

PARUL UNIVERSITY - FACULTY OF APPLIED SCIENCE

Department of Microbiology

SYLLABUS FOR 2nd Sem PROGRAMME

Molecular Virology (11201151)

Type of Course:

Prerequisite:

Rationale:

Teaching and Examination Scheme:

| Teaching Scheme | | | Credit | Examination Scheme | | | | | Total |
|-------------------|----------|----------|--------|--------------------|---|----------|----|---|-------|
| Lect Hrs/ Week | Tut Hrs/ | Lab Hrs/ | | 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: Classification of viruses, Methods of cultivation, detection, quantitation. Propagation and maintenance of viruses (bacterial, plant and animal viruses). Structure and replication of plant viruses (a) TMV (b) Cauliflower mosaic virus. | 25% | 15 |
| 2 | UNIT-2: Structure and replication of bacteriophages: Lytic ds linear DNA viruses (T2, T7); Lysogenic ds linear DNA virus (Lambda); ss Circular DNA virus (Ø X 174); Male specific filamentous ss RNA virus (F17 and M13) | 25% | 15 |
| 3 | UNIT-3: Recombination in phage, multiplicity reactivation and phenotypic mixing. Structure and replication of animal viruses (Adenovirus (eg. Type 2) | 25% | 15 |
| 4 | UNIT-4: Structure and replication of Myxoviruses (eg. Influenza); Pox virus (eg. Vaccinia); Hepatitis virus. Effect of animal virus infection on host cell; Viral interference and interferon; Tumor viruses (DNA and RNA). | 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 2nd Sem PROGRAMME

Biology of the Immune System (11201152)

Type of Course:

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: Types of immunity – Innate and adaptive. Antigens, Super antigens, Adjuvants. Cells and organs of the immune system -Thymus, bone-marrow, spleen, lymph node. T and B lymphocytes – Origin, activation, differentiation, characteristics and functions. Nature of T and B cell surface receptors. Major Histocompatibility Complex- H-2, HLA, Polymorphism of MHC molecules. Congenic and inbred strains of mice. MHC restriction and its role in immune response, Antigen presenting cells, Processing and presentation of antigens. | 25% | 15 |
| 2 | UNIT-2: Structure of immunoglobulins, Immunoglobulin classes and biological activities. Isotypes, Allotypes, Idiotypes. Immunoglobulin genes and antibody diversity, Class switching, Humoral and cell-mediated immune responses, Cytokines, Interleukins, Interferons, The Complement components and biological consequences of complement activation. | 25% | 15 |
| 3 | UNIT-3: Antigen-antibody interactions: Antibody affinity and avidity, Precipitation reactions – Immunodiffusion, Radial immunodiffusion, double immunodiffusion, immunoelectrophoresis, Rocket immunoelectrophoresis, Agglutination reactions-Hemeagglutination and complement fixation, Immunofluorescence, FACS, RIA, ELISA, Immunoblotting, Hybridoma technology - production of monoclonal antibodies and their applications, humanized antibodies. | 25% | 15 |

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| 4 | UNIT-4: Immune effector mechanisms – Hypersensitivity: immediate (type I, type II, type III) and delayed hypersensitivity reactions, Immunodeficiencies - SCID and AIDS. Autoimmunity - organ specific (Hashimoto's thyroiditis) and systemic (Rheumatoid arthritis) diseases. Tissue transplantation - auto, allo, iso and xenograft, tissue matching, transplantation rejection, mechanism and control, immunosuppressive agents. Cancer immunology – Tumor associated antigens, Immunological surveillance of cancer. | 25% | 15 |
|---|--|-----|----|

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PARUL UNIVERSITY - FACULTY OF APPLIED SCIENCE

Department of Biotechnology

SYLLABUS FOR 2nd Sem PROGRAMME

Molecular Biology of the Genes (11202151)

Type of Course:

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: Organization of genetic material - Packing of DNA in to chromatin - protein components of chromatin, histones, nucleosome organization. Solenoids loops, domains & scaffolds. Gene amplification, polytene chromosomes. DNA replication – apparatus, enzymes involved and mechanism. Replication at telomeres. DNA damage and repair mechanism. Nuclear genome. C - value paradox. Mitochondrial & plastid genomes and genes. Fine structure of the eukaryotic gene. Split genes. Different kinds of genes: overlapping assembled polyprotein & nested genes. | 25% | 15 |
| 2 | UNIT-2: Transcription in prokaryotes and eukaryotes. Mechanism of transcription, enzymes and transcription factors, zinc finger, leucine zipper mechanism. Maturation and processing of m-RNA, splicing, 5' end capping & 3' end tailing. RNA editing and transport. RNAi and small RNAs. | 25% | 15 |
| 3 | UNIT-3: Translation in prokaryotes and eukaryotes: Genetic code - properties of the genetic code, deciphering of the genetic code. Ribosome as a translation factory. t - RNA as an adaptor, its mode of function. Post translational modifications. Leader sequences & protein targeting. | 25% | 15 |

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| 4 | UNIT-4: Regulation of gene expression in prokaryotes - The operon concept, lac & tryp operons. Transcriptional control. Post translational control. Regulation in eukaryotes - Control by promoter, enhancer and silencers. Cis-trans elements. Environmental & developmental regulation. DNA methylation & gene expression. Chromatin structure & gene expression. | 25% | 15 |
|---|--|-----|----|

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PARUL UNIVERSITY - FACULTY OF APPLIED SCIENCE

Department of Biotechnology

SYLLABUS FOR 2nd Sem PROGRAMME

Lab-II (Molecular Biology) (11202152)

Type of Course:

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 plasmid DNA by miniprep method (Boiling lysis) Isolation, purification, quantification and separation of plasmid DNA by maxiprep method (Alkaline lysis)
2. Restriction analysis / mapping of vector DNA
3. Modification of DNA by Klenow and alkaline phosphatase enzyme (Kit)
4. Ligation of vector and insect DNA, and checking of Ligation Product.
5. Preparation of competent cells, transformation of E.coli and screening of transformants (Blue / white screening)
6. Determination of insert size by R.E analysis and PCR amplification of cloned DNA
7. Optimizing PCR assays (template DNA concentration, Mg+2 concentration, and temperature)
8. RAPD analysis from microbe genome.

PARUL UNIVERSITY - FACULTY OF APPLIED SCIENCE

Department of Biotechnology

SYLLABUS FOR 2nd Sem PROGRAMME

Lab-I (Molecular Virology) (11202153)

Type of Course:

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 of phage from soil.
2. Cultivation and preservation of phages
3. Quantitation of phages
4. Growth phases of phage and burst size
5. Isolation of plaque type and host range mutants
6. Phage induction
7. Lysogeny-Transduction
8. Propagation of animal viruses in egg allantoic, amniotic and CAM
9. Propagation of viruses in tissue culture
10. Plaque titration and neutralization
11. Quantitation of virus by HA, Pock titration, plaque titration
12. Identification of virus – HAI
13. Demonstration of cytopathological changes
14. Symptomatic observations of plant viral infections
15. Chloroplast agglutination of plant viruses

PARUL UNIVERSITY - FACULTY OF APPLIED SCIENCE

Department of Biochemistry

SYLLABUS FOR 2nd Sem PROGRAMME

Enzyme Technology (11203152)

Type of Course:

Prerequisite:

Rationale:

Teaching and Examination Scheme:

| Teaching Scheme | | | Credit | Examination Scheme | | | | | Total |
|-------------------|----------|----------|--------|--------------------|---|----------|----|---|-------|
| Lect Hrs/ Week | Tut Hrs/ | Lab Hrs/ | | 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 | <p>UNIT-1:</p> <p>Classification of enzymes, Remarkable properties of enzymes – catalytic power, specificity. Transformation of different forms of energy. Enzyme localization and assay of enzymes, Units of enzyme activity, Active site – Fisher and Koshland models, formation of enzyme – substrate complex and experimental evidences. Nature of active site, mapping of enzyme active site through chemical procedures and site directed mutagenesis, Factors affecting enzyme activity, Modern concepts of evolution of catalysis, ribozymes, abzyme and synzymes.</p> | 25% | 15 |
| 2 | <p>UNIT-2:</p> <p>Kinetics of single substrate enzyme catalyzed reactions, Michaelis – Menten equation, Lineweaver - Burk, Eadie – Hofstee and Hanes plots. Significance of Vmax, Km, Kcat, specificity constant (Kcat/Km). Kinetics of multisubstrate reaction – Classification with examples. Rate expression for non-sequential (ping-pong) and sequential (ordered and random) mechanisms. Use of initial velocity, Inhibition and exchange studies to differentiate between multi substrate reaction mechanisms. Flexibility and conformational mobility of enzymes. Enzyme Inhibition – reversible inhibition – competitive, non-competitive, un-competitive inhibition; irreversible inhibition, Determination of Ki values</p> | 25% | 15 |
| 3 | <p>UNIT-3:</p> <p>Types of reaction catalysis – General acid – base, electrostatic, covalent, intermolecular, metal – ion catalysis, Proximity and orientation. Mechanism of reaction catalyzed by serine proteases – trypsin and chymotrypsin, carboxypeptidase, lysozyme, triose phosphate isomerase, ribonuclease. Rotational catalysis – ATPase. Mechanism of catalysis with coenzymes – pyridoxal phosphate, flavin nucleotides, thiamine lpyrophosphate, biotin, tetrahydrofolate, lipoic acid.</p> | 25% | 15 |

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| 4 | UNIT-4: Enzyme regulation – general mechanisms of enzyme regulation. Allosteric enzymes (ATCase). Cooperativity phenomenon. Hill and Scatchard plots. Sigmodal kinetics and their physiological significance, Symmetric and sequential models of action of allosteric enzymes and their significance. Feedback inhibition and feed forward stimulation. Control of enzymatic activity by products and substrates. Reversible and irreversible activation Isoenzymes, Multifunctional enzymes, Multi – enzyme systems – properties, mechanism of action and regulation of Pyruvate dehydrogenase and Fatty acid synthase complex | 25% | 15 |
|---|---|-----|----|

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