SNDT Women's University, Mumbai

Undergraduate Degree / UG Programme (Syllabus as Per NEP) - Faculty of Science & Technology

Bachelor of Science
Home Science
(Food Science & Quality Control)

B.Sc. In H.Sc. – FSQC

As Per NEP – 2020

Semester – V & VI

Syllabus
(W.E.F. Academic Year 2026-27)

Terminologies

Vertical	Full-Form/Definition	Remarks	Related To Major And Minor Courses
Major (Core)	Subject Comprising Mandatory and Elective Courses, Major Specific IKS, Vocational Skill Courses, Internship/ Apprenticeship, Field Projects, Research Projects Connected to Major	Minimum 50% Of Total Credits Corresponding to Three/Four - Year UG Degree- Mandatory Courses	Related To The Major
Minor Course	Course From Same Or Different Faculty	Minimum 18-20 Credits to Be Completed in The First Three Years of UG Programme	Related To the Minor
OEC	Open Elective Courses/ Generic Courses	10-12 Credits to Be Offered in I And/Or II Year. Faculty-Wise Baskets of OEC To Be Prepared	OEC Is to Be Chosen Compulsorily from Faculty Other Than That of the Major
VSC	Vocational Skill Courses, Including Hands On Training Corresponding To The Major And/Or Minor Subject	8-10 Credits, To Be Offered in First Three Years, Wherever Applicable Vocational Courses Will Include Skills Based on Advanced Laboratory Practical's of Major	Related To the Major or Minor
SEC	Skill Enhancement Courses	06 Credits, To Be Offered in I And II Year, To Be Selected from The Basket of Skill Courses Approved by University	Related To the Major or Minor Any Relevant Skill
AEC	Ability Enhancement Courses	08 Credits, To Be Offered in I And II Year, English: 04 Credits to Be Earned in Sem - I, Modern Indian Language Of 04 Credits to Be Offered in II Year	NA
VEC	Value Education Courses	Understanding India, Environmental Science/Education, Digital and Technological Solutions, Health &	NA

		Wellness, Yoga Education, Sports, And Fitness	
IKS	Indian Knowledge System	Generic IKS Course: Basic Knowledge Of The IKS To Be Offered At First Year Level	Major-Specific IKS Courses: Advanced Information About the Major, Part of the Major Credit to Be Offered at Second- Or Third-Year Level
OJT	On-Job Training (Internship / Apprenticeship)	Corresponding To the Major Subject	Related To The Major
FP	Field Projects	Corresponding To the Major Subject	Related To the Major
CC	Co-Curricular Courses	Health And Wellness, Yoga Education Sports, And Fitness, Cultural Activities, NSS/NCC And Fine/ Applied/Visual/ Performing Arts	NA
CE	Community Engagement and Service		Related To Major
RP	Research Project	Corresponding To the Major Subject	Related To Major

Programme Template

Programme		B.Sc.
Specialization		Food Science & Nutrition
Faculty		Science & Technology
Specialization		Food Science & Quality Control
Preamble		The Program lays a strong emphasis on an integrated approach through Multidisciplinary subjects that will enable students to build a variety of skills and a broad base of professional knowledge related to food science and quality control. It encourages the development of scientific perspectives and a research attitude in students related to food science and nutrition. The programme focuses on quality control aspects of food science and nutrition and trains learners in human physiology, biochemistry, nutrition, food microbiology, food preservation, Post-Harvest Technology, Food Processing, Food Equipment's, Labeling, Food Toxicology and their relationships. At the end of the programme, the learners can work in the areas of food product development and food quality control.
Programme Specific Outcomes (PSOs)		After completing this programme, Learner will -
	1.	Examine the composition of various foods and the changes taking place during their processing and Cooking.
	2.	Analyze food and nutrition science.
	3.	Comprehend the fundamentals of human physiology, biochemistry, nutrition, food microbiology, food preservation, Post-Harvest Technology, Food Processing, Food Equipment's, Labeling, Food Toxicology and their relationships.
	4.	Acquire knowledge and confidence to work in the area of food quality control and food product development.
	5.	Undertake research in and about Food analysis.
Eligibility Criteria for Programme		Any woman who has successfully cleared 10+2 in Home Science or Science subjects from a recognized Board by the Government of India or respective State, or has the required credits as per government norms to join an undergraduate programme. Students who have studied Chemistry at the 10+2 level will be given preference.

Intake for Affiliated Colleges		30 (Batch size for Practical 15)

Structure with Course Titles

B.Sc. In Home Science – Food Science and Quality Control

Semester – V

Sr. No.	Course	Type of Course	Credits	Marks	Int Marks	Ext Marks
	Semester – V					
50130311	Food Standards and Quality Control (Th)	Major (Core)	4	100	50	50
50130322	Quality Control in Foods (Pr)	Major (Core)	4	100	50	50
51030321	Traditional Processing & Preservation Methods (Pr)	IKS (Major Specific)	2	50	0	50
50230311	Research Methodology and Statistics (Th)	Major (Elective) **(Any One)**	4	100	50	50
50230312	Food Plant Management (Th)					
50230323	Food Processing and Preservation (Pr)					
50330311	Food Product Development and Sensory Evaluation (Pr)	Minor Stream	4	100	50	50
50630301	Food Toxicology and Waste water Management (Pr)	VSC-4	2	50	50	0
51330301	Field Project (Pr)	FP	2	50	50	0
			22	**550**	**300**	**250**

Semester – VI

Sr. No.	Course	Type of Course	Credits	Marks	Int Marks	Ext Marks
	Semester - VI					
60130311	Food Microbiology and Safety (Th+Pr) (2+2)	Major (Core)	4	100	50	50
60130312	Industrial Equipment in Food Processing (Th)	Major (Core)	4	100	50	50
60230321	Food Entrepreneurship (Pr)	Major (Elective) **(Any One)**	4	100	50	50
60230322	Food Product Development (Pr)					
60230322	Culinary Science (Pr)					
60330311	Introduction to Food Labelling (Th)	Minor Stream **(Any One)**	2	50	0	50
60330312	Introduction To Functional Foods (Th)					
60330323	Food Analysis (Pr)	Minor Stream **(Any One)**	**4**	100	50	50
60330314	Food Preservation and Processing Techniques (Th+Pr) (2+2)					
61230321	On The Job Training in Food Science and Quality Control (Pr)	OJT	4	100	50	50
			22	**550**	**250**	**300**

Exit with Degree (3-year)

Course Syllabus

Semester – V

.5.1 Major (Core)

Course Titles	**Food Standards and Quality Control (Th)**
Course Credits	**4 Credit's**
Course Outcomes	After going through the course, learners will be able to
	1. Explain the concepts of food quality, quality control, quality assurance, food labelling, and food regulations in the food industry.
	2. Apply appropriate sampling techniques and procedures for food quality evaluation.
	3. Interpret food labels and nutritional labelling information for consumer awareness and protection.
	4. Describe national and international food laws, standards, and regulatory systems including ISO, HACCP, and Codex Alimentarius.
	5. Evaluate the quality characteristics, standards, defects, and factors affecting the quality of plant-based and animal-based food products.
	6. Describe the classification, functions, and safety considerations of food additives used in food processing.
Module 1 (Credit 1 Th): Fundamentals of Food Quality Control	
Learning Outcomes	After learning the module, learners will be able to
	1. Explain the concept and importance of quality control in food processing and food safety.
	2. Describe different sampling techniques used in food quality evaluation.
	3. Interpret the significance of food labeling and nutritional labeling.
	4. Identify major national and international food laws and standards.
Content Outline	• **Introduction to Quality Control** o Definition and concept of food quality, quality control, quality assurance, quality management, quality deviation, quality policy, quality system, quality improvement o Importance of quality control in food industry o Objectives of food quality assurance o Functions of quality controller

	• **Sampling Techniques for Quality Evaluation**
	  ○ Definition and importance of sampling
	  ○ Types of sampling techniques
	  ○ Procedures for food sampling in quality evaluation
	  ○ Sampling plan
	  ○ Sampling tools used for solid and liquid foods
	  ○ Storage and preservation of sample
	• **Food Labeling**
	  ○ Importance of labeling
	  ○ Mandatory Components/Information on food labels
	  ○ Consumer awareness and protection
	• **Nutritional Labeling**
	  ○ Components of nutritional labels
	  ○ Interpretation of nutrition facts
	  ○ Importance in promoting healthy food choices
	  ○ Nutrient and health claims
	• **Food Laws and Standards**
	  ○ Introduction to food regulations
	  ○ Overview of national and international food standards
	  ○ Mandatory and Voluntary food standards
	  ○ Introduction to ISO, HACCP, and Codex Alimentarius

Module 2 (Credit 1 Th): Quality Aspects of Plant-Based Foods	
Learning Outcomes	After learning the module, learners will be able to
	1. Describe quality characteristics of cereals and cereal products.
	2. Evaluate quality parameters of pulses and legumes.
	3. Identify quality attributes of vegetables and vegetable products.
	4. Explain quality aspects and standards of fruits and fruit products.

Content Outline	• Quality Aspects of Plant-Based Foods
	  ○ Cereals and cereal products
	  ○ Pulses and legumes
	  ○ Vegetables and vegetable products
	  ○ Fruits and fruit products
	• Quality characteristics, standards, defects, and factors affecting quality.

Module 3 (Credit 1 Th): Quality Aspects of Animal Foods	
Learning Outcomes	After learning the module, learners will be able to
	1. Describe the quality characteristics and standards of milk and milk products.
	2. Evaluate quality parameters of seafood and meat products.
	3. Identify factors affecting quality and spoilage of poultry and eggs.
	4. Identify common defects and adulteration in animal-based foods.

Content Outline	• **Quality Aspects of Animal Foods**
	  ○ Milk and milk products
	  ○ Seafood
	  ○ Meat
	  ○ Poultry and eggs
	• Quality characteristics, standards, spoilage, and defects.

Module 4 (Credit 1 Th): Quality Aspects of Fats and Oils, Other Food Products and Additives	
Learning Outcomes	After learning the module, learners will be able to
	1. Explain quality parameters and standards of fats and oils.
	2. Identify quality aspects of beverages and processed food products.
	3. Describe quality characteristics of spices and condiments.
	4. Explain the classification and functions of food additives used in food processing.

Content Outline	• **Quality Aspects of Other Products**
	  ○ Fats and oils
	  ○ Chocolates
	  ○ Carbonated Beverages
	  ○ Spices and Condiments
	• **Food Additives**
	  ○ Definition and classification
	  ○ Functions and uses of food additives
	  ○ Safety considerations and regulatory aspects

Assignments/Activities towards Comprehensive Continuous Evaluation (CCE):

CCE Components Theory Assignments:

- Identify quality control failures in a food product and suggest improvements.
- Collect different packaged food labels and identify mandatory labeling information.
- Label Design Activity: Create a correct food label for a new snack product according to regulations.
- Case Study on Food Safety Laws.
- Label Study Activity: Collect labels of milk, butter, cheese, and milk powder and identify quality standards mentioned.
- Adulteration Detection Activity: Discuss or demonstrate common milk adulteration tests (water, starch, detergent).
- Case Study: Analyze a situation where milk quality failed to meet standards and suggest corrective actions.
- Role and Safety of Food Additives in Processed Foods

References:

1. Herschdoerfer, S. M. (Ed.). (1972). Food science and technology: A series of monographs. Academic Press.
2. James, C. S. (1995). Analytical chemistry of foods. Chapman & Hall.
3. Sathe, A. Y. (1999). First course in food analysis. New Age International Pvt. Ltd.
4. Aylward, F. (2001). Food technology processing and laboratory control. Agrobios India.
5. Mirajkar, M., & Menon, S. (2001). Food science and processing technology (Vol. 2). Kanishka Publishers.
6. Ranganna, S. (1995). Handbook of analysis and quality control of fruits and vegetable products (2nd ed.). Tata McGraw-Hill.
7. Jacob, M. B. (1976). Food adulteration. Macmillan.
8. Winton, A. L., & Winton, K. B. (1999). Techniques of food analysis. Allied Scientific Publishers.
9. Nielsen, S. S. (Ed.). (1994). Introduction to the chemical analysis of foods. Jones & Bartlett Publishers.

Semester – V

.5.2 Major (Core)

Course Titles	**Quality Control in Foods (Pr)**
Course Credits	**4 Credit's**
Course Outcomes	After going through the course, learners will be able to
	1. Demonstrate laboratory techniques for the quality analysis of cereal and cereal products using standard analytical methods.
	2. Perform physicochemical analysis of food preserves such as jam, squash, ketchup, pickle, and vinegar to determine their quality parameters.
	3. Analyse quality characteristics of milk and milk products using standard tests for acidity, fat, protein, lactose, and other parameters.
	4. Determine important quality indices of fats and oils including iodine value, saponification value, acid value, and peroxide value.
	5. Evaluate the quality and safety of different food products based on analytical results and standard quality parameters.
Module 1 (Credit 1 Pr): Quality Analysis of Cereal and Cereal Products	
Learning Outcomes	After learning the module, learners will be able to
	1. Perform laboratory tests to assess the quality of wheat flour.
	2. Evaluate quality characteristics of bread and biscuits.
	3. Interpret results of quality tests in cereal products.
Content Outline	• **Quality Analysis of Cereal and Cereal Products** o Wheat flour quality analysis (Estimation of Moisture Content, Gluten content, Total Ash Content, Acid Insoluble Ash, Fermentation test) o Bread quality evaluation (Estimation of maltose content, Starch Content) o Quality analysis of biscuits (Estimation of Peroxide Value)
Module 2 (Credit 1 Pr): Quality Analysis of Food Preserves	
Learning Outcomes	After learning the module, learners will be able to
	1. Evaluate the quality of preserved food products using standard analytical methods.
	2. Identify quality defects in jams, squashes, and pickled products.
	3. Perform laboratory analysis of canned and processed fruit products.
Content Outline	• **Quality Analysis of Food Preserves**

	○ Jam (Estimation of Acidity, Total Soluble Solids, Free Reducing Sugar) ○ Squash (Estimation of Total Solids, Acidity, Total Soluble Solids, Sulphur Dioxide) ○ Ketchup (Estimation of pH, Salt Content, Acidity, Total Soluble Solids) ○ Pickle (Estimation of Acidity, Salt Content) ○ Vinegar (Estimation of Acidity) ○ Cut out examination of Canned fruits
Module 3 (Credit 1 Pr): Quality Analysis of Milk and Milk Products	
Learning Outcomes	After learning the module, learners will be able to
	1. Perform laboratory tests to evaluate the quality of milk.
	2. Analyze quality parameters of cheese and ice cream.
	3. Interpret analytical results for dairy product quality assessment.
Content Outline	• **Quality Analysis of Milk and Milk Products** ○ Quality analysis of Milk (Estimation of Acidity, Protein, Fat, Lactose Content, Specific Gravity, Total Solids, Clot on Boiling, Methylene Blue Reduction Test, Alcohol Coagulation Test) ○ Quality evaluation Cheese (Estimation of Salt Content) ○ Quality analysis Ice cream (Estimation of Titratable Acidity, Total Solids, Milk Protein, Over Run, Total Sugar, Milk Fat)
Module 4 (Credit 1 Pr): Quality Analysis of Fats and Oils	
Learning Outcomes	After learning the module, learners will be able to
	1. Perform laboratory tests to determine the quality of edible oils.
	2. Evaluate quality parameters of butter.
	3. Interpret analytical results related to fat and oil quality.
Content Outline	• **Quality Analysis of Fats and Oils** ○ Quality testing of Oil (Estimation of Iodine Value, Saponification Value, Acid Value, Peroxide Value) ○ Quality analysis of Butter (Estimation of Iodine Value, Salt Content)

Assignments/Activities towards Comprehensive Continuous Evaluation (CCE):

- Case Study: Quality Defects in Food Preserves
- Food Label Analysis Project
- Adulteration Detection in Plant-Based Foods

- Effect of Storage Conditions on Quality of Preserved Foods
- Case Study: Adulteration in Milk and Dairy Products
- Quality Evaluation of Edible Oils and butter
- Food Product Quality Survey: To conduct a consumer survey on a food product to evaluate taste preference, packaging quality, price–quality perception, and brand preference to understand consumer perception of food quality and its role in product development and marketing.

References:

1. Herschdoerfer, S. M. (Ed.). (1972). Food science and technology: A series of monographs. Academic Press.
2. James, C. S. (1995). Analytical chemistry of foods. Chapman & Hall.
3. Sathe, A. Y. (1999). First course in food analysis. New Age International Pvt. Ltd.
4. Aylward, F. (2001). Food technology processing and laboratory control. Agrobios India.
5. Mirajkar, M., & Menon, S. (2001). Food science and processing technology (Vol. 2). Kanishka Publishers.
6. Ranganna, S. (1995). Handbook of analysis and quality control of fruits and vegetable products (2nd ed.). Tata McGraw-Hill.
7. Jacobs, M. B. (1976). Food adulteration. McMillan Co.
8. Winton, A. L., & Winton, K. B. (1999). Techniques of food analysis. Allied Scientific Publishers.
9. Nielsen, S. S. (Ed.). (1994). Introduction to the chemical analysis of foods. Jones & Bartlett Publishers.

Semester – V

.5.3 Indian Knowledge System (IKS) (Major Specific)

Course Titles	**Traditional Processing and Preservation Methods (Pr)**
Course Credits	**2 Credit's**
Course Outcomes	After going through the course, learners will be able to
	1. Define food processing and preservation and explain the causes of food spoilage.
	2. Describe traditional food preservation methods and the role of dehydration, salt, sugar, oil, and spices in preservation.
	3. Demonstrate preparation of traditional preserved foods and identify microorganisms involved in food fermentation.
	4. Analyze the nutritional, cultural, and regional significance of traditional food systems.
	5. Integrate traditional food processing knowledge with modern nutrition and dietetics practices.
Module 1 (Credit 1 Pr): Introduction to Food Processing and Preservation	
Learning Outcomes	After learning the module, learners will be able to
	1. Define the concept and scope of food processing and preservation.
	2. Explain the causes of food spoilage and principles of traditional drying and dehydration methods.
	3. Describe preservation techniques using salt, sugar, oil, spices, and natural preservatives.
Content Outline	• **Traditional Drying and Dehydration Methods** o Principles of drying o Sun drying and shade drying of food grains, fruits, vegetables and spices o Smoking of food products o Advantages and limitations of drying • **Preservation using salt, sugar and oil** o Preservation using salt (salting and curing) o Preservation using sugar (jam, jelly, marmalade) o Oil-based preservation (pickles) o Role of spices and natural preservatives o Importance of acidity and osmotic pressure in preservation
Module 2 (Credit 1 Pr): Understand the importance of traditional preservation methods	

Learning Outcomes	After learning the module, learners will be able to
	1. Describe regional and community-based traditional food systems and their diversity.
	2. Explain the concept of fermentation and identify microorganisms involved in fermented foods.
	3. Demonstrate preparation of traditional fermented foods and compare traditional and modern preservation methods.
Content Outline	• **Fermentation Techniques** o Concept and principles of fermentation o Microorganisms involved in fermentation o Traditional fermented foods such as curd, idli, dosa batter, and dhokla o Nutritional and health benefits of fermented foods o Safety and hygiene in fermentation o Explain philosophical and cultural foundations of Indian food traditions

Assignments/Activities towards Comprehensive Continuous Evaluation (CCE):

- Prepare any two traditional preserved/fermented foods and submit a practical record with method, preservation technique, and observations.
- Conduct a small survey on a traditional preservation method and present its process, cultural importance, and nutritional benefits in a short report/presentation.

References:

1. Srivastava, R. P. and Kumar, S. (2002). Fruit and Vegetable Preservation: Principles and Practices. International Book Distributing Company, Lucknow, India.
2. Srilakshmi, B. (2015). Food Science (6th ed.). New Age International Publishers, New Delhi.
3. Manay, N. S. and Shadaksharaswamy, M. (2008). Foods: Facts and Principles. New Age International Publishers, New Delhi.
4. Subbulakshmi, G. and Udipi, S. A. (2001). Food Processing and Preservation. New Age International Publishers, New Delhi.
5. Ramaswamy, H. and Marcotte, M. (2006). Food Processing: Principles and Applications. CRC Press.
6. Thangam Philip (2010). Modern Cookery for Teaching and the Trade (Vol. 1). Orient Blackswan, Hyderabad – includes traditional Indian preservation methods such as pickling and drying.
7. Girdharilal, Siddappa, G. S. and Tandon, G. L. (2012 reprint). Preservation of Fruits and Vegetables. Indian Council of Agricultural Research (ICAR), New Delhi.

8. Potter, N. N. and Hotchkiss, J. H. (1995). Food Science. CBS Publishers and Distributors, New Delhi.

Semester – V

.5.4 A. Major (Elective)

Course Titles	**Research Methodology and Statistics (Th)**
Course Credits	**4 Credit's**
Course Outcomes	After completing this course, learners will be able to:
	1. Explain the concept, characteristics, and importance of research.
	2. Identify research problems and formulate research objectives and simple hypotheses.
	3. Differentiate various types of research and research designs.
	4. Select appropriate sampling methods such as simple random, purposive, and convenience sampling for basic studies.
	5. Develop basic data collection tools such as questionnaires, interview schedules, and observation formats.
	6. Organize, analyze, and present research data using basic statistical methods and graphical techniques.
	7. Interpret research findings and prepare a simple scientific research report following standard research report structure.
Module 1 (Credit 1 Th): Fundamentals of Research	
Learning Outcomes	After learning the module, learners will be able to -
	1. Explain meaning, purpose and importance of research.
	2. Describe the steps in research process.
	3. Identify and formulate research problems.
Content Outline	• **Introduction to Research** o Meaning and characteristics of research o Importance of research in Home Science • **Types of Research** o Basic and Applied research o Qualitative and Quantitative research o Survey method o Case study method
Module 2 (Credit 1 Th): Types of Research and Research Design	
Learning Outcomes	After learning the module, learners will be able to -
	1. Differentiate types of research.
	2. Explain the components of a research design, including variables, objectives, and hypothesis.
	3. Select suitable research design for simple research studies.

Content Outline	• **Research Process** o Selection of topic o Identification of research problem o Review of literature – meaning and importance o Research objectives o Variables – meaning and types (independent, dependent, discrete, continuous) o Hypothesis – meaning o Ethics in research (plagiarism, consent, confidentiality) • **Research Design** o Meaning and importance o Components of research design o Research questions and assumptions o Scope of research in Home Science
Module 3 (Credit 1 Th): Sampling and Tools of Data Collection	
Learning Outcomes	After learning the module, learners will be able to -
	1. Explain the concepts of population, sample, and sampling techniques used in research.
	2. Differentiate between probability and non-probability sampling methods.
	3. Develop basic data collection tools, including questionnaires, interview schedules, and observation methods.
Content Outline	• **Sampling** o Meaning of population and sample o Need for sampling o Probability sampling – simple random sampling o Non-probability sampling – purposive and convenience sampling o Factors affecting sample size • **Tools of Data Collection** o Primary and secondary data o Questionnaire – types of questions o Interview schedule o Observation method
Module 4 (Credit 1 Th): Basic Statistics for Research	
Learning	After learning the module, learners will be able to -

Outcomes	1. Explain the role and importance of statistics in research.
	2. Organize and present data using classification, tabulation, and graphical methods.
	3. Calculate and interpret measures of central tendency such as mean, median, and mode.
	4. Outline the structure of a scientific research report, including introduction, methodology, results, and conclusion.

Content Outline	• **Introduction to Statistics**
	  ○ Meaning and importance of statistics in research
	  ○ Types of data – qualitative and quantitative
	• **Organization and Presentation of Data**
	  ○ Classification and tabulation
	  ○ Frequency distribution
	  ○ Graphical presentation – bar diagram, pie chart, histogram
	• **Measures of Central Tendency**
	  ○ Mean
	  ○ Median
	  ○ Mode
	• **Scientific Report Writing**
	  ○ Title page
	  ○ Abstract
	  ○ Introduction
	  ○ Review of literature
	  ○ Materials and methods / Methodology
	  ○ Results and discussions
	  ○ Summary and conclusion
	  ○ Bibliographical details

Assignments/Activities towards Comprehensive Continuous Evaluation (CCE):

- Frame research objectives
- Prepare questionnaire on selected topic
- Conduct mini survey and collect small dataset
- Calculate Mean, Median and Mode from collected data
- Prepare graphs and tables from data
- Review and classify research papers
- Develop a simple research proposal

References:

1. Best, J. W., & Kahn, J. V. (2016). Research in education (10th ed.). Pearson Education.
2. Bhaskaran, V. (2008). Research methods for social work. Himalaya Publishing House.
3. Creswell, J. W., & Creswell, J. D. (2018). Research design: Qualitative, quantitative, and mixed methods approaches (5th ed.). Sage Publications.
4. Gupta, S. C. (2014). Fundamentals of statistics. Himalaya Publishing House.
5. Gupta, S. P. (2018). Statistical methods. Sultan Chand & Sons.
6. Kerlinger, F. N., & Lee, H. B. (2000). Foundations of behavioral research (4th ed.). Harcourt College Publishers.
7. Kothari, C. R., & Garg, G. (2019). Research methodology: Methods and techniques (4th ed.). New Age International Publishers.
8. Kumar, R. (2019). Research methodology: A step-by-step guide for beginners (5th ed.). Sage Publications.
9. McBurney, D. H., & White, T. L. (2010). Research methods (8th ed.). Cengage Learning.
10. Spiegel, M. R., Schiller, J., & Srinivasan, R. A. (2017). Schaum's outline of statistics (5th ed.). McGraw Hill Education.
11. Triola, M. F. (2018). Elementary statistics (13th ed.). Pearson Education.

Semester – V

.5.4 B. Major (Elective)

Course Titles	**Food Plant Management (Th)**
Course Credits	**4 Credit's**
Course Outcomes	After going through the course, learners will be able to
	1. Explain the principles and functions of management in food processing industries.
	2. Describe factors affecting plant location, plant layout, and design of food processing plants.
	3. Explain utilities and equipment selection in food plants.
	4. Apply concepts of production planning, quality management, and food safety in plant operations.
	5. Demonstrate knowledge of plant maintenance, safety practices, and personnel management in food industries.
Module 1 (Credit 1 Th): Introduction to Food Plant Management	
Learning Outcomes	After learning the module, learners will be able to
	1. Explain the concept and importance of food plant management.
	2. Describe the functions of management in food industries.
	3. Explain the organizational structure in food processing plants.
Content Outline	• Introduction to food plant management and its importance • Functions of management: Planning, Organizing, Staffing, Directing, Controlling • Organizational structure in food processing industries • Role and responsibilities of plant manager and supervisors
Module 2 (Credit 1 Th): Plant Location and Layout	
Learning Outcomes	After learning the module, learners will be able to
	1. Identify factors influencing plant location.
	2. Describe different plant layouts used in food industries.
	3. Explain the principles of efficient plant layout.
Content Outline	• Importance of plant location • Objectives and types of plant layout • Principles of good plant layout
Module 3 (Credit 1 Th): Plant Design, Equipment and Utilities	
Learning Outcomes	After learning the module, learners will be able to
	1. Explain the principles of hygienic plant design.
	2. Identify factors affecting equipment selection in food processing

	plants.
	3. Describe utilities required in food plants.
Content Outline	• Principles of food plant design • Personnel hygiene and sanitation in the food processing plant • Selection of food processing equipment • Utilities in food processing plants • Waste disposal and environmental considerations
Module 4 (Credit 1 Th): Production Management and Food Safety	
Learning Outcomes	After learning the module, learners will be able to
	1. Explain production planning and control in food plants.
	2. Describe quality control and food safety systems used in food industries.
	3. Evaluate maintenance and safety practices in food processing industries.
Content Outline	• Production planning and control • Inventory management • Overview of Food Quality management and safety systems • Food Plant maintenance • Industrial safety and occupational health

Assignments/Activities towards Comprehensive Continuous Evaluation (CCE):

- Assignment on factors affecting plant location in food industries
- Case study on plant layout of a food processing unit
- Report on utilities used in food processing plants
- Assignment on GMP and HACCP implementation in food industries
- Short survey on safety practices followed in local food processing units

References:

1. Brennan, J. G. (2006). Food processing handbook. Wiley-VCH.
2. Fellows, P. J. (2017). Food processing technology: Principles and practice (4th ed.). Woodhead Publishing.
3. Gould, W. A. (1995). Total quality assurance for the food industries. CTI Publications.
4. Hui, Y. H. (Ed.). (2006). Handbook of food science, technology, and engineering. CRC Press.
5. Potter, N. N., & Hotchkiss, J. H. (1998). Food science (5th ed.). Springer.
6. Da-Wen, S. (2014). Handbook of food processing: Food safety, quality, and manufacturing processes (2nd ed.). CRC Press.

7. Earle, R. L., Earle, M. D., & Anderson, A. (2001). Food product development: Maximising success. Woodhead Publishing.
8. Katsigris, C., & Thomas, C. (2009). Design and equipment for restaurants and foodservice: A management view (3rd ed.). Wiley.
9. Marriott, N. G., Schilling, M. W., & Gravani, R. B. (2018). Principles of food sanitation (6th ed.). Springer.
10. Food and Agriculture Organization. (2011). Guide to good hygiene practices for food processing industries. FAO.
11. Food Safety and Standards Authority of India. (2023). Food safety and standards regulations. Government of India.

Semester – V

.5.4 C. Major (Elective)

Course Titles	**Food Processing and Preservation (Pr)**
Course Credits	**4 Credit's**
Course Outcomes	After going through the course, learners will be able to
	1. Explain the basic principles and ingredients used in baking.
	2. Prepare a variety of bakery products including cakes, biscuits, and breads.
	3. Apply appropriate baking techniques and fermentation methods.
	4. Evaluate the quality characteristics of bakery products.
	5. Demonstrate practical skills in bakery production and small-scale food processing.
Module 1 (Credit 1 Pr): Introduction to Baking and Preparation of Cakes and Pastry Products	
Learning Outcomes	After learning the module, learners will be able to
	1. Explain the fundamentals of baking.
	2. Identify different bakery products and their classifications.
	3. Explain the functions of baking ingredients.
	4. Prepare different varieties of cakes using appropriate techniques.
	5. Demonstrate preparation of eggless and specialty cakes.
	6. Prepare pastry products and sponge-based desserts.
	7. Evaluate texture, flavour, and appearance of baked cakes.
Content Outline	• Introduction to basics of baking • Classification of bakery products (cakes, biscuits, breads, pastries) • Introduction to role of food ingredients used in baking • **Preparation and baking of the following products:** o Marble cake o Fruit cake o Eggless cakes o Brownies o Madeleines o Fatless sponge cake o Pineapple gateaux

	○ Short crust pastry: Pie and tart
Module 2 (Credit 1 Pr): Preparation of Biscuits, Cookies and Breads	
Learning Outcomes	After learning the module, learners will be able to
	1. Prepare different types of biscuits and cookies.
	2. Explain dough preparation and baking conditions for biscuits.
	3. Identify characteristics of good quality biscuits.
	4. Demonstrate shaping, baking and finishing techniques for biscuit products.
	5. Prepare yeast-based bakery products such as breads and buns.
	6. Explain fermentation and dough handling techniques.
	7. Demonstrate preparation of pizza and doughnuts.
Content Outline	• **Preparation and baking of the following products:** ○ Nankhatai ○ Coconut biscuits ○ Chocolate cream fingers ○ Melting moments ○ Salted biscuits ○ Cheese biscuits ○ Cherry shortbread ○ Pizza ○ Doughnuts ○ Bread rolls ○ Chelsea buns
Module 3 (Credit 1 Pr): Preservation Techniques for Vegetables	
Learning Outcomes	After learning the module, learners will be able to
	1. Understand preservation techniques used in vegetables
	2. Demonstrate the process of freezing and dehydration vegetables, including selection, blanching, packaging, and storage.
	3. Identify and classify different types of pickles based on ingredients, method of preparation, and preservation techniques.
	4. Prepare various types of chutneys (e.g., tomato chutney, apple-raisin chutney) and understand their role in food preservation and flavor enhancement.
	5. Demonstrate the preparation of tomato puree and ketchup

	6. Compare different preservation methods in terms of shelf life, cost, and quality of the final product.
Content Outline	• **Preparation of the following preserved vegetable products:** o Freezing of vegetables o Dehydration of vegetables o Different types of pickles o Chutneys: Tomato, Apple raisin etc. o Tomato puree o Tomato ketchup
Module 4 (Credit 1 Pr): Preservation Techniques for Fruits	
Learning Outcomes	After learning the module, learners will be able to
	1. Understand principles of fruit preservation and explain the role of sugar, temperature, and processing techniques in extending shelf life.
	2. Demonstrate the process of freezing and dehydration fruits, including selection, pre-treatment, packaging, and storage conditions.
	3. Prepare fruit squash and understand formulation, preservation using sugar and preservatives, and storage requirements
	4. Describe and prepare flavoured synthetic syrups, including the use of colours, flavours, and preservatives as per food safety standards.
	5. Demonstrate the preparation of jam, guava jelly and guava cheese and evaluate the role of pectin, sugar, and acid in gel formation.
	6. Demonstrate the preparation of candied fruit peels and explain sugar infusion as a preservation method.
	7. Understand the basic process of grape wine preparation, including fermentation, maturation, and storage.
Content Outline	• **Preparation of preserved fruit products:** o Freezing of fruits o Dehydration of fruits o Fruit squash (Lemon squash) o Flavoured synthetic syrups o Jam (Mixed fruit) o Guava jelly, guava cheese o Grape wine

	○ Candied peels

Assignments/Activities towards Comprehensive Continuous Evaluation (CCE):

1. Identification of bakery ingredients and equipment used in baking.
2. Preparation of various bakery products including cakes, pastries, biscuits, cookies, breads and buns.
3. Demonstration and practice of baking techniques such as mixing, creaming, kneading and fermentation.
4. Assignment on functions of baking ingredients and types of bakery products.
5. Study of basic wine making process.
6. Field visit to a bakery or food processing unit and submission of report.
7. Maintenance of practical record book including recipes, observations and results.

References:

1. McWilliams, M. (2019). Food processing: Principles and applications. Cambridge University Press.
2. Fennema, O. R. (2017). Food chemistry (5th ed.). CRC Press.
3. Earle, R. L., & Earle, A. (2017). Food science and technology (2nd ed.). Wiley.
4. Ghosh, R. (2016). Food preservation: A practical guide. Springer.
5. Pomeranz, Y., & Meloan, C. E. (2009). Food analysis: Theory and practice (4th ed.). Springer.
6. Srivastava, R. P. and Kumar, S. Fruit and Vegetable Preservation: Principles and Practices. International Book Distributing Co., Lucknow.
7. Lal, G., Siddappa, G. S. and Tandon, G. L. Preservation of Fruits and Vegetables. Indian Council of Agricultural Research (ICAR), New Delhi.
8. Joshi, V. K. Technology of Handling, Packaging, Processing and Preservation of Fruits and Vegetables. Kalyani Publishers, New Delhi.
9. Sharma, H. K. and Kaushal, B. B. L. Processing, Preservation and Product Development Techniques for Fruits and Vegetables. New India Publishing Agency, New Delhi.
10. Verma, L. R. and Joshi, V. K. Post-Harvest Technology of Fruits and Vegetables. Indus Publishing Company, New Delhi.
11. Hui, Y. H. (Ed.). Handbook of Vegetable Preservation and Processing. CRC Press, USA.
12. Fellows, P. J. Food Processing Technology: Principles and Practice. Woodhead Publishing, Cambridge.

Semester – V

.5.5 Minor Stream

Course Titles	**Food Product Development and Sensory Evaluation (Pr)**
Course Credits	**4 Credit's**
Course Outcomes	After going through the course, learners will be able to
	1. Apply principles of food product development to design innovative and nutritious food products.
	2. Demonstrate skills in standardization, formulation, and modification of food products.
	3. Conduct sensory evaluation using appropriate scientific methods.
	4. Analyse consumer acceptability and interpret sensory data.
	5. Develop prototype products with proper documentation, costing, and presentation.
Module 1 (Credit 1 Pr): Basics of Food Product Development	
Learning Outcomes	After learning the module, learners will be able to
	1. Remember the stages involved in new food product development.
	2. Understand the concept of target consumers and product planning.
	3. Apply recipe standardization using appropriate methods.
	4. Analyze the feasible and non-feasible product ideas based on basic criteria.
Content Outline	• Introduction to New Product Development (NPD) process • Steps in product development: Idea generation, screening, concept development • Identification of target group (e.g., children, elderly, therapeutic diets) • Recipe standardization techniques • Product formulation and trial preparation • Maintenance of basic records (ingredients, method, observations)
Module 2 (Credit 1 Pr): Product Formulation and Modification	
Learning Outcomes	After learning the module, learners will be able to
	1. Understand the need for nutritional modification in food products.
	2. Modify recipes to meet specific dietary requirements (e.g., high protein, low fat).

	3. Analyze the effect of ingredient substitution on sensory and physical properties.
	4. Evaluate the quality and acceptability of modified food products.
Content Outline	• Product modification for: • High protein, low fat, low sugar, high fiber diets • Development of: • Convenience foods • Functional foods (e.g., fortified snacks) • Ingredient substitution and its effects • Evaluation of product parameters: • Texture, color, flavor, consistency • Shelf-life observation (short-term)
Module 3 (Credit 1 Pr): Sensory Evaluation Techniques	
Learning Outcomes	After learning the module, learners will be able to
	1. Remember the different sensory evaluation methods and their purposes.
	2. Understand the principles and procedures of sensory testing.
	3. Apply sensory evaluation tests using standard protocols.
	4. Analyze and Interpret sensory scores and compare product samples.
	5. Evaluate and Judge product acceptability based on sensory data.
Content Outline	• Introduction to sensory evaluation • Laboratory set-up and precautions • Sensory tests: • Difference tests: Paired comparison, Triangle, Duo-trio • Rating tests: Hedonic scale, Numerical scale • Ranking test • Preparation of scorecards • Panel selection and training (basic) • Data recording and interpretation
Module 4 (Credit 1 Pr): Product Development Project and Evaluation	
Learning Outcomes	After learning the module, learners will be able to
	1. Develop a new food product based on identified needs.
	2. Analyze and document product development trials and observations.

	3. Evaluate product quality, cost, and consumer acceptability.
	4. Design and present an innovative food product with complete documentation and justification.
Content Outline	• Development of a new food product (individual/group project) • Product categories: • Health foods • Therapeutic foods • Ready-to-eat / Ready-to-cook products • Standardization and repeated trials • Sensory evaluation of final product • Cost calculation and portion size estimation • Packaging and labelling (basic concepts) • Preparation of product report: • Objectives • Methodology • Results (sensory scores) • Conclusion • Final product presentation and viva

Assignments/Activities towards Comprehensive Continuous Evaluation (CCE):

- Case Study Analysis of a Functional/Innovative Food Product
- Identify gaps in the market and develop a concept for a novel, nutritionally relevant food product (e.g., for hostel students, diabetics, athletes).
- Evaluate macronutrient composition and design a nutrition label as per guidelines.

References:

1. Amerine, M. A., Pangborn, R. M. and Roessler, E. B. (1965). Principles of Sensory Evaluation of Food. Academic Press, New York.
2. Lawless, H. T. and Klein, B. P. (1991). Sensory Science: Theory and Applications in Foods. Marcel Dekker Inc., New York.
3. Meilgaard, M., Civille, G. V. and Carr, B. T. (1987). Sensory Evaluation Techniques. CRC Press, Florida.
4. Piggott, J. R. (1988). Sensory Analysis of Foods. Elsevier Applied Science, London.
5. Watts, B. M., Ylimaki, G. L., Jeffery, L. E. and Elias, L. G. (1989). Basic Sensory Methods for Food Evaluation. International Development Research Centre, Ottawa, Canada.

6. Resurrecion, A. V. A. (1998). Consumer Sensory Testing for Product Development. Aspen Publishers Inc., Maryland, USA.
7. Jellinek, G. (1985). Sensory Evaluation of Food: Theory and Practice. Ellis Horwood, Chichester.

Semester – V

.5.6 Vocational Skill Courses (VSC-4)

Course Titles	**Food Toxicology and Industrial Waste Water Management (Pr)**
Course Credits	**2 Credit's**
Course Outcomes	After going through the course, learners will be able to
	1. Execute chemical and titrimetric methods to estimate additives and preservatives in food samples.
	2. Conduct microbiological isolation and biochemical identification of toxigenic molds and food-borne pathogens.
	3. Assess the physical and chemical quality of water by determining hardness, alkalinity, and chloride levels.
	4. Measure environmental impact parameters such as Dissolved Oxygen (DO), BOD, and COD in industrial effluents.
Module 1 (Credit 1 Pr): Food Additives and Natural Toxins, Hazard	
Learning Outcomes	After learning the module, learners will be able to
	1. Define the role of MSG, sulfur dioxide and boric acid in food products.
	2. Explain the principle of formal titration for amino acid estimation.
	3. Demonstrate the use of iodine titration to determine sulfur dioxide levels in food samples like jaggery.
	4. Use staining techniques (Lactophenol Cotton Blue, Gram Staining) to observe microbial morphology.
Content Outline	• Discuss natural and chemical toxicants, pesticide residues in food, ways to reduce pesticides from food, chemical preservatives • Estimation of MSG: Formal titration of Monosodium Glutamate using 0.1 N NaOH and phenolphthalein indicator • Determination of sulfur dioxide: Titrimetric estimation using iodine and starch indicator to monitor preservative levels • Estimation of Boric Acid in Milk: Precipitation of proteins followed by titration with neutralized glycerine • Isolation of toxigenic molds: Microscopic observation of Aspergillus and Penicillium from spoilt food • Identification of Bacillus cereus: Isolation from food samples and biochemical identification (Catalase, Casein, and Starch hydrolysis) • Pure culture studies of E. coli: Gram staining

Module 2 (Credit 1 Pr): Waste Water Management	
Learning Outcomes	After learning the module, learners will be able to
	1. Perform EDTA complexometric titrations to find total and calcium hardness.
	2. Calculate the alkalinity of various water sources (boring, tap, well) to determine buffer capacity.
	3. Assess the chloride content in water using argentometric titration (Mohr's method).
	4. Describe the significance of Dissolved Oxygen (DO) in aerobic biological treatment, BOD, COD.
	5. Measure total, suspended, and dissolved solids to determine the strength of industrial waste.
Content Outline	• Discuss hardness of water, softening methods, parameters of potable water, properties of water, sewage treatment • Total Hardness • Total Alkalinity: Titration • Chlorides in Water: Silver nitrate titration to detect salt levels in natural and treated water • Dissolved Oxygen (DO): Analysis using the Winkler (Iodometric) method • Biological Oxygen Demand (BOD): 5-day incubation test at 20°C to measure organic matter stabilization • Chemical Oxygen Demand (COD): Rapid oxidation using $KMnO_4$ to estimate total chemical oxygen demand • Estimation of Solids: Determination of total, suspended, and dissolved solids using oven drying and filtration

Assignments/Activities towards Comprehensive Continuous Evaluation (CCE):

- Study chemical preservatives
- List down natural toxicants
- Write down limits of potable water

References:

1. American Public Health Association. (1986). Standard methods for the examination of water and wastewater (16th ed.).
2. Conrung, D. M., & Landsdown, A. D. C. (1983). Toxins input.
3. Furman, N. H. Standard method of chemical analysis.
4. Pyke, M. Food science technology.

5. Rangwala, S. C. Fundamentals of water supply and sanitary engineering.
6. Rudolf, W. (1997). Industrial waste. Allied Scientific Publishers.

Semester – V

.5.7 Field Project (FP)

Course Titles	**Consumer Awareness about Food Safety (Pr)**
Course Credits	**2 Credit's**
Course Outcomes	After going through the course, learners will be able to
	1. Explain the importance of food safety and quality from a consumer perspective.
	2. Identify common food adulterants and malpractices in food commodities.
	3. Interpret food labels and consumer rights related to food safety.
	4. Perform simple practical tests for the detection of food adulteration.
	5. Demonstrate awareness regarding safe food handling and informed food choices.
Module 1 (Credit 1 Pr): Introduction to Food Safety and Consumer Awareness	
Learning Outcomes	After learning the module, learners will be able to
	1. Explain the concept of food safety and its importance for consumers.
	2. Describe common food safety issues and malpractices in the food market.
	3. Explain the role of regulatory authorities in ensuring food safety.
	4. Demonstrate understanding of consumer rights and responsibilities related to food safety.
Content Outline	• Concept of food safety and quality • Common food adulteration and food fraud practices • Food safety regulations and role of FSSAI • Importance of consumer awareness in food safety. Consumer Protection Act (2019): Understanding consumer rights (right to safety, right to be informed, etc.) • Consumer rights and responsibilities in relation to food safety • Filing Complaints: Practical simulation of filing a complaint regarding defective or spurious food products at the District Forum • • Safe Food Practices: Demonstrating the "5 Keys to Safer Food" (Keep clean, Separate raw/cooked, Cook thoroughly, Keep safe temperatures, Use safe water)
Module 2 (Credit 1 Pr): Detection of Food Adulteration and Consumer Practices	

Learning Outcomes	After learning the module, learners will be able to
	Perform simple household tests to detect food adulterants.
	Identify adulteration in common food commodities.
	Interpret food labels and understand quality marks

Content Outline	• Simple practical tests for detection of adulterants in:
	  ○ Milk and milk products
	  ○ Edible oils and fats
	  ○ Spices and condiments
	  ○ Cereals and pulses
	  ○ Honey, jaggery, and sugar
	  ○ Tea and coffee
	• Understanding food labels and mandatory labeling information
	• Quality certification marks: FSSAI, AGMARK, ISI, and other standards

Assignments/Activities towards Comprehensive Continuous Evaluation (CCE):

- Survey on Consumer Behaviour: Developing a questionnaire to study consumer awareness of food labels, expiry dates, and food safety standards (sample size: 20–30 households)
- Market Survey: Identifying unsafe, unlabelled, or expired products in local retail shops
- Preparation of Awareness Material: Designing posters, pamphlets, or digital content on food safety for consumers
- Practical demonstration of adulteration detection tests for common foods
- Assignment on consumer rights related to food safety
- Presentation on food safety practices for households
- Prepare a report on consumer rights regarding food safety
- Prepare a mock consumer complaint regarding a "spurious" food item

References:

1. Food Safety and Standards Authority of India. (2023). Eat Right India: Food safety guidelines and consumer awareness initiatives. Government of India.
2. Ministry of Health and Family Welfare. (2020). Manual of methods of analysis of foods (10th ed.). Government of India.
3. Gopalan, C., Rama Sastri, B. V., & Balasubramanian, S. C. (2017). Nutritive value of Indian foods (Revised and updated ed.). National Institute of Nutrition, Indian Council of Medical Research.

4. Food Safety and Standards Authority of India. (2023). Food safety and standards act, 2006 and regulations. Government of India.
5. Indian Council of Medical Research. (2020). Publications on food safety and nutrition. Government of India.
6. Food Safety and Standards Authority of India. (2019). DART book: Detect adulteration with rapid tests. Government of India.
7. Food Safety and Standards Authority of India. (2017). The pink book: Your guide for safe and nutritious food at home. Government of India.
8. Food Safety and Standards Authority of India. (2018). Manual for food safety officers. Government of India.
9. Lawmann. (2025). Food safety and standards laws: Food safety and standards act, 2006 with rules and regulations (Latest ed.). Lawmann Publications.
10. Chandra, A., & Kumari, S. (2021). Short notes on food safety officer examination. Academic Publishers.
11. Indira Gandhi National Open University. (2018). Principles of food safety and quality management (MVP 003). IGNOU.
12. Shaw, I. C. (2014). Food safety: The science of keeping food safe. Wiley-Blackwell.
13. Prabhakar, K. (2015). A practical guide to food laws and regulations. Academic Press.

Journals:

- Journal of Consumer Protection and Food Safety
- Food Control
- British Food Journal
- Journal of Food Safety and Technology
- International Journal of Law Management & Humanities

Course Syllabus

Semester – VI

.6.1 Major (Core)

Course Titles	**Food Microbiology and Safety (Th+Pr)**
Course Credits	**4 Credit's (2 Th + 2 Pr)**
Course Outcomes	After going through the course, learners will be able to
	1. Identify and characterize microorganisms important in food microbiology, including bacteria, yeasts, and molds.
	2. Understand the sources of microbial contamination (water, air, sewage) and their impact on food safety.
	3. Differentiate between food infections and food poisoning while identifying key pathogenic organisms.
	4. Explain the role of beneficial microbes in food fermentation and industrial applications.
	5. Apply principles of food safety management (HACCP) and sanitation in food service environments.
Module 1 (Credit 1 Th): Microbiology Fundamentals & Environmental Sources, Food Spoilage, Pathogenesis, and Preservation	
Learning Outcomes	After learning the module, learners will be able to
	1. Describe microorganisms important in food microbiology and their characteristics.
	2. Explain sources and types of microbial contamination and food spoilage.
	3. Identify environmental sources of microorganisms affecting food safety.

Content Outline	• Introduction: History and scope of food microbiology.
	• General Characteristics: Morphology, reproduction, and physiological traits of Molds, Yeasts, and Bacteria.
	• Non-Bacterial Agents: Brief introduction to Viruses, Algae, and Parasites.
	• Environmental Sources of Contamination:
	  o Water: Purification, microbial examination, and indicator organisms for water-borne illnesses.
	  o Sewage: Risks and brief overview of treatment.
	  o Air: Microflora and its impact on food processing.
	• Other Sources: Humans, pests, animals, and inanimate objects.
	• Microbial Growth & Hazards: Basic concepts of Physical, Chemical, and Biological hazards.

	• Food Spoilage: Contamination and spoilage of specific food groups:
	  o Cereals, grains, and cereal products.
	  o Meat, milk, and their respective products.
	• Food-Borne Diseases:
	  o Definitions and differentiation between food poisoning and food infections.
	  o Study of key pathogens: Salmonella, Clostridium botulinum (Botulism), E. coli, and S. aureus.

Module 2 (Credit 1 Th): Beneficial Microbes & Industrial Applications, Food Safety & Sanitation	
Learning Outcomes	After learning the module, learners will be able to
	1. Explain beneficial effects of microorganisms in food production
	2. Describe the use of microorganisms in fermentation and food industry
	3. Analyse the nutritional and technological importance of fermented foods
Content Outline	• Microbial Fermentation: Role of microorganisms in the production of Beer, Wine, Bread, and Vinegar. • Traditional Fermented Foods: Production and nutritional significance of Idli, Dhokla, Khaman, and Indian pickles. • Dairy Microbiology: Curd, Yoghurt, and Cheese. 4. Commercial Production: Introduction to industrial production of vitamins, enzymes, amino acids, and antibiotics. • Sanitation: Cleansing agents, disinfectants, and sanitizers for food service establishments. • Personal Hygiene: The role of the food handler—hand hygiene, working attire, and health status. • HACCP Principles: Need, benefits, and implementation of Hazard Analysis and Critical Control Points.
Module 3 (Credit 1 Pr): Isolation and Identification of Microorganisms	
Learning Outcomes	After learning the module, learners will be able to
	1. Study the operation of a microscope and observe various microbial structures like bacteria, yeasts, and molds
	2. Apply staining techniques to identify and classify bacterial samples
	3. Assess air quality in food processing unit
	4. Evaluate surface hygiene by performing swab testing on kitchen counters or food handlers' hands

Content Outline	• Staining of Bacteria: Simple staining,Gram's staining, spore, capsule and flagellar staining, Motility of bacteria, Staining of yeast and molds. Cultivation and Identification of important molds and yeasts. (slides and mold culture). • Study of the environment around us as sources of transmission of microorganisms in foods. (Soil, air,) Assessment of surface sanitation of food preparation units - swab and rinse techniques.
Module 4 (Credit 1 Pr): Water and Milk Analysis – MPN, MBRT	
Learning Outcomes	After learning the module, learners will be able to
	1. Learn the specific principles behind the MBRT and the MPN method
	2. Explain the significance of indicator organisms coliforms in determining the sanitary quality of water and milk
	3. Demonstrate the correct procedure for the isolation of microorganisms using streak plate, pour plate, or spread plate methods
	4. Interpret the results of a total plate count to determine if a food or water sample meets regulatory safety standards
Content Outline	• Bacteriological analysis of water and milk, Total count, MPN Coliform (Count) and MBRT • Isolation of microorganisms: Different methods and maintenance of cultures of microorganisms.

Assignments/Activities:

- Studying the microbial benefits of Idli or Dhokla batter and comparing their probiotic value to Western supplements like Greek yogurt.
- Assignment on HACCP plan of any processing industry/unit.
- Assignment on probiotic

References:

1. Frazier, W. C., & Westhoff, D. C. (2013). Food microbiology (5th ed.). Tata McGraw-Hill Education.
2. Guthrie, R. K. (Ed.). (1995). Food sanitation (3rd ed.). Van Nostrand Reinhold Company.
3. Jay, J. M., Loessner, M. J., & Golden, D. A. (2005). Modern food microbiology (7th ed.). Springer Science+Business Media.
4. Marriott, N. G., Schilling, M. W., & Gravani, R. B. (2018). Principles of food sanitation (6th ed.). Springer.
5. Pelczar, M. J., Chan, E. C. S., & Krieg, N. R. (1993). Microbiology (5th ed.). McGraw-Hill Book Company.

6. Reed, G. (Ed.). (1982). Prescott and Dunn's industrial microbiology (4th ed.). AVI Publishing Co., Inc.
7. Stanier, R. Y., Adelberg, E. A., & Ingraham, J. L. (1986). The microbial world (5th ed.). Prentice Hall.

Semester – VI

.6.2 Major (Core)

Course Titles	**Industrial Equipment in Food Processing (Th)**
Course Credits	**4 Credit's**
Course Outcomes	After going through the course, learners will be able to
	1. Explain principles of mechanical power transmission, material transportation and separation operations used in food industries.
	2. Describe mixing, blending and size reduction processes and the equipment used in food processing.
	3. Explain psychrometric properties and mechanisms of heat transfer and their applications in food processing operations.
	4. Analyse refrigeration, freezing, concentration, evaporation and dehydration processes used for food preservation.
Module 1 (Credit 1 Th): Mechanical Power Transmission and Transportation Systems	
Learning Outcomes	After learning the module, learners will be able to
	1. Explain the basic components used in mechanical power transmission.
	2. Describe different methods used for transportation of solids, liquids and gases.
	3. Explain principles of mechanical separation techniques.
	4. Identify applications of separation methods in food processing industries.
Content Outline	• **Mechanical Power Transmission** o Introduction to drives o Gears o Bearings o Friction o Speed regulation and control (definitions) • **Transportation of Materials** o Transportation of Solids: Conveyors o Transportation of Liquids: Flow of fluids, Pumps o Transportation of Gases: Blowers, Chimneys, Compressors • **Mechanical Separation** o Grading o Filtration

	○ Centrifugation ○ Solvent Extraction ○ Osmosis ○ Flotation and Sedimentation ○ Cyclone separator ○ Mechanical press • **Principles and applications of the above methods in food industries**
Module 2 (Credit 1 Th): Mixing, Blending and Size Reduction	
Learning Outcomes	After learning the module, learners will be able to
	1. Explain the principles of mixing and blending operations.
	2. Identify different mixers used for liquids and powders.
	3. Explain the concept and importance of size reduction in food processing.
	4. Describe the working and applications of various size reduction equipment.
Content Outline	• **Mixing and Blending** ○ Principles of mixing and blending ○ Types of mixers: ○ Mixers for liquids ○ Mixers for dry powders ○ Kneaders and their applications in food processing • **Size Reduction** ○ Principles of size reduction ○ Size reduction equipment: ○ Grinders (wet and dry grinding) ○ Hammer mills ○ Cryogenic mill ○ Ball mills ○ Pulpers ○ Mixers ○ Pulverisers
Module 3 (Credit 1 Th): Psychrometry and Heat Transfer Operations	
Learning Outcomes	After learning the module, learners will be able to
	1. Explain psychrometric concepts used in food processing.

	2. Differentiate between dry bulb and wet bulb temperature.
	3. Describe mechanisms of heat transfer.
	4. Describe types and applications of heat exchangers in food industries.
Content Outline	• **Psychrometry** o Definition and principle o Humidity o Dry bulb temperature o Wet bulb temperature o Applications in food processing • **Heat Transfer** o Concept and Modes of heat transfer ✓ Conduction ✓ Convection ✓ Radiation o Heat Exchangers ✓ Definition ✓ Principles of working ✓ Types of heat exchangers ✓ Applications in food industries
Module 4 (Credit 1 Th): Refrigeration, Freezing and Dehydration	
Learning Outcomes	After learning the module, learners will be able to
	1. Explain the principle of refrigeration and freezing in food preservation.
	2. Compare properties of different refrigerants.
	3. Explain methods used for concentration and dehydration of foods.
	4. Identify equipment used for evaporation and drying in food industries.
Content Outline	• **Refrigeration** o Principle of refrigeration o Refrigeration cycle o Properties of common refrigerants • **Freezing** o Principle of freezing

	○ Requirements for freezing ○ Methods used for freezing food ○ Different types of direct and indirect contact freezers • **Concentration, Dehydration and Evaporation** ○ Equipment used: ✓ Dryers (different types) ✓ Osmotic drying ✓ Vacuum drying ✓ Freeze drying ✓ Evaporators (different types) ✓ Freeze concentration

Assignments/Activities towards Comprehensive Continuous Evaluation (CCE):

- Case Study: Identify transportation systems used in a food industry
- Group Activity: Identify foods where kneading and mixing are important
- Assignment: Compare mixers used for liquids and dry powders with examples from food industries.
- Assignment: Explain conduction, convection and radiation with food industry examples.
- Case Study: Study dehydration techniques used for fruits and vegetables.
- Assignment: Compare refrigeration and freezing methods used in food preservation.

References:

1. Singh, R. P., & Heldman, D. R. (2001). Introduction to food engineering (2nd ed.). Academic Press.
2. Potter, N. N., & Hotchkiss, J. H. (1996). Food science (5th ed.). CBS Publishers & Distributors.
3. Toledo, R. T. (1994). Fundamentals of food process engineering (2nd ed.). Chapman & Hall.
4. Le Maguer, M., & Jelen, P. (Eds.). (1986). Food engineering and process applications (Vol. 2: Unit operations). Elsevier Applied Science.
5. Patel, R. C., & Karamchandani, C. J. (1989). Elements of heat engines (Vol. 3, 14th ed.). Acharya Book Depot.
6. Diamond, P. S., & Denman, R. F. (1973). Laboratory techniques in chemistry and biochemistry (2nd ed.). Butterworths.

Semester – VI

.6.3 A. Major (Elective)

Course Titles	**Food Entrepreneurship (Pr)**
Course Credits	**4 Credit's**
Course Outcomes	After going through the course, learners will be able to
	1. Explain the fundamentals of food entrepreneurship and small-scale food business operations.
	2. Explain regulatory requirements and documentation needed to start a food business.
	3. Identify viable food business opportunities in the food sector.
	4. Demonstrate knowledge of food product costing, pricing, and marketing strategies.
	5. Prepare basic business plans for food products.
Module 1 (Credit 1 Pr): Introduction to Food Entrepreneurship	
Learning Outcomes	After learning the module, learners will be able to
	1. Explain the concept and importance of entrepreneurship in the food sector.
	2. Describe qualities and skills required for successful entrepreneurs.
	3. Identify opportunities for small-scale food enterprises.
Content Outline	• Introduction to food entrepreneurship • Role of entrepreneurship in food industry development • Characteristics and qualities of successful entrepreneurs • Types of food enterprises: home-based, MSME, start-up and commercial units
Module 2 (Credit 1 Pr): Business Idea Generation	
Learning Outcomes	After learning the module, learners will be able to
	1. Explain the steps involved in food product development.
	2. Evaluate the feasibility of food business ideas.
	3. Generate innovative food product ideas based on consumer needs and market trends.
Content Outline	• Identification of business opportunities in food sector • Identification of consumer needs and current market trends • Idea generation process and screening of food-based ideas • Evaluation of product feasibility
Module 3 (Credit 1 Pr): Food Business Planning and Costing	

Learning Outcomes	After learning the module, learners will be able to
	1. Explain the financial aspects of small food businesses.
	2. Calculate production cost and pricing of food products.
	3. Prepare a basic business plan for a food enterprise.
Content Outline	• Preparation of a business plan for a food enterprise • Calculation of production cost and selling price • Basic financial planning for food startups
Module 4 (Credit 1 Pr): Food Business Management and Regulatory Aspects	
Learning Outcomes	After learning the module, learners will be able to
	1. Explain marketing and promotion strategies for food products.
	2. Identify regulatory requirements for food businesses.
	3. Develop branding and packaging concepts for food products.
Content Outline	• Marketing strategies for food products • Branding and packaging concepts • Introduction to FSSAI registration and licensing • Documentation and legal requirements for starting food business

Assignments/Activities towards Comprehensive Continuous Evaluation (CCE):

- Preparation of a report on successful food entrepreneurs
- Preparation of a business plan for a selected food product
- Costing and pricing exercise for a commercial food product
- Presentation on marketing strategy for a food startup

References:

1. Desai, V. (2020). Dynamics of entrepreneurial development and management (7th ed.). Himalaya Publishing House.
2. Fellows, P. J. (2017). Food processing technology: Principles and practice (4th ed.). Woodhead Publishing.
3. Hisrich, R. D., Peters, M. P., & Shepherd, D. A. (2017). Entrepreneurship (10th ed.). McGraw-Hill Education.
4. Kumar, S. A., Poornima, S. C., Abraham, M. K., & Jayashree, K. (2012). Entrepreneurship development. New Age International Publishers.
5. Raina, V. (2018). Entrepreneurship and small business management. Oxford University Press.
6. Singh, N., & Singh, R. (2016). Food entrepreneurship and small business management. CBS Publishers & Distributors.

7. Food Safety and Standards Authority of India. (2023). Food safety and standards regulations. Government of India.
8. Entrepreneurship Development Institute of India. (2019). Entrepreneurship development and food enterprise training modules. EDII Publications.
9. Food and Agriculture Organization. (2013). Agro-industries for development. FAO.
10. Ministry of Micro, Small and Medium Enterprises. (2022). Guidelines for micro, small and medium enterprises. Government of India.

Semester – VI

.6.3 B. Major (Elective)

Course Titles	**Food Product Development (Pr)**
Course Credits	**4 Credit's**
Course Outcomes	After going through the course, learners will be able to
	1. Explain the concepts and factors influencing new food product development.
	2. Conduct market research to identify innovative food product ideas using traditional and unconventional food sources.
	3. Apply techniques for product development, packaging, nutritional evaluation and shelf-life testing.
	4. Develop a basic business plan including costing, marketing strategies and regulatory considerations for commercialization of food products.
Module 1 (Credit 1 Pr): Introduction to New Food Product Development	
Learning Outcomes	After learning the module, learners will be able to
	1. Explain the concept and classification of new food product development.
	2. Identify factors influencing the development of new food products.
	3. Describe various strategies used in food product innovation.
	4. Explain the importance of consumer and market surveys.
Content Outline	• **Meaning and types of new food product development** • **Factors influencing development of new food products** o Social factors o Health concerns o Technology development o Market demand • **Consumer needs and market surveys** • **Types of product development** o Line extension o Reformulation or new form of product o New packaging for existing products o Innovative and creative products
Module 2 (Credit 1 Pr): Product Concept and Market Research	

Learning Outcomes	After learning the module, learners will be able to
	1. Identify potential food products from traditional and unconventional sources.
	2. Explain the role of product development in reducing post-harvest losses.
	3. Develop a concept for a new food product.
	4. Conduct basic market research for a selected product idea.
Content Outline	• Use of traditional foods in product development • Use of unconventional food sources • Reducing post-harvest losses through new products • Identifying product ideas and concepts • Conducting basic market research for selected products
Module 3 (Credit 1 Pr): Product Development and Evaluation	
Learning Outcomes	After learning the module, learners will be able to
	1. Describe the process of product standardization and prototype development.
	2. Explain the importance of packaging and labelling in food products.
	3. Perform basic nutritional evaluation of developed products.
	4. Explain methods for shelf-life testing and quality assessment.

Content Outline	• Product standardization and prototype development
	• Bulk preparation of the product
	• Packaging and labelling of food products
	  o Packaging design
	  o Designing a food label as per FSSAI regulations
	• Nutritional evaluation of the product
	• Shelf-life testing
	  o Consumer acceptability testing
	• Checking product quality and standards

Module 4 (Credit 1 Pr.) Commercialization and Business Planning	
Learning Outcomes	After learning the module, learners will be able to
	1. Calculate product cost and determine appropriate pricing.
	2. Explain marketing and advertising strategies for food products.
	3. Prepare basic components of a business plan for a food product.
	4. Identify legal and regulatory requirements for starting a food

	business in India.

Content Outline	• Selection of product for commercialization
	• Cost calculation and pricing of the product
	• Advertising and test marketing
	• Preparation of a basic business plan
	  o Market analysis
	  o Financial planning
	  o Marketing strategy
	• Food business regulations in India
	• Brand development and marketing strategy

Assignments/Activities towards Comprehensive Continuous Evaluation (CCE):

1. Case study analysis of a successful food product
2. Market survey report for a selected product concept
3. Group activity to identify potential new food products
4. Packaging design activity for a selected food product
5. Report on nutritional evaluation of a product
6. Case study on shelf-life testing of a food product
7. Preparation of a mini business plan for a new food product

References:

1. Amerine, M. A., Pangborn, R. M., & Roessler, E. B. (1965). Principles of sensory evaluation of food. Academic Press.
2. Lawless, H. T., & Klein, B. P. (1991). Sensory science: Theory and applications in foods. Marcel Dekker.
3. Meilgaard, M., Civille, G. V., & Carr, B. T. (1987). Sensory evaluation techniques. CRC Press.
4. Piggott, J. R. (1988). Sensory analysis of foods. Elsevier Applied Science.
5. Watts, B. M., Ylimaki, G. L., Jeffery, L. E., & Elias, L. G. (1989). Basic sensory methods for food evaluation. International Development Research Centre.
6. Resurreccion, A. V. A. (1998). Consumer sensory testing for product development. Aspen Publishers.
7. Jellinek, G. (1985). Sensory evaluation of food: Theory and practice. Ellis Horwood.

Semester – VI

.6.3 C. Major (Elective)

Course Titles	**Culinary Science (Pr)**
Course Credits	**4 Credit's**
Course Outcomes	After going through the course, learners will be able to
	1. Analyze the nature and composition of food.
	2. Explain the role of different ingredients in food preparations.
	3. Create acceptable food products with maximum retention of nutrients.
	4. Demonstrate culinary skills using various methods of cooking.
Module 1 (Credit 1 Pr): Introduction to Culinary Science	
Learning Outcomes	After learning the module, learners will be able to
	1. Apply basic culinary skills required in the kitchen.
	2. Prepare soups, salads, beverages and starters
Content Outline	• Terms • Weights and Measures • Cooking Methods • Kitchen equipment, tools • Preliminary preparations • Safety and Hygiene practices in the kitchen • Role of Ingredients and Cooking Methods • Soups • Beverages • Salads • Starters
Module 2 (Credit 1 Pr): Indian Cuisine	
Learning Outcomes	After learning the module, learners will be able to
	1. Prepare popular Indian regional dishes.
	2. Demonstrate various traditional cooking methods and recipes.
	3. Classify various Indian cooking methods.
Content Outline	• Role of Ingredients and Cooking Methods • Snacks • Rice Preparation • Pulses and Legumes

	• Indian Breads • Indian Traditional Sweets
Module 3 (Credit 1 Pr): Bakery and Desserts	
Learning Outcomes	After learning the module, learners will be able to
	1. Explain methods and techniques used in the preparation of bakery, pastry and confectionary
	2. Explain baking science principles and demonstrate basic baking techniques.
Content Outline	• Role of Ingredients and Cooking Methods • Cakes • Biscuits and Cookies • Tarts and Pies • Buns and Breads • Soufflés, Pudding, Cheesecakes
Module 4 (Credit 1 Pr): Continental Cuisine	
Learning Outcomes	After learning the module, learners will be able to
	1. Analyze international cuisines based on traditional ingredients, flavor components, and cooking techniques.
	2. Demonstrate the preparation of selected international dishes.
Content Outline	• Role of Ingredients and Cooking Methods • Oriental • Italian • Mexican • Thai

Assignments/Activities towards Comprehensive Continuous Evaluation (CCE):

- Continuous assessment of practical performed by the student.
- Review of recipes and project on food ingredients and preparation.

References:

1. Arora, K. (2008). Theory of catering. Frank Brothers.
2. MacVeigh, J. (2008). International cuisine. Delmar Cengage Learning.
3. McWilliams, M. (2015). Food around the world. Pearson.
4. Bali, P. S. (2012). International cuisine and food production management.
5. Heyman, P. (2016). International cooking: A culinary journey (3rd ed.). Pearson.
6. Singh, V., & Joshi, A. (2019). Art and science of culinary. Notion Press.

7. Philip, T. (2010). Modern cookery for teaching and trade (Vol. 1, 6th ed.). Orient Longman.

Semester – VI

.6.4 Minor Stream

Course Titles	**Introduction to Food Labelling (Th)**
Course Credits	**2 Credit's**
Course Outcomes	After going through the course, learners will be able to
	1. Explain the importance and purpose of food labelling in ensuring food safety and consumer awareness.
	2. Identify and interpret key components of food labels according to regulations of Food Safety and Standards Authority of India (FSSAI).
	3. Analyse nutritional information and different types of nutrition and health claims on packaged foods.
	4. Evaluate food labels critically to make informed and responsible consumer choices.
Module 1 (Credit 1 Th): Basics of Food Labels and Regulations	
Learning Outcomes	After learning the module, learners will be able to
	1. Define food labels and explain their importance.
	2. Identify key components of food labels.
	3. Explain the role of regulatory bodies such as Food Safety and Standards Authority of India, U.S. Food and Drug Administration, and European Food Safety Authority.
	4. Distinguish between mandatory and voluntary labelling.
Content Outline	• **Introduction to Food Labels** o Definition and importance of food labels o Role of food labels in food safety and consumer awareness • **Legal Framework for Food Labelling** o Overview of food labelling regulations o Regulatory bodies ✓ Food Safety and Standards Authority of India (FSSAI) ✓ U.S. Food and Drug Administration (FDA) ✓ European Food Safety Authority (EFSA) • **Food Labelling Regulations** o Mandatory vs voluntary labelling o Basic requirements for packaged foods • **Key Components of Food Labels** o Product name

	○ Ingredient list ○ Net quantity ○ Manufacturer details ○ Batch number and expiry date ○ Storage instructions
Module 2 (Credit 1 Th.) Nutritional Information and Consumer Awareness	
Learning Outcomes	After learning the module, learners will be able to
	1. Interpret nutritional information on food labels.
	2. Identify different types of nutrition and health claims.
	3. Identify special labelling categories (organic, GMO, allergen, origin).
	4. Evaluate food labels for informed consumer choices.
Content Outline	• **Nutritional Labelling** ○ Understanding macronutrients and micronutrients ○ Interpreting nutritional values on labels • **Nutrition and Health Claims** ○ Types of claims nutrient content claims, health claims, structure-function claims ○ Front-of-pack labelling systems traffic light system, Nutri-Score • **Special Labelling Requirements** ○ Organic labelling ○ GMO labelling ○ Allergen labelling ○ Country of origin labelling ○ Labels for specific groups Halal, Kosher, Vegan • **Consumer Awareness and Ethical Issues** ○ Misleading claims and marketing tactics ○ Role of food labels in public health ○ Consumer rights and responsibilities

Assignments/Activities towards Comprehensive Continuous Evaluation (CCE):

1. Case Study on Misleading Food Labels Analyse 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
3. Nutrition Comparison Activity Compare nutritional labels of similar food products.
4. Consumer Survey Conduct a small survey on consumer understanding of food labels.

References:

1. Food Safety and Standards Authority of India. (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. FutureLearn. (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.

Semester – VI

.6.4 B. Minor Stream

Course Titles	**Introduction to Functional Foods (Th)**
Course Credits	**2 Credit's**
Course Outcomes	After going through the course, learners will be able to
	1. Explain the concept of free radicals, oxidative stress, and their role in disease development.
	2. Describe the types and sources of antioxidants and their classification.
	3. Analyze the relationship between free radicals, oxidative stress, and chronic diseases such as CVD, cancer, and inflammation.
	4. Evaluate the role of antioxidants in preventing cellular damage and promoting health.
	5. Apply the knowledge of functional foods and antioxidants in daily dietary practices.
Module 1 (Credit 1 Th): Introduction to Food Safety and Consumer Awareness	
Learning Outcomes	After learning the module, learners will be able to
	1. Define, explain and describe free radicals, oxidative stress, and its physiological implications.
	2. Identify the role of free radicals in the development of diseases.
	3. Analyze the association between free radicals and chronic conditions such as CVD, cancer, inflammation, and respiratory disorders.
Content Outline	• Free Radicals ○ Definition, Meaning, types and sources ○ Free radicals and Diseases ○ CVD ○ Inflammation ○ Cancer ○ Respiratory Disorders ○ Concept of Oxidative Stress
Module 2 (Credit 1 Th): Antioxidants	
Learning Outcomes	After learning the module, learners will be able to
	1. Explain the concept of antioxidants
	2. Interpret protection mechanism of antioxidant in the body from damage caused by free radicals
	3. Differentiate between types of antioxidants and its uses

	4. Evaluate the role of antioxidants in disease prevention and health promotion
Content Outline	• Antioxidants • Definition, Meaning and Significance • Classification of Antioxidants • Enzymatic Antioxidants • Non-Enzymatic Antioxidants

Assignments/Activities towards Comprehensive Continuous Evaluation (CCE):

- Prepare a short assignment on free radicals and oxidative stress, explaining their role in diseases like CVD, cancer, and inflammation with suitable examples.
- Develop a diet plan or poster highlighting antioxidant-rich functional foods and explain their role in preventing oxidative damage and promoting health.

References:

1. Satyanarayana U, Chakrapani U. Biochemistry. 5th ed. New Delhi Elsevier 2017.
2. Devlin TM. Textbook of biochemistry with clinical correlations. 7th ed. New York Wiley 2011.
3. Halliwell B, Gutteridge JMC. Free radicals in biology and medicine. 5th ed. Oxford Oxford University Press 2015.
4. Baynes JW, Dominiczak MH. Medical biochemistry. 5th ed. Philadelphia Elsevier 2018.
5. Nelson DL, Cox MM. Lehninger principles of biochemistry. 8th ed. New York W.H. Freeman and Company 2021.
6. Sies H. Oxidative stress Oxidants and antioxidants Exp Physiol 1997 82(2) 291–295.
7. National Institutes of Health Antioxidants fact sheet Internet Bethesda MD Office of Dietary Supplements cited 2026 Mar 20 Available from https://ods.od.nih.gov
8. World Health Organization Healthy diet Internet Geneva WHO cited 2026 Mar 20 Available from https://www.who.int

Semester – VI

.6.5 A. Minor Stream

Course Titles	**Food Analysis (Pr)**
Course Credits	**4 Credit's**
Course Outcomes	After going through the course, learners will be able to
	1. Explain the importance of food analysis and sampling techniques used in food laboratories.
	2. Demonstrate knowledge of laboratory instruments and their working principles.
	3. Perform quantitative analysis of proximate food components such as moisture, fat, ash, and protein.
	4. Estimate important food components like sugars, vitamins, minerals, and acidity.
	5. Identify laboratory instruments and describe their working principles.
Module 1 (Credit 1 Pr): Introduction to Food Analysis and Laboratory Techniques	
Learning Outcomes	After learning the module, learners will be able to
	1. Explain the role and importance of food analysis.
	2. Describe different sampling techniques used in food testing.
	3. Identify laboratory instruments and explain their working principles.

Content Outline	• Introduction to food analysis and its importance
	• Sampling in food analysis
	  ○ Definition of sampling
	  ○ Sampling methods and techniques
	  ○ Classification of sampling methods
	  ○ Advantages and disadvantages of sampling
	  ○ Selection of appropriate sampling techniques for different foods
	  ○ Sampling tools
	• General instrumental methods in food analysis
	• Working principles and uses of laboratory instruments:
	  ○ Colorimeter
	  ○ Spectrophotometer
	  ○ Centrifuge

	○ Kjeldahl apparatus ○ Soxhlet apparatus ○ Different types of balances ○ Muffle furnace ○ Water bath ○ Glass distillation unit
Module 2 (Credit 1 Pr): Quantitative Analysis of Proximate Principles	
Learning Outcomes	After learning the module, learners will be able to
	1. Determine proximate composition of foods.
	2. Explain methods used for estimation of moisture, fat, ash, and protein.
	3. Interpret chemical constants used to evaluate fats and oils.
Content Outline	• Estimation of moisture by AOAC method • Estimation of crude fat/oil by solvent extraction method (Soxhlet) • Estimation of total ash by AOAC method • Estimation of protein by Macro-Kjeldahl method • **Chemical Constants of Fats and Oils** ○ Determination of Acid value ○ Determination of Saponification value ○ Determination of Iodine value
Module 3 (Credit 1 Pr): Estimation of Food Components	
Learning Outcomes	After learning the module, learners will be able to
	1. Estimate major nutrients and minerals present in foods.
	2. Perform titrimetric and colorimetric methods for food component analysis.
	3. Interpret analytical results for food quality assessment.
Content Outline	• Estimation of total and free sugars in honey by Benedict's / Lane & Eynon's method • Determination of Ascorbic acid (Vitamin C) using 2,6–dichlorophenol indophenol method • Estimation of sodium chloride in butter by Mohr's titrimetric method • Determination of acidity in milk by titrimetric method
Module 4 (Credit 1 Pr): Qualitative Analysis of Food Adulterants	
Learning	After learning the module, learners will be able to

Outcomes	1. Identify common adulterants present in food products.
	2. Perform simple qualitative tests for adulteration detection.
	3. Evaluate food quality based on regulatory standards and safety guidelines.
Content Outline	• Detection of common adulterants in: o Fats and oils o Spices and condiments o Milk and milk products o Cereals and pulses o Honey and jaggery o Tea and coffee o Sweets and confectionery

Assignments/Activities towards Comprehensive Continuous Evaluation (CCE):

1. Role of food analysis in food safety.
2. Report on chemical constants of fats and oils.
3. Assignment on analytical methods used for vitamins and minerals.
4. Case study discussion on food adulteration incidents.
5. Short field survey to identify adulteration awareness among consumers.

References

1. Egan, H., Kirk, R. S., Sawyer, R., & Pearson, D. (1981). Pearson's chemical analysis of foods (8th ed.). Churchill Livingstone.
2. Gopalan, C., Rama Sastri, B. V., & Balasubramanian, S. C. (2011). Nutritive value of Indian foods (6th ed.). National Institute of Nutrition. (Original work published 1996)
3. AOAC International. (2005). Official methods of analysis of AOAC International (18th ed.). AOAC International.
4. Raghuramulu, N., Madhavan, K., & Kalyanasundaram, S. (2003). A manual of laboratory techniques (2nd ed.). National Institute of Nutrition.
5. Sathe, A. Y. (1999). A first course in food analysis (1st ed.). New Age International (P) Limited.
6. Directorate General of Health Services, Ministry of Health and Family Welfare, Government of India. (2005). Manual of methods of analysis of foods. Government of India.
7. Jacobs, M. B. (1951). The chemical analysis of foods and food products (2nd ed.). D. Van Nostrand Company.

Semester – VI

.6.5 B. Minor Stream

Course Titles	**Food Preservation and Processing Techniques (Th+Pr)**
Course Credits	**4 Credit's (2 Th + 2 Pr)**
Course Outcomes	After going through the course, learners will be able to
	1. Understand the principles and need for food preservation.
	2. Analyse between traditional and modern preservation methods.
	3. Apply various preservation techniques for fruits and vegetables.
	4. Apply practical skills in preparation and storage of preserved foods.
	5. Evaluate food quality and shelf-life using sensory and storage parameters
Module 1 (Credit 1 Th): Principles and Methods of Food Preservation	
Learning Outcomes	After learning the module, learners will be able to
	1. Remember key concepts of food preservation
	2. Understand the principles behind different preservation techniques.
	3. Analyse preservation methods based on their mode of action.
	4. Analyse different preservation techniques in terms of effectiveness.
Content Outline	• Needs and objectives of food preservation • Principles: o Inhibition of microbial growth o Killing microorganisms o Prevention of contamination • Methods: o Low temperature (refrigeration, freezing) o High temperature (pasteurization, sterilization) o Drying and dehydration o Chemical preservatives (salt, sugar, vinegar) o Natural preservatives
Module 2 (Credit 1 Th): Traditional and Modern Preservation Techniques	
Learning Outcomes	After learning the module, learners will be able to
	1. Understand traditional and modern preservation methods.
	2. Analyse between traditional and modern techniques.

	3. Understand the role of packaging in food preservation.
	4. Evaluate the impact of storage conditions on shelf-life.

Content Outline	• Traditional methods:
	  o Salting
	  o Sugaring
	  o Pickling
	  o Fermentation
	• Modern methods:
	  o Canning
	  o Freezing
	  o Refrigeration
	• Food packaging:
	  o Types (glass, plastic, metal)
	  o Importance of packaging
	  o Storage practices and shelf-life

Module 3 (Credit 1 Pr): Preservation Techniques for Vegetables	
Learning Outcomes	After learning the module, learners will be able to
	1. Understand preservation techniques used in vegetables
	2. Demonstrate the process of freezing and dehydration vegetables, including selection, blanching, packaging, and storage.
	3. Identify and classify different types of pickles based on ingredients, method of preparation, and preservation techniques.
	4. Prepare various types of chutneys (e.g., tomato chutney, apple-raisin chutney) and understand their role in food preservation and flavor enhancement.
	5. Demonstrate the preparation of tomato puree and ketchup
	6. Compare different preservation methods in terms of shelf life, cost, and quality of the final product.

Content Outline	• Preparation of the following preserved vegetable products:
	  o Freezing of vegetables
	  o Dehydration of vegetables
	  o Different types of pickles
	  o Chutneys: Tomato, Apple raisin etc.
	  o Tomato puree

	○ Tomato ketchup
Module 4 (Credit 1 Pr): Preservation techniques for Fruits	
Learning Outcomes	After learning the module, learners will be able to
	1. Understand principles of fruit preservation and explain the role of sugar, temperature, and processing techniques in extending shelf life.
	2. Demonstrate the process of freezing and dehydration fruits, including selection, pre-treatment, packaging, and storage conditions.
	3. Prepare fruit squash and understand formulation, preservation using sugar and preservatives, and storage requirements
	4. Describe and prepare flavoured synthetic syrups, including the use of colours, flavours, and preservatives as per food safety standards.
	5. Demonstrate the preparation of jam, guava jelly and guava cheese and evaluate the role of pectin, sugar, and acid in gel formation.
	6. Demonstrate the preparation of candied fruit peels and explain sugar infusion as a preservation method.
	7. Understand the basic process of grape wine preparation, including fermentation, maturation, and storage.
Content Outline	• Preparation of preserved fruit products: ○ Freezing of fruits ○ Dehydration of fruits ○ Fruit squash (Lemon squash) ○ Flavoured synthetic syrups ○ Jam (Mixed fruit) ○ Guava jelly, guava cheese ○ Grape wine • **Food Quality Evaluation** ○ Identification of spoiled food ○ Sensory evaluation (taste, smell, texture, appearance)

Assignments/Activities towards Comprehensive Continuous Evaluation (CCE)

- Compare traditional vs modern preservation methods (advantages, limitations, sustainability)
- Case study on spoilage of a household food product and preventive measures
- Shelf-life study (theoretical) of homemade vs commercial products

- Study effect of storage conditions (temperature/humidity) on food spoilage
- Study of basic wine making process.
- Maintenance of practical record book including recipes, observations and results.

References

1. McWilliams, M. (2019). Food processing: Principles and applications. Cambridge University Press.
2. Fennema, O. R. (2017). Food chemistry (5th ed.). CRC Press.
3. Earle, R. L., & Earle, A. (2017). Food science and technology (2nd ed.). Wiley.
4. Ghosh, R. (2016). Food preservation: A practical guide. Springer.
5. Pomeranz, Y., & Meloan, C. E. (2009). Food analysis: Theory and practice (4th ed.). Springer.
6. Srivastava, R.P. and Kumar, S., Fruit and Vegetable Preservation: Principles and Practices. International Book Distributing Co., Lucknow.
7. Lal, G., Siddappa, G.S. and Tandon, G.L, Preservation of Fruits and Vegetables. Indian Council of Agricultural Research (ICAR), New Delhi.
8. Joshi, V.K., Technology of Handling, Packaging, Processing and Preservation of Fruits and Vegetables. Kalyani Publishers, New Delhi.
9. Sharma, H.K. and Kaushal, B.B.L., Processing, Preservation and Product Development Techniques for Fruits and Vegetables., New India Publishing Agency, New Delhi.
10. Verma, L.R. and Joshi, V.K., Post-Harvest Technology of Fruits and Vegetables. Indus Publishing Company, New Delhi.
11. Hui, Y.H. (Ed.), Handbook of Vegetable Preservation and Processing. CRC Press, USA.
12. Fellows, P.J., Food Processing Technology: Principles and Practice, Woodhead Publishing, Cambridge.

Semester – VI

.6.6 On-Job Training (OJT)

Course Titles	**On the Job Training in Food Science and Quality Control (Pr)**
Course Credits	**4 Credit's**
Course Outcomes	After going through the course, learners will be able to
	1. Explain the organizational structure and operations of food industries.
	2. Apply principles of food quality control and food safety practices in industrial settings.
	3. Demonstrate skills related to food processing, quality testing, and hygiene management.
	4. Evaluate quality control measures and food safety systems followed in food industries.
	5. Document and present internship experiences, observations, and case studies related to food production and quality management.
INTERNSHIP	
Learning Outcomes	1. Understand the structure of the food industry and basic food production processes.
	2. Understand food safety regulations and standards (FSSAI, HACCP, ISO) along with GMP and GHP principles.
	3. Apply food safety practices and quality control procedures during industrial operations.
	4. Analyze food production processes, audit findings, and hygiene inspection results.
	5. Evaluate the effectiveness of food safety systems and quality management practices in the industry.
	6. Create and maintain professional documentation including records, internship diary, and reports.
	7. Present internship experiences and observations effectively using appropriate communication skills.
Content Outline	• Internship Structure & Activities o Suggested Placement Areas: o Food industry: quality control, production, R&D, product development o Food testing labs or regulatory agencies • Typical Activities During Internship: o Overview of the food industry and food production units

	○ Introduction to food safety regulations and standards (FSSAI, HACCP, ISO), principles of Good Manufacturing Practices (GMP) and Good Hygiene Practices (GHP) ○ Observing and participating in food production and quality control procedures ○ Participating in food safety audits and hygiene inspections ○ Documentation and maintenance of quality and safety records ○ Implementation of food safety systems (HACCP, ISO, GMP) ○ Maintenance of daily internship diary ○ Documentation of industrial observations and practices ○ Preparation and submission of internship report ○ Presentation of internship experience

Assignments / Activities towards Comprehensive Continuous Evaluation (CCE)

Internal Assessment – 50 Marks

- Internship report submission
- Daily internship diary
- Oral presentation / viva

External Assessment – 50 Marks

- Performance evaluation by Food Industry - (30 Days internship)
- Assessment form provided by the college
- Evaluation based on professional conduct, assignments, learning, participation, and skill development