

Semester	<b>4</b>
Course	<b>Major</b>
Paper Code	<b>C2MB230411T</b>
Paper Title	<b>Basic Molecular Biology and Virology</b>
No. of Credits	<b>4</b>
Theory / Practical / Composite	<b>THEORY</b>
Minimum No. of preparatory hours per week a student has to devote	4 hours/week
Number of Modules	No modules
Syllabus	<p><b>Unit 1: Basic concepts of prokaryotic DNA replication:</b> Origin, Bi-directionality, Replication Fork, Semiconservative, Semi-discontinuous, Primer-template junction, DNA polymerase active site, Proofreading, Accessory factors (Helicase, SSB, Gyrase, Primase, Sliding Clamp, DNA Pol I, RNase H), Initiation and Termination. Regulation of DNA replication. Comparison between prokaryotic and eukaryotic replication.</p> <p><b>Unit 2: Transcription and translation</b> <b>Transcription in bacteria:</b> Role of bacterial promoters, transcription initiation, promoter escape, role of elongating polymerases, transcription termination. <b>Transcription in eukaryotes:</b> Transcription of rRNA and tRNA, transcription of protein coding genes in eukaryotes. <b>Translation:</b> Structure of Bacterial ribosomes, Overview of translational machinery, Reading frames, Charging of tRNA, Aminoacyl tRNA synthetases, Steps of translation initiation, elongation and termination. Differences between eukaryotic and prokaryotic protein synthesis, antibiotics inhibiting translation. Genetic code.</p> <p><b>Unit 3: Nature and Properties of Viruses</b> Discovery of viruses, nature and definition of viruses, general properties; theories of viral origin; structure of viruses: capsid symmetry, enveloped and non-enveloped viruses; viral taxonomy: Classification and nomenclature of viruses (ICTV and Baltimore classification); Isolation, purification and cultivation of viruses; concept of infectious agents like viroids, virusoids, satellite viruses and prions.</p> <p><b>Unit 4: Viral Transmission, Salient features of viral nucleic acids and Replication</b> Modes of viral transmission: persistent, non-persistent, vertical and horizontal; features like presence of unusual bases (TMV, T4 phage), overlapping genes (Hepatitis B virus, <math>\phi</math>X174), partial double stranded genomes (Hepatitis B), long terminal repeats (retrovirus), segmented (Influenza virus), and non-segmented genomes (picornavirus), capping and tailing (TMV) in viral genome;</p>

	<p>viral tropism. Replication strategies of viruses as per Baltimore classification (Retroviridae, Vaccinia, Picorna), entry (receptors), assembly, maturation, and release of virions.</p> <p><b>Unit 5: Bacteriophages</b>  Classification, one step growth curve, intracellular growth curve, life cycle of lytic (T4) and lysogenic phages (lambda phage); terminal redundancy and circular permutation in T4; concept of early and late proteins; regulation of transcription in <math>\lambda</math> phage, concatemeric DNA, packaging through cos sites.</p> <p><b>Unit 6: Viruses and Cancer</b>  Introduction to oncogenic viruses; types of oncogenic DNA and RNA viruses; Concepts of oncogenes and proto-oncogenes.</p>
Learning Outcomes	<ul style="list-style-type: none"> <li>• To know about the basics of molecular biology</li> <li>• To study bacterial replication, transcription and translation</li> <li>• To study about the nature, properties, replication and transmission of viruses</li> <li>• To learn about bacteriophages and oncogenic viruses</li> </ul>
Reading/Reference Lists	<ol style="list-style-type: none"> <li>1. Watson JD, Baker TA, Bell SP, Gann A, Levine M and Losick R (2008) Molecular Biology of the Gene, 6th edition, Cold Spring Harbour Lab. Press, Pearson Publication</li> <li>2. Becker WM, Kleinsmith LJ, Hardin J and Bertoni GP (2009) The World of the Cell, 7th edition, Pearson Benjamin Cummings Publishing, San Francisco</li> <li>3. De Robertis EDP and De Robertis EMF (2006) Cell and Molecular Biology, 8th edition. Lippincott Williams and Wilkins, Philadelphia</li> <li>4. Karp G (2010) Cell and Molecular Biology: Concepts and Experiments, 6th edition, John Wiley &amp; Sons. Inc.</li> <li>5. Sambrook J and Russell DW. (2001). Molecular Cloning: A Laboratory Manual. 4th Edition, Cold Spring Harbour Laboratory press.</li> <li>6. Krebs J, Goldstein E, Kilpatrick S (2013). Lewin's Essential Genes, 3rd Ed., Jones and Bartlett Learning</li> <li>7. Gardner EJ, Simmons MJ, Snustad DP (2008). Principles of Genetics. 8th Ed. Wiley-India</li> <li>8. Dimmock, NJ, Easton, AL, Leppard, KN (2007). Introduction to Modern Virology. 6th edition, Blackwell Publishing Ltd.</li> <li>9. Carter J and Saunders V (2007). Virology: Principles and Applications. John Wiley and Sons.</li> <li>10. Flint SJ, Enquist, LW, Krug, RM, Racaniello, VR, Skalka, AM (2004). Principles of Virology, Molecular biology, Pathogenesis and Control. 2nd edition. ASM press Washington</li> </ol>

	DC. 11. Levy JA, Conrat HF, Owens RA. (2000). Virology. 3rd edition. Prentice Hall publication, New Jersey.. 12. Versteeg J. (1985). A Color Atlas of Virology. Wolfe Medical Publication. 13. Padmanavan and Shastri. Virology 14. David Friefilder. Molecular Biology	
Evaluation	Theory CIA: 30 Semester Exam:70	Practical (if applicable) CA: Semester Exam:
Paper Structure for Theory Semester Exam	<b>Full marks 70</b> Short questions: 10 (each 2 marks) from 12 (10x2=20) Long questions: 5 (each 10 marks) from 7 (5x10=50)	