ELECTRONICS WORKSHOP PRACTICE   **Course Code : 312008**

Programme Name/s	**: Automation and Robotics/ Digital Electronics/ Electronics & Tele-communication Engg./ Electrical and Electronics Engineering/ Electronics & Communication Engg./ Electronics Engineering/ Instrumentation & Control/ Industrial Electronics/ Instrumentation/ Medical Electronics/ Electronics & Computer Engg.**
Programme Code	**: AO/ DE/ EJ/ EK/ ET/ EX/ IC/ IE/ IS/ MU/ TE**
Semester	**: Second**
Course Title	**: ELECTRONICS WORKSHOP PRACTICE**
Course Code	**: 312008**

I. RATIONALE

Engineering Diploma holders in Electronics and Allied branches expected to identify and test various Components, Switches, Relays, Connectors, Cables, Network cables and must be able to Solder and De solder SMD components.

II. INDUSTRY / EMPLOYER EXPECTED OUTCOME

The aim of this course is to help students to attain the following industry/employer expected outcome through various teaching learning experiences: Identification and Testing of various electronic components.

III. COURSE LEVEL LEARNING OUTCOMES (COS)

Students will be able to achieve & demonstrate the following COs on completion of course based learning

- CO1 - Use ESD accessories and safety systems for electronic equipment
- CO2 - Test various electronic components using relevant equipment
- CO3 - Identify various parts of SMPS, UPS, perform soldering and desoldering of SMD components
- CO4 - Identify various types of Switches, Relays, Connectors, Cables, Network and Data cables
- CO5 - Use of sensors for various parameters,

IV. TEACHING-LEARNING & ASSESSMENT SCHEME

Course Code	Course Title	Abbr	Course Category/s	Learning Scheme					Credits	Assessment Scheme											Total Marks
				Actual Contact Hrs./ Week			SLH	NLH		Paper Duration	Theory				Based on LL & TL				Based on SL		
															Practical						
				CL	TL	LL					FA-TH	SA-TH	Total		FA-PR		SA-PR		SLA		
											Max	Max	Max	Min	Max	Min	Max	Min	Max	Min	
312008	ELECTRONICS WORKSHOP PRACTICE	EWP	SEC	-	-	4	2	6	3	-	-	-	-	-	25	10	25@	10	25	10	75

Total IKS Hrs for Sem. : Hrs

Abbreviations: CL- ClassRoom Learning , TL- Tutorial Learning, LL-Laboratory Learning, SLH-Self Learning Hours, NLH-Notional Learning Hours, FA - Formative Assessment, SA -Summative assessment, IKS - Indian Knowledge System, SLA - Self Learning Assessment

Legends: @ Internal Assessment, # External Assessment, *# On Line Examination , @$ Internal Online Examination

Note :

1. FA-TH represents average of two class tests of 30 marks each conducted during the semester.
2. If candidate is not securing minimum passing marks in FA-PR of any course then the candidate shall be declared as "Detained" in that semester.
3. If candidate is not securing minimum passing marks in SLA of any course then the candidate shall be declared as fail and will have to repeat and resubmit SLA work.
4. Notional Learning hours for the semester are (CL+LL+TL+SL)hrs.* 15 Weeks
5. 1 credit is equivalent to 30 Notional hrs.
6. * Self learning hours shall not be reflected in the Time Table.

7. * Self learning includes micro project / assignment / other activities.

V. THEORY LEARNING OUTCOMES AND ALIGNED COURSE CONTENT

Sr.No	Theory Learning Outcomes (TLO's)aligned to CO's.	Learning content mapped with Theory Learning Outcomes (TLO's) and CO's.	Suggested Learning Pedagogies.
1	TLO 1.1 Follow safety practices TLO 1.2 Use of ESD Accessories TLO 1.3 List various protection devices	**Unit - I Safety Measures** 1.1 Electro Static Discharge (ESD): Introduction, Causes 1.2 ESD Accessories 1.3 Types of Fuses, rating of fuses 1.4 Introduction and Use of: MCB, ELCB, MCCB	Teacher input Demonstration in laboratory and using videos
2	TLO 2.1 Describe the use of Front panel controls on CRO/ DSO TLO 2.2 Describe the use of Front panel controls on Function Generator TLO 2.3 Plot the Characteristics of Multicolor LED TLO 2.4 State the need of Q factor TLO 2.5 Explain the procedure of Testing of PCB and Transformer TLO 2.6 State the need of Optocoupler TLO 2.7 List Various Tools involved in testing	**Unit - II Electronic Component Testing** 2.1 CRO/DSO: Various Controls on Front panel, Use for Testing of components 2.2 Function Generator: Various Controls on Front panel, Generation of different waveforms 2.3 LEDs: Multicolor LED testing 2.4 LCR Q meter: Introduction, Need of Q factor , Determination of Q factor 2.5 Testing: PCB connectivity, Transformer, Pulse Transformer 2.6 Introduction to Opto coupler, Fiber Optic Cable: Connectivity test 2.7 Various Tools: Wire cutter, wire stripper, screwdrivers, testers, IC plucker	Teacher input Demonstration in laboratory
3	TLO 3.1 Describe the block diagram of SMPS TLO 3.2 List the types of UPS TLO 3.3 Use of Temperature controlled soldering iron for SMD components	**Unit - III SMPS, UPS and Soldering Desoldering** 3.1 SMPS: Introduction, Various Blocks, observe waveforms at output of each block 3.2 UPS: Introduction, Types- offline, online, UPS ratings, relation between KVA rating and battery backup 3.3 SMD Soldering: Introduction, Soldering of SMD components 3.4 DeSoldering of SMD components	Teacher input Hands on practice Demonstration video
4	TLO 4.1 Classify the various types of connectors TLO 4.2 List the various types of relays TLO 4.3 List the applications of various types of switches TLO 4.4 Explain the procedure of setting up a network using network cables	**Unit - IV Connectors, Relays, Switches and Network cables** 4.1 Connectors: Need, Types and Identification 4.2 Relays: Need, Types and Identification 4.3 Switches: Need, Types and Identification 4.4 Cables: Need, Types and Identification 4.5 Network cables: Types and connection	Teacher input Hands on practice Demonstration video
5	TLO 5.1 Classify various types of Sensors TLO 5.2 Describe the operation of LDR TLO 5.3 Describe the operation of Hygrometer TLO 5.4 Describe the operation	**Unit - V Sensors** 5.1 Sensors: Introduction, Temperature sensors, Motion sensors, Proximity sensors, LDR, Humidity sensor [Hygrometer] 5.2 LDR Operation and specifications 5.3 Humidity sensor Hygrometer Operation and selection factors	Teacher input Hands on practice Demonstration video

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Sr.No	Theory Learning Outcomes (TLO's)aligned to CO's.	Learning content mapped with Theory Learning Outcomes (TLO's) and CO's.	Suggested Learning Pedagogies.
	of temp sensor IC	5.4 Temperature sensor IC characteristics	

VI. LABORATORY LEARNING OUTCOME AND ALIGNED PRACTICAL / TUTORIAL EXPERIENCES.

Practical / Tutorial / Laboratory Learning Outcome (LLO)	Sr No	Laboratory Experiment / Practical Titles / Tutorial Titles	Number of hrs.	Relevant COs
LLO 1.1 Identification of various ESD safety accessories and their applications	1	* Use various ESD safety accessories	2	CO1
LLO 2.1 Identify various types of fuses, fuse carriers, MCB, ELCB and MCCB with ratings	2	* Use various types of protection devices	2	CO1
LLO 3.1 Operate the CRO and use various controls on front panel	3	* Identify the controls of CRO/ DSO	2	CO2
LLO 4.1 Operate CRO/DSO in component testing mode LLO 4.2 Test the passive components R , L and C using CRO/DSO LLO 4.3 Test the active components Diode , Transistor using CRO/DSO	4	*Component testing using CRO	2	CO2
LLO 5.1 Operate the function generator and use various controls on front panel	5	Identify the controls of function generator	2	CO2
LLO 6.1 Generate square/sine/triangular wave of specified frequency and amplitude and observe on CRO/DSO	6	* Generate the different types of waveform by using function generator on CRO/DSO	2	CO2
LLO 7.1 Identify the single colour and multi colour LED. LLO 7.2 Test multicolor LED using DMM and D C power supply.	7	* Testing of multi colour LEDS	2	CO2
LLO 8.1 Set LCR Q meter for Quality factor measurement LLO 8.2 Measure Q of given L using LCR Q meter LLO 8.3 Measure Q of given C using LCR Q meter	8	*Determine Q factor of given component by using LCR Q meter	2	CO2
LLO 9.1 Test the continuity of printed track on a PCB using multi- meter	9	* Use of continuity tester	2	CO2
LLO 10.1 Measure the input and output voltage of transformer	10	Testing of transformer	2	CO2
LLO 11.1 Identify the various types of capacitors LLO 11.2 Determine its value of capacitor by color code LLO 11.3 Interpret the value of capacitor by reading information printed on it.	11	Determine the value of capacitor .	2	CO2
LLO 12.1 Observe input output wave forms of given pulse transformer	12	*Testing of pulse transformer	2	CO2
LLO 13.1 Identify opto electronic devices LLO 13.2 Plot transfer transfer characteristics of the Optocoupler	13	Opto electronic devices	2	CO2
LLO 14.1 Identify type of fiber optic cable LLO 14.2 Set up analog link to test optic cable connectivity	14	*Optical Fiber analog link	2	CO2
LLO 15.1 Identify the various tools: wire cutter, wire stripper, screwdrivers, testers, IC plucker used in electronics laboratories	15	* Electronic workshop tools	2	CO2

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Practical / Tutorial / Laboratory Learning Outcome (LLO)	Sr No	Laboratory Experiment / Practical Titles / Tutorial Titles	Number of hrs.	Relevant COs
LLO 15.2 Use appropriate tool for given application				
LLO 16.1 Identify various parts of SMPS LLO 16.2 Measure output voltage of SMPS	16	* Switch Mode Power Supply (SMPS).	2	CO3
LLO 17.1 Identify various types of UPS LLO 17.2 Measure the output voltage of UPS	17	Uninterrutable power supply (UPS).	2	CO3
LLO 18.1 Use of temperature controlled soldering iron for SMD components soldering	18	* Soldering the SMD component on the PCB	2	CO3
LLO 19.1 Use of appropriate desoldering tool for desoldering of SMD components from PCB	19	* Desolder the SMD component from the PCB	2	CO3
LLO 20.1 Find out various tools available with PCB layout software LLO 20.2 Prepare PCB layout for given discrete component circuit by using relevant PCB layout software	20	* Use of PCB layout software	2	CO3
LLO 21.1 Identify various types of connectors: USB type A, B, C, Lightning type, USB mini and micro connectors	21	* USB connectors	2	CO4
LLO 22.1 Identify various types of relays: Rotary, Reed, Solid state, Remote control and voltage stabilizer relays LLO 22.2 Select relay for given application	22	* Types of relays	2	CO4
LLO 23.1 Identify various types of switches: Toggle, Rotary, Slider, Lever, Micro switches, Thumbwheel, Piano, Tactile switches LLO 23.2 Select appropriate switch for given application.	23	*Types of switches.	2	CO4
LLO 24.1 Identify type of cables: RCA, HDMI, display port cable LLO 24.2 Select appropriate cable for given applications	24	* Types of cables	2	CO4
LLO 25.1 Identify the computer network cable LLO 25.2 Test network cable: CAT5, CAT6 Cable, using cable tester LLO 25.3 Prepare cable for network connection using crimping tools,	25	* Computer Networking Cables	4	CO4
LLO 26.1 Identify various temperature sensors such as RTD, Thermocouple, Thermistor and IC based temperature sensors, LLO 26.2 Plot the characteristics of temperature sensor IC LM335	26	* Temperature sensor	2	CO5
LLO 27.1 Use of hair hygrometer to measure humidity or use any other sensor (related to program) and measure the parameter	27	Use of hair hygrometer / other sensor	2	CO5
LLO 28.1 Configure local and network printer	28	Install local and network printer by applying various types of configuration settings	2	CO5
LLO 29.1 Take a print of a signal from DSO by connecting it to a printer.	29	* Interface DSO to a printer	2	CO5
LLO 30.1 Configure the scanner and printer LLO 30.2 Identify various faults of printers	30	Configure scanner and Printer	4	CO5

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Practical / Tutorial / Laboratory Learning Outcome (LLO)	Sr No	Laboratory Experiment / Practical Titles / Tutorial Titles	Number of hrs.	Relevant COs
Note : Out of above suggestive LLOs - • '*' Marked Practicals (LLOs) Are mandatory. • Minimum 80% of above list of lab experiment are to be performed. • Judicial mix of LLOs are to be performed to achieve desired outcomes.				

VII. SUGGESTED MICRO PROJECT / ASSIGNMENT/ ACTIVITIES FOR SPECIFIC LEARNING / SKILLS DEVELOPMENT (SELF LEARNING)

Micro project

- Assemble switch board with two switches
- Build a BJT based amplifier circuit and observe the output waveform
- Design a PCB layout by using relevant software for discrete or IC based components
- Design a relay based circuit to turn ON and OFF the LED

Assignment

- Prepare a report on various ESD and safety accessories by visiting a nearby industry
- Prepare a comparative chart for different types of printers
- Prepare report on electronic system maintenance tools

Note :

- Above is just a suggestive list of microprojects and assignments; faculty must prepare their own bank of microprojects, assignments, and activities in a similar way.
- The faculty must allocate judicial mix of tasks, considering the weaknesses and / strengths of the student in acquiring the desired skills.
- If a microproject is assigned, it is expected to be completed as a group activity.
- SLA marks shall be awarded as per the continuous assessment record.
- For courses with no SLA component the list of suggestive microprojects / assignments/ activities are optional, faculty may encourage students to perform these tasks for enhanced learning experiences.
- If the course does not have associated SLA component, above suggestive listings is applicable to Tutorials and maybe considered for FA-PR evaluations.

VIII. LABORATORY EQUIPMENT / INSTRUMENTS / TOOLS / SOFTWARE REQUIRED

Sr.No	Equipment Name with Broad Specifications	Relevant LLO Number
1	ESD equipment: ESD Table Mat Color: BLUE Material: antistatic Thickness: 2mm Mat Size: Can be provide as per requirement Pattern: Plain Length: 2M X 15M Shape: Roll 2m X 15m,can be provided in As per requirement Usage: ESD protection	1,2
2	Pulse transformer: core volume of 2.57x10 -4 m 3 average gap between layers of 0.002 m, 14 turns primary circuit, 108 turns secondary, 30 kV of secondary voltage, 1.5 k output impedance level	12
3	Clamp meters: AC current (50/60 Hz) real effective value Sector / accuracy 200 AAC / ±2.5% + 8 digits DC current Sector / accuracy 200 ADC / ±2.0% + 5 digits Testing AC voltage (50/60Hz) real effective value 600 VAC ±(1.5% + 8 digits) Testing DC voltage 600 VDC ±(1.5% + 2 digits) Ohms 999.9 ? ±(1.5% + 8 digits) Illumination of measurement point white LEDs Diameter of the conductor maximum of 18mm Display backlit LCD with 3 2/3 positions Power 2 AAA batteries	12,16,17
4	Opto Coupler : Test voltage for Isolation is 5000VRMS Max collector current allowed by a transistor is 100mA I/O coupling capacitance is below 0.5pF Current Transfer Ration/	13

Sr.No	Equipment Name with Broad Specifications	Relevant LLO Number
	CTR is 10% I/O isolation voltage is 500VRMS Typical Rise & Fall Time: 3us Forward Voltage of an IR LED ranges from 1.2V to 1.5V Max voltage across C&E terminals of a phototransistor is70V The Forward Current of an IR LED ranges from 10mA to 80mA Max Reverse Current of IR LED is 10uA Max Reverse Voltage of IR LED i	
5	opto-isolators : withstand input-to-output voltages up to 10 kV and voltage transients with speeds up to 25 kV/?s	13
6	SMPS: Electrical Characteristics 12V, 20A 1. Input Voltage 100 - 270V AC 2. Output Voltage 12 V DC 3. Output Current 20A 4. Leakage Current @ 230 V ac < 2mA 5. Line regulation < 1% 6. Load regulation < 1% 7. Ripple content 150mV p-p 8. Dielectric strength: Between Input & Output 2 kV AC Between Input & Earth 1.5kV AC Between Output & Earth 1.5kV AC	16
7	UPS Specifications : UPS mode Mains AC LOW Cut 170+/- 5V Mains AC LOW Cut recovery 175+/- 5V Mains AC HIGH Cut 265+/- 5V Mains AC LOW Cut recovery 260+/- 5V INVERTER mode Mains AC LOW Cut 120+/- 5 V Mains AC LOW Cut recovery 125+/- 5 V Mains AC HIGH Cut 285+/- 5 V Mains AC HIGH Cut recovery 280+/- 5 V	17
8	Temperature controlled soldering Gun: Accurate and advanced temperature Control with micro controller technology User-friendly operation. Set / Read of temperature Increase and Decrease of keys to set temperature once set the read temperature will display after two seconds by default. Temperature control accuracy ± 1°C Last set value of temperature is stored in memory Power consumption 60 W Input voltage 170 to 270 V Temperature range 180 to 270 V (180 to 480 °C). Temp stability ± 10°C Tem	18,19
9	PCB layout software: Circuitmaker	20
10	Computer System: Intel processor core i3 or i7 or latest with mother board Intel chipset 41/61/latest with 4 USB,1 serial port, 1 LPT port,2GB RAM DDR III,500 GB Sata Hard disk, 16" or 18.5" LCD/LED monitor, ATX cabinet with SMPS and lock system, DVD writer, Keyboard, USB mouse,1 Gigabit Network card/ latest configuration or Latest configuration (or higher version) 24	24,25,28,29,30
11	LM 335: Local sensor accuracy (max)6Operating temperature range (°C)-40 to 100Supply voltage (min) (V)5Supply voltage (max) (V)3.04Supply current (max) (µA)400 Interface type: Analog output Sensor gain (mV/°C)10RatingCatalog	26
12	Printer Type: LaserJet; Functionality – Single Function (Print only); Printer Output – Black & White only Connectivity – USB, Power: Input voltage 110 to 127 VAC (+/- 10%), 50/60 Hz (+/- 2 Hz), 3.5 amps; 220 to 240 VAC (+/- 10%), 50/60 Hz (+/- 2 Hz), 2 amps" ; "Compatible Operating Systems: Windows 2000; Windows 7; Windows 10 Pages per minute – 14 pages ; Ideal usage – Enterprise/Business, Frequent users (for fast, high quality printing) Page size supported – A4, A5, A6, B5, C5, DL, postcar	28,29
13	CRO: Dual Channel, 4 Trace CRT / TFT based Bandwidth 20 MHz/30 MHz X10 magnification 20 nS max sweep rate, Alternate triggering Component tester and with optional features such as Digital Readout , USB interface	3,4,6
14	Digital Storage Oscilloscope: 25MHz/60MHz/70MHz/100MHz Dual Channel, 4 Trace CRT / TFT based X10 magnification 20 nS max sweep rate, Alternate triggering Component tester and with optional features such as Digital Read out, USB interface. Any other Oscilloscope with additional features is also suitable with magnifying probe at least two probes, if possible isolated probe	3,4,6,29
15	Scanner type: Portable scanner Photoelectric device, 600 dpi Color CIS with 10368 pixels Effective pixels 5,100 × 8,400 pixels at 600 dpi Document size Max: 216 × 356 mm (8.5 × 14.0 inches) Min: 52 × 73.7 mm (2.0 × 2.9 inches) (Portrait) 85.6 × 54 mm (3.4 × 2.1 inches) (Landscape) Paper input, Face-down loading, Paper output, Face-down ejection Paper capacity, Single sheet of paper at 35 to 270 g/m2 Scanning resolution: 600 dpi (main scan), 600 dpi (sub scan) Output resolution:	30
16	Function Generator: Frequency range 0.1Hz to 30 MHz sine, square, triangular, ramp and pulse generator, Output amplitude 20V open circuited, Output impedance 50 ohms. Facility to indicate output frequency and amplitude on display	5,6

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Sr.No	Equipment Name with Broad Specifications	Relevant LLO Number
17	LCR Q Meter: Parameter L-Q, C-D, R-Q and Z-Q Frequency 00 Hz, 120 Hz and 1 KHz Accuracy Basic Accuracy : 0.3% Display 5 digits display for both primary and secondary parameters L 100 Hz, 120 Hz 1 mH - 9999 H 1 KHz 0.1 mH - 999.9 H Measurement C 100 Hz, 120Hz 1 pF – 9999 mF Range 1 KHz 0.1 pF - 999.9 mF R, |Z| 0.0001V- 999.9 MV D, Q 0.0001 – 9999 D% 0.0001% - 9999% Test Level 120 Hz 0.3 Vrms (1 ±15%) (Range Auto 1 KHz and Open 100 Hz 0.42 Vrms (1±15%) Circuit) Ranging Mod Auto and Hold Equ	8
18	Digital Multimeter: Minimum 3 ½ digit 4 ½ digit display, multimeter measures Vac, Vdc (1000V max), Adc, Aac (10-amp max), Resistance (0-100 M?), diode and transistor testing mode	8,10

IX. SUGGESTED WEIGHTAGE TO LEARNING EFFORTS & ASSESSMENT PURPOSE (Specification Table) : NOT APPLICABLE

X. ASSESSMENT METHODOLOGIES/TOOLS

Formative assessment (Assessment for Learning)

- Each practical will be assessed considering - - 60% weightage to process and - 40% weightage to product

Summative Assessment (Assessment of Learning)

- End of the term assessment, Viva-voce, Workshop performance

XI. SUGGESTED COS - POS MATRIX FORM

Course Outcomes (COs)	Programme Outcomes (POs)							Programme Specific Outcomes* (PSOs)		
	PO-1 Basic and Discipline Specific Knowledge	PO-2 Problem Analysis	PO-3 Design/ Development of Solutions	PO-4 Engineering Tools	PO-5 Engineering Practices for Society, Sustainability and Environment	PO-6 Project Management	PO-7 Life Long Learning	PSO-1	PSO-2	PSO-3
CO1	2	2	-	3	-	1	3			
CO2	3	3	3	2	-	2	3			
CO3	2	2	2	2	1	2	3			
CO4	2	-	-	3	-	2	3			
CO5	2	2	2	3	2	1	3			
Legends :- High:03, Medium:02,Low:01, No Mapping: - *PSOs are to be formulated at institute level										

XII. SUGGESTED LEARNING MATERIALS / BOOKS

Sr.No	Author	Title	Publisher with ISBN Number
1	Raghuwanshi B.S.	A Course in Workshop Technology	Dhanpat Rai & Sons, New Delhi, 2017 or latest edition
2	Sarathe A.K.	Engineering Workshop Practice	Khanna Book Publishing Co.(P) Ltd. , New Delhi; 2021 or latest edition ISBN: 978-9391505516

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Sr.No	Author	Title	Publisher with ISBN Number
3	Jones, Thomas H	Electronic Components Handbook	Reston Publishing, Virginia, US, latest edition, ISBN: 978-0879092221
4	Mehta V.K., Mehta Rohit	Principles of Electronics	S. Chand and Co., New Delhi-110 055, 2014, ISBN: 978-8121924504
5	Abraham Pressman , Keith Billings, Taylor Morey	Switching Power Supply Design	McGraw Hill Edition 3, April 16, 2009 ISBN: 978-0071482721
6	Susan S Mathew Saji T Chacko	Fundamentals of Electrical and Electronics Engineering	Khanna Book Publishing Co (P) Ltd. New Delhi 978-93-91505-59-2

XIII . LEARNING WEBSITES & PORTALS

Sr.No	Link / Portal	Description
1	https://www.boschrexroth.com/en/in/products/product-groups/a ssembly-technology/topics/manual-product	ESD Protection
2	https://electricalnotebook.com/lcr-q-meter/	LCR Q meter to measure the Q factor
3	https://nptel.ac.in/courses/108105180	SMPS Working
4	https://instrumentationtools.com/multi-color-led-works/	Multicolor LED Working
5	https://www.youtube.com/watch?v=AdaIpyOdd0w	Pulse Transformer
6	geeksforgeeks.org/how-to-set-up-a-LAN-	Network Reading material about Process to set a LAN
7	https://www.youtube.com/watch?v=cc2fyg-B5WE	Video about setting a LAN
8	https://circuitmaker.com	PCB Circuit Maker
9	https://www.services.bis.gov.in/php/BIS_2.0/bisconnect/get_i s_list_by_category_id/5	IS for electrical safety and appliances

Note :

- Teachers are requested to check the creative common license status/financial implications of the suggested online educational resources before use by the students