**choice based credit system-Academic year 2020-21**

**B.SC. (FOOD SCIENCE AND NUTRITION) COURSE STRUCTURE**

**SEMESTER -i**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **S.No** | **Course** | **Total Mark** | **Mid Sem** | **Sem End Exam** | **Teaching Hours** | **Credits** |
| 1 | First Language **(Telugu/Hindi/Urdu/Sanskrit)**  | 100 | 25 | 75 | 4 | 3 |
| 2 | Second Language **English** | 100 | 25 | 75 | 4 | 3 |
| 3 | Life Skill Courses (any 1 of 3)**HVPE (Human Values & Professional Ethics) / Computer Application/ Statistics** | 50 | 0 | 50 | 2 | 2 |
| 4 | Skill Development Courses**Skill Development (CSS1)** | 50 | 0 | 50 | 2 | 2 |
| 5 | DSC-1,Paper-1 (Core) **Food Scienc**e **(**THEORY) | 100 | 25 | 75 | 3 | 3 |
| 6 | DSC-1, Paper-1 Lab **Food Science** (PRACTICAL) | 50 | 0 | 50 | 2 | 2 |
| 7 | DSC-1, Paper-2 (Core)**Chemistry-I (**THEORY) | 100 | 25 | 75 | 3 | 3 |
| 8 | DSC-1, Paper-2 Lab**Chemistry-I** (PRACTICAL) | 50 | 0 | 50 | 2 | 2 |
| 9 | DSC-1, Paper-3 (Core)**Chemistry of Foods (**THEORY) | 100 | 25 | 75 | 3 | 3 |
| 10 | DSC-3, Paper-3 Lab **Chemistry of Foods** (PRACTICAL) | 50 | 0 | 50 | 2 | 2 |
|  | **Total** | **750** | **125** | **625** | **27** | **25** |

**CBCS/Semester System (2020-21) - I Semester Syllabus**

**B.Sc. FOOD SCIENCE AND NUTRITION**

**DSC-1 Paper-1: FOOD SCIENCE (THEORY)**

**Hours of instruction 3 per week Credits 3**

**Internals : 25 Sem end exam: 75**

**Objectives:** To enable students

 1. Obtain knowledge of different food groups, their composition and role in diet.

 2. To gain knowledge of different plant and animal derived foods and their nutritive values and properties.

 3. Different methods of processing and cooking.

**UNIT –I**

**Food groups**: Basic 4, 5&7 food groups. Functional food groups-energy yielding, body building and protective foods (only sources and not properties and functions). Food Pyramid, My Plate. Study of various cooking methods - Boiling, steaming, stewing, frying, baking, roasting, broiling, cooking under pressure. Cereals - composition of rice, wheat, effects of cooking on parboiled and raw rice, principles of starch cookery, gelatinization.

**UNIT –II**

Pulses and grams – Varieties of pulses & grams, composition, nutritive value, cooking quality of pulses, germination and its effect. Vegetables - Classification, composition, nutritive value, selection and preparation for cooking, methods and principles involved in cooking. Fruits - Composition, nutritive value, changes during ripening, methods and effects of cooking, enzymatic browning.

**UNIT –III**

Beverages - Classification, nutritive value, Milk based beverages- methods of preparing tea and coffee, fruit based beverages and preparation of carbonated non – alcoholic beverages. Spices and Condiments - Uses and abuses. Fats and Oils - Types of oils, function of fats and oils, shortening effects of oil, smoking point of oil, factors affecting absorption of oil. Sugar cookery- Stages of sugar cookery, crystallization and factors affecting crystallization.

**UNIT –IV**

Milk - Composition, nutritive value, kinds of milk, pasteurization and homogenization of milk, changes in milk during heat processing, preparation of cheese and milk powder

Egg - Structure, composition, classification, nutritive value, uses of egg in cookery, methods of cooking, foam formation and factors affecting foam formation.

**UNIT –V**

Meat -Structure, composition, nutritive value, selection of meat, post mortem changes in meat, aging, tenderness, methods of cooking meat and their effects. Poultry – types, composition, nutritive value, selection, methods of cooking. Fish - Structure, composition, nutritive value, selection of fish, methods of cooking and effects.

**Reference Books:**

 1. Food science, Chemistry and Experimental foods by M. Swaminathan.

 2. Food Science by Norman.N.Potter.

3. Experimental study of Foods by Griswold R.M.

4. Food Science by Helen Charley.

 5. Foundation of Food Preparation by A.G. Peckam.

 6. Modern Cookery for teaching and trade, volume I&II ,Thangam Philip. OrientLongmans Ltd.

7. Food Fundamentals by MacWiliams, John Willy and son‟s, New York.

8. Food Facts & Principles by Shakunthala manay & Shadakhraswamy.

9. Food Science by Srilakshmi , second edition,2002.

**CBCS/Semester System ((2020-21) - I Semester Syllabus**

**B.Sc. FOOD SCIENCE AND NUTRITION**

**DSC-1 Paper-1 Lab: FOOD SCIENCE (PRACTICAL)**

**Hours of instruction 2 per week Credits 2**

**Internals : 0 Sem end exam: 50**

1. Food group- Grouping of foods, discussion on nutritive value.

2. Measuring ingredients Methods of measuring different types of foods – grains, flours & liquids

3. Edible portion: Determination of edible portion percentage of different foods.

4. Cooking methods Moist heat methods – (i) boiling, simmering, steaming, &

 Pressure cooking, (ii). Dry heat methods – baking. (iii), Fat as a medium for

 Coking-shallow and deep fat frying.

5. Methods of cooking fine and coarse cereals. Examination of starch

6. Cooking of soaked and unsoaked pulses, Common preparations with pulses.

7. Experimental cookery using vegetables of different colours & textures. Common

 Preparations with vegetables. Preparation of soups and salads.

8. Prevention of darkening in fruits & vegetables.

9. Milk & milk products: Common preparation with milk, cheese & curd.

 -cheese curry & cooking vegetables in milk.

10. Flesh foods: Fish, meat & poultry- preparations.

11. Egg Experimental cookery- boiled egg, poached egg. Common preparations

 with egg.

12. Beverages Preparation of hot beverages- coffee, tea. Preparation of cold

 Beverages-fruit drinks & milk shake.

13. Sensory Evaluation and preparation of score card.

**CBCS/Semester System (2020-21) - I Semester Syllabus**

**B.Sc. FOOD SCIENCE AND NUTRITION**

**DSC-1 Paper-2: CHEMISTRY-1 (THEORY)**

**Hours of instruction 3 per week Credits 3**

**Internals : 25 Sem end exam: 75**

**Objectives:** To enable student

1. To understand the basics chemical bonding and configurations.
2. Synthesis of silicones and fertilizers and important dyes.

**Unit I:**

Chemical Bonding, Molecular orbital theory, bonding, antibonding and non-bonding orbitals. Molecular orbitals. MO configuration of H2, N2, O2, F2. Bond order. Diamagnetism and para magnetism.

**Unit II:**

1. Industrial Chemistry: Synthesis, properties and uses of silicones. Fuel gases: natural gas, water gas, semi water gas, carburetted water gas, producer gas, oil gas (manufacturing details not required)

2. fertilizers: urea, ammonium sulphate, ammonium nitrate, potassium nitrate NPK fertilizer. Triple superphosphate.

 **Unit III:**

1. covalent bond: orbital overlap, hybridization, geometry of organic molecules- CH4,,C2,H4,,C2,H2, C6H6. Inductive effect. Electrometric, mesomeric, hyperconjucative and steric effects. Effect in properties of compounds.

2. Stereoisomerism Optical isomerism: symmetry, elements of symmetry. Cause of optical activity, tartaric acid, Racemisation, Resolution. Geometric isomerism of maleic and fumaric acids.

 **Unit IV:**

1. Terms: chromophore, auxochrome, bathochromic shift, hypsochromic shift, hyperchromic effect, hypsochromic effect.

2. Dyes: azo and triphenylmethane dyes- Preapration one example.

**Unit V:**

1. Solutions types. Liquid in Liqui d. Raoult ’s law. Deviation f rom ideal behaviuor. Binary liquid mixtures. Fractional distillation.
2. Kinetics Rate, order, moleculality, pseudo first order, determination of order. Measurement of reaction. Effect of temperature on the rate. Energy of activation.

**Reference Books**:

1. Allied Chemistry author by Dr. V. Veeraiyan

2. Biochemistry - author – U. Satyanarayan, U. chakrapani

3. Unified Chemistry by O.P. Agrawal

4. B.Sc. Chemistry Inorganic, Organic & Physical Chemistry by T.Krishna Murthy & B. Sambasiva Rao.

5. Text book of Physical Chemistry by Peter Atkins, Julio d. Paula

6. Kinetics and mechanism by J.W Moore and R.G Pearson

7. Text book of Organic Chemistry by Ferguson

8. Industrial Chemistry by M.G. Arora

9. Inorganic Chemistry by Chopra and Kapoor

10. Chemical bonding and molecular geometry by R.J. gillepsy and P.L. Popelier

**CBCS/Semester System (2020-21) - I Semester Syllabus**

**B.Sc. FOOD SCIENCE AND NUTRITION**

**DSC-1, Paper-2 Lab: CHEMISTRY-1 (PRACTICAL)**

**Hours of instruction 2 per week Credits: 2**

**Internals : 0 Sem end exam: 50**

VOLUMETRIC ANALYSIS:

1. Estimation of sodium hydroxide using standard sodium carbonate.

2. Estimation of hydrochloric acid- standard oxalic acid.

3. Estimation of oxalic acid- standard sulphuric acid.

4. Estimation of ferrous sulphate- standard Mohr salt solution.

5. Estimation of oxalic acid- standard ferrous sulphate.

6. Estimation of potassium permanganate- standard sodium hydroxide.

**CBCS/Semester System (2020-21) - I Semester Syllabus**

**B.Sc. FOOD SCIENCE AND NUTRITION**

**DSC-1 Paper –3: CHEMISTRY OF FOODS (THEORY)**

**Hours of instruction 3 per week Credits: 3**

**Internals : 25 Sem end exam: 75**

**Objectives:** To enable students

1. To understand the chemistry of foods - composition of food, role of each

 component and their interaction.

1. To understand the functional aspects of food components and to study their role in food processing.

**UNIT – I**

Definitions **–** Food**,** nutrients**,** principle components of foods, functions of foods, classification of foods, properties of foods, physical, chemical, functional and kinetic properties.

**UNIT –II**

Colloidal system in foods – meaning, types, properties. Sols – meaning, types, properties: gels – meaning, type, properties, theory of gel formation, factors influencing gel formation.

**UNIT – III**

Emulsion – meaning, types, properties, emulsifying agents, natural and synthetic emulsifier, functions of emulsifying agent, common food emulsions: foams – meaning, methods of foam formation, theory of foam formation, properties – factors influencing foam formation, factors affecting stability of foam, foaming agents – natural and synthetic.

**UNIT – IV**

Water –Types of water, hydrogen bonding in water, water and ice properties, functions of water in food. Water activity– definition, measurement and control of water activity, estimation of moisture in foods.

**UNIT – V**

Heat transfer operations in foods – conduction, convection, radiation, gelatinization, retro gradation, dextrinisation of starches, enzymatic and non enzymatic browning reaction in foods, rancidity – types and prevention. Biochemical changes in foods.

**Reference Books:**

1. Food science, Chemistry and Experimental foods by M. Swaminathan.

2. Food Science by Norman.N.Potter.

3. Experimental study of Foods by Griswold R.M.

4. Food Science by Helen Charley.

5. Foundation of Food Preparation by A.G. Peckam.

6. Modern Cookery for teaching and trade, volume I&II ,Thangam Philip. OrientLongmans Ltd.

7. Food Fun damentals by MacWiliams, John Willy and son‟s, New York.

8. Food Facts & Principles by Shakunthala manay & Shadakhraswamy.

9. Food Science by Srilakshmi , second edition,2002.

**CBCS/Semester System (2020-21) - I Semester Syllabus**

**B.Sc. FOOD SCIENCE AND NUTRITION**

 **DSC-1, Paper-3 Lab: CHEMISTRY OF FOODS (PRACTICAL)**

**Hours of instruction 2 per week Credits: 2**

**Internals : 0 Sem end exam: 50**

1. To study the gelatinization temperature range & percentage sag of various cereal starches.
2. To study the factors affecting gelatinization of cereal starches.
3. To study dextrinization properties of various cereals and legumes.
4. To study the development of gluten in various flours.
5. To study the effect of enzymatic browning in fruits and vegetables.
6. To study non enzymatic browning, caramelization in various sugars.
7. Determination of PH of foods.
8. Determination of Moisture content in foods.
9. To study pasteurization of milk & fruit juices.
10. Specific gravity of fats and oils.

**choice based credit system-Academic year 2020-21**

**B.SC., (FOOD SCIENCE AND NUTRITION) COURSE STRUCTURE**

**SEMESTER –II**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **S.No** | **Course** | Total Mark | Mid Sem | Sem End Exam | Teaching Hours | Credits |
| 1 | First Language**(Telugu/Hindi/Sanskrit/Urdu)** | 100 | 25 | 75 | 4 | 3 |
| 2 | Second Language **English** | 100 | 25 | 75 | 4 | 3 |
| 3 | Life Skill Courses (any 1 of 3) **Indian Culture and Science/ Information&Communication Technology-1 (ICT)-1/ Entre- preneurship Development** | 50 | 0 | 50 | 2 | 2 |
| 4 | Skill Development Courses**Communication Soft Skills-II** **(CSS-2)**  | 50 | 0 | 50 | 2 | 2 |
| 5 | DSC-2, Paper – 1 (Core) **Human Physiology** (THEORY) | 100 | 25 | 75 | 3 | 3 |
| 6 | DSC-2, Paper-1 Lab:**Human Physiology** (PRACTICAL) | 50 | 0 | 50 | 2 | 2 |
| 7 | DSC-2, Paper – 2 (Core)**Chemistry –2** (THEORY) | 100 | 25 | 75 | 3 | 3 |
| 8 | DSC-2, Paper – 2 Lab:**Chemistry – 2** (PRACTICAL) | 50 | 0 | 50 | 2 | 2 |
| 9 | DSC-2, Paper – 3 (Core)**Principles of Nutrition**  | 100 | 25 | 75 | 3 | 3 |
| 10 | DSC-2, Paper – 3: Lab: **Principles of Nutrition** (PRACTICAL) | 50 | 0 | 50 | 2 | 2 |
| 11 | DSC-2,Paper – 4 (Core)**Food Microbiology** (THEORY) | 100 | 25 | 75 | 3 | 3 |
| 12 | DSC-2, Paper – 4 Lab: **Food Microbiology**(PRACTICAL) | 50 | 0 | 50 | 2 | 2 |
|  | Total | **900** | **150** | **750** | **32** | **30** |

**CBCS/Semester System (2020-21) - II Semester Syllabus**

**B.Sc., FOOD SCIENCE AND NUTRITION**

 **DSC- 2, Paper-1: HUMAN PHYSIOLOGY (THEORY)**

**Hours of instruction 3 per week Credits 3**

**Internals : 25 Sem end exam: 75**

**Objectives:** To enable students

 1. Understand the structure and functions of various organs of the body.

 2. Understanding of the physiology of various organ systems in human body.

**UNIT-I**

Cell - Structure and functions

Tissues - Structure and functions

Digestive system - Anatomical consideration – structure & functions, Brief study of the organization of the digestion, absorption and assimilation of food.

**UNIT-II**

Blood, RBC,WBC, Platelets and Lymph. Blood coagulation, blood grouping and Rh factor. Circulatory system - Heart structure and functions - cardiac cycle.

**UNIT-III**

Respiratory system - Basic anatomy of the respiratory system, process of respiration, transport and exchange of oxygen and carbon di oxide in the body.

Endocrine glands - Structure and function of pituitary, thyroid, islets of langerhans and adrenal gland.

**UNIT-IV**

Reproductive system - Anatomy of the male and female reproductive organs. Menstrual cycle.

Sense organs **-** Structure and function of eye, ear, nose, tongue and skin.

**UNIT-V** Excretory system - Excretory organs - structure of kidney and functions, formation of urine, composition of urine. Muscles - physiology of muscular action. Central nervous system - Physiology of the nerve cell, parts of the central nervous system and function.

**Reference Books:**

1. Chaterjee, C.C., Human Physiology, Vol-I&II Medical allied agency, Calcutta 1981.

2. Best and Taylor, Living body. Mc.Graw hill company, Newyork.

3. Sathya Narayana, Essentials of Biochemistry (2000).

4. Saratha Subramanian,Text of Human Physiology(2000).

5. Stuart Ira Fox,Human Physiology(2003)

**CBCS/Semester System (2020-21) - II Semester Syllabus**

**B.Sc. FOOD SCIENCE AND NUTRITION**

 **DSC- 2,Paper-1 Lab: HUMAN PHYSIOLOGY(PRACTICAL)**

**Hours of instruction 2 per week Credits 2**

**Internals : 0 Sem end exam: 50**

1. Identification of tissues

2. Bleeding time

3. Clotting time

 4. Blood groups – identification

5. Measurement of Hemoglobin

6. Measuring Pulse Rate

7. Measuring Blood Pressure

8. Measurement of height, weight and calculation of BMI

9. Physical fitness test

10. RBC, WBC – demonstration

11. Demonstration of Packed Cell Volume (PCV)

**CBCS/Semester System (2020-21) - II Semester Syllabus**

**B.Sc. FOOD SCIENCE AND NUTRITION**

**DSC- 2, Paper-2: CHEMISTRY-2 (THEORY)**

**Hours of instruction 3 per week Credits 3**

**Internals : 25 Sem end exam: 75**

**Objectives:** To enable students

1. To understand the basics of aromatic and heterocyclic and organic compounds
2. To understand the laws of thermodynamics and energetic.

**Unit I:**

Metals General methods of extraction of metals. Types of ores. Methods of ore dressing. Reduction methods, electrical methods, types of refining Van Arkel Zone refining.

 **Unit II:**

1. Aromatic compounds: Electrophilic substitution in benzene- Mechanism of nitration, halogenation, alkylation, acylation, sulphonation, Preparation and properties of naphthalene.

2. Heterocyclics: Preparation and properties of furan, thiophene, pyrrole and pyridine.

**Unit III:**

Amino Acids: Classification, preparation and properties, preparation of peptides. Classification of proteins by physical properties and by biological functions. Carbohydartes: classification, preparation and properties of glucose and fructose. Discussion of open chain ring structures of glucose and fructose.

**Unit IV:**

Energetics: Definition of first law thermodynamics. Types of sytems. Reversible, irreversible. Isothermal and adiabatic processes. Spontaneous processes, Joule-Thomson effect. Enthalpy, bond energy. Need for the second law. Carnot cycle and Carnot theorem. Entropy and its significance. Free energy change.

**Unit V:**

Electrochemistry: Measurement o f conduct ance. Kohlr aush’s law .p H determi nati on. Conductometric titrations. Hydrolysis of salts: pH and buffer in living systems. Galvanic cells, e.m.f. standard electrode potentials, reference electrodes. Electrochemical series, its applications. Pricnciples of electroplating.

**Reference Books:**

1. Allied Chemistry author by Dr. V. Veeraiyan

2. Biochemistry - author – U. sAtyanarayan, U. chakrapani

3. Unified Chemistry by O.P. Agrawal

4. B.Sc. Chemistry Inorganic, Organic & Physical Chemistry by T.Krishna Murthy & B. Sambasiva Rao.

5. Text book of Physical Chemistry by Peter Atkins, Julio d. Paula

6. Kinetics and mechanism by J.W Moore and R.G Pearson

7. Text book of Organic Chemistry by Ferguson

8. Industrial Chemistry by M.G. Arora

9.Inorganic Chemistry by Chopra and Kapoor

10. Chemical bonding and molecular geometry by R.J. gillepsy and P.L. Popelier

 **CBCS/Semester System (2020-21)- II Semester Syllabus**

**B.Sc. FOOD SCIENCE AND NUTRITION**

 **DSC- 2, Paper-2 Lab: CHEMISTRY-2 (PRACTICAL)**

**Hours of instruction 2 per week Credits 2**

**Internals : 0 Sem end exam: 50**

**ORGANIC ANALYSIS:**

Systematic analysis

1. Detection of Elements (N, S, Halogens).

2. To distinguish between aliphatic and Aromatic.

3. To distinguish between saturated and unsaturated.

4. Functional group tests for phenols, acids (mono and di), aromatic primary amine, amide, diamide, carbohydrate,

5. Functional groups characterized by confirmatory test

**CBCS/Semester System (2020-21)-II Semester Syllabus**

**B.Sc. FOOD SCIENCE AND NUTRITION**

 **DSC- 2, Paper-3: PRINCIPLES OF NUTRITION (THEORY)**

**Hours of instruction: 3 per week Credits: 3**

**Internals : 25 Sem end exam: 75**

**Objectives:** To enable students

1. Understand the vital link between nutrition and health.

2. Gain knowledge on functions, metabolism and effects of deficiency of nutrients

**UNIT-I**

Introduction to Nutrition - General introduction, history of Nutrition. Energy **-** Definition of Kilocalories, Joule, energy value of foods. Basal metabolic rate- definition, factors influencing BMR. Recommended Dietary Allowances for energy. Carbohydrates **-** functions, source, utilization, dietary fibre and health.

**UNIT-II**

Protein - Functions, sources and requirements, utilization, Protein quality – PER, BV, NPU, digestibility coefficient. Essential amino acids, their importance. Fats and Lipids – Classification of Fatty acids, functions, sources, requirement, importance of essential fatty acids, their requirements and deficiency.

**UNIT-III**

Vitamins – Fat soluble vitamins –A, D, E and K- functions, source, requirements, deficiency disorders. Water soluble vitamins –The B-complex vitamins – Thiamine, Riboflavin, Niacin, Folic acid, Biotin, Pantothenic acid, B12and Vitamin C - functions, source, requirements and deficiency disorders.

**UNIT-IV**

Minerals - General functions in the body, classification- macro and micro minerals. Micro minerals – Iron, Fluorine, Zinc, copper, Iodine -functions, absorption, utilization, requirements, deficiency and toxicity. Macro minerals – Calcium & phosphorus - functions, absorption &utilization of iron, deficiency and toxicity.

**UNIT-V**

Water Balance – Functions of water, water distribution, maintenance of water and regulation of acid-base balance in the body

**Reference Books:**

1. Essential of food & Nutrition –Vol. 1 M. Swaminathan, Bappco,Bangalore.

2. Human Nutrition and Dietetics –Davidson S. Passmore

3. Normal and Therapeutic Nutrition- Corinne. H.Robinson & Marilyn Lawler

4. Contemporary Nutrition - Gordon M. Wardlaw, Paul Insel et, al., (2000) Mosby,Chicago.

5. Nutrition- concepts and controversies- Eleanor Whitney –Eighth Edition (2000)

6. Basic principles of Nutrition- Seema Yadav, First edition (1997)

7. Essentials of Nutrition and Diet therapy -Sue Rodwell Williams, fifth edition, Times Mirror Mosby College Publishing, 1990.

8. Understanding Nutrition -Whitney P.N. and Roes S.R., West Publication Co, 1996.

**CBCS/Semester System (2020-21) -II Semester Syllabus**

**B.Sc. FOOD SCIENCE AND NUTRITION**

 **DSC- 2,Paper-3: PRINCIPLES OF NUTRITION (PRACTICAL**)

**Hours of instruction: 2 per week Credits: 2**

 **Internals : 0 Sem end exam: 50**

1. Food Groups and My plate
2. Menu Planning
3. RDA Table
4. Plan and calculate one day menu for an adult woman mentioning the portion size and nutritive value of each.
5. Study of the nutritive foods supplied by the government through ICDS projects during the current 5 year plan.
6. Preparation and calculation of nutritive values of low cost weaning foods.
7. Planning and preparing diet for low, medium and high income groups of sedentary life style.

**CBCS/Semester System (2020-21)-II Semester Syllabus**

**B.Sc., FOOD SCIENCE AND NUTRITION**

**DSC- 2, Paper-4: FOOD MICROBIOLOGY (THEORY)**

**Hours of instruction: 3 per week Credits: 3**

**Internals : 25 Sem end exam: 75**

**Objectives:** To enable students

1. To know the important genera of microorganisms associated with food and their characteristics.
2. To understand the role of microbes in fermentation, spoilage and food borne

diseases.

**UNIT 1**

**Introduction to Food Microbiology :**Introduction of microbiology and its relevance to everyday life, Inter-relationship of microbiology with other sciences. History and Development of Food Microbiology. Definition and Scope of food microbiology. General characteristics of bacteria, fungi, virus, protozoa, and algae. Beneficial effect of microorganisms.

**Characteristics of Microorganisms in Food:**  Types of microorganisms associated with food, their morphology and structure. Significance of spores in food microbiology.

**UNIT2.**

**Cultivation of Micro-organisms:** Methods of isolation and cultivation,

Serial dilution method, Pure culture technique. Enumeration of Microorganisms- qualitative and quantitative.

**Microbial Growth in Food:**  Bacterial growth curve and microbial growth in food. Factors affecting the growth of micro organisms in food, effect of environmental factors in growth of microorganism - pH , water activity , oxygen availability, temperature and others.

**UNIT3:**

**Microbial Food Spoilage:** Sources of Microorganisms in foods. Some important food spoilage microorganisms. Spoilage of specific food groups- Milk and dairy products, Meat,poultry and seafoods, Cereal and cereal products, Fruits and vegetables and Canned products.

**UNIT4.**

**Foodborne Diseases:** Microbial intoxication and infections: Sources of contamination of food, Types – food borne infections, food borne intoxications, symptoms and method of control. Toxins in foods. Common and Recent Examples of Food borne out breaks.

Importance of sanitation and hygiene in relation with spreading of microorganisms.

Relevance of microbiology standards for food safety.

Rapid Methods of detection and recent advances.

**UNIT5.**

**Control of Microorganisms in Foods:** Principles and methods of preservation.

Physical Methods of Food Preservation- Dehydration, Freezing, Cool Storage, Heat Treatment (esp.thermobacteriology), Irradiation, Chemical methods, Biopreservatives esp. Bacteriocins.

Introduction to Hurdle concept and Non Thermal methods.

**Recommended Readings**

1) Frazier William C and Westhoff, Dennis C. Food Microbiology, TMH, New Delhi,2004

2) Jay, James M. Modern Food Microbiology, CBS Publication, New Delhi, 2000

3) Garbutt, John. Essentials of Food Microbiology, Arnold, London, 1997.

4) Banwartt: Food Microbiology

5) Pelczar MJ, Chan E.C.S and Krieg, Noel R. Microbiology, 5th Ed., TMH, New Delhi, 1993.

**CBCS/Semester System (2020-21) -II Semester Syllabus**

**B.Sc. FOOD SCIENCE AND NUTRITION**

 **DSC- 2, Paper-4 Lab: FOOD MICROBIOLOGY (PRACTICAL)**

**Hours of instruction: 2 per week Credits: 2**

 **Internals : 0 Sem end exam: 50**

1. Introduction to the Basic Microbiology Laboratory Practices and Equipments

2. Functioning and use of compound microscope

3. Cleaning and sterilization of glassware

4. Preparation and sterilization of nutrient broth

5. Preparation of slant, stab and plates using nutrient agar

6. Cultivation and sub-culturing of microrganisms

7. Morphological study of bacteria and fungi using permanent slides

8. Simple staining

9. Gram’s staining

10. Standard Plate Count Method

11. Visits (at least two) to food processing units or any other organization dealing with advanced methods in food microbiology.

**choice based credit system-Academic year 2020-21**

**B.SC. (FOOD SCIENCE AND NUTRITION) COURSE STRUCTURE**

**SEMESTER -III**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| S.No | Course | Total Mark | Mid Sem | Sem End Exam | Teaching Hour | Credits |
| 1 | First Language**(Telugu/Hindi/Sanskrit/Urdu** | 100 | 25 | 75 | 4 | 3 |
| 2 | Second Language**English** | 100 | 25 | 75 | 4 | 3 |
| 3 | Life Skill Courses (any 1 of 3) **Analytical Skills/ Personality Enhancement and Leader Ship/Health and Hygiene** | 50 | 0 | 50 | 2 | 2 |
| 4 | Skill Development Courses**Communication Soft Skills-II (CSS-2)**  | 50 | 0 | 50 | 2 | 2 |
| 5 | DSC-3, Paper-1 (CORE)**Bio Chemistry-1 (**THEORY**)** | 100 | 25 | 75 | 3 | 3 |
| 6 | **DSC-3,** Paper-1 **Lab :****Bio Chemistry- I**(PRACTICAL | 50 | 0 | 50 | 2 | 2 |
| 7 | DSC-3 Paper-2 (CORE)**Nutrition in Health (**THEORY**)** | 100 | 25 | 75 | 3 | 3 |
| 8 | DSC-3, Paper-3 Lab: **Nutrition in Health** (PRACTICAL) | 50 | 0 | 50 | 2 | 2 |
| 9 | DSC-3 Paper-3 (Core)**Food Safety and Quality Control (**THEORY**)** | 100 | 25 | 75 | 3 | 3 |
| 10 | DSC-3, Paper-3 Lab:**Food Safety and Quality Control (**PRACTICAL) | 50 | 0 | 50 | 2 | 2 |
| 11 | DSC-3 Paper-4 (core)**Food Processing and Preservation (**THEORY**)** | 100 | 25 | 75 | 3 | 3 |
| 12 | DSC-3, Paper-4 Lab: **Food Processing and Preservation (**PRACTICAL) | 50 | 0 | 50 | 2 | 2 |
|  | **Total** | **900** | **150** | **750** | **32** | **30** |

**CBCS/Semester System (2020-21)-III Semester Syllabus**

**B.Sc. FOOD SCIENCE AND NUTRITION**

**DSC-3, Paper-1: BIOCHEMISTRY- 1 (THEORY)**

**Hours of instruction: 3 per week Credits: 3**

**Internals : 25 Sem end exam: 75**

**Objectives:** To enable students

1. The knowledge about basic biochemical components of foods and their metabolism.
2. Biological role of vitamins and minerals.

**UNIT 1:**

**Introduction to Biochemistry:** Definition, objectives, scope and inter-relationship between biochemistry and other biological sciences.

**Carbohydrates;** Definition, Structure and general properties of:

Monosaccharides-glucose, fructose, galactose, ribose. Disaccharides – maltose, lactose, sucrose. Polysaccharides – dextrin, starch, glycogen.

**UNIT 2:**

 **Lipids:** Definitions and classification of lipids

Types and properties of fatty acids

Composition and properties of fats

Significance of acid value, iodine value and saponification value

**UNIT 3:**

**Proteins:** Definition, classification, elementary knowledge of structure of proteins, biomedical importance. **Amino acids**; Definition, classification, Essential and non-essential amino acids, structure of important amino acids.

**Introduction to Enzymes;** Co-enzymes, Enzyme Inhibition

**UNIT 4:**

**Vitamins: Structure and biochemical role:**

Fat soluble vitamins – A, D

Water soluble vitamins – B1, B2, niacin, pyridoxine, folic acid, B12 and C

**UNIT 5:**

**Minerals**

Biological role and occurrence of inorganic elements – iron, calcium, phosphorous,

iodine, selenium and zinc

**RECOMMENDED READINGS**

1. Lehninger A L, Nelson D L and Cox M M (2009). Principles of Biochemistry, 6th Ed. CBS Publishers and Distributors.
2. Murray R.K, Granner D K, Mayes P A and Rodwell V W (2009). Harper’s Biochemistry, 28th Ed, Lange Medical Book.
3. Hawk PB, Oser BL and Summerson WH (1954). Practical Physiological Chemistry, Mcgraw Hill, New York.
4. Sundararaj P and Siddhu A (2006). Qualitative Tests and Quantitative Procedures in Biochemistry. Elite Publishing House Pvt. Ltd., New Delhi.

**CBCS/Semester System (2020-21) - III Semester Syllabus**

**B.Sc. FOOD SCIENCE AND NUTRITION**

**DSC-3, Paper-1 LAB: BIOCHEMISTRY-1 PRACTICAL**

**Hours of instruction 2 per week Credits: 2**

**Internals : 0 Sem end exam: 50**

1. **Carbohydrates**

Qualitative tests for mono, di and polysaccharides and their identification in unknown mixtures

Quantitative estimation of glucose, sucrose and lactose by titrimetric method

2. **Fats** Properties of Fats

3. **Proteins** Qualitative tests for proteins

4**. Minerals** Estimation of calcium using EDTA by titration

5**. Vitamins** Estimation of ascorbic acid by using 2, 6 dichlorophenol indophenols method

**CBCS/Semester System (2020-21) -III Semester Syllabus**

**B.Sc. FOOD SCIENCE AND NUTRITION**

**DSC-3, Paper-2: NUTRITION IN HEALTH** (THEORY)

**Hours of instruction 3 per week Credits: 3**

**Internals : 25 Sem end exam: 75**

**Objectives:** To enable students

1. Understand the nutritional demands in various stages of life cycle.

2. Acquire skills in planning adequate meals in different stages of life cycle to maintain health.

**UNIT I**

Basic Principles of Meal Planning –Basic Principles & factors to be consider while plannining menu for different age groups, My Plate.

Recommended dietary allowances-RDA for Indians, basis for requirement of energy allowance for different growth pattern of children, energy allowance for various activities.

**UNIT II**

Nutritional Needs during Pregnancy – Stages of pregnancy Normal growth and weight change, complications, Nutritional requirements, &meal planning. Nutritional needs during Lactation - physiology of lactation, hormonal control, nutritional components of colostrum and mature milk. Nutritional requirements of lactating women. Meal planning.

**UNIT III**

Nutrition during Infancy - Growth and development, factors influencing growth, difference between breast feeding and bottle feeding, factors to be considered in bottle feeding, different types of milk formulae available commercially. Weaning Foods – Preparation of Weaning foods, commercially & by other organisations. Uses of growthchart to monitor growth & development. Nutritional requirements of infants‟ upto oneyear. Problems of feeding in normal and premature infants.

**UNIT IV**

Nutritional needs of toddlers (1-5 year) &School children - Nutritional requirements of toddlers &school going children. Factors to be considered while planning meals for pre-school children. Eating problems of children and their management, packed lunch.

**UNIT V**

Nutrition during Adolescence - Physical growth and changes. Nutritional requirement, nutritional problems in adolescence- anemia, obesity , anorexia nervosa and bulimia nervosa. Nutritional needs of adults (men and women) – In relation to occupation, low cost balanced food, Menu planning. Nutrition in Menopausal women- hormonal changes. Nutrition during Old Age - Physiological changes in ageing- psycho-social and economic factors affecting eating behavior. Nutritional problems of aged and their management.

**Reference Books:**

1. Nutrition Trends in India -Vinodhini Reddy, Prahlad Rao, Govmth Sastry and Kashinath, NIN, Hyderabad, 1993.

2 Modern Nutrition in Health and Diseases- Shills, E.M. Olson, A.J. and Shike, Lea and Febiger

3. Dietetics -B. Srilakshmi, New Age International Pvt. Ltd, 2003.

4.NutritionScience-B.Srilakshmi,NewAgeInternationalPvt.Ltd., 2003.

5.Food,nutrition and diet therapy -Krause, Eleventh edition

6. Human Nutrition and Dietetics- Davidson S Passmore R, Brock JP, ELBS and Churchill, Livingstone.

7.Fundamentals of foods and Nutrition - Mudambi SR and Rajagopal M Y, Wiley Eastern Ltd. 8.ICMR- Nutritive value of Indian Foods, 1989.

9.Nutrition throughout the life cycle, Bonnie S.Worthinton, Roberts, Sue Rod well Williams.,The McGraw- Hill company,1996.

10.Nutrition in the life span- Virginia Beal, John Wiley & sons New York.

**CBCS/Semester System (2020-21)-III Semester Syllabus**

**B.Sc. FOOD SCIENCE AND NUTRITION**

**DSC-3, Paper-2 Lab: NUTRITION IN HEALTH (**PRACTICAL)

**Hours of instruction: 2 per week Credits: 2**

**Internals : 0 Sem end exam: 50**

1. Standardization of portions for cooked food.
2. Prepartion and serving the planned menu for men and women of different

occupations.

1. Planning a low cost balanced menu for a pregnant mother and display.
2. Planning a low cost balanced menu for a lactating mother and display.

Calculation of nutritive value for the prepared menu.

1. Planning and preparing diet for infants and preschool children
2. Packed lunch planning for school going children.
3. Menu planning for and adolescent girls and boys.
4. Menu planning for adult Man and Woman (moderate man and sedentary woman).
5. Preparation of diet for old age.

**CBCS/Semester System (2020-21)-III Semester Syllabus**

**B.Sc. FOOD SCIENCE AND NUTRITION**

**DSC-3, Paper-3: FOOD SAFETY AND QUALITY CONTROL** (THEORY)

**Hours of instruction 3 per week Credits 3**

**Internals : 25 Sem end exam: 75**

**Objectives**: To enable the students

1. To gain knowledge about food laws and standards for food quality
2. To know about food additives and quality control of foods.

**UNIT-I**

Principles of Quality control of foods –Raw material control, processed food control and finished product inspection. Leavening agents- classification, uses and optimum levels. Food additives - Preservatives, colouring, flavouring, sequestering agents, emulsifiers, antioxidants.

**UNIT-II**

Standardisation systems for quality control of foods:-National and International standardization system, GMP, GHP. Different types of food grade materials. Food adulteration - Common adulterants in foods and tests to detect common adulterants.

**UNIT-III**

**Standards for foods**: Cereals and pulses, milk and milk products, Coffee, tea, sugar and sugar products.

**UNIT-IV**

**Methods for determining quality** - Subjective and objective methods. Sensory assessment of food quality-appearance, color, flavour, texture and taste, different methods of sensory analysis, preparation of score card, panel criteria, sensory evaluation room.

**UNIT-V**

Food safety, Risks and hazards: Food related hazards, Microbial consideration in food safety, HACCP-principles and structured approach. FSSAI

**Reference Books:**

1.Food science-Norman potter

2.Food Technology-Presscott.S.C.and Procter

3.Food chemistry-Meyer

4.Food science,Chemistry and experimental foods-M.Swaminathan

5.Food chemistry-Lee

6.Food science-Srilakshmi(2001)2nd edition, New age international publishers-(2001)

7.Rerfus.K.Guthrie-Food sanitation –3rd edition –Van Nostrand Reinhold Newyork 1988.

8.Mahirdra-S.N.-Food safety –A techno-legal analysis-Tata McGrawhill publishers 2000.

9.Manoranjan Kalia-Food processing and preservation.

10.Roday-Food hygiene and sanitation.

11.Indian Food industry,2000,Vol19:2

**CBCS/SEMESTER SYSTEM (2020-21) - III SEMESTER**

**B. Sc FOOD SCIENCE AND NUTRITION**

**DSC-3, Paper-3 LAB: FOOD SAFETY AND QUALITY CONTROL** (PRACTICAL)

**Hours of instruction: 2 per week Credits: 2**

**Internals : 0 Sem end exam: 50**

1. Market survey of preserved fruits and vegetable products.
2. Visit to food testing lab or any agency of food standards.
3. Nutrition labeling requirements and developments.
4. Simple tests for food adulteration.
5. Care study on food safety issues – ICDS/MDM, Diarrheal our break / any other.

**CBCS/SEMESTER SYSTEM (2020-21) - III SEMESTER**

**B. Sc., FOOD SCIENCE AND NUTRITION**

**DSC-3, Paper-4: FOOD PROCESSING AND PRESERVATION** (THEORY)

**Hours of instruction 3 per week Credits: 3**

**Internals : 25 Sem end exam: 75**

**Objectives:** To enable students

1. To enable students to learn different methods of processing of plant and animal derived foods.
2. To understand the principles of food preservation and acquire skills in methods of food preservation

**UNIT I**

Principles of food processing and preservation- Preservation by Low and high temperatures, Canning, osmotic pressure, dehydration & drying, Irradiation. & use of Preservatives, Food additives, Definition, types, importance and industrial uses of Food additives.

**UNIT II**

Methods of Plant food processing- different methods of processing of cereals, legumes, nuts and oilseeds.

**UNIT III**

Methods of Processing of milk & milk products-

**UNIT IV:**

Methods of Fruits and Vegetables processing.

**UNIT V:**

Methods of Processing of Animal Foods.

Food fortification and enrichment -current trends & applications. fermented food products.

**BOOKS AND JOURNALS**

1. Sri Lakshmi B (2004) Food Science. New Age Int.

2. Pecham GG, Foundation of food preparation.1972. Mac millan Pbs.

3. Subbulakshmi G and Udipi A. 2004. Food Processing and Preservation techniques. New Age Int.

4. Swaminathan M (1992) Handbook of Food Science and Experimental foods. 2nd Ed. Bangalore.

5. Potter NH and Hotchkiss JH (1996) Food Science. 5th ed.. New Delhi, CBS pbs.

6. Sethi M and Rao SE (2001) Food science experiments and application. CBS pbs. New Delhi.

7. Journal of Food chemistry

8. Indian food Industry Journals- AFST Pbs

9. J of Food Sc. And Technology- AFST Pbs.

**CBCS/SEMESTER SYSTEM (2020-21) - III SEMESTER**

**B. Sc., FOOD SCIENCE AND NUTRITION**

**DSC-3, Paper-4 LAB: FOOD PROCESSING AND PRESERVATION** (PRACTICAL**)**

**Hours of instruction 2 per week Credits: 2**

**Internals : 0 Sem end exam: 50**

1. Methods of Food Preservation using salt and sugar.

2. Drying and Dehydration

3. Food Adulteration tests for some common foods.

4. Preservation and bottling of fruit and vegetable products.

5. Preservation by using chemicals

6. Sensory analysis of preserved and processed foods.

**choice based credit system-Academic year 2020-21**

**B.SC., FOOD SCIENCE AND NUTRITION COURSE STRUCTURE**

**SEMESTER -iV**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **S. No** | **Course** | Total Mark | Mid Sem | Sem End Exam | Teaching Hours | Credits |
| 1 | First Language**(Telugu/Hindi/Sanskrit/Urdu)** | 100 | 25 | 75 | 4 | 3 |
| 2 | Second Language**English** | 100 | 25 | 75 | 4 | 3 |
| 3 | Life Skill Courses Environmental Education | 50 | 0 | 50 | 2 | 2 |
| 4 | Skill Development Courses**Communication Soft Skills-II** **(CSS-2)**  | 50 | 0 | 50 | 2 | 2 |
| 5 | DSC-4, Paper-1 (CORE)**Bio Chemistry-II** (THEORY) | 100 | 25 | 75 | 3 | 3 |
| 6 | DSC-4, Paper-1  **Lab:** **Bio Chemistry-II** (PRACTICAL)  | 50 | 0 | 50 | 2 | 2 |
| 7 | DSC-4, Paper 2 (CORE)**Dietetics** (THEORY) | 100 | 25 | 75 | 3 | 3 |
| 8 | DSC-4, Paper-2 Lab: **Dietetics** (PRACTICAL) | 50 | 0 | 50 | 2 | 2 |
| 9 | DSC-4, Paper-3 (Core)**Food Packaging** (THEORY) | 100 | 25 | 75 | 3 | 3 |
| 10 | DSC-4, Paper-3 Lab:**Food Packaging(**PRACTICAL) | 50 | 0 | 50 | 2 | 2 |
| 11 | DSC-4 Paper-4 (core)**Community Nutrition** (THEORY) | 100 | 25 | 75 | 3 | 3 |
| 12 | DSC-4, Paper-4 Lab:**Community Nutrition**(PRACTICAL) | 50 | 0 | 50 | 2 | 2 |
|  | **Total** | **900** | **150** | **750** | **32** | **30** |

**CBCS/SEMESTER SYSTEM (20202-21) - IV SEMESTER**

**B. Sc FOOD SCIENCE AND NUTRITION**

**DSC-4,Paper-1: BIOCHEMISTRY-2 (** THEORY)

**Hours of instruction: 3 per week Credits: 3**

**Internals : 25 Sem end exam: 75**

**Objectives:**  To enable the students

1. Metabolism of biochemical constituents of foods in human body.
2. Role of these metabolites in maintaining health.

**Unit I:**

Metabolism of Carbohydrates: Introduction, anabolism, catabolism, metabolism. Glycogenesis, Glycogenolysis, Glycolysis, Kreb’s cycle, energy output, Homeostasis of blood sugar-role of hormones, Glucose Tolerance Test.

**Unit II:**

**Metabolism of lipids:** Introduction, β-oxidation of fatty acids, Biosynthesis of fatty acids, Synthesis of triglycerides, Synthesis of cholesterol, cholesterol and atherosclerosis (in brief).

**Unit III:**

**Metabolism of proteins:** Dynamic equilibrium, nitrogen balance, essential Amino acids, Glycogenic, Ketogenic, and both glycogenic and ketogenic amino acids.

Oxidation of amino acids- Transmination, Deamination-Oxidative, Non-odixative, Ddecarboxylation. Metabolism of carbon skeleton,

Metabolism of ammonia-Glutamine pathway , Urea cycle.

**Unit IV:** Integration of carbohydrate, lipid and protein metabolism.

Bioenergetics-Exergonic and endergonic reactions, Source of energy, Release of energy oxidative phosphorylation, High energy compounds, Biological Oxidation, Reduction (electron transport chain)

**Unit V:**

**Enzymes**: Introduction, Classification of enzymes.

Vitamins as coenzymes in the metabolism of carbohydrates, lipids and proteins, Coenzyme functions of Biotin, folic acid, Vitamin B12. Nucleic acid – DNA & RNA, Synthesis and Metabolism

**Reference Books:**

1. Text book of Biochemistry , Dr. AVVS Rama Rao; L.K. & S Publishing House SMVRM Hospitals campus, Tanuku.
2. Biochemisry for medical students, M. Swaminathan; Geetha Book House, K.R. Circle, Mysore.
3. Elements of Biochemistry, H.S. Srivasthava and Dr. M.C. Pant; Rastogi publishers, Meerut.
4. Essentials of Biochemistry, Dr. M.C. Pant; Kedarnath, Ramnath & Co.,, Meerut, U.P.
5. Review of physiological chemistry, H.A. Harper; Kothari book Depot, Bombay.
6. Hawk’s practical physiological chemistry, P.L. Oser; TMH publishing Co., NewDelhi.
7. Text book of Biochemistry, West and Todd; The Macillan Co.
8. Text book of Biochemistry, book House.

**CBCS/SEMESTER SYSTEM (2020-21) - IV SEMESTER**

**B. Sc FOOD SCIENCE AND NUTRITION**

**DSC-4: paper 1- LAB: BIOCHEMISTRY-2** (PRACTICAL)

**Hours of instruction 2 per week Credits: 2**

**Internals : 0 Sem end exam: 50**

1. Estimation of total carbohydrates by Anthrone method.
2. Quantitative estimation of reducing sugars by Dinitro Salicylic acid (DNS) method.
3. Estimation of total protein by Lowery’s method
4. Estimation of ascorbic acid in limejuice
5. Estimation of iodine value of fat/ free fatty acid value (sesame oil, groundnut oil, or coconut oil)

**Demonstrations:**

1. Estimation of blood glucose (Glucose Tolerance Test) Chromatographic Separation of carbohydrates/amino acids
2. Enzymes-ptyalin or salivary amylase action on boiled starch solution-spot plate testing with iodine.

**CBCS/SEMESTER SYSTEM- IV SEMESTER**

**B. Sc FOOD SCIENCE AND NUTRITION**

**DSC-4, Paper-2: DIETETICS** (THEORY)

**Hours of instruction 3 per week Credits: 3**

**Internals : 25 Sem end exam: 75**

**Objectives:** To enable students

1. Gain knowledge about principles of diet therapy and different therapeutic diets.

2. Develop aptitude for taking up dietetics as a profession.

**UNIT – I**

**Objectives of diet therapy** - Role of a dietitian. Principles of diet preparation and counselling. Normal diet in the hospitals –, liquid ,semi liquid, light , soft diet, bland diet and regular diet Different types of Feeding - Basic concepts of oral feeding, tube feeding, IV feeding, gastrostomy feeding.

**UNIT – II**

**Therapeutic diets for the following disorders**:

a. Under weight - definition, etiology, treatment

b. Obesity - definition, etiology, treatment.

c. Diseases of the gastro intestinal tract- ulcer, constipation & diarrhea

**UNIT – III**

Diseases of the liver and gall bladder (risk factors and diet therapy)

a) jaundice b) hepatitis c) cirrhosis d) fatty liver and diet therapy Diseases of the cardio vascular system (risk factors and diet therapy)

a) atherosclerosis b) arteriosclerosis c) hypertension d) congestive heart failure

**UNIT – IV**

 **Diabetes mellitus** – Types,causes, symptoms, bio-chemical changes, insulin, hypo-glycemic drugs, types only, food exchange list, dietary management. Diseases of the kidney and urinary tract- Acute and chronic nephritis, Nephrotic syndrome,Renal failure, Urinary calculi. Causes and dietary treatment of kidney diseases and dialysis,ESRD (End Stage Renal Dialysis). Nutrition and cancer- Dietary guidelines for management.

**UNIT – V**

**Diet in Allergy** - Definition, classification, common food allergy, test of allergy, diet therapy. Diet in febrile conditions - Short duration e.g. Typhoid, Long duration e.g. Tuberculosis. Diet in relation to deficiency diseases-Protein calorie deficiency, vitamin A deficiency and anemia.

**Reference Books:**

1.Krause and Mahan – Food ,Nutrition and Diet therapy, 6th Edition W.B. Saunders company, London

2. Normal and therapeutic nutrition –17th Edition, Robinson et. al ., Mac Millan Pub.Co., New York

3.ICMR(1989) Nutrient Requirements and recommended dietary allowances for Indians.

4.Antia FP (1987) Clinical Dietetics and Nutriton, Oxford University Press, New Delhi

5.Srilakshmi (2002) Dietetics, IVth Edition. New Age International (P) Limited, Publishers, New Delhi

6. Shubhangini. A. Joshi (2002) Nutrition and dietetics, Tata Mc Graw- Hill publishing company limited, New Delhi.

7. B. Srilakshmi (2002) Nutrition science, New age international (P) limited, New Delhi

8. Carolynn E.Town send and Ruth A. Roth (2002) Nutrition and Diet Therapy, Delmar publisher

9. Sue rod Williams, Nutrition and diet Therapy, Times Mirror Mosby College publishing,Boston, 1989.

10.The Indian journal of nutrition and dietetics, Avinashilingam Deemed University, Coimbatore

**CBCS/SEMESTER SYSTEM (2020-21)- IV SEMESTER**

**B. Sc FOOD SCIENCE AND NUTRITION**

 **DSC-4-Paper-2 LAB: DIETETICS** (PRACTICAL)

**Hours of instruction 2 per week Credits: 2**

**Internals : 0 Sem end exam: 50**

1. Weights and measures of foods.

2.Planning and preparation of hospital diets a. normal diet, regular diet, light diet, soft diet, full liquid diet, clear liquid diet & bland diet.

b. Diet for obesity

c. Diet for under weight

d. Diet for anaemia

e. Diet for diseases of the GI tract – peptic ulcer, diarrhoea, constipation.

f. Diet for Cardio-vascular diseases- atherosclerosis, hypertension.

g. Diet for diseases of the kidney – nephritic and nephrotic syndrome. Diet before & after dialysis.

h. Diet for diabetes – Type I & II, Diabetes with CVD disease.

i. Diet in febrile conditions- Short duration – typhoid; long duration – tuberculosis

j. Diet in liver diseases – Viral hepatitis and cirrhosis

3. Observation of a dietary department in a hospital.

4. Preparation of power point presentations on diet and disease conditions

**CBCS/SEMESTER SYSTEM (2020-21) - IV SEMESTER**

**B. Sc FOOD SCIENCE AND NUTRITION**

**DSC-4, Paper-3: FOOD PACKAGING** (THEORY)

**Hours of instruction 3 per week Credits: 3**

**Internals : 25 Sem end exam: 75**

**Objectives:**  enable the student

1. To impart comprehensive overview of the scientific and technical aspects of food packaging.
2. To instill knowledge on packaging machinery, systems, testing and regulations of packaging.
3. To gain knowledge on food packaging and applications during transportation.

**UNIT I**

**Food packaging:** Definition, functions of packaging materials for different foods, characteristics of packaging material. Food packages – bags, pouches, wrappers, tetra packs-applications.

**UNIT II**

 **Packaging materials Packaging materials:** Introduction, purpose, requirements, types of containers. Modern packaging materials and forms-Glass containers, metal cans, composite containers, aerosol containers, rigid plastic packages, semi rigid packaging, flexible packaging.

**UNIT – III**

**Packages of radiation stabilized foods:**

Introduction, rigid containers, flexible containers, general methods for establishing radiation stabilization. Radiation- measurement of radiations. Biodegradable packaging material – biopolymer based edible firm.

**UNIT - IV**

**Packages of dehydrated products**:

Orientation, metallization, co-extrusion of multilayer films, stretch, package forms and techniques. Aspectic packaging, retortable containers, modified and controlled atmosphere packaging, skin, strink and cling film packaging, micro-ovenable containers, other package forms and components of plastics.

**UNIT - V**

**Packaging of finished goods**: Weighing, filling, scaling, wrapping, cartooning, labeling, marking and trapping. Labelling: Standards, purpose, description types of labels, labeling regulation barcode, nutrition labeling, health claims, and mandatory labeling provision.

**REFERENCES**

1. Vijaya Khader, Text book of food science and technology, Indian council of Agricultural research New Delhi, 2001.

 2. Stainley Sacharous. Roger C Griffin. Principles of food packaging 2nd Ed. Avi pub Co. Westport.

3. F.A. & Paine. H.Y. Leonard hill. A hand book of food packaging. Blackie Sons Ltd London.

4. Sacharows. S. Handbook of packaging materials. Avi Pub Co. Westport.

5. Croshy N.T. Food packaging materials. Applied Science pub Ltd. London.

 6. Paine F.A. The packaging media. Blackie & Sons Ltd. London.

7. NIIR. Food packaging technology Hand book, Delhi.

**CBCS/SEMESTER SYSTEM (2020-21)- IV SEMESTER**

**B. Sc FOOD SCIENCE AND NUTRITION**

 **DSC-4, paper-3 LAB: FOOD PACKAGING** (PRACTICAL)

**Hours of instruction 2 per week Credits: 2**

**Internals : 0 Sem end exam: 50**

1. Testing of physical/mechanical properties of food packaging material.

2. Testing of thermal shock resistance of glass.

3. Gas/Vacuum packaging of foods and shelf life studies.

4. Determination of Water Vapor Transmission rate of Packaging Material.

5. Edible packaging of Food Samples.

6. Study of Sorption Isotherm for Food Package Design.

7. Packaged food cut-out analysis.

8. To study the operation of FFS machine.

**CBCS/SEMESTER SYSTEM (2020-21) - IV SEMESTER**

**B. Sc FOOD SCIENCE AND NUTRITION**

**DSC- 4, Paper- 4: COMMUNITY NUTRITION** (THEORY)

**Hours of instruction 3 per week Credits: 3**

**Internals : 25 Sem end exam: 75**

**Objectives:** To enable the students

1. To know about under nutrition, mal nutrition, causes and consequences.
2. Major nutritional problems existing in India its prevention and control.
3. Role of national and International agencies in health promotion in society.

**UNIT I Definitions -** Community, family, village and block, Meaning of Optimum Nutrition, Malnutrition- Under nutrition and over nutrition. Effects of malnutrition in different age groups, IMR, MMR, morbidity. Causes of malnutrition-Factors contributing to malnutrition in the community-habits, customs and practices, availability of food, Socio-economic factors.

**UNIT II** Assessment of the nutritional status of the community -direct and indirect methods –Clinical and Biochemical, Diet Surveys, Nutritional Anthropometry. Nutritional problems of women and men- Anemia, Vitamin A deficiency, B-complex deficiency, Lathyrism.

**UNIT III** Nutritional problems of infants and children- PEM-Marasmus and Kwashiorkor, Vitamin A deficiency, B-complex deficiency diseases, other problems- Goitre, fluorosis and anemia, ,

**UNIT IV** Nutrition intervention programmes - ICDS: Objectives and services, Noon meal programme, TINP, SNP, Vitamin A prophylaxis. Role of National and international Organizations in combating malnutrition- ICMR, NIN, ICAR,WHO, FAO, UNICEF, Health Care- Role of PHC, ESI in health care.

**UNIT V** Home Science- Meaning and Objectives. Role of Home-Scientists in rural development with reference to ongoing programmers like Family Welfare Programme, Adult Education for community-different methods, advantages and disadvantages. Nutrition education- merits and demerits of different methods of education.

**Reference Books:**

1. Jellife DN, Assessment of Nutritional Status of the community.

2. Ritchie JA, Teaching Nutrition FAO, 1979.

3. Rajalakshmi R, Applied Nutrition, Oxford and JBH Publishers, 1981.

4. Devadas RF, Nutrition in Tamil Nadu, Sanfam Publishers, Madras, 1972.

5. Mc.Laren S, Nutrition and the community, John Wiley & Sons, 1982.

6. Reddy AA, Extension Education, Srilakshmi Press, Baptla, 1971.

7. Dahama OP and Bhatnagar OP Eucation and Communication for development.Oxford IBH Publishing Co.,1980.

8. Savile AH, Extension in rural communities, Oxford University Press, 1965.

9. Nutrition News-NIN.

**CBCS/SEMESTER SYSTEM (2020-21) - IV SEMESTER**

**B. Sc FOOD SCFIENCE AND NUTRITION**

**DSC-4, Paper4-Lab: COMMUNITY NUTRITION (**PRACTICAL)

**Hours of instruction: 2 per week Credits: 2**

**Internals : 0 Sem end exam: 50**

1. Assessment of nutritional status by direct methods- Height, weight, head circumference, chest and mid arm circumference.
2. Assessment of nutritional status by indirect methods-clinical, biochemical methods.
3. Know about various governmental programmes implemented regarding

Community health.

1. Estimation of clinical parameters like, blood glucose, hemoglobin to assess health status.
2. Diet and nutrition surveys: (a) Identification of vulnerable and risk groups. (b) Diet survey for breast-feeding and weaning practices of specific groups. (c) Use of anthropometric measurement in children.
3. Preparation of visual aids.
4. Field visit to (a) Observe the working of nutrition and health oriented programmes (survey based result).
5. Hospitals to observe nutritional deficiencies.

**choice based credit system-Academic year 2020-21**

**B.SC. (FOOD SCIENCE AND NUTRITION) COURSE STRUCTURE**

**SEMESTER –V**

 **(DOMAIN RELATED SKILL ENHANCEMENT COURSES)**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Course** | **Total Mark** | **Mid Sem** | **Sem End Exam** | **Teaching Hours** | **Credits** |
| Domain –I**\*\*** (**Food Science**)Choose any one group (A/B/C) | **450** | **100** | **350** | **15** | **15** |
| Domain – II **\*\*\*** (**Nutrition**)Choose any one group (A/B/C) | **450** | **100** | **350** | **15** | **15** |
| **TOTAL** | **900** | **200** | **700** | **30** | **30** |

**Note:** Since only two domains are there in this course**, B.Sc.,** **Food Science and Nutrition,**  Only two Domains ‘**Food Science’** and ‘**Nutrition’** have been prepared with **Three** skill Enhancement courses in each of the 3 groups, **A, B, C** in each Domain. The student will select any one of the group (**A** or **B** or **C**) in each Domain so that he will study **Six** skill enhancement courses in V semester as per the guidelines.

\*\*Domain I: **FOOD SCIENCE** domain will have 3 skill enhancement courses (**SEC-1** to **SEC-3** papers with labs) in each group.

\*\*\*Domain II: **NUTRITION** domainwill have 3 skill enhancement courses (**SEC-4** to **SEC-6** papers with labs) in each group.

**Domain-I: FOOD SCIENCE**

|  |
| --- |
| **GROUP –A** |
| **S.No** | **Course** | **Total Mark** | **Mid Sem** | **Sem End Exam** | **Teaching Hours** | **Credits** |
| 1 | SEC-1:Post Harvest Technology (THEORY) | 100 | 25 | 75 | 3 | 3 |
| 2 | SEC-1 Lab: Post Harvest Technology (PRACTICAL) | 50 | 0 | 50 | 2 | 2 |
| 3 | SEC-2:Food Quality and Certification **(**THEORY) | 100 | 25 | 75 | 3 | 3 |
| 4 | SEC-2 Lab: Food Quality and Certification(PRACTICAL) | 50 | 0 | 50 | 2 | 2 |
| 5 | SEC-3:Project work | 150 | 50 | 100 | 5 | 5 |
|  | **TOTAL** | **450** | **100** | **350** | **15** | **15** |

|  |
| --- |
| **GROUP – B** |
| **S.No** | **Course** | **Total Mark** | **Mid Sem** | **Sem End Exam** | **Teaching Hours** | **Credits** |
| 1 | SEC-1:Fermentation Technology(THEORY) | 100 | 25 | 75 | 3 | 3 |
| 2 | SEC-1 Lab:Fermentation Technology(PRACTICAL) | 50 | 0 | 50 | 2 | 2 |
| 3 | SEC-2: Animal and Sea Food Technology (THEORY) | 100 | 25 | 75 | 3 | 3 |
| 4 | SEC-2 Lab: Animal and Sea Food Technology (PRACTICAL) | 50 | 0 | 50 | 2 | 2 |
| 5 | SEC-3:Project work | 150 | 50 | 100 | 5 | 5 |
|  | **TOTAL** | **450** | **100** | **350** | **15** | **15** |

|  |
| --- |
| **GROUP – C** |
| **S.No** | **Course** | **Total Mark** | **Mid Sem** | **Sem End Exam** | **Teaching Hours** | **Credits** |
| 1 | SEC-1:Baking Technology **(**THEORY) | 100 | 25 | 75 | 3 | 3 |
| 2 | SEC-1 Lab: Baking Technology (PRACTICAL) | 50 | 0 | 50 | 2 | 2 |
| 3 | SEC-2: Dairy Technology **(**THEORY) | 100 | 25 | 75 | 3 | 3 |
| 4 | SEC-2 Lab: Dairy Technology (PRACTICAL) | 50 | 0 | 50 | 2 | 2 |
| 5 | SEC-3: Project work | 150 | 50 | 100 | 5 | 5 |
|  | **TOTAL** | **450** | **100** | **350** | **15** | **15** |

**Domain-II: NUTRITION**

|  |
| --- |
| **GROUP –A** |
| **S. No** | **Course** | **Total Mark** | **Mid Sem** | **Sem End Exam** | **Teaching Hours** | **Credits** |
| 1 | **SEC-4**: Nutrition in Critical Care **(**THEORY) | 100 | 25 | 75 | 3 | 3 |
| 2 | SEC-4 Lab:Nutrition in Critical Care (PRACTICAL) | 50 | 0 | 50 | 2 | 2 |
| 3 | SEC-5: Hospital Food Service Management **(**THEORY) | 100 | 25 | 75 | 3 | 3 |
| 4 | SEC-5 Lab: Hospital Food Service Management (PRACTICAL) | 50 | 0 | 50 | 2 | 2 |
| 5 | SEC-6: Food Product development and Evaluation **(**THEORY) | 100 | 25 | 75 | 3 | 3 |
| 6 | SEC-6 Lab: Food Product development and Evaluation (PRACTICAL) | 50 | 0 | 50 | 2 | 2 |
|  | **TOTAL** | **450** | **100** | **350** | **15** | **15** |
|  |
| **GROUP – B** |
| **S.No** | **Course** | **Total Mark** | **Mid Sem** | **Sem End Exam** | **Teaching Hours** | **Credits** |
| 1 | SEC-4: Health and Fitness (THEORY) | 100 | 25 | 75 | 3 | 3 |
| 2 | SEC-4 Lab: Health and Fitness (PRACTICAL) | 50 | 0 | 50 | 2 | 2 |
| 3 | SEC-5: Food Hygiene and Sanitation (THEORY) | 100 | 25 | 75 | 3 | 3 |
| 4 | SEC-5: Food Hygiene and Sanitation (PRACTICAL) | 50 | 0 | 50 | 2 | 2 |
| 5 | SEC-6: Quantity Food Service and Physical facilities (THEORY) | 100 | 25 | 75 | 3 | 3 |
| 6 | SEC-6 Lab: Quantity Food Service and Physical facilities (PRACTICAL) | 50 | 0 | 50 | 2 | 2 |
|  | **TOTAL** | **450** | **100** | **350** | **15** | **15** |

|  |
| --- |
| **GROUP – C** |
| S.No | Course | Total Mark | Mid Sem | Sem End Exam | Teaching Hour | Credits |
| 1 | SEC-4: Sports Nutrition (THEORY) | 100 | 25 | 75 | 3 | 3 |
| 2 | SEC-4 Lab: Sports Nutrition (PRACTICAL) | 50 | 0 | 50 | 2 | 2 |
| 3 | SEC-5: Functional Foods and Nutraceuticals (THEORY) | 100 | 25 | 75 | 3 | 3 |
| 4 | SEC-5 Lab: Functional Foods and Nutraceuticals (PRACTICAL) | 50 | 0 | 50 | 2 | 2 |
| 5 | SEC-6: Food Service Facilities and Planning (THEORY) | 100 | 25 | 75 | 3 | 3 |
| 6 | SEC-6 Lab: Food Service Facilities and Planning (PRACTICAL) | 50 | 0 | 50 | 2 | 2 |
|  | **TOTAL** | **450** | **100** | **350** | **15** | **15** |

**Domain-I : FOOD SCIENCE- Group- A**

**CBCS/SEMESTER SYSTEM (2020-21) -V SEMESTER**

**B. Sc., FOOD SCIENCE AND NUTRITION**

**SEC-1:POST HARVEST TECHNOLOGY (**THEORY)

**Hours of instruction/week: 3 Credits 3**

**Internals: 25 Marks Sem end examination 75 Marks**

**Objectives:** To enable the students

1. Knowledge about food spoilage agents and prevention.

2. Understand the safety control measures in handling foods from harvest to consumption agencies of control.

**UNIT I**

Introduction to Post Harvest Technology - Definition, importance and Governmental measures to augment food production- need for food conservation.

Role of Post Harvest Technology in combating malnutrition in India.

**UNIT II**

Agents Causing Food Losses - Physical agents, (moisture, temperature), Chemical losses, biological losses- insects

**UNIT III**

Control of Spoilage Agents - Importance and methods of sanitary handling,

**UNIT IV**

Physical methods and chemical methods including fumigation techniques.

**UNIT V**

Storage of Grains - Importance of storage structures- requirements, traditional & modern and underground & above ground storage and their improvements, FCI godowns. PDS. Agencies Controlling Food Losses **-** Role of SGC, FCI, CWC, SWC, IGSI in controlling food losses.

**Reference Books:**

1. Handling and storage of food grains- S V Pingale ICAR, New Delhi, 1976.

2. Handling and storage of food grains in tropical and subtropical areas- D W Hall, FAD, Rome, 1970.

3. Food Science, N.W.Potter- The A VI Publishing Co., The Westport, 1973.

4. Food Technology, Prescott and Proctor.B.B.Mc Graw Hill Book Co., New York, 1937.

5. Gordon G Birth, Food science, Pub in New York.

6. Robins M Philip Convenience food- Recent Technology 1976.

7. Technology of cereals by NL Kent and JAD Evers.

8. Food protection technology by Charles W., Felix Havis Pub.1987.

**CBCS/SEMESTER SYSTEM (2020-21) - V SEMESTER**

**B. Sc FOOD SCIENCE ANDNUTRITION**

**SEC-1 Lab:POST HARVEST TECHNOLOGY (PRACTICAL)**

**Hours of instruction/week: 2 Credits 2**

**Internals 0 Sem End Examination: 50**

1. Processing of Selected Food Items – wheat, rice, breakfast cereals, pulses and oilseeds.
2. Related Experiences
3. Isolation of microbial contaminants from different foods, vegetables and fruits.
4. Visit to FCI (Food Processing Industries)
5. Visit to Processing Mill (Cereal & Pulse)
6. Preparation of Reports.

**Domain-I: FOOD SCIENCE- Group-A**

**CBCS/SEMESTER SYSTEM (2020-21) -V SEMESTER**

**B. Sc FOOD SCIENCE AND NUTRITION**

**SEC-2: FOOD QUALITY AND CERTIFICATION (** THEORY)

**Hours of instruction 3 per week Credits 3**

**Internals : 25 Sem end exam: 75**

**Objectives:** To enable the students

1. To get knowledge of assessing various parameters of food quality.
2. To develop aptitude for taking up food safety personnel as a profession.

**Unit-I:**

Food quality and its need in food industry - Definition of food quality - Role of food quality in Food Industry - Quality attributes - Classification of quality attributes.

**Unit-II:**

Food quality objectives, importance and functions of quality control - Methods of quality control - concepts of Rheology - Quality assessment of food materials i.e, fruits, vegetables, cereals and dairy products/milk and milk products

**Unit-III:**

Quality assessment of Food materials i.e, meat, poultry, egg and processed food products - Sensory evaluation – introduction, panel screening, selection methods. Interaction and thresholds, Statistical quality control.

**Unit-IV:**

Consumer measurements: Factors influencing acceptance and preference, objectives of consumer preference studies, information obtained from consumer study.

**Unit-V:**

Factors influencing results from consumer surveys, Methods of approach, development of the questionnaire, types of questionnaires, serving procedures and other methods of data collection.

**Books for Reference:**

1. Imteaz Ali, Food Quality Assurance, Principles and Practices, CHIPS, Texas.
2. J.L.Multon, Quality Control for Food and Agricultural Products, CHIPS, Texas.
3. Amerine, M.A.Pangborn, R.M and Rosseler, Principles of Sensory Evaluation of Food, Academic Press, New York, 1965.
4. Birk, G.G.Berman, J.G and Parker, K.J, Sensory Properties of Foods, Applied Science, London, 1977.
5. Pattee, H.E, Evaluation of Quality of Fruits and Vegetables, AVI, Westport. 1985.
6. Ranganna S, Handbook of Analysis and Quality Control-Fruits and Vegetables Products, Tata Mc Graw Hill, New Delhi, 1986.
7. BIS Standards on Sensory Evaluation.

**CBCS/SEMESTER SYSTEM (2020-21) - V SEMESTER**

**B.Sc., FOOD SCIENCE AND NUTRITION**

**SEC-2 LAB: FOOD QUALITY AND CERTIFICATION** (PRACTICAL)

**Hours of instruction per week: 2 Credits: 2**

**Internals: 0 Sem End Examination: 50**

1. Techniques of Quality assessment of fruits and vegetables
2. Quality assessment of Cereals
3. Quality assessment of dairy products,
4. Quality assessment of meat, poultry other processed products.
5. Selection and training of sensory panel.
6. Hedonic rating of food.
7. Identification and ranking of food products attributes.
8. Sensory and Instrumental methods for measuring food attributes.

**Domain-I: FOOD SCIENCE- Group-A**

**CBCS/SEMESTER SYSTEM (2020-21) - V SEMESTER**

**B.Sc., FOOD SCIENCE AND NUTRITION**

**SEC-3: PROJECT WORK**

**Hours of instruction per week:5 Credits: 5**

**Internals: 50 Sem End Examination: 100**

**Objective :**

1. Main objective is the get hands on experience and thorough knowledge in any one of the fields of food industry.

The student has to take up the project work by research /survey under the supervision of competent faculty. Progress of the project work can be evaluated internally during mid sem exams for 50 marks (25 in each mid). End semester evaluation can be carried out for 100 marks by the external examiner by viva and project report.

**Domain-I: FOOD SCIENCE-Group-B**

**CBCS/SEMESTER SYSTEM (2020-21) - V SEMESTER**

**B.Sc., FOOD SCIENCE AND NUTRITION**

**SEC-1: FERMENTATION TECHNOLOGY** (THEORY)

**Hours of instruction 3 per week Credits: 3**

**Internals : 25 Sem end exam: 75**

**Objectives:**  Enable the students

1. To understand the principles of food fermentation technology
2. To study the production of various fermented food.
3. To gain knowledge about different downstream methods.

**Unit-I**

Introduction to Industrial Fermentations: Screening, isolation and

maintenance of industrially important microorganisms. Types of

fermentation processes, Fermentor, Fermentation media, carbon and nitrogen sources, Application of non- conventional raw materials. Isolation and purification of microbial metabolites.

**Unit-II**

**Production of microbial metabolites**: Production of organic acids: citric acid,

Acetic acid and lactic acid. **Production of amino acids**: L-glutamic acid and L-aspartic Acid.

**Unit-III**

**Production of microbial metabolites**: Production of antibiotics: penicillin and tetracycline. Production of industrial enzymes: Pectinases, Agarases and Proteases.

**Unit-IV**

**Food fermentations**: Fermented milk foods: Cheese and Butter. Fermented vegetable foods- Sauerkraut and soya sauce. Single cell protein- Production of Baker’s yeast and Commercial Production of bread.

**Unit-V**

Production of industrial pigments: Commercial production of red and violet bacterial pigments. Mushroom culture- Button (*Agaricus)* and Oyster (*Pleurotus*) mushrooms. Production of fermented beverages – beer and wine.

**Text Book(s)**

1. A. H. Patel, Industrial Microbiology, 2/e, MacMillan Publishers, 2012.

2. N. Okafor, Modern Industrial Microbiology and Biotechnology, Science

Publishers, 2007.

Casida, L E JR., Industrial Microbiology, New Age International Publishers, 1968.

**References**

1. E. M. T. El Mansi, C. F. A. Bryce, A. L. Demain, A. R. Allaman, Fermentation

Microbiology and Biotechnology, 3/e, Taylor and Francis, 2011.

2. W. C. Frazier, D. C. Westhoff and N. M. Vanitha, Food Microbiology, 4/

e, McGraw Hill, 2014.

3. A. N. Glazer and H. Nikaido, Microbial Biotechnology: Fundamentals of

Applied Microbiology, 2/e, Cambridge University Press, 2007.

4. G. Reed, Presscott and Dunn's Industrial Microbiology, 4/e, CBS Publishers

and Distributors, 2004.

5. W. Cruger and A. Cruger, Biotechnology: A Textbook of Industrial

Microbiology, Panima Publishing Corporation, 2003

**CBCS/SEMESTER SYSTEM (2020-21) - V SEMESTER**

**B. Sc., FOOD SCIENCE AND NUTRITION**

**SEC-1 Lab: FERMENTATION TECHNOLOGY(**PRACTICAL**)**

**Hours of instruction: 2 per week Credits: 2**

**Internals : 0 Sem end exam: 50**

1. Isolation and characterization of industrial cultures.

2. Analysis of raw materials.

3. Fermented beverages – Production and analysis of wine and beer

4. Production of Amino acid, glutamic acid

5. Production of Citric acid

6. Baker's yeast production.

7. Production of Vinegar.

**Text Books:**

1. Fermentation, A Practical approach IRL.

**Domain-I: FOOD SCIENCE (2020-21)- Group-B**

**CBCS/SEMESTER SYSTEM- V SEMESTER**

**B.Sc., FOOD SCIENCE AND NUTRITION**

**SEC-2: ANIMAL AND SEA FOOD TECHNOLOGY** (THEORY)

**Hours of instruction 3 per week Credits: 3**

**Internals : 25 Sem end exam: 75**

**Objectives:** Enable the students

• To understand the need and importance of livestock, egg, poultry and fishery industry

• To study structure, composition and nutritional quality of animal and aquaculture products.

• To study processing and preservation of animal and fishery foods and technology behind it and byproduct utilization.

**UNIT 1 Introduction**

Livestock and poultry population and status of fishery industry in India. Development of meat, poultry and fishery industry in India and its role in nation’s economy. The egg industry, its importance and management.

**Slaughter process-** methods of slaughter, humane & religious methods. inspection grading, antemortem examination of animal meat. A Generic HACCP model, dressing of carcasses, post-mortem examination of meat.

**UNIT 2: Processing of meat-** Different cuts of meat, structure & composition of meat. Different methods of processing & preservation of meat & meat products.

**Meat quality-** Effects of feed, breed and environment on production of meat and meat quality,color, flavor, texture, Water-Holding capacity (WHC), Emulsification capacity of meat. **preservation of meat-**Refrigeration and freezing, thermal processing- canning of meat, retort pouch, dehydration, irradiation, meat curing. **Meat products-** RTE meat products, Sausages-processing, types and defects.

**UNIT 3: Avian meat and Egg Production Practices-** Structure, composition and nutritive value of Avian meat. Different methods of preservation.

Different types of eggs. Structure, composition and nutritive value of egg. Grading, packaging and preservation of eggs. Factors affecting egg quality and measures of egg quality. Processing of different egg products such as frozen & dried products.

**UNIT 4: Fish and marine products processing**-Types and their Classification and Nutritive value of fish, prawn and other marine products. Selection, grading, processing of different fish & fishery products. Special emphasis on salting & other novel methods of preservation of fish and fishery products, Shelf life and quality of processed products.

**UNIT 5 Fishery-products:**

Usage of fish products products in different areas and communities. **Fermented fish-** Flowchart of Indigenous products- Fish sauce and Paste.

**Canning of fish-**Principles of canning, cannery operations for specific canned products(Tuna,Mackerel,Sardine). Surimi, Fish protein concentrates (FPC), fish protein extracts (FPE), fish protein hydrolysis (FPH).

**Recommended Readings**

1) Lawrie R A, Lawrie’s Meat Science, 5th Ed, Woodhead Publisher, England, 1998.

2) Parkhurst & Mountney, Poultry Meat and Egg Production, CBS Publication, New Delhi,1997

3) Pearson & Gillet Processed Meats,3 Ed, CBS Publication, New Delhi, 1997.

4) Shai Barbut,Poultry Products Processing,CRC Press 2005

5) Stadelman WJ, Owen J Cotterill Egg Science and Technology, 4th Ed. CBS Publication New Delhi, 2002

**CBCS/SEMESTER SYSTEM (2020-21)- V SEMESTER**

**B.Sc., FOOD SCIENCE AND NUTRITION**

**SEC-2 Lab: ANIMAL AND SEA FOOD TECHNOLOGY** (PRACTICAL)

**Hours of instruction: 2 per week Credits: 2**

**Internals : 0 Sem end exam: 50**

1. Estimation of moisture content of meat
2. Cutout analysis of canned meats/retort pouches
3. Estimation of protein content of meat
4. Analysis of frozen meat/meat emulsion products
5. To study shelf-life of eggs by different methods of preservation
6. Evaluation of eggs for quality parameters(market eggs,branded eggs)
7. To perform freezing of yolk/albumen
8. Meat/Egg product formulation.
9. Quality evaluation of fish/prawn.
10. Subjective evaluation of Fresh Fish.
11. Cut out examination of canned fish.(Sardine,Mackerel,Tuna)
12. Fish product formulation/canning.

**Domain-I: FOOD SCIENCE- Group-B**

**CBCS/SEMESTER SYSTEM (2020-21) - V SEMESTER**

**B.Sc., FOOD SCIENCE AND NUTRITION**

**SEC-3: PROJECT WORK**

**Hours of instruction per week: 5 Credits: 5**

**Internals: 50 Sem End Examination: 100**

**Objective :**

1. Main objective is the get hands on experience and thorough knowledge in any one of the fields of food industry.

The student has to take up project work by research /survey under the supervision of competent faculty. Progress of the project work can be evaluated internally during mid semester exams for 50 marks (25 in each mid). End semester evaluation for 100 marks can be carried out by the external examiner by viva and project report book.

**Domain-I: FOOD SCIENCE-Group-C**

**CBCS/SEMESTER SYSTEM (2020-21) - V SEMESTER**

**B.Sc., FOOD SCIENCE AND NUTRITION**

**SEC-1: BAKING TECHNOLOGY**

**Hours of instruction 3 per week Credits: 3**

**Internals : 25 Sem end exam: 75**

**Objectives:** Enable the students

1. To understand the science and technology of baking
2. To the role of different ingredients in baking
3. To develop skills in planning and maintenance of a baking institution

**UNIT I :** Baking - Definition, Principles of baking, classification of baked foods. Types of equipments in baking industry, cleaning and sanitizing methods of baking equipments, baking temperature of different products, operation techniques of different baking equipments.

**UNIT II** Ingredients and Their Role in Baking - Flour, Yeast, sugar, egg, butter, salt, baking powder, colouring, flavouring agents. List of standard colouring and flavouring agents.

**UNIT III** Preparation of baked foods - Quick breads, cakes and its varieties, different types of biscuits, cookies and pastries. Decoration of baked foods - Icing- Types of Icing used in different bakery product. Role of other ingredients used in icing.

 **UNIT IV**

Types of packaging materials used for bakery products, method of packaging.

Quality control- Quality control of raw material / finished products. Spoilage of bread – Causes, Rope and mold spoilage and prevention.

**UNIT V** Baking unit/ plant layout & design of a baking unit sanitation and hygiene.

Reference Books:

1. Potter, N. Food Science, The AVI Publishing Co., Inc., West Port, Connecticut, 1975.
2. Modern Pastry Chab, Vol.I and II, A VI Publishing Co., Inc., West Port, Connecticut, 1977.
3. Dubey, S.C. (2007). Basic Baking 5th Ed. Chanakya Mudrak Pvt. Ltd.
4. Manay, S. & Shadaksharaswami, M. (2004). Foods: Facts and Principles, New Age Publishers.
5. Raina et.al. (2003). Basic Food Preparation-A complete Manual. 3rd Ed. Orient Longman Pvt. Ltd.
6. Barndt R. L. (1993). Fat & Calorie – Modified Bakery Products, Springer US.
7. Samuel A. Matz (1999). Bakery Technology and Engineering, PAN-TECH International Incorporated.
8. Faridi Faubion (1997). Dough Rheology and Baked Product Texture, CBS Publications.
9. Baker‟s Handbook on practical Baking .Wheat Associates, USA, New Delhi.

**CBCS/SEMESTER SYSTEM (2020-21) - V SEMESTER**

**B.Sc., FOOD SCIENCE AND NUTRITION**

**SEC-1 Lab: BAKING TECHNOLOGY** (PRACTICAL)

**Hours of instruction: 2 per week Credits: 2**

**Internals : 0 Sem end exam: 50**

1. Preparation of pizza base and assessment of its quality

2. Preparation of bread and assessment of its quality

3. Preparation of buns and assessment of quality

 4. Preparation of butter cake and assessment of its quality.

5. Preparation of sponge cake with icing and assessment of its quality.

6. Preparation of cookies and assessment of quality.

 7. Preparation of biscuits and assessment of quality.

8. Visit to a baking industry and preparation of report

**Domain-I: FOOD SCIENCE-Group-C**

**CBCS/SEMESTER SYSTEM) (2020-21) - V SEMESTER**

**B.Sc., FOOD SCIENCE AND NUTRITION**

 **SEC-2: DAIRY TECHNOLOGY** (THEORY)

**Hours of instruction 3 per week Credits: 3**

**Internals : 25 Sem end exam: 75**

**Objectives**: Enable the students

1. To know the need and importance of dairy and fishery industry
2. To know the compositional and technological aspects of milk and

processed milk products.

1. To develop young entrepreneurs for self-employment through dairy technology and associated activities.

**UNIT 1:**

 **Dairy development, milk production –** Dairy development in India and its importance. Systems of collection of milk- Reception, Platform testing. **Properties of milk:** Physicochemical properties of milk- Color, taste, pH and buffering capacity, refractive index, viscosity, surface tension, freezing, boiling point, specific heat. Milk Composition, its Constituents and Nutritional Importance

Preservatives, Neutralizers and Adulterants in Milk and their Detection.

**UNIT-2**:

**Equipment and Cold storage:**

Equipment used in dairy industry-Equipment for Fluid Milk Processing, Equipment for Milk Products Processing. Cleaning and maintenance of equipment. Refrigeration System-Basic Principles and Components of Refrigeration System. Different Cooling Systems for Milk and Milk Products.

**UNIT-3**:

**Processing of milk:** Thermal Processing of Milk , Various stages of processing- Clarification, separation, bactofugation, homogenization, Pasteurization and Ultra-high-temperature Processing. Packaging- materials process and machinery. Different types of fluid milk produced commercially. Storage and Distribution. Systems

**UNIT-4**:

**Processing of milk products:**

Composition, Standards, Manufacturing - Flow diagram of the following milk products, -Butter, ghee, flavored milk, yoghurt, dahi, shrikhand, ice-cream, channa, paneer, cheese. Defects during Manufacturing and Storage of- Curd/Dahi, Yoghurt, Shrikhand, Cheese (cheddar). Quality control and sensory evaluation of the products.

**UNIT-5**:

 **Dairy By products**:

Skim Milk – Casein and Caseinates. Whey – Whey Beverages, Whey Powder, Whey Protein Concentrates , Lactose, Ghee Residue.New Technologies in By-product Utilization (Membrane Processing – Reverse Osmosis and Ultra Filtration)

**Recommended Readings**

1. De Sukumar, Outlines of Dairy Technology, Oxford University Press, Oxford, 2007.

2. Webb and Johnson, Fundamentals of Dairy Chemistry, 3rd ed., CBS Publishers, New Delhi 1988.

3. Eram S. Rao. Food Science Experiments and Applications. CBS Publishers. 2nd Edition,2011.

4. Frazier WC and Westhoff DC. Food Microbiology. Tata McGraw-Hill Publishing Company Limited,1995.

5. Knechtges LI. Food Safety-Theory and Practice, USA: Jones and Barlette Learning 2012.

6. The Food Safety and Standards Act along with Rules and Regulations. Delhi: Commercial Law Publishers (India) Pvt Ltd, 2011.

**CBCS/SEMESTER SYSTEM (2020-21) - V SEMESTER**

**B.Sc., FOOD SCIENCE AND NUTRITION**

**SEC-2 Lab: DAIRY TECHNOLOGY** (PRACTICALS)

**Hours of instruction: 2 per week Credits: 2**

**Internals : 0 Sem end exam: 50**

1. Performing the platform tests of milk.(Acidity,COB,MBRT,specific gravity,SNF).
2. Estimation of milk protein by Folin method.
3. Estimation of milk fat by Gerber method.
4. Preparation of curd and Yoghurt.
5. Preparation of Shrikhand.
6. Preparation of Cheddar Cheese.
7. Preparation of Processed Cheese.
8. Preparation of Ice Cream and Determination of Overrun.
9. Visit to Ice-Cream Factory Experiment
10. Visit to Dairy Industry.
11. Sensory evaluation and shelf life determination of the prepared products.

**Domain-I: FOOD SCIENCE- Group-C**

**CBCS/SEMESTER SYSTEM- V SEMESTER**

**B.Sc., FOOD SCIENCE AND NUTRITION**

**SEC-3: PROJECT WORK**

**Hours of instruction per week: 5 Credits: 5**

**Internals: 50 Sem End Examination: 100**

**Objective :**

1. Main objective is the get hands on experience and thorough knowledge in any one of the fields of food industry.

The student has to take up project work by research /survey under the supervision of competent faculty. Progress of the project work can be evaluated internally during mid semester examinations for 50 marks (25 in each mid). End semester evaluation for 100 marks can be carried out by the external examiner by viva and project report book.

**Domain-II: NUTRITION- Group-A**

**CBCS/SEMESTER SYSTEM- V SEMESTER B.Sc. FOOD SCIENCE AND NUTRITION**

**SEC-4: NUTRITION IN CRITICAL CARE (**THEORY)

**Hours of instruction per week:3 Credits:3**

**Internals: 25 Sem End Examination: 75**

**Objectives:**  To enable the students

1. To develop skills to assess various critical conditions of patients’s health.
2. To develop skills to counsel nutrition in critical conditions of health.

**UNIT – I** Nutritional status assessment of the critically ill patients, complications, nutritional support systems for the critically ill, commercial feeding formulas and special diets for critically ill

**UNIT – II**

Diseases of the cardio vascular system- atherosclerosis, hypertension, congestive heart failure , etiology , symptoms , risk factors and diet therapy

**UNIT- III**

Diabetes mellitus – Types ,causes, symptoms, complications and dietary management

**UNIT – IV**

Diseases of the kidney- Acute and chronic nephritis, Nephrotic syndrome, Renal failure, Urinary calculi Causes and dietary treatment of kidney diseases and dialysis.

**UNIT – V**

Nutrition in cancer – etiology, symptoms, dietary management. Chemo and radiation therapy. Computer applications in nutrition, dietetics, nutritional assessment, menu planning and counseling.

**Reference Books:**

1. Nutrition in critical care , Author Gary. P. Zaloga
2. Diet and Nutrition in Critical Care, Author: **Rajendram**, Rajkumar, **Preedy**, Victor R., **Patel**.
3. Textbook of Critical Care, Author: Jean-Louis Vincent Edward Abraham Patrick Kochanek Frederick Moore Mitchell Fink

**CBCS/SEMESTER SYSTEM (2020-21) - V SEMESTER**

**B. Sc., FOOD SCIENCE AND NUTRITION**

 **SEC-4 Lab: NUTRITION IN CRITICAL CARE (**PRACTICAL)

**Hours of instruction 2 per week Credits: 2**

**Internals : 0 Sem end exam: 50**

A. Nutritional status Assessment of critically ill patients

B. Computation of nutrient requirements, planning, preparation and evaluation of therapeutic diets, formula diets for the following conditions

1. Cardiovascular diseases
2. Diabetes
3. Kidney diseases
4. Cancers

**Domain-II (Nutrition) - Group-A**

**CBCS/SEMESTER SYSTEM (2020-21) - V SEMESTER B.Sc., FOOD SCIENCE AND NUTRITION**

**SEC-5: HOSPITAL FOOD SERVICE MANAGEMENT (**THEORY)

Hours of instruction per week:3 Credits:3

Internals: 25 Sem End Examination: 75

**Objectives:** To enable students

 1. Understand the principles of planning, organizing and controlling hospital food service.

2. Develop skills in meal planning, production and service.

3.Understand the principles of sanitation and hygiene in hospital food service units.

**UNIT I**

**Types of service in hospitals** – Food service definition and its types, equipment used for serving the food in hospitals and hygienic role of persons delivering Food.

**UNIT II**

 **Physical requirements**: Kitchen area – Size and type of kitchen, design of kitchen, ventilation, lighting, flooring, carpets, wall covering and sample layout of kitchen. Storage area – Meaning, types of storage, infrastructure, sanitary measures and safety storage of food materials. Equipment - Equipment required for hospital food service - major and minor equipment with reference to food storage, preparation, holding and food service.

**UNIT III**

**Purchasing –** Meaning of purchase and buying methods. Receiving & Storing – Importance of receiving raw materials and storage procedures. Production – Menu planning for patients and process of food production. Holding of foods – methods and specifications. Cleaning – Meaning of cleaning, dishwashing, types of cleaning & sanitizing agents, bleaches and disinfectants.

**UNIT IV**

**Management -** Definition, principles and techniques of effective management, leadership and managerial abilities (in a hospital & dietary). Tools of management - organisational chart of the food service team of the hospital. The patient care team –role of medical and paramedical staff interaction. Food supply for attendant. Cost concept – Components & behaviours of cost. Cost control - Principles and methods of food cost control, labour, operating and overhead cost. Sample costing of a dish, methods and factors affecting pricing.

**UNIT V**

 Accounting - Definition and principles. Journal and ledger. Book of account – Cash book, purchase book, sales book, purchase returns & sales returns book.

 **Reference Books:**

1. Sethi M and Mahan S.-Catering Management an integrated approach , 2006, 2nd edition, John wiley & Sons, New York.

 2.Tersel MC and Harger – Profession food preparation , John wiley & Sons,New York.

 3. Joan C Boason , Lennox M.-Hotel, hostel & hospital housekeeping , 2004, 5th edition, Book power publishers, New York.

 4.Mcswane D, Linton R – Essentials of food safety & sanitation, 1998, Prentice hall international, London.

**CBCS/SEMESTER SYSTEM (2020-21)-V SEMESTER B.Sc. FOOD SCIENCE AND NUTRITION**

**SEC-5 Lab: HOSPITAL FOOD SERVICE MANAGEMENT (**PRACTICAL)

**Hours of instruction 2 per week Credits: 2**

**Internals : 0 Sem end exam: 50**

1. Equipment used in hospital food service. 2. Check list for cleanliness in hospital food service.

3. Observation of raw and prepared food storage in hospitals.

4. Observation of pest control program.

5. Calculation of food cost.

 6. Organisation chart and identification of duties in a local hospital.

7. Records maintained in a dietary department.

8. Purchasing methods for food items.

 9. Observation of different fuels used in hospital food service. 10.Observation of garbage/waste disposal.

**Domain-II: NUTRITION)- Group-A**

**CBCS/SEMESTER SYSTEM- V SEMESTER B.Sc., FOOD SCIENCE AND NUTRITION**

**SEC-6: FOOD PRODUCT DEVELOPMENT AND EVALUATION** (THEORY)

**Hours of instruction 3 per week credits 3**

**Internals: 25 Sem end exam 75 Marks**

**Objectives:** Enable the students

1. To understand the concept of development of a new product and prepare new products based on special dietary requirements, functionality, convenience and improvisation of existing traditional Indian foods.
2. Evaluation of quality of foods prepared.
3. To study the market demand of various convenience foods.

**UNIT – I:**

**Food needs and consumer preferences**: Need for new products, Innovations in product development, need, classification, characterization, Needs and types of foods consumption trends. Economic, psychological, anthropological and sociological dimensions of food consumption. Factors shaping new product development –. social concerns, health concerns, impact of technology, market influence, market sector perspective and market research. Consumer research and the market. Trends in social change and its role in diet pattern, Identifying the need for new products,. Designing need based new products and the R & D Process.

**UNIT – II**

**Phases of food product development**- introductory phase, growth phase, maturity phase and decline phase. Developing standard products, Types of products and logistics. Processing- primary and secondary, various food ingredients used, use of food additives. Standardization and large scale preparation Safety and regulatory aspects, sanitation and waste disposal

**UNIT – III**

**Packaging** - suitability, development of the package, management. Design and package graphics. Label ng, research and testing.

Storage and transportation

Types and mode of transportation, optimization of transport taking into account the

type of product, distance, storage facilities.

**UNIT – IV**

Product costing, Advertising and marketing, Entrepreneurship, plant location, Investment and financing of project.

**UNIT-V**

Chemical and physical properties of foods, Shelf life studies and shelf life prediction. Planning for the food product to be developed, Processing steps, ingredients required, equipment required, standardization, evaluation, large scale production, packaging and shelf life studies. Drawing up a working plan and time schedule.

**References:**

1. Snack Food Technology (1993) by S.A. Matz.
2. Principles of Cereal Science and Technology (1986) by R.C. Horseny.
3. Food Science (1998) by N. N. Potter *et al.*
4. Breakfast Cereals and How They are Made? (1990) by R.B. Fast and E.F.Caldwell. Food Science (5th edition) by N. N Potter et al.
5. Snack Food Technology (3rd edition) by S.A. Matz.
6. Text book of Food science and Technology (2001) by VijayaKhader.
7. Storage of cereal grains and their product (3rdedition) by C.M. Chriestenson.
8. Technology of Cereals (4th edition) by Kents.

**CBCS/SEMESTER SYSTEM- V SEMESTER**

**B. Sc FOOD SCIENCE AND NUTRITION**

**SEC-6 Lab: FOOD PRODUCT DEVELOPMENT AND EVALUATION (**PRACTICAL**)**

**Hours of instruction 2 per week Credits 2**

**Internals: 0 Sem end examination 50 Marks**

1. Market survey and enlisting various RTE food products available in the market and their movement.
2. Visit to a community nutrition programme in nearby area.
3. Selection of a target group and development of a food product to fulfill the nutritional needs of the target group.
4. Processing steps, ingredients required, equipment required.
5. Development of low cost products by using byproducts of oil industry.
6. Tests to determine nutritional parameters.
7. Tests to determine sensory parameters.
8. Drawing up a working plan and time schedule for large scale production.
9. Determination of Packaging the food product and labeling.

10. Estimating the cost and market price, storage and transportation considerations

11. Standardization and evaluation for large scale production of the product.

 12. Visits to commercial food manufacturing, packaging as well as R D Units

 where food products are developed and tested.

**Domain-II (Nutrition)- Group-B**

**CBCS/SEMESTER SYSTEM (2020-21) - V SEMESTER B.Sc. FOOD SCIENCE AND NUTRITION**

**SEC-4: HEALTH AND FITNESS (**THEORY)

**Hours of instruction per week: 3 Credits:3**

**Internals: 25 Sem End Examination: 75**

**Objectives: E**nable students

1. To understand the importance of health for quality living.

 2. To acquire knowledge about the role of food and exercise for sound health.

**UNIT I:**

 Health – Definition, meaning of health and factors affecting health. Health hazards – environment, population explosion, explosives, adulteration, dampness and measures to prevent health hazard.

**UNIT II:**

 Food for health promotion-:Definition of food, Nutrition, Nutrients and Nutritional status. Functions of food – Physiological, psychological and socio - cultural functions, constituents of food and their functions.

 **UNIT III:**

 Health improvement Balanced diet – Definition & objectives, food selection. Health education – Definition, importance of health education, personal hygiene. Physical education – Meaning & scope, role of gymnastic exercises and yoga in improving health. Difference between yoga & other gymnastic exercises.

**UNIT IV:**

 Sports nutrition –Introduction to kinanthropometry, Requirements during training and performance for athletes and endurance games, aerobic and anaerobic exercise, fuel for exercise, glycogen load. Exercise to maintain fitness. Health club equipments & activities – Tread mill, hammer strength, steppers, cycles, body sculpting, kick boxing, Reebok ridge rocker, hanging, hand grips, swing, climbing and lifting weight.

**UNIT V:**

 Health insurance scheme (government & non government) – Mediclaim policy, Employee state insurance scheme, ICICI health scheme, Specialised insurance scheme and others.

**Reference Books and websites:**

1. Sizer F, Eleanor Whitney - Nutrition concepts and controversies, Eighth Edition (2000).

2. Narayan dash B – Health & physical education, 1st edition, 2003, Neelkamal publications, Hyderabad.

3. Krause‟s– Food ,Nutrition and Diet therapy 6th Edition WB Saunders company, London.

 6. htt://adfdell.pstc.brown.edu/classes/readings/

**CBCS/SEMESTER SYSTEM (2020-21) - V SEMESTER B.Sc. FOOD SCIENCE AND NUTRITION**

**SEC-4 Lab: HEALTH AND FITNESS (**PRACTICALS)

**Hours of instruction per week: 2 Credits:2**

**Internals: 0 Sem End Examination: 50**

 1. Identification of health hazards.

2. Simple tests for food adulteration.

 3. Food intake during cultural festivals.

 4. Food selection for balanced diet for different age groups.

5. Planning a health education for any specific group.

6. Visit to a health club / fitness centre.

 7. Assessment of fitness – simple test, Stepper technique (any two).

8 . Guest lecture on health insurance schemes.

9. Observation of / Compulsory yoga exercise.

 10. Observation of physical training for sports person.

**Domain-II: NUTRITION- Group-B**

**CBCS/SEMESTER SYSTEM (2020-21) V SEMESTER B.Sc., FOOD SCIENCE AND NUTRITION**

**SEC-5: FOOD HYGIENE AND SANITATION** (THEORY)

**Hours of instruction per week: 3 Credits: 3**

**Internals: 25 Sem End Examination: 75**

**Objectives:**

1. To introduce the concept of food hygiene, and importance of safe food and its storage.

 2. To acquaint the students with importance of sanitation and health.

3. Design food hygiene and sanitation measures to control the spread of microorganisms.

 **UNIT-I**

 **Food safety and hygiene:** General principle of food hygiene. Factors affecting food safety. National andInternational standards. Personal hygiene and food handling habits. Sanitation in food plants- Sanitary aspects of building and equipment, Plant layout and design. Special requirements for high-risk foods. Safe food cooking temperature and storage techniques

**UNIT-II**

**Safe and effective insect and pest control:** Extraneous materials in foods, Principles of Insects and pests control. Physical and chemical methods of control. Effective control of micro-organisms: microorganisms important in food sanitation, micro-organisms as indicator of sanitary quality.

**UNIT-III**

**Sanitary aspects of water supply:** Source of water, quality of water, water supply and its uses in food industries. Purification and disinfection of water, preventing contamination of potable water supply.

**UNIT-IV**

 **Cleaning practices:** Effective detergency and cleaning practices: Importance of cleaning technology, physical and chemical factors in cleaning, classification and formulation of detergents and sanitizers, cleaning practices.

 **UNIT-V**

**Sanitation practices:** . Hygiene and Sanitation in Food Service Institutions. Cleaning and disinfection Personal hygiene. Pest control, Waste disposal

Sanitary aspects of waste disposal. Establishing and maintaining sanitary practices in food industry, sanitation principle and the requirements for a food sanitation program, role of sanitization, general sanitary consideration and sanitary evaluation of food plants.

**RECOMMENDED READINGS**:

1. Fellows P et al. Making Safe Food: A Guide to Safe Food Handling and Packaging for Small-scale Producers Practical. Action Publishing, 1998.
2. Frazier WC and West off DC. Food Microbiology, TMH, New Delhi, 2004.
3. IFST. Food Hygiene Training: A Guide to its Responsible Management, UK: Institute of Food Science and Technology 1992.
4. Lawley R, Curtis L and Davis J. The Food Safety Hazard Guidebook, RSC.
5. Publishing, 2004.
6. Manay NS and Shadakshasaswamy M. Food Facts and Principles, New Age.

 International, 2004.

1. Marriott NG and Gravani RB. “Principles of Food Sanitation”, New York: Springer, 2006.
2. Gaston and Tiffney, “Guide to Improve Food Hygiene”.
3. Sunetra Roday “Hygiene and Sanitation in Food Industry”..

**CBCS/SEMESTER SYSTEM- V SEMESTER B.Sc. FOOD SCIENCE AND NUTRITION**

**SEC-5 Lab: FOOD HYGIENE AND SANITATION (**PRACTICAL)

**Hours of instruction per week: 2 Credits:2**

**Internals: 0 Sem End Examination: 50**

1. Presentation on food hygiene and sanitation practices in any local food outlet.

 2. Sensory evaluation tests for processed foods

3. Determination of the quality of an egg (whole and open egg).

 4. Determination of the moisture content of various flours

 5. Determination of viscosity of various food gruels (porridge, custards, batters etc) using viscometer.

 6. Assessing the texture of raw and cooked food using penetrometer.

7. Measurement of the water activity (aw) of raw and cooked food.

8. Detection of pathogens in food using conventional microbiological tests.

**Domain-II (NUTRITION)- Group-B**

**CBCS/SEMESTER SYSTEM (2020-21)- V SEMESTER B.Sc. FOOD SCIENCE AND NUTRITION**

**SEC-6: QUANTITY FOOD SERVICE AND PHYSICAL FACILITIES**  (THEORY)

**Hours of instruction per week: 3 Credits: 3**

**Internals: 25 Sem End Examination: 75**

**Objectives:** Enable students:

1. To understand the physical requirements for quality food production

2. Gain knowledge and develop skills in handling food service equipment

 3. Understand the basics of quantity food production and meal planning.

**UNIT- I**

**Floor planning and layout** – characteristics of typical food service facilities. Floor plan – physical planning, space allocation for the various areas and flow of traffic through receiving, storage, preparation, service and dish washing areas. Working heights and dimensions of work centers, lighting, ventilation and pest – rodent control.

**UNIT-II**

**Materials** - Basic materials used in the manufacture of equipment, finishes and insulation. Strength and limitation of materials.

UNIT-III

**Equipment** - Equipment required for quantity food service-major and minor equipment with reference to food storage, preparation, service and cleaning. Factors influencing their selection and purchase. Arrangement of equipment in work centers, use, care and maintenance of equipment. Transition from traditional to modern equipment.

**UNIT-IV**

**Meal Planning** - Menu-principles involved in planning menu, types of menu. Fuel: Cooking fuels-selection, advantages, limitations, safety measures and fuel saving techniques.

**UNIT-V**

**Quantity food preparation** – Selection, purchasing and storage of foods, standardization of recipe, portion control, utilization of left over foods. Marketing of foods –Importance and need for advertisement.

 **Reference Books:**

1.Sethi and Mahan s.-Catering Management and integrated approach ,Johnwiley & Sons,New York.

 2.Lillicarp DR – Food and Beverage Service ,Edward Arnold Pub.Malbourne . 3.Longnee K and Bieker CC – sanitary techniques in food service, Johnwiley & Sons,New York.

 4.Tersel MC and Harger – Profession food preparation , Johnwiley & Sons,New York.

 5.Kotschevar LH and Terrell ME “Food Service Planning Layout and Equipment “, 2nd Edn.,John Wiley and sons ,New York ,1977.

6.Glow ,G.,”Catering Equipment and Systems Design „‟ , Applied Science Publishers Ltd.,1977.

7.Unkelsbay,Nand Unkilesbay,k.”Energy management in Food service : Ellis Harwood Ltd.,England 1982.

8.West ,BB, Wood ,L.,Hargu VF and Shugart GS “Food service in Institutions” ,Johnwiley & Sons,New York.

9.Kinton ,R and Ceserani ,V.”The Theroy of catering “, Arnold – Heinemam ,1985 10. Fundamentals of menu planning .Vanmost and Rein Hold Company , New york.

11.Marian C.Spears ,Food Service Organisation – Managerial and system approach ,prentice hall.inc.Osio,III rd edition ,1995.

**CBCS/SEMESTER SYSTEM (2020-21)- V SEMESTER B.Sc., FOOD SCIENCE AND NUTRITION**

**SEC-6 Lab: QUANTITY FOOD SERVICE AND PHYSICAL FACILITIES (**PRACTICALS)

**Hours of instruction per week: 2 Credits:2**

**Internals: 0 Sem End Examination: 50**

1. Different types of menu used.
2. Standardization of foods included in menu.
3. Planning of work space area for food processing.
4. Flow diagram for food processing facilities.
5. Identification and inventorization of raw materials used in food service unit.
6. Estimation off quantity food processing and calculation of ingredients.
7. Equipment required and its maintenance.
8. Important cooking fuels and safety and fuel saving measures.
9. Visit to a Food service Institute/unit and inventorization of equipment and raw materials.

**Domain-II: NUTRITION- Group-C**

**CBCS/SEMESTER SYSTEM (2020-21) - V SEMESTER B.Sc., FOOD SCIENCE AND NUTRITION**

**SEC-4: SPORTS NUTRITION** (THEORY)

**Hours of instruction per week: 3 Credits: 3**

**Internals: 25 Sem End Examination: 75**

**Objectives:** Enable the students

1. To acquire knowledge of various sports and an fitness tests
2. To develop skills to counsel nutrition to sports persons

**Unit-I**

**Scientific basis of sports Nutrition-** Introductionto sports nutrition, evolution and growth of sports nutrition,Understanding of human body and biological basis of movement of human body, Anthropometlic and Physiological Measurement: Various Techniques for Measuring Body Composition

 Work Capacityof sports.

**Unit-II**

**Sports and life skills Education:** Sport and socialization.Physicalactivity and sports.Yoga meditation and Relaxation. Sports in character building. Values in sports. Sports for world peace, integrity and international lunderstanding. National and International sports events.

**Unit III**

**Fitness and Weight management:** Definition, Components of physical fitness , health and related terms,Understanding Fitness, Parameters of fitness, Types of fitness, health related physical fitnesss, performance related physical fitness, activities for developing physical fitness, Fitness Tests,Assessment of fitness, B**o**dy types and posture,assessment of fitness, Anthropometry, Approaches for keeping fit. Diet and exercise for weight management, Fad diets, Principles of planning weight reducing diets

**Unit IV**

 **Health and nutrition-** Importance of nutrition,Nutritional guidelines for health and fitness

• Nutritional supplements, Elements of nutrition, Balanced Diet and malnutrition, Energy allowances for different activities in sports, Nutritional Demands of Sports and Dietary Recomendations, Ergogenic Aids for Training and Competition.

**Unit V**

**Sports nutrition** **–**Introduction to kinanthropometry, Requirements during training and performance for athletes and endurance games, aerobic and anaerobic exercise, fuel for exercise, glycogen load. Exercise to maintain fitness. Health club equipments & activities – Tread mill, hammer strength, steppers, cycles, body sculpting, kick boxing, Reebok ridge rocker, hanging, hand grips, swing, climbing and lifting weight.

**Reference Books:**

1. Sizer F, Eleanor Whitney - Nutrition concepts and controversies, Eighth Edition (2000).
2. Narayan dash B – Health & physical education, 1st edition, 2003, Neelkamal publications, Hyderabad.
3. 3. Krause‟s– Food ,Nutrition and Diet therapy 6th Edition WB Saunders company, London.
4. Wardlaw, Smith. Contemporary Nutrition: A Functional Approach. 2nd ed: 2012.Mc Graw Hill.
5. Williams Melvin. Nutrition for health, fitness and sports. 2004.Mc Graw Hill
6. Joshi AS. Nutrition and Dietetics 2010. Tata Mc Graw Hill.

**CBCS/SEMESTER SYSTEM (2020-21) - V SEMESTER B.Sc. FOOD SCIENCE AND NUTRITION**

**SEC-4 Lab: SPORTS NUTRITION (**PRACTICALS)

**Hours of instruction per week: 2 Credits:2**

**Internals: 0 Sem End Examination: 50**

1. Energy allowances for various sport events and the tips for pre-event meal.
2. Determining the dietary recommendations for important nutrients for a sports person.
3. Nutritional ergogenic aids in sports nutrition and their limits.
4. Explanation of the principle of 3R's to be followed after the event for recovery process. (Rehydration, refueling and rest).
5. Body composition assessment in athelets.
6. Assessment of work capacity in sports persons.
7. Assessment of fitness any two tests (Cardiovascular endurance and muscular endurance)
8. Visit to a health club / fitness centre.
9. Observation of physical training for sports person.
10. Compulsory and important Yoga exercises for sports persons.

**Domain-II: NUTRITION- Group-C**

**CBCS/SEMESTER SYSTEM (2020-21)- V SEMESTER B.Sc., FOOD SCIENCE AND NUTRITION**

**SEC-5: FUNCTIONAL FOODS AND NUTRACEUTICALS** (THEORY)

**Hours of instruction 3 per week Credits 3**

**Internals : 25 Sem end exam: 75**

**Objectives:** To enable the students

1. To develop comprehensive understanding of different nutraceuticals and functional
2. foods
3. To understand phytochemical components and its management on health and diseases.
4. To understand the potential of various functional foods in promoting human health

**Unit I**

Functional foods and Nutraceuticals -Definitions, sources, Health benefits, bioactive components of functional foods. Development of functional foods, challenges and safety considerations, Future trends of functional foods. Dietary supplements and fortified foods- need, health benefits adverse effects

**Unit II**

Functional foods of animal origin: Diary products, sea foods, egg, Functional foods of plant origin: fruits, vegetables, nuts, spices, cereals, beverages. Probiotics, prebiotics and synbiotics as functional foods, Effects of probiotics on health.

**Unit III**

Types of functional foods**:** whole foods, enriched foods, enhanced foods, fortified foods, modified foods. Market of functional foods, Challenges for Functional food delivery, Factors affecting consumer interest.

**Unit IV**

Diet and disease relationship – nutrition and health claims, Food component – approved health claims, labeling considerations for functional ingredients, Permissible and impermissible functional claims, Role of biotechnology in the development of functional foods.

**Unit V**

Nutraceutical compounds – Phytochemicals, phytosterols and other bioactive compounds, peptides and proteins, carbohydrates, prebiotics, probiotics and synbiotics, lipids, vitamins and minerals; their sources and role in promoting human health.

**References:**

Text Book(s)

1. N. Shakuntalamanay and M. Shadaksharaswam, Food Facts and Principles,

3/e, New Age International, 2008.

2. L. Branen, P. M. Davidson and S. Salminen, Food Additives. 2/e, Marcel

Dekker, 2001.

3. B. Gerorge, Encyclopedia of Food and Color Additives, Vol. III, CRC Press,

1996.

References

1. A. B. Gerorge. Fenaroli's Handbook of Flavor Ingredients. 5/e,.CRC Press,

2004.

2. D. L. Madhavi, S. S. Deshpande and D. K. Salunkhe, Food Antioxidants:

Technological, Toxicological and Health Perspective. CRC press, 1995.

3. I. D. Morton and A. J. Macleod, Food Flavours, Part C, Elsevier, 1990

**CBCS/SEMESTER SYSTEM (2020-21) - V SEMESTER**

**B. Sc., FOOD SCIENCE AND NUTRITION**

**SEC-5 Lab: FUNCTIONAL FOODS AND NUTRACEUTICALS** (PRACTICAL)

**Hours of instruction per week: 2 Credits: 2**

**Internals: 0 Sem end examination 50 Marks**

1. Market research analysis of functional foods
2. Market survey of locally available functional foods
3. Formulation of the functional foods and assessment of its nutritional value.
4. Formulation of the food products using nutraceuticals
5. Shelf life studies on developed functional foods

**Domain-II: NUTRITION- Group-C**

**CBCS/SEMESTER SYSTEM (2020-21)- V SEMESTER B.Sc., FOOD SCIENCE AND NUTRITION**

**SEC-6: FOOD SERVICE FACILITIES PLANNING**  (THEORY)

**Hours of instruction 3 per week credits 3**

**Internals: 25 Sem end examination 75 Marks**

**Objectives:** To enable the students

1. To understand the principles of planning, organizing and controlling in food service institutions.
2. Develop skills in meal planning to catering institutions .
3. Understand the principles of sanitation and hygiene.

**UNIT-I**

Food service facilities planning: Introduction, Design & layout. Planning: Characteristics, scope, objectives, facilitating production, materials handling, space utilization, maintenance and cleaning, cost control, investment in equipment; labour utilization, supervision, flexibility.

**UNIT-II**

The planning process: Preliminary planning information, prospectus, commissioning planners, developing the concept, equipment requirements, space requirements, developing preliminary plans, preparation of final plans, preparing specifications, bidding & awarding contracts, constructions. Preparing the prospectus: Importance, customer & user characteristics, development of the menu, service, atmosphere, operational Characteristics. The feasibility study: Importance, the market survey, site analysis, cost estimates, operating capital, projected income.

**UNIT-III**

Functional planning: Functions, concepts of flow, functional requirements, receiving, storage, preparation, cooking, baking, serving, dishwashing, pot & pan washing, waste disposal, other requirements. Planning the atmosphere: Atmosphere & mood, color, lighting, acoustics, noise and music, climate control, furnishings, exterior design, advertising & public relations.

**UNIT-IV**

Work place design: Developing work places, work place environment, concepts of motion economy, materials handling, designing safe work places. Equipment requirements: Methods, equipments check list, broilers, griddles, ovens, ranges, steam-jacketed kettles, steamers, ware washing equipments. Waste disposals, equipment selection.

**UNIT-V**

Space requirements: Introduction, space estimates, total facility size, dining areas, production areas, space calculations, receiving area, storage areas, serving areas dining areas. Layout facilities: Space arrangement, flow, other criteria for layout, layout configurations, relationship charts for layout, layout guides, layout of storage areas, layout of main cooking areas, layout of preparation areas, layout of serving areas, layout of dishwashing areas.

**REFERENCE TEXT:**

1. How to Plan & Operate a Restaurant - Dukas.P - Hayden book Co.

2. Profitable Food & Beverage Management Planning-Green E.F., Drake G.G. and Sweeney F.J -- Hayden book Co.

3. Financial Management for the Hospitality Industry - Caiman M.M - Cbt Publishing Co.

4. Quantity Food Production, Planning & Management - Knight.J and Kotschevar L.H - CBI Publishing Co.

5. Sound, Noise & Vibration Control - Yerges L.F - Van Nostrand Reinhold.

6. Work Analysis and Designs for Hotels, Restaurants & Institutions - Kazarian E.A -

AVI Publishing Co.

7. A Modem Guide to Food Service Equipments - AveryA.C - CR1 Publishing Co.

8. Food Service Planning: Equipment & Layout - Kotschcvar l.h & Terrell.M.E

- John Willey & Sons.

9. Systematic Layout Planning - Muther. R – Cahners Publishing Co

10. Food Service Facilities Planning - Edward A. Kazarian - Van Nostrand reinhold.

**CBCS/SEMESTER SYSTEM- VI SEMESTER**

**B.Sc., FOOD SCIENCE AND NUTRITION**

**SEC-6 Lab: FOOD SERVICE FACILITIES PLANNING**  (PRACTICAL)

**Hours of instruction 2 per week credits2**

**Internals: 0 Sem end examination 50 Marks**

1. Visit to a restaurant/food catering unit and report the observations.
2. Plan a layout and design for baking industry.
3. Plan an equipment design for any food service establishment.
4. Pattern of advertising followed in different industries.
5. Handling and usage of various equipment in food processing equipment.

**choice based credit system-Academic year 2020-21**

**B.SC. (FOOD SCIENCE AND NUTRITION) COURSE STRUCTURE**

**SEMESTER –Vi**

**Apprenticeship / Industrial Training**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **S.No** | **Course** | **Total Mark** | **Mid Sem** | **Sem End Exam** | **Teaching Hours** | **Credits** |
| 1 | **Apprenticeship / Internship in Hospital/Industrial Training/On the job Training** | 400 | 0 | 400 | 0 | 12 |
|  | **TOTAL** | **400** | **0** | **400** | **0** | **12** |

**CBCS/Semester System (2020-21) - VI Semester Syllabus**

**B.Sc., FOOD SCIENCE AND NUTRITION**

**APPRENTICESHIP/INTERNSHIP /ON THE JOB TRAINING**

**Hours of instruction: 0 Credits: 12**

**Internals : 0 Sem end exam: 400**

**Objectives:** To enable the students

1. To acquire professional skills in various fields of food industry and diet consultant in hospitals and public health Institutions.
2. To become an entrepreneur by starting his own startup.

Every candidate shall undergo professional training for 120 days in Hospitals / Large scale/Small scale food industries / Food processing units in VI Semester of the course. At the end of the professional training the student has to submit a report for which viva will be conducted both by Internal and External Examiners.