

# **SYLLABUS**

**(APPROVED BY ANDHRA UNIVERSITY)**

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

**(w.e.f- 2020-21)**

**CHOICE BASED CREDIT SYSTEM-AC ADEMIC YEAR 2020-21**  
**B.SC. (FOOD SCIENCE AND NUTRITION) COURSE STRUCTURE**

**SEMESTER –I**

<b>S.No</b>	<b>Course</b>	<b>Total Mark</b>	<b>Mid Sem</b>	<b>Sem End Exam</b>	<b>Teaching Hours</b>	<b>Credits</b>
1	First Language (Telugu/Hindi/Urdu/Sanskrit)	100	25	75	4	3
2	Second Language <b>English</b>	100	25	75	4	3
3	Life Skill Courses (any 1 of 3) <b>HVPE (Human Values &amp; Professional Ethics) / Computer Application/ Entrepreneurship</b>	50	0	50	2	2
4	Skill Development Courses (Any One) i) <b>Electrical Appliances (Physics) /</b> ii) <b>Plant Nursery (Botany)</b>	50	0	50	2	2
5	DSC-1, Paper-1 (Core) <b>Food Science (THEORY)</b>	100	25	75	4	4
6	DSC-1, Paper-1 Lab <b>Food Science (PRACTICAL)</b>	50	0	50	2	1
7	DSC-1, Paper-2 (Core) <b>Chemistry-I (THEORY)</b>	100	25	75	4	4
8	DSC-1, Paper-2 Lab <b>Chemistry-I (PRACTICAL)</b>	50	0	50	2	1
9	DSC-1, Paper-3 (Core) <b>Chemistry of Foods (THEORY)</b>	100	25	75	4	4
10	DSC-1, Paper-3 Lab <b>Chemistry of Foods (PRACTICAL)</b>	50	0	50	2	1
	<b>Total</b>	<b>750</b>	<b>125</b>	<b>625</b>	<b>30</b>	<b>25</b>

**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 <b>English</b>	100	25	75	4	3
3	Life Skill Courses (any 1 of 3) <b>i) Indian Culture and Science/ ii)</b> <b>ii) Information&amp;Communication</b> <b>Technology-1 (ICT)-1/</b> <b>iii) Elementary Statistics</b>	50	0	50	2	2
4	Skill Development Courses ( <b>Any 2</b> ) <b>i) Solar Energy (Physics)</b> <b>ii) Fruit &amp; Vegetable Preservation</b> <b>(Botany)</b> <b>iii) Dairy Techniques (Zoology)</b> <b>iv) Food Adulteration (Chemistry)</b>	50	0	50	2	2
		50	0	50	2	2
5	DSC-2, Paper – 1 (Core) <b>Human Physiology (THEORY)</b>	100	25	75	4	4
6	DSC-2, Paper-1 Lab: <b>Human Physiology (PRACTICAL)</b>	50	0	50	2	1
7	DSC-2, Paper – 2 (Core) <b>Chemistry –2 (THEORY)</b>	100	25	75	4	4
8	DSC-2, Paper – 2 Lab: <b>Chemistry – 2 (PRACTICAL)</b>	50	0	50	2	1
9	DSC-2, Paper – 3 (Core) <b>Principles of Nutrition</b>	100	25	75	4	4
10	DSC-2, Paper – 3: Lab: <b>Principles of Nutrition</b> (PRACTICAL)	50	0	50	2	1
	Total	<b>800</b>	<b>125</b>	<b>675</b>	<b>32</b>	<b>27</b>

**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 <b>English</b>	100	25	75	4	3
3	Life Skill Courses a) (any 1 of 3) i) Analytical Skills/ ii) Personality Development and Leadership iii) Health and Hygiene	50	0	50	2	2
	b) Environmental Education (compulsory)	50	0	50	2	2
4	Skill Development Courses (Any One) i) Environment Audit (Chemistry) ii) Poultry Farming (Zoology)	50	0	50	2	2
5	DSC-3, Paper-1 (CORE) <b>Bio Chemistry-1 (THEORY)</b>	100	25	75	4	4
6	DSC-3, Paper-1 Lab <b>Bio Chemistry- I(PRACTICAL)</b>	50	0	50	2	1
7	DSC-3 Paper-2 (CORE) <b>Nutrition in Health (THEORY)</b>	100	25	75	4	4
8	DSC-3, Paper-2 Lab <b>Nutrition in Health (PRACTICAL)</b>	50	0	50	2	1
9	DSC-3, Paper – 3 (Core) <b>Food Microbiology (THEORY)</b>	100	25	75	4	4
10	DSC-3, Paper – 3 Lab <b>Food Microbiology(PRACTICAL)</b>	50	0	50	2	1
11	<b>Yoga</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>1</b>
	<b>Total</b>	<b>800</b>	<b>125</b>	<b>675</b>	<b>32</b>	<b>28</b>

**CHOICE BASED CREDIT SYSTEM-ACADEMIC YEAR 2020-21**  
**B.S.C., FOOD SCIENCE AND NUTRITION COURSE STRUCTURE**

**SEMESTER –IV**

<b>S. No</b>	<b>Course</b>	<b>Total Mark</b>	<b>Mid Sem</b>	<b>Sem End Exam</b>	<b>Teaching Hours</b>	<b>Credits</b>
1	DSC-4, Paper-1 (CORE) <b>Bio Chemistry-II (THEORY)</b>	100	25	75	4	4
2	DSC-4, Paper-1 Lab: <b>Bio Chemistry-II (PRACTICAL)</b>	50	0	50	2	1
3	DSC-4, Paper 2 (CORE) <b>Dietetics (THEORY)</b>	100	25	75	4	4
4	DSC-4, Paper-2 Lab: <b>Dietetics (PRACTICAL)</b>	50	0	50	2	1
5	DSC-4, Paper-3 (Core) <b>Food Packaging (THEORY)</b>	100	25	75	4	4
6	DSC-4, Paper-3 Lab: <b>Food Packaging(PRACTICAL)</b>	50	0	50	2	1
7	DSC-4 Paper-4 (core) <b>Community Nutrition (THEORY)</b>	100	25	75	4	4
8	DSC-4, Paper-4 Lab: <b>Community Nutrition(PRACTICAL)</b>	50	0	50	2	1
9	DSC-4 Paper-5 (Core) <b>Food Safety and Quality Control (THEORY)</b>	100	25	75	4	4
10	DSC-4, Paper-5 Lab: <b>Food Safety and Quality Control (PRACTICAL)</b>	50	0	50	2	1
11	DSC-4 Paper-6 (core) <b>Food Processing and Preservation (THEORY)</b>	100	25	75	4	4
12	DSC-4, Paper-6 Lab: <b>Food Processing and Preservation (PRACTICAL)</b>	50	0	50	2	1
13	<b>NCC/NSS/SPORTS/EXTRA CURRICULAR</b>	0	0	0	0	2
14	<b>YOGA</b>	0	0	0	0	1
	<b>Total</b>	<b>900</b>	<b>150</b>	<b>750</b>	<b>36</b>	<b>33</b>

**CHOICE BASED CREDIT SYSTEM-ACADEMIC YEAR 2020-21**  
**B.SC., FOOD SCIENCE AND NUTRITION COURSE STRUCTURE**

**SEMESTER –V**

S. No	Course	Total Mark	Mid Sem	Sem End Exam	Teaching Hours	Credits
1	DSC-5, Paper-1 (Core) <b>Post Harvest Technology (THEORY)</b>	100	25	75	4	4
2	DSC-5, Paper-1 (Lab): <b>Post Harvest Technology (PRACTICAL)</b>	50	0	50	2	1
3	DSC-5, Paper-2 (Core) <b>Fermentation Technology (THEORY)</b>	100	25	75	4	4
4	DSC-5, Paper-2 (Lab): <b>Fermentation Technology (PRACTICAL)</b>	50	0	50	2	1
5	DSC-5, Paper-3 (Core) <b>Dairy Technology (THEORY)</b>	100	25	75	4	4
6	DSC-5, Paper-3 (Lab): <b>Dairy Technology (PRACTICAL)</b>	50	0	50	2	1
7	DSC-5, Paper-4 (Core) <b>Nutrition in Critical Care (THEORY)</b>	100	25	75	4	4
8	DSC-5, Paper-4 (Lab): <b>Nutrition in Critical Care (PRACTICAL)</b>	50	0	50	2	1
9	DSC-5, Paper-5 (Core) <b>Health and Fitness (THEORY)</b>	100	25	75	4	4
10	DSC-5, Paper-5 (Lab): <b>Health and Fitness (PRACTICAL)</b>	50	0	50	2	1
11	DSC-5, Paper-6 (Core) <b>Functional Foods and Nutraceuticals (THEORY)</b>	100	25	75	4	4
12	DSC-5, Paper-6 (Lab): <b>Functional Foods and Nutraceuticals (PRACTICAL)</b>	50	0	50	2	1
	<b>Total</b>	<b>900</b>	<b>150</b>	<b>750</b>	<b>36</b>	<b>30</b>

**CHOICE BASED CREDIT SYSTEM-ACADEMIC YEAR 2020-21**  
**B.SC., FOOD SCIENCE AND NUTRITION COURSE STRUCTURE**

**SEMESTER –VI**

**(Apprenticeship/ Internship/ Industrial Training)**

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

**CHOICE BASED CREDIT SYSTEM-AC ADEMIC YEAR 2020-21****B.SC. (FOOD SCIENCE AND NUTRITION) COURSE STRUCTURE****SEMESTER –I**

<b>S.No</b>	<b>Course</b>	<b>Total Mark</b>	<b>Mid Sem</b>	<b>Sem End Exam</b>	<b>Teaching Hours</b>	<b>Credits</b>
1	First Language (Telugu/Hindi/Urdu/Sanskrit)	100	25	75	4	3
2	Second Language <b>English</b>	100	25	75	4	3
3	Life Skill Courses (any 1 of 3) <b>HVPE (Human Values &amp; Professional Ethics) / Computer Application/ Entrepreneurship</b>	50	0	50	2	2
4	<b>Skill Development Courses (Any One)</b> i) Electrical Appliances (Physics) / ii) Plant Nursery (Botany)	50	0	50	2	2
5	DSC-1, Paper-1 (Core) <b>Food Science (THEORY)</b>	100	25	75	4	4
6	DSC-1, Paper-1 Lab <b>Food Science (PRACTICAL)</b>	50	0	50	2	1
7	DSC-1, Paper-2 (Core) <b>Chemistry-I (THEORY)</b>	100	25	75	4	4
8	DSC-1, Paper-2 Lab <b>Chemistry-I (PRACTICAL)</b>	50	0	50	2	1
9	DSC-1, Paper-3 (Core) <b>Chemistry of Foods (THEORY)</b>	100	25	75	4	4
10	DSC-1, Paper-3 Lab <b>Chemistry of Foods (PRACTICAL)</b>	50	0	50	2	1
	<b>Total</b>	<b>750</b>	<b>125</b>	<b>625</b>	<b>30</b>	<b>25</b>



**CBCS/Semester System (2020-21) - I Semester Syllabus  
B.Sc. FOOD SCIENCE AND NUTRITION**

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

**Teaching Hours: 4 Hours / week (Total - 60 Hours)**  
**Mid Sem Exam: 25 Marks**

**Credits: 4**  
**Sem End exam: 75 Marks**

**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 (12 Hours)**

**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 (12 Hours)**

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 (12 Hours)**

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 (12 Hours)**

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 (12 Hours)**

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. Orient Longmans Ltd.
7. Food Fundamentals by MacWilliams, 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)**

**Teaching Hours: 2 Hours / week**  
**Mid Sem Exam: 0 Marks**

**Credits: 1**  
**Sem End exam: 50 Marks**

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)**

**Teaching Hours: 4 Hours / week (Total - 60 Hours)**  
**Mid Sem Exam: 25 Marks**

**Credits: 4**  
**Sem End exam: 75 Marks**

**Objectives:** To enable student

1. To understand the basics of chemical bonding and configurations.
2. Synthesis of silicones, fuel gases and their application
3. Application of fertilizers and important dyes.

**Unit I (12 Hours)**

Chemical Bonding, Molecular orbital theory, bonding, antibonding and non-bonding orbitals. Molecular orbitals. MO configuration of H<sub>2</sub>, N<sub>2</sub>, O<sub>2</sub>, F<sub>2</sub>. Bond order. Diamagnetism and para magnetism.

**Unit II (12 Hours)**

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 (12 Hours)**

1. Covalent bond: orbital overlap, hybridization, geometry of organic molecules- CH<sub>4</sub>, C<sub>2</sub>H<sub>4</sub>, C<sub>2</sub>H<sub>2</sub>, C<sub>6</sub>H<sub>6</sub>. Inductive effect. Electrometric, mesomeric, hyperconjugative 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 (12 Hours)**

1. Terms: chromophore, auxochrome, bathochromic shift, hypsochromic shift, hyperchromic effect, hypsochromic effect.
2. Dyes: azo and triphenylmethane dyes- Preparation one example.

## **Unit V (12 Hours)**

1. Solutions types. Liquid in Liquid. Raoult's law. Deviation from ideal behavior. Binary liquid mixtures. Fractional distillation.
2. Kinetics Rate, order, molecularity, 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. Gillespie and P.L. Pople

**CBCS/Semester System (2020-21) - I Semester Syllabus  
B.Sc. FOOD SCIENCE AND NUTRITION**

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

**Teaching Hours: 2 Hours / week  
Mid Sem Exam: 0 Marks**

**Credits: 1  
Sem End exam: 50 Marks**

**VOLUMETRIC ANALYSIS:**

1. Estimation of sodium hydroxide using standard oxalic acid.
2. Estimation of hydrochloric acid using Sodium carbonate.
3. Estimation of Mohr's salt by dichrometry.
4. Estimation of  $\text{KMNO}_4$  by using oxalic acid.
5. Estimation of Vitamin C
4. Estimation of Iron in Iron Supplements.

**CBCS/Semester System (2020-21) - I Semester Syllabus  
B.Sc. FOOD SCIENCE AND NUTRITION**

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

**Teaching Hours: 4 Hours / week (Total - 60 Hours)**  
**Mid Sem Exam: 25 Marks**

**Credits: 4**  
**Sem End exam: 75 Marks**

**Objectives:** To enable students

1. To understand the chemistry of foods - composition of food, role of each component and their interaction.
2. To understand the functional aspects of food components and to study their role in food processing.

**UNIT – I (12 Hours)**

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

**UNIT –II (12 Hours)**

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 (12 Hours)**

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 (12 Hours)**

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 (12 Hours)**

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 Fundamentals by MacWilliams, John Willy and son's, New York.
8. Food Facts & Principles by Shakunthala manay & Shadakhswamy.
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)**

**Teaching Hours: 2 Hours / week**  
**Mid Sem Exam: 0 Marks**

**Credits: 1**  
**Sem End exam: 50 Marks**

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 P<sup>H</sup> 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 <b>English</b>	100	25	75	4	3
3	Life Skill Courses (any 1 of 3) <b>i) Indian Culture and Science/ ii)</b> <b>ii) Information&amp;Communication</b> <b>Technology-1 (ICT)-1/</b> <b>iii) Elementary Statistics</b>	50	0	50	2	2
4	Skill Development Courses ( <b>Any 2</b> ) <b>i) Solar Energy (Physics)</b> <b>ii) Fruit &amp; Vegetable Preservation</b> <b>(Botany)</b> <b>iii) Dairy Techniques (Zoology)</b> <b>iv) Food Adulteration (Chemistry)</b>	50	0	50	2	2
		50	0	50	2	2
5	DSC-2, Paper – 1 (Core) <b>Human Physiology (THEORY)</b>	100	25	75	4	4
6	DSC-2, Paper-1 Lab: <b>Human Physiology (PRACTICAL)</b>	50	0	50	2	1
7	DSC-2, Paper – 2 (Core) <b>Chemistry –2 (THEORY)</b>	100	25	75	4	4
8	DSC-2, Paper – 2 Lab: <b>Chemistry – 2 (PRACTICAL)</b>	50	0	50	2	1
9	DSC-2, Paper – 3 (Core) <b>Principles of Nutrition</b>	100	25	75	4	4
10	DSC-2, Paper – 3: Lab: <b>Principles of Nutrition</b> (PRACTICAL)	50	0	50	2	1
	Total	<b>800</b>	<b>125</b>	<b>675</b>	<b>32</b>	<b>27</b>

**CBCS/Semester System (2020-21) - II Semester Syllabus  
B.Sc., FOOD SCIENCE AND NUTRITION**

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

**Teaching Hours: 4 Hours / week (Total - 60 Hours)**  
**Mid Sem Exam: 25 Marks**

**Credits: 4**  
**Sem End exam: 75 Marks**

**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 (12 Hours)**

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 (12 Hours)**

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

**UNIT-III (12 Hours)**

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 (12 Hours)**

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 (12 Hours)**

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)**

**Teaching Hours: 2 Hours / week**  
**Mid Sem Exam: 0 Marks**

**Credits: 1**  
**Sem End exam: 50 Marks**

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)**

**Teaching Hours: 4 Hours / week (Total - 60 Hours)**  
**Mid Sem Exam: 25 Marks**

**Credits: 4**  
**Sem End exam: 75 Marks**

**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 (12 Hours)**

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 (12 Hours)**

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 (12 Hours)**

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

**Unit IV (12 Hours)**

Energetics: Definition of first law thermodynamics. Types of systems. 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 (12 Hours)**

Electrochemistry: Measurement of conductance. Kohlrausch's law. pH determination. 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. Principles 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)**

**Teaching Hours: 2 Hours / week**  
**Mid Sem Exam: 0 Marks**

**Credits: 1**  
**Sem End exam: 50 Marks**

**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)**

**Teaching Hours: 4 Hours / week (Total - 60 Hours)**  
**Mid Sem Exam: 25 Marks**

**Credits: 4**  
**Sem End exam: 75 Marks**

**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 (12 Hours)**

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 (12 Hours)**

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 (12 Hours)**

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, B12 and Vitamin C - functions, source, requirements and deficiency disorders.

**UNIT-IV (12 Hours)**

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 (12 Hours)**

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)**

**Teaching Hours: 2 Hours / week  
Mid Sem Exam: 0 Marks**

**Credits: 1  
Sem End exam: 50 Marks**

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.

**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 <b>English</b>	100	25	75	4	3
3	Life Skill Courses a) (any 1 of 3) i) Analytical Skills/ ii) Personality Development and Leadership iii) Health and Hygiene	50	0	50	2	2
	b) Environmental Education (compulsory)	50	0	50	2	2
4	Skill Development Courses (Any One) i) Environment Audit (Chemistry) ii) Poultry Farming (Zoology)	50	0	50	2	2
5	DSC-3, Paper-1 (CORE) <b>Bio Chemistry-1 (THEORY)</b>	100	25	75	4	4
6	DSC-3, Paper-1 Lab <b>Bio Chemistry- I(PRACTICAL)</b>	50	0	50	2	1
7	DSC-3 Paper-2 (CORE) <b>Nutrition in Health (THEORY)</b>	100	25	75	4	4
8	DSC-3, Paper-2 Lab <b>Nutrition in Health (PRACTICAL)</b>	50	0	50	2	1
9	DSC-3, Paper – 3 (Core) <b>Food Microbiology (THEORY)</b>	100	25	75	4	4
10	DSC-3, Paper – 3 Lab <b>Food Microbiology(PRACTICAL)</b>	50	0	50	2	1
11	<b>Yoga</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>1</b>
	<b>Total</b>	<b>800</b>	<b>125</b>	<b>675</b>	<b>32</b>	<b>28</b>

**CBCS/Semester System (2020-21)-III Semester Syllabus  
B.Sc. FOOD SCIENCE AND NUTRITION**

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

**Teaching Hours: 4 Hours / week (Total - 60 Hours)**  
**Mid Sem Exam: 25 Marks**

**Credits: 4**  
**Sem End exam: 75 Marks**

**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 (12 Hours)**

**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 (12 Hours)**

**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 (12 Hours)**

**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 (12 Hours)**

**Vitamins: Structure and biochemical role:**

Fat soluble vitamins – A, D

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

## **UNIT 5 (12 Hours)**

### **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)**

**Teaching Hours: 2 Hours / week**  
**Mid Sem Exam: 0 Marks**

**Credits: 1**  
**Sem End exam: 50 Marks**

**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)**

**Teaching Hours: 4 Hours / week (Total - 60 Hours)**  
**Mid Sem Exam: 25 Marks**

**Credits: 4**  
**Sem End exam: 75 Marks**

**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 (12 Hours)**

Basic Principles of Meal Planning –Basic Principles & factors to be consider while planning 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 (12 Hours)**

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 (12 Hours)**

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 (12 Hours)**

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 (12 Hours)**

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)**

**Teaching Hours: 2 Hours / week**  
**Mid Sem Exam: 0 Marks**

**Credits: 1**  
**Sem End exam: 50 Marks**

1. Standardization of portions for cooked food.
2. Preparation and serving the planned menu for men and women of different occupations.
3. Planning a low cost balanced menu for a pregnant mother and display.
4. Planning a low cost balanced menu for a lactating mother and display.  
Calculation of nutritive value for the prepared menu.
5. Planning and preparing diet for infants and preschool children
6. Packed lunch planning for school going children.
7. Menu planning for and adolescent girls and boys.
8. Menu planning for adult Man and Woman (moderate man and sedentary woman).
9. 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 MICROBIOLOGY (THEORY)**

**Teaching Hours: 4 Hours / week (Total - 60 Hours)**  
**Mid Sem Exam: 25 Marks**

**Credits: 4**  
**Sem End exam: 75 Marks**

**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 (12 Hours)**

**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 (12 Hours)**

**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 (12 Hours)**

**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 (12 Hours)**

**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 (12 Hours)**

**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) -III Semester Syllabus  
B.Sc. FOOD SCIENCE AND NUTRITION**

**DSC- 3, Paper-3 Lab: FOOD MICROBIOLOGY (PRACTICAL)**

**Teaching Hours: 2 Hours / week**  
**Mid Sem Exam: 0 Marks**

**Credits: 1**  
**Sem End exam: 50 Marks**

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 microorganisms
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.S.C., FOOD SCIENCE AND NUTRITION COURSE STRUCTURE**

**SEMESTER –IV**

<b>S. No</b>	<b>Course</b>	<b>Total Mark</b>	<b>Mid Sem</b>	<b>Sem End Exam</b>	<b>Teaching Hours</b>	<b>Credits</b>
1	DSC-4, Paper-1 (CORE) <b>Bio Chemistry-II (THEORY)</b>	100	25	75	4	4
2	DSC-4, Paper-1 Lab: <b>Bio Chemistry-II (PRACTICAL)</b>	50	0	50	2	1
3	DSC-4, Paper 2 (CORE) <b>Dietetics (THEORY)</b>	100	25	75	4	4
4	DSC-4, Paper-2 Lab: <b>Dietetics (PRACTICAL)</b>	50	0	50	2	1
5	DSC-4, Paper-3 (Core) <b>Food Packaging (THEORY)</b>	100	25	75	4	4
6	DSC-4, Paper-3 Lab: <b>Food Packaging(PRACTICAL)</b>	50	0	50	2	1
7	DSC-4 Paper-4 (core) <b>Community Nutrition (THEORY)</b>	100	25	75	4	4
8	DSC-4, Paper-4 Lab: <b>Community Nutrition(PRACTICAL)</b>	50	0	50	2	1
9	DSC-4 Paper-5 (Core) <b>Food Safety and Quality Control (THEORY)</b>	100	25	75	4	4
10	DSC-4, Paper-5 Lab: <b>Food Safety and Quality Control (PRACTICAL)</b>	50	0	50	2	1
11	DSC-4 Paper-6 (core) <b>Food Processing and Preservation (THEORY)</b>	100	25	75	4	4
12	DSC-4, Paper-6 Lab: <b>Food Processing and Preservation (PRACTICAL)</b>	50	0	50	2	1
13	<b>NCC/NSS/SPORTS/EXTRA CURRICULAR</b>	0	0	0	0	2
14	<b>YOGA</b>	0	0	0	0	1
	<b>Total</b>	<b>900</b>	<b>150</b>	<b>750</b>	<b>36</b>	<b>33</b>

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

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

**Teaching Hours: 4 Hours / week (Total - 60 Hours)**  
**Mid Sem Exam: 25 Marks**

**Credits: 4**  
**Sem End exam: 75 Marks**

**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 (12 Hours)**

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

**Unit II (12 Hours)**

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

**Unit III (12 Hours)**

**Metabolism of proteins:** Dynamic equilibrium, nitrogen balance, essential Amino acids, Glycogenic, Ketogenic, and both glycogenic and ketogenic amino acids. Oxidation of amino acids- Transamination, Deamination-Oxidative, Non-oxidative, Decarboxylation. Metabolism of carbon skeleton, Metabolism of ammonia -Glutamine pathway, Urea cycle.

**Unit IV (12 Hours)**

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: (12 Hours)**

**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)**

**Teaching Hours: 2 Hours / week**  
**Mid Sem Exam: 0 Marks**

**Credits: 1**  
**Sem End exam: 50 Marks**

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)**

**Teaching Hours: 4 Hours / week (Total - 60 Hours)**  
**Mid Sem Exam: 25 Marks**

**Credits: 4**  
**Sem End exam: 75 Marks**

**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 (12 Hours)**

**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 (12 Hours)**

**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 (12 Hours)**

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 (12 Hours)**

**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 (12 Hours)**

**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 Nutrition, 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. Carolyn 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)**

**Teaching Hours: 2 Hours / week**  
**Mid Sem Exam: 0 Marks**

**Credits: 1**  
**Sem End exam: 50 Marks**

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)**

**Teaching Hours: 4 Hours / week (Total - 60 Hours)**  
**Mid Sem Exam: 25 Marks**

**Credits: 4**  
**Sem End exam: 75 Marks**

**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 (12 Hours)**

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

**UNIT II (12 Hours)**

**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 (12 Hours)**

**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 (12 Hours)**

**Packages of dehydrated products:**

Orientation, metallization, co-extrusion of multilayer films, stretch, package forms and techniques. Aspective 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 (12 Hours)**

**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. Stanley 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)**

**Teaching Hours: 2 Hours / week**  
**Mid Sem Exam: 0 Marks**

**Credits: 1**  
**Sem End exam: 50 Marks**

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)**

**Teaching Hours: 4 Hours / week (Total - 60 Hours)**  
**Mid Sem Exam: 25 Marks**

**Credits: 4**  
**Sem End exam: 75 Marks**

**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 (12 Hours)**

**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 (12 Hours)**

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 (12 Hours)**

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 (12 Hours)**

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 (12 Hours)**

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. Jelliffe 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, Bapla, 1971.
7. Dahama OP and Bhatnagar OP Education 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 SCIENCE AND NUTRITION**

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

**Teaching Hours: 2 Hours / week**  
**Mid Sem Exam: 0 Marks**

**Credits: 1**  
**Sem End exam: 50 Marks**

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.
4. Estimation of clinical parameters like, blood glucose, hemoglobin to assess health status.
5. 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.
6. Preparation of visual aids.
7. Field visit to (a) Observe the working of nutrition and health oriented programmes (survey based result).
8. Hospitals to observe nutritional deficiencies.

**CBCS/Semester System (2020-21)-IV Semester Syllabus  
B.Sc. FOOD SCIENCE AND NUTRITION**

**DSC-4, Paper-5: FOOD SAFETY AND QUALITY CONTROL (THEORY)**

**Teaching Hours: 4 Hours / week (Total - 60 Hours)**  
**Mid Sem Exam: 25 Marks**

**Credits: 4**  
**Sem End exam: 75 Marks**

**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 (12 Hours)**

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 (12 Hours)**

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 (12 Hours)**

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

**UNIT-IV (12 Hours)**

**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 (12 Hours)**

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) - IV SEMESTER  
B. Sc FOOD SCIENCE AND NUTRITION**

**DSC-4, Paper-5: FOOD SAFETY AND QUALITY CONTROL  
(PRACTICAL)**

**Teaching Hours: 2 Hours / week  
Mid Sem Exam: 0 Marks**

**Credits: 1  
Sem End exam: 50 Marks**

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. Case study on food safety issues – ICDS/MDM, Diarrheal outbreak / any other.

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

**DSC-4, Paper-6: FOOD PROCESSING AND PRESERVATION (THEORY)**

**Teaching Hours: 4 Hours / week (Total - 60 Hours)**  
**Mid Sem Exam: 25 Marks**

**Credits: 4**  
**Sem End exam: 75 Marks**

**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 (12 Hours)**

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 (12 Hours)**

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

**UNIT III (12 Hours)**

Methods of Processing of milk & milk products-

**UNIT IV (12 Hours)**

Methods of Fruits and Vegetables processing.

**UNIT V (12 Hours)**

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. 2<sup>nd</sup> Ed. Bangalore.
5. Potter NH and Hotchkiss JH (1996) Food Science. 5<sup>th</sup> 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) - IV SEMESTER  
B. Sc., FOOD SCIENCE AND NUTRITION**

**DSC-4, Paper-6 LAB: FOOD PROCESSING AND PRESERVATION  
(PRACTICAL)**

**Teaching Hours: 2 Hours / week**  
**Mid Sem Exam: 0 Marks**

**Credits: 1**  
**Sem End exam: 50 Marks**

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 –V**

S. No	Course	Total Mark	Mid Sem	Sem End Exam	Teaching Hours	Credits
1	DSC-5, Paper-1 (Core) <b>Post Harvest Technology (THEORY)</b>	100	25	75	4	4
2	DSC-5, Paper-1 (Lab): <b>Post Harvest Technology (PRACTICAL)</b>	50	0	50	2	1
3	DSC-5, Paper-2 (Core) <b>Fermentation Technology (THEORY)</b>	100	25	75	4	4
4	DSC-5, Paper-2 (Lab): <b>Fermentation Technology (PRACTICAL)</b>	50	0	50	2	1
5	DSC-5, Paper-3 (Core) <b>Dairy Technology (THEORY)</b>	100	25	75	4	4
6	DSC-5, Paper-3 (Lab): <b>Dairy Technology (PRACTICAL)</b>	50	0	50	2	1
7	DSC-5, Paper-4 (Core) <b>Nutrition in Critical Care (THEORY)</b>	100	25	75	4	4
8	DSC-5, Paper-4 (Lab): <b>Nutrition in Critical Care (PRACTICAL)</b>	50	0	50	2	1
9	DSC-5, Paper-5 (Core) <b>Health and Fitness (THEORY)</b>	100	25	75	4	4
10	DSC-5, Paper-5 (Lab): <b>Health and Fitness (PRACTICAL)</b>	50	0	50	2	1
11	DSC-5, Paper-6 (Core) <b>Functional Foods and Nutraceuticals (THEORY)</b>	100	25	75	4	4
12	DSC-5, Paper-6 (Lab): <b>Functional Foods and Nutraceuticals (PRACTICAL)</b>	50	0	50	2	1
	<b>Total</b>	<b>900</b>	<b>150</b>	<b>750</b>	<b>36</b>	<b>30</b>

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

**DSC-5, PAPER-I: POST HARVEST TECHNOLOGY (THEORY)**

**Teaching Hours: 4 Hours / week (Total - 60 Hours)**  
**Mid Sem Exam: 25 Marks**

**Credits: 4**  
**Sem End exam: 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 (12 Hours)**

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 (12 Hours)**

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

**UNIT III (12 Hours)**

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

**UNIT IV (12 Hours)**

Physical methods and chemical methods including fumigation techniques.

**UNIT V (12 Hours)**

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 AND NUTRITION**

**DSC-5, PAPER-1: POST HARVEST TECHNOLOGY (PRACTICAL)**

**Teaching Hours: 2 Hours / week**  
**Mid Sem Exam: 0 Marks**

**Credits: 1**  
**Sem End exam: 50 Marks**

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.

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

**DSC-5, PAPER-2: FERMENTATION TECHNOLOGY (THEORY)**

Teaching Hours: 4 Hours / week (Total - 60 Hours)  
Mid Sem Exam: 25 Marks

Credits: 4  
Sem End exam: 75 Marks

**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 (12 Hours)**

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 (12 Hours)**

**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 (12 Hours)**

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

**Unit-IV (12 Hours)**

**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 (12 Hours)**

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, Prescott 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**

**DSC-5, PAPER-2: FERMENTATION TECHNOLOGY(PRACTICAL)**

**Teaching Hours: 2 Hours / week**  
**Mid Sem Exam: 0 Marks**

**Credits: 1**  
**Sem End exam: 50 Marks**

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.

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

**DSC-5, PAPER-3: DAIRY TECHNOLOGY (THEORY)**

**Teaching Hours: 4 Hours / week (Total - 60 Hours)**  
**Mid Sem Exam: 25 Marks**

**Credits: 4**  
**Sem End exam: 75 Marks**

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

**UNIT 1 (12 Hours)**

**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 (12 Hours)**

**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 (12 Hours)**

**Processing of milk:** Thermal Processing of Milk , Various stages of processing- Clarification, separation, bacto-fugation, 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 (12 Hours)**

##### **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 (12 Hours)**

##### **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**

**DSC-5, PAPER-3: DAIRY TECHNOLOGY (PRACTICALS)**

**Teaching Hours: 2 Hours / week**  
**Mid Sem Exam: 0 Marks**

**Credits: 1**  
**Sem End exam: 50 Marks**

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.

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

**DSC-5, PAPER-4: NUTRITION IN CRITICAL CARE (THEORY)**

**Teaching Hours: 4 Hours / week (Total - 60 Hours)**  
**Mid Sem Exam: 25 Marks**

**Credits: 4**  
**Sem End exam: 75 Marks**

**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 (12 Hours)**

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 (12 Hours)**

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

**UNIT- III (12 Hours)**

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

**UNIT – IV (12 Hours)**

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 (12 Hours)**

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**

**DSC-5, PAPER-4: NUTRITION IN CRITICAL CARE (PRACTICAL)**

**Teaching Hours: 2 Hours / week**

**Credits: 1**

**Mid Sem Exam: 0 Marks**

**Sem End exam: 50 Marks**

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

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

**DSC-5, PAPER-5: HEALTH AND FITNESS (THEORY)**

**Teaching Hours: 4 Hours / week (Total - 60 Hours)**  
**Mid Sem Exam: 25 Marks**

**Credits: 4**  
**Sem End exam: 75 Marks**

**Objectives:** Enable 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 (12 Hours)**

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 (12 Hours)**

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 (12 Hours)**

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 (12 Hours)**

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 (12 Hours)**

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. <http://adfdell.pstc.brown.edu/classes/readings/>

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

**DSC-5, PAPER-5: HEALTH AND FITNESS (PRACTICALS)**

**Teaching Hours: 2 Hours / week**  
**Mid Sem Exam: 0 Marks**

**Credits: 1**  
**Sem End exam: 50 Marks**

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.



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

**DSC-5, PAPER-6: FUNCTIONAL FOODS AND NUTRACEUTICALS  
(THEORY)**

**Teaching Hours: 4 Hours / week (Total - 60 Hours)**  
**Mid Sem Exam: 25 Marks**

**Credits: 4**  
**Sem End exam: 75 Marks**

**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 (12 Hours)**

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 (12 Hours)**

Functional foods of animal origin: Dairy 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 (12 Hours)**

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 (12 Hours)**

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 (12 Hours)**

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**

**DSC-5, PAPER-6 : FUNCTIONAL FOODS AND NUTRACEUTICALS  
(PRACTICAL)**

**Teaching Hours: 2 Hours / week  
Mid Sem Exam: 0 Marks**

**Credits: 1  
Sem End exam: 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

**CHOICE BASED CREDIT SYSTEM-ACADEMIC YEAR 2020-21**  
**B.SC., FOOD SCIENCE AND NUTRITION COURSE STRUCTURE**

**SEMESTER –VI**

**(Apprenticeship/ Internship/ Industrial Training)**

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

**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 as diet consultant in hospitals/ public health Institutions and various fields of food industry.
2. To become an entrepreneur by starting his own startup.

Every candidate shall undergo professional training for 90 days in Hospitals /Large scale/Small scale food industries/Food processing units in VI Semester of the course. Internal evaluation will be carried out to assess the progress of the work during mid semester exams. 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. Allocation of total 400 marks will be carried out as mentioned below.

**Break up of marks for on the job training/apprenticeship**

<b>Details</b>	<b>Marks</b>
Attendance	100
Training Cert	100
Project report	100
Viva voce on Project Report	100
<b>Total marks</b>	<b>400</b>