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Description generated with very high confidence

COURSE PLAN

Department : Biotechnology

Course Name and Code : Biology for Engineers, BIO1031

Semester and Branch : First semester (Chemistry Cycle)

**Couse Outcomes (COs)**

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| CO1 | The basic elements and their bonding ability, macromolecules and their structures and their role and general law of thermodynamics in biological systems. |
| CO2 | Mendel’s rules for inheritance, chromosomal theory of inheritance, relationship of Mendelian inheritance to meiosis and pedigree analysis of genetic disorder diseases. |
| CO3 | DNA as hereditary material, its replication, protein synthesis and their variation in Central Dogma for eukaryotes, prokaryotes and viruses |
| CO4 | Evolution as a tool for improvising existing life forms and few examples of evolutionary modifications |
| CO5 | Few case studies which gives insight in to overall picture of life from micro-level to macro-level and few applications in Biotechnology |

**Lesson Plan**

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| **Lecture/**  **Tutorial Number** | **Topics** | **Course outcomes addressed** |
| 1 | Introducing the topic, Elements of Life, Explanation about the important elements in any organism. Electronegativity of the element, Importance of carbon. | CO 1 |
| 2 | Different types of bonds, Some examples of different types of bonding in the biological systems, Water & phospholipid their importance in existence of life | CO 1 |
| T1 | Discussion and reasoning of alternate possible elements of life, alternate to water , compartmentalization in life as well as its architecture | CO 1 |
| 3 | Carbohydrates, ATP | CO 1 |
| 4 | Proteins and their structures. | CO 1 |
| T2 | What makes engineering structure of carbohydrates and proteins: Solving problems | CO 1 |
| 5 | Enzymes | CO 1 |
| 6 | Bioenergetics | CO 1 |
| T3 | Logical examples of how the amino acid substitution makes changes in the efficiency of ezymes, solving problems on delta G | CO 1 |
| 7 | Mendelian concept of inheritance and Logic of Mendel Monohybrid cross and segregation | CO 2 |
| 8 | Terminologies, Back cross and test cross, Dihybrid cross, Law of independent assortment, Concept of Factor for Chromosomes, concept of cell division with regard to Mendel | CO 2 |
| T4 | Problem solving on Mendelian Algorithm | CO 2 |
| 9 | Morgan’s experiment, X-linked inheritance (Concept of locating factors) | CO 2 |
| 10 | Pedigree analysis | CO 2 |
| T5 | Illustrating mode of inheritance :-Problem solving of Pedigree | CO 2 |
| 11 | Discovery of DNA - Griffith transformation experiment ,Hershey chase experiment, Chargaff’s rule | CO 3 |
| 12 | Structure of DNA, Meselson and Stahl experiment. Kornberg experiment | CO 3 |
| T6 | Interpreting the idea of complementary base pairing, What makes DNA as a material of storing information | CO 3 |
| 13 | Models of DNA replication | CO 3 |
| 14 | mRNA synthesis and processing | CO 3 |
| T7 | Solving the idea of the need of processing, interpreting why the mRNA has to go out of nucleus | CO 3 |
| 15 | Protein synthesis | CO 3 |
| 16 | Genetic code | CO 3 |
| T8 | Solving the flow of information : DNA to RNA to Protein, Constructing DNA code using protein code | CO 3 |
| 17 | Evolution as a tool of improving existing system, Concepts of Lamark and Darwin with few evidences of evolution, Symbiosis, coevolution, communal benefit, commensalism, parasitism | CO 4 |
| 18 | DNA as a tool of evolution through mutation | CO 4 |
| T9 | Solving examples of mutation: Genotype and Phenotype changes, Sickle cell anaemia | CO 4 |
| 19 | Chemical evolution:-Chlorophyll, Myoglobin, Hemoglobin, Haemocyanin, Leg hemoglobin | CO 4 |
| 20 | Vaccination | CO 4 |
| T10 | Solving problems on the logical reasoning of vaccination failure | CO 4 |
| 21 | Lac operon | CO 5 |
| 22 | Virus replication Concept of cloning | CO 5 |
| T11 | Solving problems on ascent of sap , Few examples of Virus and its logical importance | CO 5 |
| 23 | Ascent of sap-Plant water relations | CO 5 |
| 24 | Bioinspiration , Examples of Bioinspiration, how a biological concept evolved into a feasible engineering outcome | CO 5 |
| T12 | Building the ideas of Bioinspiration, Summarizing the biological concepts for engineers | CO 5 |

**References**

Sadava D, Hillis D, Heller HC and Berenbaum MR, 2011.Life, the science of Biology, 9th edition.Sinauer Associates, Inc USA. ISBN ISBN 978-1-4292-1962-4

Reece JB, Urry LA, Cain ML, Wasserman SA, Minorsky PV and Jackson RB, 20.Campbhell Biology, 9th edition, Pearson Publications, USA. ISBN-13: 978-0-321-55823-7

Johnson AT, 2010. Biology for Engineers, CRC Press Inc., USA, ISBN 9781420077636

Hall, B. and Strickberger, M.W., 2008. Strickberger's evolution.Jones & Bartlett Learning.