

Academic Course Description

BHARATH UNIVERSITY
Faculty of Engineering and Technology
Department of Electrical and Electronics Engineering

**BEE007 Bio Medical Instrumentation
Seventh Semester, (Odd Semester)**

Course (catalog) description

Discuss the internal circuitry of medical instruments and its maintenance.

Compulsory/Elective course: Elective for EEE students

Credit & Contact hours : 3 and 45 hours

Course Coordinator : Dr.S.Prakash

Instructors : Dr.S.Prakash

Name of the instructor	Class handling	Office location	Office phone	Email (domain:@bharathuniv.ac.in)	Consultation
Dr.S.Prakash	FINAL YEAR EEE	KS 304	9884302950	Prakash.eee@bharathuniv.ac.in	9.00-9.50 AM

Relationship to other courses:

Pre –requisites :BBT202 - Biology for Engineers

Assumed knowledge :The students will have a basic biology background obtained at a high school (or equivalent) level.

Syllabus Contents

UNIT I PHYSIOLOGY AND TRANSDUCERS 9

Electrophysiology: cell and its functions- Neuron-Axon-Synapse-Action Potential -Propagation of electrical impulses along the axon-Sodium pump-Salutatory condition- Electrophysiology and Cardiopulmonary systems- Respiration and nervous system and peripheral nervous system

UNIT II ELECTRO – PHYSIOLOGICAL MEASUREMENTS 9

Sensors and recorders: psychological transducer-general consideration for electronic recording systems- basic recording systems-pre amplifiers-direct writing recorders- UV recorders-electrostatic recorders-instrumentation tape recorders

UNIT III NON-ELECTRICAL PARAMETER MEASUREMENTS 9 Modem

imaging systems: X- ray machines and computed Tomography-magnetic resonance imaging systems--ultrasonic imaging systems-medical thermography-electron microscope

UNIT IV MEDICAL IMAGING AND PMS 9

Diagnostic equipments: electrocardiograph-electroencephalograph-electromyograph-blood flow meters-blood gas analyzers-computer applications in medical field- ultrasonic equipments-bio telemetry-transmission of physiological data

UNIT V ASSISTING AND THERAPEUTIC EQUIPMENTS

9

Therapeutic equipments: pace makers- defibrillators-dialysers-surgical diathermy machines-laser applications-physiotherapy and electrotherapy equipments

Text book(s) and/or required materials

1. Arumugam M. 'BioMedical Instrumentation', Anumdhaa Agencies, 1992
2. Gedders L.A. and Baker L.E. 'principles of Applied Bio- Medical instrumentation', John Wiley, 1989

Reference Books:

- R1. Bertill Jacobson and John G. Webster 'Medical and clinical Engineering' Prentice Hall India, 1977
- R2. Gedders L.A and Baker L.E 'principles of applied Bio- medical instrumentation', John Wiley-Interscience, 3rd Edition, 1989.

Computer usage: Matlab

Professional component

General	-	0%
Basic Sciences	-	0%
Engineering sciences & Technical arts	-	0%
Professional subject	-	0%
Non major elective	-	100%

Broad area :Electrical Machines| Electronics | Power System| **Control &Instrumentation**

Test Schedule

S. No.	Test	Tentative Date	Portions	Duration
1	Cycle Test-1	August 1 st week	Session 1 to 14	2 Periods
2	Cycle Test-2	September 2 nd week	Session 15 to 28	2 Periods
3	Model Test	October 2 nd week	Session 1 to 45	3 Hrs
4	University Examination	TBA	All sessions / Units	3 Hrs.

Mapping of Instructional Objectives with Program Outcome

Discuss the internal circuitry of medical instruments and its maintenance.	Correlates to program outcome		
	H	M	L
1. Describe the physiology and anatomy of human system		a,b,c,e,g,j,l	k
2. Recognize the technical concepts and operation of medical instrumentation	a,c,e	k,l	
3. With widespread use and requirements of medical instruments, this course gives knowledge of the principle of operation and design of biomedical instruments.	d	a,e,g	
4. It attempts to render a broad and modern account of biomedical instruments	a,d	b,e,j	
5. It gives the introductory idea about human physiology system which is very important with respect to design consideration		b,c,e,k,l	j

H: high correlation, M: medium correlation, L: low correlation

Draft Lecture Schedule

S.NO	Topics	Problem solving (Yes/No)	Text / Chapter
UNIT I PHYSIOLOGY AND TRANSDUCERS			
1.	Electrophysiology: cell and its functions	No	[T ₁]
2.	Action Potential	No	
3.	Propagation of electrical impulses along the axon	No	
4.	Sodium sump	No	
5.	Salutatory condition	No	
6.	Electrophysiology and Cardiopulmonary systems	No	
7.	Respiration system	No	
8.	nervous system	No	
9.	peripheral nervous system	No	
UNIT II ELECTRO – PHYSIOLOGICAL MEASUREMENTS			
10.	Sensors and recorders	No	[T ₁] [R ₂]
11.	psychological transducer	No	
12.	general consideration for electronic recording systems	No	
13.	pre amplifiers	No	
14.	direct writing recorders	No	
15.	UV recorders	No	
16.	Electrostatic recorders	No	
17.	Instrumentation tape recorders	No	
18.	Review of unit II	No	
III NON-ELECTRICAL PARAMETER MEASUREMENTS			
19.	Modern imaging systems	No	[T ₁] [R ₁]
20.	x-ray machines and computed tomography	No	
21.	Magnetic resonance imaging	No	
22.	Ultra sonic imaging systems	No	
23.	Medical thermography	No	
24.	Electron microscope	No	

25.	Review of Unit III	No	
26.	Surprise Test	No	
UNIT IV MEDICAL IMAGING AND PMS			
27.	Introduction to Diagnostic equipments	No	[T ₁] [R ₂] [T ₂]
28.	Electrocardiograph	No	
29.	electroencephalograph	No	
30.	electromyograph	No	
31.	Blood flow meters	No	
32.	Blood gas analyzed	No	
33.	Computer applications field	No	
34.	Ultrasonic equipments	No	
35.	Bio telemetry transmission of physiological data	No	
36.	Review of Unit IV		
UNIT V assisting and therapeutic equipments			
37.	Therapeutic equipments	No	[T ₁] [R ₁] [T ₂]
38.	defibrillators	No	
39.	dialysers	No	
40.	Surgical diathermy machines	No	
41.	Later application	No	
42.	Physiotherapy,	No	
43.	electrotherapy		
44.	electrotherapy		
45.	Review of unit V		

Teaching Strategies

The teaching in this course aims at establishing a good fundamental understanding of the areas covered using:

- Formal face-to-face lectures
- Tutorials, which allow for exercises in problem solving and allow time for students to resolve problems in understanding of lecture material.
- Laboratory sessions, which support the formal lecture material and also provide the student with practical construction, measurement and debugging skills.
- Small periodic quizzes, to enable you to assess your understanding of the concepts.

Evaluation Strategies

Cycle Test – I	-	5%
Cycle Test – II	-	5%
Model Test	-	10%
Assignment	-	5%
Attendance	-	5%
Final exam	-	70%

Prepared by:
Dr.S.Prakash

Dated :

Addendum**ABET Outcomes expected of graduates of B.Tech / EEE / program by the time that they graduate:**

- a) An ability to apply knowledge of mathematics, science, and engineering fundamentals.
- b) An ability to identify, formulate, and solve engineering problems.
- c) An ability to design a system, component, or process to meet the desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability.
- d) An ability to design and conduct experiments, as well as to analyze and interpret data.
- e) An ability to use the techniques, skills, and modern engineering tools necessary for engineering practice.
- f) An ability to apply reasoning informed by the knowledge of contemporary issues.
- g) An ability to broaden the education necessary to understand the impact of engineering solutions in a global, economic, environmental, and societal context.
- h) An ability to understand professional and ethical responsibility and apply them in engineering practices.
- i) An ability to function on multidisciplinary teams.
- j) An ability to communicate effectively with the engineering community and with society at large.
- k) An ability in understanding of the engineering and management principles and apply them in project and finance management as a leader and a member in a team.
- l) An ability to recognize the need for, and an ability to engage in life-long learning.

Program Educational Objectives**PEO1: PREPARATION**

Electrical Engineering Graduates are in position with the knowledge of Basic Sciences in general and Electrical Engineering in particular so as to impart the necessary skill to analyze and synthesize electrical circuits, algorithms and complex apparatus.

PEO2: CORE COMPETENCE

Electrical Engineering Graduates have competence to provide technical knowledge, skill and also to identify, comprehend and solve problems in industry, research and academics related to power, information and electronics hardware.

PEO3: PROFESSIONALISM

Electrical Engineering Graduates are successfully work in various Industrial and Government organizations, both at the National and International level, with professional competence and ethical administrative acumen so as to be able to handle critical situations and meet deadlines.

PEO4: SKILL

Electrical Engineering Graduates have better opportunity to become a future researchers/ scientists with good communication skills so that they may be both good team-members and leaders with innovative ideas for a sustainable development.

PEO5: ETHICS

Electrical Engineering Graduates are framed to improve their technical and intellectual capabilities through life-long learning process with ethical feeling so as to become good teachers, either in a class or to juniors in industry.

Course Teacher	Signature
Dr.S.Prakash	

Course Coordinator
(Dr.S.Prakash)

HOD/EEE
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