INDIAN INSTITUTE OF INFORMATION TECHNOLOGY
DESIGN AND MANUFACTURING (IIITDM) KANCHEEPURAM

INTRODUCTION OF NEW COURSE

<table>
<tr><td>Course Title</td><td>Biology for Engineers</td><td>Course Code</td><td colspan="4"></td></tr>
<tr><td>Dept./ Specialization</td><td>Science and Humanities</td><td>Structure (LTPC)</td><td>3</td><td>1</td><td>0</td><td>4</td></tr>
<tr><td>To be offered for</td><td>UG</td><td>Status</td><td colspan="2">Core ☐</td><td colspan="2">Elective ■</td></tr>
<tr><td>Faculty Proposing the course</td><td>Dr. M.Monisha</td><td>Type</td><td colspan="2">New ■</td><td colspan="2">Modification ☐</td></tr>
<tr><td colspan="2">Recommendation from the DAC</td><td>Date of DAC</td><td colspan="4"></td></tr>
<tr><td>External Expert(s)</td><td colspan="6">1) Dr. Anindya Roy, Professor, Department of Biotechnology, IIT Hyderabad
2) Dr. Thenmalarchelvi Rathinavelan, Associate Professor, Department of Biotechnology, IIT Hyderabad</td></tr>
<tr><td>Pre-requisite</td><td></td><td colspan="2">Submitted for approval</td><td colspan="2">44th Senate</td></tr>
<tr><td>Learning Objectives</td><td colspan="6">The objective of the course is to provide students with a comprehensive and concise overview of biological science with emphases on its relationship with bio-engineering. This course will help engineering students to understand the inter-connection between biology and future technologies.</td></tr>
<tr><td>Learning Outcomes</td><td colspan="6">On successful completion of the course, the student will be able to:
Recognize the importance of cell structure and constituents for the development of biosensors.
Demonstrate the concept of biology and its uses in combination with technologies for the development of biomaterials, antibodies, DNA as a storage device and Organ-on-a-chip.
Molecular modelling of 3D structures of proteins and nucleic acids.</td></tr>
<tr><td>Contents of the course (With approximate break-up of hours for L/T/P)</td><td colspan="6">Introduction to basic Biology: Cell theory, cell shapes, prokaryotic and eukaryotic cell, membrane structure and function, cell communication, cell cycle, cardiovascular system, respiratory, renal, nervous system and immune system (7L+2T).

Structure and properties of biomolecules: Carbohydrates, proteins, lipids, nucleic acid (DNA and RNA) and their types, DNA as storage device, application of enzymes in industry, large scale production of enzymes by fermentation. (8L+2T).

Genes, replication of DNA, and introduction to recombinant DNA Technology: Prokaryotic gene and eukaryotic gene structure, gene replication, transcription and translation in prokaryote and eukaryote and synthesis of protein in eukaryotes, recombinant DNA technology and cloning introduction. (10L+4T).

Applications of Biotechnology: Brief introduction to production of vaccines, antibodies, basics of biosensors, biochips and biofuels, Tissue engineering and its application, transgenic plants and animals, Bioengineering (production of artificial limbs, joints and other parts of body). (10L+4T).

Fundamental concepts of bioinformatics: DNA and Protein sequence, sequence assembly, sequence comparison, biological databases, similarity searches, multiple sequence alignment, Visualizing and modelling 3D protein and DNA structures. (7L+2T).</td></tr>
<tr><td>Text Book</td><td colspan="6">1. N. A. Campbell, J. B. Reece, L. Urry, M. L. Cain and S. A. Wasserman, “Biology: A global approach”, Pearson Education Ltd, 2018.
2. Jeremy M. Berg, John L. Tymoczko and Lubert Stryer, “Biochemistry”, W.H. Freeman and Co. Ltd., 6th Ed., 2006.</td></tr>
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	3. Bioinformatics An Introduction by Ramsden Jeremy, Springer 2021.
Reference Books	1. Molecular Biology and Biotechnology by Meyers, RA, A comprehensive Desk reference (VCH publishers). 2. Lehninger Principles of Biochemistry (WH Freeman, 7th Edition, 2017) by David L. Nelson and Michael M. Cox 3. Bioinformatics: A practical guide to the analysis of genes and proteins by Baxevanis A.D. and Ouellette B.F. John Wiley & Sons, New York, ISBN: 978-0-471-47878-2