

PARUL UNIVERSITY - FACULTY OF APPLIED SCIENCE

Department of Microbiology

SYLLABUS FOR 1st Sem M.Sc. PROGRAMME

Principles of Cell Biology (11201101)

Type of Course: M.Sc.

Prerequisite:

Rationale:

Teaching and Examination Scheme:

Teaching Scheme			Credit	Examination Scheme					Total
Lect Hrs/ Week	Tut Hrs/ Week	Lab Hrs/ Week		External		Internal			
				T	P	T	CE	P	
4	-	-	4	60	-	20	20	-	100

Lect - Lecture, **Tut** - Tutorial, **Lab** - Lab, **T** - Theory, **P** - Practical, **CE** - CE, **T** - Theory, **P** - Practical

Contents:

Sr.	Topic	Weightage	Teaching Hrs.
1	Unit-1: Structure of typical bacterial, plant and animal cells and functions of cell organelles. Mechanism of cell division. Cell cycle - Molecular events including cell cycle check points and Cdk - cyclin complexes and their role in cell cycle regulation. Ultrastructure of plasma membrane - components and membrane asymmetry. Transport processes - active transport, ionophores and ion channels. Exo- and endocytosis. Phago- and pinocytosis.	25%	15
2	Unit-2: General morphology and functions of endoplasmic reticulum. Signal hypothesis. Ribosomes - eukaryotic and prokaryotic. Ribosomal proteins. Role of Golgi in protein secretion. Lysosomes and peroxisomes. Cytoskeletal elements. Cell - cell interactions.	25%	15
3	Unit-3: Mitochondria - structure, biogenesis and enzymatic compartmentation. Organization of mitochondrial respiratory chain, mechanism of oxidative phosphorylation. Ultrastructure of the chloroplast. Photosynthesis - photophosphorylation. Carbon dioxide fixation in C-3, C-4 and CAM plants. Photorespiration.	25%	15
4	Unit-4: Organic evolution: Origin of life. Species concept, population, races, and subspecies. Mechanisms of speciation. Role of isolating mechanisms. Lamarckism, Darwinism, Neo-Darwinism, synthetic theory of evolution. Micro, macro and mega evolution, sequential and divergent evolution. Natural selection.	25%	15

***Continuous Evaluation:**

It consists of Assignments/Seminars/Presentations/Quizzes/Surprise Tests (Summative/MCQ) etc.

PARUL UNIVERSITY - FACULTY OF APPLIED SCIENCE

Department of Microbiology

SYLLABUS FOR 1st Sem M.Sc. PROGRAMME

Microbial Diversity and Systematics (11201103)

Type of Course: M.Sc.

Prerequisite:

Rationale:

Teaching and Examination Scheme:

Teaching Scheme			Credit	Examination Scheme					Total
Lect Hrs/ Week	Tut Hrs/ Week	Lab Hrs/ Week		External		Internal			
				T	P	T	CE	P	
4	-	-	4	60	-	20	20	-	100

Lect - Lecture, Tut - Tutorial, Lab - Lab, T - Theory, P - Practical, CE - CE, T - Theory, P - Practical

Contents:

Sr.	Topic	Weightage	Teaching Hrs.
1	Unit-1: Principles of Microbial Diversity: Evolution of life, Principles and concepts of microbial diversity, Ecological diversity, Structural and Functional Diversity. Methods of studying microbial diversity - microscopy, nucleic acid analysis, physiological studies, CLPP, FAME.	16%	10
2	Unit-2: Issues of Microbial Diversity: Problems and limitations in microbial diversity studies, Diversity Indices, Loss of diversity, Sustainability and Resilience, Indicator species, Exploitation of microbial diversity, Conservation and economics.	16%	10
3	Unit-3: Microbial Classification and Taxonomy: Phenetic, phylogenetic and Genotypic classification, Numerical Taxonomy, Taxonomic Ranks, Techniques for determining Microbial Taxonomy and Phylogeny - classical and molecular characteristics, phylogenetic trees; major divisions of life, Bergey's Manual of Systematic Bacteriology, Prokaryotic Phylogeny and major groups of bacteria.	17%	10
4	Unit-4: The Archaea: Ecology, Archaeal cell walls and membranes, genetics and molecular biology, metabolism, archaeal Taxonomy, Phylum <i>Crenarchaeota</i> , Phylum <i>Euryarchaeota</i> .	20%	12
5	Unit-5: Eukaryotic Diversity: Physiological variation, identification, cultivation and classification of important groups of fungi, algae and protozoa.	13%	8

6	Unit-6: Microbial Diversity in Extreme Environments: Habitat, diversity, physiology, survival and adaptation, and biotechnological potentials of : Cold and thermal environment, Saline and deep sea environment, Anaerobic environment, Osmophilic and xerophilic environment, Alkaline and acidic environment.	17%	10
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PARUL UNIVERSITY - FACULTY OF APPLIED SCIENCE

Department of Biotechnology

SYLLABUS FOR 1st Sem M.Sc. PROGRAMME

Genetics (11202101)

Type of Course: M.Sc.

Prerequisite:

Rationale:

Teaching and Examination Scheme:

Teaching Scheme			Credit	Examination Scheme					Total
Lect Hrs/ Week	Tut Hrs/ Week	Lab Hrs/ Week		External		Internal			
				T	P	T	CE	P	
4	-	-	4	60	-	20	20	-	100

Lect - Lecture, Tut - Tutorial, Lab - Lab, T - Theory, P - Practical, CE - CE, T - Theory, P - Practical

Contents:

Sr.	Topic	Weightage	Teaching Hrs.
1	Unit-1: Structure and function of <i>lac</i> operon, Induction of <i>lac</i> operon - a negative control system, Catabolite repression - a positive control system, Function and regulation of <i>trp</i> operon, Attenuation of <i>trp</i> operon, <i>ara</i> operon: dual functions of the repressor, Diversity of sigma factor - Bacterial sporulation and Phage infection in <i>Bacillus subtilis</i> , Heat-shock response in <i>E.coli</i> , Regulation of phage variation in <i>Salmonella</i> . Regulation of lytic phase and lysogenic phase of Bacteriophage λ .	25%	15
2	Unit-2: Structural changes in the eukaryotic active chromatin - hypersensitive sites, chromatin remodeling, levels of eukaryote gene control - Control at the level of transcription, processing of RNA, mRNA stabilization in the cytoplasm and translation of mRNA. Eukaryotic promoter and enhancer sequence organization. Interaction of eukaryotic transcriptional factors with DNA - helix-turn-helix motif, zinc-finger motif, leucine zipper, helix-loop-helix motif. Regulation of galactose metabolism in yeast. Steroid hormone induced gene expression. Regulation of gene expression by anti-sense RNA.	25%	15

3	Unit-3: Restriction endonucleases, Restriction maps, isolation of gene fragments using restriction endonucleases and mechanical shearing. Cloning vectors - Isolation and properties of plasmids, bacteriophage cosmids, Ti plasmid (binary vector), expression vectors, viral vectors, YAC, BAC, phagemids and vectors used for cloning in mammalian cells, other enzymes related to molecular cloning. Hosts - Prokaryotic: <i>E.coli</i> , <i>B.subtilis</i> , Eukaryotic: Yeast and mammalian cell lines. Ligation of fragments - Cohesive and blunt ends, Homopolymer tailing. Gene transfer techniques. Biological and artificial delivery system, knockout mice.	25%	15
4	Unit-4: Cloning strategies, shot gun experiments, isolation of poly mRNA, synthesis of cDNA, cDNA cloning in bacteria. Genomic and cDNA libraries. Identification of recombinants - structural and functional analysis of recombinants. Design and preparation of DNA and RNA probes for hybridization. Southern blotting, Northern blotting, South-Western blotting, PCR, Expression of cloned genes in bacteria, yeast, animal and plant cells. Biological, Medical and Industrial applications of recombinant DNA technology. Transgenics: Making Golden rice and Dolly.	25%	15

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PARUL UNIVERSITY - FACULTY OF APPLIED SCIENCE

Department of Biotechnology

SYLLABUS FOR 1st Sem M.Sc. PROGRAMME

Lab-II (Molecular Biology and r-DNA Technology) (11202102)

Type of Course: M.Sc.

Prerequisite:

Rationale:

Teaching and Examination Scheme:

Teaching Scheme			Credit	Examination Scheme					Total
Lect Hrs/	Tut Hrs/	Lab Hrs/ Week		External		Internal			
				T	P	T	CE	P	
-	-	4	2	-	60	-	40	-	100

Lect - Lecture, **Tut** - Tutorial, **Lab** - Lab, **T** - Theory, **P** - Practical, **CE** - CE, **T** - Theory, **P** - Practical

List of Practical:

1. Isolation, purification, quantification and separation of DNA from bacterial cells
2. Isolation, purification, quantification and separation of mitochondrial DNA
3. Isolation, purification, quantification and separation of Total genomic DNA (plant / animal)
4. Isolation, purification, quantification and separation of RNA
5. Restriction Endonuclease digestion of DNA, AGE and Southern blotting and Hybridization.
6. Gene transfer methods in bacteria: conjugation
7. Gene transfer methods in bacteria: Transduction
8. Induction and Identification of mutants by UV rays and chemical mutagen in E.coli
9. Identification of amylase enzyme fraction using native PAGE
10. Estimation of BOD and COD of effluent water
11. Report writing

PARUL UNIVERSITY - FACULTY OF APPLIED SCIENCE

Department of Biochemistry

SYLLABUS FOR 1st Sem M.Sc. PROGRAMME

Biochemistry of Macromolecules (11203104)

Type of Course: M.Sc.

Prerequisite:

Rationale:

Teaching and Examination Scheme:

Teaching Scheme			Credit	Examination Scheme					Total
Lect Hrs/ Week	Tut Hrs/ Week	Lab Hrs/ Week		External		Internal			
				T	P	T	CE	P	
4	-	-	4	60	-	20	20	-	100

Lect - Lecture, Tut - Tutorial, Lab - Lab, T - Theory, P - Practical, CE - CE, T - Theory, P - Practical

Contents:

Sr.	Topic	Weightage	Teaching Hrs.
1	Unit-1: <u>PROTEINS</u> Amino acids - classification, structure and physiochemical properties, chemical synthesis of peptides - solid phase peptide synthesis. Proteins - classification, purification, and criteria of homogeneity. Structural organization, sequence determination and characterization of proteins. Conformation of proteins - Ramachandran plots. Denaturation of proteins.	25%	15
2	Unit-2: <u>CARBOHYDRATES</u> Classification, chemical properties of carbohydrates, Chemistry and biological roles of homo- and heteropolysaccharides, peptidoglycan, glycosaminoglycans, glycoconjugates, glycoproteins, Structural elucidation of polysaccharides; Oligosaccharides - lectin interaction in biochemical processes.	25%	15
3	Unit-3: <u>LIPIDS</u> Classification of Lipids, Fatty acids and their physicochemical properties. Structure and properties of Prostaglandins. Fats and waxes, physicochemical properties and characterization of fats and oil. Structure, properties and biological roles of phospholipids and Sphingolipids. Chemistry and properties of Sterols and Steroids. Salient features of bacterial and plant lipids.	25%	15

4	Unit-4: <u>NUCLEIC ACIDS</u> Nucleic acids - bases, nucleosides, nucleotides, physicochemical properties of nucleic acids, cleavage of nucleic acids by enzymatic methods, non - enzymatic transformation of nucleotides and nucleic acids, methylation, sequencing, chemical synthesis of DNA. Three dimensional structure of DNA. Different forms of DNA - circular DNA and Supercoiling. Types of RNA. Structure of t-RNA. Nucleotides as regulatory molecules, enzyme cofactors and mediators of chemical energy in cells. Porphyrins - Structure and properties of porphyrins - heme, Chlorophyll and Cytochromes.	25%	15
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PARUL UNIVERSITY - FACULTY OF APPLIED SCIENCE

Department of Biochemistry

SYLLABUS FOR 1st Sem M.Sc. PROGRAMME

Lab-I (Biochemistry and Analytical Techniques) (11203105)

Type of Course: M.Sc.

Prerequisite:

Rationale:

Teaching and Examination Scheme:

Teaching Scheme			Credit	Examination Scheme					Total
Lect Hrs/	Tut Hrs/	Lab Hrs/ Week		External		Internal			
				T	P	T	CE	P	
-	-	4	2	-	60	-	40	-	100

Lect - Lecture, **Tut** - Tutorial, **Lab** - Lab, **T** - Theory, **P** - Practical, **CE** - CE, **T** - Theory, **P** - Practical

List of Practical:

1. Preparations of solutions –molar, normal, ppm, percent.
2. Study of the pH meter and preparation of buffers.
3. Qualitative tests for macromolecules (Proteins, Carbohydrates, Lipids)
4. Iodine value/ Saponification value of oils.
5. Determination of λ_{max} and verification of Beer & Lambert's law
6. Estimation of maltose by DNSA method
7. Estimation of proteins by Biuret method
8. Separation of amino acids & sugars using paper & thin layer chromatography
9. Separation of lipids by TLC
10. Isolation of – starch from potato- casein from milk
11. Separation of plant pigments by column chromatography
12. Titration curve for amino acids and determination of pK value