Techno India NJR Institute of Technology

Academic Administration of Techno NJR Institute

Syllabus Deployment

Name of Faculty: Dr. Yasmin Subject Code:4EE2-01  
Subject Name: Biology

Department: Department of Electrical Engineering (EE& EEE) SEM: IV

Total No. of Lectures Planned: 31





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| Course outcome:  CO1: To understand that Biology is as important a scientific discipline as Mathematics, Physics and Chemistry.  CO2: To understand that classification per se is not what biology is all about. The criterion, such as morphological, biochemical or ecological be highlighted. Hierarchy of life forms at phenomenological level. A common thread weaves this hierarchy.  CO3: To understand that “Genetics is to biology what Newton’s laws are to Physical Sciences” and also that all forms of life has the same building blocks and yet the manifestations are as diverse as one can imagine  CO4: To understand that without catalysis life would not have existed on earth and.the molecular basis of coding and decoding genetic information is universal.  CO5: To analyse biological processes at the reductionist level and understand that the fundamental principles of energy transactions are the same in physical and biological world. Thermodynamics as applied to biological systems |

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| Lecture No. | Unit | Topic |
| 1 | **1** | **INTRODUCTION:** Objective, scope and outcome of the course. |
| 2 | **2** | **ENERGY SCENARIO: Commercial** And Non-Commercial Energy Introduction**:** Purpose: To convey that Biology is as important a scientific discipline as Mathematics, Physics and Chemistry. Bring out the fundamental differences between science and engineering by drawing a comparison between eye and camera, Bird flying and aircraft. Mention the most exciting aspect of biology as an independent scientific discipline. Why  We need to study biology? Discuss how biological observations of 18th Century that lead to major discoveries. Examples from Brownian motion and the origin of thermodynamics by referring to the original observation of Robert Brown and Julius Mayor. These examples will highlight the fundamental importance of observations in any scientific inquiry. |
| 3 | **3** | **CLASSIFICATION:** Purpose: To convey that classification *per se* is not what biology is all about. The underlying criterion, such as morphological, biochemical or ecological be highlighted. Hierarchy of life forms at phenomenological level. A common thread weaves this hierarchy Classification. Discuss classification based on (a) cellularity- Unicellular or multicellular (b) ultrastructure prokaryotes or eucaryotes. (c) energy and Carbon utilization -Autotrophs, heterotrophs, lithotropes |
| 4 | 3 | (d) Ammonia excretion- aminotelic, uricotelic, ureotelic (e) Habitata- acquatic or terrestrial |
| 5 | 3 | organisms for the study of biology come from different groups. E.coli, S.cerevisiae, D. Melanogaster, C. elegance, A. Thaliana, M. musculus, |
| 6 | 3 | (e) Molecular taxonomy- three major kingdoms of life. A given  organism can come under different category based on classification. Model |
| 7 | **4** | **GENETICS:** Purpose: To convey that “Genetics is to biology what Newton’s laws are to Physical Sciences”. Mendel’s laws, Concept of segregation and independent assortment. |
| 8 | 4 | Concept of allele. Gene mapping, Gene interaction, |
| 9 | 4 | Epistasis. Meiosis and Mitosis be taught as a part of  genetics. Emphasis to be give not to the mechanics of cell division nor the phases but how genetic material passes from parent to offspring. |
| 10 | 4 | Concepts of recessiveness and dominance. Concept of mapping of phenotype to genes. |
| 11 | 4 | Discuss about the single gene disorders in humans. Discuss the  concept of complementation using human genetics., |
| 12 | 5 | **BIOMOLECULEs:** Purpose: To convey that all forms of life has the same building blocks and yet the manifestations are as diverse as one can imagine. Molecules of life. In this context discuss monomeric units and polymeric structures. Discuss about sugars, starch and cellulose Nucleotides and DNA/RNA. Two carbon units and lipids., |
| 13 | 5 | Amino acids and proteins. |
| 14 | 5 | Nucleotides and DNA/RNA. Two carbon units and lipids., |
| 15 | **6** | **Enzymes:** Purpose: To convey that without catalysis life would not have existed on earth. Enzymology: How to monitor enzyme catalysed reactions. |
| 16 | 6 | How does an enzyme catalyse reactions? Enzyme classification. Mechanism of enzyme action. |
| 17 | 6 | Discuss at least two examples. Enzyme kinetics and kinetic, |
| 18 | **7** | **INFORMATION TRANSFER:** Purpose: The molecular basis of coding and decoding genetic information is universal. Molecular basis of information  transfer. DNA as a genetic material. Hierarchy of DNA structure- from single stranded to double helix to nucleosomes. Define gene in terms of complementation and recombination. |
| 19 | 7 | Concept of genetic code. Universality and degeneracy of genetic code. |
| 20 | 7 | Define gene in terms of complementation and recombination. |
| 21 | **8** | **MACROMOLECULAR ANALYSIS:** Purpose: To analyse biological processes at the nreductionistic level. Proteins- structure and function. |
| 22 | 8 | Hierarch in protein structure. Primary secondary, |
| 23 | 8 | Tertiary and quaternary structure. |
| 24 | 8 | Proteins as enzymes, transporters, receptors and structural elements. |
| 25 | **9** | **METABOLISM:** Purpose: The fundamental principles of energy transactions are the same in physical and biological world. Thermodynamics as applied to biological systems. Exothermic and endothermic versus endergonic and exergonic reactions. Concept of Keq and its relation to standard free energy. Spontaneity. ATP as an energy currency |
| 26 | 9 | This should include the breakdown of glucose to CO2 + H2O (Glycolysis and Krebs cycle). |
| 27 | 9 | Synthesis of glucose from CO2 and H2O (Photosynthesis). |
| 28 | 9 | Energy yielding and energy consuming reactions. Concept of Energy charge |
| 29 | **10** | **MICROBIOLOGY:** Concept of single celled organisms. Concept of species and strains. Identification and classification of microorganisms. |
| 30 | 10 | Microscopy. Ecological aspects of single celled organisms. |
| 31 | 10 | Sterilization and media compositions. Growth kinetics. |

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| **Reference books:** Genetics and molecular biology by David r. Hyde, **McGraw Hill.**Taxonomy: The Classification of Biological Organisms by [Kristi Lew](https://www.amazon.com/s/ref=dp_byline_sr_book_1?ie=UTF8&field-author=Kristi+Lew&text=Kristi+Lew&sort=relevancerank&search-alias=books)ENZYMES: Catalysis, Kinetics and Mechanisms by N.S. Punekar, SpringerTextbook of Microbiology by C. K. Jayaram Paniker and R. Ananthanarayan  1. Textbook of Microbiology by [C.P. Baveja](https://www.amazon.in/s/ref=dp_byline_sr_book_1?ie=UTF8&field-author=C.P.+Baveja&search-alias=stripbooks) , Arya Publications  PLANT ANATOMY (PAPER-VII) & PLANT METABOLISM |