



C. U. SHAH UNIVERSITY

FACULTY OF LIFE SCIENCES
MASTERS OF SCIENCE (BIOTECHNOLOGY)

SEMESTER: I

NAME: Cell Biology & Genetics

CODE: 5SC01CBG1

	Course contents
UNIT 1	General structure of Cell. Historical origins of cell biology: The discovery of cell, development of the cell theory. The molecular evolution. Chemical bonds and functional groups in biological.
UNIT 2	Steps in cell cycle, yeast as model system, cell division control and regulation yeast cdc gene. Genes for social control of cell, Proto-oncogenes. Cell signalling: Exocrine, Endocrine, Paracrine and Synaptic strategies of Chemical signalling, surface receptor mediated transduction (DAG, Ca ²⁺ , c-AMP, G-Proteins)
UNIT 3	The structural and functional organisations of cell membrane, ionic transport (Passive and active transport) the extracellular matrix of eukaryotes, cell wall. Structure and functions of endoplasmic reticulum, golgi complex, ribosome lysosomes, peroxisomes (glyoxysomes), plastids and mitochondria. Biogenesis of mitochondria and chloroplast.
UNIT 4	Cytoskeleton and cell motility: Microtubules, microfilaments and intermediate elements. Nuclear ingredients: Nuclear membrane Nature of the genetic material, Proteins associated with nuclei. Packaging of genetic material: nucleosome model, Organisation of chromatin: chromosome structure.
UNIT 5	Mendelian Laws of inheritance, variations of Mendelian analysis. Linkage and Crossing over. Linkage mapping. Sex determination and sex linked inheritance, Development, population and evolutionary genetics.

Teaching & Learning Methodology:-

- Use of audiovisual aids, Use of charts.
- Student interaction, group discussion, seminar, quizzes, assignment, brain storming session.

Books Recommended:

1. Cell (A Molecular approach): Cooper, G. M.
2. Cell and Molecular Biology (1996) Karp, G.
3. Cell Biology (1993) Sadava D. E.
4. Cell and Molecular Biology (1995) Kish V. M. and Kleinsmith L. J.
5. Cell and Molecular Biology : deRobertis and deRobertis



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NAME: **Microbial Genetics and Physiology** CODE: **5SC01MGP1**

Course contents	
UNIT 1	History and Scope of Microbiology, Major characteristics used in microbial taxonomy (numerical and molecular), current methods of microbial identification, cultivation and enumeration of microbes from environment, Ecology of micro-organisms, Ultrastructure of bacteria, algae, protozoa and viruses.
UNIT 2	Nutritional requirements of micro-organisms, mode of nutrition, phototrophy, mixotrophy, saparophytic, symbiotic and parasitic organisms, microbial growth and population kinetics, methodology for measuring growth and growth regulation. Physical and chemical control of microbes.
UNIT 3	Glycolytic pathways, tricarboxylic acid cycle, energy production, oxidative phosphorylation, energetics of chemolithotrops and autotrophs and transport.
UNIT 4	Gene transfer mechanism in microbe's transformation, transduction, conjugation, and Recombination.
UNIT 5	Basic concepts, action of pathogens, human pathogenic viruses and bacteria, Gram-positive and Gram- negative Bacilli of medical importance. Miscellaneous bacterial agents of disease; DNA and RNA viruses and their diseases, Fungal diseases. Life cycle of some important pathogens like- Malaria, hepatitis, filaria, Kalazar and AIDS.

Teaching & Learning Methodology:-

- Use of audiovisual aids.
- Use of charts.
- Student interaction, group discussion, seminar, quizzes, assignment, brain storming session.

Books Recommended:

1. Microbiology (1996) Prescott, Harlay and Klein
2. Biology of Micro-organism: Madigan, Martinko and Parker
3. Fundamentals of Microbiology (1994) Alcano
4. Foundations in Microbiology (1996) Talaro K. and Talaro A.
5. Microbiology: Concept and Applications (1993) Pleczar M. J., Chan E. C. S. and Krieg N. R.
6. Principles of Microbiology (1994) Atlas , R. M.
7. Bergey's Manual of Systematic Bacteriology (2001) (2nd ed.) Gornity, G. M.



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FACULTY OF LIFE SCIENCES
MASTERS OF SCIENCE (BIOTECHNOLOGY)

NAME: **Tools and Techniques in Biotechnology**

CODE: **5SC01TTB1**

Course contents	
UNIT 1	Principles and applications, simple, compound, phase-contrast and fluorescent microscopes. Electron microscopy: SEM and TEM. Centrifugation Techniques: Principles, type of centrifuges, density gradient centrifugation in isolation of cells, cell organelles and biomolecules.
UNIT 2	Electromagnetic spectrum, Beer Lambert's Law. Photometry, UV/VIS Spectrophotometry, Infrared spectroscopy, Atomic absorption spectroscopy, ESR and NMR spectroscopy. Mass spectroscopy (LC-MS, GC-MS). Fluorescent spectroscopy. Applications of different Spectroscopic techniques in Biology.
UNIT 3	Introduction and types of chromatography, paper, thin layer, gas, Gel permeation, ion-exchange, HPLC, FPLC and affinity chromatography and instrumental details of each. Applications of Chromatographic techniques in Biology.
UNIT 4	Paper and gel electrophoresis, Polyacrylamide gel electrophoresis (native and SDS), Agarose gel electrophoresis, Blotting- Southern, Western and Northern blotting, Immunoblotting, Immunoelectrophoresis, DNA finger printing and ELISA.
UNIT 5	Nature and types of radiations, preparation of labelled biological samples. Detection and measurement of radioactivity, GM counter, Scintillation counter, Autoradiography, Flow cytometry. Safety measures in handling radioisotopes. RIA, non radiolabelling.

Teaching & Learning Methodology:-

- Use of audiovisual aids, Use of charts.
- Student interaction, group discussion, seminar, quizzes, assignment, brain storming session.

Books Recommended:

1. Nuclear Magnetic Resonance: Williams
2. Biochemical Techniques theory and practice : White R
3. Analytical Chemistry: Christian G. D.
4. A Biologist Guide to Principle and Techniques: Willson K. and Gounding K.H.
5. An Introduction to Practical Biochemistry: Plummer D. T.



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FACULTY OF LIFE SCIENCES
MASTERS OF SCIENCE (BIOTECHNOLOGY)

NAME: Principles of Biochemistry

CODE: 5SC01PBC1

	Course contents
UNIT I	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.
UNIT II	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.
UNIT III	Enzymes: classification, mechanism of action; Factors affecting enzyme action; Immobilized enzymes; Hormones; Thermodynamic principles and biological processes, Bioenergetics.
UNIT IV	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

Teaching & Learning Methodology:-

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1. Cell (A Molecular approach): Cooper , G. M.
2. Cell and Molecular Biology (1996) Karp, G.
3. Cell Biology (1993) Sadava D. E.
4. Cell and Molecular Biology : deRobertis and deRobertis
5. Principles of Microbiology (1994) Atlas , R. M.
6. Principle of Biochemistry: Leninger , A. L.
7. Biochemistry (1995) Lubert Stryer
8. Text Book of Biochemistry (1997) Devlin , Thomas M.



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MASTERS OF SCIENCE (BIOTECHNOLOGY)

SEMESTER: I

CODE: 5SC01BTL1

NAME: Biotechnology Lab-I

Experiment based on

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

Suggested Readings:

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.
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.