



FACULTY OF LIFE SCIENCES
DEPARTMENT OF MICROBIOLOGY

COURSE: M.Sc.

SEMESTER: I

SUBJECT NAME: Principles of Microbiology

SUBJECT CODE: 5SC01PM1

Teaching & Evaluation Scheme:-

Teaching hours/week				Credit	Evaluation Scheme/semester								
Th	Tu	Pr	Total		Theory				Practical				Total Marks
					Sessional Exam		University Exam		Internal		University		
					Marks	Hrs	Marks	Hrs	Pr	TW			
4	0	0	4	4	30	1	70	3	--	--	--	100	

Objectives:- The objective of this course is that the students can learn basic knowledge of Microbiology .

Prerequisites:- Basic knowledge of Microbiology.

Course outline:-

Sr. No.	Course Contents	Hours
1	History of development of Microbiology; Development of fields of Microbiology in 20 th century; The spontaneous generation controversy; Germ theory of disease; Microbes and fermentation; Physical and Chemical methods of sterilization.	
2	Binomial Nomenclature; Haeckel’s three kingdom classification; Woese’s three kingdom classification systems and their utility – Archaea, Eubacteria, Eukarya; Organization of prokaryotic and eukaryotic cell; Cell Division Cycle in <i>E. coli</i> and Yeast; Different groups of acellular microorganisms- Viruses, virioids.	
3	General features of microorganisms- Bacteria, Algae, Fungi and Protozoa. Classification of bacteria; Bacterial growth and metabolism. Microbes in Extreme Environment – Special features of the thermophilic, methanogenic and halophilic archaea; Photosynthetic bacteria, Cyanobacteria; microbes in other extreme conditions – deep ocean, and space.	
4	Microbial interactions- mutualism, symbiosis, commensalisms, predation, parasitism, amensalism, competition, bioluminescence, biodegradation, biofilms. Cleaning oil spills, microbes in composting, biopesticides, bioremediation, bioleaching, SCP, microbial enzymes and fermented foods. Human diseases and their causative agents. Definition of aeromicrobiology, air- borne pathogens and allergens, Phytopathogenic bacteria: Angular leaf spot of cotton, crown galls, bacterial cankers of citrus. Diseases caused by Phytoplasmas: Aster yellow, citrus stubborn.	

Learning Outcomes:- The students are expected to

- Understand the classification system for microbes.
- Understand the various types of Microbial Interactions and various application of Microbiology in the field of Environment and Public health and welfare.



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Books Recommended:-

1. Brock TD., Milestones in Microbiology, Infinity Books.
2. Pelczar M.J., Chan E.C.S. & Kreig N.R., Microbiology: Concepts and Application.,Tata McGraw Hill.
3. Stainer RY, Ingraham JL, Wheelis ML & Painter PR General Microbiology, Publisher: MacMillan.
4. Madigan M. T., Martinko J.M. and Parker J., Brock Biology of Microorganisms: Prentice-Hall , Inc USA.
5. Atlas R.M., Principles of Microbiology, Wm C. Brown Publishers.
6. Vandenmark P.V. and Batzing B.L., The Microbes – An Introduction to their Nature and Importance: Benjamin Cummings. Microbiology



FACULTY OF LIFE SCIENCES
DEPARTMENT OF MICROBIOLOGY

COURSE: M.Sc.

SEMESTER: I

SUBJECT NAME: Principles of Biochemistry

SUBJECT CODE: 5SC01PBC1

Teaching & Evaluation Scheme:-

Teaching hours/week				Credit	Evaluation Scheme/semester								
Th	Tu	Pr	Total		Theory				Practical				Total Marks
					Sessional Exam		University Exam		Internal		University		
					Marks	Hrs	Marks	Hrs	Pr	TW			
4	0	0	4	4	30	1	70	3	--	--	--	100	

Objectives:- The objective of this course is that the students can learn about basics of Biochemistry.

Prerequisites:- Basic knowledge of Chemistry.

Course outline:-

Sr. No.	Course Contents	Hours
1	Scope and importance of biochemistry; Fundamental principles governing life; Structure of water; Acid base concept and buffers; pH; Hydrogen bonding; Hydrophobic, Electrostatic and Vander Waal forces. General introduction to physical techniques for determination of structure of biopolymers.	
2	Classification, structure and function of carbohydrates; Biomembranes and lipids. Structure and function of amino acids and vitamins. Structure and function of proteins; Types of nucleic acid, their structure and functions.	
3	Enzymes: classification, mechanism of action; Factors affecting enzyme action; Immobilized enzymes; Hormones; Thermodynamic principles and biological processes, Bioenergetics.	
4	Metabolism of carbohydrates, photosynthesis and respiration, oxidative phosphorylation, lipids, proteins and nucleic acids. DNA replication, transcription and translation in Prokaryotes and eukaryotes; recombinant DNA technology.	

Learning Outcomes:- The students are expected to understand the structure and function of various Biochemical and their Metabolism.

Books Recommended:-

1. Mathews C.K., VanHolde K.E. and Ahern K.G., Biochemistry, Benjamin /Cummings.
2. Stryer L., Biochemistry, W.H. Freeman and Company.
3. Devlin’s Textbook of Biochemistry with Clinical correlations. John Wiley and Sons Inc.
4. Lehninger A.L., Nelson D.L., Principles of Biochemistry, M.M. Cox. Worth Publishing.
5. Robert K., Murray M.D., Granner D.K., Mayes P.A.4and Rodwell V.I. Harper’s Biochemistry. McGraw-Hill/Appleton and Lange.



FACULTY OF LIFE SCIENCES

DEPARTMENT OF MICROBIOLOGY LIFE SCIENCES

COURSE: M.Sc.

SEMESTER: I

SUBJECT NAME: Mycology and Phycology

SUBJECT CODE: 5SC01MAP1

Teaching & Evaluation Scheme:-

Teaching hours/week				Credit	Evaluation Scheme/semester								
Th	Tu	Pr	Total		Theory				Practical				Total Marks
					Sessional Exam		University Exam		Internal		University		
					Marks	Hrs	Marks	Hrs	Pr	TW			
4	0	0	4	4	30	1	70	3	---	---	--	100	

Objectives:- The objective of this course is that the students can learn about basics of Mycology and Phycology.

Prerequisites:- Basic knowledge of Biological Sciences.

Course outline:-

Sr. No.	Course Contents	Hours
1	Introduction of algae: Occurrence and distribution, thallus structure, characteristics, nutrition, classification and reproduction. Introduction of fungi: Occurrence and distribution, somatic structure, hyphal growth, nutrition, heterothallism, sex hormones in fungi, physiological specialization in fungi, fungi and ecosystem; saprophytic parasitic, mutualistic and symbiotic relationship with plants and animals. Classification of fungi. Reproduction in fungi: asexual, sexual and parasexual.	
2	Study of the different classes with reference to occurrence, somatic structure and life cycle and economic importance representing the following genera: Acrasiomycetes (<i>Dictyostelium</i>), Myxomycetes (Endosporus and exosporus), Chytridiomycetes (<i>Neocallimastix</i>), Oomycetes (<i>Phytophthora</i>), Zygomycetes (<i>Rhizopus</i>), Ascomycotina (Hemiascomycetes- <i>Saccharomyces</i> , Plectomycetes - <i>Penicillium</i> Pyrenomycetes - <i>Xylaria</i> , Discomycetes - <i>Peziza</i>), Basidiomycotina (Hymenomycetes <i>Agaricus</i> , Teliomycetes - <i>Puccinia</i>)	
3	Algae as pollution indicators, eutrophication agent and role in bioremediation, algae in global warming and environmental sustainability, cyanobacteria and selected microalgae in agriculture- biofertilizer and algalization, importance of algae in production of algal pigments, biofuels, hydrogen production, important bioactive molecule.	
4	Lichens: ascolichens, basidiolichens, deuterolichens, Mycorrhiza: ecto-, endo-, ectendo-, VAM, Fungi as insect symbionts, fungi as biocontrol agents, attack of fungi on other microorganisms, potential application in Agriculture, environment, industry, food. Role of fungi in Biodeterioration of wood, paper, textile. Myxotoxins, quorum sensing in fungi.	



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Learning Outcomes:- The students are expected to learn the basics of Algae, Fungi and Lichens along with their application.

Books Recommended:-

1. Alexopoulos, C.J. and C.W. Mims 1979. Introduction to Mycology (3rd Ed.) Wiley Eastern Ltd., New Del
2. Charlile M. & Watkinson S.C. The Fungi, Publisher: Academic Press.
3. E.Moore –Landeeker: Fundamentals of the fungi, Publisher: Prentice Hall.
4. L. Barsanti, Paolo Gualtieri: Algae: anatomy, biochemistry, and biotechnology
5. Ayhan Demirbas, M. Fatih Demirbas: Algae Energy: Algae as a New Source of Biodiesel (2010)
6. Linda E. Graham, James Graham, James M. Graham: Algae (2009)
7. Burnett J.H., Publisher: Edward, Arnold Crane Russak: Fundamentals of Mycology.



FACULTY OF LIFE SCIENCES
DEPARTMENT OF MICROBIOLOGY

COURSE: M.Sc.

SEMESTER: I

SUBJECT NAME: Fundamental of Biotechnology

SUBJECT CODE: 5SC01FBT1

Teaching & Evaluation Scheme:-

Teaching hours/week				Credit	Evaluation Scheme/semester								
Th	Tu	Pr	Total		Theory				Practical				Total Marks
					Sessional Exam		University Exam		Internal		University		
					Marks	Hrs	Marks	Hrs	Pr	TW			
4	0	0	4	4	30	1	70	3	--	--	--	100	

Objectives:- The objective of this course is that the students can learn about basics of Biotechnology.

Prerequisites:- Basic knowledge of Biological Sciences.

Course outline:-

Sr. No.	Course Contents	Hours
1	History and scope of biotechnology; Use of plants , animals and microbial systems for production of useful products; Microbial biotechnology; Plant and animal cell and tissue culture techniques and their applications.	
2	Recombinant DNA Technology; DNA modifying enzymes- Cutting and joining DNA molecules; Cloning strategies; Plasmid and phage vectors, Cosmids, phagemid and other advanced vectors. Expression of recombinant proteins using bacterial, animal and plant vectors; Genomic and cDNA; Designing and labeling of Primers and probes; Nucleic acid blotting.	
3	Agrobacterium-mediated transformation; Particle bombardment; Gene transfer in animals-direct microinjection, nuclear transfer technology; Bacteria-calcium chloride transformation; Electroporation; Genome transplantation in bacteria; Designer Microbes; Diagnostic tools; therapies for genetic diseases (gene therapy); monoclonal antibodies and hybridoma technology, Vaccine development; Embryo transfer technology; Immobilized enzymes; application of biotechnology in pharmaceutical, food and chemical industry.	
4	Introduction to Intellectual Property Rights: Patentable subject matter and patent types, Patent requirements: technical specifications, novelty, and non-obviousness, Rights of patent holder, Patent protection for biological materials, biotechnological inventions, software, algorithms and methods, The patent application, WIPO and WTO/TRIPS. Regulatory Procedures: Good laboratory practice, Good manufacturing practice, Regulations for recombinant DNA research and manufacturing process, Regulations for clinical trials, Rules for import and export of biological materials, Bio-safety and Bioethics	



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Learning Outcomes:- The students are expected to learn the Scope and Application of Biotechnology along with Intellectual Property Rights.

Books Recommended:-

1. Brown T.A., Gene Cloning and DNA Analysis ,Blackwell Publishing.
2. Dale J.W. & von Schantz M. 2002. From Genes to Genomes: Concepts and Applications of DNA Technology. John Wiley & Sons.
3. Gupta P.K. 2008. Biotechnology and Genomics. Rastogi Publications.



**FACULTY OF LIFE SCIENCES
DEPARTMENT OF MICROBIOLOGY**

COURSE: M.Sc.

SEMESTER: I

SUBJECT NAME: Microbiology Lab- I

SUBJECT CODE:

5SC01MBL1

Teaching & Evaluation Scheme:-

Teaching hours/week				Credit	Evaluation Scheme/semester								
Th	Tu	Pr	Total		Theory				Practical				Total Marks
					Sessional Exam		University Exam		Internal		University		
					Marks	Hrs	Marks	Hrs	Pr	TW			
0	0	20	20	10	--	--	--	--	90	--	210	300	

Objectives:- The objective of this course is that the students can perform various practical's and learn the practical aspects of microbiology.

Prerequisites:- Basic knowledge of Microbiology.

Course outline:-

Experiment based on
Microscopic examination of bacteria, actinomycetes, algae, fungi and protozoa; Differential staining methods; Study of shape and arrangement of bacterial cells. Preparation of specific media for isolation of bacteria, actinomycetes and fungi from natural sources
Isolation and identification of fungi from different environmental samples, Study the nutritional requirement of fungi, Cultivation of fungi in submerged and solid state fermentation, Production of enzymes, organic acids and other metabolites by fungi.
Principles and applications of simple and compound microscopes. Demonstration of SEM and TEM. Centrifugation Techniques in isolation of cells, cell organelles and biomolecules. Beer Lambert's Law. Photometry, UV/VIS Spectrophotometry,
Introduction and types of chromatography, paper, thin layer, gas, Gel permeation, ion-exchange, HPLC, Agarose gel electrophoresis.
Preparation of standard and buffer solutions, Estimation of sugars, Estimation of Proteins by Lowry's method; Estimation of DNA and RNA by diphenylamine and orcinol methods; Determination of enzyme activity and study of enzyme kinetics; Separation of biomolecules by electrophoresis.
Isolation of plasmid and genomic DNA, Restriction digestion, Preparation of competent cells, Study microbial cell and enzyme immobilization. Designing of gene specific primers

Learning Outcomes:- The students are expected to

- Learn various microbial techniques.
- Able to isolate and screen various types of microbes from different sources.
- Learn different types of instrumental handling (colorimeter, spectrophotometer, electrophoresis etc.)

Books Recommended:-

1. Benson H.J. Microbiology Applications – (A Laboratory Manual in General Microbiology), Wm C Brown Publishers.
2. Cappuccino J.G. and Sherman N., A Laboratory Manual, Addison-Wesley.



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Work T.S. and Work R.H.E., Laboratory Techniques in Biochemistry and Molecular Biology. Elsevier Science

3. Becker J.M., Coldwell G.A. & Zachgo E.A., Biotechnology – a Laboratory Course, Academic Press.

4. Sambrook J., Fritsch T. & Maniatis T. 2001. Molecular Cloning – a Laboratory Manual. 2nd Ed. Cold Spring Harbour Laboratory Press.