

**University of Lucknow, Lucknow**  
**M.Sc. Food Processing and Food Technology**

**Semester - II**

Course No.	Name of the Course	Credit	Remark
FPTCC-201	Technology of Fruits and Vegetables Processing	04	Core Course
FPTCC-202	Technology of Cereals, Pulses and Oilseeds	04	Core Course
FPTCC-203	Technology of Milk and Milk Products	04	Core Course
FPTCC-204	Bioprocess and Beverage Technology	04	Core Course
FPTCC-205	Food Packaging Technology	04	Core Course
FPTCC-206	Practical	04	Core Course
FPTVNC-201	Food Business and Service Management	00	Value added (Non Credited)
<b>Semester Total</b>		<b>24</b>	

**FPTCC-201: Technology of Fruits and Vegetables Processing                      04 Credit**

**Course Outcome:**

- Students will be able to understand process for production of Jam, Jellies, Marmalade, Fruit Juices, De-hydrated Fruits and canning of Fruits and Vegetable.
- To understand by product utilization of Fruits and Vegetables.
- To acquaint with principles and methods of preservation and processing of fruits and vegetables into various products.
- Applying the ionizing radiation in preservation of Fruits & Vegetable.

**Unit I**

Quality requirement of raw materials for preservation, Primary Processing: selection of fruits and vegetables for processing, grading, sorting, cleaning, washing, peeling, slicing and blanching. Syrups and brines used in processing, containers used for primary packaging of fresh fruits and vegetables and their processed products.

**Unit II**

General principles and methods of preservation. Basic principle of juice extraction, clarification and chemical preservation, use of enzymes in extraction of juice.

**Unit III**

Unfermented fruit beverages: squashes, nectars, cordials and syrups. Processing of tomatoes, pulping methods, different type of tomato products: tomato puree and paste, tomato sauce and ketch-up.

**Unit IV**

Principle Fruit Concentrates. Chemistry and preparation of pectin. preparation and defect of jam, jelly and marmalades. Technology of preserved, crystallized and glazed fruits. Principle and methods of pickling, types of pickles, nature and control of spoilage in pickles.

**Unit V**

Introduction to canning and dehydration of foods. Application of ionizing radiation in preservation of fruit and vegetables. Advantages and limitations. By-products of fruit and vegetables industries and their utilization. Recent development in fruits and vegetables processing.

**References**

1. Preservation of Fruits and Vegetables, Girdhari Lal, G.S. Siddappa, G.L. Tandon.
2. Fruit and Vegetable Preservation: Principles and Practices, Srivastava R.P.& KumarSanjeev. CBS publishers and distributors pvt ltd
3. Food Science, B. Srilakshmi Editon: VII, New Age International Publication
4. Fruit and Vegetable Processing by FAO.Org.
5. Fruits, Vegetables and Food Processing Dr. by H. Panda, Niir Project Consultancy
6. Food Processing and Preservation, B Shivsankar PHI Press

**Course Outcome:**

- Students will be able to gain the knowledge of basic composition of different cereals viz. Wheat, rice, maize and different oil seeds.
- Along with basic composition their milling knowledge will be acquired by students.
- To know the processing and technology of products related to cereals pulses and oilseeds.
- To understand technology of oil extraction.

**Unit I**

Wheat: Types of wheat. Principles of wheat milling, conventional and turbo milling. Enzymes of wheat and their role in the preparation of wheat products. Aging of flour, by-products, Chemical improvers-bleaching and maturing agents. environmental effects on wheat composition.

**Unit II**

Principles of baking; bakery ingredients and processing of wheat products-bread, biscuits.. Principles of extrusion cooking, pasta goods and breakfast cereal foods.

**Unit III**

Rice: Composition, types of proteins, starch content, amylose and amylopectin fractions. Rice milling operations. Cooking quality, by-product of rice milling and their utilization. Processed and prepared products based on rice. Parboiling of rice-technology and effect on quality characteristics; aging of rice-quality changes.

**Unit IV**

Corn: Composition, processing of corn for preparation of corn grits, meal and flour, processing of corn flakes, corn syrup, corn starch. Sorghum: Chemical composition, refining method and nutritive value.

**Unit V**

Pulses: Composition, anti-nutritional factors, processing methods: wet & dry milling and modern milling methods. Oilseeds: Extraction and refining of oil; processing of oilseeds as protein concentrates and isolates. Properties and uses of oilseed meals, technology of texturized vegetable protein: Low cost protein foods from oilseeds.

**References**

1. Kent's Technology of Cereals, Edi: IV N.L. Kent and A.D. Evers, Pergamon Publishers.
2. Advances in Cereal Science and Technology, Y. Pomeranz, AACC.
3. Technology of Cereals, Pulses and Oilseeds, Skylar Barr, Mason Sutton
4. Cereals Processing Technology edited by Gavin Owens, CRC Woodhead Publishing Ltd.

**Course Outcome:**

- To get knowledge of principles and practices from milk collection to processing and storage.
- To acquaint with different equipments related to milk processing and technology.
- Students will know about different milk products and fermented milk products.
- To get knowledge about latest techniques of milk processing and preservation.

**Unit I**

Organized market milk industry in India and abroad; Principles and practices followed in milk collection, cooling, transport, loading and unloading, milk reception, grading, separation, clarification chilling and storage. Sampling and testing of milk for physico-chemical, microbiological and sensory quality.

**Unit II**

Principles, equipment, and processes involved in the preparation of standardized market milk. Special milks viz. sterilized milk. Flavoured milk, vitaminized milk, reconstituted milk, recombined milk and fermented milk. Judging and grading of processed milk.

**Unit III**

Technology involved in processing of dehydrated milk products viz. condensed milk, evaporated milk, dried milk and malted milk powder; fat rich milk products viz. cream, butter, butter oil and ghee; frozen milk products viz. ice-cream, ices and sherbets; and fermented milk products viz. cheese, curd and yogurt. FSSAI standards for milk products.

**Unit IV**

Production and Quality management in dairy industry. Principles of cleaning and sanitation of milk processing equipments, accident prevention, building design and personal health care. HACCP concept in fluid milk processing.

**Unit V**

New physical methods for preservation of milk and milk products; Microwave processing, Pulsed electric field, High hydrostatic pressure, Sonication/Mano-thermo-sonication and Irradiation. Microfiltration, Reverse osmosis and Ultrafiltration applications in milk processing.

**References**

1. Outlines of Dairy Technology, Sukumar De, Oxford
2. Dairy Technology, Shivashraya Singh, Zaccheus Entertainment
3. Processing Technology for Milk Products Methods, Applications, and Energy Usage edited by Ashok kumar Agrawal, Megh R. Goyal 1st edition. Apple Academic Press
4. Dairy plant Design and layout, Lalat Chander ICAR
5. Hand Book of Milk Processing, Dairy Products and Packaging Technology, Board Eiri, Engineers India Research Institute

**Course Outcome:**

- To provide a technical view about bioprocessing and different level of fermentation equipments.
- Downstream and purification process of fermented products.
- Student will get knowledge about production and purification of different distilled and non distilled alcoholic beverages.
- Student will be able to know about beverage from fruits and vegetables.
- Carbonated and noncarbonated Beverages, Production of various fermented food and beverages.

**Unit I**

Introduction of bioprocess technology. Classification of fermentation systems: Overall design of fermentation plant and scale up concept. Evaluation of fermentation parameters and online monitoring of industrial fermentation process.

**Unit II**

Products purification and downstream processing: recovery of food or nutrients (single cell protein, amino acid, vitamins and enzymes). Role and application of microbes in bioprocess. Fermentation (alcoholic and non-alcoholic).

**Unit III**

Introduction and History of growth. Type of beverages: fruit & vegetable juices, fermented and non-fermented beverages, synthetic beverages, carbonated and non-carbonated beverages. Tea, Coffee and Cocoa: Production, composition, processing and preparation.

**Unit IV**

Fruit and vegetable Beverages: Juice, extraction, clarification, preservation, packaging, concentration and drying. Various beverages from fruit juices, their preparation and preservation. Vinegar, fermented vegetables. Non carbonated and carbonated synthetic beverages : Ingredients, sources of carbon dioxide, chemical and physical properties of carbon dioxide, carbonating process, packaging of carbonating beverages.

**Unit V**

Alcoholic Beverages: Non-Distilled Beverages: Beer and Wines, Distilled Beverages: Vodka, Rum, Gin, Whisky, Arrack, Toddy, Brandy. Water for beverages: Types of water required for beverages, Additives for beverages: Natural and synthetic sweeteners and colors, acids, emulsifiers, preservatives, flavour and flavour enhancers.

**References**

1. Handbook of Food Beverage Fermentation Technology Y.H. Hui, Lisbeth Meunier-Goddik Jytte Josephesen, Wai-Kit Nip, Peggy S. Stanfield, CRC Press;
2. Bioprocess technology by PT Kalaichelvan and A Arul Pandi , MJP Publisher
3. Advances in bio process Technology by Pogaku Ravindra Springer
4. Bioprocess technology by Anton Moser, Springer-Verlag Berlin and Heidelberg GmbH &Co. K
5. Principle of fermentation technology P F Stan bury A Whitaker and S H Hall, Butterworth-Heinemann Publisher
6. The Complete Technology Book on Alcoholic and Non- Alcoholic Beverages (Fruit Juices, Whisky, Beer, Rum and Wine) NPCB Board of Consultants & Engineers Asia Pacific Business Press Inc.
7. Technology Of Carbonated Drinks And Non-Carbonated Beverages With Formulations (A Complete Technology Book On Non-Alcoholic Beverages), Himadri Panda, engineers India research institute

**Course Outcomes:**

- Students get familiar with various properties of food packaging materials, their classification.
- Know the packaging of milk and milk products
- To know various rigid packaging materials like glass and composite containers, wooden boxes and crates as well as packaging requirements for fish, frozen, smoked fish meal, packaging of egg.
- Students also get knowledge of packaging law and regulations

**Unit I**

Packaging-Concepts, definition, significance, classification, Flexible packaging materials and packaging forms-paper, regenerated cellulose, film, aluminium foils, and lamination, wrappers, bags, pouches and collapsible tubes.

**Unit II**

Rigid packaging materials-glass containers and Composite Containers. Rigid packaging materials and package forms-Aerosol containers, Solid & Corrugated fibre board Containers, wooden boxes & crates. Cylindrical shipping containers and problems in packaging dehydrated foods. Packaging requirements & materials for chocolate and Confectionaries-chocolate, candy, confectionary peanut butter, chewing gum, jams & jellies. Packaging requirements and materials for beverages, vegetables and fruits juices, carbonated soft drinks.

**Unit III**

Spiral packaging methods-vacuum packaging, gas packaging and shrink packaging. Packaging of milk and milk products –milk, condensed milk, evaporated milk, milk powder, cream, butter & cheese. Semi rigid packaging materials & forms –Aluminum Containers, setup paper cartons, folding paperboard cartons, moulded pulp containers and plastic containers.

**Unit IV**

Packaging –Laws and regulations. Aseptic and retort packaging. Testing and evaluation of packaging media-retail packs and transport packages. Produce package Compatibility, toxicity, tainting and corrosion. Packaging and environment.

**Unit V**

Packaging requirements and materials for fish- fresh, frozen, salted, smoked fish meal. Packaging of egg products. Packaging equipment, principles of weighing filling, sealing, wrapping, cartooning, capping, labeling, coding, marking including bar coding and strapping.

**References**

1. Principles of food packaging 2nd edition, Stanley Sacharow, Roger.C.Griffin, AVI. Publishing.Co., Westport.
2. Sacharow, S.Hand Book of packaging materials, A VI Publishing company, West Port
3. Paine, F. A. The packaging media, Blackie and Son's Ltd, London
4. Food packaging materials, Croshy, N. T. Applied Science publication limited, London.
5. Sacharow and Grilin, Food Packaging, AVI Publications Hotchkiss, Food and Packaging Interacting-American Chemical Society.
6. Food packaging Technology, Robertson, G. L. News Port, Marcell Dekkar, Inc.
7. Food Packaging Principles And practice, , Gordon L. Robertson.
8. Novel Food Packaging Techniques, 2003, Raija Ahvenainen.
9. Active Packaging for Food Applications, Aaron, L. Brode, Eugene R. Strupinsky,. Practical / Related Experiences: A visit to packaging unit.
10. Hand Book of Food Preservation 2<sup>nd</sup> edition by M. Shafiur Rahman CRC Press
11. Food Science 5<sup>th</sup> edition by Potter, Norman N., Hotchkiss, Joseph H
12. Hand Book of Food Processing & Food Preservation by Theodoros Varzakas Constantina Tzia
13. A. hand book of food packaging Paine, F.A. & Paine, H. Y. Leonard Hill. Blackie Son's Ltd, London.

1. Determination of 1000 kernel weight of different wheat varieties.
2. Determination of test weight of different wheat varieties.
3. To determine the specific gravity of given milk sample.
4. Determination of titrable acidity of given milk sample.
5. To perform different platform test of milk.
6. Determination of the gluten content of given flour sample.
7. To determine the acid value of given oil sample.
8. Estimation of fat in the given milk sample.
9. Observation of fermentation process with different carbohydrate sources
10. Detection of alcohol in given sample by Iodoform test
11. Determination of total hardness in given water sample
12. Determination of BOD in given water sample
13. Determination of COD in given water sample
14. Preparation of RTS beverage
15. Preparation of squash, cordial
16. Preparation of Jam and jellies, marmalade
17. Preparation of ketchup
18. Preparation of potato wafers
19. Preparation of dehydrated fruits and vegetables
20. Estimation of anthocyanin
21. Estimation of lycopene
22. Estimation of carotene
23. Preparation of khoa and ghee
24. Preparation of flavoured milk
25. Preparation of cottage, mozzarella and cheddar cheese
26. Preparation of fortified food
27. Blanching of vegetables
28. Bottling of fruits

**Course Outcome:**

- Student will be able to manage the human resources within a food services organization or department.
- The student will get idea about development of managing skill as plant manager.
- Marketing, finance management as well as entrepreneurship development.
- Student will get knowledge about food service industry Adhere to regulations, standards and best practices of food service industry and Food branding and Advertising.
- Food Supply chain Management. Develop nutritional menus for food service production

**Unit I**

Management: Meaning, nature, scope, significance, functions and principles; levels of management, process of management, co-ordination as an essence of management. Planning: Meaning and importance of planning. Organizing: Meaning and importance, process of organizing, principles of effective organization;

**Unit II**

Introduction to functional areas of management: personnel management, production management, financial management, Objectives and functions of personnel management, production and financial management. Production management: plant location and layout, production planning and control.

**Unit III**

Introduction to marketing management, Marketing research, fundamentals of marketing principles, costing and cost management, pricing methods; fundamentals of operations and supply chain management, financial studies; marketing challenges and approaches for new products and services.

**Unit IV**

Food branding and Advertising, Food Supply chain Management, Food Marketing, Nature, scope and importance of entrepreneurship; business ideas, source of business ideas, feasibility studies, problem solving and decision making.

**Unit V**

Agribusiness management, HRM in Food business, Agricultural sector and food processing industry problems and opportunities; self employment need and entrepreneurship in foods sector, fund management and enterprise management issues in food entrepreneurship, entrepreneurship development policies of government in food business

**References**

1. Management and Entrepreneurship, Naidu NVR and Krishna Rao T.I.K. International Pvt. Ltd.
2. Management Concepts & Practices, Singh B.P., Dhanpat Rai & sons, Nai Sarak, Delhi.
3. Management – An Integrated Approach Dwivedi R.S., National Publishing Co., Delhi.
4. Food Supply Chain Management, Jane Eastham, Liz Sharples & Stephen Ball. Elsevier Science.
5. Small scale food entrepreneurship: A technical guide for food ventures, authored & published by Northeast Centre for Food Entrepreneurship
6. Food safety management by Yashmine Motrajemi and Huub Lelieveld Academic press
7. Food and beverage management by Piyush Bhatanger and Nitin Popil, SBS Publishers