

INSTRUCTIONS FOR PAPER SETTER

The question paper shall contain three sections. Section A shall comprise of eight very short type questions of 2 marks each to be answered in about 10-20 words. Section B shall comprise of 4 short type questions of 8 marks each to be answered in about 200-250 words. Two questions to be attempted from Section C, out of 4 long answer type questions of 16 marks each in about 400-500 words. Due weightage shall be given to all four units while setting the questions.

Objectives

1. To enable students to understand microbial spoilage of foods.
2. To provide the students a basic information regarding food born diseases.

Unit - I

- **History and scope of food microbiology**– Historical development in food preservation, food spoilage and food poisoning.
- **Microbial growth pattern**– Growth curve of microbial cultures, its application to food preservation.
- **Factors affecting microbial growth**– pH, moisture content, Eh, nutrient content, antimicrobial constituents, biological structures, extrinsic factors.
- **Control of microbial growth in foods**–High temperature, freezing, refrigeration, chemical preservatives, irradiation.

Unit – II

- Types of microorganism associated with food – Mold-general characteristics, morphological features, reproduction, physiological requirements, common molds associated with foods.
- Bacteria–Morphological, physiological characteristics, important food spoilage and pathogenic bacteria, associated with foods.
- Yeast- General Characteristics, reproduction, cultural characteristics, physiological characteristics.
- Viruses- Structure and replication with particular reference to food born viruses.
- Biochemical changes caused by micro organisms– Degradation of carbohydrates, fermentation, degradation of lipids, degradation of proteins and amino acids, putrefaction.

Unit – III

- **Microbial contamination and spoilage of foods**– Vegetables, cereals, pulses, oilseeds, milk and meat during handling, processing and storage.
- **Microbiology of water and Atmosphere.**

- **Spoilage of processed foods** – Canned products, causes of spoilage, appearance of spoiled cans, types of spoilage of canned foods by yeast, moulds and bacteria.

Unit IV

- **Food borne disease** – Staphylococcal gastroenteritis, Botulism, Listeriosis, Salmonellosis, Shigellosis.
- **Toxicants of microbial origins** – Aflatoxins, ochratoxins, patulin, botulin, enterotoxins.
- **Detection of food borne pathogens** - Physical, chemical and immunological methods of detecting microbes in foods with special reference to Staphylococcus, Clostridium, Listeria, Yersenia, Salmonella, Escherichia, Vibrio.

References:

1. Food Microbiology by Frazier.
2. Modern Food Microbiology by James Jay.
3. Basic Food Microbiology by Banwart.
4. Microbiology by Pelezar, Smith and Chan.
5. Introduction to Microbiology by Stainier.

INSTRUCTIONS FOR PAPER SETTER

The question paper shall contain three sections. Section A shall comprise of eight very short type questions, of 2 marks each to be answered in about 10-20 words. Section B shall comprise of 4 short type questions of 8 marks each to be answered in about 200-250 words. Two questions to be attempted from Section C, out of 4 long answer type questions of 16 marks each in about 400-500 words. Due weightage shall be given to all four units while setting the questions.

Objectives

To enable students to:

1. Have a sound back ground regarding various nutritional components of foods.
2. Understand the behavior of various chemical constituents during processing and preservation.

Unit – I

- **Food chemistry** - Definition and importance. Approaches to the study of food chemistry, societal role of food chemists.
- **Water in foods**– Water activity and shelf life of foods, moisture sorption isotherms, hysteresis.
- **Water solute interactions**- Free water, bound water, interaction of water with ionic and non-ionic groups.
- **Carbohydrates**– Classification, Structure and properties. Chemical reactions in foods, starch gelatinization and retrogradation, modified starches, alginate, pectin, carageenan. Non- enzymatic browning, Factors affecting the rate of non- enzymatic browning.

Unit – II

- **Lipids** - Classification, Structure and use of lipids in food, saturated and unsaturated foods, hydrogenation of fats.
- **Physical and chemical properties of lipids**– Lipid oxidation, rancidity, factors affecting rate of oxidization, methods to measure lipid oxidization, control of rancidity.
- **Effect of processing on functional properties and nutritive value**– Thermal decomposition, chemistry of frying.

Unit – III

- **Protein and amino acids** - Physical and chemical properties, protein structure, forces governing stability of proteins, denaturation.
- **Functional properties of proteins** – Protein hydration, solubility, emulsifying properties, foaming properties.

- **Modification of proteins** – Alkylation, acylation, phosphorylation, esterification, enzymatic modification.
- **Effect of processing on protein quality**
- **Enzymes in foods** – Papain, lipoxygenase, PPO, use of pectinase, cellulase and amylase in food industry.
- **Loss of vitamins and minerals due to processing.**

Unit IV

- **Pigments in foods** – Heme compounds, chlorophyll, alteration of chlorophyll, preservation of chlorophyll during processing, carotenoids and their properties, anthocyanins, their properties and stability, betalains and their properties, use of pigments and biocolours.
- **Food flavours** – Taste modalities, sweet, sour, bitter and salty, astringency, pungency, flavours from lactic acid – ethanol fermentation.
- **Browning reactions** – Enzymatic and non enzymatic, factors effecting their rate.
- **Food contaminants** - Additives and toxicants.

References:

1. Food Chemistry by Owen R. Fennema.
2. Food Chemistry by Meyer.
3. Mechanism & Theory in Food Chemistry by Wong.

INSTRUCTIONS FOR PAPER SETTER

The question paper shall contain three sections. Section A shall comprise of eight very short type questions, of 2 marks each to be answered in about 10-20 words. Section B shall comprise of 4 short type questions of 8 marks each to be answered in about 200-250 words. Two questions to be attempted from Section C, out of 4 long answer type questions of 16 marks each in about 400-500 words. Due weightage shall be given to all four units while setting the questions.

Objectives

To enable students to have knowledge regarding status of food production and consumption.

To provide a basic knowledge regarding fundamental principles governing food processing

Unit – I

- **Food production**– Production of important food grains and pulses in India, consumption trend in India.
- **Status of Indian food industry**– Exports scenario of fruits, vegetables, spices, and their processed products.
- **Scope and importance of food processing**– Driving forces for food industry and constraints, challenges to food security, impact of WTO on food scenario, national and international perspective.
- **Approaches to combat world hunger.**

Unit–II

- **Thermal Processing** – Canning, Sterilization, Pasteurization, Extrusion.
- **Dehydration**– Water activity, types of dryers, effect of dehydration on food quality. Freeze drying. Intermediate moisture foods.
- **Fermentation**– Types, nutritional importance of fermented foods.
- **Preservation by chemicals** – Benzoate, sorbate, propionate, sulphur dioxide, anti oxidants,
- **Hurdle Technology**

Unit – III

- **Irradiation**– Mechanism, dosimetry, equipment, effect of irradiation on micro-organisms, and on food. Safety and wholesomeness of irradiated foods.
- **Aseptic processing**– Equipment, characteristics, HTST and UHT processing,
- **Membrane processing**– Advantages, types of membranes, equipments, applications and effect on foods.

- **Minimally processed foods**– Preservation and packaging of minimally processed foods.
- **Microwave processing**– Electro magnetic spectrum, difference between microwave and infrared energy, dielectric constant, relaxation time, equipment and applications.

Unit – IV

- **Refrigeration and frozen storage**- Components of refrigerator, freezing curves, equipment, freezing and chilling injuries.
- **Controlled atmospheric storage** – Principle, design considerations, effects of CA storage on food quality.
- **Modified atmospheric storage** - Gas storage, hypobaric storage.

References:

1. Food Processing Technology by P. Fellows.
2. The Technology of Food Preservation by Desrosier.
3. Food Science by N.N. Potter.
4. Introduction to Food Science and Technology by Stewart.

INSTRUCTIONS FOR PAPER SETTER

The question paper shall contain three sections. Section A shall comprise of eight very short type questions, of 2 marks each to be answered in about 10-20 words. Section B shall comprise of 4 short type questions of 8 marks each to be answered in about 200-250 words. Two questions to be attempted from Section C, out of 4 long answer type questions of 16 marks each in about 400-500 words. Due weightage shall be given to all four units while setting the questions.

Objectives

To enable students to:

1. Understand the engineering principles underlying various processing techniques.
2. Understand fundamentals of food plant design and its maintenance.

Unit –I

- **Unit and dimensions** – Definition of dimension, unit, base unit, derived unit, precision, accuracy, systems of measurement, SI system, conversion of units, dimensional constant.
- **Material balance** – Basic principles, total mass balance, component mass balance, numerical problems based on dilution, concentration and dehydration.
- **Fluid flow** - Fluid statics, fluid dynamics, fluid flow applications.
- **Heat transfer** - Modes of heat transfer, conduction, convection and radiation, blanching, pasteurization, distillation.
- **Energy balance** - Introduction to laws of thermodynamics, specific heat of solids and liquids, properties of saturated and super heated steam, steam tables, heat balance, numerical problems based on heat balanced.
- **Heat exchanger**– scraped surface, double pipe, shell and tube and plate heat exchangers.
- **Thermal process calculations**- D Value, Z value, F value calculation of process time for canned foods.

Unit – II

- **Refrigeration**– Principle, refrigeration cycle, thermo dynamics of refrigeration system.
- **Food freezing**– Prediction of freezing time, chest freezers, blast freezers, belt freezers, fluidized bed freezers, immersion freezers.
- **Evaporation**– Single effect evaporators, multiple effect evaporators, steam economy, essence recovery during evaporation.
- Characteristics of building materials in relation to water and vapour.

Unit – III

- **Dehydration** – Psychrometry, ERH, EMC.
- **Mechanical handling**- Conveying and elevation.
- **Size reduction** – Elastic stress limit, yield point, Kicks law, Rittengers law, Bonds law. Equipment for fibrous foods – slicing, dicing, flaking, shredding, pulping and chopping. Equipment of dry foods – ball mills, disc mills, hammer mills, roller mills. Size reduction of liquid foods – homogenization,
- **Mixing** – Theory of solids mixing, theory of liquids mixing, equipment for low, medium and high viscosity foods. Mixtures for dry and fortilidae foods.

Unit – IV

- Food plant design - General consideration in designing the plant, plant location.
- Plant layout-types of layout considerations in efficient layout.
- Food plant hygiene – Cleaning, sterilizing, waste disposal methods.
- Engineering aspect of radiation processing.

References:

1. Introduction to Food Engineering by R.P. Singh and D.R. Heldman.
2. Fundamentals of Food Process Engineering by R.T. Toledo.
3. Transport Processes and Unit Operation by C.J. Geankoplis.
4. Food processing Technology by P.Fellows.

FT-05 EXPERIMENTS IN FOOD MICROBIOLOGY (PRACTICAL)

Max. Marks:- 100

External Exam: - 80 Internal Assessment: - 20

1. Microscopy.
2. Cleaning and sterilization of glassware.
3. Preparation of nutrient media and techniques of inoculation.
4. Staining techniques-Monochrome staining, negative staining, gram staining, acid fast staining, spore staining, capsule staining.
5. Examination of bacteria, yeast and moulds.
6. Identification of bacteria
 - i) Cultural characteristics
 - ii) Morphological characteristics
 - iii) Biochemical characteristics
 - a) Indole Test.
 - b) Starch-hydrolysis
 - c) Oxidase Test
 - d) TSI test
 - e) Coagulase test
 - f) Catalase test
 - iv) Serological slide and tube agglutination test for Salmonella
7. Enumeration of micro-organisms– TPC, Yeast and mould count.
8. Anaerobic Culture methods.
9. Growth characteristics of bacteria,
 - a) Generation time
 - b) Factors influencing growth-pH, temperature, thermal death, time, growth curves for bacteria and yeasts, Osmotic pressure, preservatives.
10. Examination of moulds important in foods.
11. Examination of yeast and algae.
12. Microbiological examination of natural product.
 - a) Water
 - b) Milk and milk products.
 - c) Fruits and vegetables.

References:-

1. Microbiology-Pelczar, Smith & Chan.
2. Food Microbiology by Frazier.
3. Textbook of Practical Microbiology by Subhash Chandra Parija.
4. Laboratory Manual in Microbiology by Gunasekaran.

FT-06 EXPERIMENTS IN FOOD BIOCHEMISTRY (PRACTICAL)

Max.Marks:- 100

External Exam: - 80 Internal Assessment: - 20

1. Preparation and standardization of solution.
2. Moisture content by
 - a) Drying method (using hot-air oven and vacuum oven)
 - b) Moisture meters
3. Ash Estimation in different foods:
 - Fruits
 - Cereals
 - Vegetables
 - Meat
4. Protein content by
 - a) Kjeldhal method
 - b) Lowrey's Method
 - c) Quantitative tests for proteins paper chromatography of amino acids
5. Carbohydrates-qualitative tests, estimation of reducing & non-reducing sugars, total sugars, starch, amylose and polarimetry of sugars.
6. Determination of trypsin inhibitor.
7. Crude fibre estimation in foods.
8. Estimation of crude fat in food samples.
9. Determination of acidity of various food samples.
10. Determination of Vit. C in foods.
11. Determination of diastase activity in cereals.
12. Estimation of chlorophyll in leafy vegetables.
13. Estimation of anthocynins in fruits.
14. Determination of carotenoids in foods.

References:-

1. Handbook of Analysis and Quality Control for Fruit and Vegetable products by Ranganna.
2. General Analytical Techniques in Nutritional Biochemistry by Krishna and Ranjah.
3. Experiments in General, Organic and Biological Chemistry by Arne Langsjoen et al.
4. Experimental Biochemistry by Beedu Sashidhar

INSTRUCTIONS FOR PAPER SETTER

The question paper shall contain three sections. Section A shall comprise of eight very short type questions, of 2 marks each to be answered in about 10-20 words. Section B shall comprise of 4 short type questions of 8 marks each to be answered in about 200-250 words. Two questions to be attempted from Section C, out of 4 long answer type questions of 16 marks each in about 400-500 words. Due weightage shall be given to all four units while setting the questions.

Objectives

To enable students to:

1. To impart knowledge and skills to the students regarding various food quality parameters.
2. To provide a background to the students regarding food laws and standards.

Unit – I

- **Objectives, importance and functions of quality control.**
- **Methods of quality assessment**– Subjective & objective methods.
- **Sampling**–Types of samples, preparations & preservation of sample, sampling errors. Factors affecting sampling size.
- **Statistical quality control**– X & R charts, steps for developing control charts.

Unit – II

- **Properties of foods**– Colour , gloss, flavour, consistency, viscosity, texture & their relationship with quality.
- **Quality evaluation of foods**– Fruits, vegetables, cereals, dairy products, meat, poultry, egg and processed food products.
- **Establishment of food testing laboratory**– Infrastructure requirement, design and accreditation considerations.

Unit - III

- **National & international Food laws**– AGMARK, PFA, FPO, Codex Alimentarius Commission, grades and standards. IPR and patents.
- **General hygiene and sanitation in food industry**– GMP, HACCP.
- **Food adulteration and food safety**– Physical, chemical & biological hazards in foods.

Unit IV

- **Sensory evaluation** - Definition, objectives.

- **Panel screening** - Selection methods, interaction and threshold.
- **Sensory evaluation methods / training**– Difference tests (Paired comparison, Duo Trio, Triangle), Rating (ranking, single sample, two sample, multiple sample, hedonic), sensitivity threshold test.
- **Instrumental analysis in quality control and food rheology**

References:

1. Sensory Evaluation Practices by Stone.
2. Principles of Sensory Evaluation of Foods by M.A. Amerine, R. M. Rangborn and E.B. Roessler.
3. Quality Control in Food Industry by Hershoerfer.
4. Quality Control in Food Industry by Kramer and Tuig.

INSTRUCTIONS FOR PAPER SETTER

The question paper shall contain three sections. Section A shall comprise of eight very short type questions, of 2 marks each to be answered in about 10-20 words. Section B shall comprise of 4 short type questions of 8 marks each to be answered in about 200-250 words. Two questions to be attempted from Section C, out of 4 long answer type questions of 16 marks each in about 400-500 words. Due weightage shall be given to all four units while setting the questions.

Objectives

1. To impart knowledge and skills regarding food packaging
2. To have a basic understanding of properties of packaging materials and their impact on food quality.

Unit – I

- Introduction to packaging.
- Packaging operation, package functions and design.
- Principles in the development of protective packaging.
- Deteriorative changes in foodstuffs and packaging methods for prevention.
- Shelf life of packaged food stuffs, method to extend shelf life. Migration of contaminants.

Unit – II

- **Food containers**– Rigid containers, Corrosion of containers (Tin plate).
- **Can Fabrication.**
- **Flexible packaging materials and their properties**– Bags, pouches, wrappers, cartons and other traditional package.
- Shrink packaging, retortable pouches.
- Wooden boxes, crates, plywood and wire bound boxes.

Unit – III

- Corrugated and fiber board boxes.
- Textile and paper sacks.
- Factors affecting package stability.
- Special problems in packaging of food stuff.
- **Consideration in packaging performance**– WVTR, GTR, bursting strength, tensile strength, drop test, puncture test.

Unit IV

- **Packaging equipments**– Can former; form, fill and seal machine; bags, shrink packing unit; tetra pack units.
- Packaging standards and regulations, labeling, regulations and functions of labelling.
- Flexible and laminated pouches, aluminum as packaging material.
- Biodegradable, edible and active packaging.
- Preservative packaging for fresh meats, poultry.
- Packaging requirements of fruits / vegetables, meat, milk, fruit juices and pulps, spices.

References:

1. Food Packaging Principles by Gordon Robertson.
2. Principles of Food Packaging by Saccharow and Griffin.
3. Food Packaging by Takashi Kadoya.
4. Handbook of Food Packaging by Paine and Paine.
5. Food and Packaging Materials Interactions by Paul Acherman
6. Innovations in Food Packaging by Jung M. Han.

INSTRUCTIONS FOR PAPER SETTER

The question paper shall contain three sections. Section A shall comprise of eight very short type questions, of 2 marks each to be answered in about 10-20 words. Section B shall comprise of 4 short type questions of 8 marks each to be answered in about 200-250 words. Two questions to be attempted from Section C, out of 4 long answer type questions of 16 marks each in about 400-500 words. Due weightage shall be given to all four units while setting the questions.

Objectives

1. To provide knowledge regarding application of some biological phenomena for processing, preservation and nutritional upgradation of foods.

Unit – I

- History and development of biotechnology.
- Scope and limitations of food biotechnology.
- Use of biotechnology in food industry, baking, fat and oil industry, fruit and vegetable industry, dairy industry.

Unit – II

- Application of genetics to food production. Basic concepts and methods of cloning, immobilization of microbial and cultured plant cells, Solid state and submerged fermentation, fermenter design.
- Principles of downstream processing- Bacterial starter culture, methods of inoculums and medium preparation, slurry processing and product isolation.

Unit – III

- **GM foods**– Safety aspects, consumer's attitudes, constraints in the growth of GM foods marketing.
- Technological aspects of industrial production of enzymes (amylase, pectinase, proteases).
- Production of organic acids, amino acids, vitamins, antibiotics, baker's yeast, single cell proteins, enzymes.
- **Immobilized enzymes** –Methods of immobilization, effects of immobilization.

Unit – IV

- **Sprouts**– Bio-chemical changes during sprouting, nutritional significance.
- **Fermented foods**– Origin, scope and developmental, sauerkraut, yoghurt, cheese, miso, tempeh, idli, dosa, cider, fruit vinegar, vegetable pickle, traditional dairy products (kaladi).
- Regulatory and social aspects of biotechnology of foods.

References:

1. Industrial Microbiology by Prescott and Dunn.
2. Food Microbiology by Frazier.
3. Modern Food Microbiology by James Jay.
4. Biotechnology and Food Ingredients by Israel Goldberg and Richard Williams.

FT-10 ADVANCED TECHNIQUES OF FOOD ANALYSIS

Max.Marks:- 100

External Exam: - 80 Internal Assessment: - 20

INSTRUCTIONS FOR PAPER SETTER

The question paper shall contain three sections. Section A shall comprise of eight very short type questions, of 2 marks each to be answered in about 10-20 words. Section B shall comprise of 4 short type questions of 8 marks each to be answered in about 200-250 words. Two questions to be attempted from Section C, out of 4 long answer type questions of 16 marks each in about 400-500 words. Due weightage shall be given to all four units while setting the questions.

Objectives

1. To make students familiar with advanced techniques of food analysis
2. To make student to understand the application of analytical chemistry in food quality evaluation.

Unit – I

- Role of analyst, various methods of sampling, analysis of results.
- **Refractometry**– Theory, instrumentation, specific & molar refraction, variables affecting refractive measurements, its applications, types of refractometers.
- **Principles and application of colorimetry**– Optical aspects (hue, value, chroma), tristimulus colour system, tintometers & hunter lab CDM.
- **Flame photometry**– Concept of ground state, excited state, ionization energy. resonance line, inferences , components of flame emission spectrophotometer.

Unit - II

- **Principles and application of atomic absorption spectroscopy**– Components of atomic absorption spectroscopy, ICP.
- **X-ray analysis of foods**– Properties, production & detection, x- ray tubes, detectors, x- ray fluorescence, sources, application in food industry.
- **Electrophoresis**–Applications, principles of separation of neutral molecules, separation of optical isomers and buffers.
- **Mass spectroscopy**– Components, Low voltage Mass Spectrometry, Quantitative analysis.

Unit - III

- **Chromatography**– Different types (HPLC, Paper Chromatography, TLC, GLC) their principles and applications.
- **Rheology measurement**– Farinograph, Amylograph, Viscosity measurement, Texture analysis.

Unit IV

- Enzymatic methods, DSC, SEM.
- Rapid methods of microbial analysis, immunoassays.
- **Nuclear magnetic resonance (NMR)** – Principle, Components, Interpretation of NMR spectra, application of NMR.

References:

1. Food Analysis by Pomeranz.
2. The Chemical Analysis of Food and Food Products by Jacobs.
3. Handbook of Analysis and Quality Control for Fruit and Vegetable products by Ranganna.

FT-11 EXPERIMENTS IN QUALITY CONTROL AND SENSORY EVALUATION OF FOODS (PRACTICAL)

Max.Marks:- 100

External Exam: - 80 Internal Assessment: - 20

1. Determination of total solid, temporary and permanent hardness of water.
2. To examine the quality of fruits and vegetables, meat, poultry, milk, cereal and their products.
3. Identification and ranking of food product attributes.
4. Sensory and instrumental methods for measuring food attributes.
5. Application of modern techniques for evaluation of color, texture, viscosity and consistency.
6. Texture evaluation of fruits, vegetable, dough, baked, paste, dairy and meat products.
7. Analysis of products for FPO specifications.
8. Qualitative and quantitative determination of adulterants in milk, ghee, edible oil, legumes, saffron, sugar, black pepper, turmeric, chillies, coffee, honey, mustard seeds.
9. Determination of total solid, total dissolved solids, total suspended solids, BOD and COD in food industry waste water.
10. Determination of food preservatives – SO₂ & benzoic acid.
11. Assessment of nutritive value of foods.
12. Determination of NaCl concentration.

References:-

1. Chemical and Biological Methods for Water Pollution Studies R.K.Trivedy & P. K. Goel.
2. Pearson Composition and Analysis of Foods by R .Kirk / R . Sawyer.
3. Physical Properties of Food by R.Jowitt & Fescher.
4. Analysis of Food Contaminants by J. Gilbert.

FT-12 EXPERIMENTS IN FOOD PACKAGING (PRACTICAL)

Max.Marks:- 100

External Exam: - 80 Internal Assessment: - 20

1. Identification of different types of packaging material.
2. Physical and chemical properties of packaging films.
3. Designing of packaging material for foods.
4. ERH studies of different foods.
5. Uniformity and amount of wax determination.
6. Chemical resistance of packaging material.
7. WVTR of different packaging material.
8. Shelf life studies of packaged food.
9. Grease resistance of packaging material.
10. Puncture resistance of corrugated boxes.
11. Packaging of fresh foods I) Fruits & Vegetables II) Meat.
12. Shrink packaging of poultry.
13. Determination of tin coating weight & porosity.
14. Determination of continuity of lacquer coating.
15. Determination of tensile strength and heat seal strength of packaging material.
16. Determination of water absorption of paperboard and CFB.
17. To conduct drop test.
18. Visits to food packaging units.

References:-

1. Food Packing Principles and Practices by Gordoul.

FT-13 CEREAL, LEGUME AND OIL SEED TECHNOLOGY

Max. Marks:- 100

External Exam: - 80 Internal Assessment: - 20

INSTRUCTIONS FOR PAPER SETTER

The question paper shall contain three sections. Section A shall comprise of eight very short type questions, of 2 marks each to be answered in about 10-20 words. Section B shall comprise of 4 short type questions of 8 marks each to be answered in about 200-250 words. Two questions to be attempted from Section C, out of 4 long answer type questions of 16 marks each in about 400-500 words. Due weightage shall be given to all four units while setting the questions.

Objectives

1. To impart knowledge regarding composition and nutritional value of important cereals.
2. To impart skills regarding processing of cereals and cereal based foods.

Unit – I

- General introduction to cereals, new varieties, production trends of wheat, rice, barely, oats, corn, sorghum, pearl millet and minor millets in India.
- Structure and nutrients distribution in cereals.

Unit – II

- Wheat– Structure, types and composition of wheat grain, molecular basis of wheat grain hardness and softness.
- Milling of wheat– Quality of flour and flour treatment.
- Manufacturing techniques, uses and functionality of vital wheat gluten. Structure and functionality of wheat proteins. Carbohydrates and Lipids in bread making. Enzymes of wheat and their technological significance.
- Dough chemistry and rheology.
- Technology of bread, biscuits, cakes, durum wheat and pasta products.

Unit – III

- Rice- Grain structure, chemical composition, milling, milling machine.
- Effect of different factors on milling yield and rice quality. By products of rice milling and their utilization.
- Parboiling of rice, effect of aging on rice quality, rice products, enrichment with vitamin and minerals, byproduct utilization.
- Chemical constituents, processing, pearling and malting of barley.
- Corn - wet and dry milling, corn flakes.
- Preparation of extruded products.

Unit IV

- **Types of oil seeds and their chemical composition, oil extraction**– Mechanical and solvent extraction.
- **Refining of crude oils**– Degumming, bleaching and deodorization.
- Processing of oil seeds for protein concentrates and isolates.
- Margarine manufacturing processing and its uses.
- Structure and composition of pulses, their importance in Indian diet
- Dhal milling and processing of pulses.
- Fermented and traditional products.

References

1. Handbook of Cereal Science and Technology by Karel Kulp and Joseph G. Pante.
2. Modern Cereal Science and Technology by Pomeranz.
3. Rice Chemistry and Technology by B.O. Juliano.
4. Corn Chemistry and Technology by Watson and Ramsat.

FT-14 FRUIT AND VEGETABLE TECHNOLOGY

Max. Marks:- 100

External Exam: - 80 Internal Assessment: - 20

INSTRUCTIONS FOR PAPER SETTER

The question paper shall contain three sections. Section A shall comprise of eight very short type questions, of 2 marks each to be answered in about 10-20 words. Section B shall comprise of 4 short type questions of 8 marks each to be answered in about 200-250 words. Two questions to be attempted from Section C, out of 4 long answer type questions of 16 marks each in about 400-500 words. Due weightage shall be given to all four units while setting the questions.

Objectives

1. To impart knowledge and skills to the students regarding techniques of fruit and vegetables processing.
2. To enable students to know fruit and vegetable storage technology.

Unit – I

- Fruit maturing and ripening indices.
- Principles and methods of fruit and vegetable preservation.
- Composition and related quality factors for processing.
- Principles of storage of fruits and vegetables.
- Types of storage: natural, ventilated, low temperature storage, CA and MA storages.

Unit – II

- Preservation of fruits and vegetables, by heat, chemicals, sugar, salt, fermentation, drying etc.
- Canning of fruits and vegetables, tin cans, glass containers, seaming technology.
- Aseptic canning technology.

Unit – III

- Fruit & vegetables juices - Preparation and preservation of juices, syrup, cordials, nectars, juice concentrate.
- Pectin and related compounds, jams, jellies, marmalades, preserves, candies.
- Theory of gel formation.
- Pickles and vinegar production, tomato products.

References:

1. Handbook of Analysis and Quality Control for Fruit and Vegetable products by Ranganna.

Unit – IV

- Drying and dehydration of fruits and vegetables, problems related to storage of dehydrated products.
- Freezing and freeze-drying of food and frozen products.
- Fruit products order (FPO) and quality control.

References:

1. Commercial Vegetable Processing by Woodroof and Lue.
2. Commercial Fruit and Vegetable Processing by W.V. Crues.
3. Handbook of Analysis and Quality Control of Fruit and Vegetable Products S. Ranganna.
4. Processing Fruits Science and Technology by Barrett, Somogyi and Ramaswamy.

FT-15 STATISTICS AND COMPUTER APPLICATIONS

Max. Marks:- 100

External Exam: - 80 Internal Assessment: - 20

INSTRUCTIONS FOR PAPER SETTER

The question paper shall contain three sections. Section A shall comprise of eight very short type questions, of 2 marks each to be answered in about 10-20 words. Section B shall comprise of 4 short type questions of 8 marks each to be answered in about 200-250 words. Two questions to be attempted from Section C, out of 4 long answer type questions of 16 marks each in about 400-500 words. Due weightage shall be given to all four units while setting the questions.

Unit – I

- **Collection of data:** Sources and methods.
- **Sampling:** Steps and techniques, size of sample, sampling and non- sampling errors.
- Processing operations, Presentation of data scaling techniques.
- Measures of central tendency: Mean, Median and Mode.

Unit –II

- **Measures of dispersion:** Quartile deviation, Mean Deviation, Standard deviation, Coefficient of variation.
- Correlation Analysis: Concept and significance, Karl parson's coefficient of correlation, Rank correlation and concurrent deviations (Ungrouped data).
- Regression analysis: Lines of regression and Regression equations.

Unit – III

- **Testing of hypothesis:** Chi- square, t-test and F- test
- Analysis of variance: Concept and assumptions, Computation of one way analysis of variance.
- Experimental Design: RBD and LSD.

Unit IV

- **Introduction to Computer Softwares:** Operating systems: Types and differences, Application software.
- **Introduction to MS- excel:** Functions and formulae.
- **Software packages:** SPSS and Mini-tab.

References:

1. Introductory Statistics by Prem S. Mann.
2. Statistical Methods by S.P Gupta.
3. Statistics by William L. Hays.

FT-16 NEURACEUTICALS AND FOOD TOXICOLOGY

Max. Marks: - 100

External Exam: - 80 Internal Assessment: - 20

INSTRUCTIONS FOR PAPER SETTER

The question paper shall contain three sections. Section A shall comprise of eight very short type questions, of 2 marks each to be answered in about 10-20 words. Section B shall comprise of 4 short type questions of 8 marks each to be answered in about 200-250 words. Two questions to be attempted from Section C, out of 4 long answer type questions of 16 marks each in about 400-500 words. Due weightage shall be given to all four units while setting the questions.

Objectives

1. To enhance the understanding of the students regarding therapeutic value of some food constituents.
2. To enhance the understanding of students regarding harmful constituents of foods and safe food processing.

Unit – I

- **Introduction** - Definition, Classification of neutraceutical factors.
- Food and non food sources.
- Mechanism of action.
- Neutraceutical factors in specific foods.
- Dietary fibre – Types, Effects of fibre deficient diets, physical and physiological properties, hypocholesterolemic, hypolipidemic and hypoglycemic effects, its role in prevention of CHD, Probiotics and prebiotics – common probiotic products, yoghurt, kefir and ice-cream. Health benefits of probiotics.

Unit – II

- **Omega 3 fatty acids**- introduction, nomenclature.
- Biological and functional effects.
- Omega 3 fatty acids and insulin resistance.
- Olive oil and its health benefits.
- **Phytochemicals and Antioxidants** – Introduction, therapeutic properties of some common plants.
- Role of ascorbic acid, flavonoids, Tocopherols, Carotenoids, capsaicinoids as disease prevention agents.
- Tocopherols in health.

Unit – I11

- Basic concepts of toxicology- Dose effect and response, dose response relationship, statistical concept of toxicity, toxicity testing.
- Toxicological testing methods, manifestation of organ toxicity.
- Carcinogenesis, mutagenesis and teratogenesis.
- Measurement of toxicity and toxicants.
- Absorption, translocation and excretion of xenobiotics.
- Biotransformation of bio xenobiotics.
- Naturally occurring toxins in foods – occurrence and denaturation.
- Food additives and their toxics effect.
- Artificial sweeteners and their toxic effects.
- Toxins produced during processing.

Unit – IV

- Poisonous forms of foods – mushrooms and sea foods.
- Heavy metals, radio nucleotides and industrial containments.
- Food packaging containments.
- Residues in animal products.
- Residues in plant products.
- Anti obesity food supplements and toxic effects.

References

1. Functional Foods by Goldberg.
2. Handbook of Nutraceuticals and Functional Foods by Wildman.
3. Food Additives Toxicology by Joseph A. Maga.
4. Food Toxicology by Carl K. Winter

FT-17 EXPERIMENTS IN CEREALS, LEGUMES & OIL SEEDS PROCESSING (PRACTICAL)

Max. Marks:- 100

External Exam: - 80 Internal Assessment: - 20

1. Experimental milling of wheat and rice, assessment of per cent of head, broken, immature kernels, degree of polish.
2. Physico-chemical testing of wheat and rice.
3. Determination of quality characteristics of flours.
4. Experimental parboiling and evaluation of quality of parboiled rice.
5. Evaluation of cooking quality of rice.
6. Rheological properties of dough using Farinograph/ Extensograph/Mixograph.
7. Pasting properties of starches using Visco-amylograph/RVA.
8. Experimental baking of different products and their evaluation, bread, cake and biscuit.
9. Experimental extrusion cooking and quality evaluation of Extrudates.
10. Solvent extraction of oil seeds.
11. Quality evaluation of oils.
12. Visit to wheat and rice, processing plants.

FT-18 EXPERIMENTS IN FRUITS AND VEGETABLES PROCESSING

(PRACTICAL)

Max.Marks:- 100

External Exam: - 80 Internal Assessment: - 20

1. Examination of fresh fruits and vegetables for processing.
2. Pre-cooling of Fresh fruits and vegetables and its effect on storage life.
3. Can seaming operations.
4. Canning of fruits.
5. Canning of vegetables.
6. Testing of can, cut out analysis
7. Preparation and analysis of syrups and Brines.
8. Experimental dehydration of fruits and vegetables.
9. Dehydration and rehydration ratio.
10. Thermal process evaluation for low and high acid canned foods.
11. Freezing of fruits and vegetables.
12. Preparation and preservation of juices.
13. Preparation and preservation of squashes and RTS.
14. Preparation and preservation of Jam, Jellies and marmalades.
15. Preparation and preservation of pickle and vinegar.
16. Preparation of tomato ketchup and sauce.
17. Visit to a fruits and vegetables processing industry.

References:

1. Handbook of Analysis and Quality Control of Fruit and Vegetable Products S. Ranganna

FT-19 TECHNOLOGY OF MILK AND MILK PRODUCTS

Max.Marks:- 100

External Exam: - 80 Internal Assessment: - 20

INSTRUCTIONS FOR PAPER SETTER

The question paper shall contain three sections. Section A shall comprise of eight very short type questions, of 2 marks each to be answered in about 10-20 words. Section B shall comprise of 4 short type questions of 8 marks each to be answered in about 200-250 words. Two questions to be attempted from Section C, out of 4 long answer type questions of 16 marks each in about 400-500 words. Due weightage shall be given to all four units while setting the questions.

Objectives

1. To impart knowledge and skills regarding processing and preservation of fluid milk.
2. To provide applied knowledge to the students regarding production of commercially important dairy products.

Unit – I

- Dairy industry in India and its scope.
- Sources and composition of milk, nutritive value.
- Factors affecting composition of milk.
- Processing of market milk- standardization, toning of milk, homogenization.

Unit – II

- Storage, transportation and distribution of milk. Pasteurization and sterilization.
- Milk products - Processing of cream, butter oil, cheese spread, condensed milk, evaporated milk, whole and skimmed milk.

Unit – III

- Production of Ice creams.
- Quality control in Ice cream manufacturing.
- Production of fermented milk products.
- Instantization of milk and milk products.

Unit – IV

- Judging and grading of milk and its products.
- In plant cleaning system.
- Quality standards of milk and milk products.
- Packaging of dairy products.
- By product utilization.

References

1. Technology of Dairy Products by Early. R.
2. Outlines of Dairy Technology by S. K. De.
3. Chemistry and Testing of Dairy Products by Athestem.

FT-20 TECHNOLOGY OF MEAT, FISH AND POULTRY PRODUCTS

Max.Marks:- 100

External Exam: - 80 Internal Assessment: - 20

INSTRUCTIONS FOR PAPER SETTER

The question paper shall contain three sections. Section A shall comprise of eight very short type questions, of 2 marks each to be answered in about 10-20 words. Section B shall comprise of 4 short type questions of 8 marks each to be answered in about 200-250 words. Two questions to be attempted from Section C, out of 4 long answer type questions of 16 marks each in about 400-500 words. Due weightage shall be given to all four units while setting the questions.

Objectives

1. To impart knowledge to the students regarding commercial processing of meat.
2. To impart knowledge to students regarding traditional meat products.

Unit – I

- Scope of meat industry in India with special reference to J&K.
- Sources of meat, composition and nutritive value of meat.
- Microscopic structure of meat.
- Factors affecting meat production and quality.

Unit – II

- Slaughtering of animals and poultry.
- Inspection and grading of meat.
- Factors affecting post mortem changes.
- Properties and shelf life of meat.
- Meat quality evaluation.
- Mechanical deboning.
- Meat tenderization and aging, pickling and smoking of meat.

Unit - III

- Meat plant sanitation and safety.
- By product utilization.
- Recent trends in meat processing.
- Traditional meat products of J&K.
- Structure, composition, nutritive value and functional properties of eggs.
- Preservation of eggs by different methods.
- Factor affecting egg quality and measures of egg quality.

Unit – IV

- Types of fish, composition, structure.
- Post mortem changes in fish.
- Handling of fresh water fish.
- Canning, smoking, freezing and dehydration of fish.
- Fish sausage.
- Radiation processing.
- MFPO.

References

1. Throntons Meat Hygiene.
2. Principles of Meat Science by Forest.
3. Developments in Meat Science by Lawrie.
4. Processed Meats by Pearsons.
5. Fish Processing Technology by George M. Hall.
6. A Textbook of Fish Processing Technology by K. Gopalkumar (ICAR – publications).

FT- 21 POLLUTION CONTROL AND WASTE UTILIZATION

Max.Marks:- 100

External Exam: - 80 Internal Assessment: - 20

INSTRUCTIONS FOR PAPER SETTER

The question paper shall contain three sections. Section A shall comprise of eight very short type questions, of 2 marks each to be answered in about 10-20 words. Section B shall comprise of 4 short type questions of 8 marks each to be answered in about 200-250 words. Two questions to be attempted from Section C, out of 4 long answer type questions of 16 marks each in about 400-500 words. Due weightage shall be given to all four units while setting the questions.

Objectives

1. Understand the impact of food processing industry on environment.
2. To enhance the skills of students in conversion of food industry by products into some commercially important products.

Unit – I

- **Basics of environmental**– Ecosystems, resource consumption, population growth.
- **Water pollution**– Waste water from food industries, water treatment system.
- Hazardous waste treatment technologies.
- Standards of effluents for land and water body disposal.

Unit – II

- **Air pollution**– Clean air act, pollutant criteria.
- Atmospheric dispersion.
- Indoor air quality, Monitoring air quality.
- Global atmospheric changes.
- Green house effects.
- CFCs and their impact.

Unit – III

- **Solid waste**– Categories characteristics, land disposal problems.
- Recycling, collection, separation and resource recovery.
- Remediation, incineration, composting.
- Monitoring environmental quality in food industry.

Unit IV

- Characteristics of fruit and meat processing wastes.
- Conversion into useful products (Pectin, blood meal).
- Utilization of bones,feathers,hair,intestine,visceral organs
- Utilization of whey, butter milk,casein,skimmed milk

References

1. Food Processing Waste Management by Green and Cramer.
2. Principles of Food Sanitation by Mariett, NG.
3. Managing Food Industry Waste by Robert. R. Zall.

FT-22 PROJECT MANAGEMENT AND ENTREPRENEURSHIP

Max. Marks:- 100

External Exam: - 80 Internal Assessment: - 20

INSTRUCTIONS FOR PAPER SETTER

The question paper shall contain three sections. Section A shall comprise of eight very short type questions, of 2 marks each to be answered in about 10-20 words. Section B shall comprise of 4 short type questions of 8 marks each to be answered in about 200-250 words. Two questions to be attempted from Section C, out of 4 long answer type questions of 16 marks each in about 400-500 words. Due weightage shall be given to all four units while setting the questions.

Course Objectives: The purpose of this course is to expose the non- management students to the basics of management and its functional areas.

UNIT-1

- Entrepreneurship –Concept and development.
- Characteristics and personal attributes of successful entrepreneurship. Developing entrepreneurial competencies.
- Entrepreneurial motivation. Functions and role of entrepreneurs.
- Problems faced by entrepreneurs and their remedies.

UNIT-2

- Identification of project, generation and screening of project ideas. Classification of projects. Forms of ownership –sole proprietorship, partnership, company and cooperative society.
- Factors influencing the choice.
- Steps for starting a small business, Procedure and formalities for registration. Incentives and subsidies.

UNIT-3

- Market and demand analysis- Demand forecasting.
- Technical, management and economic analysis of projects.
- Estimation of cost of project- Objectives, components and basic of estimates.
- Working capital requirement and its estimates.
- Sources of finance- Short term and long term sources.

UNIT-4

- Proforma Profit and loss statement and balance sheet.
- Techniques of financial analysis- Break- even analysis, Payback period, Average rate of return.
- Project format- Common format of a project proposal. Information base and rules governing the preparation of project proposal.
- Project implementation- Prerequisites for successful implementation. Monitoring, Controlling and follow up.

References:

1. Bhargava, B. S. et al, 1977. Project identification, formulation and Appraisal. Goel, E.B (1991).
2. Hisrich, R.D., and Peters, M.P. (1995). Entrepreneurship – Starting Developing and Managing a New Enterprise, Richard D, Irwin, INC, USA.
3. Meredith, G.G. et al, (1982): Practice of Entrepreneurship, ILO Geneva.
4. Chandra, P. (1992) Project Preparation, Budgeting and Implementation. Tata McGraw Hill, New Delhi.
5. Goel, E.B (1991). Project Management. Tata McGraw Hill, New Delhi.

FT-23 EXPERIMENTS IN MILK PROCESSING (PRACTICAL)

Max.Marks:- 100

External Exam: - 80 Internal Assessment: - 20

1. Quantitative estimation of milk constituents such as moisture, % TS, ash, & fat.
2. Determination of acidity of milk.
3. Determination of Specific gravity of milk & observe effect of water addition on it.
4. Performance of platform tests on given sample of milk.
5. Milk pasteurization & sterilization.
6. Preparation of flavored milks.
7. Detection of adulterants in milk –Water, starch, urea.
8. Detection of preservatives in milk.
9. COB test.
10. Quality control tests in milk.
11. Visit to local milk processing plant.
12. Preparation of common milk products.
 - a. Ice- cream
 - b. Yoghurt
 - c. Cheese
 - d. Butter
 - e. Flavoured milks

References:

1. Outlines of Dairy Technology by S. K. De.
2. Chemistry and Testing of Dairy Products by Athestem.

FT-24 EXPERIMENTS IN FISH AND MEAT PRODUCTS PROCESSING

(PRACTICAL)

Max. Marks: - 100

External Exam: - 80 Internal Assessment: - 20

1. Survey of meat and fish products available in market.
2. To study slaughtering and dressing of meat animals.
3. Study of post-mortem changes.
4. Meat cutting and handling.
5. Evaluation of meat quality.
6. Preparation of various meat products such as:
7. Meat pickle
8. Cured meat
9. Meat emulsion and sausage manufacture.
10. Preparation and evaluation of traditional meat products.
11. Shelf-life studies on processed meat products.
12. To evaluate freshness of fish.
13. To determine meat to bone ratio of fish meat.
14. Dressing of fish and calculation of dressing percentage.
15. Preparation of fish products such as fish cutlets, pickle, curry, tandoori fish.
16. Experiments in dehydration, freezing, canning, curing, smoking and pickling of fish and meat.
17. Visit to local slaughterhouse.
18. Quality evaluation of eggs.
19. Preservation of eggs.
20. Slaughtering of poultry.
21. Determination of meat to bone ratio in Chicken.

FT-25 PROJECT WORK

Max. Marks -100

Internal Evaluation -100

The Project work will be evaluated internally by the internal examiners .The students are required to submit the project report in specified format and thereafter to present the same by power point presentation before the examiner/s.