

Academic Course Description

BHARATH UNIVERSITY
 Faculty of Engineering and Technology
 Department of Electrical and Electronics Engineering
BEE605 Measurement And Instrumentation
Six Semester (Even Semester)

Course (catalog) description

To make the student have a clear knowledge of the basic laws governing the operation of the instruments, relevant circuits and their working, Introduction to general instrument system, error, calibration etc

Credit hours & contact hours : 3 & 45 hours

Course Coordinator : Mr.S.P.Vijayaragavan

Instructors : Ms. G. Hemavathi

Name of the instructor	Class handling	Office location	Office phone	Email (domain:@bharathuniv.ac.in)	Consultation
Ms. G. Hemavathi	Third year EEE	KS 302	04422290125	Vijayaragavan.eee@bharathuniv.ac.in	12.30-1.30 PM

Relationship to other courses:

Pre –requisites : Control System

Assumed knowledge : Basic Knowledge In Analog And Digital Electronics

Following courses : Fibre Optics and Laser Instrumentation, Process control Engineering, Micro Electro Mechanical Systems

Syllabus Contents

UNIT I INTRODUCTION 9

Functional elements of measurement system – static characteristics – static calibration – accuracy, precision, resolution, linearity, dynamic, characteristics – performance characteristics of zero first, second order system – error in measurement.

UNIT II SENSORS AND TRANSDUCER 9

Basic requirement of sensors – classification of sensors – resistive, inductive and capacitive transducers – LVDT, piezoelectric, thermoelectric, optical and digital transducer – transducers application in force, torque, level, flow, pressure, speed, and temperature measurement – PH electrode – photoelectric transducer..

UNIT III SIGNAL CONDITIONING SYSTEM AND BRIDGE CIRCUIT 9

Bridges – instrumentation amplifier – operational amplifier – buffer amplifier – differential amplifier – active filter, V/F and F/V converters, PLL, sample and hold circuit, A/D and D/A converters, function generators, multiplexing and de-multiplexing system, data acquisition system.

UNIT IV ELECTRICAL AND ELECTRONICS MEASUREMENT AND TELEMETRY

9

Principle of ammeter and voltmeter – digital voltmeter – energy meter – wattmeter – current – voltage and position telemetry system – AC telemetry – wattmeter – current, voltage and position telemetry system – AC system

UNIT V INPUT – OUTPUT DEVICES AND DISPLAYS

9

Seven segment display – LED, LCD, mixie tube, alphanumeric display – CRT, CRO – Magnetic tape recorder – digital printer – X-Y recorder.

Text book(s) and/or required material

1. Doebeline, E.O., “Measurement Systems – Application and Design”, McGraw Hill Publishing compeney, 1990.
2. H.S. Kalsi, “Electronic instrumentation”, Tata McGraw Hill Co., 1995.
3. Shawney A.K., “Electronic Instrumentation”, Dhanpat Rai & Sons, New Delhi, 2008.
4. Moorthy.D.V.S, ”Tranducers and Instrumentation”, Prentice Hall of India Pvt Ltd 1995.

Reference Books:

1. Stout M.B., ‘Basic electric Measurement, Prentice Hall of India. 1986
2. Dalley, J.W. Riely, W.F and Meconnel, K.G., “Instrumentation for Engineering Measurement”, John Wiley & Sons, 1993 J.B Gupta, Measurements and Instrumentation”.
3. http://nptel.iitg.ernet.in/courses/Elec_Engg/IIT%20Bombay/Electrical%20and%20Electronic%20Measurements.htm

Computer usage: NIL

Professional component

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

Broad area :Electrical Machines/Electronics/Power system/**Control &Instrumentation.**

Test Schedule

S. No.	Test	Tentative Date	Portions	Duration
1	Cycle Test-1	February 2nd week	Session 1 to 18	2 Periods
2	Cycle Test-2	March 2 nd week	Session 15 to 36	2 Periods
3	Model Test	April 3rd week	Session 1 to 45	3 Hrs
4	University Examination	TBA	All sessions / Units	3 Hrs.

Mapping of Instructional Objectives with Program Outcome

To make the student have a clear knowledge of the basic laws governing the operation of the instruments, relevant circuits and their working, Introduction to general instrument system, error, calibration etc.	Correlates to program outcome		
	H	M	L
1. Gain the knowledge of measuring various electrical and non electrical parameters.	b,d	A,e,g,l,j,l	C,f,h,k
2. Know the working and functions of Transducers and advanced sensors.	A,b,d,i	E,g,j,l	C,f,h,k
3. Gain the knowledge in digital measurement and data acquisition system.	A,b,d,e,i	C,f,g,j,l	H,k
4. Ability to measure frequency, phase with Oscilloscope.	A,b,d,e,i	C,f,g,j,l	H,k
5. Ability to measure strain, displacement, Velocity, Angular Velocity, temperature, Pressure, Vacuum and Flow	A,b,d,e,i	C,f,g,j,l	H,k

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

Draft Lecture Schedule

S.NO	Topics	Problem solving (Yes/No)	Text / Chapter
UNIT I INTRODUCTION			
1.	Functional Elements Of Measurement System	No	[T1][R1]
2.	Functional Elements Of Measurement System	No	
3.	Static Characteristics	No	
4.	Static Calibration	No	
5.	Accuracy, Precision	No	
6.	Resolution, Linearity, Dynamic, Characteristics	No	
7.	Performance Characteristics Of Zero First	No	
8.	Second Order System	Yes	
9.	Error In Measurement.	Yes	
UNIT II SENSORS AND TRANSDUCER			
10.	Basic requirement of sensors	No	[T1][T4]
11.	classification of sensors	No	
12.	resistive, inductive and capacitive transducers	No	
13.	LVDT ,piezoelectric, thermoelectric	No	
14.	optical and digital transducer	No	
15.	transducers application in force	No	
16.	torque, level, flow, pressure, speed	Yes	
17.	temperature measurement	Yes	

18.	PH electrode – photoelectric transducer.		
UNIT III SIGNAL CONDITIONING SYSTEM AND BRIDGE CIRCUIT			
19.	Bridges – instrumentation amplifier	No	[T1][T2]
20.	operational amplifier	No	
21.	buffer amplifier – differential amplifier	No	
22.	active filter, V/F and F/V converters,	No	
23.	PLL, sample and hold circuit	No	
24.	A/D and D/A converters,	No	
25.	function generators	No	
26.	multiplexing and de-multiplexing system	Yes	
27.	data acquisition system.		
UNIT IV ELECTRICAL AND ELECTRONICS MEASUREMENT AND TELEMETRY			
28.	Principle of ammeter and voltmeter	No	[T1][T2][T3]
29.	digital voltmeter	No	
30.	energy meter	No	
31.	wattmeter	No	
32.	current	No	
33.	voltage and position telemetry system	No	
34.	AC telemetry– wattmeter – current	No	
35.	voltage and position telemetry system	No	
36.	AC system	No	
UNIT V INPUT – OUTPUT DEVICES AND DISPLAYS			
37.	Seven segment display	No	[T1][T2][R3]
38.	Seven segment display	No	
39.	LED, LCD, mixie tube	No	
40.	LED, LCD, mixie tube	No	
41.	alphanumeric display	No	
42.	CRT, CRO	No	
43.	Magnetic tape recorder	No	
44.	digital printer	No	
45.	X-Y recorder.	No	

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	-	05%
Cycle Test – II	-	05%
Model Test	-	10%
Attendance	-	05%
SEMINAR&ASSIGNMENT	-	05%
Final exam	-	70%

Prepared by:Mr.S.P.Vijayaragavan

Date:

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
Ms. G. Hemavathi	

Course Coordinator
Mr.S.P.Vijayaragavan

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