

**B. Sc. Food Science and Quality Control**  
**Semester-I Theory syllabus**  
**Paper – I: Food Chemistry & Nutrition**

**OBJECTIVES:**

To enable the students to:

- a) Understand the relationship between nutrition and human wellbeing.
- b) Know and understand the functions, importance of all nutrients for different age groups and special groups
- c) To know the major and minor components of foods.
- d) To know composition and properties of food.

**UNIT – I**

1. Introduction to nutrition – definition of nutrition, Food as a source of nutrients. Functions of foods
2. Inter relationship between nutrition and health, visible symptoms of good health.
3. Food guide-basic five food groups and usage of food guide.
4. Use of food in body-digestion, absorption, transport, utilization of nutrients in the body.

**UNIT – II**

1. Carbohydrates- composition, classification, sources, functions, structure, physical & chemical properties.
2. Lipids – classification, composition, nomenclature, saturated& unsaturated fatty acids, food sources, functions of fats.
3. Proteins – composition, classification, sources, functions, denaturation, and protein deficiency, determination of protein quality.
4. Amino acids – classification, Physio-chemical properties, modification of food protein through processing and storage.

**UNIT – III**

1. Water as a nutrient, function, sources, requirement, structure and water balance – effect of deficiency.
2. Moisture in food: Hydrogen bonding, Bound water, free water, Water activity and Food stability.
3. Energy – Unit of energy, food as a source of energy, energy value of food, the body's need for energy, energy requirement for different age groups. B.M.R. activities
4. Enzymes. Nomenclature, specificity, uses of enzymes in foods, enzyme added to food during processing

**UNIT – IV**

1. Mineral functions, sources, Bio-availability, and deficiency of following minerals – calcium, Iron, Iodine, Fluorine, sodium, potassium.
2. Vitamins – Classification, units of measurement, sources, functions and deficiency diseases caused by following vitamins:
3. Pigments indigenous to food, structure, chemical and physical properties. Effect of processing and storage.
4. Flavours – Vegetables, fruit and spice flavours, fermented food, Meat and sea food.

**Semester-I Practical syllabus**  
**Paper – I: Food Chemistry & Nutrition**

1. Experiments on properties of monosaccharides- Glucose, Fructose and Galactose
2. Experiments on properties of Disaccharides - maltose, lactose and sucrose.
3. Experiments on properties of Polysaccharides -starch
4. Estimation of glucose in a given sample.
5. Experiments on properties of amino-acids.
6. Experiments on properties of proteins
7. Experiments on properties of fats.
8. Saponification number of lipids.
9. Determination of T S S
10. Determination of Ash content

**B.Sc. Food Science and Quality Control**  
**Semester II Theory syllabus**  
**Paper – II: Food Microbiology, Sanitation and Hygiene**

**OBJECTIVES:**

To help the students to

- a) Acquire an elementary knowledge about micro-organism.
- b) To develop an understanding of the role of microorganisms in environment, Industry and in maintenance of health.
- c) Understand the importance of safe handling of food.

**UNIT – I**

- Introduction to microbiology and its relevance to everyday life-General morphology of micro-organisms – General characteristics of bacteria, fungi, virus, protozoa, algae.
- Control of micro-organisms, growth curve – Effect of environmental factors on growth of microorganisms-pH, water activity – oxygen availability, temperature & others.
- The relationship of micro-organism to sanitation. Role of microbiology-Environment effects of microbial growth.

**UNIT – II**

- Effects of micro-organisms on food degradation and food bore illness – Bacteria, Virus, Molds, Yeasts and parasites (food poisoning).
- Other food hazards – chemicals, antibiotics, hormones, metals contamination – poisonous foods.
- Other agents of contamination: Human, domestic animals, vermins, birds.
- Beneficial effect of micro-organisms.

**UNIT – III**

1. Microbiology of different foods – Spoilage and contamination- Sources, types, effects on the following:
  - a) Cereals & Cereals products.
  - b) Vegetables & Fruits.
  - c) Meat & Meat products.
  - d) Eggs & Poultry.
  - e) Milk & Milk products.

**UNIT – IV**

- Importance of personal hygiene of food handlers – clothes, illness. Education of food handler in handling and serving food
- Safety in food procurement, storage, handling and preparation – control of spoilage – safety of left over foods.
- Cleaning and sanitization. Products and methods – use of detergents and chemicals Planning and implementation of training programmes for health personnel.
- Relevance of microbiological standards for food safety.

**REFERENCES:**

1. Adams, M.R and Mass, M.D. (2008). Food Microbiology. newAge International Pvt. Ltd. Publishers.
2. Banwart, G.T. (1987). Basic Food Microbiology. CBS Publications:New Delhi.
3. Block, J.G. (1999). Microbiology Principles and Explorations. 4<sup>th</sup> Edition. John

Wiley and sons Inc.

4. Frazier, W.C. (1968). Food Microbiology. 4<sup>th</sup> Edition. McGraw Hill Inc.
5. Jay, J.M., Lossner, M.J and Golden, D.A. (2008). Modern Food Microbiology. 7<sup>th</sup> edition. Springer. ISBN: 0387231803
6. Kawata, J.G. (1963). Environment Sanitation in India. Lucknow Publishing House.
7. Longree, K. (1967). Quality Food Sanitation. McGraw Hill Publishers: New York.
8. Pelezar, H.J. and Rober, D. (1968). Microbiology. 2nd Edition. McGraw Hill: New York.

### **Semester II practical syllabus**

#### **Paper – II: Food Microbiology, Sanitation and Hygiene**

1. Microscope and its parts. Examination under low power/high power and oil immersion objectives.
2. Gram staining, Isolation and Identification.
3. Ziehl-Neelsen staining.
4. Examination of yeasts, mould and non-pathogenic bacteria.
5. Study of sterilization equipments.
6. On the job training for 1 month during summer break.

**B.Sc. Food Science and Quality Control**  
**Semester III Theory syllabus**  
**Paper – III: Post-harvest technology of field crops**

**Course Objectives:**

- To teach importance of horticultural crops and preservation techniques.
- To impart technical knowledge on refining of oilseeds
- To understand the basic composition and structure of cereals and legumes

**UNIT I**

**Vegetables**

Composition, Classification, Nutritive Value, Changes during cooking, storage, factors affecting storage and post-harvest losses. Canning and blanching of fruits and vegetables Preparation and preservation of seasonal pickles, tomato ketchup and chutneys.

**Fruits**

Composition, Classification, Nutritive Value, Post harvest Changes and Storage, ripening of fruits, enzymatic browning. Processing and preservation of fruit products- jam, jelly, marmalade, nectar, cordial, squashes.

**UNIT II**

**CEREALS AND MILLETS**

Rice-Types, structure, chemical composition, Nutritive Value, milling-parboiling, ageing, processed food products of rice.

Wheat-Types, structure, composition, Nutritive value, milling of wheat, milling types, milling of wheat in to different types of flours, processed wheat products.

Millets- Ragi, Jowar, Bajra- structure, chemical composition, processed millet products and health benefits.

**UNIT III**

**PULSES & LEGUMES**

Composition, Nutritive Value, Processing of Pulses and Legumes-milling of pulses by traditional and commercial methods-dry milling of pulses, milling of pulses by CFTRI method.

Toxic constituents of pulses -Trypsin Inhibitors, Lathyrogens, Favism, Haemagglutinins, Cyanogenic Glycoside, Saponins and Goitrogens. Methods to eliminate toxic constituents.

**UNIT IV**

**NUTS & OILSEEDS**

Nuts & Oilseeds – Composition and Nutritive Value, Processing of groundnut & sunflower seeds in to edible oils, Hydrogenation of oils, Rancidity of Oils- Definition, Types and prevention. Anti-oxidants used to extend shelf life of oils, adulteration of different oils and methods used to determine adulteration

**Course Outcome:**

- Students will be able to understand the importance of processing and preservation of horticultural crops, cereals, legumes and oil seeds. And also, technology used in different milling industries.

**REFERENCES**

1. Bennion, M and Scheule, B. (2014). Introductory Foods. Pearson education.
2. Manay, N.S and Shadaksharaswamy, M. (2001). Food Facts and Principles. New Age International Publishers.
3. Srilakshmi, B. (2007). Food Science. NewAge International.
4. Subbulakshmi, G. (2001). Food Science and Preservation. New Age International (P) Ltd.

**Semester III Practical syllabus**  
**Paper – III: Post-harvest technology of field crops**

1. Preservation of fruits and vegetables by following methods:
  - a. Canning
  - b. Squash/Jam/Nectar
  - c. Pickles
  - d. Drying
2. To process and preserve fruit and vegetable-based products
3. To observe processing of cereals, oils at various food manufacturing Units
4. Simple physical and chemical tests to be determine quality and detect adulterants in the following:
  - i. Oil and Fats
  - ii. Spices and Condiments (any five)
  - iii. Food Grains, Pulses and Oilseeds,
  - iv. Flours – Wheat
  - v. Canned foods
  - vi. Sugar and Honey
  - vii. Milk & Milk

**B. Sc. Food Science and Quality Control**  
**Semester IV Theory syllabus**  
**Paper – IV: Technology of Animal Foods**

**Course Objectives:**

- To study about the processing of different dairy products.
- To study about the importance meat, processing and preservation of meat by various techniques
- To study about processing of sea foods

**Unit-I**

Definition of milk- composition, sources of milk, types of cow and buffalo varieties for high yielding of milk and nutritive value of milk-physical and chemical properties of milk. Processing of milk: Receiving of milk, Platform tests, filtration and clarification, standardization – Pasteurisation Methods - Sterilisation methods, Homogenisation, packaging and distribution of milk. Types of milk. Milk production as an entrepreneurship activity-government schemes.

**Unit-II**

Processing of milk in to different milk products-Cream, butter, ghee, cheese-types. Fermented milk products.

Manufacturing of Ice-cream- Definition, classification, composition, ingredients used, colours and flavours used, defects and over-run in ice-cream.

Manufacturing of indigenous milk products-Khoa, kalakhand, paneer, rasogolla, channa.

**Unit III**

Meat industry in India-sources of meat-composition, nutritive value and microscopic structure of meat- stunning and slaughtering methods -Post mortem changes in meat-meat preservation methods and packaging of meat

Classification of poultry meat; Composition and nutritional value of poultry meat; Processing of poultry meat; By-product utilization. Structure, composition and nutritive value of egg.

**Unit-IV**

Fish industry and production in India. Classification of fresh water fish and marine fish; Commercial handling, storage and transport of raw fish; Average composition of fish; Freshness criteria and quality assessment of fish; Spoilage of Fish; Methods of Preservation of fish: Canning, Freezing, Drying, Salting, Smoking and Curing. Fish products and shrimp processing

**Course Outcome:**

- Student will be able to understand the importance of meat, preservation and processing into different products

**Suggested Readings:**

- Aneja RP, Mathur BN, Chandan RC & Banerjee AK. 2002. Technology of Indian Milk Products. Dairy India Publ.
- De Sukumar,1980. Outlines of Dairy Technology. Oxford Univ. Press.
- Rathore NS et al. 2008. Fundamentals of Dairy Technology - Theory &Practices. Himanshu Publ
- Web BH, Johnson AH & Lford JA. 1987. Fundamental of Dairy Chemistry. 3rd Ed. AVI Publ.
- Spreer E. 1993. Milk and Dairy Products. Marcel Dekker.

- Walstra P. 1999. Dairy Technology. Marcel Dekker.

**Semester IV Practical syllabus**  
**Paper – IV: Technology of Animal Foods**

- 1) Study on basics of reception of milk at the plant;
- 2) platform tests in milk;
- 3) estimation and fat and SNF in milk;
- 4) Operation of LTLT & HTST
- 5) Pasteurization; Preparation of special milks;
- 6) Cream separation & standardization of milk;
- 7) Preparation and evaluation of table butter, ice cream, cheese and indigenous milk product such as khoa, chhana, paneer, ghee, rasogulla, gulab jamun, shrikhand, lassi, burfi etc.;  
Visit to dairy plants.



**B. Sc. Food Science and Quality Control**  
**Semester V Theory syllabus**  
**Paper – V: Technology of Fermented Foods and Beverages**

**Course Objectives:**

- To understand the principles of food fermentation technology
- To study the types of starters used in Food Industry
- To study the production of various fermented foods, alcoholic and non-alcoholic beverages.

**UNIT-I**

**Fermented foods:**

- Introduction to fermentation-types of fermentation, benefits of fermentation.
- Production of sauerkraut: Preparation of traditional pickles-fermentation of pickles and microbiology involved in p r e s e r v a t i o n of pickles.
- Traditional fermented foods like Idli, Dosa - Manufacturing process and microorganisms involved in fermentation, importance of nutritive value as a breakfast food.

**UNIT-II**

**Beverages:**

- Introduction and classification of beverages; Growth of beverage industry in India; Ingredients used in beverages
- Water- Introduction, Sources, types of water, different methods of purification of water, BIS standards for packaged drinking water.
- Additives used in beverages- colours, flavours, sweetners and preservatives.

**UNIT-III**

- Fruit based beverages – manufacturing process and preservation of Nectar, Cordial, Squash.
- Carbonated beverages- Soft drinks-manufacturing process, role of ingredients used in soft drinks, leading companies in the world and their products
- Low calorie beverages, sports drinks.
- Tea and coffee processing- manufacturing process and different types of tea and coffee beverages.

**UNIT-IV**

**Alcoholic beverages:**

- Introduction to alcoholic beverages, types, role of ingredients used in alcoholic beverages.
- Wine- - Ingredients used types of wine, manufacturing process of wine, fermentation and preservation of wine, uses and demerits of wine on consumption as an alcoholic beverage.
- Beer-Ingredients used types of beer, manufacturing process and role of yeast in fermentation of beer, packaging of beer.
- Distilled beverages: Rum, brandy and whisky.

**Course Outcome:**

- Student will be able to understand the importance of fermentation and different micro organisms associated with foods

**SUGGESTED READINGS:**

- Ravinder, A. Srinivas Maloo and Dr. Emmanuel, S.J. 2013. Hand Book of Fermented foods and Beverages, 1<sup>st</sup> edition. Mumbai: Himalaya Books Publishing House.
- Priest, F.G. and Stewart, G.G. 2006. Handbook of Brewing. 2<sup>nd</sup> edition. New Delhi:

CRC Publication.

- Richard, P. 1981. Commercial Wine Making - Processing and Controls. New Delhi: AVI Publication.
- Prescott, S.C. and Dunn, C.G. 1959. Industrial Microbiology. 6<sup>th</sup> edition. New Delhi: Tata McGraw Hill.
- Varnam, A.H. and Sutherland, J.P. 1994. Beverages: Technology, Chemistry and Microbiology. Scotland: Chapman & Hall.
- Woodroof, J.G. and Phillips, G.F.1974. Beverages: Carbonated and Non-Carbonated. New Delhi: AVI Publication.

### **Semester V Practical syllabus**

1. Preparation of yoghurt
2. Preparation of buttermilk
3. Preparation of whey based fermented beverages
4. Preparation of pickles
5. Preparation of wine
6. Production of sauerkraut
7. Preparation of fruit beverages
8. Preparation of carbonated soft drinks
9. Preparation of non carbonated and non alcoholic beverages
10. Visit to beverage industry

**B. Sc. Food Science and Quality Control**  
**Semester VI Theory syllabus**  
**Paper – VI: Food Safety, Quality Control and Sensory Evaluation**

**Course Objectives:**

The objectives are to introduce the principles and methods of Food Quality Control and Assurance, principles and selection of panelists for sensory evaluation and Quality Management System and existing food Standards (ISO).

**UNIT-1**

Food safety: Characterization and risk analysis- Food hazards: Physical, Chemical and biological systems for food safety. Hazard Analysis Critical Control Point (HACCP) and its implementation.

**UNIT-II**

Quality Assurance: Theoretical and practical considerations, description of different systems: GAP, GMP, TQM, ISO. Indian food standards- Voluntary and Obligatory standards (PFA, FPO, MMPO, AGMARK etc.) Codex alimentarius, Worldwide food safety issues.

**UNIT-III**

Sensory evaluation: Requirements and methods. Sensory parameters: Colour, flavour, texture, taste, aroma, general acceptability. Subjective and Objective test of sensory parameters. (Differential test, Descriptive test, Rating test, Sensitivity threshold test).

**UNIT –IV**

Clean In Place (CIP)- Different sanitizers and detergents- Sanitation and hygiene in quality assurance in different food industries ( Fruits and vegetables, Meat, Milk, Cereal Based).Cost of Quality, Supplier development.

**Course Outcomes:**

Upon completion of this course, the student will be able to understand the principles and methods of Quality Control and Assurance in foods, understand the principles of sensory evaluation, understand the principles of HACCP in different food processing. (Skills) carry out sensory evaluation of a newly developed product, identify hazards and critical control points of different existing production processes.

**References:**

- Amerine MA, Pangborn RM & Rosslos EB. 1965. Principles of Sensory Evaluation of Food. Academic Press.
- Early R.1995.Guide to Quality Management Systems for Food Industries. Blackie Academic.
- Furia TE.1980. Regulatory status of Direct Food Additives. CRC Press.
- Jellinek G. 1985. Sensory Evaluation of Food - Theory and Practice. Ellis Horwood.
- Krammer A & Twigg BA.1973. Quality Control in Food Industry. Vol. I, II. AVI Publ.
- Macrae R, Roloson R & Sadlu MJ. 1994. Encyclopedia of Food Science & Technology & Nutrition. Vol. XVI. Academic Press.
- Piggot J.R. 1984. Sensory Evaluation of Foods. Elbview Applied Science.
- Ranganna S. 2001. Handbook of Analysis and Quality Control for Fruit and Vegetable Products. 2nd Ed. Tata-McGraw-Hill.
- Export/Import policy by Govt. of India.

**B. Sc. Food Science and Quality Control**  
**Semester VI Theory syllabus**  
**Paper – VII: Food Packaging**

**Course Objectives**

The objectives of this course are to establish the different functions performed by packaging material. To inform about health implications of food-package interactions. To inform about packaging requirement for fresh and processed food for local and international markets

**UNIT-1**

Introduction to packaging. Packaging operation, package functions and design. Principle in the development of protective packaging. Deteriorative changes in food stuff and packaging methods for prevention, Shelf life of packaged food stuff, methods to extend shelf life.

**UNIT-II**

Food containers: Wooden boxes, crates, plywood and wire bound boxes, corrugated and fiber board boxes, textile and paper sacks. Metal containers, tin plate, corrosion of containers. Food packages- Bags, pouches, wrappers, cartons and other traditional package.

**UNIT-III**

Flexible packaging materials (Paper, metal foils, polymers and laminates) and their properties. Packaging additives Consideration in the packaging of perishable and processed foods. Aluminum as packaging material. Bar coding, Printing, Package standards and regulation.

**UNIT-IV**

Trends in latest packaging- Modified atmospheric packing (MAP), Controlled atmospheric packaging (CAP), Oxygen Scavengers, Shrink packaging, Aseptic and retortable pouches etc. Flexible and laminated pouches, biodegradable packaging, Active packaging. Packaging of different food materials- Fruit and vegetables, meat, milk and egg products, oils, RTE foods etc.

**Course Outcome**

Student will be able to understand the need for packaging food, understand the various functions of food packages as influenced by their characteristics, understand the health implications of food-package interactions.

**Suggested Readings**

- Crosby NT, Food Packaging: Aspects of Analysis and Migration Contaminants 1981. App. Sci. Publ.
- Kadoya T. (Ed). 1990. Food Packaging. Academic Press.
- Mahadeviah M & Gowramma RV. 1996. Food Packaging Materials. Tata McGraw Hill.
- Palling SJ. (Ed). 1980. Developments in Food Packaging. App. Sci. Publ.
- Painy FA. 1992. A Handbook of Food Packaging. Blackie Academic.

**B. Sc. Food Science and Quality Control**  
**Project Internship: Vi Semester**

**Objective:**

- To develop research and project writing skills in students.

A research or industrial project for **one month** will be allotted to each student after the V semester. They will be required to complete the data collection, analysis and writing of dissertation so as to submit it at the end of V Semester and to present it at seminar.