

Integral University, Lucknow

Department of Biosciences

B.Sc. (Biochemistry)

II Semester

B. Sc. Biochemistry Semester - II

Course Code	Course Title	Type of Paper	Periods/week				Evaluation Scheme			Maximum Marks	Credits	Total Credit
			L	T	P	CT	TA	Total	ESE			
ES115	Fundamentals of Environmental Studies	Foundation	3	1	0	25	15	40	60	100	3:1:0	4
CH114	Fundamental of Organic Chemistry	Core	3	1	0	25	15	40	60	100	3:1:0	4
BS232	Plant Physiology	Core	3	1	0	25	15	40	60	100	3:1:0	4
BS233	Animal Physiology	Core	3	1	0	25	15	40	60	100	3:1:0	4
BS113	Fundamental of Microbiology	Core	3	1	0	25	15	40	60	100	3:1:0	4
	Chemistry Lab-II											
CH115		Practical	0	0	6	25	15	40	60	100	0:0:3	3
BS205	Microbiology lab.	Practical	0	0	6	25	15	40	60	100	0:0:3	3
		Total								700	26	26

UNIT I-

(10hrs)

Environment its components & segments, Physical, Chemical and biological study of Environment, Multidisciplinary nature of environmental studies, Concept of Sustainable development & Sustainable life styles, Public awareness & Environmental movements like Chipko, Silent valley, Narmada Bachao Andolan.6

Natural Resources:

Renewable and non-renewable resources: Natural resources and associated problems.

- a. **Forest resources:** Use and over-exploitation, deforestation. Timber extraction, mining, dams and their effects on forest and tribal people.
- b. **Water resources:** Use and over-utilization of surface and ground water, floods, drought, conflicts over water, dams-benefits and problems.
- c. **Mineral resources:** Use and exploitation, environmental effects of extracting and using mineral resources.
- d. **Food resources:** World food problems, changes caused by agriculture and overgrazing, effects of modern agriculture, fertilizer-pesticide problems, water logging, salinity.
- e. **Energy resources:** Growing energy needs, renewable and non renewable energy sources, use of alternate energy sources.
- f. **Land resources:** Land as a resource, land degradation, man induced landslides, soil erosion and desertification. Role of an individual in conservation of natural resources. Equitable use of resources for sustainable lifestyles.

UNIT II-

(8hrs)

Ecosystems:

- Concept of an ecosystem.
- Structure and function of an ecosystem.
- Producers, consumers and decomposers.
- Energy flow in the ecosystem.
- Ecological succession.
- Food chains, food webs and ecological pyramids.
- Introduction, types, characteristic features, structure and function of the following ecosystem:
 - a. Terrestrial Ecosystem
 - b. Aquatic ecosystems

UNIT III-

(8hrs)

Biodiversity and its conservation:

- Introduction – Definition : genetic, species and ecosystem diversity.
- Bio-Geographical classification of India.
- Value of biodiversity : consumptive use, productive use, social, ethical, aesthetic and option values.
- Biodiversity at global, National and local levels.
- India as a mega-diversity nation.
- Hot-spots of biodiversity.
- Threats to biodiversity : habitat loss, poaching of wildlife, man-wildlife conflicts.
- Endangered and endemic species of India.
- Conservation of biodiversity : In-situ and Ex-situ conservation of biodiversity.

UNIT IV-

(8hrs)

Environmental Pollution

Definition:

- Cause, effects and control measures of
 - a) Air pollution
 - b) Water pollution
 - c) Soil pollution
 - d) Marine pollution
 - e) Noise pollution
- Solid waste Management: Causes, effects and control measures of urban and industrial wastes.
- Disaster management : floods, earthquake, cyclone and landslides.

UNIT V-

(6 h r s)

Social Issues and the Environment:

- From Unsustainable to Sustainable development.
- Urban problems related to energy.
- Water conservation, rain water harvesting, watershed management.
- Resettlement and rehabilitation of people; its problems and concerns, case studies.
- Environmental ethics : Issues and possible solutions.
- Green house effect and global warming, effects of acid rain and their remedial measures and ozone layer depletion.
- Ill-effects of fire works
- Environment Protection Act. Air (Prevention and Control of Pollution) Act. Water (Prevention and control of Pollution) Act. Wildlife Protection Act. Forest Conservation Act. Issues involved in enforcement of Environmental legislation. Case studies.

Human Population and the Environment:

- Population growth, variation among nations. Population explosion – Family Welfare Programme. Environment and human health. Human Rights.
- Value Education.
- HIV/AIDS. Women and Child Welfare.

Suggested Reading:

1. Environmental Studies by Benny Joseph, Tata McGraw Hill, 2005.
2. Environmental Studies by Dr. D.L. Manjunath, Pearson Education, 2006.
3. Principles of Environmental Science and Engineering by P. Venugopal Rao, Prentice Hall of India.
4. Environmental Science and Engineering by Meenakshi, Prentice Hall of India.

(Revised w.e.f. session 2015-2016)

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UNIT I-Inorganic: Acid and Bases: Elementary idea of Bronsted-Lowry and Lewis concept of acids and bases (Proton-donor acceptor and electron donor acceptor systems), Relative strengths of Lewis acids bases and the effect of substitutes and the solvent on them.

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UNIT II-General properties of 3rd group elements & Co-ordination Compounds: Molecular compounds, Werners coordination theory, IUPAC system of nomenclature of coordination compounds. Discussions of outer and inner orbit complexes. Role of tracer elements (Ne, K, Mg, Ca Mn, Fe, Co, Ca, Xn, Cr, P,S, Cl, and I) in biological systems.

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UNIT III-General trends in the Chemistry of p-block elements: Preparation, properties, uses and structure of the following compounds. Tin Chlorides, hydrazine, hydroxylamine and acids, Oxides, Oxyacids hydrogen sulphide (analytical applications), Oxides and Oxyacids of sulphur,

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UNIT IV- Physical: Liquids: Vapor pressure, variation of vapour pressure of liquids with temperature, Solutions: Henry's Law, Raoult's Law, critical solutions temperatures, fractional distillation and steam distillation.Osmosis and measurement of osmotic pressure. Effect of solutes on boiling points and freezing points of solutions.

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UNIT V-Heterogenous equilibria: Phase rule, phase diagrams of water and sulphur system. Nernst distribution law, solvent extraction.

Suggested Readings:

1. Advanced Inorganic Chemistry Vol-I & II, Satya Prakash, G.D. Tuli, S.K. Basu, R.D. Madan, S. Chand & Co. Ltd.
2. Test book of Inorganic Chemistry, P.L. Soni, Sultan Chand & Sons
3. Simplified Course in Inorganic Chemistry, Madan & Tuli, S. Chand & Co. Ltd.
4. Concise Inorganic Chemistry, J.D. Lee, Black Well Sciences
5. Essentials of Physical Chemistry, Bahl & Tuli, S. Chand & Co. Ltd.
6. Principles of Physical Chemistry, Puri, Sharma & Pathania, Vishal Publishing Co.
7. Simplified course in Physical Chemistry, Madan & Tuli, S. Chand & Co. Ltd.
8. Atkin's Physical Chemistry, Atkin, Oxford Press.
9. Physical Chemistry, Vemulapalli, Printice Hall of India

Subject: Plant Physiology

Subject Code: BS232

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UNIT I- Plant-water relations

Importance of water, Diffusion and water potential, Osmosis, Ascent of sap, Transpiration and its significance; Factors affecting transpiration, guttation.

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UNIT II- Mineral nutrition and transport

Essential elements, macro and micronutrients, Role of essential elements; Absorption of mineral salts, Transport of ions across cell membrane, active and passive transport, carriers, channels and pumps. Translocation in phloem, Composition of phloem sap.

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UNIT III- C and N metabolism: Photosynthesis Photosynthetic Pigments (Chl a, b); Photosystem I and II, Electron transport and mechanism of ATP synthesis; C₃, C₄ and CAM pathways of carbon fixation; Photorespiration. Nitrogen metabolism Biological nitrogen fixation; Nitrate and ammonia assimilation.

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UNIT IV- Plant growth regulators: Enzymes: general structure and properties, Plant growth regulators: Discovery and physiological roles of auxins, gibberellins, cytokinins, ABA, ethylene. role and applications in agri-horticulture. Seed Physiology: Dormancy, Breaking of dormancy, Germination.

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UNIT V Growth and Development: Plant response to light and temperature: Photomorphogenesis, Plant movements, Photoperiodism, (SDP, LDP, Day neutral plants); Phytochrome (discovery and structure), red and far red light responses on photomorphogenesis; Growth response to temperature, Vernalization. Introduction to Stress physiology.

Suggested Reading:

1. Taiz, L., Zeiger, E.,. Plant Physiology. Sinauer Associates Inc., U.S.A. 5th Edition.
2. Hopkins, W.G., Huner, N.P.,. Introduction to Plant Physiology. John Wiley & Sons, U.S.A. 4th Edition.
- 3 Bajracharya, D.,. Experiments in Plant Physiology- A Laboratory Manual. Narosa Publishing House, New Delhi.
4. Frank B. Salisbury, Cleon W. Ross: Plant Physiology. Wadsworth Publishing Company

Unit-I -Digestion and absorption: Role of salivary glands, liver, pancreas and intestinal glands. Digestion and absorption of carbohydrates, lipids and proteins.

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Unit-II-Blood: Composition of blood, blood cells, plasma proteins and Rh factor; Blood coagulation – mechanism and regulation. Circulatory & Cardiovascular System: Heart and circulation; cardiac cycle.

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Unit-III -Respiration: Respiratory volumes, Haemoglobin and oxygen transport, carbon dioxide transport, Bohr's effect and chloride shift. Excretion and osmoregulation: Structure of nephron, urine formation and its regulation ; excretory product.

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Unit-IV- Muscle system: Muscles and Movement, Skeletal, cardiac and smooth muscle.

Nervous system: central and peripheral nervous system, nerve impulse – its conduction and synaptic transmission, neurotransmitters.

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Unit-V-Endocrine system : Endocrine glands and their functions; Nature of hormones; Regulation of hormone secretion; Mode of action of hormones. Reproductive system: testis, ovary, Spermatogenesis, Oogenesis, Totipotency.

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Suggested Reading:

1. Textbook of Medical Physiology by Guyton. A.C., H. Sanders Philadelphia. 1988.
2. Physiological basis of Medical practice, West J.B., Best and Taylor.
3. Introduction to Physiology by Davidson H and Segal M.B. Academic Press.
4. Fox S I – Human Physiology, (McGraw Hill, 1998, ISBN: 0071157069)
5. Moffett D and Schauf C L – *Human Physiology: Foundations & Frontiers*, (Mosby, 1993, ISBN: 801669030)
6. Seeley R, Stephens T and Tate P – *Anatomy & Physiology*, (McGraw-Hill, 1999, ISBN: 0071169881)
7. Sherwood L – *Human Physiology: From Cells to Systems*, (Wadsworth Publishing, 2000,ISBN: 0534568262)
8. Tortora G J *Principles of Anatomy & Physiology*, (John Wiley & Sons, 1999, ISBN: 0471366927)

Subject: Fundamentals of microbiology

Subject Code: BS113

(Revised w.e.f. session 2015-2016)

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UNIT I-History and classification of microbiology: Pasteur's experiments, Various forms of microorganisms (bacteria, fungi, viruses, protozoa, PPOs); Nutritional classification of microorganisms; Nature of the microbial cell surface, gram positive and gram negative bacteria; Growth curve.

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UNIT II- Control of Microorganisms: Physical agents (Autoclave, Hot air oven, Laminar airflow and membrane filter.), chemical agents (Alcohol, Halogens and Gaseous agents, antibiotics), Radiation Methods (UV rays). **Pathogenesis of microorganisms:** Some common pathogenic microorganisms: Bacterial (tuberculosis, gall), viral (SARS, TMV), fungal (red rot of sugar cane, dermatitis) and protozoan (malaria).

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UNIT III- Microbes in extreme environments and microbial interactions: The thermophiles alkalophiles, acidophiles and symbiosis and antibiosis among microbial population, N₂ fixing microbes in agriculture and forestry.

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UNIT IV- Recombination in Prokaryotes: Transformation, Conjugation and Transduction.

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UNIT V-Bacteriophage: Lytic and lysogenic cycle. Stains and staining techniques: Principles of staining, Types of stains – simple stains, structural stains and Differential stains.

Suggested Reading:

1. Introduction to Microbiology, Ingraham, 2ed.
2. Brock Biology of Microorganisms, Madigan et al, 9th ed.
3. General Microbiology, R.Y. Stanier, J.L. Ingraham, M.L.Wheelis and P.R. Painter, Macmillian
4. Microbiology VI Edition, M.J. Pelczar, E.C.S. Chan and N.R. Kreig, Tata McGraw Hill
5. Principles of Microbiology, R.M. Atlas, Wm C. Brown Publisher.
6. The Microbial World, Roger Y. Stanier, Prentice Hall
7. Howe.C. (1995) Gene Cloning and manipulation, Cambridge University Press, USA
8. Lewin, B., Gene VI New York, Oxford University Press.
9. Sambrook et al (2000) Molecular cloning Volumes I, II, & III Cold spring Harbor Laboratory Press, New York, USA
10. Walker J.M. and Gingold, E.B. (1983) Molecular Biology & Biotechnology (Indian Edition) Royal Society of Chemistry U.K

PRACTICALS

CH115 Chemistry Lab-II

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1. Qualitative analysis of inorganic mixtures, containing not more than four ionic species (excluding insoluble substances) out of the following : Pb^{2+} , Ag^+ , Cu^{2+} , Cd^{2+} , As^{3+} , Sn^{2+} , Fe^{3+} , Zn^{2+} , Ba^{2+} , Sr^{2+} , Ca^{2+} , Mg^{2+} , NH_4^+ , Co^{3+} , S , NO_2^- , CH_3COO^- , Cl^- , Br^- , I^- , NO_3^- , SO_4^{2-} , PO_4^{3-}
2. Purification of Organic compounds by crystallization (from water or alcohol) and distillation.
3. Detection of functional groups in mono-functional Organic Compounds.

Subject Name: Microbiology Lab

Subject Code: BS205

(Revised w.e.f 2016-2017)

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1. Isolation and purification of genomic DNA. Estimation of DNA and RNA
2. Enzyme assay (one example)
3. Biochemical tests—starch hydrolysis, gelatin liquefaction.
4. Cleaning and sterilization of glass ware.
5. Study of instruments: Compound microscope, Autoclave, Hot air oven, pH meter, Laminar airflow and centrifuge
6. Media preparation: Nutrients agar, Nutrient broth and LB.
7. Staining Techniques: Simple, Negative staining, Gram staining, Endospore staining, fungal staining.
8. Isolation of bacteria and fungi from soil/ air/water – dilution and pour plate methods
9. Study of *Rhizobium* from root nodules of legumes
10. Growth curve of bacteria

