

Basic Electronics

2 credits (2-0-0)

Electronic Components, Sources and Measuring Equipments, Electronic Devices – Diodes and Transistors, Amplifiers and Oscillators, Digital Logics, Principles of Measurement and Analysis, Sensors and Sensing Mechanism

Course code	Basic Electronics	L	T	P	C
ECExxxx		2	0	0	2
Pre-requisite	Nil	Syllabus version			
		V. XX.XX			
Course Objectives					
1. To introduce the students to the basic concepts of electronic components, sources, measurements and instrumentation.					
2. To apply the inculcated knowledge for developing simple circuits using various electronic components and devices					
3. To familiarize the students with the basic concepts of number system and digital logics.					
4. To analyse the concepts associated with multiple sensors and its sensing mechanism.					
Course Outcome					
Students will be able to					
1. Understand the basic electronic components, sources and measuring equipments					
2. Comprehend the characteristics Diode, Transistors and its applications					
3. Design and analyse the amplifiers and oscillators					
4. Design and implement a simple digital circuits					
5. Analyse the performance metrics of the measurement systems.					
6. Comprehend the basic concept of various sensors and its sensing mechanism.					
Module:1	Electronic Components, Sources and Measuring Equipments	3 hours			
Evolution of Electronics – Impact of Electronics in Industry and Society – Familiarization of Resistors, Capacitors, Inductors – Colour Coding – types and specifications, – Electro-mechanical components – Relay and Contactors – Regulated Power supply, Function Generator – Multimeter - CRO					
Module:2	Junction Diodes	4 hours			
Intrinsic and extrinsic semiconductors – doping - PN Junctions, Formation of Junction, Physical operation of diode, Barrier Potential, I - V Characteristics, Rectifiers, Zener diode – I-V Characteristics, Zener diode as Voltage regulator.					
Module:3	Transistors	5 hours			
Bipolar Junction Transistor (BJT) - Device structure and physical operation, Concept of CB, CE and CC Configuration, Transistor as a Switch, - Metal-Oxide Field Effect Transistor (MOSFET) - Device Structure, mode of operation and Characteristics, MOSFET configurations (CS, CD, CG).					
Module:4	Amplifiers and Oscillators	4 hours			
BJT as an amplifier (CE configuration), MOSFET as an amplifier (CS configuration), Feedback concept, Oscillators - Barkhausen's criteria for sustained oscillation, RC Phase Shift Oscillator, LC Oscillator.					
Module:5	Digital Logics	4 hours			
Number systems, conversion of bases, Boolean algebra, Logic Gates, Concept of universal gate, Simplification and implementation of Boolean functions.					
Module:6	Principles of Measurement and Analysis	3 hours			
Units and standards, Errors, Functional Elements of a Measurement System and Instruments, Applications and Classification of Instruments, Types of measured Quantities, Measures of					

Dispersion, Sample deviation and sample mean, Calibration and standard.			
Module:7	Sensors and Transducers		5 hours
Sensor fundamentals and characteristics - General concepts and terminology of measurement systems, Sensors and transducers - Classification of sensors, Static and dynamic characteristics Principle of Resistive Sensors, Capacitive Sensors, Inductive Sensors, Magnetic sensors, Optical sensor, Self-generating Sensors			
Module:8	Contemporary issues		2 hours
Lecture by Industry Experts			
	Total Lecture hours:		30 hours
Text Book(s)			
1.	A. P. Malvino, D. J. Bates, Electronic Principles, 2017, 7/e, Tata McGraw-Hill.		
2	Albert D. Helfrick and William D. Cooper, “Modern Electronic Instrumentation and Measurement Techniques”, 2016, First Edition, Pearson Education, Noida, India.		
Reference Books			
1.	David A Bell, Electronic Devices and Circuits, Oxford Press, 5 th Edition, 2008		
2	Robert L. Bolysted and Louis Nashelsky, Electronic Devices and Circuit Theory, Prentice Hall of India, 11th Edition, 2017		
3	D. Patranabis – Sensor and Transducers (2e) Prentice Hall, New Delhi, 2003		
4	A.K. Sawhney, Puneet Sawhney, A Course In Electrical And Electronic Measurements And Instrumentation, Dhanpat Rai & Co., 2015		
Mode of Evaluation: Internal Assessment (CAT, Quizzes, Digital Assignments) & FAT			
Recommended by Board of Studies		08-07-2021	
Approved by Academic Council		No. 62	Date 15-07-2021

Study of electronic components and measuring equipments, Characteristics and Applications of Diodes and transistors, Digital logic functions and gates, Performance metrics of measurement systems and characteristics of various sensors

Course code	Basic Electronics Lab	L	T	P	C
ECExxxx		0	0	2	1
Pre-requisite	Nil	Syllabus version			
		V. XX.XX			
Course Objectives					
1. To familiarize the various characteristics of Diodes and transistors					
2. To understand the concept of digital logic functions and verify its truth tables					
3. To familiarize the performance metrics of measurement systems and characteristics of various sensors					
Course Outcome					
Students will be able to					
1. Analyse the various characteristics and applications of Diodes and transistors					
2. Design logic circuits using logic gates and verify their truth tables					
3. Measure the physical parameters using different transducers					
Experiments					
1	Identify, mark the terminal and find the value of a particular component from the given group of electronic components, Study of electronic measurement devices (Multimeter, DSO, function generator)				4 hours
2	V-I Characteristics of PN Junction diode and Zener diodes				2 hours
3	Half Wave and Full Wave Rectifier circuits				2 hours
4	Zener Diode as a voltage regulator				2 hours
5	Characteristics of BJT in Common Emitter Configuration				2 hours
6	Characteristics of MOSFET in Common Source Configuration				2 hours
7	Frequency response of BJT single stage amplifier				2 hours
8	Study of the signal generation using RC Phase shift Oscillator				2 hours
9	Study of logic gates and implementation of Boolean functions				4 hours
10	Strain gauge sensors for measurement of normal strain.				2 hours
11	Displacement measurement using LVDT and LDR.				2 hours
12	Temperature measurement using RTD, Thermistor and Thermocouple.				4 hours
Total Laboratory Hours					30 hours
Mode of assessment: Continuous assessment / FAT / Oral examination and others					
Recommended by Board of Studies		08-07-2021			
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