

COURSE OUTLINE

FIRST YEAR		
CODE	PAPER NAME	MARKS
THEORY		
B.Sc. (HA01)	Principles of Human Nutrition	50
B.Sc. (HA02)	Food Preservation	50
B.Sc. (HA03)	Introduction to Clothing and Textiles	50
B.Sc. (HA04)	Textile Designing and Finishes	50
B.Sc. (HA05)	System Dynamics and Management of Resources	50
B.Sc. (HA06)	Consumer Education	50
B.Sc. (HA07)	Introduction to Human Development	50
B.Sc. (HA08)	Life span Development I	50
B.Sc. (HA09)	Human Physiology	50
PRACTICAL		
B.Sc. (HA10)	Food Preservation	50
B.Sc. (HA11)	Introduction to textile, its designing and finishes	50
B.Sc. (HA12)	Human Physiology	50
SECOND YEAR		
THEORY		
B.Sc. (HA13)	Introduction to Extension education	50
B.Sc. (HA14)	Communication and Instructional technology	50
B.Sc. (HA15)	Nutrition: A life cycle approach	50
B.Sc. (HA16)	Therapeutic Nutrition	50
B.Sc. (HA17)	Introduction to Housing and Space Design	50
B.Sc. (HA18)	Introduction to Interior Designing	50
B.Sc. (HA19)	Life Span Development II	50
B.Sc. (HA20)	Population Dynamics	50
B.Sc. (HA21)	Fashion studies	50
PRACTICAL		
B.Sc. (HA22)	Communication and Instructional Technology	50
B.Sc. (HA23)	Normal and Therapeutic Nutrition	50
B.Sc. (HA24)	Fundamentals of Housing and Interior Designing	50
THIRD YEAR		
THEORY		
B.Sc. (HA25)	Clothing Construction and Flat pattern making	50
B.Sc. (HA26)	Traditional Indian Textiles	50
B.Sc. (HA27)	Food standard and Quality control	50
B.Sc. (HA28)	Nutrition Education	50
B.Sc. (HA29)	Early Childhood Education and Management	50
B.Sc. (HA30)	Children with Special Needs	50
B.Sc. (HA31)	Financial Management	50
B.Sc. (HA32)	Entrepreneurship Development	50
B.Sc. (HA33)	NGO Management and CSR	50
PRACTICAL		
B.Sc. (HA34)	Clothing Construction and Flat pattern making	50
B.Sc. (HA35)	Food Quality and Nutrition Education	50
B.Sc. (HA36)	Early Childhood Management and Special Education	50

COURSE DETAILS

FIRST YEAR

B.Sc. (HA01) Principles of Human Nutrition

Units	Course details
Unit 1	Terms and definitions used in nutrition History of nutrition and important landmarks Classification and functions of food
Unit 2	Macro nutrients (i) Carbohydrates: Types of carbohydrates in food, digestion, metabolism and functions of carbohydrates, Health conditions affected by excess and lack of carbohydrates.
Unit 3	(ii) Lipids: Types of lipids in foods, digestion, metabolism and functions of lipids, Health problems associated with lipids (iii) Proteins: Amino acids as building blocks of proteins, classification, structure of protein, metabolism and functions of protein, Health conditions affected by protein. (iv) Energy source: Dietary carbohydrates, proteins, fats and alcohol. three basic functions of energy, basal metabolic rate, physical activity and thermogenesis and factors influencing them.
Unit 4	Micronutrients Vitamins: Requirement, sources, function, toxicities and signs and symptoms of deficiencies of: Fat soluble vitamins; water soluble vitamins Minerals: Requirement, sources, functions, deficiencies and toxicities Water its metabolism, sources, distribution of water, structural and regulatory functions

Recommended readings:

- Wilson E D, Fisher K H and Garcia P A 1980 Principles of Nutrition. Jhon Wiley & Sons, NewYor
- Bamji M S ; Rao P N and Reddy V; 1997 Textbook of Human Nutrition. Oxford and IBH Publishing Co.

B.Sc. (HA 02) Food Preservation

Units	Course details
Unit 1	Concept and significance of food preservation; need, benefits and aims Food deterioration, causes of food spoilage, factors affecting it and control of microorganism, enzymes and other factors, Selection and purchase of fruits and vegetables for preservation.
Unit 2	Principles and method of food preservation • Principles and methods of food drying and concentration- sun drying, freeze drying, spray drying, drying by osmosis, factors in control of drying Preservation by the use of heat- Sterilization, pasteurization, blanching and canning. Preservation by cold- Distinction between refrigeration and freezing; freezing preservation- air freezing, quick freezing, slow freezing, cryogenic freezing
Unit 3	Preservation by use of chemical preservatives, salt, sugar and other additives Principles of food preservation by irradiation and refrigerated gas storage of various foods.
Unit 4	Storage stability of preserved products, objective test of quality of stored like odour, texture etc. Effect of food preservation on nutritive value of food. Enhancing nutritional quality of the food Fermentation: role of microorganism and benefits of fermentation. Sprouting, food fortification, supplementation and enrichment.

Recommended readings:

- Manay, Sakuntala and Shadaksharaswamy, M. (2001). Food Facts and Principles, 2nd edition. New Age International Publishers.
- Srilakshmi, B. (2001). Food Science. New Age International Publishers.
- Potter, N.N. and Hotchkiss, J.H., (1996). Food Science Vth ed. CBS Publishers, New Delhi.

B.Sc. (HA03) Introduction to Clothing and Textiles

Units	Course details
Unit 1	Textile fibres and their properties Primary and secondary properties of textile fibres with reference to their effect on fibre characteristics, structure of fibres Classification of fibres Origin, production, manufacturing and properties of various fibres: Natural- cotton, linen, jute, hemp, ramie, wool, silk, asbestos. Man-made-rayon, polyester and nylon.
Unit 2	Basic principle of yarn making: Mechanical spinning (cotton system, wool system, worsted system), Chemical spinning (wet, dry and melt) Types of yarns: Staple, Filament, Simple, complex Properties of yarns: Yarn numbering systems and twist. Textured yarns: Classification, manufacture and properties
Unit 3	Weaving: Its principles and basic weaves, parts and functions of the loom Weaves: Classification, construction, characteristics and usage
Unit 4	Knitting: Classification, construction, characteristics and usage, Non-woven and felts-construction, properties and usage.

Recommended readings:

- Cobman, P.B (1985) Textiles Fibre to Fabrics. 6th edition Mc Graw Hill Book Co, US.
- Sekheri S, (2013) Textbook of Fabric Science, Fundamentals to finishings PHI Learning, Delhi.

DEPARTMENT OF MICROBIOLOGY

SYLLABUS

B.Sc. with MICROBIOLOGY

(Annual System)



SRI DEV SUMAN UTTARAKHAND UNIVERSITY
BADSHAHHITHOL, TEHRI (GARHWAL),
UTTARAKHAND

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STRUCTURE OF B.Sc. MICROBIOLOGY (Annual System)

	Paper	MM
I	Fundamentals of Microbiology	50
	Microbial diversity	50
	Microbial Physiology & Biochemistry	50
	Lab Course based on all three papers	50
II	Microbial Genetics & Molecular Biology	50
	Biostatistics , Bioinformatics & Computer	50
	Environmental Microbiology	50
	Lab Course on all three papers	50
III	Industrial Microbiology	50
	Medical Microbiology & Immunology	50
	Food& Dairy Microbiology	50
	Lab Course on all three papers	50

Internal examination: 30 marks; External examination: 70 marks

Dr. K. R. Singh

General Microbiology

Unit I

History of microbiology, scope and relevance of microbiology, classification of microbial world; bacteria, cyanobacteria, archaea, actinomycetes, fungi, algae and protozoa.

Unit II

Principle, types and application of microscopes, LAF cabinet, autoclave, oven, colony counter, spectrophotometer, pH meter, anaerobic chamber; Principle, basic apparatus and applications of electrophoresis, thermocycler (PCR), centrifuge, blotting, Chromatography & its types.

Unit III

Isolation, cultivation and identification techniques for microorganisms, aerobic and anaerobic cultivation, biochemical methods for identification, culture media & its type, maintenance & preservation of pure cultures.

Unit IV

Study of Morphology of microbes by staining methods –staining, Simple (Leffer's polychrome methylene blue & negative staining) Gram's staining, Ziel-neelson staining, Flurochrome staining, Leishman's staining, Giemsa's staining, special staining methods to demonstrate granules, capsules & spores.

Microbial Diversity

Unit I

General virology ; nomenclature and classification of viruses, Morphology and ultrastructure, capsids and their arrangements, types of envelopes and their compositions. Viral genome, their types and structures. Virus related organisms (viroids, virusoids and prions).

Unit II

Morphology and ultra structure of bacteria; structure, properties and function of cell wall, cell membranes, flagella, cilia, pili, gas vesicle, chromosomes, carboxysomes, magnetosomes and phycobilisomes, nucleoid.

Unit III

Flagellate protozoa : the Mastigophora, ameboid protozoa: the Rhizopoda, ciliate protozoa: the ciliophora. Protozoal disease: malaria, Giardiasis, Trichomoniasis, Toxoplasmosis, Pneumocystis pneumonia and disease caused by Leishmania, Trypanosomes.

Unit IV

Algae; General account of habitat, cell structure, pigments, flagellum, reserve food. Conflicts of taxonomic position of Cyanobacteria. Algal growth and reproduction. Cultivation of algae in laboratory. Nitrogen fixation, Biological and economic aspects of algae, algal biotechnology. Fossil records of algae. Algal blooms and eutrophication.

Unit V

Fungi: Habitat, fungal structure and thallus organization, wall structure, hyphal growth, sexual and asexual reproductive structures. Nutrition and reproduction in fungi, Mycorrhiza, lichens, Heterothallism, sex hormones in fungi. Evolutionary tendencies in lower fungi. Economic importance. Fungal diseases.

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Microbial Physiology & Biochemistry

Unit I

Enzymes as biocatalyst, enzymes classification, properties. Enzymes kinetics : Michaelis-Menten equation for simple enzymes, Effects of pH and temperatures, on enzymes action, enzyme inhibition. Electron carriers, artificial electron donors, inhibitors uncouplers, energy bond and phosphorylation.

Unit II

Microbial metabolism: anabolism and catabolism, energy production in aerobic, anaerobic process and photosynthesis, chemiosmotic hypothesis of ATP synthesis. Bacterial electron transport chain. Autotrophy, Heterotrophy, chemolithotrophy, fermentation. Transport of nutrients by active and passive transport.

Unit III

Respiratory metabolism – Glycolysis, EMP pathway, ED pathway, Glyoxylate pathway, Krebs's cycle-oxidative and substrate level phosphorylation. Reverse TCA cycle – Gluconeogenesis, fermentation and carbohydrates – homo and heterolactic fermentations.

Unit IV

Assimilation of nitrogen – dinitrogen, nitrate nitrogen, ammonia assimilation, synthesis of major amino acids, synthesis of Polysaccharides – peptidoglycan, biopolymers as cell components.

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Microbial Genetics & Molecular Biology

Unit I

Nucleic acid as genetic information carrier: Experimental evidence. DNA structure current concepts. DNA replications, general principles and various modes of replications.

Unit II

Gene as a unit, mutation and recombination. Molecular nature of mutations. Mutagens. Spontaneous mutation. DNA damage and repair: type of DNA damage (deamination, oxidative damage, alkylation, pyridine dimers). Repair mechanisms – methyl directed mismatch repair, very short patch repair, nucleotide excision repair, base excision repair, recombination repair, SOS system.

Unit III

Gene expression and protein synthesis: Structural features of RNA (rRNA, tRNA, and mRNA) and relation of function. Transcription; general principles, type of RNA polymerases, steps: initiation, elongation and termination. Inhibitors of RNA synthesis. Polycistronic and Monocistronic RNA. Basic features of genetic code. Protein synthesis and its steps: initiation, elongation and termination. Inhibitors of protein synthesis. Gene conversion site specific recombination, transposable elements, insertion sequences, transposons.

Unit IV

Gene transfer mechanisms – Transformations, Transductions, conjugation and Transfection, mechanisms and applications. Plasmids: F factor description and their use in genetic analysis. Bacteriophage: Lytic phages-T4. Lysogenic phage – lambda X174 : uses in microbial genetics.

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Biostatistics, Bioinformatics & Computer application

Unit I

Introduction: definition of statistics, the sample and population, statistical inference, parameter and statistics. Measures of central tendency: Mean median, mode and their relationship, standard deviation, chi square test, student's t test and goodness of fit. Probability: Random experiment, events, sample space, independent and dependent events. Probability density functions and its properties. Probability distributions (Basic idea and applications)- Binomial, Poisson and normal.

Unit II

Probability density functions and its properties. Probability distributions (Basic idea and applications)- Binomial, Poisson and normal. Analysis of variance: Analysis of co-variance: Introduction, procedures and tests, multiple comparisons. standard curves; correlation, linear regression (fitting of best line through a series of points), Multiple colinearity. Standard curves and interpolation of unknown Y- values.

Unit III

What is bioinformatics, importance of bioinformatics, Biological database; primary and secondary database. DNA sequence database, DNA sequence analysis, pair wise alignment, multiple sequence alignment.

Unit IV

Computer basics: Component of computer system. Memory: primary and secondary. CPU, Operating system: definition, importance, Disk operating system. Network: Types of network. Local Area Network (LAN), Wide Area Network (WAN), Metropolitan Air Network (MAN). Internet: basic idea.

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Environmental Microbiology

Unit I

Air pollution: sources, types, effects of pollutants, control measures brief account of air borne transmission of microbe; viruses, bacteria and fungi, their diseases and preventive measures. Aeroallergy and Aeroallergens. Assessment of air quality.

Unit II

Aquatic Microbiology: water ecosystem and its type, marine microorganisms and their importance, Eutrophication, brief account of major water borne diseases and their control measures. Water treatment –wastes types, solid and liquid wastes characterization, Primary secondary , tertiary solid waste treatment, Bioaccumulation, Bioremediation, Bioleaching of copper and uranium.

Unit III

Soil microbiology : classification of soil, physical and chemical characteristics, micro flora of various soil types, brief account of microbial interactions, symbiosis-mutualism, commensalisms, competition, Ammensalism, synergism, parasitism, predation.

Unit IV

Biogeochemical cycles and the microorganisms –carbon, nitrogen, phosphorous and sulfur, Biofertilizers : Vesicular Arbuscular Micorrhizae (VAM); Ecto, Endo, Ectendo Mycorrhizae.

Unit V

Organic matter decomposition; Organic matter dynamics in soil- microbial decomposition of cellulose, hemi cellulose, lignin. Factors affecting organic matter decomposition (litter quality, temperature, aeration, soil pH, inorganic chemicals, moisture); Pesticide degradation in soil, effects of pesticides on soil microflora, soil microbial biomass as an index of soil fertility.

Dr. Ravi R. Singh

Industrial Microbiology

Unit I

Isolation of industrially important microbial strains, strain improvement, preservation and maintenance of industrial microbes, scale-up. Criteria used for selection of micro-organisms for fermentation. Growth kinetics of industrially important microorganisms.

Unit II

Fermentation process: Batch, fed – batch and continuous fermentations; solid state and submerged fermentations. Components in a typical bioreactor and types. Maintenance of pH, temperature, dissolved oxygen and aeration.

Unit III

Substrate for industrial fermentation ; Molasses, corn steep liquor, sulfite waste liquor, whey, yeast extract. Detection and assay of fermentation product. Down stream Processing, immobilization & its applications. Antifoams. Mycotoxins with reference to Aflatoxins. Microbial production of industrial products ; citric acid , ethanol ,acetone , penicillin, streptomycin , vitamin B12 , riboflavin , amylase, single cell protein .

Unit IV

Food as a substrate for micro organisms , microbial spoilage of different food – stuffs , principles and methods of food preservation . Microbiology of milk , dairy products and fermented foods . Food – borne diseases.

Unit V

Industrial production of antibiotics (β – lactam and rifamycin), citric acid,acetic acid , lactic acid , ethanol, enzymes(pectinase, amylases, lipases, proteases, cellulases). Amino acids (glutamic acid and lysine), vitamins (Riboflavin and cyanocobalmine). Aseptic operation and containment of recombinant organisms.

Dr. K. Singh

Medical Microbiology & Immunology

Unit I

Historical background of medical microbiology, Classification of medically important microorganisms, Disease cycle, transmission of pathogen and its routes. Infection and its type. Host parasite relationship, pathogenicity and virulence in relation with bacteria, Virus fungi and parasites.

Unit II

Silent features of the diseases caused bacteria; Clostridium, Bacillus, Staphylococcus, streptococcus, E.coli, Klebsiella, Salmonella, Pseudomonas, Vibrio, Neisseria, Mycobacteria. Viral disease – Hepatitis, HI, dengue fever, small pox, polio. Protozoan diseases- Malaria & Amoebiasis.

Unit III

Protein toxins – types and disease, early diagnosis and detection of disease by serological methods –RIA, ELISA, complement fixation, agglutination, chemotherapy types and action mechanism of anti microbial assay and drug resistance vaccines interferons.

Unit IV

Immune responses and its types – innate (non specific), acquired (cell mediated and humoral) immunity. Antigens – structure and properties, Immunoglobulin structures properties & functions Antigen – antibody reactions – ELISA, RIA, Agglutination & precipitate Complements structures and functions Major Histocompatibility complex (MHC) Structure and functions. Autoimmunity and hypersensitivity reactions.

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**DEPARTMENT OF MICROBIOLOGY
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Food and Dairy Microbiology

Unit I

Microorganisms important in food microbiology- Molds, Yeasts and Bacteria- general characteristics, classification and importance. Asepsis- removal of microorganisms, anaerobic conditions, high, low temperatures, drying; Factors influencing microbial growth –Extrinsic and Intrinsic factors, chemical preservatives and food additives. Heat processing; D, Z, and F values and working out treatment parameters for canned foods; Canning.

Unit II

Initial microflora of raw milk ; Sources of contamination of milk; cheese, acidophilus milk, kefir and yoghurt, Nutritional and therapeutic benefits of fermented milk products; Probiotic foods; Spoilage of fermented dairy products; Quality control in dairy industry.

Unit III

Food borne infections and intoxications; Bacterial diseases with examples of infective and toxic types – Brucella, Bacillus clostridium, Escherichia, Salmonella, Shigella, Staphylococcus, Vibrio, Yersinia, fungi and viruses; Aflatoxins - structures and functions; Food borne outbreaks – laboratory testing procedures; Preventive measures – Sanitation in manufacture; Food control agencies and its regulations, HACCP, ISO standards.

Unit IV

Food fermentations; bread, vinegar, fermented vegetables; prevention and spoilage of cereals, vegetables, fruits, meat and meat products fish and sea products. Foods produced by Microbes – Fermented foods, microbial cells as food (single cell proteins); Mushroom cultivation Industrial enzymes and their uses in food industry – amylases, proteases, cellulases; Oriental foods – Mycoprotein, Tempeh, soya sauce; Traditional foods.

