FUNDAMENTALS OF ELECTRICAL & ELECTRONICS ENGINEERING

Sl No	Unit skill set (In cognitive domain) *On successful completion of the class, the students will be able to*	Topics/Sub topics	Practical	
		UNIT-1 **Electrical Safety**		
1	Comply with the Electrical safety	1. Electrical Symbols 2. Electrical safety • Identify Various types of safety signs and what they mean • Demonstrate and practice use of PPE • Demonstrate how to free a person from electrocution • Administer appropriate first aid to victims, bandaging, heart attack, CPR, etc. • Fire safety, causes and precautionary activities. • Use of appropriate fire extinguishers on different types of fires. • Demonstrate rescue techniques applied during fire hazard, correct method to move injured people during emergency • Inform relevant authority about any abnormal situation http://nreeder.com/Flash/sym	1. Electrical symbols related to electrical engineering. 2. Electrical safety	
		bols.htm http://bouteloup.pierre.free.fr/iufm/as/de/house/safety.html		
		UNIT-2 **Electrical Fundamentals**		

2	1. Identify and select the different measuring devices. 2. Identify different electrical supply systems 3. Identify open circuit, close circuit and short circuit conditions.	1. Describe the sources of electrical energy. 2. Electrical current, voltage, emf, potential difference, resistance with their SI units. 3. Mention the meters used to measure different electrical quantities. 4. Explain supply systems like AC, DC. 5. Describe open circuit, close circuit and short circuit http://nreeder.com/Flash/units.htm	1. Identification of measuring devices. 2. Measure current, voltage and analyses the effects of shorts and opens in series/parallel circuits.	
3	Calculate basic electrical quantities	• Behavior of V, I in Series and Parallel DC circuits. • Relationship between V, I and R. http://nreeder.com/Flash/ohmsLaw.htm	1. Measure the voltage and current against individu al resistance in electrical circuit. 2. Compare the theoretical values with actual in the circuit.	
4	Connect resistances in different combination	1. Equation to find the Resistances connected in series 2. Equation to find Resistances connected in parallel series and 3. Resistances connected parallel combinations 4. Simple problems.	1. Determine the equivalent Resistance of series connected resistances. 2. Determine the equivalent Resistance of parallel connected resistances.	
5	Calculate and measurement of different parameters of an AC quantity.	**Ac sinewave: S**inusoidal voltage, current, amplitude, time-period, cycle, frequency, phase, phase difference, and their units. http://nreeder.com/Flash/freqPeriod.htm http://nreeder.com/Flash/oscilloscope.htm	Demonstrate the measure ment of frequency, time period and phase difference of AC quantity using CRO and function generator.	

6	1. Calculate and measure electric power and energy 2. Identify and differentiate Single phase and Three phase supply	1. Electrical work, energy, power and power factor • SI units • Mention the meters used to measure them 2. Single phase and Three phase supply http://nreeder.com/Flash/powerLaw.htm	• Measure the voltage, current, power and energy using relevant measuring instruments in a single-phase load. • Compare the theoretical values with actual in the circuit. • Measure the voltages in Single phase and Three phase supply.	
UNIT-3 **Protective Devices and Wiring circuit s**				
7	Identify and select Protective Devices for given current and voltage rating	1. Necessity of Protective Devices 2. Various Protective devices and their functions • fuse wire, • Glass cartridge fuse • HRC fuse • Kit-kat fuse • MCB • MCCB • RCCB • ELCB • Relay 3. Earthing • Types • Pipe earthing • Plate earthing	1. Identification and Selection of various prot ective devices 2. Inspection of their instal lation in the college buil ding/public building.	
8	Identify and select the various electrician tools	1. Different types of electrician tools and their function. 2. Describe various wiring tools. 3. State procedure of care and maintenance of wiring tools.	Identification and selection of different tools.	

9	1. Identify and select Wiring systems for a given applications 2. Identify and select the cables used for different current and voltage ratings. 3. Draw the wiring diagram	1. Describe different types of wiring systems. • Surface conduit • concealed conduit • PVC casing capping 2. Wiring systems and their applications. 3. Describe the types of wires, cables used for different current and voltage ratings.	1. Identification and selection of different Wiring systems. 2. Wire up and test PVC Conduit wiring to control of 2 sockets and 2 lamps. 3. Wire up and test PVC Conduit wiring to control one lamp from two different places.	
10	Estimate and plan electrical wiring	Explain Plan and estimate the cost of electrical wiring for one 3m × 3m room consisting of 2 lamps, 1ceiling fan, 2 three pin sockets.	Prepare the estimation and plan	
UNIT-4 **Electrical Machines and Batteries and UPS**				
11	1. Identify the types of transformer. 2. verify the transformation ratio.	**Transformer** • working principle • Transformation ratio • Types and applications with their ratings	Connect the Single- phase transformer as Step-Up, Step-Down transformer and verify the transformation ratio.	
12	1. Start and run the induction motor. 2. Troubleshoot DOL/Stardelta starter and induction motor	1. **Induction motor** • Types Induction motor and applications • Difference between single and three phase motors • Necessity of starters for AC motors • Describe different types of starters and applications 2. What are different causes and remedies for a failure of starter and induction motor.	1. Construct a suitable circuit to start and reverse the direction of three phase induction motor using DOL/ Stardelta starter. 2. Troubleshoot the DOL/S tar-delta starter and induction motor	
13	Select and test the battery for a given application	**Battery** • Types of batteries (Lead acid battery, lithium, sealed maintenance free (SMF) battery, Modular battery). • Selection criteria of batteries for different applications. • Ampere-Hour Capacity. • Efficiency	Testing Condition of a Lead-acid battery	

14	Select the size of the UPS for a given application	**UPS** • List the types and applications • Selection criteria of UPS • Sizing of UPS	Sizing of UPS	
UNIT-5 **Introdu ction to Electronic Devices and Digital Electronics**				
15	Identify and differentiate Conductors, insulators and semiconductors.	Compare Conductors, insulators and semiconductors with examples http://nreeder.com/Flash/resistor. htm	Identification of types and values of resistors-color codes. Determine the value of resistance by color code and compare it with multimeter readings.	
16	Identify and test PN junction Diode	**PN junction diode** • Symbol • Characteristics • Diode as switch. • Types of diodes and ratings • Applications	Identify the terminals of a Diode and test the diode for its condition.	
17	Build and test bridge rectifier circuit	**Rectifier** • Need for AC to DC conversion • Bridge rectifier with and without C filter, • Rectifier IC.	Construct and test bridge rectifiers using semiconductor diode and rectifier IC. Compare the waveforms using CRO.	
18	1. Identify and test Transistor 2. Build and test transistor as an electronic switch	**Transistor (BJT)** • Symbol • Structure • Working principle	1. Identification of transistor terminals and test. 2. Construct and test the transistor as an electronic switch	
19	1. Identify and test various Sensors and actuators.	**1.Sensors** • Concept • Types: Temperature, Pressure, Water, Light, Sound, Smoke, proximity Sensors, Flow, humidity, voltage, vibration, IR (Principle/working, ratings/ specifications, cost, and applications) **2.Actuators** • Concept • Types and applications.	1. Connect and test an IR proximity sensor to a Digital circuit. 2. Connect and test a relay circuit using an Optocoupler. (Photo Diode & Transistor)	

		• Relay as an actuator.		
20	1. Identify and test different digital IC	• Comparison of analog and digital signal • Digital systems, examples. • Binary numbers, Boolean identities and laws. • Digital system building blocks: Basic logic gates, symbols and truth tables. • IC-Definition and advantages.	• Test a Digital IC. • Identification and selection of suitable ICs for basic gates. • Verify NOT, AND, OR, NOR, EXOR and NAND gate operations (two inputs).	
21	Know the application of Microcontroller and PLC	• Microcontroller as a programmable device, and list of real-world applications. • PLC and Their applications.	• Identify different application microcontroller. • Identify commercially available PLC and their specifications	

FUNDAMENTAL OF ELE. & ELECTRONICS PRATICAL

Sl. No.	Practical Out Comes/Practical exercises
1	1. Collect/draw standard prominent electrical symbols related to electrical engineering. 2. Identify Various types of safety signs and what they mean
2	• Identify Various types of safety signs and what they mean • Demonstrate and practice use of PPE • Demonstrate how to free a person from electrocution • Administer appropriate first aid to victims, bandaging, heart attack, CPR, etc. • Fire safety, causes and precautionary activities. • Use of appropriate fire extinguishers on different types of fires. • Demonstrate rescue techniques applied during fire hazard, correct method to move injured people during emergency • Inform relevant authority about any abnormal situation
3	1.Identification Measuring devices • Ammeter • Voltmeter • Wattmeter • Ohmmeter • Digital Multimeter • Megger • Tong tester 2. Measure current, voltage and analyses the effects of shorts and opens in series / parallel circuits.
4	Measure the voltage and current against individual resistance in electrical circuit. Compare the theoretical values with actual in the circuit.
5	1. Determine the equivalent Resistance of series connected resistances. 2. Determine the equivalent Resistance of parallel connected resistances.
6	Demonstrate the measurement of frequency, time period and phase difference of AC quantity using CRO and function generator.
7	Measure the voltage, current, power and energy using relevant measuring instruments in a Single-phase load. Compare the theoretical values with actual in the circuit. Measure the voltages in Single phase and Three phase supply.

8	1.Identification and selection of various protective devices. • HRC fuse • Kit kat fuse • MCB • MCCB • RCCB • ELCB • Relay Videos/Presentations/Discussion on different protective devices. 2.Inspection of their installation in the college building/public building.
9	Identification and selection of different tools. Handson use of the tools for appropriate applications. Combination plier, Cutting Plier, Nose plier, screw driver set, line tester, Poker, Hand Drill, Power Drill, Concrete Drill, Megger, Earth tester, Continuity tester, crimping tool, wire cutter, Wire splicer, wire stripper standard wire gauge, soldering iron, wooden mallet, ball pin hammer, testing board
10	1.Identification and selection of different tools. Handson use of the tools for appropriate applications. Surface conduit • concealed conduit • PVC casing capping 2.Wire up and test PVC Conduit wiring and practice control of 2 sockets and 2 lamps.
11	Wire up and test PVC Conduit wiring to control one lamp from two different places.
12	Plan and estimate the cost of electrical wiring for one 3mx3m room consisting of 2 CFL 1ceiling fan, 2 three pin sockets.
13	Connect the Single- phase transformer as Step-Up, Step-Down transformer and verify the transformation ratio.
14	Construct a suitable circuit to start and reverse the direction of three phase induction motor using DOL/star-delta starter.
15	Troubleshoot the DOL/Star-delta starter and induction motor
16	Testing Condition of a Lead-acid battery
17	Estimate the UPS rating for a computer lab with 50 computers/domestic.
18	1.Identification of types and values of resistors-color codes. 2.Determine the value of resistance by color code and compare it with multimeter readings
19	Identify the terminals of a Diode and test the diode for its condition.

20	Construct and test bridge rectifiers using semiconductor diode and rectifier IC. Compare the waveforms using CRO.
21	Identification of transistor terminals and test. Construct and test the transistor as an electronic switch.
22	Connect and test anIR proximity sensor to a Digital circuit.
23	Connect and test a relay circuit using an Optocoupler. (Photo Diode & Transistor)
24	Test an IC. Verify the truth-table AND, OR, NOT logic gates.
25	Verify the truth-table NAND, NOR, EX-OR, EX-NOR logic gates.
26	1.Identify MCS-51 variants 2.Identify commercially available PLC and their specifications.