

PAPER I: NUTRACEUTICALS

Code: BTFS – NFP01

Unit 1: Introduction to Nutraceutical Industry

Organizational elements, classification of nutraceuticals, dietary supplements, fortified foods, functional foods and phytonutracuticals. Scope involved in the industry, Indian and global scenario.

4 Hours

Unit 2: Concept, Biochemistry of nutrition and dietetics

Balanced Diet, Basic Five Food Groups, Food Pyramid, Classification of Nutrients, Nutritional Assessment of Carbohydrates – Classification, Functions, Recommended Dietary Intake. Dietary Fibre – Components, physiological Effects, potential health benefits, recommended Dietary Intake.

Glycemic index.

Nutritional Assessment of Proteins –Classification based on amino acid content, food sources, functions, RDA, Nitrogen Balance, Protein Efficiency Ratio(PER), Net Protein Utilisation(NPU).

Lipids – Classification of Fats and Fatty Acids, Functions, Nutritional Requirements, Associated Deceases and Preventive Measures.

Basics of Energy Balance - Basal Metabolic Rate (BMR) and Factors Affecting BMR, Thermogenesis and Physical activity

8 Hours

Unit 3: Nutrition related diseases and disorders

Carbohydrates, Protein, Fat - Excess and deficiency

Metabolic disorders– types Nutritional Factors, prevention and treatment. Role of nutraceuticals in the prevention and treatment with special reference to diabetes mellitus, hypertension, hypercholesterolemia.

Concept of antioxidants - use of antioxidants as dietary supplements in prevention and treatment of cancer, obesity and stress. Role of nutraceuticals and functional foods in pediatrics, geriatrics, sports, pregnancy and lactation.

8 Hours

Unit 4: Nutraceuticals of plant and animal origin

Plant secondary metabolites, classification and sub-classification - Alkaloids, phenols, Terpenoids. Extraction and purification, applications with specific examples with reference to skin, hair, eye, bone, muscle, heart, brain, liver, kidney, general health and stimulants. Concept of cosmoceuticals and aquaceuticals.

Animal metabolites - Sources and extraction of nutraceuticals of animal origin. Examples: chitin, chitosan, glucosamine, chondroitin sulphate and other polysaccharides of animal origin, uses and applications in preventive medicine and treatment.

8 Hours

Unit 5: Microbial and algal nutraceuticals

Concept of prebiotics and probiotics - principle, mechanism, production and technology involved, applications - examples of bacteria used as probiotics, use of prebiotics in maintaining the useful microflora - extraction from plant sources. Synbiotics for maintaining good health. Algae as source of omega - 3 fatty acids, antioxidants and minerals - extraction and enrichment.

5 Hours

Unit 6: Biotechnology in Phytonutraceuticals

Role of medicinal and aromatic plants in nutraceutical industry – propagation - conventional and tissue culture, cultivation, post harvest technology and strategies for crop improvement, development of high yielding lines and yield enhancement,

plant genomics and metabolomics. Introduction to nanobiotechnology with special reference to nutraceuticals.

4 Hours

Unit 7: Product development and clinical trials

Activity screening, formulations, toxicology, bioavailability, bioequivalence; use of animal models and pre-clinical and clinical trials involved.

4 Hours

PAPER II – FOOD PROCESSING

Code: BTFS - NFP02

Unit 1: Introduction to Food Processing Industry

Food Processing Industry, scope, Indian and global scenario.

2 Hours

Unit 2: Food Chemistry

Carbohydrates, lipids, proteins and enzymes - nomenclature, classification, structure, physical and chemical properties. Sources and uses in food processing industry.

9 Hours

Unit 3: General principles and technology of food processing

(a) Physical and chemical principles in different types of food processing techniques, food additives-types of food additives with examples of preservatives, emulsifiers, gums, antioxidants, dough conditioners, flour improvers, enzymes, starches, Basics of colours and flavours - chemistry and technology of natural and synthetic colors and flavors, chelating agents and nutritional enhancers.

(b) Preservation, storage, packaging - food spoilage and defects, food infections - different types of microorganisms involved in food spoilage, factors affecting spoilage. Basics of dehydration, different types of drying, freezing, radiation and chemical preservation.

(c) Types of packaging, materials, methods and operations.

14Hours

Unit 4: Technologies in food processing

Fruit and vegetable processing - Introduction to fruit and vegetable products, different types of products, dehydration techniques, canning, processed fruits and vegetables - pulps, jams, jellies, marmalades and other products like fruit juice and fruit bars.

Cereals and pulses processing - Different types of processing methods used in case of cereals and pulses-conventional and modern methods, uses of products and by-products of processed cereals and pulses. Case studies of paddy, pulses and maize processing.

Dairy technology - milk processing by filtration, clarification, standardisation, homogenisation and pasteurisation, cream separating techniques and chilling techniques. Types of milk and milk products-cream, butter, spray dried powder, casein, lactose, whey, ice cream, fermented dairy products, technology and applications with examples of Yoghurt, Acidophilous milk and value added products.

Sugar and Confectioneries - Types of sugars and different products of sugar industry, sugar processing - chocolate and confectionary manufacturing.

Beverages and spices technology - Chemistry and production technology of coffee, tea and cocoa cultivation, harvesting, management and manufacture, value added products; Spice industry -cultivation, processing, chemical constituents of spices, and manufacture of value added products, specific examples of pepper, cardamom, ginger, turmeric, vanilla, garlic etc.,

Bakery - Different types of bakery products, manufacturing process of bread, biscuits and others.

Poultry, meat and fish processing - sources, process and products.

15 Hours

**PAPER III: ANALYTICAL TECHNIQUES IN FOOD
PROCESSING AND NUTRACEUTICAL INDUSTRY**

Code: BTFS – NFP03

Unit 1: Introduction to analytical techniques and scope.

2 Hours

Unit 2: Chromatography

Basic concepts, principle and methodology, paper chromatography, thin layer chromatography, ion exchange chromatography, affinity chromatography and gel exclusion chromatography. High pressure liquid chromatography, gas liquid chromatography - principle, instrumentation and applications. Column chromatography as a separation technique.

10 Hours

Unit 3: Spectroscopy

Basic principles of spectroscopy-, UV-Visible spectroscopy, colorimetry, NMR, ESR, Mass spectrometry, Flame photometry and atomic absorption spectroscopy, Fluorescence spectrometry, IR spectrometry- Instrumentation and applications.

9 Hours

Unit 4: Food measurements

Viscosity and consistency, rheological properties and texture. Measurement of specific gravity, refractive index, gel strength, densitometry, refractometry, polarimetry and measurement of colour, relative humidity and water activity measurement. pH, conductivity, turbidity and stability measurements.

9 Hours

Unit 5: Electrophoresis

Basic principles in electrophoresis, electrophoretic mobility - Capillary and zone electrophoresis- Instrumentation and applications of Gel electrophoresis - PAGE, SDS-PAGE, two dimensional electrophoresis, pulsed field gel electrophoresis, isoelectric focussing and isotachophoresis.

10 Hours

PAPER IV: SAFETY REGULATIONS, CONTROL AND ENTREPRENEURSHIP

Code: BTFS – NFP04

Unit 1: Quality control and Quality assurance

Good laboratory practices and good manufacturing practices, development of SOPs and safety practices in the production areas. Microbial load assessment - classification of microorganisms, physical and chemical factors affecting growth of microorganisms, water co-efficient and other properties. Heavy metal load, safety, toxicity, stability, pH and other physical and chemical characteristics of food and nutraceuticals.

10 Hours

Unit 2: Safety regulations

Structure, organisations and operations of national and international regulatory bodies. Role of regulatory authorities in India - functioning, legal acts and their enforcements with suitable examples.

Concept of HACCP - Hazard assessment, ISO 22000 regulations - implementation in food, dairy, poultry, meat and meat products industry.

10 Hours

Unit 3: Labelling regulations

Need, scope and limitations of labelling - components of labelling, regulations of labelling of irradiated products, organic foods, products of biotechnological applications, GMOs, national and international regulations on labelling; claims related to health and nutritional profile.

6 Hours

Unit 4: Ethics and environmental concern

Biosafety guidelines for research, environmental aspects of GMOs, handling and disposal of laboratory organisms, waste disposal and environmental concern. Legal issues involved, Indian drug and cosmetics Act. Ethical issues related to animal testing.

10 Hours**Unit 5: Entrepreneurship, research, IPR related issues and job opportunities****4 Hours**

PRACTICAL I:
NUTRACEUTICALS AND FOOD PROCESSING

Code: BTFS – NFP005

1. Extraction of plant secondary metabolites by different methods.
2. Chemical profiling of plant samples and extracts.
3. Isolation and purification of colours and flavours from plant sources
4. Preparation of chitin, chitosan and glucosamine from prawn shell.
5. Optimisation of extraction methods for herbal extracts with active principles.
6. Extraction of alkaloids
7. Extraction of polyphenols and related compounds
8. Extraction of flavonoids and isoflavones.
9. Extraction of terpenes and terpenoids
10. Extraction of saponins.
11. Lab scale cultivation of algae of nutraceutical importance
12. Lab scale production of probiotics
13. Extraction of prebiotics from suitable plant sources.
14. Formulation of health drinks
15. Preparation of syrups, squashes, jams, jellies, fruit bars, ketchups and sauces
16. Processing of fruits and vegetables- Gerkins, roseonions and amla; wine preparation.
17. Lab scale preparation of fermented milk products.

PRACTICAL II:
Quality control and analytical techniques

Code: BTFS – NFP006

1. Biochemistry of food products- Quantitative determination of reducing sugars by DNS method
2. Quantification of proteins by Folins cio-calteau method.
3. Enzyme studies- Activity and Specific activity measurements of amylase, protease, catalase, peroxidise and urease.
4. Immobilization of enzymes by gel entrapment method.
5. Determination of activity of phosphatase in milk.
6. Test for cellulase activity.
7. Determination of moisture, total sugars, fiber, ash and fat content.
8. Determination of caffeine and tannin content in coffee and tea.
9. Study of different drying methods employed in food processing industry.
10. Preparation of culture media for cultivation of bacteria, molds and yeasts.
11. Assessment of sanitation quality at food preparation units-swab and rinse techniques
12. Isolation of microorganisms- Different methods and maintenance of cultures of microorganisms.
13. Bacteriological analysis of foods, yeast and mold count in food samples.
14. Microbial analysis of water and milk-Total count, MPN Coliform and MBRT.
15. Biochemical tests for characterisation of bacteria.
16. Rapid methods for identification of microorganisms using diagnostic kits.
17. Determination of physical constants in food samples- bulk density, specific gravity, refractive index, gel strength, melting and freezing points, viscosity and consistency measurement.
18. Separation techniques- Chromatographic separation-paper, TLC, column, GC and HPLC.
19. Electrophoretic separation

20. Spectroscopic techniques- Quantitative determination of active principles and minerals in nutraceuticals and processed foods by UV-Vis and Atomic absorption spectroscopy.
21. Determination of BMR and BMI.
22. Study of different documentation procedures involved in food processing and nutraceutical industry.
23. Stability studies of processed foods and nutraceutical products.