

Academic Course Description

<p>BHARATH UNIVERSITY</p> <p>Faculty of Engineering and Technology</p> <p>Department of Electronics and Communication Engineering</p> <p>BEI406 Electronic Instrumentation</p> <p>Fourth Semester, 2016-17 (Even Semester)</p>
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Course (catalog) description

This course will introduce industrial instrumentation as used for troubleshooting, process measurements and process control. Specifically, the course will discuss measurement terminology, differentiating between analog and digital, describe the instrumentation used for electronic testing and develop the principles of operation of transducers used for industrial process measurement and control.

Compulsory/Elective course : Compulsory for ECE students

Credit & contact hours : 3 & 45

Course Coordinator : Mr.D. Sridhar Raja, Assoc. Professor, Department of ECE

Instructors :

Name of the instructor	Class Handling	Office location	Office phone	Email (domain: @bharathuniv.ac.in)	Consultation
Mr.D. Sridhar Raja	II ECE	SA 006			12.45 – 1.15 PM
Ms. Mohanraj	II ECE	SA 006		mohanraj.ece@bharathuniv.ac.in	12.45 – 1.15 PM

Relationship to other course

Pre-requisites : BEE101-Basic Electrical & Electronics Engineering

Assumed knowledge : Basic Knowledge In Analog And Digital Electronics

Following courses : BEI 601-Control Systems

Syllabus Contents

UNIT 1 TRANSDUCERS

9 HOURS

Measurements, Instrumentation, Errors in measurements, Calibration and standard, Classification and characteristics of Transducers, Digital, Electrical, Electronic Weighing System, AC / DC Bridge measurement and their applications.

UNIT 2 SIGNAL GENERATOR AND SIGNAL ANALYZER

9 HOURS

A.F. Generator, Pulse Generator, AM/FM Signal generator, Function generator, Sweep frequency generator, wave analyzers, Spectrum Analyzers, Logic Analyzers, Distortion Analyzers.

UNIT 3 DIGITAL INSTRUMENTS

9 HOURS

Digital Voltmeters and Multimeters, Automation in Voltmeters, Accuracy of DVM, Guarding Techniques, frequency, period, time interval and pulsewidth measurements, automatic vector voltmeter.

UNIT 4 DATA DISPLAY AND RECORDING SYSTEM

9 HOURS

CRO, single beam, dual trace, double beam CRO, Digital storage and Analog storage Oscilloscope, sampling Oscilloscope, Power scope, Curve Tracer, Analog, Digital Recorders and Printers.

UNIT 5 COMPUTER CONTROLLED TEST SYSTEM

9 HOURS

Testing and Audio amplifier, Testing a Radio Receiver, Instrument used in Computer Controlled Instrumentation, Digital Control Description, Microprocessor based measurements, Isolation and safety standards of Electronic equipments, Case studies in Instrumentation.

TOTAL 45 HOURS

TEXT BOOK

[T1] Rangan C.S., " Instrumentation Devices and Systems ", Tata McGraw Hill,1998.

[T2] Cooper, " Electronic Instrumentation and Measurement Techniques ", Prentice Hall of India, 1988.

REFERENCES

[R1] H.S.Kalsi, "Electronic Instrumentation", Tata Mc Graw-Hill Education, 2004.

[R2] J.B.Gupta, "Measurements and Instrumentation", S K Kataria & Sons, Delhi, 2003.

[R3] Oliver and Cage, " Electronic Measurements and Instrumentation ", McGraw Hill, 1975.

[R4] <https://www.nptel.ac.in>

Computer usage: Nil

Professional component

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

Broad area : Communication | Signal Processing | Electronics | VLSI | Embedded

Test Schedule

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

Mapping of Instructional Objectives with Program Outcome

To learn the basic concepts and definitions in measurement, bridge configurations and their applications, importance of signal generators and analyzers in measurements. This course emphasizes:	PROGRAM OUTCOMES		
	H	M	L
1. Recognize the evolution and history of units and standards in Measurements.	-	b	-
2. Identify the various parameters that are measurable in electronic instrumentation.	a,c	e,h,i	f
3. Employ appropriate instruments to measure given sets of parameters	c,d	a,b,h,j	-
4. Practice the construction of testing and measuring set up for electronic systems.	a,,c,d,e	h	-
5. To have a deep understanding about instrumentation concept which can be applied to control systems.	-	d,j	i
6. Relate the usage of various instrumentation standards	a,f	-	b,j

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

Draft Lecture Schedule

Session	Topics	Problem Solving (Yes/No)	Text / Chapter
UNIT 1 TRANSDUCERS			
1.	Measurements	No	[T1] chapter-1,2 [R1]chapter-1
2.	Instrumentation	No	
3.	Errors in measurements	No	
4.	Calibration and Standards	Yes	
5.	Classification and Characteristics of transducers	No	
6.	Digital Weighing System	Yes	
7.	Electrical Weighing System	Yes	
8.	Electronic Weighing System	Yes	
9.	AC/DC Bridge Measurement and their applications	Yes	
UNIT 2 SIGNAL GENERATOR AND SIGNAL ANALYZERS			
10.	A.F. Generator	Yes	[T1] chapter –12,19 [T1] chapter-8,9
11.	Pulse Generator	Yes	
12.	AM/FM Signal Generator	Yes	
13.	Function Generator	Yes	
14.	Sweep frequency generator	Yes	
15.	wave analyzers	Yes	
16.	Spectrum Analyzers	Yes	
17.	Logic Analyzers	Yes	
18.	Distortion Analyzers	Yes	
UNIT 3 DIGITAL INSTRUMENTS		Problem	
19.	Digital Voltmeters	Yes	[T1] chapter –19 [R1] chapter – 8,9
20.	Digital Multimeters	Yes	
21.	Automation in Voltmeters	Yes	
22.	Accuracy of DVM	Yes	
23.	Guarding Techniques	No	
24.	Frequency, period measurements	Yes	
25.	Single Mode lasers, Modulation of Laser Diodes	No	
26.	Temperature effects, Introduction to Quantum laser	No	
27.	Fiber amplifiers	No	
UNIT 4 DATA DISPLAY AND RECORDING SYSTEM			
28.	CRO	No	[T1] chapter–19 [R1] chapter–12
29.	Single beam CRO	No	
30.	Dual trace CRO	No No	
31.	Double beam CRO	No	
32.	Digital storage Oscilloscope	No	

33.	Analog storage Oscilloscope	No	
34.	Sampling Oscilloscope	No	
35.	Power scope, Curve Tracer	No	
36.	Analog, Digital Recorders and Printers	No	
UNIT 5 COMPUTER CONTROLLED TEST SYSTEM			
37.	Introduction to computer controlled test system	No	[T2] chapter– 13
38.	Testing an Audio amplifier	No	
39.	Testing a Radio Receiver	No	
40.	Instrument used in Computer Controlled Instrumentation	No	
41.	Digital Control Description	No	
42.	Microprocessor based measurements	No	
43.	Isolation and safety standards of Electronic Equipment	No	
44.	Case studies in Instrumentation	No	
45.	PC based data acquisition system	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	-	5%
Cycle Test – II	-	5%
Model Test	-	10%
Assignments/Seminar/online test/quiz	-	5%
Attendance	-	5%
Final exam	-	70%

Prepared by: Mr.D. Sridhar Raja, Assoc. Professor, Department of ECE

Dated :

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

- a) An ability to apply knowledge of mathematics, science, and engineering
- b) An ability to design and conduct experiments, as well as to analyze and interpret data
- c) An ability to design a hardware and software system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability
- d) An ability to function on multidisciplinary teams
- e) An ability to identify, formulate, and solve engineering problems
- f) An understanding of professional and ethical responsibility
- g) An ability to communicate effectively
- h) The broad education necessary to understand the impact of engineering solutions in a global, economic, environmental, and societal context
- i) A recognition of the need for, and an ability to engage in life-long learning
- j) A knowledge of contemporary issues
- k) An ability to use the techniques, skills, and modern engineering tools necessary for engineering practice.

Program Educational Objectives**PEO1: PREPARATION**

Electronics Engineering graduates are provided with a strong foundation to passionately apply the fundamental principles of mathematics, science, and engineering knowledge to solve technical problems and also to combine fundamental knowledge of engineering principles with modern techniques to solve realistic, unstructured problems that arise in the field of Engineering and non-engineering efficiently and cost effectively.

PEO2: CORE COMPETENCE

Electronics engineering graduates have proficiency to enhance the skills and experience to apply their engineering knowledge, critical thinking and problem solving abilities in professional engineering practice for a wide variety of technical applications, including the design and usage of modern tools for improvement in the field of Electronics and Communication Engineering.

PEO3: PROFESSIONALISM Electronics Engineering Graduates will be expected to pursue life-long learning by successfully participating in post graduate or any other professional program for continuous improvement which is a requisite for a successful engineer to become a leader in the work force or educational sector.

PEO4: SKILL

Electronics Engineering Graduates will become skilled in soft skills such as proficiency in many languages, technical communication, verbal, logical, analytical, comprehension, team building, interpersonal relationship, group discussion and leadership ability to become a better professional.

PEO5: ETHICS

Electronics Engineering Graduates are morally boosted to make decisions that are ethical, safe and environmentally-responsible and also to innovate continuously for societal improvement.

Course Teacher	Signature
Mr.D.Sridhar Raja	
Mr.Mohanraj	

Course Coordinator

HOD/ECE