DAV UNIVERSITY JALANDHAR

Course Scheme & Syllabus

For

B.Sc. Microbiology (Hons.)
(Program ID-6)

1st TO 6th SEMESTER
Examinations 2013–2014 Session Onwards

Syllabi Applicable For Admissions in 2013

DAV UNIVERSITY, JALANDHAR

Scheme of Courses B.Sc.

B.Sc. Microbiology (Hons.)

Semester 1

S.No	Course Code	Course Title	L	T	P	Cr	% Weightage				E
							A	B	C	D	
1	MIC101	Microbiology	4	0	0	4	25	25	25	25	**100**
2	PHY153	Optics and Lasers	4	0	0	4	25	25	25	25	**100**
3	CHE153	Organic Chemistry	4	0	0	4	25	25	25	25	**100**
4	BOT101	Plant Diversity I	4	0	0	4	25	25	25	25	**100**
5	SGS101	Human Values and Ethics	2	0	0	2	25	25	25	25	**50**
6	EVS102	Environment Education	2	0	0	2	25	25	25	25	**50**
7	MIC102	Microbiology Lab	0	0	3	2	-	-	-	-	**50**
8	CHE154	Organic Chemistry Lab	0	0	2	2	-	-	-	-	**50**
9	PHY154	Physics Lab II	0	0	2	2	-	-	-	-	**50**
10	BOT102	Plant Diversity I Lab	0	0	3	2	-	-	-	-	**50**
			20	**0**	**10**	**28**					**700**

A: Continuous Assessment: Based on Objective Type Tests
B: Mid-Term Test-1: Based on Objective Type & Subjective Type Test
C: Mid-Term Test-2: Based on Objective Type & Subjective Type Test
D: End-Term Exam (Final): Based on Objective Type Tests
E: Total Marks
L: Lectures T: Tutorial P: Practical Cr: Credits

DAV UNIVERSITY, JALANDHAR

Scheme of Courses
B.Sc. Microbiology (Hons.)

Semester 2

S.No	Course Code	Course Title	L	T	P	Cr	% Weightage				E
							A	B	C	D	
1	PHY155	Modern Physics	4	0	0	4	25	25	25	25	**100**
2	MIC103	Microbial Physiology and Genetics	4	0	0	4	25	25	25	25	**100**
3	BOT103	Plant Diversity II	4	0	0	4	25	25	25	25	**100**
4	SGS102	General Knowledge and current affairs	2	0	0	2	25	25	25	25	**50**
5	EVS103	Road Safety and Legal Awareness	2	0	0	2	25	25	25	25	**50**
6	ENG151	Basic Communication skills	4	0	0	3	25	25	25	25	**75**
7	MTH170	Basic Mathematics	2	0	0	2	25	25	25	25	**50**
8	MIC104	Microbial Physiology and Genetics Lab	0	0	3	2	-	-	-	-	**50**
9	PHY156	Modern Physics Lab	0	0	2	2	-	-	-	-	**50**
10	BOT104	Plant Diversity II Lab	0	0	3	2	-	-	-	-	**50**
11	ENG152	Basic Communication Skills Lab	0	0	2	1	-	-	-	-	**25**
12	SGS104	Stenography	2	0	0	0	-	-	-	-	**-**
13	SGS105	Stenography Lab	0	0	1	0	-	-	-	-	**-**
			21	**0**	**11**	**28**					**700**

A: Continuous Assessment: Based on Objective Type Tests
B: Mid-Term Test-1: Based on Objective Type & Subjective Type Test
C: Mid-Term Test-2: Based on Objective Type & Subjective Type Test
D: End-Term Exam (Final): Based on Objective Type Tests
E: Total Marks
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DAV UNIVERSITY, JALANDHAR

Scheme of Courses B.Sc.

B.Sc. Microbiology (Hons.)

Semester 3

S.No	Course Code	Course Title	L	T	P	Cr	% Weightage				E
							A	B	C	D	
1	MIC201	Mycology	2	1	0	2	25	25	25	25	**50**
2	ZOO101	Animal Diversity I	4	1	0	4	25	25	25	25	**100**
3	BCH101	Biomolecules	4	1	0	4	25	25	25	25	**100**
4	ENG180	English	4	0	0	4	25	25	25	25	**100**
5	CHE253	Inorganic Chemistry II	4	1	0	4	25	25	25	25	**100**
6	MIC202	Mycology Lab	0	0	2	1	-	-	-	-	**25**
7	BCH102	Biomolecules Lab	0	0	3	2	-	-	-	-	**50**
8	ZOO102	Animal Diversity I Lab	0	0	3	2	-	-	-	-	**50**
9	CHE254	Inorganic Chemistry Lab	0	0	2	2	-	-	-	-	**50**
			18	**4**	**10**	**25**					**625**

A: Continuous Assessment: Based on Objective Type Tests
B: Mid-Term Test-1: Based on Objective Type & Subjective Type Test
C: Mid-Term Test-2: Based on Objective Type & Subjective Type Test
D: End-Term Exam (Final): Based on Objective Type Tests
E: Total Marks
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Scheme of Courses B.Sc.

B.Sc. Microbiology (Hons.)

Semester 4

S.No	Course Code	Course Title	L	T	P	Cr	% Weightage				E
							A	B	C	D	
1	MIC203	Phycology	2	0	0	2	25	25	25	25	**50**
2	MIC205	Industrial Microbiology	4	1	0	4	25	25	25	25	**100**
3	ZOO103	Animal Diversity II	4	1	0	4	25	25	25	25	**100**
4	BCH103	Metabolism	4	1	0	4	25	25	25	25	**100**
5	CSA253	Basic Computer Applications	4	0	0	3	25	25	25	25	**75**
6	MIC204	Phycology Lab	0	0	2	1	-	-	-	-	**25**
7	MIC206	Industrial Microbiology Lab	0	0	3	2	-	-	-	-	**50**
8	ZOO104	Animal Diversity II Lab	0	0	3	2	-	-	-	-	**50**
9	BCH104	Metabolism Lab	0	0	3	2	-	-	-	-	**50**
10	CSA254	Basic Computer Applications Lab	0	0	2	1	-	-	-	-	**25**
11	MIC251	BSc Seminar IV	1	0	0	1	-	-	-	-	**25**
			18	**3**	**13**	**26**					**650**

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C: Mid-Term Test-2: Based on Objective Type & Subjective Type Test
D: End-Term Exam (Final): Based on Objective Type Tests
E: Total Marks
L: Lectures T: Tutorial P: Practical Cr: Credits

DAV UNIVERSITY, JALANDHAR

Scheme of Courses

B.Sc. Microbiology (Hons.)

Semester 5

S.No	Course Code	Course Title	L	T	P	Cr	% Weightage				E
							A	B	C	D	
1	BTY201	Cell Biology	4	1	0	4	25	25	25	25	**100**
2	BTY101	Introductory Biotechnology and Bioanalytical Techniques	4	1	0	4	25	25	25	25	**100**
3	CHE353	Physical Chemistry	4	1	0	4	25	25	25	25	**100**
4	MIC301	Basic Immunology	4	1	0	4	25	25	25	25	**100**
5	BTY102	Introductory Biotechnology and Bioanalytical Techniques Lab	0	0	3	2	-	-	-	-	**50**
6	BTY202	Cell Biology Lab	0	0	3	2	-	-	-	-	**50**
7	CHE354	Physical Chemistry Lab	0	0	2	2	-	-	-	-	**50**
8	MIC302	Basic Immunology Lab	0	0	3	2	-	-	-	-	**50**
			16	**4**	**11**	**24**					**600**

A: Continuous Assessment: Based on Objective Type Tests
B: Mid-Term Test-1: Based on Objective Type & Subjective Type Test
C: Mid-Term Test-2: Based on Objective Type & Subjective Type Test
D: End-Term Exam (Final): Based on Objective Type Tests
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DAV UNIVERSITY, JALANDHAR

Scheme of Courses
B.Sc. Microbiology (Hons.)

Semester 6

S.No	Course Code	Course Title	L	T	P	Cr	% Weightage				E
							A	B	C	D	
1	MIC303	Environmental Microbiology	4	1	0	4	25	25	25	25	**100**
2	BTY205	Molecular Biology	4	1	0	4	25	25	25	25	**100**
3	BTY307	Microbial and Industrial Biotechnology	4	1	0	4	25	25	25	25	**100**
4	MIC305	Medical Microbiology	4	1	0	4	25	25	25	25	**100**
5	MIC351	BSc Seminar VI	1	0	0	1	-	-	-	-	**25**
6	MIC304	Environmental Microbiology Lab	0	0	3	2	-	-	-	-	**50**
7	BTY208	Molecular Biology Lab	0	0	3	2	-	-	-	-	**50**
8	BTY310	Microbial and Industrial Biotechnology Lab	0	0	3	2	-	-	-	-	**50**
9	MIC306	Medical Microbiology Lab	0	0	3	2	-	-	-	-	**50**
			17	**4**	**12**	**25**					**625**

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B: Mid-Term Test-1: Based on Objective Type & Subjective Type Test
C: Mid-Term Test-2: Based on Objective Type & Subjective Type Test
D: End-Term Exam (Final): Based on Objective Type Tests
E: Total Marks
L: Lectures T: Tutorial P: Practical Cr: Credits

Course Title: Microbiology
Course Code: MIC101

L	T	P	Credits	Marks
4	0	0	4	100

Course Objective: This course is to learn basic microbiology, microbial growth and control methods of microbes.

Unit-A

Microbiology: definition, history and development of Microbiology. Biogenesis versus abiogenesis. 5 hours

Composition of microbial world and its applications. Distinguishing features of major groups of microorganisms: bacteria, fungi, algae, protozoa, viruses.
5 hours

Microscopy and observation of microbes: Light microscopy: bright field microscope, dark field microscope, phase contrast microscope, fluorescence microscope. Electron microscopy: The transmission electron microscope, Scanning electron microscope. 5 hours

Unit-B

Characteristics of microorganisms: Prokaryotic cell structure and function, size, shape, capsule and slime layer, spore, cell wall, cell membrane, outer membrane, ribosome, motility organelle, fimbriae and nuclear region. 6 hours

Cultivation of microorganisms: nutrition, cultivation methods and environmental factors affecting microbial growth.
5 hours

Bacterial growth curve. Maintenance of cells in exponential phase, synchronous growth, continuous culture, fed batch culture and measurement of growth.
4 hours

Cell division, genes in cell division 3 hours

Unit-C

Microbial metabolism: Metabolic pathways of carbohydrate metabolism common (Embden Meyerhof pathway, pentose phosphate pathway, Entner- Doudoroff pathway, pyruvate decarboxylation, TCA cycle) 6 hours

Unique to heterotrophic and phototrophic microorganisms (Ketoadipate pathway), Electron transport chain, Calvin cycle, patterns of energy yielding metabolism in microorganisms (respiration and fermentation) 8 hours

Unit-D

Control of microorganisms: control of microorganisms by physical and chemical agents, patterns of microbial death, factors affecting effectiveness of antimicrobial agents activity. 8 hours

Antimicrobial chemotherapy: Development of chemotherapy, general characteristics of antimicrobial drugs, and mechanisms of action of antimicrobial agents. Origin of drug resistance and its transmission in microorganisms. 8 hours

60 hours

Reference books

1. Microbiology. Pelczar, M. J., Chan, E. C. S. and Krieg, N. R. Tata McGraw Hill Publishing Company Limited. 5th edition. 1993

2. General microbiology. Roger Y. Stainer, John L. Ingraham, Mark L. Wheelis and Page R. Painter. Macmillan Press Ltd. 5th edition. 1987.

3. Tortora, G.J., Funke, B. R. and Case, C. L. (2001). Microbiology-An Introduction (7th Ed.). Benjamin Cummings, Carson, USA.
4. Brock Biology of Microorganisms (12th edition) by Madigan and John M. Martinko, Paul V. Dunlap, David P. Clark. Benjamin Cummings, 2008.
5. Microbiology. Lansing M. Prescott. McGraw-Hill Higher Education. 5th edition. 2002

Course Title: Microbiology Lab
Course Code: MIC102

L	T	P	Credits	Marks
0	0	3	2	50

1. Preparation of media
2. Preparation of buffer
3. Culture transfer and pure culture by streaking method
4. Storage of pure culture – slant culture, glycerol stock
5. Bright Field microscopy
6. Phase contrast microscopy
7. Bacterial motility
8. Negative staining
9. Smear preparation and simple staining
10. Gram staining

45 hours

Course Title: Microbial Physiology and Genetics
Course Code: MIC103

L	T	P	Credits	Marks
4	0	0	4	100

Course Objectives: This course is to learn bacterial physiology and genetics. This course covers transcription, translation, mutation, gene organization gene transfer.

Unit-A

Structure of nucleic acids. Replication of DNA semiconservative

Transcription – synthesis of RNA, codon

Translation- Protein synthesis, charging of tRNA, initiation, elongation and termination 15 hours

Unit-B

Mutation, variation and evolution. Types of mutation. Mechanism of mutation (spontaneous mutation, chemical mutagen, UV irradiation)

Phenotype, Phenotype restoration (reversion, suppression, complementation)

Isolation and identification of mutants (mutation and selection, replica plating, penicillin enrichment, molecular methods) 15 hours

Unit-C

Gene organization. Transcriptional control (terminators, attenuators, anti-terminators, Induction and repression)

Translational control, codon usage

Plasmids, Plasmid replication and stability. 15 hours

Unit-D

Gene transfer: Transformation, Conjugation (F plasmid), Transduction (general and specialized)

Insertion sequence, Transposons, Mechanism of transposition,

Strain development, Generation of variation, Overproduction of primary metabolite, Overproduction of secondary metabolite

Genetic methods for investigating bacteria (complementation, cross feeding, reporter genes) Bacterial virulence, Detection of virulence genes, specific mutagenesis

Gene mapping (conjugational analysis, co-transformation, co-transduction), Gene sequencing, Genome sequencing

Physical and genetic map, Analysis of gene expression 15 hours

60 hours

Reference books

1. Molecular genetics of bacteria. Jeremy W. Dale and Simon F Park. John Wiley and Sons Ltd. 4th edition. 2008.
2. Microbial genetics. Stanley R. Maloy, John E. Cronan and David Freifelder. Jones and Bartlett Publishers. 2nd edition. 1994.

3. Brock Biology of Microorganisms (12th edition) by Madigan and John M. Martinko, Paul V. Dunlap, David P. Clark. Benjamin Cummings, 2008.

4. Microbial physiology. Albert G. Moat, John W. Foster and Michael P. Spector. John Wiley & Sons. 4th edition. 2002.

Course Title: Microbial Physiology and Genetics Lab
Course Code: MIC104

L	T	P	Credits	Marks
0	0	3	2	50

1. Preparation of competent cells by chemical method
2. Preparation of competent cells for electroporation
3. Transformation of *Escherichia coli*
4. Plasmid DNA extraction
5. Genomic DNA extraction
6. Transduction of *Escherichia coli* by P1 phage
7. Conjugation mating in *Escherichia coli*

45 hours

Course Title: Mycology
Course Code: MIC201

L	T	P	Credits	Marks
2	1	0	2	50

Course Objective: This course is to learn basics of fungi. Fungal physiology, growth, spores and classification are covered in this course.

Unit A

Fungi, physiology of growing hypha, spores, classification.

The structure and composition of fungal cell, The growth and form of fungal cell, The growth of population and colonies. The effect of environment on growth, Vegetative multihyphal system, Prevention of fungal growth.

12 hours

Unit B

Role of spores in mycology and in the life of the organism. Initiation of sporulation and sporophore maturation. Spore liberation, Spore dispersal, Spore deposition, Dormancy and survival, Spore germination

8 hours

Unit C

Life cycles, mating systems and genetic exchange.

Variation, microevolution and speciation.

Classification, identification and evolutionary trends

10 hours

Unit D

Myxomycota, Plasmidiophoromycota.

Straminipila, Oomycota, Chytridiomycota, Zygomycota

Ascomycota, Arachiascomycetes, Hemiascomycetes, Plectomycetes 4hours Hymenoascomycetes: Pyrenomycetes, Erysiphales, Pezizales, Helotiales, Lecanorales 4 hours

Loculoascomycetes, Basidiomycota, Heterobasidiomycota

Urediniomycetes, Ustilaginomycetes,

10 hours

30 hours

Reference books

1. Introduction to Fungi. John Webster and Roland W. S. Weber. Cambridge University Press. 2007.
2. The Fungi. Michael J. Carlile, Sarah C. Watkinson, Graham w. Gooday. 2nd edition, Academic Press, 2001.
3. Introduction to Fungi. Alexopolus and Mims. CRC Press, 2005

Course Title: Mycology Lab
Course Code: MIC202

L	T	P	Credits	Marks
0	0	2	1	25

1. Preparation of potato dextrose agar medium
2. Isolation of fungi from rotten bread and vegetables.
3. Gram stain slides of *Candida albicans* and *Cryptococcus neoformans*.
4. Looking at cotton blue stained *Rhizopus, Aspergillus, Penicillium, Fusarium*.
5. Looking at spores of *Rhizopus, Aspergillus, Penicillium, Fusarium*

30 hours

Course Title: Phycology
Course Code: MIC203

L	T	P	Credits	Marks
2	0	0	2	50

Course Objective: This course covers both prokaryotic and eukaryotic algae. This course is to learn basic phycology.

Unit A

Basic characteristics of algae, structure of the algal cell.

Nutrition, Classification, Algal fossil records.

Toxic algae, Chemical defence mechanism of algae, applications of algae. 8 hours

Unit B

The prokaryotic algae- cyanobacteria, Morphology, protoplasmic structure, pigments, heterocysts- nitrogen fixation, asexual reproduction, symbiosis, ecology of cyanobacteria, cyanotoxins, cyanophages

Glaucophyta, Rhodophyta – cell structure, secretory cells, reproductive structures, epiphytes and parasites, commercial utilization of red algae.

Chlorophyta- cell structure, phototaxis, asexual and sexual reproduction, classification

12 hours

Unit C

Euglenophyta- structure and classification, Dinophyta- structure, resting spores, bioluminescence, heterotrophic dianoflagellates, symbiotic dianoflagellates. Apicomplexa

6 hours

Unit D

Cryptophyta- cell structure, ecology, symbiotic association.

Chrysophyceae- cell structure , statospores, ecology. Synurophyceae. Eustigmatophyceae. Pinguiophyceae.

Dictyochophyceae, Pelagophyceae, Bolidophyceae, Bacillariophyceae- cell structure, motility, resting spores, auxospores, physiology, chemical defence against predation.

Raphidophyceae, Xanthophyceae- cell structure, sexual and asexul reproduction. Phaeothamniophyceae

Phaeophyceae- cell structure, life cycle. Prymnesiophyta- cell structure, toxin, classification

14 hours

30 hours

Reference books

1. Algae, by Linda E. Graham, Lee W. Wilcox, Cambridge University Press, 2004
2. Phycology, 4th edition, Robert Edward Lee. Cambridge University Press, 2008.

Course Title: Phycology Lab
Course Code: MIC204

L	T	P	Credits	Marks
0	0	2	1	25

1. Looking at *Oedogonium*.
2. Looking at *Chara*.
3. Looking at *Oscillatoria*.
4. Looking at *Nostoc.*
5. Looking at *Ectocarpus.*

30 hours

Course Title: Basic Immunology
Course Code: MIC301

L	T	P	Credits	Marks
4	1	0	4	100

Course Objective: This course is to learn basic immunology and clinical microbiology. Antibodies and pathogenic bacteria are covered by this course.

Unit A

History of immunology, Innate immunity, Adaptive immunity.

Hematopoiesis, Cells of immune system, Organs of immune system

Immunogenicity versus antigenicity, Epitopes, Pattern recognition receptors 10 hours

Unit B

Antibodies: Structure, Effector functions, Antibody classes and biologic activities,

Generation of antibody diversity, class switching. 10 hours

The B cell receptor, Monoclonal antibodies

Antigen antibody reaction, Cross reactivity, Precipitation reaction, Agglutination reaction, Radioimmunoassay, Enzyme linked immunosorbent assay, Western blotting, Immunoprecipitation, Immunofluorescens, Flow cytometry, Immunoelectron microscopy.

10 hours

Unit C

Major Histocompatibility complex. Antigen processing and presentation: Role of antigen presenting cells, two processing and presentation pathways.

Cytokines, Cytokines receptor, Cytokine related disease, Therapeutic uses of cytokines. 10 hours

The function of complement, Complement activation, Biological consequences of complement activation, Complement deficiencies

Vaccines, Active and passive immunization, Designing vaccine for active immunization, Whole organism vaccine, Purified macromolecules as vaccine, Recombinant vaccine. 10 hours

Unit D

Hypersensitivity and types of hypersensitivity.

Autoimmunity and tolerance and their mechanism. 10 hours

60 hours

Reference books

1. Kuby Immunology. Thomas J. Kindt, Richard A. Goldsby, Barbara A. Osborne. W.H. Freeman and Co. Publishers. 6th Edition. 2007
2. Janeway's Immunobiology. Kenneth Murphy, Paul Trevers, Mark Walpart. Garland Science Publishers. 2012.
3. Roitt's Essential Immunology. Ivan M. Roitt and Peter J. Delves. Blackwell Publishing Ltd. 10th Ed. 2001
4. Fundamental Immunology. William E. Paul. Lippincott Williams & Wilkins, a Wolters Kluwer business. 6th edition. 2008

Course Title: Basic Immunology Lab
Course Code: MIC302

L	T	P	Credits	Marks
0	0	3	2	50

1. Blood grouping
2. Differential leukocyte counting.
3. Agglutination reaction
4. Immunoelectrophoresis
5. Enzyme linked immunosorbent assay

45 hours

Course Title: Environmental Microbiology
Course Code: MIC303

L	T	P	Credits	Marks
4	1	0	4	100

Course Objective: This course is to learn environmental microbiology. This course covers history of microbiology, techniques in microbiology, waste management techniques and soil microbiology.

Unit–A: Bioremediation of Xenobiotics

Microbiology of degradation of xenobiotics in the environment, ecological considerations, decay behaviour, biomagnification and degradative plasmids, hydrocarbons, substituted hydrocarbons,
oil pollution, surfactants and pesticides. Genetically Modified Organisms released and its environmental impact assessment and ethical issues.

15 hours

Unit B: Effluent treatment techniques

Microbiology of wastewater and solid waste treatment: Waste-types-solid and liquid waste characterization, physical, chemical, biological, aerobic, anaerobic, primary, secondary: Activated Sludge process, Oxidation Ponds, Aerated Lagoons, Rotating Biological Contractors, Trickling Filters and tertiary treatments. Anaerobic processes: Anaerobic digestion, anaerobic filters, and up flow anaerobic sludge. Treatment schemes for effluents of dairy, distillery, tannery, sugar and antibiotic industries.

15 hours

Unit-C: Waste management techniques

Biogas technology: Plant design, construction, operation, biogas form organic wastes, water weeds; Landfills; Biotransformation, bioconversion, bioremediation, phytoremediation; Environmental problems & Environmental monitoring through microorganism; Microbiology of water, air and soil, microbes as pathological agent in plant, animal and man; Composting and Vermicomposting.

15 hours

Unit-D: Soil Microbiology

Microorganisms in soil, air and water; Rhizosphere and non- rhizosphere microorganisms; Role of microorganisms in carbon, nitrogen and sulphur cycle; The range of nitrogen fixing organisms, biochemistry of nitrogenase, genetics of nitrogen fixation, regulation of *nif* gene expression, symbiotic nitrogen fixation, genetic analysis of Rhizobium bacteria and regulation of nod gene expression.

15 hours

60 hours

Reference books

1. Alexander, M (1961) Introduction to Soil Microbiology, John Wiley and Sons, Inc, New Delhi.
2. James M.Jaj (1986), Modern Food Microbiology, Third Edition, CBS Publishers & Distributors.
3. Michael J. Pelczar, J.R.E.C.S. Chan Noel R.Krieg (1993) Microbiology, Tata Mc Graw Hill Edition, New Delhi.
4. Pelczar, M. J., Chan, E. C. S., Krieg, N. R. (1993). Microbiology-Concepts and Applications. McGraw Hill Inc.
5. Taussig, M. J. (1984). Microbiology (2nd ed.) Blackwell Scientific Publications. Oxford London.
6. Tortora, G.J. Funke, B. R., Case, C. L. (2001). Microbiology-An introduction (7th ed.) Addison Wesley longman, Inc.

Course Title: Environmental Microbiology Lab
Course Code: MIC304

L	T	P	Credits	Marks
0	0	3	2	50

1. Estimation of LC50 and LD50 for a given heavy metal using a suitable organisms
2. Preparation of culture media for Micro organisms
3. To show the presence of microorganisms around us.
4. Gram staining of bacteria.
5. Isolation of Microorganisms from the soil.
6. Observation of root nodule bacteria.
7. Isolation of root nodule bacteria.
8. Microbial techniques: Streaking, Inoculation, Frozen Permanents, Master Plates, Minimal plates.
9. Assignment by teacher.

45 hours

Course Title: Medical Microbiology
Course Code: MIC305

L	T	P	Credits	Marks
4	1	0	4	100

Course Objective: This course is to learn clinical microbiology. This course covers host parasite relationship and pathogenic bacteria and pathogenic fungi.

Unit A

Normal microbial flora.

Immune response to infection. The immuneresponsive cells, T cell responses.

Host parasite relationship. Pathogen, Microbial pathogenicity, Strategy for survival, Overcoming the host immune system, Virulence factors. 12 hours

Unit B

Sterilization and disinfection.

Antibacterial and antiviral agents.

Antimicrobial resistance.

Priciples of laboratory diagnostics of infectious diseases. 12 hours

Unit C

Pathogenic bacteria. Staphylococci, Streptococci, Enterococci,

Pathogenic bacteria : Clostridium, Bacteroids, Neissaria, Enterobacteriaceae,

Pathogenic bacteria : Vibrio, Pseudomonas, Haemophilus, Bordotella,

Pathogenic bacteria : Mycoplasma, Legionella, Spirochetes,

Pathogenic bacteria : Mycobacteria, Actinomyces, Nocardia,

Pathogenic bacteria : Chlamydia, Rickettsia, Coxiella, Bartonella, 18 hours

Unit D

Pathogenic fungi, Pathogenesis, immunity and chemotherapy of fungal infection

Sporothrix, Candida, Aspergillus, Cryptococcus, Histoplasma, Pneumocystis

Local and systemic infections. Skin and wound infection, Bone and joint infection.

Upper respiratory tract infections, Lower respiratory tract infection, Enteric infections and food poisoning, Urinary tract infection. 18 hours

60 hours

Reference books

1. Microbiology. Pelczar, M. J., Chan, E. C. S. and Krieg, N. R. Tata McGraw Hill Publishing Company Limited. 5th edition. 1993.
2. General microbiology. Roger Y. Stainer, John L. Ingraham, Mark L. Wheelis and Page R. Painter. Macmillan Press Ltd. 5th edition. 1987.
3. Microbiology-An Introduction. Tortora, G.J., Funke, B. R. and Case, C. L. Benjamin Cummings, Carson, USA. 7th edition. 2001
4. Brock Biology of Microorganisms. Madigan and John M. Martinko, Paul V. Dunlap, David P. Clark. Benjamin Cummings, 12th edition. 2008.
5. Sherris medical microbiology. Kenneth J. Ryan and C George Ray. Macgrew Hill. 4th edition. 2004.

6. Jawetz, Melnick, & Adelberg's Medical Microbiology. Geo F. Brooks, Karen C. Carroll, Janet S. Butel and Morse. Mcgraw Hill. 24th edition. 2007.

Course Title: Medical Microbiology Lab
Course Code: MIC306

L	T	P	Credits	Marks
0	0	3	2	50

1. Preparation of media. Blood agar, Chocolate agar.
2. Test of hemolysis. α, β hemolysis.
3. Test of motility on agar plate and under microscope.
4. Catalase test.
5. Acid fast staining
6. Giemsa staining
7. Siderophore production detection by chrom-azurol sulfate agar.
8. Isolation of pure culture and preservation techniques

45 hours

Course Title: Industrial Microbiology
Course Code: MIC205

L	T	P	Credits	Marks
4	1	0	4	100

Course Objective: This course is to learn industrial microbiology. This course covers strain improvement, enzymes of industrial importance and fermentation.

Unit A

Definition and scope of industrial microbiology. Historical development of industrial microbiology concepts.

Fermenters and its use. Design of a fermenter. Aseptic operation and containment. Body construction. Aeration and agitation. The agitator (impeller). The aeration system (sparger). The achievement and maintenance of aseptic condition. Valves and steam traps. Fermentation vessels.

15 hours

Unit B

Stages in fermentation processes:

Upstream processing: Isolation preservation and improvement of industrially important microorganisms. Media for industrial fermentations. Medium formulation-nitrogen, energy and carbon source, oxygen requirement. Medium sterilization-batch and continuous. Development of inocula for industrial fermentations.

8 hours

Fermentation process: Methods of measuring process variables. Temperature. Flow measurement and control. Pressure measurement. Rate of stirring. Foam sensing and control. Meaurement and control of dissolved oxygen.

8 hours

Downstream processing: The recovery and purification of fermentation products. Removal of microbial cells and other solid matters. Foam separation, Precipitation, Filtration. Centrifugation. Cell disruption. Liquid-liquid extraction. Chromatography. Ultrafiltration.

9 hours

Unit C

Food fermentation: Cheese and other fermented dairy products. Lactic acid fermentation of cabbage, cucumber and other produce. Bakery foods. Wine, Beer and distilled beverages.

10 hours

Unit D

Microbial cells as fermentation products (Baker's yeast, bacterial insecticides, legume inoculants, mushrooms). Enzymes as fermentation products (Amylases, Proteolytic enzymes, Pectinases, Invertase). Organic acids as fermentation product (citric acid, fumaric acid).

10 hours

60 hours

Reference books

1. Industrial Microbiology. Casida, L.E. New Age International Publisher. 2012.
2. Prescott & Dunn's Industrial Microbiology. 4th Edition. Edited by Gerald Reed. CBS publishers & Distributors Pvt. Ltd. 2004.
3. Principles of Fermentation Technology. 2nd Edition. Stanbury P.F., Whitaker A., and Hall S.J. Butterworth Heinemann. 2003.

Course Title: Industrial Microbiology Lab
Course Code: MIC206

L	T	P	Credits	Marks
0	0	3	2	50

1. Preparation and sterilization of medium.
2. Making of curd from milk.
3. Fermentation of sugarcane juice with yeast.
4. Baking of bread with baker's yeast
5. Preservation of bacterial cultures.
6. Isolation of antibiotic producing streptomycetes from soil.

45 hours

B.Sc. Seminar IV

Course Code: MIC251

L	T	P	Credits	Marks
1	0	0	1	25

Seminar Objective:

During the course students will come to know about the general understanding of the most common problems, recent advances in microbiology research. Each student shall be allotted a topic by the instructor. Student will have to understand the topic, collect literature and prepare the presentation. Through this the students will develop habit of reading newer topics, will become inquisitive and develop confidence of presentation and discussion before audience.

The students shall submit a project report on the allotted topic, which shall be evaluated by the concerned internal faculty. He/She then would present a seminar on the concerned topic. The students will be encouraged to explore all available literature as well as the internet to prepare the seminar report and present the same using informative slides made using Power Point or projectors.

Seminar Contents:

Students will present their work on a selected topic with the following headings:

- Title
- Objectives
- Review of Literature
- Materials and Methods
- Results
- Conclusion/recommendations

Examination Scheme:

Literature study/ Fabrication/ Presentation	50
Written Report	25
Question answer session	25
Total	100

B.Sc. Seminar VI

Course Code: MIC351

L	T	P	Credits	Marks
1	0	0	1	25

Seminar Objective:

During the course students will come to know about the general understanding of the most common problems, recent advances in microbiology research. Each student shall be allotted a topic by the instructor. Student will have to understand the topic, collect literature and prepare the presentation. Through this the students will develop habit of reading newer topics, will become inquisitive and develop confidence of presentation and discussion before audience.

The students shall submit a project report on the allotted topic, which shall be evaluated by the concerned internal faculty. He/She then would present a seminar on the concerned topic. The students will be encouraged to explore all available literature as well as the internet to prepare the seminar report and present the same using informative slides made using Power Point or projectors.

Seminar Contents:

Students will present their work on a selected topic with the following headings:

- Title
- Objectives
- Review of Literature
- Materials and Methods
- Results
- Conclusion/recommendations

Examination Scheme:

Literature study/ Fabrication/ Presentation	50
Written Report	25
Question answer session	25
Total	100

Course Title: Animal Diversity I
Course Code: ZOO101

L	T	P	Credits	Marks
4	1	0	4	100

Course Objective: To acquaint students with the general characters and classification of invertebrate phyla and the affinities between different groups. To impart knowledge regarding the morphological, anatomical and physiological make up of a few representative organisms from each phylum.

UNIT-A 15 hours

- Description of animal diversity. Principles of classification-salient features and classification upto orders in non-chordates. Structural organization in different classes of non-chordates.
- Protozoa: locomotion, osmoregulation, nutrition and reproduction in Protozoa. Detailed Study of *Euglena, Amoeba, Paramecium, Plasmodium*

UNIT-B 18 hours

- Origin of Metazoa-metamerism and symmetry.
- Porifera: skeleton and canal system. Detailed study of *Sycon*
- Coelenterata: corals and coral reefs, polymorphism in Hydrozoa. Detailed study of *Obelia,* Sea anemone.
- Platyhelminthes: reproduction, variation in life cycles, parasitic adaptations and evolution of parasitism in Helminthes. Detailed study of *Planaria, Fasciola, Taenia*
- Nematoda: pseudocoelom, parasitic adaptations. Detailed study of *Ascaris*

UNIT-C 15 hours

- Annelida: coelom, metamerism, excretion. Detailed study of *Nereis, Pheretima, Hirudinaria*
- Arthropoda: vision, respiration and larval forms. Social life in insects. Detailed study of *Palaemon, Periplaneta*

UNIT-D 12 hours

- Mollusca: torsion and detorsion, shell and respiration. Detailed study of *Pila, Unio, Sepia*
- Echinodermata: water vascular system and larval forms. Detailed study of *Asterias.*

Reference books

1. Kotpal, R.L., Modern Text Book of Zoology Invertebrates, 10th ed., Rastogi Publishers, Meerut, 2012.
2. Kotpal, R.L., Minor phyla, 5th ed., Rastogi Publishers, Meerut, 2006.

3. Dhami, P.S. and Dhami, J.K., Invertebrate Zoology, 5th ed., R. Chand & Co., New
Delhi, 2004.
4. Parker, T.J. and Haswell, W.A., Text book of Zoology, Invertebrates, 7th ed., Vol. I
(eds. A.J. Marshall & W.D. Williams), CBS Publishers & Distributors., Delhi, 1992.
5. Hyman L.H. The Invertebrates. Vol. I, II, III, IV and V. McGraw Hill Book Company. Inc., New York. London. Toronto, 1959.

Course Title: Animal Diversity I Lab
Course Code: ZOO102

L	T	P	Credits	Marks
0	0	3	2	50

General survey of invertebrate phyla through slides/specimens/charts/models/e-resources:

- Protozoa: *Amoeba, Euglena, Paramecium* and *Vorticella*, *Balantidium*, *Nyctotherus*, *Opalina*, Radiolarians and Foraminiferans.
- Porifera: *Sycon*, *Grantia, Spongilla*, *Euplectella, Hyalonema,Chalina, Euspongia,* Temporary mounts of gemmules and spicules of *Sycon.*
- Coelenterata: *Hydra, Obelia, Porpita, Velella, Physalia, Aurelia, Metridium, Alcyonium, Tubipora, Zooanthus, Madrepora, Favia, Fungia, Gorgoni*, *Pennatula, Sertularia, Plumularia, Pennaria, Bougainvillea, s*tatocyst of *Aurelia.*
- Platyhelminthes: *Planaria, Fasciola* (W.M. & T.S.), *larval stages of Fasciola, Taenia* (scolex, proglottids-mature and gravid), *Ascaris* (male and female).
- Annelida: *Pheretima,* T.S. of typhlosolar region, setae, pharyngeal nephridia, septal nephridium and integumentary nephridium of *Pheretima, Eutyphoeus, Lumbricus, Nereis, parapodium of Nereis*, *Heteronereis, Polynoe, Aphrodite, Amphitrite, Chaetopterus, Anodonta, Mytilus, Pholas, Pecten, Haliotis, Aplysia, Doris, Limax, Pila, Sepia, Octopus, Nautilus, Chiton* and *Anodonta. Arenicola, Hirudinaria, Pontobdella*.
- Arthropoda: *Peripatus, Lepisma,* cockroach,trachea and mouth parts of cockroach, grasshopper, praying mantis, earwig, dragonfly, termite (queen and other castes), ant, butterfly, moth, beetle, wasp, honeybee, crab, prawn, *Lepas*, *Balanus, Apus, Limulus*, scorpion, spider, millipede andcentipede*, Cypris, Cyclops, Daphnia*, Prawn, Gill and statocyst of Prawn.
- Mollusca: *Anodonta, Mytilus, Pholas, Pecten, Haliotis, Aplysia, Doris, Limax, Pila,* Glochidium larva and radula of *Pila, Sepia, Octopus, Nautilus, Chiton* and *Anodonta.*

Demonstration of anatomy of the following animals through charts/e-resources/dissection of animal

- Earthworm: digestive, reproductive and nervous systems
- Cockroach: digestive, nervous and reproductive systems, mouth parts of cockroach
- Prawn: digestive and nervous systems. Appendages and gills of prawn.
- *Anodonta*: digestive and nervous systems,
- *Pila*: digestive and nervous systems, radula of *Pila*
  Asterias: Aristotle's lantern, tube feet.

Note: Practicals related to Animal Diversity I Lab are in accordance with UGC guidelines ad have been approved by Dissection Monitoring Committee.

Course Title: Animal Diversity II
Course Code: ZOO103

L	T	P	Credits	Marks
4	1	0	4	100

Course Objective: To acquaint students with the general characters and classification of chordates and the affinities between different groups. To impart knowledge regarding the morphological, anatomical and physiological make up of a few representative organisms from each phylum.

UNIT-A 15 hours

- Origin and general characters of chordates with detailed classification of each animal group with special emphasis on salient features and interrelationships
- Hemichordata: Hemichordates as link between non-chordates and chordates with detailed study of *Balanoglossus*
- Urochordata: development, affinities, retrogressive metamorphosis. Detailed study of *Herdmania.*
- Cephalochordata: development, affinities. Detailed study of *Branchiostoma.*

UNIT-B 15 hours

- Cyclostomata: migration. Detailed study of *Petromyzon*
- Pisces: scales, fins, migration, parental care. Detailed study of *Scoliodon,* and *Labeo*

UNIT-C 12 hours

- Amphibia: Respiration, Parental care. Detailed study of *Rana*
- Reptilia: Terrestrial adaptations, parental care. Detailed study of *Uromastix*

UNIT-D 18 hours

- Aves: Respiration, Flight, Endothermy. Detailed study of *Columba*
- Mammals: Integument, Dentition. Detailed study of *Oryctogalus*

Reference books

1. Dhami, P.S., Dhami, J.K., Chordate Zoology, 5th ed., R. Chand & Co., New Delhi,
   2006.
2. Kotpal, R.L., Text Book of Zoology- Vertebrates, Rastogi Publications, Meerut, 2012.
3. Parker, T.J., and Haswell, W.A., A Text Book of Zoology Vertebrates, 7th ed. Vol. II
   (eds. A.J. Marshall & Williams,W.D.), Mac Millan, London, 1972.
4. Dodson, E.O., A Text Book of Zoology, CBS Publishers & Distributors, Delhi, 1976.

L	T	P	Credits	Marks
0	0	3	2	50

Course Title: Animal Diversity II Lab
Course Code: ZOO104

General survey of chordates through slides/specimens/charts/models/e-resources:

- Hemichordata: *Balanoglossus*
- Protochordata - *Herdmania*, pharynx and spicules of *Herdmania, Molgula, Ciona, Ascidia, Botryllus, Pyrosoma, Salpa, Doliolum, Oikopleura* and *Branchiostoma*, T.S. *Branchiostoma* through different regions
- Cyclostomata – *Myxine, Petromyzon* and *Ammocoetes* larva. Chondrichthyes - *Zygaena, Pristi., Narcine, Trygon* and *Rhinobatos*.
- Actinopterygii – *Polypterus, Acipenser, Lepidosiren, Mystus, Catla, Labeo rohita, Cirrhinus mrigala, Cyprinus carpio, Hippocampus, Syngnathus, Exocoetus, Anabas, Diodon, Ostracion, Tetradon, Echeneis, Lophius, Solea* and *Anguilla,* cycloid and ctenoid scales of fishes.
- Dipneusti (Dipnoi) – Any of the lungfishes.
- Amphibia – *Necturus, Proteus, Amphiuma, Salamandra, Ambystoma, Triton, Hyla, RhacophorusI chthyophis* and *Axolotl* larva.
- Reptilia- Tortoise, Turtle, *Hemidactylus, Calotes, Draco, Varanus, Phrynosoma, Chamaeleon, Typhlops, Python, Ptyas, Bungarus, Naja, Hydrus, Vipera, Crocodilus, Gavialis* and Alligator.
- Aves : *Anas, Ardea, Milvus, Pavo, Tyto, Alcedo, Eudynamis, Casuarius;* and *Struthio.*
- Mammalia – *Echidna, Ornithorhynchus, Macropus, Erinaceus, Sorex, Loris, Macaca, Manis, Hystrix, Funambulus, Felis, Capra, Canis, Herpestes, Pteropus* and *Leo*.

Demonstration of anatomy of the following animals through charts/e-resources/dissection of animal

- *Herdmania*: General Anatomy, pharynx and spicules
  Labeo: Digestive and reproductive systems, skeleton
  Rana: Digestive, arterial, venous and reproductive systems. Skeleton
  Varanus: Digestive, arterial, venous and reproductive systems. Skeleton
  Hen: Digestive, arterial, venous and reproductive systems. Skeleton
  Rat: Digestive, arterial, venous, urinogenital systems, skeleton

Note: Practicals related to Animal Diversity II Lab are in accordance with UGC guidelines ad have been approved by Dissection Monitoring Committee.

L	T	P	Credits	Marks
4	0	0	4	100

COURSE CODE: PHY153
OPTICS AND LASERS

Total Lecture-60

AIM: The aim and objective of the course on **Optics and Lasers** for the students of B.Sc. (Hons) Chemistry, Mathematics, Microbiology is to enable them to understand the different phenomenon exhibited by the light as well as the basics of the laser light.

- The question paper for end-semester examination will have a weightage of 25%. It will consist of 100 objective questions of equal marks. All questions will be compulsory.
- Two preannounced test will be conducted having a weightage of 25% each. Each preannounced test will consist of 20 objective type, 5 short questions/problems on the UGC-NET (objective type) pattern as well as one long answer type question. The student is expected to provide reasoning/solution/working for the answer. The candidates will attempt all question. Choice will be given only in long answer type. The question paper is expected to contain problems to the extent of 40% of total marks.
- Four objective/MCQ type surprise test will be taken. Two best out of Four objective/MCQ type surprise test will be considered towards final each of 12.5% weightage to the final. Each surprise test will include 20-25 questions.
- The books indicated as text-book(s) are suggestive However, any other book may be followed.

I
INTERFERENCE
(15):

Young's double slit experiment, Coherent Source, Theory of interference fringes, Types of interference, Fresnel's biprism, thickness of thin transparent sheet, Interference in thin films, Newton's rings and their application, Michelson Interferometer, Application of thin film interference; Anti reflection coatings; dielectric mirrors; interference filters; Holography.

II
DIFFRACTION
(15):

Difference between Fresnel andFranunhoffer diffraction, Franunhoffer diffraction at a single slit and its discussion, Fraunhoffer diffraction at double slit, missing orders in a double slit, Diffraction of N slits and its discussion, Diffraction grating, Missing orders, dispersive power, Rayleigh Criterion for resolving power, resolving power of a diffraction grating.

III
POLARIZATION
(15):

Polarised light and its production; polarisers and analyzers; anisotropic crystals;Polarization by transmission and reflection, Malus Law, Brewster's Law, Polarization by refraction, anisotropic crystals, Theory of double refraction, Elliptically and circularly polarized light, Quarterwave and halfwave plates, Production and detection of polarized light, Optical activity, specific rotation. Half shade polarimeter; LCD's.

IV **LASERS**
(15):

Attenuation of light in an optical medium; thermal equilibrium; interaction of light with matter; Einstein relations; light amplification; population inversion; active medium, pumping; metastable states; principle pumping schemes; optical resonant cavity; axial modes; gain curve and laser operating frequencies, transverse modes; types of lasers; Qswitching; laser beam characteristics and applications.

Reference Books:

1. Textbook of Optics: N. Subramanayam, B. Lal, M. N. Avadhamulu; S. Chand & Company, New Delhi, 2006.
2. Fundamentals of Optics: F.A. Jenkins, H.E. White, McGrawHill Publication, USA (4th Eds.)
3. Optics: AjoyGhatak, Tata McGraw Hill Publication, New Delhi, 2008.

COURSE CODE: PHY154

PHYSICS LAB II

L	T	P	Credits	Marks
0	0	2	2	50

(60hrs) **Max Marks: 50**

Objective: The laboratory exercises have been so designed that the students learn to verify some of the concepts learnt in the theory courses. They are trained in carrying out precise measurements and handling sensitive equipments.

Note:

- Students are expected to perform at least eight-ten experiments out of following list. The experiments performed in first semester cannot be repeated in second Semester.
- The examination for both the courses will be of 3 hours duration.
- Total marks of practical will include 20% weightage of Continuous Assessment and 80% end semester exam including Notebook / Viva / Performance/ written test**.**

List of Experiments:

Experimental skills: General Precautions for measurements and handling of equipment, representation of measurements, Fitting of given data to a straight line, and Error analysis, Significant figures and interpretation of results.

List of Experiments: Students are expected to perform at least eight experiments out of following list.

1. To determine the Refractive Index of the Material of a given Prism using Sodium Light.
2. To determine the Dispersive Power of the Material of a given Prism using Mercury Light.
3. To determine the Resolving Power of a Prism.
4. To determine wavelength of sodium light using Fresnel Biprism.
5. To determine wavelength of sodium light using Newton's Rings.
6. To determine the Thickness of a Thin Paper by measuring the Width of the Interference Fringes produced by a WedgeShaped Film.
7. To determination Wavelength of Sodium Light using Michelson's Interferometer.
8. To determine the wavelength of Laser light using Diffraction of Single Slit.
9. To determine the wavelength of (1) Sodium and (2) Mercury Light using Plane Diffraction Grating.
10. To determine the Dispersive Power of a Plane Diffraction Grating.
11. To determine the Resloving Power of a Plane Diffraction Grating.
12. To determine the (1) Wavelength and (2) Angular Spread of HeNe Laser using Plane Diffraction Grating.
13. To study the wavelength of spectral lines of sodium light using plane transmission grating.
14. To study the specific rotation of sugar solution Laurents half shade polarimeter method
15. To study the numerical aperture and propagation losses using HeNe laser Optical fibre set up.
16. To compare the focal length of two lenses by Nodal slide method.

COURSE CODE: PHY155

MODERN PHYSICS

L	T	P	Credits	Marks
4	0	0	4	100

Total Lecture 45

The aim and objective of the course on Modern Physics for the student of B.Sc. (Hons.) Physics is to equip them with the knowledge of wave particle duality, quantum mechanics and atomic nucleus and radioactivity

- The question paper for end-semester examination will have a weightage of 25%. It will consist of 100 objective questions of equal marks. All questions will be compulsory.
- Two preannounced test will be conducted having a weightage of 25% each. Each preannounced test will consist of 20 objective type, 5 short questions/problems on the UGC-NET (objective type) pattern as well as one long answer type question. The student is expected to provide reasoning/solution/working for the answer. The candidates will attempt all question. Choice will be given only in long answer type. The question paper is expected to contain problems to the extent of 40% of total marks.
- Four objective/MCQ type surprise test will be taken. Two best out of Four objective/MCQ type surprise test will be considered towards final each of 12.5% weightage to the final. Each surprise test will include 20-25 questions.
- The books indicated as text-book(s) are suggestive However, any other book may be followed.

Unit-I

Wave Particle Duality

(14):

Quantum theory of light, Xrays and their diffraction, Compton effect, pair production, Wave Properties of Particles;de Broglie waves, waves of probability, the wave equation, phase and group velocities, particle diffraction, uncertainty principle and its applications.

Unit-II.

Quantum Mechanics

(15):

Difference between classical and quantum mechanics, wave function and wave equations. Schrodinger's equation, time dependent and steady state forms, Expectation values, particle in a box, reflection and transmission by a barrier, tunnel effect, harmonic oscillator.

Unit-III.

Quantum Theory of Hydrogen Atom

(15):

Schrodinger's equation for the hydrogen atom, separation of variables, quantum numbers, principal quantum number, orbital quantum number,
magnetic quantum number, electron probability density, radiative transitions, selection rules. Zeeman Effect, Anomalous Zeeman effect, Xray Spectra.

Unit-IV. Atomic Nucleus and Radioactivity

(16):

Nonexistence of electrons in the nucleus, The neutron, stable nuclei, nuclear sizes and shapes, binding energy, liquid drop model, shell model, meson theory of nuclear forces Radioactivity; Radioactive decay, Halflife, radioactive dating, radioactive series, alpha decay and its theory, beta decay, gammadecay, radiation hazards and radiation units.

Books:

1. Concepts of Modem Physics: A. Beiser (McGraw Hill), 1987.
2. Quantum Mechanics: Ghatak and Loknatham (Springer), 2004.
3. Atomic Spectra: H. Kuhn (Longman Green), 1969.
4. Basic ideas and Concepts in Nuclear Physics: K. Hyde (Institute of Physics), 2004.

Course Code: PHY156

MODERN PHYSICS LABORATORY (60)

L	T	P	Credits	Marks
0	0	2	2	50

Max Marks: 50

Objective: The laboratory exercises have been so designed that the students learn to verify some of the concepts learnt in the theory courses. They are trained in carrying out precise measurements and handling sensitive equipment.

Note:

- Students are expected to perform at least eight-ten experiments out of following list. The experiments performed in first semester cannot be repeated in second Semester.
- The examination for both the courses will be of 3 hours duration.
- Total marks of practical will include 20% weightage of Continuous Assessment and 80% end semester exam including Notebook / Viva / Performance/ written test**.**
- **.**

List of Experiments:

Experimental skills: General Precautions for measurements and handling of equipment, representation of measurements, Fitting of given data to a straight line, and Error analysis, Significant figures and interpretation of results

1. Determination of Planck's constant using photocell.
2. Study of SolarCell characteristics
3. To find halflife period of a given radioactive substance using GM counter
4. Study of C.R.O. as display and measuring device, Study of Sinewave, square wave signals (half wave and full wave rectification)
5. Determination of ionization potential of mercury.
6. Study of excitations of a given atom by Franck Hertz set up.
7. To determine charge to mass ratio (e/m) of an electron by Thomson method.
8. Study of Arc emission spectrum of given samples (Fe and Cu).
9. To determine the heat capacity of given materials.
10. To find conductivity of given semiconductor crystal using four probe method.
11. To determine the Hall coefficient and mobility of given semiconductors.
12. To determine the operating plateau and dead time of a given G.M. Counter.
13. To find the coefficient of thermal conductivity of a bad conductor by Lee's method.
14. To find the ionization potential of mercury using gas filled diode.
15. To determine the thermionic work function of tungsten using directly heated diode.
16. To determine the speed of light in air.
17. To study the various laws of thermal radiation.
18. To demonstrate diaparaferro magnetism in an inhomogeneous magnetic field.
19. To measure the wave lengths of Balmar series of visible emission line from hydrogen.
20. To determine the electronic charge by Millikan oil drop method.

Course Title: Basic Communication Skills

Course Code: ENG151

No. Of Lectures: 45

L	T	P	Credits	Marks
3	0	0	3	75

Course Objective:

- To enhance students' vocabulary and comprehensive skills through prescribed texts.
- To hone students' writing skills.

Learning Outcomes: Students will be able to improve their writing skills as well as will enrich their word power.

Unit – A Applied Grammar (Socio-Cultural Context)	
• Parts of Speech: Noun, Pronoun, Adjective, Verb, Adverb, Preposition, Conjunction, Interjection	4 hours
• Tenses (Rules and Usages in Socio-cultural contexts)	5 hour
• Modals: Can, Could, May, Might, Will, Would, Shall, Should, Must, Ought to	4 hours
• Passives	3 hours
• Reported/Reporting Speech	3 hour
Unit – B Reading (Communicative Approach to be Followed)	
• J M Synge: Riders to the Sea (One Act Play)	5 hours
• Anton Chekhov : Joy (Short Story)	4 hours
• Swami Vivekanand : The Secret of Work (Prose)	5 hours
Unit – C Writing	
• Paragraph and Essay Writing	4 Hours
• Letter Writing: Formal and Informal	4 hours
• Notice and Email	4 hours

References:

a. Books

1. Kumar, Sanjay and PushpLata. *Communication Skills*. India: OUP, 2012.
2. Vandana, R. Singh. *The Written Word* by. New Delhi: Oxford University Press, 2008.

b. Websites

1. www.youtube.com (to download videos for panel discussions)

2. www.letterwritingguide.com
3. www.teach-nology.com
4. www.englishforeveryone.org
5. www.dailywritingtips.com
6. www.englishwsheets.com
7. www.mindtools.com

NOTE:

- The question paper for end-semester examination will have a weightage of 25%. It will consist of 100 objective questions of equal marks. All questions will be compulsory.
- Two preannounced tests will be conducted having a weightage of 25% each. Each preannounced test will consist of 20 objective type, 5 short questions/problems on the UGC-NET (objective type) pattern as well as one long answer type question. Students are expected to provide reasoning/solution/working for the answer. They will attempt all questions. Choice will be given only in long answer type. The question paper is expected to contain problems to the extent of 40% of total marks.
- Four surprise tests will be conducted. Out of these four, two will be speaking evaluations.

  Two best out of four surprise tests will be considered towards final, each of 12.5% weightage to the final. Each objective surprise test will include 20-25 questions.

  The books indicated as text-book(s) are suggestive. However, any other book may be followed.

Course Title: Basic Communication Skills Lab

Course Code: ENG152

No. Of Lectures: 30

L	T	P	Credits	Marks
0	0	2	1	25

Course Objective:

- To improve fluency in speaking English.
- To promote interactive skills through Group Discussions and role plays.

Learning Outcome: Students will get exposure to speaking through the above mentioned interactive exercises. In addition, they will develop a technical understanding of language learning software, which will further improve their communicative skills.

Unit – A Speaking/Listening	
• Movie-Clippings	10 hours
• Role Plays	10 hours
• Group Discussions	10 hours

Instructions:

1. Each student will prepare a scrap file on any of the topics given by class teacher. Student should be able to justify the contents of his/her Scrap file, which carries the weightage of 10 marks. Marks will be given for originality, creativity and presentation of thoughts.
2. In the end of semester, viva exam will be conducted. Viva will be for 10 marks. Spoken English will be the focus of exam. Examiner will ask questions related to scrap file and other general (non-technical) topics.
3. In the End-term exam, lab activity will carry the weightage of 10 marks.
4. Acknowledge all the sources of information in your scrap file.

References:

Books

1. Gangal, J. K. *A Practical Course In Spoken English.* India: Phi Private Limited, 2012.
2. Kumar, Sanjay and PushpLata. *Communication Skills*. India: OUP, 2012.

Websites

1. www.youtube.com (to download videos for panel discussions)
2. www.englishforeveryone.org
3. www.talkenglish.com
4. www.mindtools.com

Course Title: ENGLISH
Course Code: ENG180
Total Lectures: 60

L	T	P	Credits	Marks
4	0	0	4	100

Course Objective: To familiarize students of non-literary programmes with some of the basics of literary studies through a critical study of the prescribed texts

Learning Outcomes:

Unit – A *Never Never Nest* by Cedric Mount	
• Consumerist Lifestyle	3 hours
• Bank Loans and Modern Times	3 hours
• Character Analysis	5 hours
• Stylistic Analysis	4 hours
Unit – B *Guide* by R. K. Narayana	
• Interpersonal Relationships	4 hours
• Religious Beliefs/Rituals in Rural India	4 hours
• Character Analysis	4 hours
• Stylistic Analysis	3 hour
Unit – C *Twelfth Night* by Shakespeare	
• Salient Features of Shakespearean Comedy	5 hours
• Character Analysis	5 hours
• Stylistic and Thematic Analysis	5 hours
Unit – D *Animal Farm* by George Orwell	
• Marxist Principles	5 hours
• As a Progressive Text	5 hours
• Symbolic Analysis	5 hours

Suggested Reading:

1. Falvey, Peter ,Peter Kennedy. *Learning Language Through Literature: A Sourcebook for Teachers of English in Hong Kong.* HKU: Hong Kong University Press, 1997.
2. www.britishcouncil.com
3. Kumar, Sukrita Paul. *Language, Literature And Creativity*. New Delhi: Orient Blackswan Pvt Ltd, 2010.
4. Swann, Joan , Robert Pope and Ronald Carter*. Creativity in Language and Literature: The State of the Art.* USA : Palgrave MacMillan, 2011.

Course Title: Human Values and Ethics
Course Code: SGS101

L	T	P	Credits	Marks
2	0	0	2	50

Course Objectives

- To sensitize students about the role and importance of human values and ethics in personal, social and professional life.
- To encourage students to read and realize the values of enlightened human beings.
- To enable students to understand and appreciate ethical concerns relevant to modern lives.

Learning Outcomes:

Students becoming responsible citizens and better professionals who practise Values and Ethics in every sphere of life.

Unit - A

Human Values

1. **Concept of Human Values:** Meaning, Types and Importance of Values. **2 hours**
2. **Human Values:** Lessons from the lives and teachings of great thinkers. 3 **hours**
3. **Value Education :** The content of value education **2 hour**
4. **Value crisis and its redressal.** **1 hour**

Unit - B

Being Good and Responsible

1. Self Exploration and Self Evaluation **2 hour**
2. Acquiring Core Values for Self Development **2 hour**
3. Living in Harmony with Self, Family, Society and Nature **3 hours**
4. Values enshrined in the Constitution: Liberty, Equality Fraternity and Fundamental Duties. 3 **hours**

Unit - C

Value – based living

1. Vedic values of life **2 hour**
2. Karma Yoga and Jnana Yoga **2 hours**
3. Ashta Marga and Tri-Ratna **2 hours**
4. Truth, Contentment and Wisdom **2 hours**

Unit - D

Ethical Living

1.	Personal Ethics	**2 hours**
2.	Professional Ethics	**3 hours**
3.	Ethics in Governance	**2 hours**
4.	Ethics in Education	**2 hours**
		Total = 35 hours

Suggested Readings:

1. Restoring Values (ed.) E. Sreedharan and Bharat Wakhlu, Sage Publications Ltd., New Delhi 2010.
2. Indian Ethos and Values by Nagarajan K, Tata McGraw Hill, 2011
3. Human Values, A N Tripathi, New Age International Publishers, New Delhi, Third Edition, 2009
4. Indian Ethos and Values in Management, 1st Edition by Sankar, Tata McGraw Hill Education Pvt. Ltd.
5. Values and Ethics, Osula, Asian Books, 2001.
6. Professional Ethics, R. Surbiramanian, Oxford University Press, New Delhi, 2013.
7. Human Values and Professional Ethics, Rishabh Anand, Satya Prakashan, New Delhi, 2012
8. Human Values and Professional Ethics, Sanjeev Bhalla, Satya Prakashan, New Delhi, 2012.
9. Human Values and Professional Ethics, Ritu Soryan Dhanpat Rai & Co. Pvt. Ltd., First Edition, 2010.
10. Human Values and Professional Ethics by Suresh Jayshree, Raghavan B S, S Chand & Co. Ltd. , 2007.
11. Human Values and Professional Ethics, Dr. R K Shukla, Anuranjan Misra, A B Publication 2010.
12. Human Values and Professional Ethics, Sharma, Vayu Education of India Language publishers, 2012.
13. Human Values and Professional Ethics, S. Kannan, K. Srilakshmi, Taxmann Publication, Pvt. Ltd., 2009
14. Human Values and Professional Ethics, Smriti Srivastava, S K Kataria & Sons, 2001
15. Human Values and Professional Ethics, Yogendra Singh, Ankur Garg, Aitbs publishers, 2011.

16. Human Values and Professional Ethics, Vrinder Kumar, Kalyani Publishers, Ludhiana, 2013.
17. Human Values and Professional Ethics, R R Gaur, R. Sangal, GP Bagaria, Excel Books, New Delhi 2010.
18. Values and Ethics, Dr. Bramwell Osula, Dr. Saroj Upadhyay, Asian Books Pvt. Ltd., 2011.
19. Complete works of Swami Vivekanand, Advaita Ashram, Calcutta – 1931.
20. Indian Philosophy, S. Radhakrishnan, George Allen & Unwin Ltd., New York: Humanities Press INC, 1929.
21. Essentials of Hinduism, Jainism and Buddhism, A N Dwivedi, Books Today, New Delhi – 1979
22. Light of Truth : Satyarth Parkash, Maharishi Dayanand Saraswati, Arya Swadhyay Kendra, New Delhi, 1975.
23. Dayanand : His life and work, Suraj Bhan, DAVCMC, New Delhi – 2001.
24. Moral and Political Thoughts of Mahatma Gandhi, V. Raghavan, N Iyer, Oxford University Press India, New Delhi, 2000.
25. Guru Nanak Dev's view of life, Amplified by Narain Singh, Published by Bhagat Puran Singh All India Pingalwara Society, Amritsar 2010.
26. Esence of Vedas, Kapil Dev Dwivedi, Katyayan Vedic Sahitya Prakashan, Hoshiarpur, 1990.
27. Vedic Concepts, Prof. B B Chaubey, Katyayan Vedic Sahitya Prakashan, Hoshiarpur, 1990.
28. Mahatma Gandhi: Essays and Reflections on his life and work by Saravapalli Radhakrishnan, Zaico Publication, Mumbai, 1977.
29. Lala Har Dayal, Hints for Self Culture, Jaico Publishing House, Mumbai, 1961.
30. Maharishi Swami Dayanand Saraswati, The Light of Truth (The Satyartha Prakashan), available at URL :
www. aryasamajjamnagar.org/download/satyarth_prakash_eng.pdf
31. Krishnamurti J, The First and Last Freedom, available at URL :
http://www.jiddu-krishanmurti.net/en/th-first-and-last-freedom/
32. Sri Raman Maharishi, Who Am I, available at URL :
http://www.sriramanamaharshi.org/resource_centre/publicatins/who-am-i-books/
33. Ramesh S Balsekar, Peace and Harmony in Daily Living, Yogi Impressions; 1st edition

Course Title: General Knowledge and Current Affairs

Course Code: SGS102

L	T	P	Credits	Marks
2	0	0	2	50

COURSE OBJECTIVES

The study of General Knowledge and Current Affairs has become even more important today. It is not only a major constituent of most competitive examinations but also aids in acquiring general awareness.

The objectives of this course are:

- To introduce students with the course and contents of various competitive examinations
- To prepare a foundation for appearing in various competitive examinations
- To sensitize the students about the current issues and events of national and international importance
- To provide opportunity to the students to study inter disciplinary subjects like Geography, Science, Economy, Polity, History, International Relations etc.

Learning Outcomes:

- Students would get an opportunity to aspire, plan and prepare for various competitive examinations in advance.
- It would polish their personalities and sharpen the skills of debates, group discussions, communication, interview etc.
- Students would acquire general awareness of National and International Events.

Unit — A

General Geography

World Geography:

The Universe, The Solar System, The Earth, Atmosphere, The World we live in, Countries rich in Minerals, Wonders of the World, Biggest and Smallest. **2 hours**

Indian Geography:

Location, Area and Dimensions, Physical Presence, Indian States and Union Territories, Important sites and Monuments, Largest-Longest and Highest in India. **2 hours**

General History

Glimpses of India History, Ancient Indian, Medieval India, Modern India, Various Phases of Indian National Movement, Prominent Personalities. **3 hours**

Glimpses of World History

Important Events of World History, Revolutions and Wars of Independence, Political Philosophies like Nazism, Fascism, Communism, Capitalism, Liberalism etc. **2 hours**

Unit — B

General Polity

World Politics – Major Actors and their political relations, **3 hours**

UNO and other organizations viz: WTO, EU, SAARC, ASEAN, BRICS, WTO, OIC, OAU, OPEC, GCC etc.

Indian Polity: Constitution of India:

Important Provisions, Basic Structure, Union Government, Union Legislature and Executive, State Government: State Legislature and Executive, **3 hours**

Indian Judiciary, The Election Commission, Panachayati Raj System, RTI etc.

General Economy:

The process of liberalization, privatization, globalization and **3 hours**

Major World Issues. Indian Economy, Indian Financial System, Major Economic Issues, Economic Terminology.

Unit — C

General Science:

General appreciation and understandings of science including **3 hours**

the matters of everyday observation and experience. Inventions and Discoveries.

Sports and Recreation : **3 hours**

The World of Sports and recreation. Who's Who is sports, Major Events, Awards and Honours. Famous personalities, Festivals. Arts and Artists.

Current Affairs :

National and International Issues and Events in News. Governments **3 hours**

Schemes and Policy Decisions.

India and Neighbours:

Current phase relations with China, Pakistan, Bangladesh, Nepal, Sri Lanka and Afghanistan **2 hours**

Unit — D

Miscellaneous Information

Who is who

Books and Authors, Persons in News, Awards and Honours, **2 hours**

Abbreviations and Sports

SUGGESTED READINGS :

Books

- Advance Objective General Knowledge, R. S. Aggarwal, S. Chand Publisher (2013)
- Concise General Knowledge Manual 2013, S. Sen, Unique Publishers,2013
- Encyclopedia of General Knowledge and General Awareness by R P Verma, Penguin Books Ltd (2010)
- General Knowledge Manual 2013-14, Edgar Thorpe and Showick Thorpe, The Pearson, Delhi.

- General Knowledge Manual 2013-14, Muktikanta Mohanty, Macmillan Publishers India Ltd., Delhi.
- India 2013, Government of India (Ministry of Information Broadcasting), Publication Division, 2013.
- Manorama Year Book 2013-14, Mammen Methew, Malayalam Manorama Publishers, Kottayam, 2013.
- Spectrum's Handbook of General Studies – 2013-14, Spectrum Books (P) Ltd., New Delhi
- Unique Quintessence of General Studies – 2013-14, Unique Publishers, New Delhi.

CURRENT AFFAIRS

Magazines

Economic and Political Weekly, Yojna, the Week, India Today, Frontline, Spectrum. Competition Success Review, Competition Master, Civil Services Chronicle, Current Affairs, World Atlas Book

Newspapers

The Hindu, Times of India, The Hindustan Times, The Tribune

Course Title: Stenography
Course Code: SGS104

L	T	P	Credits	Marks
2	0	0	0	0

Course Objective: The course is to inculcate writing and listening skills among the students. This would act as building blocks for the learner to begin the study of stenography. As the learners are from the senior secondary background the course has been created keeping in mind their requirements for the future.

Learning Outcome:

After going through this course the participant would have understood the basic concepts of shorthand language and would be able to apply them in daily life. Completion of the course will improve their speed of writing and typing. They would be able to pronounce the English words correctly and can use effective English communication.

Unit A I. The Consonants II. The Vowels III. Intervening Vowels and Position Grammalogues, Punctuation IV. Alternative Signs for r and h V. Diphthongs Abbreviated w. VI. Phaseography Tick the VII. Circle s and z—Left and Right Motion VIII. Stroke s and z IX. Large Circles sw and ss or sz X. Loops st and str.	12 hours
Unit B XI. Initial Hooks to Straight Strokes and Curves XII. Alternative Forms for fr, vr, etc. Intervening Vowels XIII. Circle or Loop Preceding Initial Hook XIV. n and f Hooks XV. Circles and Loops to Final Hooks.XVI The shun hook. XVII. The Aspirate. XVIII. Upward and Downward r.XIX. Upward and downward l and sh. XX. Compound consonants XXI. Vowel indication**.**	12 hours
Unit C XXII. The halving principle (section 1). XXIII. The halving principle (section 2). XXIV. The Doubling principle. XXV. Diphonic or two vowel signs. XXVI. Medial semicircle. XXVII. Prefixes negative words. XXVIII. Suffixes and terminations. XXIX. Contractions. XXX. Figures, etc .proper names.	11 hours
Unit D XXXI. Note taking, transcription, etc. XXXII. Essentials vowels. XXXIII. Special contractions. XXXIV. Advanced pharseography. XXXV. Intersections. XXXVI. Business phrases. XXXVIII. Banking and stockbroking phrases. XXXIX. Insurance and shipping phrases. XL. Technical and railway phrases. XLI. Legal phrases. XLIII. Special list of words. XLIV. Shorthand in practice.	10 hours
Total	**45 hours**

Text Book:

Pitman Shorthand Instructor and Key ,Pearson publisher.

Course Title: Stenography Lab
Course Code: SGS105

L	T	P	Credits	Marks
0	0	1	0	0

Course Objective: The course is to inculcate writing and listening skills among the students. This would act as building blocks for the learner to begin the study of stenography. As the learners are from the senior secondary background the course has been created keeping in mind their requirements for the future.

Learning Outcome:

After going through this course the participant would have understood the basic concepts of typing and would be able to apply them in daily life. Completion of the course will improve their speed of typing and typing skills.

Unit A Beginner : Basics-fjdk, sla;, ghty,vmbn,ruei,woqp,cx. .	04 hours
Unit B Shift keys, numeric pad, Digits and symbols	03 hours
Unit C Intermediate- Syllables and words.	04 hours
Unit D Expert- Paragraphs and Stories	04 hours
Total	**15 hours**

Course Title: Environment Education
Course Code: EVS102

L	T	P	Credits	Marks
2	0	0	2	50

Course Objective: This course aims at understanding the students in aspects of environmental problems, its potential impacts on global ecosystem and its inhabitants, solutions for these problems as well as environmental ethics which they should adopt to attain sustainable development.

Unit 1

The multidisciplinary nature of environmental studies
(2 Hours)
Definition, scope and importance, Need for public awareness

Natural Resources: Renewable and non-renewable resources:
(8 Hours)
Natural resources and associated problems.
(a) **Forest resources:** Use and over-exploitation, deforestation, case studies. Timber extraction, mining, dams and their effects on forests 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, case studies.
(d) **Food resources:** World food problems, changes caused by agriculture and overgrazing, effects of modern agriculture, fertilizer-pesticide problems, water logging, salinity, case studies.
(e) **Energy resources:** Growing energy needs, renewable and non-renewable energy sources, use of alternate energy sources, case studies.
(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.

Ecosystem: **(4 Hours)**

- 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. Forest ecosystem
b. Grassland ecosystem
c. Desert ecosystem
d. Aquatic ecosystems (ponds, streams, lakes, rivers, ocean estuaries)

Unit II

Biodiversity and its conservation 4 Hours

- 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, global and national efforts.
- Genetically modified crops
- Cartagena Protocol
- Biodiversity Act

Environmental Pollution 8Hours

- Definition, causes, effects and control measures of:
  a. Air pollution
  b. Water pollution
  c. Soil pollution
  d. Marine pollution
  e. Noise pollution
  f. Thermal pollution
  g. Nuclear pollution
- Solid waste management: Causes, effects and control measures of urban and industrial wastes.
- Role of an individual in prevention of pollution
- Pollution case studies
- Disaster management: floods, earthquake, cyclone and landslides

Indoor Pollution: 2 Hours

- Practical tips on how to save the self from self-inflicted pollution.
- Basics of toxicity.
- Problems of lifestyle based diseases.
- Solutions needed for safety.

Unit III

Social Issues and the Environment 7 Hours

- Population growth, variation among nations, Population explosion – Family Welfare Programmes.
- Environment and human health,
- From unsustainable to sustainable development
- Urban problems and 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

- Climate change, global warming, acid rain, ozone layer depletion, nuclear accidents and holocaust. Case studies.
- Wasteland reclamation
- Consumerism and waste products
- Environmental Laws: The Environment Protection Act, 1986; The Air (Prevention and Control of Pollution) Act, 1981; The Water (Prevention and control of Pollution) Act 1974; The Wildlife Protection Act, 1972; Forest Conservation Act, 1980.
- Issues involved in enforcement of environmental legislation
- Public Awareness

Unit IV

Human Population and Environment5 Hours

- Population Growth and Variations among Nations
- Population Explosion
- Human Rights
- Value Education
- HIV / AIDS
- Women and Child Welfare
- Role of Information Technology in Environment and Human Health
- Case Studies

Global environmental issues 5 Hours

- Stockholm Conference
- Brundtland Commission
- Montreal Protocol
- Kyoto protocol
- Earth Summit
- World Summit

Field Work 5 Hours

- Visit to a local area to document environmental assets river/ forest/ grassland/hill/mountain
- Visit to a local polluted site – Urban / Rural / Industrial / Agricultural
- Study of common plants, insects, birds
- Study of simple ecosystems-Pond, river, hill slopes, etc (Field work equal to 5 lecture hours)

References:

1. Botkin, D.B. and Kodler, E.A. (2000). Environmental Studies: The Earth as a living planet. John Wiley and Sons Inc., New York.
2. De, A.K. (1990). Environmental Chemistry. Wiley Eastern Ltd. New Delhi.
3. Odum, E.P. (1983). Basic Ecology. Halt Saundurs, International Edition, Japan.

4. Sharma, P.D. (2004). Ecology and Environment. Rastogi Publications, Meerut.
5. Singh, J.S., Singh, S.P. and Gupta, S.R. (2006). Ecology, Environment and Resource Conservation, Anamaya Publishers, New Delhi.

Course Title: Road Safety and Legal Awareness
Course Code: EVS103

L	T	P	Credits	Marks
2	0	0	2	50

Course Objective: This course aims to aware the students about safety measures taken during driving and commuting on roads.

Unit I

Road Safety **15 Hours**

- Road safety: Concept and its importance.
- Attitude of people towards road safety
- Role of traffic police in road safety
- Traffic rules
- Traffic signs
- How to obtain driving license
- Traffic offences, penalties and procedures
- Common driving mistakes
- Significance of first-aid in road safety
- Role of civil society in road safety and Traffic police-public relationship
- Motor Vehicle Act 1998 (2010)

Unit II

Legal Awareness **10 Hours**

- Legal literacy
- Child labour
- Domestic Violence
- Right to Education

References:

1. De, A.K. (1990). Environmental Chemistry. Wiley Eastern Ltd. New Delhi.
2. Sharma, P.D. (2004). Ecology and Environment. Rastogi Publications, Meerut.
3. Singh, J.S., Singh, S.P. and Gupta, S.R. (2006). Ecology, Environment and Resource Conservation, Anamaya Publishers, New Delhi.

Course Title: Organic Chemistry

Course Code: CHE153

Time: 04 Hours

L	T	P	Credits	Marks
4	0	0	4	100

Course Objectives:

This course is intended to learn the basic concepts of Organic Chemistry. The present syllabus has been framed as per the latest UGC guidelines and recent research trends in the subject. The various topics of the syllabus are grouped under different units in order to bring forth the importance of academic and laboratory skills for the undergraduate students.

Expected Prospective:

This course will equip students with the necessary chemical knowledge concerning the fundamentals in the basic areas of Organic chemistry. The students will be able to pursue their career objectives in advance education, in scientific research and in teaching careers following graduation in the course.

Instructions for Candidates:

- The question paper for end-semester examination will have a weightage of 25%. It will consist of 100 objective questions of equal marks. All questions will be compulsory.
- Two preannounced test will be conducted having a weightage of 25% each. Each preannounced test will consist of 20 objective type, 5 short questions/problems on the UGC-NET (objective type) pattern as well as one long answer type question. The student is expected to provide reasoning/solution/working for the answer. The candidates will attempt all question. Choice will be given only in long answer type. The question paper is expected to contain problems to the extent of 40% of total marks.
- Four objective/MCQ type surprise test will be taken. Two best out of four objective/MCQ type surprise test will be considered towards final each of 12.5% weightage to the final. Each surprise test will include 20-25 questions.
- The books indicated as text-book(s) are suggestive However, any other book may be followed.

PART A

Compounds of Carbon (8 Hrs)

Differences in chemical and physical behavior as consequences of structure. Discussion (with mechanism) of reactions of hydrocarbons' ranging from saturated acyclic and alicyclic, unsaturated dienes and aromatic systems. Huckel rule; as applied to 4n+2 systems. Industrial sources and utility of such compounds in daily life for medicine clothing and shelter.

PART B

Stereochemistry (15 Hrs)

Structure, reactivity and stereochemistry. Configuration and conformation. Optical activity due to chirality; d, l, meso and diasteroisomerism, sequence rules. Reactions involving stereoisomerism. Geometrical isomerism – determination of configuration of geometric isomers. E & Z system of nomenclature. Conformational isomerism – conformational analysis of ethane and n-butane; conformations cyclohexane, axial and equatorial bonds, conformations of monosubstituted cyclohexane derivatives. Newman projection and Sawhorse formula, Fischer and flying wedge formulae.

PART C

Alkyl Halides (8 Hrs)

Structure of alkyl halides and their physical properties. Preparation from alcohols, hydrocarbons, alkenes and by halide exchange method.

Reactions : (i) Nucleophilic substitution (SN2 and SN1) kinetics, mechanism, stereochemistry, steric and electronic factors, reactivity of alkyl halides, rearrangement, dependence on nucleophile, role of solvent (ii) Elimination E2 and E1 mechanism, stereochemistry, kinetics, rearrangement.

Alcohols (4 Hrs)

Structure, physical properties (Hydrogen bonding), Methods of preparation: Grignard synthesis (scope and limitations),

Reactions: Reactions with hydrogen halides. Mechanism and rearrangement, Reaction with Phosphorous trihalides, mechanism of Dehydration rearrangement.

PART D

Ethers (2 Hrs)

Structure, Physical properties, preparation (Williamson synthesis). Reactions: Cleavage, by acids, Electrophilic substitution in ethers.

Aldehydes and Ketones (8 Hrs)

Structure, Physical Properties; Methods of Preparation: Oxidation of Primary and secondary alcohols, Oxidation of methylbenzenes, Reduction of acid chlorides, Friedel- Crafts Acylation,

Reactions; Nucleophilic addition, Addition of Grignard reagents, Addition of cyanide. Addition of Bisulphite, Addition of derivatives of ammonia. Acetal Formation, Cannizzaro reaction, Aldol Condensation.

Suggested Books:

1. R.N. Morrison & R.N. Boyd, Organic Chemistry, Dorling Kindersley (India) Pvt. Ltd. (Pearson Education).
2. I.L. Finar, Organic Chemistry (Volume 1), Dorling Kindersley (India) Pvt. Ltd. (Pearson Education).
3. E.L. Eliel & S.H. Wilen, Stereochemistry of Organic Compounds, Wiley: London, 1994.
4. March, Jerry Advanced Organic Chemistry: Reactions, Mechanism and Structure, 6th edition, John Wiley, 2007.

Course Title: ORGANIC CHEMISTRY LAB

Course Code: CHE154

Time: 04 Hours

L	T	P	Credits	Marks
0	0	2	2	50

Course Objectives:

This course is intended to learn the basic concepts of Organic Chemistry Laboratory. The present syllabus has been framed as per the latest UGC guidelines and recent research trends in the subject. The various experiments have been designed to enhance laboratory skills of the undergraduate students.

Expected Prospective:

The students will be able to understand the basic objective of experiments in organic chemistry, properly carry out the experiments, and appropriately record and analyze the results through effective writing and oral communication skills. They will know and follow the proper procedures and regulations for safe handling and use of chemicals and solvents.

1. Calibration of Thermometer

80-82^o (Naphthalene), 113-114^o (acetanilide).

132.5-133^o (Urea), 100^o (distilled Water)

2. Determination of melting point

Naphthalene 80-82^o, Benzoic acid 121.5-122^o

Urea, 132.5-133^o, Succinic acid 184-185^o

Cinnamic acid 132.5-133^o, Salicylic acid 157-5-158^o

Acetanilide 113-5-114^o, m-Dinitrobenzene 90^o

P-Dichlorobenzene 52^o. Aspirin 135^o.

3. Determination of boiling points

Ethanol 78^o, Cyclohexane 81.4^o, Toluene 110.6^o, Benzene 80^o.

4. Mixed melting point determination

Urea-Cinnamic acid mixture of various compositions (1:4, 1:1, 4:1)

5. Distillation

Simple distillation of ethanol-water mixture using water condenser,

Distillation of nitrobenzene and aniline using air condenser.

6. Crystallization

Concept of induction of crystallization

Phthalic acid from hot water (using fluted filter paper and stemless funnel), Acetanilide from boiling water,

Naphthalene from ethanol,

Benzoic acid from water.

7. Decolorisation and crystallization using charcoal

Decolorisation of brown sugar (sucrose) with animal charcoal using gravity filtration.

Crystallization and Decolorisation of impure naphthalene (100g of naphthalene mixed with 0.3g of Congo Red using 1g decolorising carbon) from ethanol.

8. Sublimation (Simple and Vacuum)

Camphor, Naphthalene, Phthalic acid and Succinic acid.

9. Extraction: the separatory funnel, drying agent:

Isolation of caffeine from tea leaves

10. Steam distillation

Purification of aniline/nitrobenzene by steam distillation.

Suggested Books:

1. Vogel A.I., Tatchell A.R., Furnis B.S., Hannaford A.J., Smith, P.W.G.,Vogel's Text Book of Practical Organic Chemistry,5th Edn., Pubs: ELBS, 1989.

2. Pavia D.L., Lampanana G.M., Kriz G.S. Jr., Introduction to Organic Laboratory Techniques, 3rd Edn., Pubs: Thomson Brooks/Cole, 2005.

3. Mann F.G., Saunders. P.C., Practical Organic Chemistry, Pubs: Green & Co. Ltd., London, 1978.

4. Svehla, G., Vogel's Qualitative Inorganic Analysis (revised); 7th edition, Pubs: Orient Longman, 1996.

5. Bassett, J., Denney, R.C., Jeffery, G.H., Mendham, J., Vogel's Textbook of Quantitative Inorganic Analysis (revised); 4th edition, Pubs: Orient Longman, 1978.

Course Title: Inorganic Chemistry

Course Code: CHE253

L	T	P	Credits	Marks
4	1	0	4	100

Time: 04 Hours

Course Objectives:

This course is intended to learn the basic concepts of Inorganic Chemistry. The present syllabus has been framed as per the latest UGC guidelines and recent research trends in the subject. The various topics of the syllabus are grouped under different units in order to bring forth the importance of academic and laboratory skills for the undergraduate students.

Expected Prospective:

This course will equip students with the necessary chemical knowledge concerning the fundamentals in the basic areas of Inorganic chemistry. The students will be able to pursue their career objectives in advance education, in scientific research and in teaching careers following graduation in the course.

Instructions for Candidates:

- The question paper for end-semester examination will have a weightage of 25%. It will consist of 100 objective questions of equal marks. All questions will be compulsory.
- Two preannounced test will be conducted having a weightage of 25% each. Each preannounced test will consist of 20 objective type, 5 short questions/problems on the UGC-NET (objective type) pattern as well as one long answer type question. The student is expected to provide reasoning/solution/working for the answer. The candidates will attempt all question. Choice will be given only in long answer type. The question paper is expected to contain problems to the extent of 40% of total marks.
- Four objective/MCQ type surprise test will be taken. Two best out of four objective/MCQ type surprise test will be considered towards final each of 12.5% weightage to the final. Each surprise test will include 20-25 questions.
- The books indicated as text-book(s) are suggestive However, any other book may be followed.

PART A

Atomic Structure and periodic properties (12 Hrs)

Wave mechanical model of Hydrogen atom, The de Broglie relationship, The uncertainty principle, Schrodinger wave equation and its derivation, Significance of Ψ and Ψ^2, Quantum numbers, Normal and orthogonal wave functions, Pauli's exclusion principle, Hund's rule of maximum multiplicity, Aufbau principle and its limitations. Concept of extra stability of half and completely filled electronic configuration, Electronic configuration of elements, Penetration and shielding (The Slater's rules). The origin and distribution of the elements, The structure of the periodic table, Atomic parameters and their variation in periodic table, Electronegativity and various scales.

PART B

Ionic Compounds (Bonding and structures) (12 Hrs)

Properties of ionic substances, Occurrence of ionic bonding, The radius ratio rules, Efficiency of packing, Hexagonal close packing, Cubic close packing, Structures of different crystal lattices, Sodium chloride, Cesium chloride, Wurtzite, Zinc blende, Fluorite, Rutile, Cristobalite, Nickel arsenide, Calcium carbide, Lattice energy, Born-Haber cycle, The calculations of the lattice energy on the basis of Born-Lande equation, Covalent character in predominantly ionic compounds, Imperfections of crystals, Polarizing power and polarizabilty of ions, Fajan's rule.

PART C

Covalent Bond (12 Hrs)

The Lewis theory, Valence bond theory - A mathematical approach, Resonance, Valence Shell Electron Pair Repulsion Model (VSEPR theory), Prediction of structures and variation of bond angles on the basis of VSEPR theory, Shortcomings of VSEPR theory. Concept of hybridization, Rules for obtaining hybrid orbitals, Extent of d-orbital participation in molecular bonding (SO_2, PCl_5, SO_3), Molecular orbital theory (LCAO method), Symmetry of molecular orbitals, Applications of MOT to homo- and hetero-nuclear diatomic molecules, Molecular orbital energy level diagrams (Be_2, N_2, O_2, F_2, NO, CO, HCl, NO_2, BeH_2).

PART D

Coordination chemistry (8 Hrs)

Werner's theory, nomenclature of coordination complexes, isomerism in coordination complexes, chelating agents, metal chelates and chelate effects, names and abbreviations of important ligands, polydenate ligands, polypyarzolyborates, macrocylic ligands, macrocylic effect, ketoenolates, troplonates, tripod ligands, conformation of chelate rings, factors determining kinetic and thermodynamic stability.

Suggested Books:

1. D.F.C. Shriver, P.W. Atkins and C.H. Langford, Inorganic Chemistry, ELBS Oxford, 1991.

2. J.E. Huheey, E.A. Keiter, R.L. Keiter, Inorganic Chemistry, 4th Ed, Pearson Education, Singapore, 1999.

3. J.D. Lee, Concise Inorganic Chemistry, ELBS, Oxford 1994.

Course Title: Inorganic Chemistry Lab

Course Code: CHE254

Time: 04 Hours

L	T	P	Credits	Marks
0	0	2	2	50

Course Objectives:

This course is intended to learn the basic concepts of Inorganic Chemistry Laboratory. The present syllabus has been framed as per the latest UGC guidelines and recent research trends in the subject. The various experiments have been designed to enhance laboratory skills of the undergraduate students.

Expected Prospective:

The students will be able to understand the basic objective of experiments in inorganic chemistry, properly carry out the experiments, and appropriately record and analyze the results through effective writing and oral communication skills. They will know and follow the proper procedures and regulations for safe handling and use of chemicals and solvents.

Qualitative Analysis

Identification of cations and anions in a mixture which may contain combinations of acid ions.

These must contain interfering acid anions and one, the insoluble.

a) Special Tests for Mixture of anions

I. Carbonate in the presence of sulphate.

II. Nitrate in the presence of nitrite

III. Nitrate in the presence of bromide and iodide.

IV. Nitrate in the presence of chlorate.

V. Chloride in the presence of bromide and iodide.

VI. Chloride in the presence of bromide.

VII. Chloride in the presence of iodide.

VIII. Bromide and iodide in the presence of each other and of chloride.

IX. Iodate and iodide in the presence of each other.

X. Phosphate, arsenate and arsenite in the presence of each other.

XI. Sulphide, sulphite, thiosulphate and sulphate in the presence of each other.

XII. Borate in the presence of copper and barium salts.

XIII. Oxalate in the presence of fluoride.

XIV. Oxalate, tartrate, acetate, citrate in the presence of each other.

b) Separation and identification of cations in mixtures

i) Separation of cations in groups.

ii) Separation and identification of Group I, Group II (Group IIA and IIB), Group III, Group IV, Group V and Group VI cations.

Suggested Books:

1. G. Svehla, B. Sivasankar, Vogel's Qualitative Inorganic Analysis (revised); 7th edition, Pubs: Pearson, 1996.

2. J. Bassett, R. C. Denney, G. H. Jeffery, J. Mendham, Vogel's Textbook of Quantitative Inorganic Analysis (revised); 4th edition, Pubs: Orient Longman, 1978.

3. W. G. Palmer, Experimental Inorganic Chemistry; 1st edition, Pubs: Cambridge, 1954.

Course Title: PHYSICAL CHEMISTRY

Course Code: CHE353

L	T	P	Credits	Marks
4	1	0	4	100

Time: 04 Hours

Course Objectives:

This course is intended to learn the basic concepts of Physical Chemistry. The present syllabus has been framed as per the latest UGC guidelines and recent research trends in the subject. The various topics of the syllabus are grouped under different units in order to bring forth the importance of academic and laboratory skills for the undergraduate students.

Expected Prospective:

This course will equip students with the necessary chemical knowledge concerning the fundamentals in the basic areas of physical chemistry. The students will be able to pursue their career objectives in advance education, in scientific research and in teaching careers following graduation in the course.

Instructions for Candidates:

- The question paper for end-semester examination will have a weightage of 25%. It will consist of 100 objective questions of equal marks. All questions will be compulsory.
- Two preannounced test will be conducted having a weightage of 25% each. Each preannounced test will consist of 20 objective type, 5 short questions/problems on the UGC-NET (objective type) pattern as well as one long answer type question. The student is expected to provide reasoning/solution/working for the answer. The candidates will attempt all question. Choice will be given only in long answer type. The question paper is expected to contain problems to the extent of 40% of total marks.
- Four objective/MCQ type surprise test will be taken. Two best out of four objective/MCQ type surprise test will be considered towards final each of 12.5% weightage to the final. Each surprise test will include 20-25 questions.
- The books indicated as text-book(s) are suggestive However, any other book may be followed.

PART A

Chemical Thermodynamics (15Hrs)

Objectives and limitations of Chemical Thermodynamics, State functions, thermodynamic equilibrium, work, heat, internal energy, enthalpy.

First Law of Thermodynamics: First law of thermodynamics for open, closed and isolated systems. Reversible isothermal and adiabatic expansion/compression of an ideal gas. Irreversible isothermal and adiabatic expansion, .Enthalpy change and its measurement, standard heats of formation and absolute enthalpies. Kirchhoff's equation.

Second and Third Law: Various statements of the second law of thermodynamics. Efficiency of a cyclic process (Carnot's cycle), Entropy, Entropy changes of an ideal gas with changes in P,V, and T, Free energy and work functions, Gibbs-Helmholtz Equation., Criteria of spontaneity in terms of changes in free energy, Third law of thermodynamics, Absolute entropies.

PART B

Chemical Equilibrium (5 Hrs)

General characteristics of chemical equilibrium, thermodynamic derivation of the law of chemical equilibrium, Van't Hoff reaction isotherm. Relation between Kp, Kc and Kx. Temperature dependence of equilibrium constant-Van't Hoff equation, homogeneous & heterogeneous equilibrium, Le Chetalier's principle.

PART C

Chemical Kinetics (15 Hrs)

Rates of reactions, rate constant, order and molecularity of reactions. Chemical Kinetics: Differential rate law and integrated rate expressions for zero, first, second and third order reactions. Half-lifetime of a reaction, Methods for determining order of reaction, Effect of temperature on reaction rate and the concept of activation energy, Reaction mechanism, Steady state hypothesis

Catalysis

Homogeneous catalysis, Acid-base catalysis and enzyme catalysis (Michaelis-Menten equation). Heterogeneous catalysis, Unimolecular surface reactions.

PART D

Electro-Chemistry (5 Hrs.)

Specific conductance, molar conductance and their dependence on electrolyte concentration, Ionic Equilibria and conductance, Essential postulates of the Debye-

Huckel theory of strong electrolytes, Mean ionic activity coefficient and ionic strength, Transport number and its relation to ionic conductance and ionic mobility, Conductometry titrations, pH scale, Buffer solutions, salt hydrolysis, Acid-base indicators.

Electrochemical cells (5Hrs.)

Distinction between electrolytic and electrochemical cells, Standard EMF and electrode potential, Types of electrodes, Reference electrode, Calculation of NG, NH, NS and equilibrium constant from EMF data, Potentiometric determination of pH, Potentiometric titrations.

Suggested Books:

1. P.W. Atkins, Physical Chemistry, 8th Ed., Oxford University Press, 2006 (Indian Print).

2. T. Engel & P. Reid, Physical Chemistry, 1st ed., Pearson Education, 2006.

3 G. W. Castellan, Physical Chemistry, 3rd Ed., Addison Wisley/Narosa, 1985 (Indian Print)

4. G. M. Barrow, Physical Chemistry 6th Ed., New York, McGraw Hill, 1996.

5. R. J. Silbey, R. A. Albert & Moungi G. Bawendi, Physical Chemistry, 4th Ed., New York: John Wiley, 2005.

This syllabus has been designed as per national syllabus suggested by UGC and covers 20% extra syllabus as per requisite of honors degree.

Course Title: PHYSICAL CHEMISTRY LAB

Course Code: CHE354

L	T	P	Credits	Marks
0	0	2	2	50

Time: 04 Hours

Course Objectives:

To teach the fundamental concepts of Physical Chemistry and their applications. The syllabus pertaining to B.Sc. (Other branches.) in the subject of Chemistry has been upgraded as per provision of the UGC module and demand of the academic environment. The syllabus contents are duly arranged unit wise and contents are included in such a manner so that due importance is given to requisite intellectual and laboratory skills.

Expected Prospective:

The students will be able to understand the basic objective of experiments in organic chemistry, properly carry out the experiments, and appropriately record and analyze the results through effective writing and oral communication skills. They will know and follow the proper procedures and regulations for safe handling and use of chemicals and solvents.

1. Treatment of experimental data

Recording of experimental data. Significant number, accuracy and precision, error analysis.

2. Liquids and Solutions

(i) To determine relative viscosities of aqueous solutions of glycerol at different concentrations. (ii) Calculate partial molar volume of glycerol at infinite dilution from density measurement.

(ii) To determine viscosity-average molecular weight, number-average molecular weight and mean diameter of polyvinyl alcohol molecule from intrinsic viscosity data.

3. Thermochemistry

(i) To determine heat capacity of a calorimeter and heat of solution of a given solid compound.

(ii) To determine heat of solution of Solid calcium chloride and calculate lattice energy of calcium chloride using Born-Haber cycle.

(iii) To determine heat of hydration of copper sulphate.

4. Distribution Law

(i) To determine distribution (i.e. partition) coefficient of a solute between water and a non-aqueous solvent.

5. Surface Phenomena

To study the adsorption of acetic acid/oxalic acid from aqueous solution on charcoal. Verify Freundlich and Langmuir adsorption isotherms.

6. Colorimetery

(i) To verify Lambert-Beer law.

7. pH-metry

(i) To titrate a strong acid against a strong base pH-metrically.

(ii) To titrate a weak acid against a strong base and determine the ionization constant of the weak acid.

Suggested Books

1. Levitt, B.P., Findlays Practical Physical Chemistry; 8th edition, Pubs: Longman Group Ltd., London & New York (1978).

2. Khosla, B.D., Garg, V.C., Gulati, A., Senior Practical Physical Chemistry; 11thedition, Pubs: R. Chand & Co., New Delhi (2002).

3. Das, R.C., Behra, B., Experimental Physical Chemistry; Pubs: Tata McGraw Hill Publishing Co. Ltd. (1983).

4. Vogel's Textbook of Quantitative Chemical Analysis (revised by Jeffery, Bassett, Mendham and Denney), 5th Edn., Pubs: ELBS (1989).

5. Svehla G., Vogel's Qualitative Inorganic Analysis (revise), 6th Edn., Pubs: Orient Longman, New Delhi (1987).

6. Christian G.D., Analytical Chemistry, Pubs: John Wiley & Sons Inc,

This syllabus has been designed as per national syllabus suggested by UGC and covers 20% extra syllabus as per requisite of honors degree.

Course Title: Basic Computer Applications
Course Code: CSA253
Course Duration: 45 Hours

L	T	P	Credits	Marks
3	0	0	3	75

Course Objective: The students will understand the fundamental concepts of Computer. In addition, they will be proficient in using office automation tools, viz. Word, PowerPoint, Excel, etc.

Unit – A

Introduction to Computer Systems

- Block diagram of a computer: basic functions of each component
- Classification of Digital computers based on size
- Uses of Computers, Operating system basics - Role of operating system
- Networks & data communication
- The uses of a network
- How networks are structured: Network topologies
- Media & hardware, Internet & online resources: How Internet works
- Features of the Internet, Accessing the Internet, Working on the Internet

Unit – B

Word Processing

- Editing and Formatting a Document, Text Formatting, Paragraph Formatting, Headers and Footers
- FIND command & REPLACE command, Checking Spelling and Grammar; On-line Spelling and Grammar correction using Auto correct
- Auto Text, Using Thesaurus, Using Clip Gallery. Inserting Graphics From files
- Working with Tables -Creating Table , Entering Text in the Table
- Changing Format of Text of cells, Changing Column width and Row height, Formatting Table Border
- Using Mail Merge - Mail Merge Procedure, Printing a document

Unit – C

Spreadsheets

- Basic Operations - Arithmetic operators, Comparison operators, Text operator & (ampersand) Reference operator
- Modifying the worksheet layout - Changing Width of Column, Changing Height of Row, Deleting Rows/Columns/Cells, Moving and copying contents of cell, Alignment of text in the cell
- Printing the workbook - Setting up Print Area, Setting up

Margins, Defining Header and Footer, Controlling Gridlines
- Working with functions - Date and time function, Statistical function, Financial function, Mathematical and Trigonometric functions, Lookup and Reference Functions, Data Base functions, Text function, Logical functions
- Introduction to CHARTS - Formatting Charts
- Working with MACRO, Importing and exporting files

Unit – D
Presentations
- Creating a presentation slide, Design Templates and Blank presentations
- Power Point standard toolbar buttons
- Working with the text in a slide, Arranging Text in Different Levels
- Changing Font, Font Size and Bold; Moving the frame and inserting clip art; Different slide layouts; Formatting the Slide Design; Work with the Slide Master; Saving the presentation
- The Auto Content Wizard; Using Existing Slides; Using the different views of a slide
- Adding Transitions and Animation, Running Slide Show

Refrence Books:

1. K. Kumar, and R. Rajkumar, Computer Applications in Business, Tata McGraw Hill
2. Kogent Learning Solutions Inc, Office 2010 in Simple Steps, DreamTech Press
3. A. Goel, Computer Fundamentals, Pearson
4. Silberschatz & A. Korth, Database System Concepts, New York, McGraw-Hill
5. A. Simpson, C. Robinson, Mastering Access 2000, New Delhi, BPB
6. R. K. Taxali, P C Software Made Simple, New Delhi, Tata McGraw-Hill

Course Title: Basic Computer Applications Laboratory
Course Code: CSA254

L	T	P	Credits	Marks
0	0	2	1	25

- The laboratory will comprise of using commands and tools available in MS Word, PowerPoint, and Excel.
- Assignments based on the applications of above mentioned software packages.

L	T	P	Credits	Marks
2	0	0	2	50

Course Title: Basic Mathematics
Course Code: MTH170

Course Objective: This course is designed to introduce the fundamental concepts of continuity, differentiation and integration of functions of one variable. Its objective is to acquaint students with various applications of these topics relating to extreme value problems, problems of finding areas and distance travelled, moreover to describe connection between integral and differential calculus through Fundamental Theorem of Calculus and This course familiarizes the students with the theory of matrices.

NOTE:

- The question paper for end-semester examination will have a weightage of 25%. It will consist of 60 objective questions. All questions will be compulsory.
- Two pre-announced test will be conducted having a weightage of 25% each. Each pre-announced test will consist of 20 objective type, 5 short questions/problems on the UGC-NET (objective type) pattern as well as one long answer type question. The student is expected to provide reasoning/solution/working for the answer. The candidates will attempt all question. Choice will be given only in long answer type. The question paper is expected to contain problems to the extent of 40% of total marks.
- Four objective/MCQ type surprise test will be taken. Two best out of four objective/MCQ type surprise test will be considered towards final each of 12.5% weightage to the final. Each surprise test will include 20-25 questions.
- The books indicated as text-book(s) are suggestive however, any other book may be followed.

UNIT-A **15 HOURS**

Review of trigonometric functions, sum and product formulae for trigonometric functions, Trigonometric Equations.
Complex Numbers and Quadratic Equations Permutations and combinations Binomial Theorem.
Sequences and series

UNIT-B **14 HOURS**

Matrices, Operations on Matrices, Determinants, singular and non-singular matrices, Adjoint and Inverse of a matrix.
Co-ordinate Geometry: Rectangular Coordinate system. Straight lines. Circles and family of Circles. Parabola, Ellipse and Hyperbola-their equations in standard form

UNIT-C **14 HOURS**

Introduction. Limits. Continuity. Differentiability. Exponential and Logarithmic Differentiation. Derivative of a function in parameter Second order Integral as ant derivative. Integration by substitution, by partial fractions and by parts. Definite integral and its properties. Areas of bounded regions. The definition of integral of a real valued function of real variable as limit of sum motivated by the determination of area. Fundamental theorem of integral calculus.

UNIT-D **13 HOURS**

Vector valued functions. Limit and continuity of vector functions. Differentiation of vector Functions. Arc length. Line, Surface and Volume integrals. The gradient, divergence and curl. The Del operator. Green's, Gauss' and Stokes' theorems (statements only). Applications to Physical problems

References:

1. Mathematics, A Text book for Class XI and XII (Parts I & II), NCERT 2003, New Delhi
2. Shanti Narayan & P. K. Mittal, A Text Book of Matrices, S. Chand & Co. Ltd., New Delhi, Reprint 2002.
3. George B. Thomas and Ross L. Finney: Calculus and Analytic Geometry, 9th Edition, Addison Wesley, 1998.

Plant Diversity I (Phycology, Mycology and Lichenology)
Course Code **BOT101**

L	T	P	Credits	Maximum Marks
4	0	0	4	100

Objective:
To acquaint the students about the morphology, biology and importance of prokaryotes, eukaryotes, algal organisms, fungal organisms and lichens.

Learning Outcome
The course will enable students to know the earlier plants, their vegetative and reproductive structures and their importance.

Instruction for candidates:

- The question paper for end-semester examination will have a weightage of 25%. It will consist of 100 objective questions of equal marks. All questions will be compulsory.
- Two preannounced test will be conducted having a weightage of 25% each. Each preannounced test will consist of 20 objective type, 5 short questions/problems on the UGC-NET (objective type) pattern as well as one long answer type question. The student is expected to provide reasoning/solution/working for the answer. The candidates will attempt all question. Choice will be given only in long answer type. The question paper is expected to contain problems to the extent of 40% of total marks.
- Four objective/MCQ type surprise test will be taken. Two best out of four objective/MCQ type surprise test will be considered towards final each of 12.5% weightage to the final. Each surprise test will include 20-25 questions.
- The books indicated as text-book(s) are suggestive However, any other book may be followed.

UNIT I

Plant Kingdom: Different classifications of kingdoms and criteria; Six and eight kingdom classification; Diversity in habitat, forms, life span and nutrition; Evolution and phylogeny of land plants. **(5 Lectures)**

UNIT II

Algae: General characteristics, classification, ecology and distribution of algae; Morphology; thallus organization, cell structure, pigment system, reserve food, reproduction of Cyanophyta (*Nostoc*), Chlorophyta (*Chara*), Rhodophyta (*Batrachospermum*), Bacillariophyta (*Pinnularia*), Xanthophyta (*Vaucheria*) and Phaeophyta (*Sargassum*); Economic importance of algae. **(15 Lectures)**

UNIT III

Fungi: General characteristics, classification of fungi, Salient features and brief account of myxomycota (*Physarum*), oomycota (*Albugo*), chytridiomycota, (*Synchytrium*), zygomycota (*Rhizopus*), ascomycota (*Aspergillus*), basidiomycota (*Agaricus*), deuteromycetes (*Alternaria*); Life cycle patterns; Economic importance. **(15 Lectures)**

UNIT IV

Lichens: Occurrence and general characteristics of lichens; Ecology and distribution; Growth forms in lichens; Nature of association of algal and fungal partners; Reproduction in lichens; Economic importance of lichens.

(8 Lectures)

Practicals

1. To learn the principles and procedures of fixation and staining.
2. To study of morphology and cell structure of the prokaryotic algae **(***Nostoc),* eukaryotic algae unicellular (*Chlamydomonas),* colonial (*Volvox),* Filamentous (*Ulothrix, Spirogyra, Oedogonium)* through temporary or permanent slides.
3. To study of vegetative and reproductive structures of *Chara, Vaucheria*, *Batrachospermum, Sargassum* through temporary or permanent slides.
4. To study of the following through temporary or permanent slides:
   (a) *Asperillus*,
   (b*) Rhizopus*
   (c) *Agaricus*
   (d) *Albugo*
5. To study of growth forms of lichens (crustose, foliose, fruticose) on different substrata.
6. To study of thallus and reproductive structures (isidia, soredia, apothecium) of lichens through permanent slides.

Suggested Readings

1. Lee, R.E. *Phycology,* Cambridge University Press, Cambridge, 2008.
2. Kumar, H.D. *Introductory Phycology,* East West Press, New Delhi, 1999.
3. Alexopolous, C.J.Mims, C.W. and Blackwell, M. *Introductory Mycology,* John Wiley and Sons, New York, 1996.
4. Pelczar, M.J. Microbiology, 5th Edition, Tata Mc Graw-Hill Co, New Delhi, 2001.
5. Hale, M.E. The Biology of Lichens, Arnold, London, 2001.

Plant Diversity I (Phycology, Mycology and Lichenology) Lab

Course code: BOT102

L	T	P	Credits	Maximum Marks
0	0	3	2	50

1. To learn the principles and procedures of fixation and staining.
2. To study of morphology and cell structure of the prokaryotic algae **(***Nostoc),* eukaryotic algae unicellular (*Chlamydomonas),* colonial (*Volvox),* Filamentous (*Ulothrix, Spirogyra, Oedogonium)* through temporary or permanent slides.
3. To study of vegetative and reproductive structures of *Chara, Vaucheria*, *Batrachospermum, Sargassum* through temporary or permanent slides.
4. To study of the following through temporary or permanent slides:
   (a) *Asperillus*,
   (b*) Rhizopus*
   (c) *Agaricus*
   (d) *Albugo*
5. To study of growth forms of lichens (crustose, foliose, fruticose) on different substrata.
6. To study of thallus and reproductive structures (isidia, soredia, apothecium) of lichens through permanent slides.

Suggested Readings

1. Alexopolous, C.J.Mims, C.W. and Blackwell, M. *Introductory Mycology,* John Wiley and Sons, New York, 1996.
2. Hale, M.E. The Biology of Lichens, Arnold, London, 2001.
3. Kumar, H.D. *Introductory Phycology,* East West Press, New Delhi, 1999.
4. Lee, R.E. *Phycology,* Cambridge University Press, Cambridge, 2008.

Pelczar, M.J. Microbiology, 5th Edition, Tata Mc Graw-Hill Co, New Delhi, 2001.

Plant Diversity II (Bryophytes, Pteridophytes and Gymnosperms)

Course Code: BOT103

L	T	P	Credits	Marks
4	0	0	4	100

Objective:

To make the students learn about morphology, biology and importance of the vascular plants.

Learning Outcome

The students will get to learn the origin of vascular systems, and seed habit from non-vascular plants.

Instruction for candidates:

- The question paper for end-semester examination will have a weightage of 25%. It will consist of 100 objective questions of equal marks. All questions will be compulsory.
- Two preannounced test will be conducted having a weightage of 25% each. Each preannounced test will consist of 20 objective type, 5 short questions/problems on the UGC-NET (objective type) pattern as well as one long answer type question. The student is expected to provide reasoning/solution/working for the answer. The candidates will attempt all question. Choice will be given only in long answer type. The question paper is expected to contain problems to the extent of 40% of total marks.
- Four objective/MCQ type surprise test will be taken. Two best out of four objective/MCQ type surprise test will be considered towards final each of 12.5% weightage to the final. Each surprise test will include 20-25 questions.
- The books indicated as text-book(s) are suggestive However, any other book may be followed.

UNIT I

Bryophytes: Salient features; Adaptations to land habit; Classification; Characteristic and comparative account of Muscophytina, Hepatophytina and Anthocerophytina; Variation in structure of gametophytes (Isophhyllous e.g.

Funaria; Anisophyllous e.g. *Porella* and thalloid e.g. *Marchantia*); Vegetative and asexual reproduction. **(15 Lectures)**

UNIT II

Pteridophytes: Salient features; Classification; Evolution of stelar system: Telome theory; The earliest known records of Pteridophytes with special reference to *Rhynia*; A general account and evolutionary significance of Psilotopsida (*Psilotum*), Lycopsida (*Selaginella*), Sphenopsida (*Equisetum*) and Pteropsida (*Pteris*). **(15 Lectures)**

Unit III

Gymnosperms: Salient features; Distribution in India; Classification; Morphology and life history (gametophyte, sex organs and embryo) of *Cycas* (Cycadales), *Pinus* (Coniferales), *Ephedra* (Ephedrales); Pteridospermic seeds and evolution of seed habit in gymnosperm. (developmental stages not included).

(15 Lectures)

UNIT IV

Economic importance of Bryophytes, Pteridophytes and Gymnosperms; Ecological importance of bryophytes (pioneer colonizers, role in water conservation, prevention of soil erosion and management of forest floors, Phytoremediation and pollution monitoring). **(7 Lectures)**

Paper: Plant Diversity II Lab

Course Code: BOT104

L	T	P	Credits	Marks
0	0	3	2	50

Practicals

1. Morphological studies of *Funaria*, *Porella*, *Marchantia*, *Riccia*, *Anthoceros*.
2. Internal organization of thallus in *Anthoceros*, *Riccia*, *Marchantia*.
3. Structure of sporophytes in *Funaria*, *Marchantia*.
4. Study of morphology, anatomy and reproductive organs of *Selaginella* and *Equisetum*, *Pteris*.
5. Study of morphology, anatomy; and reproductive organs in the available Gymnosperms (*Pinus*, *Cycas*, *Ephedra*, *Zamia* and any other).

Suggested Reading

1. Bhatnagar, S.P. and Moitra, A. Gymnosperms. New Age International Limited, New Delhi, 1996.
2. Chopra, R.S. and Kumar, S.S. Mosses of Western Himalaya and Adjacent Plain, Chronica Botanica, New Delhi.
3. Coulter, J.M. and Chamberlain, C.J. Morphology of Gymnosperms, Chicago University Press, Chicago, 1917.
4. Gifford, E.M. and Foster, A.S. Morphology and Evolution of Vascular Plants, W.H. Freeman and Company, New York, 1989.
5. Parihar, N.S. The Biology and Morphology of Pteridophytes, The Central Book Depot, Allahabad, 1972.
6. Rashid, A. An Introduction to Pteridophytes, Vikas Publishing House Pvt. Ltd., New Delhi, 1992.
7. Richardson, D.H.S. Biology of Mosses, Blackwell Scientific Publications, Oxford, 1981.
8. Sporne, K.R. The Morphology of Pteridophytes-The Structure of Ferns and Allied Plants, B.I. Publications, Bangalore, 1982.
9. Sporne, K.R. The Morphology of Gymnosperms, B.I. Publications, Bombay, 1974.

Sundara Rajan, S. Introduction to Pteridophyta, Wiley Eastern India, New Delhi, 1995.

INTRODUCTORY BIOTECHNOLOGY AND BIOANALYTICAL TECHNIQUES

Course Code: BTY101

L	T	P	Credits	Marks
4	1	0	4	100

Course Objective:
The student will have and introduction to history, scope, importance and interdisciplinary nature of biotechnology and its impact on society. Student will also be exposed to principles, instrumentation & application of various instruments & techniques used in biological field.

Course Contents:

Unit I: Introduction to Biotechnology (7 lectures)
History of Biotechnology, Old and New Biotechnology, Interdisciplinary nature of biotechnology, scope and importance of biotechnology, commercial potential of biotechnology, biotechnology in India.

Unit II: Biotechnology and Healthcare (8 lectures)
Role of biotechnology in prevention, diagnosis and treatment of diseases, detection of genetic diseases, drug designing, drug delivery and targeting, gene therapy, fertility control, DNA fingerprinting and forensic medicine.

Unit III: Fuel Biotechnology (7 lectures)
Renewable and non-renewable energy sources, conventional fuels and their impact on environment, solar energy converters, biofuels, energy crops, biogas, bioethanol, biobutanol, biodiesel, biohydrogen, *in vitro* photosynthetic-hydrogenase system.

Unit IV: Biosafety (6 lectures)
Objectives of biosafety guidelines, risk assessment, physical and biological containment, planned introduction of genetically modified organisms, biosafety during industrial production, biosafety guidelines in India, guidelines and regulations.

Unit V: Instruments, basic principles and usage (8 lectures)
pH meter, absorption and emission spectroscopy, Principle and law of absorption, fluorimetry, colorimetry, spectrophotometry (visible, UV, infra-red), polarography, centrifugation, atomic absorption, NMR, X-ray crystallography.

Unit VI: Chromatography techniques (8 lectures)
Paper chromatography, thin layer chromatography, column chromatography, HPLC, gas chromatography, gel filtration and ion exchange chromatography.

Unit VII: Electrophoresis (8 lectures)
Agarose gel electrophoresis, SDS polyacrylamide gel electrophoresis, immunoelectrophoresis, Isoelectric focussing and 2D gel electrophoresis.

Unit VIII: Radioactive Techniques (8 lectures)
Radioisotope tracer techniques and autoradiography.

Text Books:

Practical Biochemistry, Principles and Techniques, Keith Wilson and John Walker

Bioinstrumentation, Webster

Biotechnology Expanding Horizons, B.D. Singh, Kalyani Publishers

Recommended Books:

Advanced Instrumentation, Data Interpretation, and Control of Biotechnological Processes, J.F. Van Impe, Kluwer Academic

Crystal Structure Analysis, J.P. Glusker and K.N. Trueblood, Oxford University Press

Modern Spectroscopy, J.M. Hollas, John Wiley and Son Ltd.

NMR Spectroscopy: Basic Principles, Concepts and Applications in Chemistry, H. Gunther, John Wiley and Sons Ltd.

Principles of Physical Biochemistry, K.E. Van Holde, Prentice Hall.

Principles and Practice of Bioanalysis, Richard F. Venn

Microscopic Techniques in Biotechnology, Michael Hoppert

Principles of Fermentation Technology, P.F. Stanbury, A. Whitaker, S.J. Hall

John E. Smith. Biotechnology 5th Edition, Cambridge Press

INTRODUCTORY BIOTECHNOLOGY AND BIOANALYTICAL TECHNIQUES LAB

L	T	P	Credits	Marks
0	0	3	2	50

Course Code: BTY102

Experiments

- To understand principle, working and handling of
  a) Laminar Air Flow
  b) pH meter
  c) Autoclave
  d) BOD Incubator
  e) Centrifuge
  f) Agarose and Polyacrylamide gel electrophoresis apparatus
  g) Micropipettes
  h) Incubator Shaker
  i) Water double-distillation unit
- Good Lab Practices:
- Glassware washing & sterilization, Packing and sterile handling, Biosafety issues.
- Preparation of standard buffers and determination of pH of a solution.
- Separation of plant pigments using paper chromatography.
- Estimation of DNA and RNA.

CELL BIOLOGY
Course Code: BTY201

L	T	P	Credits	Marks
4	1	0	4	100

Course Objective: To study in detail about the cell which encompasses the cell structure, structure and functions of organelles, locomotion, life cycle and division. To impart knowledge to students about the basics of stem cells and their applications as well as to introduce them to the world of cellular differentiation and cloning.

Course Contents:

Unit I: Cells and organelles (18 lectures)

Inroduction: Cell as a basic unit of living system, Biochemical composition of cell, the cell theory, ultrastrcuture of cell.

Cytoskeleton: The Nature of the Cytoskeleton and endomembrane system, intermediate filaments, microtubules, cilia and centrioles, actin filaments, actin-binding proteins.

Cell membranes: Architecture and dynamics (models); Membrane composition, the lipid bilayer/membrane; A summary of membrane functions - simple diffusion, Facilitated transports, Active transport, Endocytosis, Pinocytosis, Phagocytosis, Exocytosis. Introduction to important receptors in cell membrane.

Unit II: Molecule and Protein Trafficking (16 lectures)

The compartmentalization of higher cells, transport of molecules into and out of organeller membranes, the endoplasmic reticulum, transport from the ER through the Golgi Apparatus, transport from the trans Golgi network to lysosomes, transport from the plasma membrane via endosome: Endocytosis, molecular mechanisms of vesicular transport; introduction to transit peptide, signal peptide and translocons.

Unit III: Nucleus and Cell Cycle (10 lectures)

Genome organization, structure and function of nucleus, nuclear envelope, structure of chromatin, nucleosome and chromosome, cell cycle, mitosis and meiosis.

Unit IV: Eukaryotic cell organelles and functions (16 lectures)

Structure and functions of the following cell organelles: endoplasmic reticulum, Golgi complex, lysosome, ribosome and mitochondria. Principles & applications of differential centrifugation in the fractionation of cellular organelles and Svedberg unit; endosymbiotic theories.

Recommended Books :

1. Molecular Biology and the Cell (2003) Albert Watson, Gerland Pub. USA.
2. Molecular Cell Biology (2003) Dornall and Baltmore, Scientific Publishers, USA
3. Mol. Cell Biology (2004) Lodish et al. Freeman & Co.
4. The World of the Cell (2007) Becker, Klein Smith & Hardin Pearson education Inc.
5. Cell Biology by Powar, Himalaya Publishing House, Mumbai.

CELL BIOLOGY LAB
Course Code: BTY202

L	T	P	Credits	Marks
0	0	3	2	50

- Understanding principle, working and handling of light microscope and microtome.
- Understanding microscope adjustments, light sources, microscopic measurements, calibration and types of microscopes available.
- Observation of microorganisms under phase contrast microscope and dark-field microscope.
- Preparation of different types of stains
- Cytological preparations, Fixation, dehydration and staining
- Squash preparation of meiotic and mitotic cells
- Embedding and sectioning.
- Examination of various stages of mitosis and meiosis

MOLECULAR BIOLOGY
Course Code: BTY205

L	T	P	Credits	Marks
4	1	0	4	100

Course Objective: The aim is to extend understanding of the molecular mechanisms via which genetic information is stored, expressed and transmitted among generations.

Course Contents:

Unit I: Life, Nucleic acids and Genome (13 lectures)

Molecular basis of life, models of DNA structure, RNA structure, brief history of development of double helical model of DNA. C-value paradox, cot curve and its significance, repetitive DNA, satellite DNA.

Unit II: Organization of chromosome and gene (14 lectures)

Chromosome structure in Eukaryotes and Prokaryotes, chromatin, nucleosome, histones and non-histones; fine structure of gene, split genes, overlapping genes, gene clusters, transposons and retrotransposons.

Unit III: Central Dogma of Molecular Biology (20 lectures)

DNA replication: DNA-Protein interaction, DNA-binding motifs, models of DNA replication, enzymology of DNA replication; Process of DNA replication: initiation, elongation and termination. Transcription and mRNA processing: Transcription machinery in Prokaryote and Eukaryotes, initiation, elongation and termination of transcription; capping, polyadenylation and splicing of transcripts, mRNA and its stability. Translation: Genetic code and its nature, tRNA & aminoacyl synthetases, rRNA and ribosomes in Prokaryotes and Eukaryotes; Process of translation: initiation, peptide elongation and peptide termination. Regulation of gene expression.

Unit IV: Gene Mutation and Molecular Evolution (13 lectures)

Somatic vs germinal mutation, Mutant types, Selective Systems, Induction of mutation, Chromosomal mutations, Changes in chromosome structure mutation and cancer. Introduction to DNA based phylogenetic trees and DNA bar coding.

Recommended Books

- Freshney, R. I., 2000, Culture of Animal Cells 'A Manual of Basic Technique', Published by Willey & Liss publication.
- Atala, A. 2000, Methods of Tissue Engineering, Academic Press, 1 st Ed.
- Harrison & Rae, 1997, General Techniques of Cell Culture, Cambridge University Press.
- Masters, J.R. 2000. Animal Cell Culture: A Practical Approach, Oxford University Press, 3rd Edition.
- Friefelder, D., 1993, Molecular Biology, Jones and Bartlett, London.
- Hoffee, P.A., 1998, Medical Molecular Genetics, Fence Creek Publishing, Madison Connecticus, USA.
- Albert B, Bray D, Lewis J, Raff M, Roberts K. and Watson JD. 2002, Molecular Biology of the Cell, Garland Publishing Inc. New York, USA.

MOLECULAR BIOLOGY LAB
Course Code: BTY208

L	T	P	Credits	Marks
0	0	3	2	50

Experiments

- Isolation of DNA from animal and plant tissue using classical methods
- Isolation of RNA from animal and plant tissue using classical methods
- Isolation of plasmid DNA from *E. coli* using boiling-prep and alkali lysis method
- Restriction fragment length polymorphism
- Agarose gel electrophoresis
- Polyacrylamide gel electrophoresis
- Elution of nucleic acids from agarose gel
- Primer Designing
- Polymerase Chain Reaction

MICROBIAL AND INDUSTRIAL BIOTECHNOLOGY

L	T	P	Credits	Marks
4	1	0	4	100

Course Code: BTY307

Course Objective: The objective of this course is to use microorganism to produce various compounds of commercial interest. The student will be exposed to various techniques available for large scale cultivation of microorganisms.

Course Contents:

Unit-I (12 lectures)

Microbial evolution, systematics and taxonomy - new approaches to bacterial taxonomy, classification including ribotyping, ribosomal RNA sequencing, and characteristics of primary domains, taxonomy, nomenclature and Bergey's manual.

Unit-II (8 lectures)

Microbes in extreme environments: Archae as the earliest forms, thermophiles, pyshrophiles, halophiles, alkalophiles, acidophiles, hyperthermophiles.

Unit-III (10 lectures)

Introduction to industrially important microbes and microbial fermentative products (Production of antibiotics with special reference to penicillin & streptomycin, enzymes, biotransformation of steroids), food products from microbes (Dairy & SCP etc)

Unit-IV (6 lectures)

Introduction to fermentation, the fermentation industry, Production process batch and Continuous system of cultivation, Solid-state fermentation

Unit-V (12 lectures)

Selection of industrial microorganisms, media for fermentation, aeration, pH, temperature and other requirements during fermentation, downstream processing and product recovery, food industry waste as fermentation substrate.

Unit VI (12 lectures)

Production of compounds like antibiotics, enzymes, organic acids, solvents, beverages, SCP. Production of fermented dairy products. Immobilized enzymes systems, production and applications.

Recommended Books:

The Microbial World, Roger Y. Stanier, Prentice Hall Microbiology, Prescott and Dunn, C.B.S. Publishers

References:

- General Microbiology, R.Y. Stanier, J.L. Ingraham, M.L.Wheelis and P.R. Painter, Macmillian
- Microbiology VI Edition, M.J. Pelczar, E.C.S. Chan and N.R. Kreig, Tata McGraw Hill
- Principles of Microbiology, R.M. Atlas, Wm C. Brown Publisher.
- The microbes – An Introduction to their Nature and Importance, P.V. Vandenmark and B.L. Batzing, Benjamin Cummings.

MICROBIAL AND INDUSTRIAL BIOTECHNOLOGY LAB

L	T	P	Credits	Marks
0	0	3	2	50

Course Code: BTY310

Experiments

- Autoclaving
- Microbial cells counting by serial dilution techniques.
- Microbial cell counting by pore plate techniques.
- Measurement of bacterial size
- Screening of cellulase producing microorganism from wood degrading soil.
- Antibiotic sensitivity of the above microorganism
- Minimum inhibitory concentration of a antibiotics for the above microorganism.
- Additive and synergistic effect of two drugs on the above microorganisms.
- Plating the milk samples for microbial contamination.
- MBRT Test for determination of milk quality.

Course Title: Biomolecules
Course Code: BCH101

L	T	P	Credits	Marks
4	1	0	4	100

Course Objectives: This course introduces students to the importance of biochemistry and covers various biomolecules, with a brief overview of their chemistry, their functions and their relevance to physiology and disease.

Unit A (15 hours)

Introduction to Biochemistry

Water as a biological solvent. Weak acids and bases. pH and buffers. Henderson-Hasselbalch equation. Physiological buffers. Fitness of the aqueous environment for living organisms.

Carbohydrates

Structure of monosaccharides. Stereoisomerism and optical isomerism of sugars. Reactions of aldehyde and ketone groups. Ring structure and anomeric forms, mutarotation. Reactions of sugars due to hydroxyl groups. Important derivatives of monosaccharides, disaccharides and trisaccharides (structure, function and occurrence of important ones). Structure, occurrence and biological importance of monosaccharides, oligosaccharides and polysaccharides - cellulose, chitin, agar, algenic acids, pectins, proteoglycans, sialic acids, blood group polysaccharides, glycogen and starch. Bacterial cell wall polysaccharides. Glycoproteins.

Unit B (15 hours)

Proteins

Introduction to proteins. Classification based on solubility, shape, composition and functions. Amino acids: common structural features, stereoisomerism and RS system of designating optical isomers. Classification and structures of standard amino acids as zwitterion in aqueous solutions. Physical and chemical properties of amino acids. Titration of amino acids. Separation of amino acids. Essential amino acids.

Structure of peptide bond. Solid-phase synthesis of peptides. Peptide sequencing. Chemical and enzymatic cleavage of polypeptide chains and separation of peptides. Levels of structure in protein architecture. denaturation and renaturation of proteins. Behaviour of proteins in solutions. Salting in and salting out of proteins. Structure and biological functions of fibrous proteins (keratins, collagen and elastin), globular proteins (haemoglobin, myoglobin), lipoproteins, metalloproteins, glycoproteins and nucleoproteins.

Unit C (15 hours)

Nucleic Acids

Nature of genetic material. Evidence that DNA is the genetic material. Composition of DNA and RNA. Generalized structural plan and Nomenclature of nucleic acids. DNA double helix.

Structure and roles of different types of RNA. Size of DNA in prokaryotes and eukaryotes. Central dogma of molecular biology. Concepts of gene, genome and chromosome.

Porphyrins

Porphyrin nucleus and classification of porphyrins. Important metalloporphyrins occurring in nature. Detection of porphyrins. Bile pigments – chemical nature and physiological significance.

Unit D (15 hours)

Lipids

Definition and classification of lipids. Fatty acids: introduction, classification, nomenclature, structure and properties of saturated and unsaturated fatty acids. Essential fatty acids, prostaglandins. Triacylglycerols: nomenclature, physical properties, chemical properties and characterization of fats – hydrolysis, saponification value, rancidity of fats, Reichert-Meissel Number and reaction of glycerol. Biological significance of fats. Glycerophospholipids (lecithins, lysolecithins, cephalins, phosphatidylserine, phosphatidylinositol, plasmalogens), sphingomyelins, glycolipids – cerebrosides, gangliosides. Properties and functions of phospholipids, isoprenoids and sterols.

Recommended books

1. Nelson DL & Cox M.M., Lehninger Principles of Biochemistry, 5th Edition, WH Freeman & Company, New York, 2008.

2. Voet D & Voet JG, Biochemistry, 3rd Edition, John Wiley & Sons Inc., Singapore, 2004.

3. Murray, R.K., Granner, D.K. and Rodwell, V.W. Harper's Illustrated Biochemistry, 27th Edition, McGraw Hill Company Inc. Singapore, 2006.

L	T	P	Credits	Marks
0	0	3	2	50

Course Title: Biomolecules Laboratory
Course Code: BCH102

Experiments:

1. Preparation of normal, molar and percent solutions.

2. Titration curve of Glycine.

3. Buffer preparation.

4. Qualitative tests for Carbohydrates, Lipids, Amino acids, Proteins, Nucleic acids

5. Preparation of casein from milk and determination of its isoelectric point.

6. Titrimetric analysis of Vitamin C.

Course Title: Metabolism
Course Code: BCH103

L	T	P	Credits	Marks
4	1	0	4	100

Course Objectives: The course is designed to survey the major metabolic pathways involved in energy generation and synthesis of biomolecules.

Unit A (15 hours)

Introduction to Metabolism

General features of metabolism, experimental approaches to study metabolism – intact organisms, bacterial mutants, tissue slices, radioisotopes.

Carbohydrate Metabolism

Reactions and energetics of glycolysis. Alcoholic and lactic acid fermentations. Reactions and energetics of TCA cycle. Gluconeogenesis, glycogenesis and glycogenolysis. Reactions and physiological significance of pentose phosphate pathway. Regulation of glycolysis and TCA cycle. Photosynthesis – a brief review.

Unit B (10 hours)

Electron Transport Chain and Oxidative Phosphorylation

Structure of mitochondria. Sequence of electron carriers. Sites of ATP production. Inhibitors of electron transport chain. Chemiosmotic hypothesis. Inhibitors and uncouplers of oxidative phosphorylation. Transport of reducing potentials into mitochondria.

Unit C (20 hours)

Lipid Metabolism

Introduction. Hydrolysis of triacylglycerols. Transport of fatty acids into mitochondria. β-oxidation of saturated fatty acids. ATP yield from fatty acid oxidation. Biosynthesis of saturated and unsaturated fatty acids. Metabolism of ketone bodies. Oxidation of unsaturated and odd chain fatty acids. Biosynthesis of triglycerides and important phospholipids, glycolipids, sphingolipids and cholesterol. Regulation of cholesterol metabolism.

Amino Acid Metabolism

General reactions of amino acid metabolism – transamination, oxidative deamination and decarboxylation. Urea cycle. Degradation and biosynthesis of amino acids. Glycogenic and ketogenic amino acids.

Unit D (15 hours)

Nucleotide Metabolism

Sources of atoms in the purine and pyrimidine nucleotides. Biosynthesis and degradation of purines and pyrimidines. Regulation of purine and pyrimidine biosynthesis.

Porphyrin Metabolism

Biosynthesis and degradation of porphyrins. Production of bile pigments.

Recommended books

1. Nelson DL & Cox M.M., Lehninger Principles of Biochemistry, 5th Edition, WH Freeman & Company, New York, 2008.

2. Conn EE, Stumpf PK, Bruening G and Doi RH. Outlines of Biochemistry. 5th edition, John Wiley & Sons Inc, 1987.

3. Voet D & Voet JG, Biochemistry, 3rd Edition, John Wiley & Sons Inc., Singapore, 2004.

4. Murray, R.K., Granner, D.K. and Rodwell, V.W. Harper's Illustrated Biochemistry, 27th Edition, McGraw Hill Company Inc. Singapore, 2006.

Course Title: Metabolism Laboratory
Course Code: BCH104

L	T	P	Credits	Marks
0	0	3	2	50

Experiments:

1. Estimation of blood glucose.

2. Estimation of cholesterol

3. Sugar Fermentation in Microorganisms.

4. Estimation of Glucose 6-P.

5. Assay of serum transaminases.

6. Estimation of Urea.

7. Estimation of Uric acid.

8. Estimation of Creatinine.