

# **CURRICULUM PLAN 2021-22 (Even Semesters: II, IV VI)**

**Dr. Ranjana Roy Mishra**

**Semester – IV (Semester System)**

**B. Sc. (H) Botany Semester IV cbcs**

**Dr. Ranjana Roy Mishra**

| Name of Paper & Code   | Allocation of Lectures | Month wise schedule followed by the Department | Tutorial/Assignment/ Presentation etc. | Suggested Readings   |
|--|------------------------|--|--|--|
| <b>Theory Paper Core course VIII Molecular Biology</b>   |                        |  |  |  |
| <b>Unit 1 Nucleic acids as carriers of genetic information</b> (3 lectures)<br>Historical perspective; Experiments that established nucleic acids (DNA & RNA) as the carrier of genetic information: Griffith's, Hershey & Chase, Avery, McLeod & McCarty and Fraenkel-Conrat's experiment   | 03                     | January- February 2022                         | Presentation by Students               | <b>Suggested Readings</b><br>Watson J.D., Baker, T.A., Bell, S.P., Gann, A., Levine, M., Losick, R. (2007). Molecular Biology of the Gene, Pearson Benjamin Cummings, CSHL Press, New York, U.S.A. 6th edition.<br>Snustad, D.P. and Simmons, M.J. (2010). Principles of Genetics. John Wiley and Sons Inc., 5th edition.<br>Klug, W.S., Cummings, M.R., Spencer, C.A. (2009). Concepts of Genetics. Benjamin Cummings. U.S.A. 9th edition.<br>Russell, P. J. (2010). Genetics- A Molecular Approach. Benjamin Cummings, U.S.A. 3rd edition.<br>Griffiths, A.J.F., Wessler, S.R., Carroll, S.B., Doebley, J. (2010). Introduction to Genetic Analysis. |
| <b>Unit 2. The Structure and organisation of the genetic material</b> (09 lectures)<br>DNA Structure: Miescher to Watson and Crick- historic perspective, DNA structure, Salient features of double helix, Types of DNA, Types of genetic material, denaturation and renaturation, cot curves; Organization of DNA- Prokaryotes, Viruses, Eukaryotes. RNA Structure- Organelle DNA mitochondria and chloroplast DNA. The Nucleosome Chromatin structure- Euchromatin, Heterochromatin- Constitutive and Facultative heterochromatin. | 09                     |  |  |  |
| <b>Unit 3 : Central Dogma and Genetic Code</b> 3 lectures<br>Key experiments establishing- The Central Dogma, Genetic code (salient features & experiments that deciphered the correlation between mRNA codon and amino acid).   | 03                     |  |  |  |
| <b>Unit 4 The Replication of DNA</b> 9 lectures<br>Mechanism - initiation, elongation and termination, Kornberg's discovery; Enzymes and other proteins involved in DNA replication; General principles - bidirectional, semiconservative and semi discontinuous replication (Replisome), RNA priming (primase)  | 09                     |  |  |  |

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| <p>&amp; Primosome); Various modes of DNA replication, including rolling circle, <math>\theta</math> (theta) mode of replication, replication of linear ds-DNA. Replication of the 5' end of linear chromosome (end replication problem &amp; Telomerase).</p>  |   |                            |                            | <p>W. H. Freeman and Co., U.S.A. 10th edition.</p> |
| <p><b>Unit 5</b><br/> <b>Mechanism of Transcription</b> 9 lectures<br/> Transcription in prokaryotes and eukaryotes ; Understanding the steps in process of transcription: Initiation, Elongation and Termination. Enzymes and factors involved in transcription.</p> <p><b>Unit 6</b><br/> <b>Processing and modification of RNA</b> 7 lectures<br/> Split genes-concept of introns and exons, Splicing pathways, group I &amp; group II intron splicing, Spliceosome and assembly of the spliceosome machinery , Alternative splicing, Eukaryotic mRNA processing (5' cap, 3' poly A tail) ; Ribozymes, RNA Editing</p> <p><b>Unit 7</b><br/> <b>Mechanism of Translation</b> 10 lectures<br/> Translation in prokaryotes and eukaryotes ; Understand the steps in process of translation - Initiation, Elongation and Termination. Enzymes and factors involved in translation. Ribosome structure and assembly (in prokaryotes and eukaryotes); charging of tRNA, aminoacyl tRNA synthetases; Fidelity of translation; Inhibitors of protein synthesis; Post-translational modifications of proteins.</p> | <p>09</p> <p>07</p> <p>10</p> <p>10</p> | <p>February-March 2022</p> | <p>itation by students</p> |  |
| <p><b>Unit 8</b><br/> <b>Gene Regulation in prokaryotes and eukaryotes</b> 10 lectures<br/> Basic principles of transcriptional regulation: Positive &amp; negative; Inducible &amp; Repressible; Activators and Repressors ; Prokaryotes: Operon</p>   | <p>10</p>                               | <p>March 2022</p>          |                            |  |

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| concept & regulation of lactose metabolism (positive and Negative) and tryptophan synthesis (Repression-Derepression and Attenuation) in <i>E.coli</i> ; Eukaryotes: Gene silencing: Methylation, RNAi, Imprinting.   |  |  |  |  |
| <b>Practicals</b>   |  |  |  |  |
| <b>Practicals</b><br>1. Preparation of LB medium and raising <i>E. coli</i><br>2. DNA isolation from cauliflower heads<br>3. Quantification of unknown DNA by diphenylamine reagent.<br>4. Study of experiments establishing nucleic acid as genetic material (Avery et al, Griffith's, Hershey & Chase's and Fraenkel & Conrat's experiments) through photographs<br>5. Numericals based on DNA re-association kinetics (melting profiles and <i>Cot</i> curves)<br>6. Study of DNA replication through photographs: Modes of replication - Rolling circle, Theta and semi-discontinuous ; Semiconservative model of replication (Messelson and Stahl's experiment); Telomerase assisted end-replication of linear DNA<br>7. Study of structures of : tRNA (2D and 3D); prokaryotic RNA polymerase and eukaryotic RNA polymerase II through photographs<br>8. Study of the following through photographs: Assembly of Spliceosome machinery; Splicing mechanism in group I & group II introns; Ribozymes and Alternative splicing<br>9. Understanding the regulation of lactose ( <i>lac</i> ) operon (positive & negative regulation) and tryptophan ( <i>trp</i> ) operon (Repression and De-repression & Attenuation) through photographs.<br>10. Understanding the mechanism of RNAi by photographs. |  |  |  | January 2022<br>January 2022<br>January 2022<br>January 2022<br>February 2022<br>February 2022<br>March 2022<br>March 2022<br>March 2022<br>April 2022 |

**Semester-VI (semester system)**  
**B. Sc. Prog. (Life Science)**  
**GE Paper: Economic Botany and Biotechnology**

| <b>PRACTICALS: Economic Botany and Biotechnology</b>   |                           |
|--|---------------------------|
| 1. Study of economically important plants : Wheat, Gram, Soybean, Black pepper, Clove Tea, Cotton, Groundnut through specimens, sections and microchemical tests | January – February 2022   |
| 2. Familiarization with basic equipments in tissue culture.  | February – March 2022     |
| 3. Study through photographs: Anther culture, somatic embryogenesis, endosperm and embryo culture; micropropagation.   | March 2022                |
| 4. Study of molecular techniques: PCR, Blotting techniques, AGE and PAGE.  | March- april 2022<br>2022 |

**Semester – II (Semester System)**  
**B.Sc. Prog. Life Science**  
**Core Paper : Plant Ecology & Taxonomy**

| <b>PRACTICALS: Plant Ecology and Taxonomy</b>  |                |
|--|----------------|
| 1. Study of instruments used to measure microclimatic variables: Soil thermometer, maximum and minimum thermometer, anemometer, psychrometer, hygrometer, rain gauge and lux meter.  | April 2022     |
| 2. Determination of pH, and analysis of two soil samples for carbonates, chlorides, nitrates, sulphates, organic matter and base deficiency by rapid field test.   | April- May2022 |
| 3 (a) Study of morphological adaptations of hydrophytes and xerophytes (four each).  | May 2022       |
| 1. (b)Study of biotic interactions of the following: Stem parasite ( <i>Cuscuta</i> ), Root parasite ( <i>Orobanch</i> ), Epiphytes, Predation (Insectivorous plants)  |                |
| 2. Determination of minimal quadrat size for the study of herbaceous vegetation in the college campus by species area curve method. (species to be listed)   |                |
| 3. Quantitative analysis of herbaceous vegetation in the college campus for frequency and comparison with Raunkiaer's frequency distribution law   |                |
| 4. Study of vegetative and floral characters of the following families (Description, V.S. flower, section of ovary, floral diagram/s, floral formula/e and systematic position according to Bentham & Hooker's system of classification):Brassicaceae - <i>Brassica</i> , <i>Alyssum</i> / <i>Iberis</i> ; Asteraceae - <i>Sonchus</i> / <i>Launaea</i> , <i>Vernonia</i> / <i>Ageratum</i> , <i>Eclipta</i> / <i>Tridax</i> ; Solanaceae - <i>Solanumnigrum</i> , <i>Withania</i> ; Lamiaceae - <i>Salvia</i> , <i>Ocimum</i> ; Liliaceae - <i>Asphodelus</i> / <i>Lilium</i> / <i>Allium</i> . | May-June 2022  |
| 5. Mounting of a properly dried and pressed specimen of any wild plant with herbarium label (to be submitted on the herbarium sheet with appropriate label.)   | July 2022      |