



University of Kerala

Discipline	PHYSICS				
Course Code	UK4SECPHY200				
Course Title	BASIC INSTRUMENTATION SKILLS				
Type of Course	SEC				
Semester	IV				
Academic Level	200 - 299				
Course Details	Credit	Lecture per week	Tutorial per week	Practical per week	Total Hours/Week
	3	2 Hrs	-	2 Hr	4 Hrs
Pre-requisites					
Course Summary	This course provides students with a comprehensive understanding of key concepts and practical skills in instrumentation. It will help the students to emerge with a solid foundation in instrumentation, equipped with the knowledge and skills needed to design experiments, collect and analyze data, and effectively communicate their findings in various settings.				

BOOKS FOR STUDY:

1. Kalsi H.S. *Electronic Instrumentation*, (2nd ed.), New Delhi: Tata McGraw Hill publishing.
2. Cooper W.D. and Helfrick A.D. (2008). *Electronic Instrumentation and Measuring Techniques*, (3rd ed.), New Delhi: PHI.
3. Salivahanan S., Suresh Kumar N. (2012). *Electronic Devices and Circuits*, (3rd ed.), New Delhi: Tata McGraw Hill Education Private Limited.
4. Kishore K.L. (2010). *Electronic measurements and Instrumentation*, Delhi: Pearson.
5. Sedha R.S. (2013). *Electronic Measurements and Instrumentation*, S. Chand Publishing.

BOOKS FOR REFERENCE:

1. Principles of Electronics, Malvino A.P, 7th Edition, Tata McGraw Hill (2011).
2. Principles of Electronics, Mehta V. K. (11th ed.), S. Chand & Co. (2014).
3. Anand M.M.S. (2009. *Electronic Instruments and Instrumentation Technology*, PHI Learning).

DETAILED SYLLABUS: THEORY

Module	Unit	Content	Hrs	CO No
I	Measurements and basic components		8	CO
	1	Qualities of measurements- Static characteristics- instrument, measurement, accuracy, resolution, precision, expected value, sensitivity. Book : 1, Chapter 1	1	1
	2	Significant figures. Types of error. Book : 2, Chapter 1	2	1
	3	Passive components- resistors, types (names only), colour coding of resistors, Connecting resistors-resistors in series, resistors in parallel, capacitors, types of capacitors (names only), Connecting capacitors - capacitors in series, capacitors in parallel, inductors, types of inductors (names only), diodes, zener diode Book : 3, Chapter 2,5	3	1
	4	Bipolar Junction Transistors, Transistor biasing(basic ideas only), transistor as an amplifier, IC - Introduction Book : 3:Chapter 6,19	2	1
II	Digital and analog meters		4	
	5	DC ammeter, multirange ammeter, DC voltmeter, multirange voltmeter, Loading Book : 1, Chapter 3,4	2	1
	6	Digital voltmeter, Types of Digital voltmeter, Advantages of Digital voltmeter, Digital Multimeter, Features of Basic Digital Multimeter, Block diagram of Digital Multimeter, Advantages Book :5, Chapter 6	2	1
III	Function Generators and CRO		6	
	7	Types of Signal Generators -Sine, square and Triangular wave (basic ideas only) Book : 4, Chapter 2	2	2

	8	Block diagram of basic CRO, Types of CRO probes, Applications of CRO Book : 4, Chapter 4	2	2
	9	Digital CRO, Block diagram of a digital CRO, CRO probes Book : 4, Chapter 5	2	2
	LEDs and LCDs		6	
IV	10	Light Emitting Diode (LED), Advantages and Disadvantages of LED, Applications of LED, Multicolour LEDs Book : 5, Chapter 12	3	3
	11	Liquid Crystal Displays, Advantages and Disadvantages of LCD, Applications of LCD, comparison between LED and LCD Book : 5, Chapter 12	3	3
	Transducers		6	
V*	12	Transducers, Classification of transducers, Active and Passive Transducers, Requirements of a good Transducer, Characteristics of a Transducer, Selection of Transducer, Book : 5, Chapter 14	2	3
	13	Resistive transducer, Inductive transducer, Capacitive transducer (basics only), Advantages and Disadvantages of Capacitive transducer. Book : 5, Chapter 14	2	3
	14	Photoelectric transducers, Piezoelectric transducer. Book : 3, Chapter 21	2	3

DETAILED SYLLABUS: PRACTICALS

Part A – At least 5 Experiments to be performed		CO No
Sl No	Name of Experiment	
1	Identify the measuring equipments and their functioning (Multimeter, voltmeter, ammeter)	4
2	Identifying and measuring the values of the passive components	4
3	Test the circuits with active and passive components	4
4	Make a two-socket electric extension board.	4

5	Observe the loading effect of a multimeter while measuring voltage across a low resistance and high resistance.	4
6	Design and construction of variable dc power supply (0-12V) using diodes, capacitors and IC 7812	4
7	Study the operation of Multimeters (Analog and Digital)	4
8	Measurement of voltage, frequency, time period and phase angle using CRO.	4
9	Measurement of rise, fall and delay times using a CRO	4
10	Study the operation of Signal Generator, Regulated Power Supplies, CRO.	4
Part B* – At least One Experiment to be performed		
11	LED bulb assembling	4
12	LED tube assembling	4
13	Familiarization with basic transducers	4
14	Measurement of speed using photoelectric transducers	4

COURSE OUTCOMES

No.	Upon completion of the course the graduate will be able to	Cognitive Level	PSO addressed
CO-1	Recognize the fundamental concepts of measurement and identify basic components and systems used in analog circuits	R, U	PSO-1,5
CO-2	Explain the functioning of measurement devices, function generators and CROs	R, U	PSO-1,5
CO-3	Describe the fundamental concepts of transducers, LEDs, LCDs and their applications	R, U	PSO-1,5, 7
CO-4	Apply basic analog devices to form simple circuits and evaluate its performance	Ap	PSO-1, 2, 6, 7

R-Remember, U-Understand, Ap-Apply, An-Analyse, E-Evaluate, C-Create

Name of the Course: BASIC INSTRUMENTATION SKILLS

Credits: 2:0:1 (Lecture: Tutorial: Practical)

CO No.	CO	PO / PSO	Cognitive Level	Knowledge Category	Lecture (L)/ Tutorial (T)	Practical (P)
CO-1	Recognize the fundamental concepts of measurement and identify basic components and systems used in analog circuits	PO-1/ PSO-1,5	R, U	F,C	L	-
CO-2	Explain the functioning of measurement devices, function generators and CROs	PO-1,3/ PSO-1,5	R, U	C, P	L	-
CO-3	Describe the fundamental concepts of transducers, LEDs, LCDs and their applications	PO-1,3/ PSO-1,5,7	R, U	C, P	L	-
CO-4	Apply basic analog devices to form simple circuits and evaluate its performance	PO-1,2,3,4/ PSO-1,2,5,6,7	Ap	C, P	L	P

F-Factual, C- Conceptual, P-Procedural, M-Metacognitive

Mapping of COs with PSOs and POs :

	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6	PSO 7	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8
CO-1	1	-	-	-	3	-	-	1	-	-	-	-	-	-	-
CO-2	1	-	-	-	3	-	-	1	-	1	-	-	-	-	-
CO-3	1	-	-	-	3	-	2	1	-	1	-	-	-	-	-
CO-4	1	2	-	-	3	1	2	1	2	1	1	-	-	-	-

Correlation Levels:

Level	-	1	2	3
Correlation	Nil	Slightly / Low	Moderate / Medium	Substantial / High

Assessment Rubrics:

- Quiz / Assignment/ Discussion / Seminar
- Midterm Exam
- Programming Assignments
- Final Exam

Mapping of COs to Assessment Rubrics:

CO No	Internal Exam	Assignment	Project Evaluation	End Semester Examinations
CO-1	✓	✓	-	✓
CO-2	✓	✓	-	✓
CO-3	✓	✓	-	✓
CO-4	-	✓	-	-