

Maulana Abul Kalam Azad University of Technology, West Bengal

Department of Food Science & Technology B. Sc (Food Science & Nutrition) Syllabus 2021 - 22

**B.Sc. in Food Science and Nutrition
(SYLLABUS)**

Duration: 3 Years (Six Semesters)

Level: Under Graduate

Type: Degree

Admission Requirements: Higher Secondary (Science/Arts) with minimum 60% marks.

Bachelor of Food Science and Nutrition (B.Sc) is an undergraduate course. Food Science & Nutrition is the integration of two disciplines, food science and human nutrition. It is an interdisciplinary subject blend of food science, food chemistry, food microbiology, human physiology, biochemistry, nutrition and dietetics. It also deals with the techniques involved in processing, preservation, quality management of food as well as menu planning, disease management and public health.

In addition the course also includes a significant quantum of industrial learning giving students the opportunities to boost their specialist professional skills facilitate independent learning and implement a reflective and practical approach to practice.

Under this program students gain a close perspective of real-world problems to food science and nutrition. Students interested in more detailed learning of the subject can apply for higher education in national or international forum.

The Bachelor degree course in Food Science & Nutrition is an important and career oriented nature that opens a lot of job opportunities for the candidate in the position of Food Inspector, Food Safety Officer, Nutritional therapist, Dietician, Quality control manager, Regulatory affairs officers, Scientific laboratory technician, Food Service Management, etc.

Proposed Syllabus of B.Sc. (H) Food Science & Nutrition

The course in Choice Based Credit System would be of 3 year (each year would consist of 2 semesters) duration having 6 semesters, divided into 14 Core Courses, 4 Discipline Specific Elective Courses, 2 Skill Enhancement Courses, 2 Ability Enhancement Compulsory Courses and 4 Generic Elective Courses. The new course has been prepared keeping in view, the unique requirements of B.Sc. (H) Food Science & Nutrition students. The objectives of the course are-

1. To impart knowledge of various areas related to Food Science and Nutrition,

2. To enable the students to understand food composition and its physicochemical, nutritional, microbiological and sensory aspects,
3. To familiarize the students about the type of nutrition required, diet planning, public health, community nutrition, basic human physiology
4. To emphasize the importance of food safety, food quality, food commodities, sports nutrition, food service management.

The contents have been drawn-up to accommodate the widening horizons of the discipline of **Food Science and Nutrition**. They reflect the current changing needs of the students. For the Generic Elective (GE) to be chosen by students, it is recommended that subjects like Computer Fundamental & Programming, Basic Chemistry, Spices, Bakery and Confectionery, Nutrition and Health Education be chosen as they are synergistic to the curriculum.

- ❖ For each paper, the course objectives have been listed along with the course outcomes (CO) mapped with each module and the contents divided into modules.
- ❖ The detailed syllabus for each paper is appended with the list of suggested readings.
- ❖ Teaching time allotted for each paper shall be 4 periods for each theory paper and 3 periods for each practical class per week for each paper per week.
- ❖ Each practical batch should ideally be between 15-20 students so that each student receives individual attention.

Eligibility Criteria: Higher Secondary (Science/Arts) with minimum 60% marks.

Subject type	Abbreviation	Number of courses	Credit Point	Total Credit	Credit Distribution	Proposed MOOCs	Mode of delivery
Core Course	CC	All 14	6	84	(Theory, Practical)		Online/Offline/ Blended
Discipline Specific elective	DSE	All 4	6	24	(Theory, Practical)		Online/Offline/ Blended
Skill Enhancement course	SEC	All 2	2	4	(Theory)		Online/Offline/ Blended
Generic elective or Interdisciplinary	GE	All 4	6	24	(Theory, Practical)		
Ability Enhancement Compulsory Courses	AECC	All 2	2	4	Theory		Online/Offline/ Blended
Grand Total				140			

PROPOSED SYLLABUS OF B.Sc. (H) FOOD SCIENCE & NUTRITION

Semester I

Code	Course Title	Contact Hours (period/week)				Credits
		L	T	P	Total	
BSUFSN-101	Food Microbiology	4	0	0	4	4
BSUFSN-102	Human Physiology I	4	0	0	4	4
Total of Theory					8	8
CC	Practical					
BSUFSN-191	Food Microbiology Lab	0	0	3	3	2
BSUFSN-192	Human Physiology I Lab	0	0	3	3	2
Total of Practical					6	4
Total Credits of CC						12
GE	Theory [Any one]					
BSUFSN-103A	Spices and its Nutritional Aspects	4	0	0	4	4
BSUFSN-103B	Basic Chemistry					
Total of Theory					4	4
CC	Practical [Any one]					
BSUFSN-193A	Spices and its Nutritional Aspects Lab	0	0	3	3	2
BSUFSN-193B	Basic Chemistry Lab					
Total of Practical					3	2
Total Credits of GE						6
AECC	Theory					
BSUFSN-104	English communication skill	2	0	0	2	2
Total of Theory					2	2
Total Credits of AECC						2
Audit Course						
BSUFSN-181	Introduction to Applied Mathematics	0	0	0	0	0

Total Credits of Semester I: 12 + 6 + 2 + 0 =20

Semester II

Code	Course Title	Contact Hours (period/week)				Credits
		L	T	P	Total	
CC	Theory					
BSUFSN-201	Nutritional Biochemistry	4	0	0	4	4
BSUFSN-202	Human Physiology II	4	0	0	4	4
Total of Theory					8	8
CC	Practical					
BSUFSN-291	Nutritional Biochemistry Lab	0	0	3	3	2
BSUFSN-292	Human Physiology II Lab	0	0	3	3	2
Total of Practical					6	4
Total Credits of CC						12
GE	Theory [Any one]					
BSUFSN-203A	Introduction to Computer Fundamentals	4	0	0	4	4
BSUFSN-203B	C-Programming Language					
BSUFSN-203C	Python					
Total of Theory					4	4
GE	Practical [Any one]					
BSUFSN-293A	Introduction to Computer Fundamentals	0	0	3	3	2
BSUFSN-293B	C-Programming Language					
BSUFSN-293C	Python					
Total of Practical					3	2
Total Credits of GE						6
AECC	Theory					
BSUFSN-204	Environmental Science	2	0	0	2	2
Total of Theory					2	2
Total Credits of AECC						2

Total Credits of Semester II: 12 + 6 + 2 =20

Semester III

Code	Course Title	Contact Hours (period/week)				Credits
		L	T	P	Total	
CC	Theory					
BSUFN-301	Basic Food Science I	4	0	0	4	4
BSUFN-302	Food Preservation	4	0	0	4	4
BSUFNS-303	Research Methodology and Biostatistics	5	1	0	6	6
Total of Theory					14	14
CC	Practical					
BSUFNS-391	Basic Food Science I Lab	0	0	3	3	2
BSUFNS-392	Food Preservation Lab	0	0	3	3	2
Total of Practical					6	4
Total Credits of CC						18
GE	Theory [Any one]					
BSUFNS-304A	Bakery and Confectionery	5	1	0	6	6
BSUFNS-304B	Nutrition and Health Education					
Total of Theory					6	6
Total Credits of GE						6
SEC	Theory					
BSUFNS-305	Sports Nutrition	2	0	0	2	2
Total of Theory					2	2
Total Credits of SEC						2

Total Credits of Semester III: 18 + 6 + 2 =26

Semester IV

Code	Course Title	Contact Hours				Credits
		(period/week)				
CC	Theory	L	T	P	Total	
BSUFSN-401	Basic Food Science II	4	0	0	4	4
BSUFSN-402	Community Nutrition	4	0	0	4	4
BSUFSN-403	Human Nutrition I	4	0	0	4	4
Total of Theory					12	12
CC	Practical					
BSUFSN-491	Basic Food Science II Lab	0	0	3	3	2
BSUFSN-492	Community Nutrition Lab	0	0	3	3	2
BSUFSN-493	Human Nutrition I Lab	0	0	3	3	2
Total of Practical					9	6
Total Credits of CC						18
GE	Theory [Any one]					
BSUFSN-404A	Food Borne Diseases and Food Toxicology	5	1	0	6	6
BSUFSN-404B	Diet Planning, Counseling & Patient Care					
Total of Theory					6	6
Total Credits of GE						6
SEC	Theory					
BSUFSN-405	Food Service Management	2	0	0	2	2
Total of Theory					2	2
Total Credits of SEC						2

Total Credits of Semester IV: 18 + 6 + 2 =26

Semester V

Code	Course Title	Contact Hours (period/week)				Credits
		L	T	P	Total	
CC	Theory					
BSUFSN-501	Human Nutrition II	4	0	0	4	4
BSUFSN-502	Diet Therapy I	4	0	0	4	4
Total of Theory					8	8
CC	Practical					
BSUFSN 591	Human Nutrition II Lab	0	0	3	3	2
BSUFSN 592	Diet Therapy I Lab	0	0	3	3	2
Total of Practical					6	4
Total Credits of CC						12
DSE	[Any one from each Group]					
BSUFSN 503A	Food Safety & Regulations	4	0	0	4	4
BSUFSN 503B	Food Commodities					
BSUFSN 504A	Public Health	5	1	0	6	6
BSUFSN 504B	Introduction to Business Management					
Total of Theory					10	10
DSE	Practical [Any one]					
BSUFSN 593A	Food Safety & Regulations Lab	0	0	3	3	2
BSUFSN 593B	Food Commodities Lab					
Total of Practical					3	2
Total Credits of DSE						12

Total Semester V Credits: 12 + 12 = 24

Semester VI

Code	Course Title	Contact Hours (period/week)				Credits
		L	T	P	Total	
CC	Theory					
BSUFSN-601	Diet Therapy II	4	0	0	4	4
BSUFSN-602	Geriatric Nutrition	4	0	0	4	4
Total of Theory					8	8
CC	Practical					
BSUFSN-691	Diet Therapy II Lab	0	0	3	3	2
BSUFSN-692	Geriatric Nutrition Lab	0	0	3	3	2
Total of Practical					6	4
Total Credits of CC						12
DSE	Theory [Any one]					
BSUFSN-603A	Food and Beverage Management	4	0	0	4	4
BSUFSN-603B	Mushroom Culture					
Total of Theory					4	4
DSE	Practical					
BSUFSN-693A	Food and Beverage Management Lab	0	0	3	3	2
BSUFSN-693B	Mushroom Culture Lab					
Total of Practical					3	2
PROJECT						
BSUFSN-681	Project	4	0	3	7	6
Total Credits of DSE						12

Total Semester VI Credits: 12 + 12 = 24

Grand Total Credits: 20 + 20 + 26 + 26 + 24 + 24 = 140

Detailed Syllabus of B.Sc. (H) Food Science & Nutrition

Semester I

BSUFSN-101: Food Microbiology

(CREDITS 6: THEORY: 4, PRACTICAL: 2)

Course Objectives:

1. To familiarize students with the general characteristics and growth characteristics of microbes.
2. To develop an understanding of spoilage microorganisms and their effects on food and to get an idea about beneficial organisms.
3. To impart basic knowledge about the microbes present in the environment and handling of waste disposal.

Course Outcomes (COs):

Sl. No.	Cos	Mapped Modules
1	Know the different types and morphology of microorganisms and magnification capacity of different types of microscopes.	Module I
2	Understand the factors affecting the growth in controlling the growth curve of microorganisms.	Module II
3	Able to preserve the perishable foods from different types of microbial spoilage.	Module III, IV
4	Able to preserve the non-perishable foods from microbial contamination and spoilage.	Module III, IV
5	Explore the beneficial effects of microorganisms in the processing and development of fermented foods.	Module IV

Module I: Introduction and scope of food microbiology

[9L]

Introduction of microbiology and its relevance to everyday life. General characteristics of bacteria, fungi, virus, protozoa, and algae. Identification of microorganisms, Morphological characteristics important in food bacteriology, Industrial importance

Module II: Growth of microorganisms

[8L]

Growth curve-Intrinsic Factors (Substrate Limitations), nutrient content, pH and buffering capacity, antimicrobial barriers and constituents, water Activity, relative humidity, temperature, gaseous atmosphere

Module III: Microbiology of different foods

[10L]

Cereal and cereal products, Sugar and sugar products, Vegetables and fruits, Meat and meat products, Fish, egg and poultry, Milk and milk products, Canned foods.

Environmental microbiology: Water and water borne diseases, Air and air borne diseases, Soil and soil borne diseases, Sewage and diseases.

Waste product handling: Planning for waste disposal, Solid wastes and liquid waste, Waste treatment and disposal, Biological oxygen demand (BOD)-Preliminary treatments, Chemical treatment, Biological treatment and disposal, Types of food wastes

Microbial intoxication and infections: Sources of contamination of food, mycotoxins, toxin production and physiological action, sources of infection of food by pathogenic organisms, symptoms and method of control.

Module IV: Beneficial effect of organism & Food safety

[9L]

Some applications of microorganisms-Food products: Alcoholic drinks, Dairy products, Bread, Vinegar, Pickled foods, Mushroom, Single-cell protein

Products from microorganisms: Enzymes, Amino acids, Antibiotics, Citric acid, Concepts of prebiotics, probiotics and organic food

Relevance of microbial standards for food safety.

Food Agricultural Organization (FAO), World Health Organization (WHO), The International Children's Emergency Fund (UNICEF), Codex Alimentarius, The International Commission on Microbiological Specifications for Foods (ICMSF), The Food and Drug Administration (FDA), United States Department of Agriculture (USDA).

Revision

[4L]

Total

[40L]

Practical: BSUFNS-191: Food Microbiology Lab
(CREDITS: 2)

1. Study of equipments in a microbiology lab- microscope.
2. Preparation of laboratory media and special media, cultivation of bacteria, yeasts and moulds.
3. Staining of bacteria: gram-staining.
4. Cultivation and identifications of important molds and yeast in food items.
5. Study of bacterial growth: Growth curve

Recommended Readings:

1. Frazier, W. C. and Westhoff, D. C. (1988): 4th edition, Food Microbiology, McGraw Hill Inc.
2. Jay James. N. (1986): 3rd edition, modern Food Microbiology, Van Nostrand Reinhold Company Inc.
3. Peleazar, M.I. and Reid, K. D. (1978): Microbiology, McGraw Hill Company, New York.
4. Benson Harold, J. (1990): Microbiological Application, Publishers, U.S.A
5. Colling, C.E. and Lyne, P.M. (1976): Microbiological Methods Butterworth. London.

BSUFNS-102: Human Physiology I
(CREDITS 6: THEORY: 4, PRACTICAL: 2)

Course Objectives:

1. To impart basic knowledge about the organelles of a typical cell and to describe their functions.
2. To develop an idea on Circulatory and Cardiovascular system, Digestive System, Respiratory System, Musculoskeletal System

Course Outcomes (COs):

Sl. No.	Cos	Mapped Modules
1	Know the structure of cells and its different parts including their functions.	Module I
2	Understand the function, structure and mechanism of Circulatory and Cardiovascular system.	Module II
3	Impart basic knowledge about the structure and function of digestive system.	Module III
4	Acquaint with the basic concepts of Respiratory System	Module IV
5	Develop knowledge of formation and function of Musculoskeletal System	Module V

Module I: Cell**[8L]**

Structure and functions of cell, Plasma membrane, Cell organelles : Mitochondria, Ribosome, Endoplasmic reticulum. Nucleus (nuclear membrane, nuclear chromatin and nucleolus). Nucleotide, Homeostasis.

Module II: Circulatory and Cardiovascular system**[7L]**

Blood cells, Haemoglobin, Blood groups, Coagulation Factors , Anaemia, Introduction to immune system, Erythropoiesis and anaemia, Structure and functions of heart, Heart rate, Cardiac cycle, cardiac output, blood pressure, hypertension, radial pulse.

Module III: Digestive System**[7L]**

Structure and functions of Gastrointestinal system, Process of digestion and absorption of food, Structure and functions of liver, gallbladder and pancreas, small and large intestine.

Module IV: Respiratory System**[7L]**

Structure of Lungs, Ventilation, Functions, Lungs volumes and capacities.

Module V: Musculoskeletal System**[7L]**

Functions of muscles, Mechanism of muscle contraction, Bones, joints & bone deformities.

Revision**[4L]****Total****[40L]****Practical: BSUFSN-192: Human Physiology I Lab****(Credit: 2)**

1. Measurement of blood pressure.
2. Determination of pulse rate in resting condition and after exercise.
3. Determination of Bleeding Time (BT) and Clotting Time (CT).
4. Measurement of Peak Expiratory flow rate.
5. Identification of blood cells by study of peripheral blood smear.

Recommended Readings:

1. Chatterjee CC (1988). Text Book of Physiology – Vol I & II.

2. Chaudhuri SK (2000). Concise Medical Physiology. New Central Book Agency (P) Ltd.
3. Guyton AC, Hall JE (1966). Text book of Medical Physiology. 9th Ed. Prism Books (Pvt.) Ltd. Bangalore..
4. Wilson (1989). Anatomy and Physiology in Health and Illness. Edinburgh, Churchill Livingstone.
5. Winword (1988). Sear's Anatomy and Physiology for Nurses. London, Edward Arno.
6. Koepfen BM and Stanton BA (2017): Berne and Levy Physiology, 7th Ed. Elsevier
7. Rhoades R and Pflanzer R (2003): Human Physiology, 4th ed. Thomson.
8. Eroschenko VP (2007): diFore's Atlas of Histology, diFiore's Atlas of Histology with Functional Correlations, 11th Edition. Lippincott Williams & Wilkins.
9. McLaughlin D, Stamford J and White D (2006)
10. Bios Instant Notes on Human Physiology, 1st Ed. Taylor & Francis.

BSUFSN-103A: Spices and its Nutritional Aspects
(CREDITS 6: THEORY – 4, PRACTICAL - 2)

Course Objectives:

1. Cultivation and Harvesting of different Spice Crops.
2. To gain the Knowledge on different spice production and processing.
3. To give the idea on organic spices production and processing.
4. To know the Quality Control and Testing of Spices.

Course Outcomes (COs):

Sl. No.	COs	Mapped Modules
1	Know the methods, requirements of cultivation and harvesting of spice crops.	Module I
2	Understand the importance of medicinal and aromatic spices upon human health, the requirements of cultivation and harvesting of medicinal and aromatic spices.	Module II
3	Acquaint with the processing technologies of spices	Module III
4	Develop knowledge about organic spices	Module IV

Module I: Cultivation and Harvesting of Spice Crops

[12L]

Introduction, importance of spice crops-historical accent, present status - national and international, future prospects, climatic and soil requirements, commercial varieties/hybrids, site selection, layout, sowing/planting times and methods, seed rate and seed treatment, nutritional and irrigation requirements, harvesting, post harvest management, plant protection measures, precision farming, organic resource management, organic certification, quality control, pharmaceutical significance and protected cultivation of: Black pepper, cardamom, Clove, cinnamon and nutmeg, allspice, Turmeric, ginger and garlic, Coriander, fenugreek, cumin, fennel, ajwain, dill, celery, Tamarind, garcinia and vanilla.

Module II: Agronomy of Medicinal, Aromatic and Under-Utilized Spices

[8L]

Importance of medicinal and aromatic plants in human health, national economy and related industries, classification of medicinal and aromatic plants according to botanical characteristics and their uses, export potential and indigenous technical knowledge; Climate and soil requirements; cultural practices; Post harvest handling –drying, processing, grading, packing and storage, value addition and quality standards in herbal products.

Module III: Processing of Spices**[8L]**

Commercial uses of spices and plantation crops. Processing of major spices - cardamom, black pepper, ginger, turmeric, chilli and paprika, vanilla, cinnamon, clove, nutmeg, allspice, coriander, fenugreek, curry leaf. Extraction of oleoresin and essential oils; Microbial contamination of stored product. Influence of temperature and time combination on active principles; Extraction and analysis of active principles using TLC / HPLC / GC. Distillation, solvent extraction.

Module IV: Organic Spices**[8L]**

Importance, principles, perspective, concept and component of organic production of spice and plantation crops; organic production of spice crops and plantation crops, viz. Pepper, cardamom, turmeric, ginger, cumin, vanilla, processing and quality control for organic spices/ regular spices (describe briefly to match with lab experiments).

Revision**[4L]****Total****[40L]**

Practical: BSUFSN-193A: Spices and its Nutritional Aspects Lab
(Credit: 2)

1. Determination of moisture of spices.
2. Determination of Total Ash content of spice.
3. Determination of Water soluble and acid insoluble ash.
4. Determination of Non Volatile Ether Extract (NVEE).
5. Determination of Volatile oil of spice.
6. Determination of Crude Fiber of spice.
7. Determination of Extraneous matter of different spices.

Recommended Readings:

1. ASTA, Official Analytical Methods of the American Spice Trade Association, IV Edition, 1997.
2. Purselove, J.W., E.G. Brown. G.L. Green, and S.R.J. Robbins.
3. Cardamom-Chemistry. Spices, Vol. I, Tropical Agricultural Series. Longman, London, 1981.
4. Pruthi, J.S. Spices and Condiments: Chemistry, Microbiology, and Technology. First Edition. Academic Press Inc., New York, USA. 1980.

BSUFT-103B: Basic Chemistry
(CREDITS 6: THEORY: 4, PRACTICAL: 2)

Course Objectives:

1. Understanding of the fundamental theories and basic concepts of Thermodynamics.
2. Understanding of the fundamental theories and applications of the concepts of dilute solutions, Colligative properties, Electrochemistry, Ionic Equilibrium.

- To get an insight into the instrumental methods of spectral analysis and learning about the basic laws of photochemistry and various photochemical processes.
- Learning about the chemistry of colloids and emulsions.
- Learning about the chemistry of nanomaterials, the basics of nanotechnology and its related applications in food industries.

Course Outcomes (COs):

Sl. No.	COs	Mapped Modules
1.	The application of mathematical tools to calculate thermodynamic and kinetic properties	Module I
2.	The relationship between microscopic properties of molecules with macroscopic thermodynamic observables	Module I
3.	The derivation of rate equations from mechanistic data	Module IV
4.	The use of simple models for predictive understanding of physical phenomena associated to chemical thermodynamics and kinetics	Module I, IV
5.	The limitations and uses of models for the solution of applied problems involving chemical thermodynamic and kinetics	Module I, IV
6.	The basic (colligative) properties of solutions	Module II
7.	The fundamentals of acid/base equilibria, including pH calculations, buffer behavior, acid/base titrations, and their relationship to electrophiles and nucleophiles	Module III
8.	The thermodynamic and kinetic forces involved in chemical reactions which determine how much and how soon products are formed	Module IV
9.	The basics of electrochemistry, and the relationship of electrical parameters to thermodynamic and stoichiometric parameters	Module III
10.	Solubility and complex ion equilibria	Module III
11.	The historical evolution and current revolution that is nanoscience, the fundamental uniqueness of the chemical and physical properties of nanomaterials and their potential impact in science, engineering, medicine, and the environment, the interdisciplinary nature of nanoscience, top down and bottom up methods of nanomaterials preparation, examples of different nanomaterials, applications of nanomaterials with emphasis in food sector	Module VII
12.	The basic concept and fundamentals of colloids, its preparation and stability, associated colloids and emulsions	Module V
13.	Understanding the operation and principle of UV spectroscopy, Instrumentation of UV spectrophotometer and applications of UV	Module VI
14.	Understanding the basic laws of photochemistry and different photochemical reactions, Examples of different photochemical reactions, calculations of absorbance, molar extinction co-efficient and transmittance	Module VI

Module I: Thermodynamics

[10L]

Systems: Open, Close, Isolated. Definition with examples of Diathermic and Adiabatic wall. Extensive and Intensive property.

Process: Isothermal, Adiabatic, Isobaric, Isochoric.

First Law of Thermodynamics: Statement and mathematical form.

Internal energy: Definition, Example, Change in internal energy for ideal gas.

Enthalpy: Definition, Example, Change in internal energy for ideal gas.
Heat Capacity: Definition, Classification of heat capacity (C_p and C_v), Expression of C_p and C_v for ideal gas.
Reversible and Irreversible Processes: Definition. Work done in both processes for ideal gases. Adiabatic Process: Work done.
Second Law of Thermodynamics.
Concept of Entropy: Introduction Expression (Mathematical). Change in entropy for both reversible and irreversible process.
Work functions and free energy: Gibbs and Helmholtz free energy. Condition of spontaneity of reaction.

Module II: Dilute solutions– Colligative properties [3L]

Lowering of vapor pressure of solution, elevation of boiling point, freezing point depression, definition, principles, and laws of osmotic pressure.

Module III: Electrochemistry [8L]

Electrochemistry I: Conductance of Electrolytic solution. Specific conductance, Equivalent conductance, molar conductance, Ion conductance. Kohlrausch's law of independent migration of ions.

Electrochemistry II: Cell and EMF. Nernst's equation.

Ionic equilibrium: Solubility and solubility product, common ion effect, determination of solubility product by EMF method, ionic product of water, pH, pOH, hydrolysis of salt solutions: Strong acid and weak base, weak acid and strong base, weak acid and weak base, concepts of buffer.

Module IV: Reaction Mechanisms [5L]

Reaction Dynamics: Reaction Laws: Rate and Order. Molecularity. Zero, First, and Second order Kinetics. Pseudo-molecular and Arrhenius reaction. Transition and Collision state theory.

Module V: Colloid chemistry [4L]

Definition of colloid, principle of colloid formation, types of colloid, colloid preparation, stability of colloid, association of colloid and emulsion.

Module VI: Photochemistry [4L]

Instrumental methods of spectral analyses, Photochemistry: Lambert's law and Beer's Law, Laws of photochemistry, Photochemical processes.

Module VII: Nanomaterial [2L]

Basic principles of nano science and technology, classification, preparation, properties and application of nano material.

Revision [4L]

Total [40L]

Practical: BSUFT-193B: Basic Chemistry Lab
(Credit: 2)

1. Determination of surface tension and viscosity.
2. Determination of hardness of water.
3. Determination of chloride content of water.
4. pH metric titrations.
5. Thin layer chromatography.
6. Preparation and standardization of Mohr's solution by $KMnO_4$ solution.

7. Preparation of standard $K_2Cr_2O_7$ solution and standardization of Mohr's Salt solution.
8. Determination of Cu (II) using standard sodium thiosulphate solution.

Recommended Readings:

1. Engineering Chemistry: Bandyopadhyay and Hazra
2. Physical Chemistry: P.C. Rakshit
3. Organic Chemistry: Finar, vol-1
4. Engineering Chemistry: B.Sivasankar, Tata Mc Graw Hill, 2008
5. A Text book of Engineering Chemistry: S.S.Dara, 10th Edition, S.Chand & Company Ltd., New Delhi, 2003.
6. Engineering Chemistry Simplified: S. Nandi and R. Bhattacharyya, Chayya Prakashani Pvt. Ltd.
7. Advanced practical chemistry, 3rd edition by Subhas C Das.
8. An advanced course in practical chemistry by Ghoshal, Mahapatra and Nad.

BSUFSN-104: English Communication Skill
(Credit: 2)

Course Objectives	
Sl. No.	
1	To enable the learner to communicate effectively and appropriately in a real-life situation
2	The course will help to use English effectively during the entire course curriculum and enable the learner to communicate effectively and appropriately in a real-life situation.
3	The course will enable the learner to develop and demonstrate the speaking skills for group discussions, Viva-voce, Personal Interview etc.
Course Outcomes (COs)	
Sl. No.	<i>- By the end of this course students will able to:</i>
1	Use the English grammar correctly in order to make an error-free communication.
2	Use their writing skill to set a positive impression for them.
3	Enrich their vocabulary and use them effectively and appropriately.
4	Become confident in group discussion. By looking at various scenarios, a student will learn key language for group discussion as well as gain some business etiquette
5	Improve confidence in the personal interview, job interview, or any kind of presentation.
6	Apply the four language skills to communicate more effectively and properly.

Sl. No.	Pre- Requisite:
1	Basic knowledge of English Grammar.
2	Basic understanding of the English language when it is spoken.

Module	Topic	Covered COs	Hours
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I	Grammar: Sentence Structure, Voice, Narration	1,2,3	5
II	Writing Skills: Report Writing (Structure, Types of report), Article/ Blog writing	2	3
III	Business Correspondence: Formal letter, Job Application, CV/ Resume, Email	1,2,5	2
IV	Reading Comprehension (Seen) Selected pieces from literature (1 Prose & 1 Poetry)	3,6	2
V	Reading Comprehension (Unseen) Skill of answering questions by understanding a given text	3,6	1
VI	Communication Skills: Video & Audio Conferencing, Group Discussion, non-verbal skills,	4,5,6	3
VII	Speaking Skills: Mock Interview sessions, Group Discussion Practice, Extempore, Debate	4,5,6	4

Total

[20L]

Recommended Readings:

1. S R Inthira &, V Saraswathi, Enrich your English a) Communication skills b) Academic skills, CIEFL &, OUP
2. R.C. Sharma and K.Mohan Business Correspondence and Report Writing Tata McGraw Hill New Delhi, 1994
3. Maxwell Nurnberg and Rosenblum Morris, All About Words- A Text-Book for English for Engineers &, Technologists General Book Depot, New Delhi, 1995

BSUFSN-181: Introduction to Applied Mathematics

[Audit Course] (Credit: 2)

Course Objectives:

1. To understand and apply the fundamental concepts of mathematics.
2. To apply mathematics in real life model.
3. To introduce the computational methodology for different problems.
4. To understand the various types of model.
5. To analyze and visualization of biological problem using programming language and different software.

Course Outcomes (COs):

1. To train the student for making their decision making capability more strong: **Module I, II, III, IV**
2. To strong in different tools and techniques for industrial problem solving: **Module I, II, III, IV**

Module I: [5L]

Basics of Sets and number theory, theory of equations, vectors, Boolean algebra.

Module II: [5L]

Theory of matrices, Arithmetic operation on matrix, determinant, different properties, caley Hamilton theorem, eigen value and eigenvector, range space and null space, solution of system of equation using matrix theory, diagonalization.

Module III: [5L]

Limit, continuity of a function, ordinary and partial derivative, calculus of several variable, integration.

Module IV: [5L]

First and second order ordinary differential equation, system of differential equation.

Total [20L]

Recommended Readings:

1. Higher Engineering Mathematics by B.S. Grewal
2. Engineering Mathematics, Pal and Bhunia

Semester II

BSUFSN-201: Nutritional Biochemistry
(CREDITS 6: THEORY: 4, PRACTICAL: 2)

Course Objectives:

1. To acquaint the students with the basic concepts of Biochemistry and metabolism.
2. To acquaint the students with the basic concepts and functions of enzymes, coenzymes.
3. To acquaint the students with the basic concepts of vitamins, hormones and water metabolism.
4. To acquaint the students with the basic structures and functions of carbohydrates, proteins, lipids, amino acids and nucleic acids.

Course Outcomes (COs):

Sl. No.	CO	Mapped Modules
1	Understanding of the basics about energy metabolism, measurement of energy and calorific value, BMR and the factors affecting the same, insights about nutrition and health.	Module I
2	To impart basic knowledge about the structure, function and metabolism of carbohydrate, lipid, amino acid, protein and nucleic acid.	Module II
3	To impart basic knowledge about the structure, function and metabolism of vitamins, hormones and water.	Module IV

4	To impart the basic concepts and functions of different enzymes and various coenzymes.	Module III
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Module I: Basics of energy metabolism, nutrition & dietetics [7L]

Module of measuring energy, calorific value of food, BMR & factors affecting it, SDA of food, calculation of energy requirement, balanced diet, Nutrition in health & diseases (protein energy malnutrition)

Module II: Chemistry of carbohydrates, protein, lipids & their related metabolism [15L]

Carbohydrates: Introduction, Definition, Classification, Biomedical importance, Brief outline of metabolism: Glycogenesis, Glycogenolysis, Glycolysis, Citric acid cycle & its significance, HMP shunt, Gluconeogenesis, regulation of blood glucose levels, Glucose tolerance test, Glycosurias, Hypoglycemia & its causes

Amino acids – Definition, classification, Essential & non essential amino acids.

Proteins: Introduction, definition, classification, biomedical importance Metabolism: Transformation, Decarboxylation, Transamination, Ammonia formation & transport, Urea cycle.

Lipids: Introduction, Definition, Classification, Biomedical importance, Essential fatty acids, Identification of fats & oils (saponification no, acid no, iodine no, acetyl no, reichert- miesel no. etc.), Brief outline of metabolism, Beta oxidation of fatty acids, ketosis

Module III: Enzymes [7L]

Introduction, definition, classification, coenzymes, isoenzymes, properties, factors affecting enzyme action, enzyme inhibition, diagnostic value of serum enzymes- Creatinine kinase, Alkaline phosphatase, Acid phosphatase, LDH, SGOT, SGPT, Amylase, Lipase, Carbonic anhydrase

Module IV: Vitamins, Hormones & Water metabolism [7L]

Vitamins: Water & fat soluble vitamins, sources, requirements, deficiency disorders, Biochemical functions.

Hormones: Classification, general mode of action of hormones of -Pituitary, Thyroid, Parathyroid, Adrenals, Reproductive Glands, Pancreas,

Hormonal disorders, Counter regulatory hormones

Water: Distribution of fluids in the body, ECF, ICF, Water metabolism, dehydration

Revision [4L]

Total [40L]

Practical: BSUFNS-291: Nutritional Biochemistry Lab

(Credit: 2)

1. Estimation of Protein (Biuret method and Lowry method)
2. Estimation of blood Glucose (Folin Wu method)
3. Estimation of inorganic phosphorus
4. Estimation of blood creatinine.
5. Test for carbohydrate, protein, lipid
6. Estimation of Vitamin C
7. Estimation of Amylase
8. Estimation of Lipase
9. Determination of BOD (biological oxygen demand)/ COD in waste water.

Recommended Readings:

1. West, E. S., Todd, W. R.; Mason. H.S. and Van Bruggen J.T. : 4th Ed. Text Book of Biochemistry. Amerind Publishing Co. Pvt. Ltd. 15.
2. Murray, r. K. Grannen, D. K.; Mayes, P. A. and Rodwell. V. W. : Harper's Biochemistry. Lange Medical Book.
3. Handler, P.: Smith E.I.; Stelten, D. W.: Principles of Biochemistry, Me. Grew Hill Book Co.
4. Lehninger, A.L.; Nelson, D. L. and Cox, M. M. Principles of Biochemistry. CBS Publishers and Distributors.
5. Devlin, T. M.: Text Book of Biochemistry with Clinical Corelations. John Wiley and Sons.
6. Strayer. L. Biochemistry. Freeman W.H. and Co.
7. Assaini. J. Kaur. Text Book of Biochemistry. C.B.S. Publication.
8. An introduction of Practical Biochemistry: D. Plummer
9. Practical Biochemistry: K Wilson and Walker
10. Biochemical Methods: S. Sadasivan and K Manikam.
11. Hawk's Physiological Chemistry: B. L. Oser (ed).
12. Practical biochemistry: R. L. Nath.

BSUFNS-202: Human Physiology II

(CREDITS 6: THEORY – 4, PRACTICAL - 2)

Course Objectives:

1. To develop an idea on Excretory system, Reproductive system, Nervous System and Endocrine system.

Course Outcomes (COs):

Sl. No.	COs	Mapped Modules
1	Know the structure and function of Excretory system	Module I
2	Understand the structure and function of Reproductive system.	Module II
3	Develop concept of Nervous System and its functions.	Module III
4	Acquaint with the structure and functions of Endocrine System	Module IV

Module I: Excretory system	[10L]
Structure and function of skin, regulation of temperature of the body, Structure and functions of kidney in special reference to nephron, Physiology of urine formation.	
Module II: Reproductive system	[10L]
Structure and functions of male & female reproductive organs, menstruation, puberty, menopause, lactation, fertilization and development of fertilized ovum, placenta and its function.	
Module III: Nervous System	[10L]
Brief idea of sympathetic and parasympathetic nervous system, Structure and functions of cerebrum, cerebellum, hypothalamus and neuron, Concept on synapse and synaptic transmission. Reflexes.	
Module IV: Endocrine system	[6L]
List of Endocrine glands, Hormones: Their secretion and functions (in brief).	
Revision	[4L]
Total	[40L]

Practical: BSUFSN-292: Human Physiology II Lab
(Credit: 2)

1. Detection of Blood group (Slide method).
2. Interpretation of normal ECG curve with 6 chest leads.
3. Identification with reasons of histological slides (Lung, Liver, Kidney, Small intestine, Stomach, Thyroid, Adrenal, Pancreas, Testis, Ovary and Muscle of mammals).
4. Estimation of haemoglobin, RBC, WBC and ESR.

Recommended Readings:

1. Chatterjee CC (1988). Text Book of Physiology – Vol I & II.
2. Chaudhuri SK (2000). Concise Medical Physiology. New Central Book Agency (P) Ltd.
3. Guyton AC, Hall JE (1966). Text book of Medical Physiology. 9th Ed. Prism Books (Pvt.) Ltd. Bangalore..
4. Wilson (1989). Anatomy and Physiology in Health and Illness. Edinburgh, Churchill Livingstone.
5. Winword (1988). Sear's Anatomy and Physiology for Nurses. London, Edward Arno.
6. Koeppen BM and Stanton BA (2017): Berne and Levy Physiology, 7th Ed. Elsevier
7. Rhoades R and Pflanzer R (2003): Human Physiology, 4th ed. Thomson.
8. Eroschenko VP (2007): diFore's Atlas of Histology, diFiore's Atlas of Histology with Functional Correlations, 11th Edition. Lippincott Williams & Wilkins.
9. McLaughlin D, Stamford J and White D (2006): Bios Instant Notes on Human Physiology, 1st Ed. Taylor & Francis.

BSUFT-203A: Introduction to Computer Fundamentals
(CREDITS 6: THEORY: 4; Practical: 2)

Course Objectives:

1. To acquaint students with Concepts of fundamental of computer with history and design of computer.
2. To impart basic knowledge about Operating system (processor, memory, device, file management etc.).
3. To understand about positional Number system and basics of digital logic.

Course Outcomes (COs):

Sl. No.	COs	Mapped Modules
1	Acquire knowledge on the Binary logic, the use of number system and data representation.	Module III
2	Understanding Boolean algebra and its significance in digital computer operations.	Module III
3	Familiarity to design efficient combinational and sequential logic circuits.	Module III
4	Comprehend the various types of process, memory and their management.	Module II
5	Master the basic hardware of a digital computer and its workings.	Module 1

Module I: Basic concept of Computer System

[5L]

Introduction, Characteristics of Computer, Components of Computer, Basic organization of Computer System (I/P, O/P, Memory & CPU Modules). Generation of Computer: 1st to 4th generations with characteristics, Classification of computer systems.

Module II: Operating System

[18L]

Introduction: What operation systems do? Operations of OS. Evolution of OS – Batch processing, Multiprogramming, Time sharing, Distributed.

Process Management: Process concept, Process States, Process control block (PCB) Process scheduling: Schedulers (long-term, short-term and medium-term), Context switching, scheduling criteria, scheduling algorithms (FCFS, SJF, Priority, RR), Multilevel Queue scheduling and Multilevel Feedback Queue scheduling. Threads: Concept, Models, Multi-threading example (word processor). Process Synchronization: Cooperating process, Critical-Module problem and solution, Semaphores (Binary & counting). Deadlocks: Concept, Resource Allocation Graph, Necessary conditions for Deadlock, Handling deadlocks: Deadlock prevention and avoidance. Concept of Banker's algorithm with example, Deadlock recovery.

Memory management: Memory management concept, Memory allocation rule, Swapping, Overlay, Paging, Demand paging, segmentation, virtual memory. Device management, File management.

Module III: Digital Logic

[13L]

Number System: Positional & Non-positional, Representation of positional number system, Classification of positional number system (Decimal, Binary, Octal, Hexadecimal).

Inter-conversion: among known and unknown bases.

Digital Logic: addition, subtraction, multiplication, division, r's complement & (r-1)'s complement.

Boolean Algebra & Logic Gates Basic laws and postulates, Huntington postulates, Duality.

Logic Gates: AND, OR, NOT, NAND, NOR, XOR & XNOR with truth table.

Boolean Functions: Representation (Boolean expression, Truth Table & Circuit Diagram), Canonical Form (SOP, POS), Conversion between canonical forms.

Revision [4L]

Total [40L]

Practical: BSUFSN-293A: Computer Fundamentals lab
(Credit: 2)

1. Usage of MS-DOS commands: basic concepts of internal & external commands, directory and file commands, copying, erasing, renaming, displaying files, introduction to pipes & filters, concept of batch file.
2. Microsoft word- concept of toolbar, character, paragraph & document formatting, drawing toolbar, header, footer, document editing, page set up.
3. Microsoft excel- concept of spread sheets, creating worksheet, well formatted document, concept of row, column, cell & formula bar, using function, using shortcuts, charts, goal, validation rule.
4. Microsoft Power Point presentation- slide layout & design, custom animation, image importing, slide transition.

Recommended Readings:

1. Computer Fundamentals – by R.S. Salaria, Khanna Publishing House.
2. Computer Fundamentals – by Pradeep K Sinha, Priti Sinha.
3. Operating System Concepts – by Abraham Silberschatz, Peter B. Galvin, GergGange.
4. Operating System Concepts – by EktaWalia, Khanna Publishing House.
5. Operating System – by P. Bala Krishna Prasad.
6. Digital Design - by M. Morris R. Mano (Author), Michael D. Ciletti (Author).
5. Digital Logic and Computer Design – by M. Morris Mano

BSUFSN-203B: C-Programming Language
(CREDITS 6: THEORY – 4, PRACTICAL - 2)

Course Objectives:

1. The objective of this course is to give conceptual exposure of essential contents of C programming languages to students.
2. Students should be able to gain broad understanding about procedural oriented concept and syntactical concept of C language to problem solving on a diverse variety of disciplines.

Course Outcomes (COs):

Sl. No.	COs	Mapped
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		Modules
1	Obtain knowledge to Design an algorithm and draw flowcharts.	Module I
2	Attain knowledge about the fundamentals of programming.	Module I, II
3	Trained skill to solve problems through programming environment for simple applications.	Module I, II
4	Understand the use of Arrays, functions, pointers, structures and unions.	Module III
5	Gain knowledge about the basics of file handling mechanism.	Module IV, V

Module I:

[5L]

Programming Language concepts & Introduction to C. C character set, Constants, variables and keywords. Type of variables & constants. Rules of constructing variable identifier.

Module II:

[10L]

Types of C Instructions (Type declaration, Arithmetic & Control Instructions), Data Types, Operators, Hierarchy of operators, Associativity of operators, Type conversion (explicit and implicit), Control Instructions: if-else, switch case, conditional operator. Loops (for, while, do-while). Break & continue statement.

Module III:

[7L]

Array: one-dimensional & multi-dimensional (2D) array. Function and Pointer: Prototype, definition and calling of function, Recursive functions, Call-by-value & Call-by-reference, passing array to function. Pointer concept, pointer to pointer, pointer operations, pointer and array.

Module IV:

[10L]

C Preprocessor: Concept, File inclusion & Macro expansion, Symbolic constants. Type modifiers (long, short & signed), Storage class (auto, extern, static & register). String: Pointer and String, Standard library functions (strlen(), strcpy(), strcmp(), strcat()). Structure and Union, Self-referential structure.

Module V:

[4L]

File handling: File opening modes, Reading from file, writing into file.

Revision

[4L]

Total

[40L]

Practical: BSUFT-293B: C- Programming Lab
(Credit: 2)

1. Write a program, which will take marks of five subject of a student and will give the output as sum & percentage of marks.
2. Write a program to determine inputted integer is even or odd.
3. Write a program to calculate sum of digits of an inputted integer.
4. Write a program to find reverse of an inputted integer. 5. Write a program to find weather given integer is palindrome or not.
6. Write a program which will calculate the electricity bill on the basis of following condition:

Bill amount = 1000 if Modules < 500, Bill amount = 1000 + 2*(Modules – 1000) if Modules in between 500 and 1000, Bill amount = 1000 + 3*(Modules – 1000) if Modules is more than 1000.

7. Write programs to display following patterns based on height:

(a)

```
*  
* *  
* * *  
* * * *
```

(b)

```
* * * *  
* * *  
* *  
*
```

8. Write a program to find factorial of given positive integer.

9. Find the sum of several series up to nth term:

10. Write a program to calculate, where x and y are positive integers.

11. Find the sum of following series up to nth term:

12. Write a program to determine whether an inputted integer is prime or not.

13. Write a recursive function to calculate factorial of given positive integer.

14. Write a recursive function to obtain the first N numbers of a Fibonacci series.

15. Write a program to check whether given string is palindrome or not [use strcmp() function].

16. Write a menu driven program which has following options:

a. Factorial of a number. b. Prime or not. c. Odd or even. d. Exit.

17. Write a program to obtain transpose of a matrix. [Hints: The transpose of a matrix is obtained by exchanging the elements of each row with the elements of the corresponding column].

18. Write a program, which will produce an output to show student details (roll, name, city, phone number, and department) from an institution.

19. Write a program to calculate the number of characters, words, blanks, tabs & lines in a given text file.

20. Write a program to copy the content of a given text file into a newly created file.

Recommended Readings:

1. Problem Solving & Programming in C – by R.S. Salaria (Khanna).
2. Programming with C – by Byron Gottfried.
3. Let Us C -by Yashavant P. Kanetkar.

BSUFSN-203C: Python
(CREDITS 6: THEORY – 4, PRACTICAL - 2)

Course Objectives:

1. The objective of this course is to give conceptual exposure of essential contents of modern Python programming languages to students.
2. Students should be able to gain broad understanding about control stamens, looping, strings, functions, file, lists, dictionaries and tuples concept and syntactical concept of python to problem solving on a diverse variety of disciplines.

Course Outcomes (COs):

Sl. No.	COs	Mapped Modules
1	Apply decision and repetition structures in program design.	Module I, II
2	Develop functions to improve readability of programs.	Module III
3	Design the programs with the use of Python lists and dictionaries.	Module V, VI
4	Adopt file and exception handling mechanisms.	Module IV
5	Ability to build python program to solve real world problems.	Module I, II, III, IV, V, VI

Module I:

[3L]

Introduction to Python, installation of Python, character set, Constants, variables and keywords. Type of variables & constants. Rules of constructing variable identifier.

Module II:

[10L]

Types of C Instructions (Type declaration, Arithmetic & Control Instructions), Data Types, Operators, Keywords, Hierarchy of operators, Associativity of operators, Type conversion (explicit and implicit), Different types of operators, Control Instructions: if-else, switch case, conditional operator. Loops (for, while), break & continue statement.

Module III:

[8L]

String operations- Asking the user for input, Comments, String slices, String length, Strings are immutable, in operator, String comparison, String methods, Parsing strings, Format operator, Function calls- Built-in functions, Type conversion functions, Math functions, adding new functions, Function Definitions and uses, Flow of execution, Parameters and arguments, Fruitful functions and void functions,

Module IV:

[4L]

Files- Persistence, opening files, Text files and lines, reading files, searching through a file, User choose the file name, using try-except-open, Writing files.

Module V:

[4L]

Lists- list is a sequence, Lists are mutable, traversing a list, List operations, List slices, List methods, deleting elements, Lists and functions, Lists and strings, Objects and values, List arguments.

Module VI:

[7L]

Dictionaries- Dictionary as a set of counters, Dictionaries and files, Looping and dictionaries.

Tuples- Tuples are immutable, comparing tuples, Tuple assignment, Dictionaries and tuples, Multiple assignment with dictionaries, Using tuples as keys in dictionaries.

Revision [4L]

Total [40L]

Practical: BSUFSN-293C: Python Lab
(Credit: 2)

1. Write a program that uses input to prompt a user for their name and then welcomes them.
2. Write a program to prompt the user for hours and rate per hour to compute gross pay.
3. Write a program which prompts the user for a Celsius temperature, convert the temperature to Fahrenheit, and print out the converted temperature.
4. Write a program to prompt for a score between 0.0 and 1.0. If the score is out of range, print an error message. If the score is between 0.0 and 1.0, print a grade using the following-

Score	Grade
≥ 0.9	A
≥ 0.8	B
≥ 0.7	C
≥ 0.6	D
< 0.6	F

5. Write a program for pay computation with time-and-a-half for overtime and create a function called `compute_pay` which takes two parameters (hours and rate).
6. Write a program for the grade program (program 4) using a function called `compute_grade` that takes a score as its parameter and returns a grade as a string.
7. Write a program to find factorial of given positive integer using function.
8. Write a menu driven program which has following options using function:
a. Factorial of a number. b. Prime or not. c. Odd or even. d. Exit.
9. Write a program which repeatedly reads numbers until the user enters "done". Once "done" is entered, print out the total, count, and average of the numbers. If the user enters anything other than a number, detect their mistake using try and except and print an error message and skip to the next number.
10. Write another program that prompts for a list of numbers as above and at the end prints out both the maximum and minimum of the numbers instead of the average.
11. Write a program to check whether given string is palindrome or not.
12. Write a program to read through a file and print the contents of the file (line by line) all in upper case.
13. Write a program to prompt for a file name, and then read through the file and copy the content to another file.
14. Write a program to open the file and read it line by line. For each line, split the line into a list of words using the split function. For each word, check to see if the word is already in a list. If the word is not in the list, add it to the list. When the program completes, sort and print the resulting words in alphabetical order.
15. Write a program to read a file and when you find line that starts with "From", you will split the line into words using the split function. Print each line from the second word on the "From" line.
16. Write a program that prompts the user for a list of numbers and prints out the maximum and minimum of the numbers at the end when the user enters "done". Write the program to store the numbers the user enters in a list and use the `max()` and `min()` functions to compute the maximum and

minimum numbers after the loop completes.

17. This program counts the distribution of the hour of the day for each of the messages (for a file stored relevant information). You can pull the hour from the "From" line by finding the time string and then splitting that string into parts using the colon character. Once you have accumulated the counts for each hour, print out the counts, one per line, sorted by hour.
18. Etc.

Recommended Readings:

1. Introduction to Python Programming language- Chaitanya Singh.
2. Python programming language- by G van Rossum.
3. Python Programming: An Introduction to Computer Science, by John Zelle.

BSUFSN-204: Environmental Science (Credit: 2)

Course Objectives:

1. Understanding of the fundamentals of environment and its relation with human activities.
2. Learning the environmental laws and regulations to develop guidelines for health and safety issues.
3. Acquiring skills to solve problems related to air, water noise, land and sound pollutions.

Course Outcomes (COs):

Sl. No.	COs	Mapped Modules
1	Gain in-depth knowledge on natural processes that sustain life, and govern economy.	Module I, II
2	Predict the consequences of human actions on the web of life, global economy and quality of human life.	Module II
3	Develop critical thinking for shaping strategies (scientific, social, economic and legal) for environmental protection and conservation of biodiversity, social equity and sustainable development.	Module III, IV, V, VI
4	Acquire values and attitudes towards understanding complex environmental-economic social challenges, and participating actively in solving current environmental problems and preventing the future ones.	Module II, III, IV, V, VI
5	Adopt sustainability as a practice in life, society and industry.	Module VII

Module I: Introduction

[2L]

Basic ideas of environment, basic concepts, man, society & environment, their inter-relationship. Mathematics of population growth and associated problems, Importance of population study in environmental engineering.

Module II: Environmental degradation**[5L]**

Natural environmental Hazards like Flood, earthquake, Landslide-causes, effects and control/management; Anthropogenic degradation like Acid rain-cause, effects and control. Nature and scope of environmental science and engineering.

Ecology: Elements of ecology: System, open system, closed system, definition of ecology, species, population, community, definition of ecosystem- components types and function.

Structure and function of the following ecosystem: Forest ecosystem, Grassland ecosystem, Desert ecosystem, Aquatic ecosystems, Mangrove ecosystem (special reference to Sundarban); Food chain: definition and one example of each food chain, Food web.

Biogeochemical Cycle- definition, significance, flow chart of different cycles with only elementary reaction [Oxygen, carbon, Nitrogen, Phosphate, Sulphur].

Module III: Air pollution and control**[4L]**

Atmospheric Composition: Troposphere, Stratosphere, Mesosphere, Thermosphere, Tropopause and Mesopause.

Green house effects: Definition, impact of greenhouse gases on the global climate and consequently on sea water level, agriculture and marine food. Global warming and its consequence, Control of Global warming. Earth's heat budget.

Lapse rate: Ambient lapse rate Adiabatic lapse rate, atmospheric stability, temperature inversion (radiation inversion).

Module IV: Water pollution and Control**[3L]**

Hydrosphere, Hydrological cycle and Natural water. Pollutants of water, their origin and effects: Oxygen demanding wastes, pathogens, nutrients, Salts, thermal application, heavy metals, pesticides, volatile organic compounds.

River/Lake/ground water pollution: River: DO, 5 day BOD tests, Seeded BOD test, BOD reaction rate constants,

Ground water: Aquifers, hydraulic gradient, ground water flow (Definition only)

Standard and control: Waste water standard [BOD, COD, Oil, Grease], Water Treatment system [coagulation and flocculation, sedimentation and filtration, disinfection, hardness and alkalinity, softening].

Module V: Land Pollution**[2L]**

Lithosphere; Internal structure of earth, rock and soil. Solid Waste: Municipal, industrial, commercial, agricultural, domestic, pathological and hazardous solid wastes; Recovery and disposal method- Open dumping, Land filling, incineration, composting, recycling. Solid waste management and control (hazardous and biomedical waste).

Module VI: Noise pollution**[2L]**

Definition of noise, effect of noise pollution, noise classification [Transport noise, occupational noise, neighbourhood noise]

Definition of noise frequency, noise pressure, noise intensity, noise threshold limit value, equivalent noise level, L10 (18hr Index), Ldn. Noise pollution control.

Module VII: Environmental Management**[2L]**

Environmental impact assessment, Environmental audit, Environmental laws and protection act of India, Different international environmental treaty/ agreement/ protocol.

Total**[20L]****Recommended Readings:**

1. Masters, G. M., "Introduction to Environmental Engineering and Science", Prentice-Hall of India Pvt. Ltd., 1991.
2. De, A. K., "Environmental Chemistry", New Age International.

Semester III
BSUFSN-301: Basic Food Science I
(CREDITS 6: THEORY – 4, PRACTICAL - 2)

Course Objectives:

1. To know the chemistry that underlies in the Classification, Structure & properties of various calorie giving food components.

Course Outcomes (COs):

Sl. No.	COs	Mapped Modules
1	Understand the food groups and their functions	Module I
2	Know about carbohydrates	Module II
3	Familiarize with proteins.	Module III
4	Acquaint with lipids.	Module IV

Module I: Introduction [6L]
 Definition and Basic concept on Food, Classification of Food, Classification of Nutrients.

Module II: Carbohydrates [10L]
 Definition, Classification, Structure and general properties.
 a) Monosaccharides - glucose, fructose, galactose.
 b) Disaccharides - Maltose, lactose, sucrose
 c) Ologosaccharides- Raffinose, Stachyose
 d) Polysaccharides - Dextrin, starch, glycogen, cellulose.
 Carbohydrates - Sources, daily requirements, functions. Effects of over and under consumption of carbohydrates on health. Digestion and absorption of carbohydrates.

Module III: Proteins [10L]
 Definition, Classification, Structure & general properties.
 Amino acids- Classification, types, functions.
 Structure of peptides.
 Proteins - Sources, daily requirements, functions. Denaturation and renaturation of protein. Effect of protein rich diet and low protein diet on health. Digestion & absorption. Protein quality (BV, PER, NPU, DC, NPR). Factors affecting protein bio-availability including anti-nutritional factors.

Module IV: Lipids [10L]
 Definition, Classification & Properties. general properties.
 Lipids - sources, daily requirements, functions. Digestion & Absorption of lipids. Concept of PUFA, MUFA, SFA, W-3 fatty acid.

Revision [4L]

Total [40L]

Practical: BSUFSN-391: Basic Food Science I Lab
(Credit: 2)

1. Estimation of Reducing and Non Reducing sugar.
2. Estimation of Proteins by Kjeldhal method.
3. Identification and estimation of Proteins & amino acids
4. Estimation of fat.
5. Estimation of calorific value.

Recommended Readings:

1. SrilakshmiB(2017): Nutrition Science,6th Multicolour Ed. New Age International (P) Ltd.
2. RodayS(2012): Food Science and Nutrition, 2nd Ed. Oxford University Press.
3. Mann J and Truswells(2017) : Essentials of Human Nutrition, 5th Ed. Oxford University Press.
4. Wilson K and Walker J(2000): Principles and Techniques of Practical Biochemistry, 5th Ed. Oxford University Press.
5. Sadasivan S and ManikamK(2007): Biochemical Methods, 3rd Ed. New Age International (P) Ltd.
6. Oser B L(1965). Hawk's Physiological Chemistry, 14th Ed. McGraw-Hill Book
7. Nath RL and NathRK(1990). Practical biochemistry in clinical medicine, 2nd Ed. Academic Publishers.
8. Sen AR, Pramanik NK and Roy SK(2001): A treatise on analysis of food fat and oil, Oil Technologists Association of India (EZ), Kolkata, 76, 119.
9. Plummer D(2017): An introduction of Practical Biochemistry, 3rd Ed. McGraw Hill Education.
10. SwaminathanM(2007): Essentials of Food and Nutrition(Vol. I & II), 2nd Ed. Bappco.
11. Meyer LH (2004): Food Chemistry, CBS Publishers & Distributors.

BSUFSN-302: Food Preservation
(CREDITS 6: THEORY: 4, PRACTICAL: 2)

Course Objectives:

1. To prevent the contamination of **food** from damaging agents.
2. To delay or prevent the growth of microorganisms in the **food**.
3. To delay of enzymatic spoilage, i.e. self-decomposition of the **food** by naturally occurring enzymes within it.

Course Outcomes (COs):

Sl. No.	COs	Mapped Modules
1	Develop basic idea of food preservation and composition, manufacture, selection, cost, storage, uses and nutritional aspects.	Module I
2	Know the various Processing of fruits and vegetables products.	Module II
3	Impart basic idea about meat, fish, poultry and egg processing	Module III
4	Impart basic knowledge about the Food Standards	Module IV

Module I:

[9L]

Food preservation: definition, objectives and principles of food preservation. Different methods of food preservation.

Module II:	[12L]
Preserved Products: Jam, Jelly, Marmalade, Tomato Sauce, Chilly Sauce, Pickles, Squash, specification and manufacture, Sauercraut preparation. Potatoes preservation. Potato chips processing. Dry peas. Corn Processing.	
Module III:	[9L]
Meat, Fish, Poultry and Egg Preservation and Processing.	
Module IV:	[6L]
Food Standards: BIS, Agmark, FPO, MPO, PFA, FSSAI., HACCP, AOAC.	
Revision	[4L]
Total	[40L]

Practical: BSUFSN-392: Food Preservation Lab
(Credit: 2)

1. Different methods of Food preservation – Drying, Freezing, Frying, canning, bottling etc.
2. Aseptic handling: Sources of contamination of foods.
3. Preparation of pickles, tomato sauce, chili sauce, jelly, tomato puree, squashes etc.
4. Sauercraut preparation.
5. Potato chips preparation.
6. Drying of Peas.

Recommended Readings:

1. Subalakshmi, G and Udipi, SA (2006): Food processing and preservation, 1st Ed. New Age International (P) Ltd.
2. Srilakshmi B (2018): Food Science, 7th Colour Ed. New Age International (P) Lt
3. Potter NN and Hotchkiss JH (1999): Food science, 5th Ed , Spinger.
4. Srivastava RPO and Kumar S (2014): Fruit and Vegetable Preservation Principles and Practices, 3rd Ed., International Book Distribution Company.
5. McWilliamsM and Paine H (1984): Modern Food preservation. Surjeet Publications.
6. Cruess WV (2004): Commercial Fruits and Vegetable Products, Agrobios India.
7. Desrosier NW and Desrosier JN (2006): The Technology of Food Preservation, 4th Ed. CBS Publishers and Distributors, New Delhi.
8. Adams M and Nout MJR (2001): Fermentation and Food Safety, Spinger.

BSUFSN-303: Research Methodology and Biostatistics
(CREDITS 6: THEORY: 5, TUTORIAL: 1)

Course Objectives:

1. To familiarize participants with basic of research and the research process.
2. To enable the participants in conducting research work and formulating research synopsis and report.
3. To familiarize participants with Statistical analysis.

Course Outcomes (COs):

Sl. No.	COs	Mapped Modules
1	Develop the ability to apply the methods while working on a research project work	Module I
2	Describe the appropriate statistical methods required for a particular research design	Module II
3	Choose the appropriate research design and develop appropriate research hypothesis for a research project	Module III
4	Know how to analyse the data	Module IV
5	Develop a appropriate framework for report writing	Module V

Module I: Research Methodology

[10L]

Methods of Research Definition of research, Characteristics of research, Criteria of good research, Merits and demerits of scientific research, Types of research - Historical research, laboratory experiments, Field, experiments, survey research, evaluative research, Case study research, operational research, participatory research.

Module II: Research Problem

[8L]

Research Abstract: Definition, guidelines for writing abstract, Thesis: Definition, parts, steps in writing thesis

Module III: Study Design

[10L]

Strategies in the field of Food And Nutrition- Descriptive studies(Correlation, Case studies, Cross-sectional surveys) Analytical studies (Observational, Case-control, Cohort studies –Prospective and Retrospective), Experimental studies (Clinical /Intervention trials including Randomized controlled trials), Steps in conducting research, Hypothesis: Definition, purpose, types, Reporting: Methods of reporting, Technical reports.

Module IV: Sampling of Data and Analysis

[12L]

Statistical Methods: Variable, parameter, statistics. Frequency distribution. Cumulative frequency. Graphical presentation techniques including Histogram, Bar chart, Pie chart along with the concepts of frequency polygon. Measures of central tendency: mean, median and mode, their relative advantages and disadvantages Measures of dispersion: Mean deviation, standard deviation, Coefficient of variation, percentile, Types of correlation, coefficient of correlation and its interpretation, Rank correlation, Regression equations and predictions, Analysis of variance, , Chi-square test, 't' test: student's 't' test, paired 't' test, unpaired 't' test, 'F' test.

Module V: Preparation of report

[10L]

a. Graphical and diagrammatic presentation. b. Interpretation of – Meaning of interpretation, Technique of interpretation, c. Precaution in interpretation- Interpretation of tables and figures. d. Report writing – Significance of report writing, Steps in writing report, Types of reports.

Tutorial

[10L]

Total

[60L]

Recommended Readings:

1. Best, JW and Kahn, JV (1992) Research in Education.6th ed. New Delhi, Prentice Hall of India Pvt. Ltd,
2. Kothari, CR (2004) Research Methodology, Methods & Techniques, 2nded. New Age International Publishers.
3. Goode, WJ and Hatt, PK (1981) Methods in Social Research, McGraw Hill International Editions, Sociology Series.
4. Kerlinger, FN (1983) Foundations of Educational Research. 2nd ed.
5. Marjory L. Joseph, William D Joseph (1996) Research Fundamentals in Home Economics / Human Ecology. Plycon Press.
6. WHO (2001) Health Research Methodology – A Guide for Training in Research Methods.
7. Gilbert N. (1981). Statistics. 2nd ed. CBS College Publishing. Japan
8. Moser CA, Kalton G (1979). Survey methods in social investigation. 2nd ed. Heinemann Educational Books Ltd. London.

BSUFSN-304A: Bakery and Confectionery
(CREDITS 6: THEORY: 5, TUTORIAL: 1)

Course Objectives:

1. To impart basic knowledge about the scopes, technical common terms of bakery science
2. To develop a basic idea on the ingredients, process of manufacture and processing condition of bakery items as bread, cake, cookies, biscuits and pastries.
3. To understand the fundamentals of confectionery product development.

Course Outcomes (COs):

Sl. No.	COs	Mapped Modules
1	Understand the principles of baking.	Module I
2	Acquire knowledge on role of various ingredients used in baking.	Module II
3	Use combination of foods in the development of baked products.	Module III
4	Identify and control faults in baking.	Module IV
5	Develop value added bakery products	Module V
6	Understand the principles of confectionery.	Module VI
7	Use combination of foods in the development of confectionery products.	Module VII

Module I: Introduction to bakery

[6L]

Current status, growth rate, and economic importance of Bakery Industry in India. Product types, nutritional quality and safety of products, Bakery hygiene and cleanliness

Module II: Bread, Buns and Pizza Base

[12L]

Ingredients & processes for breads, buns, pizza base, Equipments used, product quality characteristics, faults and corrective measures.

Module III: Cakes

[7L]

Ingredients & processes for cakes, Equipments used, product quality characteristics, faults and corrective measures. Different types of icings.

Module IV: Biscuits, Cookies & Crackers

[6L]

Ingredients & processes, Equipments used, product quality characteristics, faults and corrective measures.

Module V: Modified Bakery Products

[9L]

Modification of bakery products for people with special nutritional requirements e.g. high fibre, low sugar, low fat, gluten free bakery products.

Module VI: Introduction to confectionery

[2L]

Introduction of raw materials like cane sugar, liquid glucose etc, classification of sugar confectionery. Cocoa processing.

Module VII: Confectionery Products

[8L]

Cake icings, hard-boiled candies, toffees, fruit drops, chocolates

Tutorial

[10L]

Total

[60L]

Recommended Readings:

1. Edwards WP (2006): The Science of Bakery Products, 1st Ed. Royal Society of Chemistry.
2. Khetarpaul N, Grewal Rajbala and Jood S(2005):Bakery Science and Cereal Technology, Daya Publishing House.
3. Hui YH (2005): Bakery Products: Science and Technology, 1st Ed. Wiley India.

BSUFSN-304B: Nutrition and Health Education
(CREDITS 6: THEORY: 5, TUTORIAL: 1)

Course Objectives:

1. To impart basic knowledge about the objectives, importance and principles of nutrition and health education.
2. To know the steps and method involved in nutrition and health education.
3. To evaluation of nutrition and health education programmes.

Course Outcomes (COs):

Sl. No.	COs	Mapped Modules
1	Acquaint with the concept, objectives and importance of nutrition and health education	Module I
2	Know the Principles of health education	Module II
3	Familiarize with the nutrition and health education communication process	Module III
4	Know the steps in planning health and nutrition education	Module IV

5	Understand the methods involved in nutrition and health education	Module V
6	Evaluation of nutrition and health education programmes	Module VI

Module I: [9L]
 Basic concept of nutrition and health education. The Basics of Personal Health, Gender Specific Preventative Health-Males, Gender Specific Preventative Health-Females, Relationship between food, nutrition and health. Physiological changes, nutritional guidelines, nutritional concerns, and healthy food choices (for adult, pregnant woman, lactating mother, elderly people).

Module II: [9L]
 Knowledge of health education. Health promotion concepts. Causes, symptoms, treatment, prevention of the following: Protein Energy Malnutrition(PEM), Vitamin A Deficiency (VAD), Iron Deficiency Anaemia (IDA), Iodine Deficiency Disorders (IDD), Zinc Deficiency, Fluorosis.

Module III: [8L]
 Nutrition and health education communication process. Nutrition and health status for Special Conditions: Introduction to Nutrition for physical fitness and sports, Considerations during natural and man-made disasters- basic guidelines in disaster management, e.g. floods, war. Basic guidelines in disaster management. Basic guidelines during pandemic (COVID-19 etc.)

Module IV: [8L]
 Steps in planning health and nutrition education: collecting baseline information, identifying the health problem, detailed plan of action, manage the planning process, develop indicators and review the program plan. Planning and preparation of healthy and nutritional food (one for vegetarian and one for non-vegetarian) items for removing Protein Energy Malnutrition (PEM), Vitamin A Deficiency (VAD), Iron deficiency Anemia (IDA), Zinc Deficiency (ZD), Iodine Deficiency Disorders (IDD).

Module V: [8L]
 Different methods of nutrition and health education: individual methods, group methods and mass methods. Nutritional needs of nursing mothers and infants: Determination of birth weight and consequences of low birth weight. Breastfeeding biology, its support and counseling. Infant and young child feeding, diet, and care. Feeding problems in children with special needs, Malnutrition among preschool children and other adult people, and its remedy. Planning of meals for adults of different activity levels for various income groups.

Module VI: [8L]
 Evaluation of nutrition and health education programmes. Educator perceptions. Health care costs, health outcomes. Cost Analysis. Different National level Nutritional and Health policy and programmes: Integrated Child Development Services (ICDS) Scheme, Mid day Meal Programme (MDMP), National Programme for Prevention of Anemia (NPPA), Vitamin A and Iodine deficiency programme, Programme on Identification of Clinical signs of common nutritional disorders for all age group people.

Tutorial [10L]

Total [60L]

Recommended Readings:

1. Park K (2017): Textbook of Preventive and Social Medicine, 24th Ed. Banarsidas Bhanot Publishers.
2. Mahajan BK, Roy RN, Saha I, Gupta, MC (2013): Text book of Preventive and Social Medicine, 4th Ed. Japee Brothers.
3. Pandya R (2010): Community Health Education, Rawat Publications.

BSUFSN-305: Sports Nutrition
(CREDITS 2: THEORY: 2)

Course Objectives:

1. To impart basic knowledge about the objectives, importance and principles of nutrition and health education.
2. To know the steps and method involved in nutrition and health education.
3. To evaluation of nutrition and health education programmes.

Course Outcomes (COs):

Sl. No.	COs	Mapped Modules
1	Acquaint with the sports nutrition	Module I
2	Know the benefits of physical activity and exercise	Module II
3	Familiarize with the classification of Sports activities	Module III
4	Know the nutritional requirements of sports person	Module IV
5	Impart basic knowledge about Pre- event meal and diets for athletes.	Module V

Module I: [4L]
Definition of physical activity, exercise, physical fitness, sports physiology and sports nutrition.

Module II: [3L]
Benefits of physical activity and exercise. walking (recreational) fitness or gym, running, swimming, cycling, walking, football or soccer, yoga.

Module III: [3L]
Classification of Sports activities.

Module IV: [4L]
Nutritional requirements of sports person. Carbohydrate, Protein and fat nutrition for sports.

Module V: [4L]
Pre- event meal. Designing diets for athletes.

Revision [2L]

Total [20L]

Recommended Readings:

1. Campbell B (2017): Sports Nutrition: Enhancing Athletic Performance, CRC Press, Taylor & Francis.
2. Haff GG (2008): Essentials of Sports Nutrition Study Guide, Humana Press.

- Dunford M and Doyle JA(2008):Nutrition for Sport and Exercise, Thomson Wadsworth,
- Brouns F (2002): Essentials of Sports Nutrition, 2nd Revised Ed. Wiley-Blackwell.
- Bean A (2017): The Complete Guide to Sports Nutrition, 8th Ed. Bloomsbury Sport.
- Benardot D (2011): Advanced Sports Nutrition, 2nd Ed. Human Kinetics Publishers.
- Srilakshmi B (2014): Dietetics, 7th Multicolour Ed. New Age International (P) Ltd.

Semester IV
BSUFNS-401: Basic Food Science II
(CREDITS 6: THEORY – 4, PRACTICAL - 2)

Course Objectives:

- To know the chemistry underlying the Classification, Structure & properties of various non-calorie giving food components.

Course Outcomes (COs):

Sl. No.	COs	Mapped Modules
1	Know about food component Minerals	Module I
2	Acquaint with food component Vitamins	Module II
3	Familiarize with food component Dietary Fibre	Module III
4	Understand the food component Water	Module IV

Module I: Minerals

[9L]

Minerals & Trace Elements, Role of the minerals in human physiology, bio-availability & requirements, sources, deficiency & excess (Calcium, Sodium, Potassium, Phosphorus, Iron, Fluoride, Zinc, Selenium, Iodine, Chromium), Ca & P ratio.

Module II: Vitamins

[9L]

Sources, unit, requirements, Role of the vitamins in human physiology, Hypo- and Hyper vitaminosis.

Module III: Dietary Fibre

[9L]

Classification, properties, sources, composition, & nutritional importances.

Module IV: Water

[9L]

Functions, daily requirements, Water balance, Cause and Effect of dehydration .

Revision

[4L]

Total

[40L]

Practical: BSUFNS-491: Basic Food Science II Lab
(Credit: 2)

- Determination of Moisture content in food.
- Determination of Total Ash content and acid insoluble ash in food.
- Determination of calcium in food.

4. Determination of iron content in food.
5. Estimation of crude fibre in food.

Recommended Readings:

1. SrilakshmiB(2017): Nutrition Science,6th Multicolour Ed. New Age International (P) Ltd.
2. RodayS(2012): Food Science and Nutrition, 2nd Ed. Oxford University Press.
3. Mann J and TruswellsS(2017) : Essentials of Human Nutrition, 5th Ed. Oxford University Press.
4. Wilson K and Walker J(2000): Principles and Techniques of Practical Biochemistry, 5th Ed. Oxford University Press.
5. Sadasivan S and ManikamK(2007): Biochemical Methods, 3rd Ed. New Age International (P) Ltd.
6. Oser B L(1965). Hawk's Physiological Chemistry, 14th Ed. McGraw-Hill Book
7. Nath RL and NathRK(1990). Practical biochemistry in clinical medicine, 2nd Ed. Academic Publishers.
8. Sen AR, Pramanik NK and Roy SK(2001): A treatise on analysis of food fat and oil, Oil Technologists Association of India (EZ), Kolkata, 76, 119.
9. Plummer D(2017): An introduction of Practical Biochemistry, 3rd Ed. McGraw Hill Education.
10. SwaminathanM(2007): Essentials of Food and Nutrition(Vol. I & II), 2nd Ed. Bappco.
11. Meyer LH (2004): Food Chemistry, CBS Publishers & Distributors.

BSUFSN-402: Community Nutrition **(CREDITS 6: THEORY – 4, PRACTICAL - 2)**

Course Objectives:

1. To identify individuals or population groups at risk of becoming malnourished
2. To know the steps and method involved in nutrition and health education.
3. To evaluation of nutrition and health education programmes.

Course Outcomes (COs):

Sl. No.	COs	Mapped Modules
1	Acquaint with the community	Module I
2	Know the nutritional assessment	Module II
3	Familiarize with the different assessment methods	Module III
4	Impart basic knowledge of diet	Module IV
5	Identify some deficiency syndromes	Module V
6	Know the measurement techniques	Module VI
7	Acquaint with the regional agencies and organizations and their duties.	Module VII

Module I:

[5L]

Idea of Community, types of Community, Factors affecting health of the Community, Nutrition and health in National development.

Module II:

[4L]

Malnutrition- meaning. Factors contributing to malnutrition, over nutrition.

Module III:

[7L]

Nutritional assessment of human: Clinical findings, nutritional anthropometry, biochemical tests, biophysical methods. Improvement of nutrition of a community: Modern methods of improvement or nutritional quality of food, food fortification, enrichment and nutrient supplementations.

Module IV: [5L]
Methods of assessing nutritional status: Direct assessment - Diet surveys, Need and importance, methods of dietary survey, Indirect assessment- Food balance sheet, ecological parameters and vital statistics. adequacy of diet in respect to RDA, concept of family food security.

Module V: [5L]
Clinical Signs: Need & Importance's, identifying signs of PEM, vitamin A deficiency and iodine deficiency, Interpretation of descriptive list of clinical signs.

Module VI: [5L]
Nutritional anthropometry: Need and importance, standard for reference, techniques of measuring height, weight, head, chest and arm circumference, interpretation of these measurements. Use of growth chart.

Module VII: [5L]
International, national, regional agencies and organizations. Community nutrition programme planning - Identification of problem, analysis of causes, resources constraints, selection of interventions, setting a strategy, implementations and evaluation of the programme.

Revision [4L]

Total [40L]

Practical: BSUFSN-492: Community Nutrition Lab
(Credit: 2)

1. Diet and nutrition surveys: (a) Identification of vulnerable and risk groups.
2. Diet survey for breast-feeding and weaning practices of specific groups.
3. Use of anthropometric measurement in children. Length, weight, circumference of chest, mid-upper arm circumference, precautions to be taken.
4. Comparison with norms and interpretation of the nutritional assessment data and its significance. Weight for age, height for age, weight for height, body Mass Index (BMI), Waist - Hip Ratio (WHR), Skin fold thickness.
5. Growth charts - plotting of growth charts, growth monitoring and promotion.
6. Clinical assessment and signs of nutrient deficiencies specially PEM (Kwashiorkor, marasmus) I vitamin A deficiencies, Anaemia, Rickets, B-Complex deficiencies.
7. Hospitals to observe nutritional deficiencies.

Recommended Readings:

1. Jelliffe DB. Assessment of the Nutritional Status of the Community; World Health Organisation.
2. Sahn DE, Lockwood R, Scrimshaw NS(1988): Methods the Evaluation of the Impact of Food and Nutrition Programmes, 2nd Printing, United Nations University.
3. Ritchie, JAS(1979): Learning Better Nutrition , Nutritional Studies number 20, FAO, Rome.
4. Gopaldas T and Seshadri S(1988): Nutrition Monitoring and Assessment, Oxford University Press.
5. Mason JB, Habicht, JP, Tabatabai H and Valverde V(1984): Nutritional Surveillance, World Health Organisation.

6. Park K(2017): Textbook of Preventive and Social Medicine,24th Ed. Banarsidas Bhanot Publishers.
7. King MH, King PMA, Morley D and AP Burgess(2015):Nutrition for Developing Countries, ELBS Oxford University Press.
8. Passmore R and Eastwood MA (1986): Davidson and Passmore’s Human Nutrition & Dietetics , 8th Revised Ed. Churchill Livingstone.
9. SeshubabuVVR(2011): Review in Community Medicine, 2nd Ed, Paras Medical Books Pvt Ltd.
10. Mahajan BK, Roy RN , Saha I, Gupta, MC (2013):Text book of Preventive and Social Medicine, 4th Ed. Japee Brothers.
11. Vir SC(2011): Public Health Nutrition in Developing Countries, Woodhead Publishing India.
12. Bamji MS, Krishnaswamy K and BrahmamGNV(2017): Textbook of Human Nutrition , 4th Ed. Oxford & IBH Publishing Co. Pvt. Ltd.

BSUFSN-403: Human Nutrition I
(CREDITS 6: THEORY – 4, PRACTICAL - 2)

Course Objectives:

1. To impart basic knowledge about the nutrition, energy, growth and development.

Course Outcomes (COs):

Sl. No.	COs	Mapped Modules
1	Impart basic knowledge about nutrition.	Module I
2	Understand the nutritional requirements.	Module II
3	Idea of the energy in human nutrition.	Module III
4	Develop knowledge of growth and development	Module IV
5	Monitoring the growth.	Module V

Module I:

[6L]

Introduction to nutrition - Food as source of nutrients, functions of food, definition of nutrition, nutrients & energy, adequate, optimum & good nutrition, malnutrition, functional food, prebiotics, probiotics, phytochemicals, nutraceuticals.

Module II:

[7L]

Nutritional Requirement and RDA: formulation of RDA and Dietary Guidelines Reference Man and Reference Woman. Food guide - Basic five food groups How to use food guide (according to R.D.A.).

Module III:

[8L]

Energy in Human Nutrition: Concept of Energy and its unit, Energy Balance, Assessment of Energy Requirements—deficiency and excess, Calculation of Energy in food, B.M.R. and its regulation, S.D.A., physical activity ratio (PAR).

Module IV:

[8L]

Interrelationship between nutrition & health: Visible symptoms of goods health, Growth & Development from infancy to adulthood: Somatic, physical, brain and mental development, puberty, pre-pubertal and pubertal changes, Factors affecting growth and development.

Module V:

[7L]

Growth monitoring and promotion: Use of growth charts and standards, Importance of Nutrition for ensuring adequate development.

Revision [4L]

Total [40L]

Practical: BSUFSN-493: Human Nutrition I Lab
(Credit: 2)

1. Use and care of kitchen equipments.
2. Process involved in cooking: pressure cooking, microwave, steaming, grilling ,deep fat frying.
3. General ideas of weights and measures. Eye estimation of raw and cooked foods.
4. Preparation of food from different food groups and their effect on health.
5. Preparation of supplementary food for different age group and their nutritional significance.
6. Planning and preparation of nutritious but low cost diet.

Recommended Readings:

1. SrilakshmiB(2014): Dietetics, 7th Multicolour Ed. New Age International (P) Ltd.
2. Guthrie AH(1986):Introductory Nutrition, 6th Revised Ed., McGraw-Hill Inc., US.
3. Robinson CH and Lawler M(1990): Normal and Therapeutic Nutrition. 17th Revised Ed. Macmillan USA.
4. SwaminathanM(2007): Essentials of Food and Nutrition(Vol. I & II), 2nd Ed. Bappco
5. GopalanC , Rama Sastri BV and Balasubramanian SC(2016): Nutritive value of Indian Foods, Indian Council of Medical Research.
6. Nutrient Requirements and Recommended Dietary Allowance for Indians, Indian Council of Medical Research: New Delhi.
7. FAO/WHO/UNO: Technical Report Series, 724 (1985). Energy and Protein Requirement,Geneva.
8. GhoshS(2007):Nutrition and Child Care, 2nd Ed. Jaypee Brothers Medical Publishers Private Limited.
9. WHO : A growth chart for International use In Maternal and Children Health Care, Geneva.
10. Mann J and TruswellS(2017) : Essentials of Human Nutrition, 5th Ed. Oxford University Press.
11. Worthington- Roberts B and Williams SR(1999): Nutrition Throughout the Life Cycle , 4th Ed. McGraw-Hill Higher Education.
12. Elizabeth KE(2015); Nutrition and Child Development , 5th Ed. Paras Medical Publishers.
13. Geissler C and Powers H (2005):Human Nutrition, 11th Ed. Churchill Livingston.
14. Zimmermann M(2001):Burgerstein's Handbook of Nutrition: Micronutrients in the Prevention and Therapy of Disease Thieme Stuttgart.
15. Samour PQ and King K(2010): Pediatric Nutrition, 4t Ed. Jones & Bartlett Learning.
16. Insel P, Ross D, McMahan K and Bernstein M(2016): Nutrition, 6th Ed. Jones & Bartlett Learning.
17. MudambiSR(2018): Fundamentals of Foods, Nutrition and Diet Therapy, 6th Ed. New Age International (P) Ltd.
18. Williams SR(2001): Basic Nutrition and Diet Therapy, 11th Ed. Elsevier.
19. Proudfit FT and Robinson CH(1967):Normal and Therapeutic Nutrition, 13th Ed. Mamillan.
20. Guthrie H and Picciano MF (1994): Human Nutrition , WCB McGraw-Hill,
21. Smith A and ColleneA(2015); Wardlaw's Contemporary Nutrition, 10th Ed. McGraw-Hill Education.
22. Sharlin J and Edelstein S(2010): Essentials of Life Cycle Nutrition, 1st Ed. Jones & Bartlett Learning.

23. Indian National Code for Protection of Breast Feeding: Govt. of India. Ministry of Social Welfare, New Delhi.

BSUFSN-404A: Food Borne Diseases and Food Toxicology
(CREDITS 6: THEORY: 5, TUTORIAL: 1)

Course Objectives:

1. To describe the major food borne bacterial pathogens and diseases caused by them.
2. To impart basic knowledge about enzyme deficiency causing disease.
3. To develop an idea on food safety, sanitation and hygiene.
4. To know about the food toxins.

Course Outcomes (COs):

Sl. No.	COs	Mapped Modules
1	Know the food borne diseases.	Module I
2	Understand the enzyme deficiency causing disease	Module II
3	Understand the mechanism of food borne diseases	Module III
4	Know basic knowledge about food safety	Module IV
5	Acquaint with the basic concepts hygiene and sanitation	Module V
6	Understand basic knowledge about food safety management	Module VI
7	Develop knowledge of food toxins	Module VII

Module I: Food borne diseases

[11L]

Definition related to food borne diseases, types of causes: chemical, biological, microbial. Diseases with example (Pandemic, Endemic and Epidemic). Brief idea about characteristics, source, symptoms: *Salmonella*, *Shigella*, *Clostridium perfringens*, *Clostridium botulinum*, *Staphylococcus aureus*, *Bacillus cereus*, *Campylobacter jejuni*, *Listeria monocytogenes*, *Escherichia coli*, *Vibrio parahomolyticus*, *Aeromonas sp.*

Module II: Lactose intolerance

[2L]

Lactose intolerance-its mechanism and enzyme deficiency, Remedy.

Module III: Mechanism of food borne diseases

[4L]

Mechanism of food borne diseases. Prevention.

Module IV: Food safety

[5L]

Definition: Food safety, types of hazards (Biological, chemical and physical hazards), effect on health, control measures, factors affecting food safety.

Module V: Hygiene and sanitation

[11L]

Hygiene and sanitation: Contamination, sources of contamination, Prevention of contamination, Procedures to minimize microbial load, Common faults in food preparation, control methods using physical and chemical agents, use of preservatives,. Health and hygiene of food handler.

Module VI: Food safety management

[5L]

Food safety management: Concept of safety management, prerequisites- GHPs, GMP, HACCP etc.

Module VIII: Toxic agents in food

[12L]

Toxic agents in food: Botulinum, lathyrogen, Goitrogen, Gossypol, Aflatoxin, Mycotoxin, Ciguatoxins, Tetrodotoxins, Saxotoxins, conotoxins, Antivitamins, Haemagglutins, Cyanogenicglycosides, Strychnine, Solanine, atropine, Muscarine

Tutorial [10L]

Total [60L]

Recommended Readings:

1. Infections Diseases and Clinical Microbiology 2014, Amber Arnold, George E. Griffin, Oxford.
2. Fundamentals of Food Process Engineering 2000, Romeo T. Toledo, CBS PUB & DIS.
3. Food Processing and Preservation 2008, G. Subhalakshmi, S. A. Udipi, New Age.
4. Fruit and Vegetable Preservation 2016, R. P. Srivastava, Sanjeev Kumar, CBS, PUB & DIS.
5. Food Toxicology, Debasis Bagchi, Anand Swaroop.

BSUFSN-404B: Diet Planning, Counselling and Patient Care
(CREDITS 6: THEORY: 5, TUTORIAL: 1)

Course Objectives:

1. To aware of the fact that diet plays an important role in the treatment of the disease.
2. To educate the patient regarding the nature of the disease, its hazards, how a disease can be recognized and prevented. It is essential to advice the patient on personal hygiene, individual instructions on diet and any specific therapy needed.

Course Outcomes (COs):

Sl. No.	COs	Mapped Modules
1	Acquaint with term Dietician	Module I
2	Know the role of dietician in hospital	Module II
3	Know the role of dietician in community	Module III
4	Idea of nutrition care process, nutritional assessment, Nutritional Diagnosis,	Module IV, V. VI
5	Acquaint with nutrition vs. medical diagnosis, Nutrition Interventions	Module VII, VIII
6	Monitoring & Evaluation of the Nutritional aspects	Module IX

Module I: [4L]

Introduction to term Dietician: Definition of Dietician, Difference between registered dietician & Nutritionist.

Module II: [6L]

Role of Dietician: Role of dietician in hospital, work area of hospital dietician, role of dietician in hospital, interpersonal relationship with patient,

Module III: [5L]

Role of dietician in community: Function and working area of community dietician.

Module IV: [7L]

Definition of nutritional care, planning and implementary dietary care, Team approach to nutritional care. Steps of Nutrition Care Process.

Module V:	[6L]
Nutrition Assessment: Definition, Nutrition assessment component, Critical thinking.	
Module VI:	[6L]
Nutrition Diagnosis: nutrition diagnosis domain: intake, clinical, behavioral – environmental.	
Module VII:	[5L]
Nutrition diagnosis, component nutrition vs. medical diagnosis	
Module VIII:	[5L]
Nutrition Interventions: Definition and objectives	
Module IX:	[6L]
Nutrition Monitoring & Evaluation: Definition, Nutrition monitoring & evaluation components, nutrition goals & objectives. Evaluation of nutrition care.	
Tutorial	[10L]
Total	[60L]

Recommended Readings:

1. Mahan LK and Escott-Stump S(2007): Krause's Food and Nutrition Therapy. 12th Ed. WB Saunders Company, London.
2. Robinson. CH, Lawler MR, Chenoweth WL and Garwick, AE(1986): Normal and Therapeutic Nutrition. 17th Ed.,Macmilian Publishing Co.
3. Williams SR (1989): Nutrition & Diet Therapy, 6th Ed. Times Mirror/Mosby College Publishing, St. Louis.

BSUFNS-405: Food Service Management
(CREDITS 2: THEORY: 2)

Course Objectives:

1. To manage the human resources within a food services organization or department
2. To communicate appropriately with clients, staff and management.
3. To develop nutritional menus for food service production.
4. To manage food service production.

Course Outcomes (COs):

Sl. No.	COs	Mapped Modules
1	Gain knowledge about various types of food services	Module I
2	Familiarize with preparation, cleaning, storing, serving and planning a food serving unit	Module II
3	Develop knowledge of menu planning	Module III
4	Idea of food service	Module IV

5	Realise the importance of sanitation and hygiene in food service institutions.	Module V
6	Understand about personnel Management, financial management and legal aspects of catering.	Module VI

Module I: [4L]

Organization of food service management: Definition, Various types of Food Service institutions, their characteristics and functions. Function of management: Managing, Planning, Organizing, Directing, Coordinating, Controlling and Evaluating.

Module II: [4L]

Planning a food service unit, layout design, planning of different work areas.. Kitchen Space – Size and types, Developing kitchen plan, Work simplification Features to be considered in kitchen designing Storage Space – Types of storage, Factors to be considered while planning storage spaces, Service Area – Location, Structural designing and planning storage spaces, Equipment – Classification of equipment, Selection of equipment, Designing, installation and operation, Purchasing equipment, Care and maintenance of equipment, Lighting and ventilation, working heights in relation to equipment.

Module III: [2L]

Institutional Menu Planning: Factors influencing menu planning, principles of menu planning, different kinds of menus. Sensory quality of menu.

Module IV: [2L]

Quality food Service – types-Centralized, de-centralized objectives. Styles of service, Waiter service, self service and vending.

Module V: [4L]

Importance of sanitation and hygiene in food, cleaning of equipments and utensils, kitchen hygiene, Hygienic handling of Food, employee's health, hygiene of food service unit. Pest control: Housefly, Rats and rodents, Cockroaches, Importance of pest control, Use of pesticides and insecticides. Waste disposal.

Module VI: [2L]

Personnel Management- selection, training and supervision of personnel, criteria for selection of Dietician and Food Service staff.

Revision [2L]

Total [20L]

Recommended Readings:

1. Khan MA (1987):Food Service Operations, Avi Publication Co.
2. Tompkins D(1969):Table Layout and Decoration, Ward Lock Co. Ltd.
3. Kinton R and CaseraniV(1989): The Theory of Catering, 6th Ed. ELBS.
4. Edward K(1997): Food Service Facilities Planning 3rd Ed, John Wiley & Sons.
5. Sethi M (2015):Catering Management: An Integrated Approach,3rd Ed. New Age International(P) Ltd.
6. RodayS(2017): Food Hygiene and Sanitation with Case Studies, 2nd Ed. McGraw Hill Education.

Semester V
BSUFSN-501: Human Nutrition II
(CREDITS 6: THEORY – 4, PRACTICAL - 2)

Course Objectives:

1. To manage nutrition during Pregnancy, Lactation, Infancy, Children etc.
2. To learn nutritional management skill for human beings.

Course Outcomes (COs):

Sl. No.	COs	Mapped Modules
1	To understand the health problems associated with nutrient deficiency or toxicity.	Module I
2	The importance of diet in maintaining human health and leading active lifestyle.	Module II
3	To highlight the physiological and metabolic role of nutrients and their relationship to human health and wellbeing.	Module III
4	The concept of diet therapy in treatment and management of nutritional disorders.	Module IV
5	To understand the essential of nutrients in growth and development of children.	Module V

Module I:

[10L]

Nutrition During Pregnancy: Factors (non-nutritional) affecting pregnancy outcome, importance of adequate weight gain during pregnancy, antenatal care and its schedule, Nutritional requirements during pregnancy and modification of existing diet and supplementation, Deficiency of nutrients, specially energy, iron folic acid, protein, calcium, iodine. Physiological changes, Common problems of pregnancy and their managements, specially - nausea, vomiting, pica, food aversions, pregnancy induced hypertension, obesity, diabetes. Adolescent pregnancy. Maternal weight gain and complications of pregnancy, Increase in Nutritional requirements during pregnancy.

Module II:

[8L]

Nutrition during Lactation: Nutritional requirements during lactation, dietary management, food supplements, galactogogues, preparation for lactation. Care and preparation of nipples during breast feeding. Nutritional component of colostrum and mature milk.

Module III:

[10L]

Nutrition during Infancy: Infant physiology relevant to feeding and care, Initiations of breast feeding. Advantages of exclusive breast feeding. Basic principles of breast feeding. Composition of different types of milk – cow, buffalo, goat and camel, formula milk Breast feeding Vs bottle feeding, Care & sterilization of bottles. Feeding of Low birth weight and premature infants, Human Milk Banks Weaning: Homemade foods vs commercial foods

Module IV:

[4L]

Management of preterm and low birth weight babies.

Module V:

[4L]

Nutritional needs of toddlers, preschool, school going children and adolescents- Dietary management. Nutritional requirements Factors to be considered while planning diet for the preschool children,

School going children: Nutritional requirements, Packed lunch, Factors to be considered while planning diet for school going children, Nutritional requirements during adolescence.

Revision [4L]

Total [40L]

Practical: BSUFNS-591: Human Nutrition II Lab
(Credit: 2)

1. To standardize raw and cooked foods. 1. Cereal and Pulse- Rice, Upma , Phulka, Chapathi, Kichidi, Idli, Dosa, Dhal with Green Leafy Vegetable
2. Beverages and Desserts - Tea, Soup, Juices, Milk Shakes, Porridges, Plain Custard
3. Vegetable and fruits- Vegetable curries and salads.
4. Planning and preparation of adequate meal for different age groups with special reference to different physiological conditions:
 - a) Infants,
 - b) Pre-schooler,
 - c) School children,
 - d) Adolescents,
 - e) Adults,
 - f) Pregnancy,
 - g) Lactation
 - h) Old age.

Recommended Readings:

1. SrilakshmiB(2014): Dietetics, 7th Multicolour Ed. New Age International (P) Ltd.
2. Guthrie AH(1986): Introductory Nutrition, 6th Revised Ed., McGraw-Hill Inc., US.
3. Robinson CH and Lawler M(1990): Normal and Therapeutic Nutrition. 17th Revised Ed. Macmillan USA.
4. SwaminathanM(2007): Essentials of Food and Nutrition(Vol. I & II), 2nd Ed. Bappco
5. GopalanC , Rama Sastri BV and Balasubramanian SC(2016): Nutritive value of Indian Foods, Indian Council of Medical Research.
6. Nutrient Requirements and Recommended Dietary Allowance for Indians, Indian Council of Medical Research: New Delhi.
7. FAO/WHO/UNO: Technical Report Series, 724 (1985). Energy and Protein Requirement, Geneva.
8. GhoshS(2007): Nutrition and Child Care, 2nd Ed. Jaypee Brothers Medical Publishers Private Limited.
9. WHO : A growth chart for International use In Maternal and Children Health Care, Geneva.
10. Mann J and TruswellsS(2017) : Essentials of Human Nutrition, 5th Ed. Oxford University Press.
11. Worthington- Roberts B and Williams SR(1999): Nutrition Throughout the Life Cycle , 4th Ed. McGraw-Hill Higher Education.
12. Elizabeth KE(2015); Nutrition and Child Development , 5th Ed. Paras Medical Publishers.
13. Geissler C and Powers H (2005): Human Nutrition, 11th Ed. Churchill Livingstone.
14. Zimmermann M(2001): Burgerstein's Handbook of Nutrition: Micronutrients in the Prevention and Therapy of Disease Thieme Stuttgart.
15. Samour PQ and King K(2010): Pediatric Nutrition, 4t Ed. Jones & Bartlett Learning.
16. Insel P, Ross D, McMahon K and Bernstein M(2016): Nutrition, 6th Ed. Jones & Bartlett Learning.

17. MudambiSR(2018): Fundamentals of Foods, Nutrition and Diet Therapy, 6th Ed. New Age International (P) Ltd.
18. Williams SR(2001): Basic Nutrition and Diet Therapy, 11th Ed. Elsevier.
19. Proudfit FT and Robinson CH(1967):Normal and Therapeutic Nutrition, 13th Ed. Mamillan.
20. Guthrie H and Picciano MF (1994): Human Nutrition , WCB McGraw-Hill,
21. Smith A and ColleneA(2015); Wardlaw's Contemporary Nutrition, 10th Ed. McGraw-Hill Education.
22. Sharlin J and Edelstein S(2010): Essentials of Life Cycle Nutrition, 1st Ed. Jones & Bartlett Learning.
23. Indian National Code for Protection of Breast Feeding: Govt. of India. Ministry of Social Welfare, New Delhi.

BSUFNS-502: Diet Therapy I
(CREDITS 6: THEORY – 4, PRACTICAL - 2)

Course Objectives:

1. To learn the diet therapy for different common diseases.
2. To learn the diet management for common symptoms.

Course Outcomes (COs):

Sl. No.	COs	Mapped Modules
1	To know the Basic concepts of diet therapy.	Module I
2	To know Team approach to health care.	Module II
3	To know the Routine Hospital Diets.	Module III
4	To know the Diets for different febrile conditions.	Module IV
5	To know the Etiological factors, symptoms, and Management.	Module V, VI
6	To know the Diseases of the liver and Biliary System. Dietary Management.	Module VII, VIII

Module I:

[5L]

Concept of Diet therapy: growth and source of dietetics, purpose and principles of therapeutic diets, modification of normal diet, classification of therapeutic diets.

Module II:

[4L]

Team approach to health care. Assessment of Patient's needs.

Module III:

[4L]

Routine Hospital Diets: Pre-operative and post-operative diets, Basic concepts and methods of Oral feeding, Tube feeding, Parental nutrition, Intravenous feeding.

Module IV:

[4L]

Diet in fever and infections- Types- metabolism in fever, general dietary consideration diet in influenza, typhoid fever, recurrent malaria and Tuberculosis.

Module V:

[4L]

Diet in gastritis, peptic ulcer- symptoms, clinical findings, treatment, dietary modification, adequate nutrition, amount of food, and intervals of feeding.

Module VI:

[5L]

Diet in disturbances of small intestine and color. Diarrhoea- (child and adult)- classification, modification of diet , fibre, residue. fluids & nutritional adequacy. Constipation- flatulence - dietary considerations. Ulcerative colitis (adults)- symptoms, dietary treatment. Spruce, coeliac disease- disaccharide intolerance, dietary treatment.

Module VII: [5L]

Diet in diseases of the liver, gall bladder and pancreas,
Etiology, symptoms and dietary treatment in - Jaundice, hepatitis, cirrhosis and hepatic coma.
Role of alcohol in liver diseases.
Dietary treatment in cholecystitis, cholelithiasis and pancreatitis.

Module VIII: [5L]

Diet in surgical conditions, burns and cancer, Anaemias: General concept, aetiology, classification, and dietary management of Nutritional anaemia.

Revision [4L]

Total [40L]

Practical: BSUFSN-592: Diet Therapy I Lab
(Credit: 2)

1. Planning and preparation of normal diets.
2. Planning and preparation of fluid diets.
3. Planning and preparation of soft/semi solid diets.
4. Planning, preparation and calculation of diets in fever and infections.
5. Planning, preparation and calculation of diets for insulin dependent Diabetes mellitus, Planning, snacks, desserts and beverages for diabetes.
6. Planning, preparation and calculation of diet in cardiovascular diseases.
7. Planning, preparations and calculation of diet in Kidney failure, Kidney transplant, Renal complication & Kidney stones.
8. Planning, preparations and calculation of diet in Cancer, Trauma (burns) & Surgery.

Recommended Readings:

1. Anderson L, Dibble MV, Turkki PR, Mitchall HS, and Rynbergin HJ(1983): Nutrition in Health and Disease, 17th Ed. J. B. Lipincott& Co. Philadelphia.
2. Anita FP and Abraham P: Clinical Dietetics and Nutrition, 4th Ed. Oxford University Press, Delhi.
3. Mahan LK and Escott-Stump S(2007): Krause's Food and Nutrition Therapy. 12th Ed. WB Saunders Company, London.
4. Robinson. CH, Lawler MR, Chenoweth WL and Garwick, AE(1986): Normal and Therapeutic Nutrition. 17th Ed.,Macmilian Publishing Co.
5. Williams SR (1989): Nutrition & Diet Therapy, 6th Ed. Times Mirror/Mosby College Publishing, St. Louis.
6. Begum RM (2009): A textbook of Food, Nutrition and Dietetics, 3rd Ed. Sterling Publishers, New Delhi.
7. Joshi SA(2017): Nutrition and Dietetics, 4th Ed. Tata McGraw Hill Publications, New Delhi.
8. Hutchison, R(2010)Food And The Principles Of Dietetics , Kessinger Publishing, LLC.

BSUFSN-503A: Food Safety & Regulations
(CREDITS 6: THEORY – 4, PRACTICAL - 2)

Course Objectives:

1. To acquaint on Food Laws, regulations for the safety of Foods.
2. To gather knowledge on Food additives, adulterants, and their effect on human health.

Course Outcomes (COs):

Sl. No.	COs	Mapped Modules
1	To know the Food additives and their effect on human health.	Module I
2	To know the Common adulterants in food and their effects on health.	Module II
3	To know the spoilage of different foods; infections and infestation.	Module III
4	To understand the Food laws, and their regulations.	Module IV

Module I: Food additive and food safety

[8L]

Concept of food safety, Food additives-characteristics of a compound to be selected as an additive, various types of additives, uses, limits and their effects on health.

Module II: Food spoilage

[9L]

Cereals, Pulses, Vegetables & Fruits, Milk & milk products, Fish, meat, egg, Fatty food, Food borne infections & infestation.

Module III: Food adulterants

[10L]

Definition of food adulteration, Types of Adulterants, Common adulterants in food: their detection and their effects on health.

Module IV: Food laws and regulatory authority

[9L]

Prevention of Food Adulteration (PFA) Act, International Standards, Regulating authority-Codex Alimentarius, Agmark, Fruit Products Order (FPO), Vegetable Oil Products Order (VOPO), Meat Products Order (MPO), Bureau of Indian Standards (BIS), HACCP, FSSAI.

Revision

[4L]

Total

[40L]

Practical: BSUFSN-593A: Food Safety & Regulations Lab
(Credit: 2)

1. Detection of common adulterant in food

- i) Water, starch, formalin, in milk
- ii) Urea in puffed rice
- iii) Khesari flour in besan
- iv) Vanaspati in Ghee/Butter
- v) Dried papaya seeds in black pepper
- vi) Metanil yellow in turmeric or coloured sweet products.

- vii) Artificially foreign matter in tea (dust/leaves).
- viii) Argemone seed in mustard seed.

Recommended Readings:

1. Subalakshmi, G and Udipi (2001), S.A. Food processing and preservation; New Age International Publishers, New Delhi.
2. Srilakshmi, B. (2003), Food Science. New Age International Publishers, New Delhi.
3. Potter, N.N. and Hotchkiss J. H. (1996), Food Science. CBS publishers and distributors.
4. Srivastava, R.P.O. and Kumar, S. (1994) Fruit and vegetable preservation, International Book distribution Company, Lucknow.
5. MC Williams, M and Paine, H. (1994), Modern Food preservation. Surjeet Publications, Delhi.
6. Cruess, W.V.(1997), Commercial Fruits and Vegetable Products, Anees Offset press, New Delhi.

BSUFSN-503B: Food Commodities
(CREDITS 6: THEORY – 4, PRACTICAL - 2)

Course Objectives:

1. To know the types/varieties, selection, processing/ preparation of different food commodities.
2. To gather knowledge on food commodities and hence to implement in different food processing aspects.

Course Outcomes (COs):

Sl. No.	COs	Mapped Modules
1	To know the structure, composition, nutritive value, variety, processing, storage criteria of cereals, millets, pulses and legumes.	Module I, II
2	To know the classifications, selection & processing, storage criteria, nutritional aspect, shelf-life of milk and milk products, eggs, meat, fish, poultry, vegetables, fruits.	Module III, IV, V, VI
3.	To know the grading, production, storage criteria, nutritional aspect, shelf-life of sugar and sugar products, fats and oils.	Module VII, VIII
4.	To know the types, constituents, classifications, uses of Raising and Leavening agents, and Food Adjunct.	Module IX, X
5.	To know the types, Nutritional aspect, Storage of convenience foods, salts, and beverages	Module XI, XII, XIII

Module I: Cereals and Millets

[3L]

Structure, composition, nutritive value, variety, processing, storage, use in various preparation, Cereal products, breakfast cereals, fast food.

Module II: Pulses and Legumes

[3L]

Structures, composition, nutritive value, variety, processing, storage, use in different preparations,

Module III: Milk and Milk products	[3L]
Composition, Classification, Quality, Processing, Storage and uses in different preparations, Nutritional aspects.	
Module IV: Eggs	[3L]
Structure, composition, grade, quality, storage and spoilage, nutritive value and use in different preparations.	
Module V: Meat, Fish and Poultry	[3L]
Composition, types, Storage, Uses, preparations, Spoilage of fish, meat and poultry.	
Module VI: Vegetables and Fruits	[3L]
Variety, Selection, purchase, storage, availability, spoilage and nutritional aspects of raw and processed vegetables and fruits and their products.	
Module VII: Sugar and sugar Products	[3L]
Types of natural, sweeteners, manufacture, selection, storage and use as preserves, stages in sugar cookery.	
Module VIII: Fats and Oils	[3L]
Composition, nutritive value, types and sources (animal and vegetable), Processing, uses in different preparations.	
Module IX: Raising and Leavening agents	[2L]
Types, constituents, uses in cookery and bakery.	
Module X: Food Adjunct	[3L]
Spices, condiments, herbs, extracts; concentrates essences, food colours, classification, description, uses.	
Module XI: Convenience Foods	[2L]
Types, advantages and disadvantages, uses and contribution to diet.	
Module XII: Salt	[2L]
Composition, types and uses.	
Module XIII: Beverages	[3L]
Tea; Coffee. Chocolate and Cocoa Powder-Processing, nutritional aspects, other beverages.	
Revision	[4L]
Total	[40L]

Practical: BSUFNS-593B: Food Commodities Lab
(Credit: 2)

1. Detection of water, starch, sucrose, formalin, boric acid, and urea in milk.
2. Detection of urea in puffed rice.
3. Detection of Vanaspati in Ghee/Butter.
4. Detection of Khesari flour in besan.

5. Detection of Metanil yellow in turmeric/coloured sweet products.
6. Detection of Argemone oil in edible oil.
7. Detection of Argemone seed in mustard seed.
8. Detection of artificially colour / foreign matter in tea (dust/leaves).
9. Dried papaya seeds in black pepper.

Recommended Readings:

1. Swaminathan MS Food Science, Chemistry and Experimental Foods, Bangalore Print & Publishing Company.
2. SrilakshmiB(2018): Food Science, 7th Colour Ed. New Age International (P) Ltd.
3. Lavies, S (1998): Food Commodities Ltd. London.
4. Hughes O and Bennion, M (1970): Introductory Foods, 5th Ed. Macmillan & Co., New York.
5. Parker R and Pace M(2016): Introduction to Food Science and Food Systems, 2nd Ed. Delmar Cengage Learning.
6. Meyer LH(2004): Food Chemistry, 1st Ed. CBS Publishers and Distributors, New Delhi.
7. Mudambi SR, Rao SM and Rajagopal MV(2006): Food Science, 2nd Ed. New Age International (P) Ltd.
8. Manay SN and ShadaksharaswamyM(2008): Foods: facts and principles , 3rd Ed. New Age International (P) Ltd.
9. Potter NN and Hotchkiss JH(1999): Food science, 5th Ed , Spinger.
10. PruthiJS(2011): Spices and Condiments, National Book trust, New Delhi.
11. Pyke M and Murrey J (1974): Catering Service and Technology, John Murrey Pube, London.

BSUFSN-504A: Public Health
(CREDITS 6: THEORY – 5, TUTORIAL - 1)

Course Objectives:

1. To learn the health parameters and its dimensions.
2. To learn the different contaminated foods and its impact on public health.

Course Outcomes (COs):

Sl. No.	COs	Mapped Modules
1	To understand health vs. absence of disease, vital statistics.	Module I, II
2	To know immunization, and its importance.	Module III
3	To know the different wastes, and waste management.	Module IV
4	To gain the concept of Concept of Epidemiology.	Module V
5	To understand the Communicable and infective disease control.	Module VI
6	To give an idea about Public health hazards due to contaminated foods.	Module VII

Module I:

[7L]

Principles and practices of public health. Positive health Versus Absence of disease. Introduction to Health System and Policy in Developing Countries.

Module II:

[7L]

Secondary Sources of Community Health data: Reproductive, Maternal Health, Child Health and adolescent.

Module III:	[7L]
Immunization: Importance and Immunization schedule for children, adults and for foreign travelers.	
Module IV:	[7L]
Community Water and Waste Management: Importance of water to the community, etiology and effects of toxic agents, water borne infectious agents, sources of water, safe drinking water, potable water, waste and waste disposal, sewage disposal and treatment, solid waste and disposal, liquid waste disposal.	
Module V:	[7L]
History of Epidemiology • Measurements in Epidemiology • Incidence and prevalence • Causation and association • Measures of association •	
Module VI:	[8L]
Outline of study designs (including cross sectional study design, case control study design, cohort study design and randomised control trials) • Introduction to confounding and bias • Screening tests- validity and reliability methods • Disease surveillance • Outbreak investigation • Communicable and non-communicable diseases.	
Module VII:	[7L]
Public health hazards due to contaminated foods: Food borne infections and intoxications: symptoms, mode of transmission and methods of prevention, investigation and detection of food borne disease outbreak.	
Tutorial	[10L]
Total	[60L]

Recommended Readings:

1. Smith, G.W.: Preventive Medicine and public health. 2nd edition. McMillan Co. New York.
2. Park: Park's Textbook of preventive and Social Medicine. 9th Edition. M/s. Banarasi Das Bhanot. Jabalpur.
3. SeshubabuVVR(2011): Review in Community Medicine, 2nd Ed, Paras Medical Books Pvt Ltd.
4. Mahajan BK, Roy RN , Saha I, Gupta, MC (2013):Text book of Preventive and Social Medicine, 4th Ed. Japee Brothers.
5. Vir SC(2011): Public Health Nutrition in Developing Countries, Woodhead Publishing India.
6. Willett W(2012): Nutritional Epidemiology, 3rd Ed. Oxford University Press,USA.

BSUFNS-504B: Introduction to Business Management
(CREDITS 6: THEORY – 5, TUTORIAL - 1)

Course objectives:

1. To familiarize students with the basic concepts of various fields of Management.
2. To develop an understanding of business facets and how it works to make profit.
3. To align the minds of the students to the business point of view of the Agribusiness Industry.

Course Outcomes (COs):

Sr. No.	COs	Mapped Modules
1.	To know the nature and functions of a Manager, also learn about the Planning, concept and the decision making process of the Organizational structure	Module I
2	To learn about various leadership styles and communication processes and also learn about basics concepts of economics related to management.	Module II
3	To learn about various Marketing techniques and understanding the minds of customers	Module III
4	To learn about financial management concepts and financial requirements of business	Module IV
5	To understand various concepts about developing the right kind of Business in terms of Human Resource	Module V
6	To understand operations related activities pertaining to the business environment	Module VI

Module I: Basics of Principles of Management

[7L]

Definition, importance and nature of Management, challenges & trends of managers, ethics in managing and social responsibility of managers, planning and control, planning process and strategies, SWOT analysis, barriers to effective planning, Planning- control relationship, process of control, Decision Making & Organizing Nature, process of decision making, decision making under Certainty and Uncertainty, decision-tree, group-aided decision, brain-storming. Organizing – concept, nature and process of organizing, authority and responsibility, delegation and empowerment, centralization and decentralization, concept of departmentation.

Module II: Leadership & Concepts of Managerial Economics

[7L]

Defining leadership and its role, should managers lead, leadership style, leadership development, Leadership behavior. Communication- Process, Bridging gap-using tools of communication, electronic media in Communication, Introduction of Managerial Economics, Demand Analysis, Production and Cost Analysis, Managerial Decision Making under Alternative Market Structures , Pricing Decisions, Externalities and Market Failure.

Module III: Marketing Management

[9L]

Definition, Concepts Significance & functions of Marketing, Fundamentals of Marketing - Role of Marketing - Relationships of Marketing with other functional areas, Buying Behavior, Marketing Mix, Market Segmentation, Sales Forecasting, Pricing, Advertising and Promotion, Marketing Research.

Module IV: Financial Management [9L]

Nature of Financial Management, Capital Budgeting, Cost of Capital, Capital Structures, Operating and Financial Leverage, Dividend Policy Decision, and Management of Working Capital.

Module V: Human Resource Management [9L]

Scope & Coverage of Human Resource Management, Development of HR Functions, Structure and Function of HR Manager, Role of Line Managers in Managing Human Resources, Human Resource Planning, Employment Administration, Compensation Management, Employee Benefits, Industrial Relations in India.

Module VI: Production Management [9L]

Basics of production Management: Labour productivity, location planning, Capacity Planning, Maintenance Management, Supply chain management, Purchasing and Warehousing, Materials management, Total Quality Management.

Tutorial: Case Studies [10L]

Total [60L]

Recommended Readings:

1. Koontz – Principles of Management (Tata McGraw Hill, 1st Edition 2008)
2. Robbins &Caulter – Management (Prentice Hall of India, 8th Edition)
3. Marketing Management By Philip Kotlers
4. S.Bhatt: Financial Management, Excel Books
5. V.S.P. Rao: Human Resource Management, Excel Books
6. J.K, Sharma: Operations Research, Macmillian, 2013

Semester VI

BSUFNS-601: Diet Therapy II

(CREDITS 6: THEORY – 4, PRACTICAL - 2)

Course Objectives:

1. To know the nutritional energy calculation, and energy management.
2. To know the different life style diseases, corresponding diet, and dietary management.

Course Outcomes (COs):

Sl. No.	COs	Mapped Modules
1	To understand Energy modifications and nutritional care for	Module I

	weight management.	
2	To gather the knowledge of Diet in disease of the endocrine pancreas and according diet plan.	Module II
3	To make an idea about different common diseases in daily lifestyle such as Hypertension, Diseases of the cardiovascular system, ischemia, angina pectoris, myocardial infarction, heart attack and stroke.	Module III
4	To know Renal Diseases, their causes, symptoms, Dietary Management.	Module IV

Module I:

[9L]

Obesity and Overweight: Classification of obesity,(gynoid/android and Regulation hypertrophy/hypersplasia, Etiology and assessment of obesity and prevalence in Indian situation, Complications of obesity. Management: Medical (Pharmacological), Nutrition and lifestyle, Surgical, Behavioural Juvenile Obesity. Underweight:Etiology ,Diet management, Eating disorders: (Anorexia Nervosa and Bulimia), Management (Medical,Nutritional care), Psychological support and preventions.

Module II:

[9L]

Diet in disease of the endocrine pancreas: Diabetes Mellitus: Definition, Etiology, Classification, long and short term complications, Diagnosis, Management (Insulin Therapy, Exercise, Pharmacological), Role of artificial sweeteners. special diabetic foods, Overview of special conditions: Diabetes in Childhood, Pregnancy. meal plan (with and without insulin).

Module III:

[9L]

Hypertension: classification, aetiology, symptoms and dietary management. Diseases of the cardiovascular system: Definition of ischemia, angina pectoris, myocardial infarction, heart attack and stroke. Atherosclerosis and hyperlipidaemias – classification, symptoms, dietary and lifestyle management.Prevention of cardiovascular diseases.

Module IV:

[9L]

Diet in Renal diseases: Basic renal function, symptoms and dietary treatment in acute and chronic glomerulonephritis, Nephrosis, renal failure, dialysis. urinary calculi-causes & treatment, acid and alkali producing and neutral foods and dietary treatment, uremia. Use of sodium and potassium exchange list.

Revision

[4L]

Total

[40L]

Practical: BSUFNS-691: Diet Therapy II Lab
(Credit: 2)

1. Planning and preparation of Diets for the following diseases:
 - i. Obesity and Underweight.
 - ii. Diabetes mellitus.
 - iii. Hypertension and Atherosclerosis.
 - iv. Acute and chronic glomerulonephritis.
 - v. Gout.
 - vi. Osteoporosis.

Recommended Readings:

1. Anderson L, Dibble MV, Turkki PR, Mitchall HS, and Rynbergin HJ(1983): Nutrition in Health and Disease, 17th Ed. J. B. Lipincott& Co. Philadelphia.
2. Anita FP and Abraham P: Clinical Dietetics and Nutrition, 4th Ed. Oxford University Press, Delhi.
3. Mahan LK and Escott-Stump S(2007): Krause's Food and Nutrition Therapy. 12th Ed. WB Saunders Company, London.
4. Robinson. CH, Lawler MR, Chenoweth WL and Garwick, AE(1986): Normal and Therapeutic Nutrition. 17th Ed.,Macmilian Publishing Co.
5. Williams SR (1989): Nutrition & Diet Therapy, 6th Ed. Times Mirror/Mosby College Publishing, St. Louis.
6. Begum RM (2009): A textbook of Food, Nutrition and Dietetics, 3rd Ed. Sterling Publishers, New Delhi.
7. Joshi SA(2017): Nutrition and Dietetics, 4th Ed. Tata McGraw Hill Publications, New Delhi.
8. Hutchison, R(2010)Food And The Principles Of Dietetics , Kessinger Publishing, LLC.

BSUFSN-602: Geriatric Nutrition
(CREDITS 6: THEORY – 4, PRACTICAL - 2)

Course Objectives:

1. To know the Geriatric nutrition and its management.
2. To know the nutritional status of different age group people.

Course Outcomes (COs):

Sl. No.	COs	Mapped Modules
1	To know the gerontology, geriatrics, and geriatric nutrition.	Module I
2	To know the Physiological and biochemical changes during old age.	Module II
3	To know the nutritional status of older adults.	Module III
4	To understand Nutritional requirements and general dietary guidelines for elderly people.	Module IV
5	To know the Major nutritional and health problems during old age.	Module V

Module I:

[8L]

Introduction to ageing. Definition of ageing, senescence, old age or aged people, gerontology, geriatrics, and Geriatric nutrition. Classification of old population.

Module II:

[7L]

Metabolic syndrome, Physiological and biochemical changes during old age. Implication of ageing population for rehabilitation: Demography, mortality and morbidity.

Module III:

[7L]

Assessment of nutritional status of older adults. Weight disorders, Obesity, Underweight and malnutrition.

Module IV:

[7L]

Nutritional requirements and general dietary guidelines for elderly, Presenting oral health exam for the elderly.

Module V:	[7L]
Major nutritional and health problems during old age. Dementia and Parkinson's disease: physiology, diagnosis, therapy, nutrition dementia, artificial feeding and bedsores, osteoporosis.	
Revision	[4L]
Total	[40L]

Practical: BSUFSN-692: Geriatric Nutrition Lab
(Credit: 2)

1. Visit to old- age homes.
2. Preparation of dishes suitable for older person-
 - a) Soft,
 - b) Semisolid
 - c) Liquid
 - d) Easily digestible balanced diet.

Recommended Readings:

1. Human Nutrition by H. Guthrie and M.F. Piccianom, WCB McGrawHill,1995.
2. Robinson CH, Lawler MR, Chenoweth WL, GarwickAE(199!): Normal And Therapeutic Nutrition, 17th Ed, MacMillan Publishing Company, New York,
3. Insel PM, Turner RE and RossD (2004): Nutrition ,Jones & Bartlett Learning,
4. Morley JE and Thomas DR(2007): Geriatric Nutrition, 1st Ed. CRC Press.
5. Watson RR (2008):Handbook of Nutrition in the Aged, 4th Ed. CRC Press.
6. Chernoff R(2013):Geriatric Nutrition : The Health Professional's Handbook, 4th Revised Ed. Jones and Bartlett Publishers.

BSUFSN-603A: Food and Beverage Management
(CREDITS 6: THEORY: 4, PRACTICAL: 2)

Course Objectives:

1. To gain a basic understanding of the Food and Beverage industry by analyzing the industry's growth and development, reviewing its organizational structure, investigating its relationship with the hotel's other departments and by focusing on industry opportunities and future trends.
2. To prepare students to meet the challenges associated with the Food and Beverage Industry

Course Outcomes (COs):

Sl. No.	COs	Mapped Modules
1	Develop general knowledge on the origins and development of food service in hotels, restaurants, and institutions.	Module I
2	Identify the basic principles of Food and Beverage production and define the steps involved in menu planning and menu design.	Module II

3	Know how to manage the personnels and handle the employees.	Module III
4	Describe safety procedures and techniques used on the Food and Beverage industry.	Module IV

Module I: Introduction to Food Service [9L]

Service of Food, Introduction to food service industry in India, factors contributing to the growth of food service industry, sectors of food service industry, food service operations, Kinds of food service establishments, environmental factors influencing food service operations, styles of food service. Service of non alcoholic beverages, Breakfast service. Soup service, Afternoon tea set up, Receiving Guest and taking orders.

Module II: Food Production & Menu Planning [10L]

Food production process, Menu Control, Menu planning: Menu Structure, Importance of menu, Factors affecting menu planning, Menu planning for different kinds of food service units, Constraints of Menu Planning, Pricing of Menus, Menu as Marketing Tool, Food Purchase and Storage, Quantity Food production: Standardization of recipes, quantity food preparation - techniques, recipe adjustments and portion control, Quality of food and beverage, Alcoholic and non alcoholic beverages.

Module III: Resources of food service establishments [9L]

Food and beverage staff, organization structure, qualities of food service staff, training; Essential Equipments in Food and Beverage Service, Loading carrying – trays/trolley, food & beverage pricing, revenue control, food and beverage marketing,

Module IV: Personnel Management [8L]

Personnel Management, Recruitment, selection, work standards, productivity, supervision, induction, employee facilities& benefits, safety at work, Hygiene and Sanitation.

Revision [4L]

Total [40L]

Practical: BSUFNSN-693A: Food and Beverage Management Lab
(Credit 2)

1. Planning of A Food Service Unit Planning the set up a) Identifying resources b) Developing Project plan c) Determining investments d) Project Proposal.
2. Planning for nonalcoholic beverage unit
3. Planning of Breakfast menu.

Recommended Readings:

1. West B Bessie & Wood Levelle (1988) Food Service in Institutions 6th Edition Revised By Hargar FV, Shuggart SG, &Palgne Palacio June, Macmillan Publishing Company New York.
2. SethiMohini (2005) Institution Food Management New Age International Publishers.
3. Knight J B &Kotschevar LH (2000) Quantity Food Production Planning & Management 3rd edition John Wiley & Sons.
4. Philip E Thangam (2008) Modern Cookery for teaching and Trade Part I & II Orient Longmam.
5. Taneja S and Gupta SL (2001) Enterpreneurship development, Galgotia Publishing.

BSUFSN-604B: Mushroom Culture
(CREDITS 6: THEORY – 4, PRACTICAL - 2)

Course Objectives:

1. To know the biology of mushroom.
2. To know the mushroom cultivation (processing), and its storage
3. To understand the types of mushroom and their nutritive status
4. Explore the Economic value of mushroom

Course Outcomes (COs):

Sl. No.	COs	Mapped Modules
1	To know the characteristics, Morphology and life cycle of different types of Mushroom along with their medicinal and nutritional vale	Module I, II
2	To Identify and classification of mushroom. To know the Types of edible mushrooms, and their processing. Poisonous mushroom	Module I, II
3	Cultivation of mushroom. Factors affecting the cultivation and processing of mushroom	Module III
4	Economics of mushroom cultivation, Precautions measures in mushroom processing, Mushroom recipes	Module IV
5	To know the Storage (Short and long term) and nutrition gain from mushrooms. Marketing of mushrooms in India and world	Module V

Module I:

[6L]

Definition and characteristics of mushroom. History of mushroom cultivation. Proximate composition and Nutritional value of mushroom. Benefits and problems of mushroom consumption, Edible mushrooms and cultivation in India and world. Different types of edible mushroom.

Module II:

[8L]

Morphology and life cycle of Mushroom. Identification and classification of mushroom. Types of edible mushrooms available in India- *Volvariella volvacea*, *Pleurotus citrinopileatus*, *Agaricus bisporus*. Nutritional and medicinal value of edible mushrooms. Poisonous mushrooms and mushroom poisoning.

Module III:

[10L]

Cultivation Technology of mushroom: Infrastructure, equipments and substrates in mushroom cultivation. Polythene bags, vessels, inoculation hook, inoculation loop, sieves, culture racks, mushroom unit or mushroom house, water sprayer, tray, boilers, driers, pure culture.

Spawn: types of spawn, preparation of spawn, mushroom bed preparation and factors affecting mushroom bed preparation. Different types of raw materials used.

Compost: materials used for compost preparation, compost technology in mushroom production. Problems in cultivation: Disease, Pest, Nematodes, weeds and their control.

Module IV:

[6L]

Economics of mushroom cultivation – precautions in mushroom cultivation – precaution to be taken while selecting the area, Preparation of culture, mother spawn, production, multiplication of spawn,

maintenance of mushroom beds of oyster mushroom. Mushroom recipes (western and Indian recipes, pickles, powders, jams etc.)

Module V:	[6L]
Storage and food preparation from mushrooms: Methods of storage of mushroom cultivation, Long term and short term storage of mushrooms Foods/recipes from mushrooms. Mushroom research centers/farms: National level and regional level. Marketing of mushrooms in India and world	
Revision	[4L]
Total	[40L]

Practical: BSUFNS-694B: Mushroom Culture Lab
(Credit: 2)

1. Visit to Mushroom Culture Centers/ Farms.
2. Visual identification of different types and varieties of mushroom.
3. Visual Identification of edible and poisonous mushroom
4. Study of storage life of mushroom.
5. Mushroom marketing
6. Different Food preparation from mushroom.

Recommended Readings:

1. Staff E (2007): Hand Book of Mushroom Cultivation, Processing and Packaging Import, Educa Books.
2. Pandey RK and Ghosh SK (1999): A Handbook of Mushroom Cultivation, Emkay Publications.
3. Patil NN (2010): Mushroom : Cultivation, Processing and Uses, 1st Ed. Universal Prakashan.

BSUFNS-681: Project
(CREDITS 6)

Course Objectives:

With this intention Project work is included in course curriculum to promote the students towards research and innovation in the field. Hand on experience in Laboratory/Industry in the area of Food Processing and Quality Control is included. Accordingly, the Project work is not supposed to be a formal dissertation, rather it should be objective based to make minor changes in existing products or product innovation based on consumer demand and market needs. This part also helps the student to become an entrepreneur.