

# PARUL UNIVERSITY - FACULTY OF APPLIED SCIENCE

Department of Biotechnology

SYLLABUS FOR 4th Sem B.Sc. PROGRAMME

Recombinant DNA Technology (11102254)

Type of Course: B.Sc.

Prerequisite:

Rationale:

Teaching and Examination Scheme:

Teaching Scheme (Hrs./Week)			Credit	Examination Scheme					Total
Lect	Tut	Lab		External		Internal			
				T	P	T	CE	P	
3	-	-	3	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	<p><b>Unit-1:</b></p> <p><b>Isolation, Identification, and Characterization of DNA Fragments:</b></p> <p>Nucleic Acid Purification methods, Yield Analysis,</p> <p>Radiolabelling of Nucleic acids: Probe preparation by random primer, nick translation, end labelling. Primer extension labelling, Non radioactive probes, molecular probes (Immunogenetics purposes)</p> <p>Southern and Northern Hybridization –principle, method and listing applications only. Techniques of introducing DNA into cell-calcium chloride transformation and High efficiency transformation by electroporation, Agro bacterium-mediated transformation, Protoplast transformation, Particle gun</p>	25%	11
2	<p><b>Unit-2:</b></p> <p><b>Molecular Tools and Applications:</b></p> <p>Polymerase Chain Reaction-Essential features, design of primers, DNA polymerases for PCR, study with reference to principle, methodology and single application in detail, conventional PCR, RT-PCR. Mutagenesis: random mutagenesis and directed mutagenesis( primer extension method, error prone PCR methods</p>	24%	11
3	<p><b>Unit-3:</b></p> <p><b>Applications of rDNA technology:</b></p> <p>-in understanding genes and genomes, in biotechnology (protein production and protein engineering), in medicine and forensics, transgenic plants and animals, Organism cloning, Engineering of <math>\beta</math>-carotene, engineering of abzymes and phage display for hormone engineering. Mapping: promoter (Foot printing analysis), Transcriptional start site (Primer extension), Size of transcript –run off and run on assay.</p>	24%	11

4	<p><b>Unit-4:</b></p> <p><b>Gene Cloning strategies and analysis:</b></p> <p>Cloning strategies- cloning from mRNA, cloning from genomic DNA, Construction of Genomic library, Maniatis Strategy, cDNA cloning with conventional cDNA and full length cDNA.. Genetic selection and screening methods- Chromogenic substrates, insertional inactivation, complementation Screening using nucleic acid hybridization – Nucleic acid probes, screening clone banks, Immunological screening for expressed genes</p> <p>Analysis of cloned genes- in vitro mRNA translation, restriction mapping, blotting techniques, DNA sequencing</p>	27%	12
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**\*Continuous Evaluation:**

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

# PARUL UNIVERSITY - FACULTY OF APPLIED SCIENCE

Department of Biotechnology

SYLLABUS FOR 5th Sem B.Sc. PROGRAMME

Omics Technologies (11102305)

Type of Course: B.Sc.

Prerequisite:

Rationale:

Teaching and Examination Scheme:

Teaching Scheme (Hrs./Week)			Credit	Examination Scheme					Total
Lect	Tut	Lab		External		Internal			
				T	P	T	CE	P	
3	-	-	3	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	<p><b>Unit-1:</b></p> <p><b>Genomics:</b></p> <p>Genome sequencing projects Microbes, plants and animals, Accessing and retrieving genome project information from web, Identification and classification using molecular markers-16S rRNA typing/sequencing, EST's and SNP's. Comparative-genomics Introduction, comparative genomics of plants, cereal and legume Evolutionary Genomics Introduction to genome evolution, Acquisition of new genes, Evolution of non-coding regions, Molecular phylogenetics and applications, Evolution of multigene families in the genome</p> <p>Introduction and applications of Structural Genomics, Functional Genomics, Metagenomics and Pharmacogenomics.</p>	%	11
2	<p><b>Unit-2:</b></p> <p><b>Singenomics and Next Generation Sequencing:</b></p> <p>Designing and producing microarrays, types of microarrays, cDNA microarray technology, oligonucleotide arrays, Sample preparation, labeling, hybridization, generation of microarray data. Next generation sequencing technologies</p> <p>Introduction to Next Generation Sequencing (NGS) technologies, Principles of NGS by Roche/454, Illumina, Life Technologies, Pacific Biosciences, Ion Torrent technologies, Applications of NGS to disease diagnosis and personalized medicine. Protein micro arrays Types of protein arrays, Protein microarray fabrication, Experimental analysis of proteins arrays. Data acquisition and processing, Applications of protein microarray types.</p>	%	11

3	<b>Unit-3:</b> <b>Epigenetics and Epigenomics:</b> Introduction and their impact on cellular homeostasis, Epigenomics in Cancer and Neuroregenerative diseases Epigenomics in plants.	%	8
4	<b>Unit-4:</b> <b>Protein analysis</b> (includes measurement of concentration, amino-acid composition, N-terminal sequencing), 2-D electrophoresis of proteins, Gel based and Gel free proteomics, Microscale solution isoelectric focusing, Peptide mass fingerprinting, LC/MS-MS for identification of proteins and modified proteins, MALDI-TOF, SAGE and Differential display proteomics, Protein-protein interactions. Proteomics of chloroplast, nucleus, mitochondria. Proteomics in Seed germination, allergy and Cancer	%	8
5	<b>Unit-5:</b> <b>Other -Omics technologies:</b> Introduction and applications (with special reference to diseases) of Transcriptomics, Lipidomics, Metabollomics, Degradomics, Nutritionomics, Toxicomics, Interactomics, Connectomics	%	7

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**Reference Books:**

1. DNA Microarrays - A Practical Approach  
Schena M
2. DNA Microarrays  
Rinaldis E. D. and Lahm A.
3. Mass Spectrometry – Principles and Applications  
Hoffman E. D. and Stroobant V
4. Data mining for Genomics and Proteomics  
Darius M. Dziuda
5. Introduction to Proteomics : Tools for new Biology  
Daniel C. Liebler
6. Proteomics  
Timothy Palzkill
7. Research papers and reviews of concerned topics

# PARUL UNIVERSITY - FACULTY OF APPLIED SCIENCE

Department of Biotechnology

SYLLABUS FOR 5th Sem B.Sc. PROGRAMME

Developmental Biology (11102308)

Type of Course: B.Sc.

Prerequisite:

Rationale:

Teaching and Examination Scheme:

Teaching Scheme (Hrs./Week)			Credit	Examination Scheme					Total
Lect	Tut	Lab		External		Internal			
				T	P	T	CE	P	
3	-	-	3	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	<b>Unit-1:</b> <b>Fertilization and Cleavage:</b> Early development, Fertilization, Types of cleavage, Gastrulation: Cell movement and formation of germ layers in frog, chick and mouse, concept of determination, competence and differentiation, Development of vertebrate nervous system, Formation of neural tube, Formation of brain region, Tissue architecture of the central nervous system	%	9
2	<b>Unit-2:</b> <b>Developmental Biology of model organisms:</b> Caenorhabditis: Vulva formation, Drosophila: Maternal genes and formation of body axes, Segmentation genes, Homeotic genes function, Imaginal disc development Vertebrates: Axes formation and HOX genes, Limb formation in chick Genetic determination of sex in Caenorhabditis, Drosophila and mammals	%	11
3	<b>Unit-3:</b> <b>Stem Cells:</b> Types of stem cells and their applications, Totipotency, Stem cell therapy, Clinical embryology	%	7

4	<b>Unit-4:</b> <b>Reproduction:</b> Differentiation of germ cells and gametogenesis, Fertilization and implantation, Stages of human embryonic development, Congenital malformations and teratogenesis, Reproductive failure and infertility and assisted reproduction	%	9
5	<b>Unit-5:</b> <b>Plant developmental biology:</b> Life cycle of angiosperms, Root apical meristem, Shoot apical meristem, totipotency, developmental plasticity, the vegetative-to-reproductive transition, plant growth regulation, floral development, Inter-cell-layer communication during floral development	%	9

**\*Continuous Evaluation:**

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

**Reference Books:**

1. Developmental Biology  
Scott F. Gilbert
2. Developmental Biology  
Browder, Erickson and Jeffery
3. Analysis of Biological Development  
Kalthoff
4. Mammalian Development – A Practical Approach  
Monk
5. Human Embryology and Teratology  
O'Rahilly and Muller
6. Principles of Development  
Wolpert

# PARUL UNIVERSITY - FACULTY OF APPLIED SCIENCE

Department of Biotechnology

SYLLABUS FOR 5th Sem B.Sc. PROGRAMME

LAB-2(Recombinant DNA Technology and Developmental Biology) (11102309)

Type of Course: B.Sc.

Prerequisite:

Rationale:

Teaching and Examination Scheme:

Teaching Scheme (Hrs./Week)			Credit	Examination Scheme					Total
Lect	Tut	Lab		External		Internal			
				T	P	T	CE	P	
-	-	3	2	-	30	-	-	20	50

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

Contents:

Sr.	Topic	Weightage	Teaching Hrs.
1	<b>Recombinant DNA technology:</b> Minipreparation of plasmids	%	
2	<b>Recombinant DNA technology:</b> Preparation of Insert and Vector for restriction enzyme directed cloning	%	
3	<b>Recombinant DNA technology:</b> Preparation of chemically competent cells for transformation of <i>E. coli</i> (DH5 $\alpha$ and DH10 $\beta$ )	%	
4	<b>Recombinant DNA technology:</b> Ligation reaction of restriction enzyme digested insert and vector	%	
5	<b>Recombinant DNA technology:</b> CaCl <sub>2</sub> mediated transformation of recombinant plasmid	%	
6	<b>Recombinant DNA technology:</b> Blue-White screening	%	
7	<b>Recombinant DNA technology:</b> Replica Plating	%	
8	<b>Recombinant DNA technology:</b> Preparation of Insert and Vector for PCR directed cloning	%	

9	<b>Recombinant DNA technology:</b> Electrophoresis (Agarose and PAGE)	%	
10	<b>Recombinant DNA technology:</b> Gel elution of DNA bands	%	
11	<b>Developmental Biology:</b> Floral morphology of dicot and monocot flower	%	
12	<b>Developmental Biology:</b> T.S. of an anther of <i>Hibiscus rosasinensis</i>	%	
13	<b>Developmental Biology:</b> Artificial pollination by emasculation (bagging method)	%	
14	<b>Developmental Biology:</b> Pollen germination ( <i>In vitro/ In vivo</i> )	%	
15	<b>Developmental Biology:</b> Pollen viability test	%	
16	<b>Developmental Biology:</b> Drosophila development study by chart and model	%	
17	<b>Developmental Biology:</b> Stages of developments of humans during pregnancy	%	

**\*Continuous Evaluation:**

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



# PARUL UNIVERSITY - FACULTY OF APPLIED SCIENCE

Department of Biochemistry

SYLLABUS FOR 5th Sem B.Sc. PROGRAMME

Clinical Biochemistry (11103301)

Type of Course: B.Sc.

Prerequisite:

Rationale:

Teaching and Examination Scheme:

Teaching Scheme (Hrs./Week)			Credit	Examination Scheme					Total
Lect	Tut	Lab		External		Internal			
				T	P	T	CE	P	
3	-	-	3	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	<b>Unit 1:</b> <b>In born error metabolism:</b> of protein, Amino acid, nucleic acid. Occurrence, pattern of inheritance, disorders of amino acids metabolism- phenyl ketouria, Maple syrup, urine disease, cystinosis etc.	%	11
2	<b>Unit 2:</b> <b>Disorders of carbohydrates and lipid metabolism:</b> Porphyrias and Gout <b>Molecular disease</b> Sickle cell anemia and thalassemias, adenosine deaminase deficiency, systemic lupus erythematosus <b>Liver and kidney tests-</b> their significance	%	11
3	<b>Unit 3:</b> <b>Endocrine disorders:</b> Pancreatic, <i>Diabetes mellitus</i> , mellituria, hypoglycemia, glucose tolerance test, thyroid -hypo and -hyper, parathyroidism, parathyroid-abnormalities of parathyroid functions	%	12

4	<b>Unit-4:</b> <b>Blood related disorders:</b> Abnormal hemoglobin and hemoglobinopathies, anemias, polycythemia, erythremia, eosinophilia, schistosomiasis, leucopenia, leukemias, hemophilia, thrombocytopenia, thromboembolic conditions.	%	11
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**\*Continuous Evaluation:**

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

**Reference Books:**

1. Clinical Biochemistry: Metabolic and clinical aspects  
William J. Marshall and Stephen K. Bengert
2. Clinical Biochemistry: An illustrated text  
Allan Gaw et. al.
3. Clinical Biochemistry  
Nanda Maheshwari
4. Practical clinical Biochemistry  
Ranjana Chawala
5. Clinical Biochemistry  
R. Luxton
6. Clinical Biochemistry  
Nessar Ahmad

# PARUL UNIVERSITY - FACULTY OF APPLIED SCIENCE

Department of Biochemistry

SYLLABUS FOR 5th Sem B.Sc. PROGRAMME

Endocrinology (11103302)

Type of Course: B.Sc.

Prerequisite:

Rationale:

Teaching and Examination Scheme:

Teaching Scheme (Hrs./Week)			Credit	Examination Scheme					Total
Lect	Tut	Lab		External		Internal			
				T	P	T	CE	P	
3	-	-	3	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	<b>Unit-1:</b> <b>Introduction:</b> Definitions, a brief history of endocrinology, research landmarks, Methods in endocrinology, classes of hormones, cascades and feedback loops, Hormone -sources, synthesis, receptors and target tissues.	%	10
2	<b>Unit-2:</b> <b>The steroid hormones:</b> Sources, structure, synthesis, regulation, receptors and effects on target tissues, Steroids and the athlete Steroids, the releasing hormones, structure of the hypothalamus . Steroids and reproductive behavior.	%	10
3	<b>Unit-3:</b> <b>Posterior and anterior pituitary hormones:</b> Morphology of the pituitary, structure and function, Genomic and non-genomic mechanisms. The anterior pituitary as the central regulatory center, Anterior pituitary control over gonadal function and development  Thyroid hormones: structure, control, release and function: Hypo- and hyperthyroidism	%	12

4	<b>Unit-4:</b> <b>Pancreatic hormones:</b> Insulin and glucagon, Diabetes, GI hormones and calcium regulation. The adrenal glands: glucocorticoids, structure and function. Stress hormones and interactions with other regulatory pathways. Androgen, gonadal differentiation and free-martins. Estrogens and the endocrinology of pregnancy Neuroendocrinology of reproduction. Prostaglandins, pineal gland, cell growth factors.	%	13
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**\*Continuous Evaluation:**

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

**Reference Books:**

1. Text book of Endocrinology  
Williams
2. Metabolic basis of inherited disease  
Stanbury
3. The Thyroid  
Ingbar
4. RIA – Principles and practices  
Pillai and Bhandarkar
5. Reproductive Endocrinology  
Speroff
6. Textbook of Clinical Chemistry  
Tietz
7. Endocrinology  
Leslie J DeGroot
8. Pediatric Endocrinology  
Hindmarsh

# PARUL UNIVERSITY - FACULTY OF APPLIED SCIENCE

Department of Biochemistry

SYLLABUS FOR 5th Sem B.Sc. PROGRAMME

Nutritional Biochemistry (11103303)

Type of Course: B.Sc.

Prerequisite:

Rationale:

Teaching and Examination Scheme:

Teaching Scheme (Hrs./Week)			Credit	Examination Scheme					Total
Lect	Tut	Lab		External		Internal			
				T	P	T	CE	P	
3	-	-	3	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	<b>Unit-1:</b> <b>Nutritional aspects of carbohydrates:</b> Biochemical functions the relative importance of different carbohydrates in diet, utilization of absorbed carbohydrates in the body, regulation of blood glucose level of blood dietary fibre and their biochemical effect in human nutrition.	%	12
2	<b>Unit-2:</b> <b>Nutritional aspects lipids:</b> Fats in the body and food, biochemical function of fats, role of in diet, effect of trans fatty acids, blood lipids, transport and storage of lipids, role of liver in lipid metabolism, omega fatty acids	%	12
3	<b>Unit-3:</b> <b>Nutritional aspects proteins:</b> Nutritional significance of amino acids , specific function of some important amino acids, complementary value of proteins, methods of proteins (BV, NB, PER, NPR)	%	12
4	<b>Unit-4:</b> <b>Role of vitamins:</b> Minerals in health and disorders biochemical function of water detoxification  <b>Biochemical features:</b> Some diet related disorders like protera-calorie malnutrition diabetes , cardiovascular disease goiture, anemia etc.	%	9

**\*Continuous Evaluation:**

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

**Reference Books:**

1. Harper's Illustrated Biochemistry  
Murray, Granner and Rodwell
2. Food and nutrition  
Swaminathan
3. Nutritional biochemistry and metabolism  
Linten
4. Biochemistry with clinical correlation  
Devlin

# PARUL UNIVERSITY - FACULTY OF APPLIED SCIENCE

Department of Biochemistry

SYLLABUS FOR 5th Sem B.Sc. PROGRAMME

LAB-1(Clinical Biochemistry and Endocrinology) (11103304)

Type of Course: B.Sc.

Prerequisite:

Rationale:

Teaching and Examination Scheme:

Teaching Scheme (Hrs./Week)			Credit	Examination Scheme					Total
Lect	Tut	Lab		External		Internal			
				T	P	T	CE	P	
-	-	3	2	-	30	-	-	20	50

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

Contents:

Sr.	Topic	Weightage	Teaching Hrs.
1	<b>Clinical Biochemistry:</b> Analysis of blood for clotting and prothrombin time	%	
2	<b>Clinical Biochemistry:</b> Analysis of blood haemoglobin and derivative	%	
3	<b>Clinical Biochemistry:</b> Analysis of serum for Calcium and Phosphorous	%	
4	<b>Clinical Biochemistry:</b> Analysis of plasma for fibrinogen	%	
5	<b>Clinical Biochemistry:</b> Analysis of blood sugar by chemical and enzymatic method.	%	
6	<b>Clinical Biochemistry:</b> Analysis of serum for RFT ( Creatinine , Creatine, uric acid ).	%	
7	<b>Clinical Biochemistry:</b> Analysis of serum for LFT (bilirubin, total protein- albumin and globulin, GOT, GPT, acid and alkaline phosphatase).	%	
8	<b>Clinical Biochemistry:</b> Analysis of serum lipid profiles- Total Cholesterol , HDL cholesterol and LDL cholesterol, Triacylglyceride).	%	

9	<b>Clinical Biochemistry:</b> Analysis of serum for creatine kinase.	%	
10	<b>Clinical Biochemistry:</b> Determination of ABO, Rh blood group.	%	
11	<b>Endocrinology:</b> Lipid profile-TAG, Lipoproteins, Cholesterol	%	
12	<b>Endocrinology:</b> Glucose tolerance test	%	
13	<b>Endocrinology:</b> Vitamin D assay	%	
14	<b>Endocrinology:</b> Assay of estrogen	%	
15	<b>Endocrinology:</b> Estimation of Calcium	%	
16	<b>Endocrinology:</b> HCG test for pregnancy	%	

**\*Continuous Evaluation:**

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