Phy3022: Biomedical Engineering

Programme: B.Tech. (CSE, CCE, ECE, MME) Year: III Semester : 2
Course : Core/Program/Open/HSS/Science/Math : open Credits : 4 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 through out 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 name and course code)

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
C02 They can make various android applications connected with medical field
C03 They can interpret and analyze medical data using signal processing and image processing
C04 They can make hospital and heath management software
C05 They can efficiently participate in a multidisciplinary project
C06 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**		7
2.1 Essential Chemistry : Ph, Gibb's Free Energy	2	
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
3.1 Mendel's Law	1	
3.2 Recombinant DNA Technology, Cloning	1	
3.3 Applications of Recombinant DNA Technology	1	
UNIT - IV **4. Cell Biology**		2
4.1 Cell Biology	1	
4.2 Cellular respiration, Kreb Cycle, Photosynthesis	2	
UNIT-V **5. BioPhysics**		4
5.1 Bioelectric Phenomena	0.5	
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**		10
6.1 Circulatory system, Heart, ECG	3	
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**		9
7.1 Biological Modeling	2	
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. Introduction To Biomedical Engineering (Hardcover) by John D. Enderle , Susan M. Blanchard, Joseph D. Bronzino
2. Biomedical Engineering by W. Mark Saltzman

Reference books:

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

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

Evaluation Methods:

Item	Weightage
Quiz1	10
Quiz2	
Quiz3	
Quiz4	
Midterm	20

Final Examination	40
Project	25
Attendance	5

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