

PHY3022: Biomedical Engineering

Programme: B.Tech. (CSE, CCE, ECE, MME)
 Course: Core/Program/Open/HSS/Science/Math: Open

Year: III
 Credits: 3

Semester: VI
 Hours: 4

Course Context and Overview (100 words):

Biomedical Engineering is a new emerging interdisciplinary field in today's world. Lot of research work is going on throughout the world. The electrical engineers, chemical engineers, mechanical engineers as well as computer engineers have contributed a lot in the development of instruments, devices, materials, drugs used in medical technology. This course tries to give the basic knowledge of Biology, Biochemistry, Human Physiology and Biomedical engineering to the electrical and computer science engineers or more commonly called IT engineers so that they can efficiently contribute to this emerging field. Furthermore, any educated individual should have basic knowledge about human body, diet and nutrition, common degenerative and non-degenerative diseases and pathological tests.

Prerequisites Courses: None

Course Outcomes (COs):

On completion of this course, the students will have the ability to:
CO1: Engineers can fabricate some biomedical products like simple ECG device, Braille reader etc
CO2: They can make various android applications connected with medical field
CO3: They can interpret and analyze medical data using signal processing and image processing
CO4: They can make hospital and health management software
CO5: They can efficiently participate in a multidisciplinary project
CO6: They will be more informed about their own health

Course Topics:

Topics	Lecture Hours	
UNIT - I		
1. Introduction		3
1.1 What is biomedical Engineering: its Importance	1	
1.2 Important Biomedical Products	1	

1.3 Medical Terminologies, Homeostasis	1	
UNIT - II		
2. Essential Biochemistry		
2.1 Essential Chemistry : Ph, Gibb's Free Energy	2	7
2.2 Carbohydrates	1	
2.3 Lipids	1	
2.4 Proteins	1	
2.5 Nucleic acids, Protein Synthesis	1	
2.6 Diet	1	
UNIT - III		
3. Genetics		
3.1 Mendel's Law	1	3
3.2 Recombinant DNA Technology, Cloning	1	
3.3 Applications of Recombinant DNA Technology	1	
UNIT - IV		
4. Cell Biology		
4.1 Cell Biology	1	2
4.2 Cellular respiration, Krebs Cycle, Photosynthesis	2	
UNIT-V		
5. BioPhysics		
5.1 Bioelectric Phenomena	0.5	4
5.2 Membrane potential, Action Potential,	1	
5.3 Neurons, Synaptic transmission of impulses	1	
5.4 EEG, EMG, MEG, ECG (details later)	1	
UNIT-VI		
6. Human Physiology and related Biomedical Devices		
6.1 Circulatory system, Heart, ECG	3	10
6.2 Different Biomedical Devices related to heart	1	
6.3 Respiratory system and related devices	2	
6.4 Digestive system and related devices	1	
6.5 Urinary system and related devices (dialysis)	2	
6.4 Reproductive Physiology and contraceptives	1	
UNIT-VII		
7 Advanced Topics of Biomedical Engineering		
7.1 Biological Modeling	2	9
7.2 Biomechanics	1	
7.3 Biomedical Sensors	2	
7.4 Biomedical Imaging	2	
7.5 Biomaterials	1	
7.6 Biomedical Optics and lasers	1	

Textbook references (IEEE format):**Text Book:**

1. John D. Enderle, Susan M. Blanchard, Joseph D. Bronzino, *Introduction to Biomedical Engineering (Hardcover)*.
2. W. Mark Saltzman, *Biomedical Engineering*.

Reference books:

1. Campbell, Reece and Simon, *Essential Biology with Physiology*.
2. R S Khandpur, *Handbook of biomedical Instrumentation*.
3. David Hames and Nigel Hooper, *Biochemistry : Bios Instant Notes*
4. L Cromwell, F J Weibell, A A Pfeiffer, *Biomedical Instrumentation and Measurements by*

Additional Resources (NPTEL, MIT Video Lectures, Web resources etc.):**Evaluation Methods:**

Item	Weightage (%)
Quiz1	10
Quiz2	
Quiz3	
Quiz4	
Mid Term Examination	20
End Term Examination	40
Project	25
Attendance	5

Prepared By:**Last Update: 5 April, 2015**