of carbohydrates and lipids in the body through their respective metabolic pathways. 2. Recognize the regulatory mechanisms that control the pathways of carbohydrate and lipid utilization. 3. Evaluate the significance of these metabolic pathways in maintaining energy balance and supporting essential functions in the body. 4. Explain the synthesis, regulation, and significance of essential non-nitrogenous compounds derived from amino acids.
Content Outline	**1. Carbohydrate metabolism:** a. Various Biological pathways -- site, significance, intermediates with chemical structures, enzymes, coenzymes involved, Regulation and energetics b. Glycolysis, TCA [Kreb's cycle], Pentose phosphate pathway Gluconeogenesis, Glycogenesis, Glycogenolysis. c. Alcohol metabolism and biochemical alterations in alcoholism d. Biological oxidation and Electron transport chain **2. Lipid Metabolism:** a. Oxidation of saturated, unsaturated, even, and odd chain fatty acids (β-Oxidation), regulation, energetics b. Biosynthesis of fatty acids, regulation of synthesis, Elongation and desaturation of fatty acid chains, Ketosis and Ketone bodies metabolism **c.** Triglyceridessynthesis **---** Intestinal resynthesis of triglycerides, synthesis in Liver. Introduction of Cholesterol – Parent steroid sources, Cholesterol biosynthesis with structures, mode of utilization, Control of cholesterol metabolism d. Plasma Lipoproteins, Synthesis and significance of Chylomicrons, LDL, HDL and VLDL **3. Protein, Non- proteinous and Nucleic Acid Metabolism** a. Trans-amination, Oxidative and non oxidative De-amination with diagrammatic representation, role of pyridoxine, b. Metabolic fate of Ammonia-- Formation of glutamate, Formation of Glutamine and Urea cycle –pathway with structures. c. Metabolism of non protein nitrogenous compounds: Structures of purines, pyrimidines and uric acid, catabolic pathways without structures of the intermediates . Uric acid and gout. Synthesis (without structures) and significance of glutathione. d. Synthesis, catabolism and significance of Creatnine, Transmethylation and one carbon transfer – scheme of inter conversion and disposition of one carbon fragments derived from catabolism of amino acids (without structures)

	e. Metabolic fate of the carbon skeleton of amino acids – glucogenic, ketogenic and glucogenic and ketogenic amino acids.
Module 3(Credit 1 Pr) Practical Applications in Biomolecule Identification, Enzyme Activity	
Learning Outcomes	After learning the module, learners will be able to 1. Demonstrate proficiency in the qualitative and quantitative identification of biomolecules, including carbohydrates, proteins, and fats, using various analytical techniques and methods. 2. Evaluate enzyme activity and inhibition by studying the effects of temperature and pH on enzyme function.
Content Outline	**1: Identification of Biomolecules** Qualitative analysis of carbohydrates, Glucose, fructose, sucrose, lactose, maltose, starch. Estimation of Glucose/sucrose using Benedict's Quantitative method. Qualitative tests for proteins (colour reactions and precipitation reactions) Qualitative tests for fats. **2: Enzyme Activity and Inhibition** i. Estimation of enzyme activity (e.g. Amylase activity on starch) ii. Effect of temperature and pH on enzyme activity
Module 4(Credit 1 Pr) Practical Applications in Metabolic Disorder Analysis	
Learning Outcomes	After learning the module, learners will be able to 1. Perform qualitative and quantitative estimations of normal and abnormal constituents in urine, including urea and glucose, to analyze metabolic conditions. 2. Quantify and interpret serum/blood constituents such as urea, uric acid, total protein, and cholesterol to investigate metabolic disorders.
Content Outline	**1. Analysis of Simulated Metabolic Disorders.** 1. Qualitative Estimation of Normal Constituents of Urine. 2. Qualitative Estimation of Abnormal Constituents of Urine. 3. Quantitative Estimation in Urine. a. Urea b. Glucose 4.Quantitative Estimation in Serum / Blood. 1. Urea 2. Uric acid 3. Total protein 4. Cholesterol

Assignments/Activities towards Comprehensive Continuous Evaluation (CCE):
CCE Components Theory Assignments:

1. Clinical importance of Enzymes
2. Disorders of Nucleic acid metabolism

Practical-Based Assignments/Projects:

1. Alcohol Metabolism Presentation
2. Case Study: Lipid Storage Disorders
3. Oxidation of Odd/Unsaturated Fatty Acids
4. ETC inhibition & lactic acidosis scenario
5. Effects on Enzyme activity

References: -

1. Rastogi, S. C. (2003). *Biochemistry* (2nd ed.). Tata McGraw-Hill Publishing Co. Ltd.
2. Jain, J. L., Jain, S., & Jain, N. (2005). *Fundamentals of biochemistry* (6th ed.). S. Chand Company Ltd.
3. Plummer, D. T. (1971). *An introduction to practical biochemistry* (2nd ed.). McGraw-Hill Publishing Co. Ltd.
4. Apps, D. K., Cohen, B. B., & Steel, C. M. (1992). *Biochemistry: A concise text for medical students*. Bailliere Tindall.
5. Das, D. (1980). *Biochemistry* (2nd ed.). Academic Publishers.
6. Satyanarayana, U., & Chakrapani, U. (2008). *Biochemistry* (3rd ed.). Books & Allied Publishers.
7. Chatterjee, M. N., & Shinde, R. (2012). *Textbook of medical biochemistry* (8th ed.). Jaypee Brothers Medical Publishers.
8. Nelson, D. L., & Cox, M. M. (2017). *Lehninger's principles of biochemistry* (7th ed.). Freeman and Co.
9. Berg, J. M., Tymoczko, J. L., & Stryer, L. (2015). *Biochemistry* (8th ed.). W. H. Freeman.
10. Vasudevan, D. M., & Sreekumari, S. (2007). *Textbook of biochemistry for medical students* (5th ed.). Jaypee Brothers Medical Publishers.
11. Murray, R. K., & Granner, D. K. (2017-18). *Harper's illustrated biochemistry* (31st ed.). Prentice Hall International.
12. Voet, D., & Voet, J. G. (2018). *Biochemistry* (5th ed.). John Wiley & Sons.

3.2 Major (Core)

Course Title	**Food Science and Chemistry (2Th + 2 Pr)**
Course Credits	**4**
Course Outcomes	After going through the course, learners will be able to:
	1. Describe the chemical structure and composition of food components. 2. Explain the interactions of nutrients during food processing. 3. Identify and analyze the physical and chemical changes in food commodities during processing. 4. Demonstrate the functional roles of various food commodities in food preparation. 5. Evaluate the beneficial effects of food science developments and processing techniques.
Module 1(Credit 1)(TH) Plant based foods(Cereals, Pulses, Legumes, Fruits and Vegetables)	
Learning Outcomes	After learning the module, learners will be able to:
	1. Describe the structure and composition of various cereals. 2. Examine the physical and chemical changes in starch and protein content of cereals during processing. 3. List the major nutritional components of pulses, legumes, fruits, and vegetables. 4. Explain the presence of anti-nutritional factors in legumes and identify methods used to reduce them. 5. Compare and discuss the nutritional and functional benefits of germination and fermentation processes. 6. Explain the roles of Pectic substances and vegetable gums
Content Outline	1. Structure and composition of cereal grain 2. Starch cookery: Types, Gelatinization, retrogradation, dextrinization 3. Gluten formation and factors affecting it 4. Colloids in food 5. Composition and anti-nutrients in pulses & legumes 6. Germination & Fermentation: Process and nutritional advantage 7. Fruits & Vegetables: Classification, composition, pigments 8. Pectic substances and vegetable gums and their uses
Module 2(Credit 1) (Th) Water, Animal Based foods(Milk, Meat, Egg, Fish), Fats & oils, Leavening agents	
Learning Outcomes	After learning the module, learners will be able to:
	1. Define the physical forms and types of water in foods. 2. Explain composition and structures of animal-origin foods. 3. Understand changes due to cooking, storage, spoilage. 4. Describe the functional roles of foods like water, eggs, fats and oils 5. Assess the role and action of various leavening agents.

Content Outline	1. Bound & Free water; Hard & Soft water; Role in cookery 2. Colligative properties of solutions 3. Milk: Composition, protein changes, Maillard reaction 4. Meat: Structure, rigor mortis, ageing, tenderization 5. Eggs: Structure, changes during storage, functional roles 6. Fish: Classification, quality indicators, spoilage types 7. Fats: Plasticity, smoke/flash point, emulsification, spoilage 8. Rancidity: Types, causes, prevention; antioxidants 9. Leavening agents: Natural and chemical, mechanisms
Module 3(Credit 1) (Pr) Plant based foods(Cereals, Pulses, Legumes, Fruits and Vegetables)	
Learning Outcomes	After learning the module, learners will be able to: 1. Describe the process of gelatinization and the role of heat and moisture in starches. 2. Explain the process of gluten formation and the factors influencing the same 3. Distinguish between the color pigments and examine the effect of heat , acid and alkali 4. Observe and explain changes during germination and fermentation
Content Outline	1. Demonstration: Gelatinization of different starches and factors affecting it 2. Experiment: Gluten formation and factors affecting it 3. Experiment: Colour pigments in fruits and vegetables: effect of heat, acid and alkali 4. Demonstration: Germination and fermentation of pulses and legumes 5. Report: Photo documentation of home-cooked pigment-based dishes
Module 4 (Credit 1) (Pr)Water, Animal Based foods(Milk, Meat, Egg, Fish), Fats & oils, Leavening agents	
Learning Outcomes	After learning the module, learners will be able to 1. Identify physical and functional properties of fats and evaluate factors influencing fat absorption and stability during cooking. 2. Distinguish between types of rancidity and demonstrate methods for its prevention in food products. 3. Identify types, causes and prevention of rancidity in fats and oils 4. Observe and interpret physical and chemical changes in milk during heating and reactions with other substances. 5. Demonstrate formation of egg foams and analyze factors that influence their volume and stability 6. Compare natural and chemical leavening agents andanalyse its effect in different products
Content Outline	1. Demonstration and Experiment: Fats- Smoke/flash point, emulsification, factors affecting fat absorption during frying 2. Activity: Rancidity- Types and prevention 3. Demonstration and Experiment : Milk- Scum formation, boil over, protein changes (effect of heat acid and alkali), Maillard reaction

	4. Activity : Eggs- egg foams (stages), factors affecting egg foam stability 5. Comparison: Leavening agents- Natural and chemical, products using the same

Assignments/Activities towards Comprehensive Continuous Evaluation (CCE)

1. Assignment: Application of colligative properties of solutions in food processing
2. Assignment: Examples of different food colloidal systems
3. Activity: Demonstrate starch cookery in different food recipes
4. Assignment: Identify anti-nutritional factors present in daily food commodities and discuss the methods to remove or reduce them
5. Activity: Demonstrate the effects of heat, acid and alkali on different food pigments by preparing different recipes at home and submit a report on it inclusive of actual pictures
6. Assignment: Application of functional roles of egg in food processing
7. Activity: Exhibit the role of different leavening agents in food preparations and compare the results

References: -

1. Srilakshmi, B. (2010). *Food science* (5th ed.). New Age International Pvt Ltd.
2. Shadaksharaswamy, M., &Manay, S. (2010). *Food facts and principles* (3rd ed.). New Age International.
3. Bennion, M., & Scheule, B. (2009). *Introductory foods* (13th ed.). Prentice Hall.
4. Manay, S. (2009). *Food facts*. New Age International Pvt Ltd.
5. Subbulakshmi, G., & Udipi, S. A. (2006). *Food processing and preservation*. New Age International Pvt Ltd.
6. Potter, N. N., & Hotchkiss, J. H. (1999). *Food science* (5th ed.). Springer.
7. Freeland-Graves, J., & Peckham, G. C. (1995). *Foundations of food preparation* (6th ed.). Prentice Hall.
8. Pomeranz, Y. (Ed.). (1991). *Functional properties of food components* (2nd ed.). Academic Press.
9. Salunke, D. K., & Kadam, S. S. (2001). *Handbook of vegetable science and technology*. Marcel Dekker.

3.2 Major (Core)

Course Title	**Food Processing Technology- I (Th)**
Course Credits	**4**
Course Outcomes	After going through the course, learners will be able to
	1. Describe the Principles of Cereal Processing and Storage. Apply Processing Techniques for Rice, Millets, Pulses, and Breakfast Foods 2.Apply Processing and Preservation Techniques for Fruits 3.Demonstrate knowledge of Vegetable Processing and Preservation 4.Analyze Spice and Oilseed Processing 5.Demonstrate competence in Beverage Processing
Module 1(Credit 1)	**Processing of Cereals and Pulses**
Learning Outcomes	After learning the module, learners will be able to
	1. Explain Cereal Processing and Storage. 2. Analyze Wheat Processing and Baking Technology. 3. Evaluate Rice Processing and Product Development. 4. Explore Millet Processing and Applications. 5. Compare Pulse Processing Techniques. 6. Apply Breakfast Food Production.
Content Outline	**1.Processing and preservation of Cereals** i. Introduction ii. Milling of Cereals **iii.** Care during storage of cereals **2.Technology of Wheat Products** i. Structure and composition ii. Milling of wheat **Baking technology** i. Bread, biscuits, cake and pasta foods. **3.Technology of Rice and Rice Products** Drying of harvested paddy, parboiling, curing of rice, milling of rice. **Rice products** -Instant mixes from rice and rice based instant foods. **4.Maize processing** **5.Processing of millets** -Polishing, pearling **6.Production of Breakfast Food** -Puffed and flake products- Oat, maize and other millets. **7.Processing of Pulses** -Decortication, soaking, germination, fermentation
Module 2(Credit 1)	**Processing and Preservation of Fruits**
Learning Outcomes	After learning the module, learners will be able to
	1. Examine Maturity Detection and Harvesting Techniques. 2. Apply Storage and Preservation Methods. 3. Manufacture and Store Fruit-Based Products. 4. Produce High-Acid and High-Sugar Products. 5. Preserve Candied and Glazed Fruits.

Content Outline	**1.Processing and Preservation of Fruits** **i.** -Detection of maturity ii. -Harvesting of fruits and vegetables- Manual and Mechanical harvesting techniques iii. -Storage **2.Preservation** i. -Canning of fruits- Pineapple etc. ii. -Precooking and Freezing of Fruits iii. -Dehydration of Fruits **3.Processed products** i. -Fruit juice, squashes, fruit drink, fruit cordial, fruit punch, fruit syrups, fruit juice concentrate, carbonated fruit beverages. ii. Changes during storage of processed products **4.High acid and High sugar products** i. Jams, jellies. Marmalades and guava cheese ii. Common defects in jams and marmalades. **5.Preservation of candies** -Crystallized and Glazed fruits
Module 3(Credit 1)	**Processing and Preservation of Vegetables**
Learning Outcomes	After learning the module, learners will be able to 1. Explore Vegetable Processing and Preservation Techniques. 2. Manufacture Pickles and Chutneys. 3. Process Tomato-Based Products.
Content Outline	**1.Pickles and Chutneys** -Processing of oil and vinegar pickles -Processing of chutneys **2.Tomato products** -Processing of tomato juice, puree, ketchup -Common defects in tomato products **3.Vegetable juices** -Processing of Raw mango panna, carrot juice, lactic fermented juice, etc.
Module 4(Credit 1)	**Processing of other plant based products**
Learning Outcomes	After learning the module, learners will be able to 1. Explore the Processing and Preservation of a few spices. 2. Analyze Oilseed Processing and Extraction. 3. Describe Tea Processing Techniques. 4. Compare the Coffee Processing Methods. 5. Analyze Cocoa Processing and Product Development.
Content Outline	**1.Dehydrated rhizomes:** -Dehydrated Ginger and Turmeric **2.Processing of oil seeds and nuts:** Major oil seeds of food importance, production and composition. -Oil extraction methods -Refining, hydrogenation, unconventional oils. **3.Beverage processing:** Soups, Carbonated soft drinks Alcoholic beverages Tea Processing Coffee Processing Cocoa Processing

Assignments/Activities towards Comprehensive Continuous Evaluation (CCE)

1. Assignment: Market survey on different breakfast cereals available in the market and brief explanation of processing technology involved in each one of them
2. Presentation: on harvesting techniques used for various fruits and vegetables
3. Assignment: Carry out osmodrying of fruit/vegetable at home and discuss the results
4. Assignment: Oil refining techniques, types and prevention of rancidity

References:

1. Srilakshmi, B. (2018). *Food science* (7th ed.). New Age International Publishers.
2. Joslyn, M. A., & Heid, J. L. (1964). *Food processing operations*. AVI Publishing.
3. Matz, S. A. (1996). *Bakery technology and engineering* (3rd ed.). CBS Publishing.
4. Girdharilal, Siddappa, G. S., & Tandon, G. L. (1986). *Preservation of fruits and vegetables*. ICAR Publication.
5. Potter, N. N. (1968). *Food science*. AVI Publishing Co
6. Salunke, D. R. (2009). *Storage, processing, and nutritional quality of fruits and vegetables*. In *Encyclopedia of food and technology*. AVI Publishing.
7. Sharma, A. (2020). *Textbook of food science & technology*. CBS Publishers.

.3.4 Minor (Stream)

Course Title	**Basic Food Science (Th)**
Course Credits	**2**
Course Outcomes	After going through the course, learners will be able to
	1. Describe the composition of foods. 2. Explain the physical and chemical properties of foods. 3. Analyze the scientific changes that occur in food during processing. 4. Discuss the effects of food processing on nutritional and sensory qualities. 5. Identify and interpret the roles of food components in cooking.
Module 1(Credit 1	**Food Science Principles of Plant Based Foods**
Learning Outcomes	After learning the module, learners will be able to
	1. Examine the composition of foods. 2. Explain the physical changes in food components during cooking 3. Describe the practical uses of food preparation changes caused by cooking
Content Outline	1. Cereals : Structure and composition of a cereal grain, Properties of starch – Thickening & Gelatinization, Gel Formation, syneresis, Retrogradation and Lump formation, Dextrinization, Identity of grains, ,Gluten formation – Factors affecting: Dextrinization ,Gelatinization ,Gluten formation. Leavening agents: Natural and Chemical and their action. 2. Pulses & legumes: Composition, toxic factors, its effects, and elimination, soaking, fermentation and germination 3. Vegetable & Fruits: Composition, color pigments and effect of cooking, non-enzymatic browning 4. Sugars: Stages of sugar cookery, Caramelization, Inversion 5. Fats & Oils: Physical properties – plasticity, smoke point, flash point Functional role of fats: flavor, texture, tenderness, emulsification, shortening & leavening effects. Emulsions Fat Spoilage – rancidity its types &its prevention.
Module 2(Credit 1)	**Food Science Principles of Animal Based Foods**
	After learning the module, learners will be able to:
	1. Examine the composition and properties of animal based foods. 2. Describe the effects of processing and cooking. 3. Identify the functional role in cooking. 4. Recognize the quality indicators.
Content Outline	**1.** Milk**:** Composition, effect of heat, acid, alkali and enzymes on milk, scum formation, maillard reaction 2. Egg**:** Structure & composition of egg, protein in egg White & Egg Yolk, Methods to judge Egg quality (grading) Physical &chemical changes during egg storage, foams**,** role of egg in Cookery, methods of cooking egg. 3. Meat & Poultry**-**Composition, Structure, post mortem changes, ripening or ageing of meat, tenderization of meat, changes during meat cooking.

	4. Fish : Classification, quality indicators of fish, types of fish spoilage

Assignments/Activities towards Comprehensive Continuous Evaluation (CCE):

1. Activity: Demonstrate starch cookery in different food recipes
2. Assignment: Different methods of storage for cereals
3. Presentation on maturity indices for different fruits and vegetables
4. Market survey on different types of fruit/vegetable-based chutneys available commercially
5. Activity: Identify the cause and methods of prevention of rancidity in different spoilt products
6. Assignment: Application of functional roles of egg in food processing

References: -

1. Bennion, M., & Scheule, B. (2009). *Introductory Foods* (13th ed.). Prentice Hall.
2. Freeland-Graves, J., & Peckham, G. C. (1995). *Foundations of Food Preparation* (6th ed.). Prentice Hall.
3. Manay, S., &Shadaksharaswamy, M. (2010). *Food Facts and Principles* (3rd ed.). New Age International Publishers.
4. Potter, N. N., & Hotchkiss, J. H. (1999). *Food Science* (5th ed.). Springer.
5. Srilakshmi, B. (2023). *Food Science* (8th ed.). New Age International Pvt Ltd Publishers
6. Sharma, A. (2019). *Textbook of food science and technology* (3rd ed.). CBS Publishers & Distributors.
7. Subbulakshmi, G., & Udipi, S. A. (2006). *Food Processing and Preservation*. New Age International Pvt Ltd Publishers**.**

3.5 OEC

Course Title	**Basics of Food Processing (Pr)**
Course Credits	**2**
Course Outcomes	After going through the course, learners will be able to:
	1. Explain the fundamental principles and techniques involved in food processing. 2. Demonstrate the use of thermal and cold processing methods for preserving food. 3. Apply dehydration and chemical preservation techniques to enhance shelf life of food products. 4. Analyze the effectiveness of various preservation methods on food quality and safety. 5. Develop and evaluate instant food mixes using suitable food processing methods.
Module 1(Credit 1) Introduction to Food Processing, Low and High temperature processing:	
Learning Outcomes	After learning the module, learners will be able to:
	1. Explain the importance of food laboratories, Good Manufacturing Practices (GMP), and hygiene in food processing 2. Demonstrate high-temperature processing techniques such as blanching, canning 3. Apply low temperature storage techniques for different foods.
Content Outline	**1.Introduction to food Processing:** - Introduction to food laboratory - Good manufacturing practices (GMP) - Basics of personal and area hygiene **2.High temperature processing:** - Blanching of vegetables and its effect on enzyme activity - Canning of fruits/vegetables in glass jars - Osmo-dehydration of fruits **3.Low temperature processing:** - Freezing of fruits and vegetables: Effect on texture and quality (explain the difference in slow and quick freezing techniques) - Chilling and cold storage techniques for perishable foods like fresh fruits and vegetables, dairy products
Module 2(Credit 1) Dehydration Techniques, Chemical Preservation and Instant mixes	
Learning Outcomes	After learning the module, learners will be able to:
	1. Explain the dehydration process of fruits and vegetables using sun and mechanical drying methods 2. Demonstrate the preparation of traditional dehydrated foods 3. Apply chemical preservation techniques in making jams, jellies, squashes, and tomato-based products 4. Develop instant mixes (sweet and savory) using food processing principles

Content Outline	**1.Dehydration process:** - Dehydration of fruits and vegetables (Sun and mechanical) - Traditional dehydrated foods like papad, sandage **2.Chemical preservation techniques:** - Preparation of jam, fruit jelly, squashes - Preparation of tomato products like sauce, ketchup, chutney etc. **3.Preparation of Instant mixes:** - Apply the knowledge of food processing in preparing different instant mixes (sweet and savory)
Assignments/Activities towards Comprehensive Continuous Evaluation (CCE) 1. Presentation on food laboratory safety, personal hygiene, GMPs 2. Activity: Carry out osmo drying of fruit/vegetable at home and make a report on outcome 3. Activity: Identify the effect of slow and quick freezing techniques on food products by comparing slow and quick frozen foods 4. Market survey of different dehydrated foods 5. Market survey of instant foods and development of one instant food and present the report 6. Journal	

References: -

1. Arora, M. (Year of Publication). *Practical Manual Food Processing*. Nirali Prakashan
2. Singh, A. K. (Year of Publication). *Food Technology-I*. ICAR eCourse
3. National Council of Educational Research and Training (NCERT). (Year of Publication). *Food Processing and Technology*
4. Hameed, F., Ayoub, A., Gupta, N., & Anjum, N. (Year of Publication). *Fundamentals of Food Processing and Preservation*. Astral International
5. Anandharamakrishnan, C., & Ishwarya, S. P. (2019). *Essentials and Applications of Food Engineering*. CRC Press
6. Panjagari, N. R. (n.d.). *Principles of Food Processing and Preservation*. INFLIBNET Centre

3.5 OEC

Course Title	**Basic Biochemistry (Pr)**
Course Credits	**2**
Course Outcomes	After going through the course, learners will be able to
	1. Develop insights regarding biomolecules and their metabolic pathways 2. Explain the fundamentals of carbohydrates and their role in metabolism. 3. Describe the structure and functions of proteins and nucleic acids in biological processes. 4. Appreciate the importance of lipids and their functions in biological systems. 5. Explain the role of enzymes and the factors affecting their activity in metabolism.
Module 1(Credit 1)	**Biomolecules – Carbohydrates and Proteins**
Learning Outcomes	After learning the module, learners will be able to
	1. Explain the fundamentals of carbohydrates and their role in metabolism. 2. Describe the structure and functions of proteins and nucleic acids in biological processes.
Content Outline	1. Introduction to Biochemistry -Definition and scope of biochemistry 2. Carbohydrates General formula, Classification, Structure, properties and uses of monosaccharides (Glucose, Fructose), disaccharides (Lactose, Maltose and Sucrose), oligosaccharides, and polysaccharides (Starch, Glycogen). Introduction to the structure of D & L forms. Optical and stereo isomers. Anomers. Cyclic forms of monosaccharides of glucose and fructose including structures. Reactions of Monosaccharides- Oxidation and reduction reactions, esterification reaction, osazone formation 3. Proteins and Amino Acids Structure, classification, and properties of amino acids Zwitter ionic form. Peptide bond. Structure of proteins (primary, secondary, tertiary and quaternary structure. Denaturation of proteins. Salting out of proteins and isoelectric precipitation.
Module 2(Credit 1)	**Lipids, Nucleic Acids, and Enzymes**
Learning Outcomes	After learning the module, learners will be able to
	1. Recognize the importance of lipids and their functions in biological systems. 2. Explain the role of enzymes and the factors affecting their activity in metabolism.

Content Outline	1. Lipids Definition, Introduction, and Structural formula. Classification: Simple, compound, and derived lipids Difference between saturated and unsaturated fatty acids Chemical Constants of fats-iodine value, saponification value, acid value and Richert- Miesel numbers. Rancidity Sterols-Structure and function of cholesterol, 7 dehydro-cholesterol and ergosterol. 2. Nucleic Acid Structure: Structure and function of DNA and RNA Role of nucleic acids in protein synthesis Gene expression and regulation 3. Enzymes: Definition and general properties Nomenclature and classification of enzymes Enzyme specificity Mechanism of enzyme action Factors affecting enzyme activity (Temperature, pH, Substrate concentration, Inhibitors) Enzyme inhibition: Competitive & Non-competitive inhibition Coenzymes and isoenzymes and their role in metabolism
Assignments/Activities towards Comprehensive Continuous Evaluation (CCE): Practical Performance	

References:

1. "Murray Harper's Illustrated Biochemistry" 29th Edition, (2012) Prentice Hall Int.
2. Apps D.K. and Cohen B.B. and Steel C.M. "Biochemistry: A Concise Text for Medical Students" (1992), Bailliere Tindall,
3. Berg J.M. Tymoczko J.L., and Stryer. L. "Biochemistry", 5th edition, (2002). W.H. Freeman.
4. Chatterjee M.N., Shinde R. "Textbook of Medical Biochemistry" 8th Edition (2012) Jaypee Brothers, Medical Publishers.
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17. Voet D, and Voet J.G "Biochemistry" 4th Edition. (2011), John Wiley & Sons.

3.6 FP

3.7

Course Title	**Market surveys of Food commodities (Pr)**
Course Credits	**2**
Course Outcomes	After going through the course, learners will be able to
	1. Explain the significance and methodologies of market surveys in the food industry. 2. Identify various food commodities and analyze their pricing, availability, and consumer demand. 3. Assess the influence of economic and seasonal factors on food commodity trends. 4. Conduct primary market research and collect relevant data from food markets. 5. Interpret market data and present findings using appropriate formats and tools.
Module 1(Credit 1) Market Structure, Food Commodities & Pricing Trends	
Learning Outcomes	After learning the module, learners will be able to
	1. Explain market structures and their impact on food commodity availability. 2. Identify and classify different food commodities. 3. Analyze factors influencing food pricing trends.
Content Outline	1. Introduction to Market Survey: Importance and objectives in the food industry. 2. Types of Food Commodities: Perishable, semi-perishable, and non-perishable. 3. Market Structure: Local markets, supermarkets, wholesale markets, online retail. 4.Pricing Trends & Influencing Factors: i. Demand and supply. ii. Seasonal variations. iii. Branding and quality. iv. Government policies and international trade. 5. Designing a market survey framework.
Module 2(Credit 1)	**Consumer Preferences, Quality Standards & Data Analysis**
Learning Outcomes	After learning the module, learners will be able to
	1. Conduct market research and collect relevant data. 2. Evaluate consumer preferences based on market data. 3. Develop a structured market survey report with key insights.
Content Outline	1. Conducting field visits to different types of markets. 2. Collecting data on price, quality, and availability of selected food commodities. 3. Consumer Preferences & Buying Behavior: Factors influencing purchase decisions (price, packaging, brand, nutrition). 4. Data Interpretation & Report Writing: Compiling and interpreting survey data. 5. Preparing and presenting a market survey report.

Assignments/Activities towards Comprehensive Continuous Evaluation (CCE)

1. Activity: Conduct a survey on selected food commodities across different market structures (local, supermarket, online).
2. Analyze pricing trends, seasonal variations, and consumer preferences. Compile findings in a structured report and present the data interpretation and conclusions.

References: -

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3. Manay, S., &Shadaksharaswamy, M. (2008). *Foods: Facts and principles* (3rd ed.). New Age International Publishers.
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7. Young, R. H., &MacCormac, C. W. (Eds.). (1987). Market research for food products and processes in developing countries. International Development Research Centre

Semester: IV

4.5 Major (Core)

Course Title	**Design Thinking & Innovation in Food Processing (2 Th+2 Pr.)**
Course Credits	**4**
Course Outcomes	After going through the course, learners will be able to
	1. Identify and define complex food processing challenges using user-centered research and empathy-based observation. 2. Apply design thinking tools to develop innovative, sustainable processing techniques for food systems. 3. Prototype, test, and refine food products and processing methods through iterative feedback loops. 4. Evaluate user needs, technical feasibility, and industry viability to create impactful food processing innovations. 5. Develop and present entrepreneurial business models within food technology and processing sectors based on design thinking.
Module 1(Credit 1 Th) Introduction to Design Thinking & Problem Identification in Food Processing	
Learning Outcomes	After learning the module, learners will be able to
	1. Understand the **foundational principles of Design Thinking & Innovation (DT&I)** in **food processing.** **2.** Conduct **user research** related to **food processing technology and consumer needs.** **3.** Define **real-world food processing challenges** using **data-driven analysis.**
Content Outline	☐ Overview of Design Thinking and Innovation (DT&I) in Food Processing ☐ Principles of empathy, observation, and contextual research in food systems ☐ Food industry trends and challenges in processing efficiency, safety, and sustainability ☐ Identifying user needs related to food preservation, shelf life extension, and process optimization ☐ Secondary and primary research: industrial food processing studies, ethnographic research ☐ Problem framing and user journey mapping for food processing innovations
Module 2(Credit 1 Th) Analysis, Ideation, and Concept Development in Food Processing	
Learning Outcomes	After learning the module, learners will be able to

	1. Develop low-fidelity and high-fidelity prototypes for food processing methods and technology. 2. Conduct testing and gather meaningful industry feedback. 3. Refine food processing models for enhanced efficiency and product quality.
Content Outline	• Food processing **problem analysis tools:** affinity mapping, SWOT, process flow diagrams • **Innovative ideation methods:** brainstorming, SCAMPER, lateral thinking for food processing improvements • Concept development and evaluation • **Creativity techniques** for food processing and preservation methods • Case studies of **successful food processing innovations**
Module 3(Credit 1 Pr) Prototyping and User Testing in Food Processing Innovation	
Learning Outcomes	After learning the module, learners will be able to
	1. Develop low-fidelity and high-fidelity prototypes for food processing methods and technology. 2. Conduct testing and gather meaningful industry feedback. 3. Refine food processing models for enhanced efficiency and product quality.
Content Outline	☐ Types of food processing prototypes: thermal processing, dehydration methods, extrusion technology ☐ Human-centered design in food technology development ☐ Prototyping tools and techniques for food innovations ☐ User feedback methodologies: industry testing, sensory evaluations, regulatory compliance ☐ Food processing ethics, safety, and efficiency standards
Module 4(Credit 1 Pr) Business Model Development & Market Implementation in Food Processing	
Learning Outcomes	After learning the module, learners will be able to
	1. Apply design thinking principles to develop viable food processing business models. 2. Plan for implementation, scaling, and sustainability of food technology innovations. 3. Pitch a compelling food processing innovation, backed by research and prototyping.
Content Outline	☐ Basics of entrepreneurship in food processing ☐ Business model canvas for food manufacturing ventures ☐ Market analysis for food technology innovations ☐ Brand positioning and commercialization of food processing solutions

	☐ Final project presentations: prototype to market impact

Assignments/Activities towards Comprehensive Continuous Evaluation (CCE)

Suggested Sample Student Projects

1.Smart Nutrition Meal/ food products for Urban Professionals

2.Zero-Waste Functional Food Packaging

3.Digital App for food products survey

Reference Books:

1. Brown, T. (2009). *Change by design: How design thinking creates new alternatives for business and society*. Harvard Business Press.
2. Liedtka, J., & Ogilvie, T. (2011). *Designing for growth: A design thinking tool kit for managers*. Columbia University Press.
3. Kelley, T., & Kelley, D. (2013). *Creative confidence: Unleashing the creative potential within us all*. Crown Business.
4. Osterwalder, A., Pigneur, Y., Bernarda, G., & Smith, A. (2014). *Value proposition design: How to create products and services customers want*. Wiley.
5. Martin, R. L. (2009). *The design of business: Why design thinking is the next competitive advantage*. Harvard Business Press.
6. Yadav, S., & Sharma, D. (2016). *Entrepreneurship in the food processing sector*. LAP Lambert Academic Publishing.
7. Francis, F. J., & Smith, R. (2013). *Food product development: From concept to the marketplace*. Springer.
8. Wided Batat, Design Thinking for Food Well-Being, The Art of Designing Innovative Food Experiences, Springer International Publishing (2021)

4.2 Major (Core)

Course Title	**Food Processing Technology II (Th)**
Course Credits	**4**
Course Outcomes	After going through the course, learners will be able to:
	1. Describe the purpose and basic methodologies of market surveys in the food sector. 2. Identify and classify various food commodities based on their pricing, availability, and demand. 3. Analyze the influence of economic and seasonal factors on food market trends. 4. Apply research techniques to collect and organize primary market data. 5. Interpret collected data and present market survey findings through structured formats.
Module 1(Credit 1)	**Milk Processing**
Learning Outcomes	After learning the module, learners will be able to:
	1. Examine post harvest handling of milk and milk products. 2. Explore the processing techniques used in production of various milk products.
Content Outline	Milk industry in India, Processing of milk: 1. Pasteurization, Homogenization, 2. Cream: Types and processing 3. Butter: Processing 4. Cheese: Classification, types and processing 5. Condensed milk, Milk powder: Processing 6. Ice creams: Role of ingredients and processing 7. Processing of Indigenous milk products: 8. Khoa, channa, rasgulla, ghee, cottage cheese 9. Cultured milk products: types and processing
Module 2(Credit 1)	**Fish Processing**
Learning Outcomes	After learning the module, learners will be able to:
	1. Identify traditional and modern fish-catching methods. 2. Describe proper handling, hygiene, and transportation techniques for fish. 3. Examine causes, detection, and prevention of fish spoilage. 4. Explain the canning process, including pretreatments and sterilization steps. 5. Describe cold storage and different freezing techniques for fish preservation. 6. Explain different smoking, drying and curing techniques for fish. 7. Know different processed fish products.

Content Outline	1. Development of sea food industry 2. Catching methods 3. Handling and transportation of fish 4. Spoilage of fish 5. Heat Processing: Canning of fish (Pretreatments and steps involved in detail) 6. Cold storage and freezing of fish 7. Curing of fish: Types of curing 8. Drying of fish: Theory and techniques 9. Smoking of fish: Types of smoking 10. Specialized fish products: Fish paste (Surimi), Fish fingers, Fish pickles, Wafers, Fish protein concentrates
Module 3(Credit 1)	**Meat:Processing and Preservation**
Learning Outcomes	After learning the module, learners will be able to: 1. Explain stunning and slaughtering techniques used in the meat industry. 2. Compare various techniques used for processing and preservation of meat. 3. Identify the utilization of byproducts of meat processing.
Content Outline	1. Stunning and Slaughtering techniques 2. Low temperature storage: Chilling and freezing 3. Dehydration of meat 4. Preservation by direct microbial inhibition (Irradiation, Use of Antibiotics) 5. Processing of meat Products: 6. Corned beef, Sausages (Types), Luncheon meat 7. Types and processing of animal fats (Lard, Tallow) 8. Processing of by-products of slaughtering industry: Gelatin, Casings for sausages, Blood plasma
Module 4 (Credit 1)	**Egg processing, Poultry Processing and Fermented Products**
Learning Outcomes	After learning the module, learners will be able to 1. Describe the steps involved in conversion of poultry bird to poultry meat. 2. Examine the processing of different egg and chicken products. 3. Explain the processing of common fermented products from different food groups.
Content Outline	1. Processing of eggs: - Pasteurization, freezing, dehydration (desugaring techniques) 2. Processing of poultry - Processing of bird to poultry meat - Processing of Chicken products: Sausages, nuggets, dehydration 3. Fermentation Technology: - Production of yeast - Processing of fermented food from different food commodities Cereals: bread, fermented batter products (idli, dosaetc) - Pulses: soy based (Natto, miso, soy sauce etc.) - Vegetables: sauerkraut, kimchi - Fish : fermented fish paste, Fish protein concentrate

Assignments/Activities towards Comprehensive Continuous Evaluation (CCE)

1. Assignment**:** Classification of cheese and Processing of different types of cheese
2. Survey on processed fish products available in Indian markets
3. Assignment: Processing of products of slaughtering industry
4. Presentation of fermented products from different food categories

References: -

1. Mary Chandy N.V.T, India- The Land and the people, Fishes, 639.3.
2. Jane Bowers, Food Theory and application, 664, Macmillan Publishing Company, New York.
3. Sukumar De, Outlines of Dairy Technology, (1994), Delhi, Oxford University Press.
4. Hui, Y. H. (2012). *Handbook of meat and meat processing* (2nd ed.). CRC Press.
5. Fellows, P. J. (2009). *Food Processing Technology: Principles and Practice* (3rd ed.). Woodhead Publishing
6. Subbulakshmi, G., & Udipi, S. A. (2001). *Food processing and preservation*. New Age International
7. Sen, D. P. (2005). *Advances in fish processing technology*. Allied Publishers Pvt. Ltd.
8. Hall, G. M. (Ed.). (1997). *Fish processing technology* (2nd ed.). Springer US
9. Barbut, S. (2002). *Poultry products processing: An industry guide*. CRC Press

4.3 Major (Core)

Course Title	**Food Packaging and Labelling (2Th+2Pr)**
Course Credits	**4**
Course Outcomes	After going through the course, learners will be able to:
	1.Explain the principles, functions, and types of food packaging 2.Analyze food-packaging interactions and their impact on food quality 3.Interpret food packaging and labeling laws, including FSSAI regulations 4.Identify mandatory labeling components, nutrition labeling, and health claims 5.Select appropriate packaging materials for various food commodities 6.Demonstrate practical skills in evaluating packaging materials and designing food labels. 7. Analyze packaging performance and consumer communication through labels.
Module 1(Credit 1) Th- Packaging: Levels, Functions, Forms & Techniques	
Learning Outcomes	After learning the module, learners will be able to:
	1. Explain the concept of food packaging and factors affecting shelf life during storage. 2. Describe the importance and functions of food packaging in food preservation and safety. 3. Identify different levels of packaging, including primary, secondary, and tertiary packaging. 4. Compare the properties, advantages, disadvantages and making processes of various packaging materials.
Content Outline	i. Functions and levels of food packaging ii. Types of packaging materials: Their properties, advantages, disadvantages and types (if any)-Glass, Paper, Plastics, Metals, Laminates iii. Forms: Bottles and jars, Cans, Pouches, Tetra Pak, Blister packs, Tubes, Punnets, Rigid plastic containers, closures for the containers iv. Techniques: Shrink, Aseptic, Form-Fill-Seal, Modified Atmosphere Packaging, Controlled Atmosphere Packaging, Active packaging v. Active/smart packaging
Module 2(Credit 1) Th- Packaging- Food Interaction, Testing, Shelf-life studies, Labelling, Nutrition Labelling, Packaging laws and standards, Barcodes	
Learning Outcomes	After learning the module, learners will be able to:
	1. Identify food-packaging interactions (migration, permeation, etc.) 2. Describe shelf-life study methods and packaging material testing 3. Interpret FSSAI regulations and other standards 4. Evaluate label components, claims, and consumer rights

Content Outline	i. Interaction between food packaging and food and their effects ii. Quality testing of different packaging materials iii. Shelf-life testing techniques iv. Importance of food labelling and FSSAI labelling regulations v. Nutrition labelling: Nutrient and health claims vi. Organic, GMO, Halal, Kosher, Vegan labeling vii. Barcodes
Module 3(Credit 1)	**Pr Identification of Packaging Materials, forms and techniques**
Learning Outcomes	After learning the module, learners will be able to: 1. Identify and classify common packaging materials such as paper, plastic, glass, and metal. 2. Interpret plastic recycling codes and identification marks used in packaging. 3. Conduct tests to determine the physical properties of packaging materials, including drop test, WVTR, and thickness. 4. Analyze and compare packaging materials based on properties, applications, and performance.
Content Outline	1. Collection and identification of packaging materials (paper, plastic, glass, metal) 2. Interpretation of plastic recycling codes and identification marks 3. Testing of packaging materials: Drop test, Shelf life studies, determination of WVTR, thickness of material, height, weight
Module 4 (Credit 1)	**Pr Packaging Forms and Applications**
Learning Outcomes	After learning the module, learners will be able to 1. Identify various packaging materials, closure systems, and label components. 2. Design a food label following FSSAI guidelines, including nutritional and regulatory details. 3. Evaluate food labels for compliance, accuracy, and clarity of claims. 4. Analyze the impact of packaging conditions on food quality and safety.
Content Outline	i. Dissection of multilayer pouches, tetra packs, blister packs ii. Identify closure systems iii. Design a label for a product using FSSAI guidelines iv. Documentation of food quality changes in different packaging conditions (temp, light) v. Presentation: Innovative packaging materials, techniques or forms etc. vi. Prepare a label for a sample product using FSSAI guidelines vii. Include nutritional panel, claims, barcode, batch, MRP, expiry viii. Evaluate 10 market food labels for compliance, claims, and clarity **Case Study:**

	i. Analyze misleading claims and propose corrective designs ii. Compare global label formats: FSSAI vs FDA vs EFSA

Assignments/Activities towards Comprehensive Continuous Evaluation (CCE):

1. **Collection Activity**: Gather 10 packaged food products and analyze packaging material & label components.
2. **Plastic Audit**: Identify types of plastic in home packaging waste.
3. **Assignment**: Types of food-packaging interactions and their implications.
4. **Project**: Create a compliant label for a student-designed food product.
5. **Mini-Experiment**: Basic shelf-life test under controlled storage.

References:

1. Choudhary, V. (2014). *Fundamentals of Food Processing, Packaging, Labelling and Marketing*. New Delhi: Anmol Publications Pvt. Ltd.
2. Khetarpaul, N. (2006). *Food Packaging*. Delhi: Daya Publishing House
3. Shukla, A. K. (2022). *Food Packaging: The Smarter Way*. Singapore: Springer
4. Robertson, G. L. (2012). *Food Packaging: Principles and Practice* (3rd ed.). Boca Raton, FL: CRC Press
5. Food Safety and Standards Authority of India (FSSAI). (2011). *Food Safety and Standards (Packaging and Labelling) Regulations, 2011*

4.4 OEC

Course Title	**Food Labels (Th)**
Course Credits	**2**
Course Outcomes	After going through the course, learners will be able to
	1. Define legal framework of food labeling. 2. Identify misleading claims and assess their impact on consumer trust and public health. 3. Describe key food label components. 4. Interpret nutritional labeling, macronutrients, micronutrients, and front-of-pack labeling systems. 5. Analyze different types of nutrition claims and their regulatory implications. 6. Evaluate the regulatory and consumer implications of special labeling requirements for organic, GMO, allergen, and country-of-origin claims.
Module 1(Credit 1)	**Introduction, regulations, ethical considerations**
Learning Outcomes	After learning the module, learners will be able to
	1. Explain the Basics of Food Labels. 2. Analyze the Legal Framework for Food Labeling. 3. Evaluate Country-Specific Food Labeling Regulations. 4. Assess Consumer Awareness and Ethical Considerations in Food Labeling.
Content Outline	**1.Introduction to Food Labels** -Definition and importance of food labels -Legal framework for food labeling **2.Food Labeling Regulations** -Country-specific regulations (e.g., FDA [USA], FSSAI [India], EFSA [EU]) -Mandatory vs. voluntary labelling **3.Consumer Awareness and Ethical Considerations** -Misleading claims and marketing tactics -The role of food labels in public health -Consumer rights and responsibilities
Module 2(Credit 1) requirements	**Key components, nutritional claims and special**
Learning Outcomes	After learning the module, learners will be able to
	1. Identify and describe the essential components of food labels 2. Recognize the importance of nutritional labeling and its impact on consumer choices and health. 3. Analyze different types of nutrition claims, such as health claims. 4. Evaluate front-of-pack labeling systems like the traffic light system and Nutri-Score in guiding consumer decisions.

Content Outline	**1.Key Components of Food Labels** -Mandatory components of food labels as per FSSAI guidelines **2.Nutritional Labeling & Claims** -Understanding macronutrients and micronutrients on labels -Types of nutrition claims (health claims, nutrient content claims, structure-function claims) -Front-of-pack labelling (traffic light system, Nutri-Score, etc.) **3.Special Labeling Requirements** -Organic, GMO, and allergen labelling -Country of origin labelling (COOL) -Labelling for specific consumer groups (e.g., Halal, Kosher, Vegan)

Assignments/Activities towards Comprehensive Continuous Evaluation (CCE):

1. Case Study on Misleading Food Labels: Analyze real-life examples of misleading food labels, discuss their impact on consumer trust and health, and propose regulatory measures to prevent such practices.
2. Activity: Prepare a sample food label as per the FSSAI (Mandatory) and other voluntary standards

References: -

1. Food Safety and Standards Authority of India (FSSAI). (2019). *The Pink Book: Your guide for safe and nutritious food at home.* FSSAI.
2. Scott, J. K., & Hayes, M. I. (2012). *Food labeling: FDA protections and country-of-origin labels*. Nova Science Publishers.
3. Future Learn. (n.d.). *Understanding food labels*. University of Reading. Retrieved February 23, 2025,
4. Choudhary, V. (2014). *Fundamentals of food processing, packaging, labelling and marketing*. Anmol Publications Pvt. Ltd.
5. NIIR Board of Consultants & Engineers. (2020). *Food packaging technology handbook* (3rd rev. ed.). NIIR Project Consultancy Services.

4.5 SEC

Course Title	**Sensory Evaluation (Pr)**
Course Credits	**2**
Course Outcomes	After going through the course, learners will be able to
	1. Describe the basic sensory quality attributes (color, flavor, texture, appearance) of raw and processed foods. 2. Explain the principles and importance of sensory evaluation in food quality control. 3. Differentiate between objective and subjective methods of sensory evaluation. 4. Apply appropriate sensory evaluation techniques to assess food quality. 5. Analyze sensory characteristics of food products and interpret results for quality assurance in the food industry.
Module 1(Credit 1)	**Introduction to Sensory Attributes of Food**
Learning Outcomes	After learning the module, learners will be able to
	1. Identify and Describe Sensory Attributes. 2. Elaborate the Mechanisms of Sensory Perception. 3. Design and Implement Sensory Evaluation Tests. 4. Recognize Factors Influencing Sensory Measurements.
Content Outline	**1.Introduction to Sensory Attributes of Food** -Appearance, flavour, textural factors and additional quality factors -Mechanism of taste perception -Mechanism of odour perception -Perception of colour -Texture classification **2.Sensory evaluation pre-requisites** -Arrangements for Sensory Evaluation Test controls -Environment and test room design -Product controls: sample preparation and presentation -Panelist controls **3.Factors influencing measurements** -Psychological and physiological errors
Module 2(Credit 1)	**Sensory Evaluation techniques**
Learning Outcomes	After learning the module, learners will be able to
	1. Conduct Basic Taste Recognition Tests 2. Execute and perform Testing Methods for various food products 3. Identify and Analyze Flavor Defects in a few Food Products
Content Outline	**1. Training of sensory panel.** -To perform recognition tests for basic tastes. -To perform various Analytical tests **2.Difference Tests:** -Paired comparison test -Duo trio test -Triangle test **3.Rating test:** -Hedonic -Numerical

	-Composite scoring -Ranking test **4.Sensitivity Tests:** -Threshold /Dilution for basic tastes **5.Perform sensory evaluation of food products** -Analyze flavour defects in food products eg. milk, butter, etc.

Assignments/Activities towards Comprehensive Continuous Evaluation (CCE):

1. Daily practicals
2. Journal

References:

1. Srilakshmi, B. (2018). *Food science* (7th ed.). New Age International Publishers.
2. Rao, E. S. (2014). Food Quality Testing and Evaluation: Sensory Tests and Instrumental Techniques. Variety Book Publishers. New Delhi
3. Meilgard. (1999). Sensory Evaluation Techniques (3rd ed.). CRC Press LLC.
4. Rao, E. S. (2013). Food Quality Evaluation (Ist ed.). New Delhi: Variety Book Publishers.
5. Harry, T. Lawless. & Barbara, P. Klien. (1991) Sensory Science Theory and Applications in Food. New York: Marcel Dekker

4.6 CE

Course Title	**Food Adulteration (Pr)**
Course Credits	**2**
Course Outcomes	After going through the course, learners will be able to
	1. Identify common food adulterants in various food products. 2. Perform qualitative tests to detect adulterants in fats, oils, spices, milk products, cereals, and other food items. 3. Analyze the impact of food adulteration on public health. 4. Demonstrate practical skills in qualitative food adulteration analysis through hands-on experiments. 5. Evaluate the effectiveness of community engagement in raising awareness of food adulteration. 6. Communicate findings effectively through reports, presentations, and discussions on food adulteration cases.
Module 1(Credit 1) Qualitative analysis of common food adulterants in laboratory	
Learning Outcomes	After learning the module, learners will be able to
	1. Define food adulteration and classify different types of adulterants. 2. Describe the common adulterants present in various food categories such as fats, oils, spices, milk, cereals, honey, and confectionery. 3. Demonstrate qualitative tests to detect food adulterants in specific food items.
Content Outline	1.Introduction to Food Adulteration 2.Qualitative analysis of common food adulterants in laboratory Fats and oils Spices and condiments Milk and milk products Cereals and pulses Honey and Jaggery Tea and coffee Sweets and confectionary
Module 2(Credit 1) Qualitative analysis of common food adulterants in Community	
Learning Outcomes	After learning the module, learners will be able to
	1. Interpret test results to determine the presence of adulterants in food samples. 2. Report findings accurately in journals and assignments. 3. Defend their practical knowledge through viva voce.
Content Outline	**1.Qualitative analysis of common food adulterants in Community** Fats and Oils Spices and condiments Milk and milk products Cereals and pulses Honey and Jaggery Tea and coffee

	Sweets and confectionary

Assignments/Activities towards Comprehensive Continuous Evaluation (CCE):

1. Daily practical
2. Journal
3. Activity: Prepare a booklet on analysis of common adulterants in food and methods to detect them
4. Community-Based Project: Food Adulteration Awareness Campaign Conduct a community outreach project where students educate local consumers about common food adulterants, their health risks, and simple household detection tests.

References: -

1. De, S. (2018). *Outlines of dairy technology* (2nd ed.). Oxford University Press.
2. Kumar, P. (2020). *Food safety and quality control* (2nd ed.). CBS Publishers & Distributors.
3. Potter, N. N., & Hotchkiss, J. H. (2019). *Food science* (6th ed.). Springer.
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7. Jonallagadda, V. (2023). *A text book of food adulteration*. Perfect Paperback.
8. Deshpande, H. W., &Poshadri, A. (2023). *Food analysis and quality control*. NIPA.
9. Khan, M. S., & Rahman, M. S. (Eds.). (2021). *Techniques to measure food safety and quality: Microbial, chemical, and sensory*. Springer.
10. Sehgal, S. (2016). *A laboratory manual of food analysis*. I K International Publishing House.
11. Shirke, G. (2022). *Food & beverage adulteration and its implications: Theory & practice*. Notion Press.
12. Halde, P., & Sharma, S. (2017). *Objective Food Science and Safety Standards* (2nd ed.). Jain Brothers.