

INDIAN INSTITUTE OF TECHNOLOGY KHARAGPUR

1. **Name of the Academic Unit:** Bioscience and Biotechnology

2. **Subject Name:** Science of Living Systems **L-T-P: 3-0-0**

Credits: 3

3. **Pre-requisites:** None

4. **Compulsory or Elective:** Compulsory for BSBT students

5. **Level of the subject:** UG

6. **Syllabus and reference books:**

Syllabus:

Introduction to living systems and bioinspired design; Physical and chemical properties of nucleic acids; DNA as information storage material; Mechanism of copying information from DNA; Processing of genetic information: transcription and translation; Proteins: the nanomachine of life; Enzymes, the biological catalysts; enzyme kinetics, inhibitor design; brief introduction to Protein Engineering; Bioenergetics.

Introduction to different life forms: prokaryotes and eukaryotes; cellular ultrastructure and cell division; Stem cell biology and tissue engineering; Emperor of all maladies: Cancer; Introduction to neuroscience and Human Brain; Virus and viral diseases; Mechanism of host defense and vaccination; Genetic disorders and other noncommunicable diseases; Genetic engineering: basic concept and its applications.

Reference Books:

Lehninger Principles of Biochemistry (2017) by David L. Nelson, Michael Cox; WH Freeman Publishing.

Biochemistry (2023) by Jeremy M. Berg, Gregory J. Gatto Jr., Justin Hines, John L. Tymoczko, Lubert Stryer; WH Freeman Publishing.

Essential Cell Biology (2020) by Bruce Alberts, Karen Hopkin, Alexander D. Johnson, David Morgan, Martin Raff; W. W. Norton & Company.

7. Lecture-wise break-up:

Sl. No.	Topic	No. of lectures
1.	Introduction to living systems and bioinspired design	2
2.	Structures of DNA and RNA, Physical and chemical properties of nucleic acids	3
3.	DNA as information storage material; Mechanism of copying information from DNA	3
4.	Processing of genetic information: transcription and translation;	3
5.	Proteins: the nanomachine of life, understanding structure, function and folding of proteins	3
6.	Introduction to enzyme kinetics, inhibitor design; brief introduction to Protein Engineering	3
7.	Bioenergetics: understanding the energy flow through living system	3
8.	Introduction to different life forms: prokaryotes and eukaryotes	1
9.	cellular ultrastructure, cell division and cell cycle	3
10.	Stem cell biology and tissue engineering; Emperor of all maladies: Cancer	3
11.	Introduction to neuroscience and Human Brain, neurodegenerative diseases	2
12.	Understanding viruses and common viral diseases	3
13.	Mechanism of host defense and vaccination	3
14.	Genetic disorders and common noncommunicable human diseases	2
15.	Genetic engineering: basic concept and its applications	3
Total number of hours		40