COEP TECHNOLOGICAL UNIVERSITY, PUNE
A Unitary Public University of Government of Maharashtra
(formerly College of Engineering Pune)
School of Transdisciplinary Sciences & Management
Wellesley Road, Chhatrapati Shivajinagar, Pune - 411005.

F.Y. B.Tech. (Semester I/II): Biology for Engineers (BFE)

Course Code	AS23004	**Scheme of Evaluation**	**MSE & ESE**
Teaching Plan (L-T-P-S)=TC	2-0-0-1= 2	**MID Semester**	50
Credits	2	**END Semester**	50

Syllabus:

Unit	Contents	L
01.	**Crosstalk between Biology and Engineering** a) Biologically inspired technologies: Case studies of designs in nature and inspired technologies, Biomemetics: Nature inspired material and mechanisms, Self-cleaning surfaces; Self-healing Bioconcrete, Biomining, Algorithms in nature, b) Contribution of engineering in biological domain: Contribution of Microscope, Imaging techniques, Bio-medical Instruments, Mechanisms (Ergonomics)	**4**
02.	**Organization of Living Machines** Biomolecules and manufacturing of Biopolymers: • Carbohydrates (structure-based function and engineering applications) • Lipids (structure-based function and engineering applications) • Proteins (structure-based function and engineering applications) • Nucleic Acids (structure-based function and engineering applications) Organization of life forms: Cell to organism Bioenergetics- Energy dynamics in biological system- principles of energy conservation and optimization	**8**
03.	**Analogy of biological organ/system and engineering Device/Mechanism** Organ & system: Brain & CPU, Eye & Camera, Kidney & Filtration system, Lungs & purification system, Heart & Pumping system Process: Photosynthesis & solar cells, Xylem & plumbing, Thermoregulation in human body & heat transfer in machine, Defense mechanism in organism, signaling processing in biology and electronics	**6**
04.	**Concepts in Bioengineering** Biomechanics: Mechanical properties of tissues, Prosthesis and rehabilitation Bioprinting: 3D printing of biological tissues and organ engineering and transplanting Biomaterials: Types, properties and applications Tissue Engineering: Principle, Components, Methods of Scafold synthesis, properties and applications	**6**
05.	**Application areas of Bioengineering**	**6**

	Databases & Biocomputing: Acquisition, storage, processing and transmission of biological data and its applications like PCR Bioinstrumentation: Diagnostic and Therapeutic devices Bio-medical imaging: Principle, types and examples Biosensors: Principle, types and examples Computational biology and application of Artificial Intelligence in bio-medical field	

Course outcomes:

Students will be able to

CO1: Recognize the correlation in Biology and Engineering domain
CO2: Reiterate the fundamental concepts in Biology
CO3: Compare the analogy of structure/ process with device/ mechanism
CO4: Integrate the Biological concepts in Engineering field
CO5: Appraise the applications of Biological processes through the Engineering interventions

Suggested learning resources:

1. Lehninger, A. L., Nelson, D. L., & Cox, M. M. (2000). Lehninger principles of biochemistry. New York: Worth Publishers.
2. Lewin B. (2000) Genes VII. Oxford University Press.
3. Rao CNR, et.al. Chemistry of Nanomaterials: Synthesis, Properties and Applications.
4. Eggins BR. (1006) Biosensors: An Introduction. John Wiley & Sons Publishers.
5. Palsson B.O. and Bhatia S.N. (2009) Tissue Engineering. Pearson.
6. Susan Hockfield (2019) The Age of Living Machines – How Biology Will Build the Next Technology Revolution
7. Shu Chien, Peter C Y Chen & Y C Fung (Ed.) (2000) An Introductory Text to Bioengineering. World Scientific.
8. NPTEL Course on Biology for engineers and other non-biologists (4 weeks UG Course) By Prof. G.K. Suraishkumar & Prof. Madhulika Dixit (IIT. Madras)