

Academic Course Description

<p>BHARATH UNIVERSITY Faculty of Engineering and Technology Department of Electrical and Electronics Engineering</p> <p>BBM405 Bio Sensors And Transducers Seventh Semester,(Odd Semester)</p>

Course (catalog) description

1. Understand the purpose of measurement, the methods of measurements, errors associated with measurements.
2. Know the principle of transduction, classifications and the characteristics of different transducers and study its biomedical applications

Compulsory/Elective Course: Elective for EEE students

Credit hours : 3 credits 45 hours

Course Coordinator : Mr. Vijayaragavan

Instructors : Ms. Venkateswari

Name of the instructor	Class handling	Office location	Office phone	Email (domain: @bharathuniv.ac.in)	Consultation
Ms. Venkateswari	final year EEE	KS 101	04422290125		9.00-9.50 AM

Relationship to other courses:

Pre-requisites : BBT202 - Biology For Engineers

Assumed knowledge : Understand and demonstrate the ability to apply the basic concepts of calculus and linear algebra Understand and demonstrate the ability to apply the basic concepts of probability and statistics Write elementary computer codes using the statistical programming language R Apply the basic concepts of mathematics, statistics and computing to simple biological problems.

Syllabus Contents

UNIT I SCIENCE OF MEASUREMENT 9
 Units and Standards - calibration methods - static calibration - classification of errors, error analysis - statistical methods - odds and uncertainty.

UNIT – II CHARACTERISTICS OF TRANSDUCERS 9
 Static characteristics - accuracy, precision, sensitivity, linearity etc - mathematical model of transducers - zero first - order and second - order transducers - response to impulse step, ramp and sinusoidal inputs.

UNIT – III VARIABLE RESISTANCE TRANSDUCERS**9**

Principle of operation, construction details, characteristics and applications of resistance potentiometers, strain gauges, resistance thermometers, thermistors, hot-wire anemometer, piezoresistive sensors and humidity sensors.

UNIT - IV BIOSENSORS - PHYSIOLOGICAL RECEPTORS - J RECEPTORS 9

Chemoreceptors, Baroreceptors, Touch receptors, Biosensors - Working Principle and Types, Applications.

UNIT - V OTHER TRANSDUCERS**9**

Piezoelectric transducers, magnetostrictive transducer, IC sensor digital transducers - smart sensor - fibre optic transducers.

Text book(s) and/or required materials

Doebelin. E. O, Measurement Systems, McGraw Hill Book Co. 1998
 Renganathan S, Transducer Engineering, Allied Publishers, Chennai,2000.
https://www1.ethz.ch/lbb/Education/Biosensors/Lecture_1_overview.pdf

Computer usage:**Professional component**

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

Broad area :**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

Instructional Objectives	Correlates to program outcome		
	H	M	L
1. Understand the purpose of measurement, the methods of measurements, errors associated with measurements. 2. Know the principle of transduction, classifications and the characteristics of different transducers and study its biomedical applications		a,b,c,e,g,j,l	k
1. Describe the purpose and calibration methods.		a,b,c,e,g,j,l	k
2. To study the basic characteristics of transducers	a,c,e,	k,l	
3. Know the principle of transduction, classifications and the characteristics of different transducers and study its biomedical applications	c,	a,e,g,	
4. Remember and understand the concepts, types, working and practical applications of important biosensors	a,d,	b,e,j	
5. Know some of the commonly used biomedical transducers		b,c,e,k,l	j

S.NO	Topics	Problem solving (Yes/No)	Text / Chapter
UNIT I SCIENCE OF MEASUREMENT			
			T1,T2
1.	Units and standards	yes	
2.	Calibration methods	yes	
3.	Statics calibration	Yes	
4.	Classification of errors	Yes	
5.	Error analysis	Yes	
6.	Statistical methods	Yes	
7.	Odds and uncertainty	Yes	
8.	Odds and uncertainty	Yes	
9.	Analysis		
UNIT II CHARACTERISTICS OF TRANSDUCERS			
10.	Static characteristics	No	T1,T2
11.	Accuracy,precision,sensitivity	No	
12.	Mathematical model of transducers	Yes	
13.	Zero first order and second order	No	
14.	Order transducer	No	
15.	Response to impulse step	No	
16.	Ramp and sinusoidal inputs	No	
17.	Input Modulation Problems	Yes	
18.	Testing Analysis	Yes	
UNIT III VARIABLE RESISTANCE TRANSDUCERS			
19.	Principle of operation	NO	T1,T2
20.	Construction details	NO	
21.	Characteristics and application of resistance	No	
22.	potentiometers	no	
23.	Strain guages	no	
24.	Resistance thermometers	no	
25.	thermistors	no	
26.	Hot wire aneometer	no	
27.	Humidity sensors, Practical	no	
UNIT IV biosensors –physiological receptors –j receptors			
28.	chemoreceptors	NO	
29.	baroreceptors	NO	
30.	Touch receptor	NO	

31.	Bio sensors	NO	T1,T2
32.	Working principle and types	NO	
33.	Applications in medical field	NO	
34.	J RECIPTORS	NO	
35.	Physiological receptors	NO	
36.	Problem Solving, Sensor application	YES	
UNIT V OTHER TRANSDUCERS			
37.	Piezoelectric transducer	NO	T1,T2
38.	Magnetostrictive transducer	NO	
39.	Ic sensor digital transducer	NO	
40.	Smart sensor	NO	
41.	Fibre optic transducers	NO	
42.	Fibre optic transducers		
43.	Application of transducer		
44.	Application of transducer		
45.	Reall time aplications	NO	

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

Draft Lecture Schedule

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:
Mr.Vijayaragavan

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.

BBM 405-Bio Sensors And Transducer

Course Teacher	Signature
Mr.Vijayaragavan	

Course Coordinator
(Mr.Vijayaragavan)

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