

CHOICE BASED CREDIT SYSTEM-ACADEMIC YEAR 2020-21
B.S.C., 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) Post Harvest Technology (THEORY)	100	25	75	3	3
2	DSC-5, Paper-1 (Lab): Post Harvest Technology (PRACTICAL)	50	0	50	3	2
3	DSC-5, Paper-2 (Core) Fermentation Technology (THEORY)	100	25	75	3	3
4	DSC-5, Paper-2 (Lab): Fermentation Technology (PRACTICAL)	50	0	50	3	2
5	DSC-5, Paper-3 (Core) Dairy Technology (THEORY)	100	25	75	3	3
6	DSC-5, Paper-3 (Lab): Dairy Technology (PRACTICAL)	50	0	50	3	2
7	DSC-5, Paper-4 (Core) Nutrition in Critical Care (THEORY)	100	25	75	3	3
8	DSC-5, Paper-4 (Lab): Nutrition in Critical Care (PRACTICAL)	50	0	50	3	2
9	DSC-5, Paper-5 (Core) Health and Fitness (THEORY)	100	25	75	3	3
10	DSC-5, Paper-5 (Lab): Health and Fitness (PRACTICAL)	50	0	50	3	2
11	DSC-5, Paper-6 (Core) Functional Foods and Nutraceuticals (THEORY)	100	25	75	3	3
12	DSC-5, Paper-6 (Lab): Functional Foods and Nutraceuticals (PRACTICAL)	50	0	50	3	2
	Total	900	150	750	36	30

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

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

Teaching Hours: 3 Hours / week (Total - 60 Hours)
Mid Sem Exam: 25 Marks

Credits: 3
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: 3 Hours / week
Mid Sem Exam: 0 Marks

Credits: 2
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: 3 Hours / week (Total - 60 Hours)
Mid Sem Exam: 25 Marks

Credits: 3
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
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DSC-5, PAPER-2: FERMENTATION TECHNOLOGY(PRACTICAL)

Teaching Hours: 3 Hours / week
Mid Sem Exam: 0 Marks

Credits: 2
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
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DSC-5, PAPER-3: DAIRY TECHNOLOGY (THEORY)

Teaching Hours: 3 Hours / week (Total - 60 Hours)
Mid Sem Exam: 25 Marks

Credits: 3
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, 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 (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: 3 Hours / week
Mid Sem Exam: 0 Marks

Credits: 2
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: 3 Hours / week (Total - 60 Hours)
Mid Sem Exam: 25 Marks

Credits: 3
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

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B. Sc., FOOD SCIENCE AND NUTRITION

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

Teaching Hours: 3 Hours / week
Mid Sem Exam: 0 Marks

Credits: 2
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
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DSC-5, PAPER-5: HEALTH AND FITNESS (THEORY)

Teaching Hours: 3 Hours / week (Total - 60 Hours)
Mid Sem Exam: 25 Marks

Credits: 3
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: 3 Hours / week
Mid Sem Exam: 0 Marks

Credits: 2
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
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**DSC-5, PAPER-6: FUNCTIONAL FOODS AND NUTRACEUTICALS
(THEORY)**

Teaching Hours: 3 Hours / week (Total - 60 Hours)
Mid Sem Exam: 25 Marks

Credits: 3
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: 3 Hours / week
Mid Sem Exam: 0 Marks**

**Credits: 2
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