Maharashtra State Board Of Technical Education, Mumbai
Learning and Assessment Scheme for Post S.S.C Diploma Courses

Programme Name	: Diploma In Electronics & Computer Engg.	
Programme Code	: TE	**With Effect From Academic Year** : 2023-24
Duration Of Programme	: 6 Semester	**Duration** : 16 WEEKS
Semester	: Second **NCrF Entry Level : 3.0**	**Scheme** : K

Sr No	Course Title	Abbrevation	Course Type	Course Code	Total IKS Hrs for Sem.	Actual Contact Hrs./Week			Self Learning (Activity/ Assignment /Micro Project)	Notional Learning Hrs /Week	Credits	Paper Duration (hrs.)	Theory				Based on LL & TL				Based on Self Learning		Total Marks
																		Practical					
						CL	TL	LL					FA-TH	SA-TH	Total		FA-PR		SA-PR		SLA		
													Max	Max	Max	Min	Max	Min	Max	Min	Max	Min	
(All Compulsory)																							
1	APPLIED MATHEMATICS	AMS	AEC	312301	2	3	1	-	-	4	2	3	30	70	100	40	-	-	-	-	-	-	100
2	BASIC ELECTRONICS	BEL	AEC	312314	-	4	-	4	-	8	4	3	30	70	100	40	50	20	25@	10	-	-	175
3	ELEMENTS OF ELECTRICAL ENGINEERING	EEE	SEC	312315	-	3	-	2	1	6	3	3	30	70	100	40	25	10	25@	10	25	10	175
4	PROFESSIONAL COMMUNICATION	PCO	SEC	312002	-	-	-	2	-	2	1	-	-	-	-	-	25	10	25@	10	-	-	50
5	SOCIAL AND LIFE SKILLS	SFS	VEC	312003	-	-	-	-	2	2	1	-	-	-	-	-	-	-	-	-	50	20	50
6	ELECTRONICS WORKSHOP PRACTICE	EWP	SEC	312008	-	-	-	4	2	6	3	-	-	-	-	-	25	10	25@	10	25	10	75
7	PROGRAMMING IN 'C' LANGUAGE	CPR	SEC	312009	-	2	-	2	2	6	3	-	-	-	-	-	25	10	25@	10	25	10	75
8	WEB PAGE DESIGN	WET	SEC	312013	-	-	-	4	2	6	3	-	-	-	-	-	25	10	50@	20	25	10	100
	Total				2	12	1	18	9		20		90	210	300		175		175		150		800

Sr No	Course Title	Abbrevation	Course Type	Course Code	Total IKS Hrs for Sem.	Actual Contact Hrs./Week			Self Learning (Activity/ Assignment /Micro Project)	Notional Learning Hrs /Week	Credits	Paper Duration (hrs.)	Theory			Based on LL & TL Practical				Based on Self Learning SLA		Total Marks
						CL	TL	LL					FA-TH	SA-TH	Total	FA-PR		SA-PR				
													Max	Max	Max Min	Max	Min	Max	Min	Max	Min	

Abbreviations : CL- Classroom Learning , TL- Tutorial Learning, LL-Laboratory Learning, 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.

Course Category : Discipline Specific Course Core (DSC) , Discipline Specific Elective (DSE) , Value Education Course (VEC) , Intern./Apprenti./Project./Community (INP) , AbilityEnhancement Course (AEC) , Skill Enhancement Course (SEC) , GenericElective (GE)

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												
				Actual Contact Hrs./Week			SLH	NLH		Paper Duration	Theory				Based on LL & TL				Based on SL		Total Marks
															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

ELECTRONICS WORKSHOP PRACTICE   **Course Code : 312008**

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 Demonstrartion 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

MSBTE Approval Dt. 01/10/2024   **Semester - 2, K Scheme**

ELECTRONICS WORKSHOP PRACTICE   **Course Code : 312008**

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.
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 of temp sensor IC	**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 5.4 Temperature sensor IC characteristics	Teacher input Hands on practice Demonstration video

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

ELECTRONICS WORKSHOP PRACTICE   **Course Code : 312008**

Practical / Tutorial / Laboratory Learning Outcome (LLO)	Sr No	Laboratory Experiment / Practical Titles / Tutorial Titles	Number of hrs.	Relevant COs
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 LLO 15.2 Use appropriate tool for given application	15	* Electronic workshop tools	2	CO2
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

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ELECTRONICS WORKSHOP PRACTICE   **Course Code : 312008**

Practical / Tutorial / Laboratory Learning Outcome (LLO)	Sr No	Laboratory Experiment / Practical Titles / Tutorial Titles	Number of hrs.	Relevant COs
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

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

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ELECTRONICS WORKSHOP PRACTICE   **Course Code : 312008**

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/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	13
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

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Sr.No	Equipment Name with Broad Specifications	Relevant LLO Number
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
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

ELECTRONICS WORKSHOP PRACTICE   **Course Code : 312008**

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
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/assembly-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_is_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

MSBTE Approval Dt. 01/10/2024   **Semester - 2, K Scheme**

PROGRAMMING IN 'C' LANGUAGE	**Course Code : 312009**

Programme Name/s	: 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	: DE/ EJ/ EK/ ET/ EX/ IC/ IE/ IS/ MU/ TE
Semester	: Second / Third
Course Title	: PROGRAMMING IN 'C' LANGUAGE
Course Code	: 312009

I. RATIONALE

C language is basic programming language for enhancing logical and problem solving ability of student . This course enhances and builds confidence in programming skills of diploma students. This course will enable students to inculcate programming concepts and methodology to solve engineering problems.

II. INDUSTRY / EMPLOYER EXPECTED OUTCOME

The aim of this course is to attain the following industry employer expected outcome through various teaching learning experiences - Develop 'C' programs to solve wide-reaching electronic engineering related problems.

III. COURSE LEVEL LEARNING OUTCOMES (COS)

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

- CO1 - Develop C program using input/output and arithmetic expressions.
- CO2 - Develop C program using decision making statements and loops.
- CO3 - Use predefined and user defined functions to develop C program.
- CO4 - Develop C programs using arrays and strings.
- CO5 - Implement the basics of structures and pointers to enhance the performance of the program.

IV. TEACHING-LEARNING & ASSESSMENT SCHEME

Course Code	Course Title	Abbr	Course Category/s	Learning Scheme						Assessment Scheme											
				Actual Contact Hrs./Week			SLH	NLH	Credits	Paper Duration	Theory				Based on LL & TL				Based on SL		Total Marks
															Practical						
				CL	TL	LL					FA-TH	SA-TH	Total		FA-PR		SA-PR		SLA		
											Max	Max	Max	Min	Max	Min	Max	Min	Max	Min	
312009	PROGRAMMING IN 'C' LANGUAGE	CPR	SEC	2	-	2	2	6	3	-	-	-	-	-	25	10	25@	10	25	10	75

PROGRAMMING IN 'C' LANGUAGE   **Course Code : 312009**

Total IKS Hrs for Sem. : 0 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 Write the basic structure of C program. TLO 1.2 Differentiate between keywords and identifiers. TLO 1.3 Use relevant data types as per the given situation. TLO 1.4 Construct algorithm and draw flowchart for the given problem. TLO 1.5 Use different types of operators in given situations.	**Unit - I Basics of C Programming** 1.1 Algorithms and Flow Charts: 1.1.1 Steps for writing algorithm 1.1.2 Notations of flow charts. 1.2 Structure of C program , Introduction of Assembler, Linker, Compiler, Interpreter. 1.3 Character set, Keywords, identifiers , constants, Variables 1.4 Data Types: 1.4.1 Predefined Data types :integer-unsigned, signed, long, float, double, character, single ,octal, hexadecimal 1.4.2 User defined Data Types: Arrays, Structures . 1.5 Operators and expressions: 1.5.1 Formatted input and output statements 1.5.2 Types of Operators: Arithmetic, logical, relational, increment and decrement, bitwise, special operators: unary, ternary operators, 1.5.3 Precedence, Associativity of Operators	Chalk-Board Hands-on
2	TLO 2.1 Implement branching and looping. TLO 2.2 Demonstrate control statements using "if-else". TLO 2.3 Apply different types of loops as per the given problem.	**Unit - II Decision Control & Looping** 2.1 Introduction to decision control, branching and looping 2.2 Decision Control statements: if, if-else, if-else-if ladder, switch case, 2.3 Looping and branching Statements: 2.3.1 while Loop, 2.3.2 for Loop, nested for loop 2.3.3 do-while loop, break, continue 2.3.4 Goto statement	Chalk-Board Demonstration Hands-on

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MSBTE Approval Dt. 01/10/2024   **Semester - 2 / 3, K Scheme**

PROGRAMMING IN 'C' LANGUAGE   **Course Code : 312009**

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.
3	TLO 3.1 Use functions for implementing C program. TLO 3.2 Write 'C' program to pass values between the functions. TLO 3.3 Use library functions for the given problem. TLO 3.4 Develop a recursive function for the given problem.	**Unit - III Functions** 3.1 Concept and Need of a Function. 3.1.1 Declaration ,definition and calling of functions 3.2 Passing Values between Functions: call by value ,call by reference, Scope Rule of Functions. 3.3 Using Library Functions: 3.3.1 math functions like : mod(),sqrt(),pow(),exp(),sum(), round(), 3.3.2 Character Functions like islower(),isupper(),isdigit(),tolower() 3.4 Recursive function.	Chalk-Board Demonstration Hands-on
4	TLO 4.1 List down the steps to declare, initialize and display array elements. TLO 4.2 Write a C program to handle Two dimensional arrays. TLO 4.3 Write steps to declare, initialize and display the strings in C program. TLO 4.4 Apply relevant string library functions as per the given problem.	**Unit - IV Arrays And Strings** 4.1 Concept and need of Arrays, 4.1.1 Declaration, Initialization, Storing Array Elements in Memory, Displaying array elements 4.2 Two-Dimensional Arrays 4.2.1 Initializing a Two-Dimensional Array 4.2.2 Adding elements to 2-D Array 4.2.3 Display elements of 2-D Array 4.3 Introduction of Strings 4.3.1 Declaration, Initialization and Display of string 4.4 Standard Library String Functions 4.4.1 strlen(),strcpy(), strcat( ), strcmp( )	Chalk-Board Demonstration Hands-on
5	TLO 5.1 Develop a program to declare , access and display structures in C. TLO 5.2 Use pointers to access memory and perform pointer arithmetic.	**Unit - V Structures & Pointers.** 5.1 Introduction to structures: 5.1.1 Declaring a Structure 5.1.2 Accessing Structure elements 5.1.3 Displaying Structure elements 5.2 Concept of pointer 5.2.1 Pointer notation 5.2.2 Pointer variables, declaration of pointer 5.2.3 Pointer arithmetic like increment and decrement operation.	Chalk-Board Demonstration Hands-on

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 Implement format specifiers available in C language.	1	(*) Write a 'C'program to display hexadecimal, decimal, octal format of entered number using %d, %c. %i. %f, %g, %u, %o ,%s, %x, %n, %%,	2	CO1

MSBTE Approval Dt. 01/10/2024   **Semester - 2 / 3, K Scheme**

PROGRAMMING IN 'C' LANGUAGE   **Course Code : 312009**

Practical / Tutorial / Laboratory Learning Outcome (LLO)	Sr No	Laboratory Experiment / Practical Titles / Tutorial Titles	Number of hrs.	Relevant COs
LLO 2.1 Implement basic/input output statement of C language. LLO 2.2 Apply logical and bitwise operators on given data	2	(*) Write a program to perform following operations. (a) Display the message "Hello World", name. address, date of birth and email id using print( ) function. (b) Logical operations: And(&) ,	(OR) for given values , Bitwise operations :<< (LEFT SHIFT), >> (RIGHT SHIFT) for given values	2	CO1
LLO 3.1 Use header files to perform specific task. LLO 3.2 Determine equivalent value of parallel resister using a C program.	3	(*) 1) Write a program to display current time and date using **time.h** header file. 2) Write a program to obtain the equivalent value for parallel resistor by assuming resistor values.	2	CO1
LLO 4.1 Determine the bandwidth of amplifier using a C program.	4	(*) Write a program to Calculate bandwidth of given amplifier having higher 3 dB cutoff frequency at 20 KHz and lower 3dB cutoff frequency 50Hz .Display the bandwidth in KHz.	2	CO1
LLO 5.1 Implement If-else, if-else-if ladder for solving given task.	5	(*) 1) Write a program to check whether given number is even or odd. 2) Write a program to determine leap year using "if-else-if" ladder	2	CO2
LLO 6.1 Implement post tested loop using do-while loop	6	Write a program to reverse a given number using do-while loop	2	CO2
LLO 7.1 Apply switch-case statement for implementing menu driven program.	7	(*) Write a C menu driven program to perform arithmetic operations using switch statement.	2	CO2

PROGRAMMING IN 'C' LANGUAGE   **Course Code : 312009**

Practical / Tutorial / Laboratory Learning Outcome (LLO)	Sr No	Laboratory Experiment / Practical Titles / Tutorial Titles	Number of hrs.	Relevant COs
LLO 8.1 Use for loop to implement iteration.	8	(*) Write a program to print table of given number using for loop.	2	CO2
LLO 9.1 Apply Goto statement for implementing branching operation in C.	9	Write a program to implement goto statement	2	CO2
LLO 10.1 Use user defined functions to solve given task.	10	(*) Write a user defined function power (a, b) to calculate the value of a raised to b.	2	CO3
LLO 11.1 Implement call by value and call by reference	11	(*) Write a program to implement swapping of two integer by using following methods i) call by value ii) call by reference	2	CO3
LLO 12.1 Implement inbuilt math functions to perform mathematical operations.	12	(*) Write a program to implement following math functions i) mod() ii) sqrt() iii)pow() iv)exp() v)sum() vi) round()	2	CO3
LLO 13.1 Implement inbuilt character functions to perform operations on character data type.	13	Write a program to implement following character function in C. i) islower() ii) isupper() iii) isxdigit() iv) tolower() v) toupper()	2	CO3
LLO 14.1 Write a program to implement One -Dimensional array. LLO 14.2 Apply 2-Dimnesional array to perform matrix operations	14	(*) 1) Write a program to store 10 numbers in an array and find sum of 10 numbers. 2) Write a program to perform following matrix operations using 2-D array • Addition • Subtraction • Transpose • Sum of digonal of matrix	2	CO4

MSBTE Approval Dt. 01/10/2024   **Semester - 2 / 3, K Scheme**

PROGRAMMING IN 'C' LANGUAGE   **Course Code : 312009**

Practical / Tutorial / Laboratory Learning Outcome (LLO)	Sr No	Laboratory Experiment / Practical Titles / Tutorial Titles	Number of hrs.	Relevant COs
LLO 15.1 Perform string operations using standard library functions	15	Write a program to implement following Standard Library String Functions. i) strlen() ii) strcpy() iii) strcat( ) iv) strcmp( ) v) strrev()	2	CO4
LLO 16.1 Use structures to store multiple data types.	16	(*) Declare a structure Student consisting of following members: • rollno • name • address • percentage Write a program to take data of three students and display the same.	2	CO5
LLO 17.1 Create a C program for implementing pointers	17	Write C program to create, initialize, assign and access a pointer variable	2	CO5

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)

Virtual Labs

• Students are encouraged to solve IIT Virtual Labs assignment on any selected topic. Link for Virtual Labs: https://cse02-iiith.vlabs.ac.in/Introduction.html

Micro project

• Unit Convertor: Each batch will prepare a menu driven program to perform different operations unit conversion.
• Patterns: Each batch will prepare a program to display different number patterns
• Basic Mathematical Functions: Each batch will prepare a menu driven program to perform following operations: i) Pascal triangle ii) Armstrong No. iii) Floyd's triangle iv) HCF and LCM.
• Number Conversion System: Each batch will prepare a menu driven program to convert decimal number system to i) binary ii) Octal iii) Hexadecimal number system
• a) Bus Reservation System: Each batch will prepare a menu driven program to following operations i) Book a Ticket ii) List the information of all the tickets booked.

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	Hardware : Personal Computer , RAM minimum 2 GB onwards. Operating System : Windows 10 onwards / Linux Software : Turbo C / GCC / Visual Studio Code or any relevant C compiler.	All

IX. SUGGESTED WEIGHTAGE TO LEARNING EFFORTS & ASSESSMENT PURPOSE (Specification Table)

Sr.No	Unit	Unit Title	Aligned COs	Learning Hours	R-Level	U-Level	A-Level	Total Marks
1	I	Basics of C Programming	CO1	8	0	0	0	0
2	II	Decision Control & Looping	CO2	6	0	0	0	0
3	III	Functions	CO3	6	0	0	0	0
4	IV	Arrays And Strings	CO4	5	0	0	0	0
5	V	Structures & Pointers.	CO5	5	0	0	0	0
		Grand Total		**30**	**0**	**0**	**0**	**0**

X. ASSESSMENT METHODOLOGIES/TOOLS

Formative assessment (Assessment for Learning)

- Continuous assessment based on process and product related performance indicators.Each practical will be assessed considering 60% weightage to process and 40% weightage to product.t

Summative Assessment (Assessment of Learning)

- End of term examination (Lab performance)viva voce

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	3	2	2	3	-	-	1			

CO2	3	2	3	3	-	-	1		
CO3	2	2	3	3	-	-	2		
CO4	2	2	3	3	-	-	2		
CO5	2	2	3	3	-	-	2		

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	Yashwant Kanetkar	Let Us 'C'	BPB Publication New Delhi ISBN: 978818331630
2	E Balaguruswamy	Programming in 'C'	Tata McGrawHill New Delhi ISBN: 978-1-25-900461-2
3	Herbert Schildt	C: The Complete Reference	McGraw Hill ISBN: 978-0070411838
4	Brian W. Kernighan / Dennis Ritchie	The C Programming Language 2e	Pearson Publication ISBN : 10. 0131103628

XIII .   LEARNING WEBSITES & PORTALS

Sr.No	Link / Portal	Description
1	www.tutorialpoint.com	Basics of C programming
2	www.cprogramming.com	Cprogramming.com covers both C in-depth, with both beginner-friendly tutorials, more advanced artic
3	www.sourcecodeworld.com	C programming made easier
4	www.programmiz.com	Website provides easy to learn study material with online compiler to learn C programming
5	www.indiastudycente.com	Online portal to study C programming
6	www.c4learn.com	Website provides easy to learn study material with online compiler to learn C programming

Note :

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

WEB PAGE DESIGN	**Course Code : 312013**

Programme Name/s	: **Electronics & Computer Engg.**
Programme Code	: **TE**
Semester	: **Second**
Course Title	: **WEB PAGE DESIGN**
Course Code	: **312013**

I. RATIONALE

Web Page Design is used to develop online applications for various organizations such as Organizational and Educational websites, Virtual Learning environments, Business Applications in various fields such as Products, Sales, Banking, Railways Reservation, Services etc. Web pages are categorized into two namely, Static and Dynamic Web Pages. This course introduces Web Page Design using HTML5 and also give emphasis on learning Cascading Stylesheets (CSS) which is a stylesheet language used for describing the presentation of a document written in a markup language for formatting and styling of content.

II. INDUSTRY / EMPLOYER EXPECTED OUTCOME

The aim of this course is to help the students to attain the following Industry identified outcomes through various Teaching Learning experiences:
• Develop and Host Website.

III.   COURSE LEVEL LEARNING OUTCOMES (COS)

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

- CO1 - Use HTML formatting tags to present content on Web Page.
- CO2 - Develop Web Page using List and Hyperlinks.
- CO3 - Develop Web Pages using Images, Colors and Backgrounds.
- CO4 - Design HTML forms using Table and Frames.
- CO5 - Apply presentation schemes on content using Cascading Stylesheet(CSS).
- CO6 - Publish Website on Internet or Intranet.

IV.   TEACHING-LEARNING & ASSESSMENT SCHEME

Course Code	Course Title	Abbr	Course Category/s	Learning Scheme						Assessment Scheme											
				Actual Contact Hrs./Week			SLH	NLH	Credits	Paper Duration	Theory				Based on LL & TL				Based on SL		Total Marks
																	Practical				
				CL	TL	LL					FA-TH	SA-TH	Total		FA-PR		SA-PR		SLA		
											Max	Max	Max	Min	Max	Min	Max	Min	Max	Min	
312013	WEB PAGE DESIGN	WET	SEC	-	-	4	2	6	3	-	-	-	-	-	25	10	50@	20	25	10	100

WEB PAGE DESIGN   **Course Code : 312013**

Total IKS Hrs for Sem. : 0 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 Differentiate characteristics of the given type of website. TLO 1.2 Describe structure of the given HTML page. TLO 1.3 Explain use of Head tag and Body tag in the given Web Page. TLO 1.4 Describe the procedure of using the given Block level tag on a Web Page. TLO 1.5 Describe the procedure of using the given Text level tag and use of Special characters in Web Page.	**Unit - I Introduction to HTML** 1.1 Introduction of HTML. 1.2 Terminologies used in Web Design: World Wide Web (www), Web Pages, Website, Web Browsers, Web Servers and types of sites. Static vs. Dynamic website, Search Engine. 1.3 Web page structure: DOCTYPE, HTML, TITLE, HEAD, BODY and other meta tags with attributes. 1.4 Block Level Elements: Headings, Paragraphs, Breaks, Divisions, Centered Text, Block Quotes, Preformatted text, types of Address, HR tag. Horizontal Rule. 1.5 Text Level Elements: Bold, Italic, Teletype, Underline, Strikethrough, Superscript, Subscript, DIV tag, displaying special characters, Comments.	Demonstration Presentations Hands-on
2	TLO 2.1 Explain use of the given type of list in Web Pages. TLO 2.2 Describe different types of Links.	**Unit - II Lists and Links** 2.1 Lists: Ordered Lists, Unordered Lists, Definition Lists, Nested Lists. 2.2 Links: Absolute, Relative and Inline links, Use image as link, Link to an E-mail address, Button as link, Types of Links, Linking various documents for Internal and external links, To link different web page of same site, link different location on the same web page, A Specific location on different web page of same site. To specific section within the Document, Inserting E-mail link.	Demonstration Presentations Hands-on

WEB PAGE DESIGN   **Course Code : 312013**

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.
3	TLO 3.1 Describe the given Image attribute on a Web Page with HSPACE & VSPACE. TLO 3.2 Describe the use of colors / images as page background on a Web Page.	**Unit - III Images, Colors and Background** 3.1 Image: Types of image format, jpg, bmp, png, gif etc. IMG tag, alternate text, image alignment, HSPACE, VSPACE, wrapping text, height and width of images, Image as a link, Inserting Images, formatting image for sizing, alignment, Border and other attributes with IMG tag. 3.2 Colors and Backgrounds: The text color, color attribute of FONT tag, text attribute of BODY tag. bgcolor attribute of BODY tag, Changing link colors: link, alink, vlink, attributes of BODY tag, Backgrounds: Inserting image as page background, Background attributes of BODY tag, Creating solid color page background.	Demonstration Presentations Hands-on
4	TLO 4.1 Explain the given table attributes to organize data on a Web Page and Table setting. TLO 4.2 Describe the table formatting in Web Pages. TLO 4.3 Describe the given type of frame with examples and procedure to display given screen layout using frames. TLO 4.4 Create basic form using different form fields and Button tags.	**Unit - IV Table, Frames and Forms** 4.1 Table: Table tag with attributes. TABLE, <tr>, <th>, <td> tags. Border, cell spacing, cell padding, width, align, bgcolor attributes. Adding captions: CAPTION tag 4.2 Formatting contents in the table cells: align, valign, bgcolor, height, width, nowrap attributes. Spanning rows and columns: rowspan and colspan attributes. 4.3 Frames: Types of Frames with their attributes, Creating frames: FRAMESET tag – rows, cols attributes, FRAME tag – name, frame border, margin height, margin width, src, resize, scrolling Attributes, Use of NOFRAMES tag, Frame targeting. 4.4 Forms: Creating basic form: FORM tag, action and method attributes, Form fields: Single line Text Field, Password field, multiple line Text Area, Radio Buttons, and Check Boxes. Pull down menus: SELECT and OPTION tags. Buttons: submit, reset and generalized buttons. Formatting technique: Using table to layout form.	Demonstration Presentations Hands-on
5	TLO 5.1 Describe CSS code for the given type of formatting on a Web Page with different CSS properties. TLO 5.2 Describe the procedure to create CSS for applying the given presentation scheme on a Web Page.	**Unit - V Cascading Stylesheets** 5.1 Cascading Stylesheets: Different types of Stylesheets, Benefits of CSS. Adding style to the document: Linking to Stylesheets, Embedding stylesheets, Using inline style, Selectors: CLASS rules, ID rules. 5.2 Style sheet properties: Font, Text, Box, Color and Background properties; Creating and Using a simple external CSS file; Using the internal and inline CSS; background and color gradients in CSS Setting font and text in style sheet using Table layout.	Demonstration Presentations Hands-on
6	TLO 6.1 Describe the procedure to configure a web server and host the given website.	**Unit - VI Website Hosting** 6.1 Website Hosting: Concept of Internet and Intranet. Publishing website on Intranet, Installing and configuring web server, uploading files on Intranet site, access Intranet-based website; Publishing website on Internet, hiring Web space, uploading files using FTP, Virtual Hosting, access internet-based website.	Demonstration Presentations Hands-on

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

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MSBTE Approval Dt. 01/10/2024   **Semester - 2, K Scheme**

WEB PAGE DESIGN   **Course Code : 312013**

Practical / Tutorial / Laboratory Learning Outcome (LLO)	Sr No	Laboratory Experiment / Practical Titles / Tutorial Titles	Number of hrs.	Relevant COs
LLO 1.1 Create Web Page using structure tags to display sample message.	1	* Create a Simple Web Page	2	CO1
LLO 2.1 Create a Web Page which display a string "Maharashtra State Board of Technical Education, Mumbai" in all <h1> to <h6> header tags.	2	* Use of Heading tags in Web Page	2	CO1
LLO 3.1 Design a Web Page with two paragraphs each of 8-10 lines. Assign title to web page. Practice formatting tags for bold, italics, underline, center, break, space, horizontal lines, span tag, pre tag etc	3	* Working of Paragraphs in Web Page	2	CO1
LLO 4.1 Create a Web Page for displaying a paragraph using block level tags, HR tags	4	* Working with block level tags in Web Page	2	CO1
LLO 5.1 Create a Web Page using Text level tags.	5	* Working with Text level tag in Web Page	2	CO1
LLO 6.1 Create a Web Page to insert a border property in html statements.	6	* Implement the border properties in Web Page	2	CO1
LLO 7.1 Create a Web Page using Special Characters.	7	Use of Special Characters in Web Page	2	CO1
LLO 8.1 Design a Web Page for implementing Ordered List and Unordered List.	8	* Working with Ordered and Unordered List	2	CO2
LLO 9.1 Design a Web Page for implementing a) Ordered list within unordered list b) Unordered list within ordered list c) Ordered list within Ordered list d) Unordered list within Unordered list	9	Use of different types of Nested List in Web Page	4	CO2
LLO 10.1 Create a Web Page to link: a) A different web page of same site. b) A different location on the same web page. c) A Specific location on different web page of same site	10	* Create a Web Page link	2	CO2
LLO 11.1 Create Web Page to link: a) An external page of different web site. b) To an e-mail ID.	11	Use of links in Web Page	2	CO2
LLO 12.1 Create a webpage with photos and align them with the ALT property on the left, right, and center. LLO 12.2 Create a webpage where Set one picture in left, right, and middle alignment.	12	Create a Web Page to display images	2	CO2
LLO 13.1 Demonstrate to change the color of links on Web Page.	13	* Use of the color for links in Web Page	2	CO2
LLO 14.1 Insert images on Web Page using various attributes and set image as background.	14	* Insert an image as the foreground and background of a web page with various properties	2	CO3
LLO 15.1 Create a webpage, add an image with the correct dimensions (Height and Width), and include a hyperlink to another webpage.	15	* Insert images with hyperlink and set image width and height property of image	2	CO3

Practical / Tutorial / Laboratory Learning Outcome (LLO)	Sr No	Laboratory Experiment / Practical Titles / Tutorial Titles	Number of hrs.	Relevant COs
LLO 16.1 Create a web page and apply following background properties with an image a) Set the background color of the page to line n. b) Set border to h1 tag. c) Set background image to a page. LLO 16.2 Create a web page and apply following background properties with an image: a) Repeat the image vertically only. b) Repeat the image horizontally only. c) Show the background image at top	16	Working with different background properties in Web Page	4	CO3
LLO 17.1 Create a Web Page to implement Table.	17	* Create table in Web Page	2	CO4
LLO 18.1 Create table within table and also insert an image within the data elements of the table.	18	* Create table within table and Insert images in table	2	CO4
LLO 19.1 Create a Web Page that displays first year timetable. Make effective use of rowspan and colspan attributes. Make use of <th> tag.	19	Working with row and column attributes of table	2	CO4
LLO 20.1 Create a Web Page to implement frame tags.	20	* Create a frame in Web Page	2	CO4
LLO 21.1 Create a webpage that provides a form for filling information. The webpage must contain following elements: a) Textbox b) Text area c) Textbox for password LLO 21.2 Create a webpage that provides a form for filling information. The webpage must contain following elements: a) Radio button b) Checkbox c) Buttons (Submit / RESET)	21	* Creates different elements in Web Page	4	CO4
LLO 22.1 Demonstrate the use of style sheets in HTML.	22	Use of CSS in Web Page	2	CO5
LLO 23.1 Create a Web Page for demonstration of CSS by applying Internal style.	23	* Create CSS by applying Internal style	2	CO5
LLO 24.1 Create a Web Page for demonstration of CSS by applying External style.	24	* Create CSS by applying external style	2	CO5
LLO 25.1 Create a Web Page for demonstration of CSS by applying Inline style.	25	Create CSS by applying inline style	2	CO5
LLO 26.1 Create a website and host on open source platform.	26	* Host web pages on open source platform	4	CO6

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)

Self-Learning

- Following are some suggestive self-learning topics or any relevant topics suggested by the Teacher:
1) Insert Video in an HTML page.
2) Create an animation using various HTML tags.

3) Create an E-mail Newsletter.
4) Contribute to an open-source project.

Micro project

- The microproject has to be industry application based, internet-based, workshop-based, laboratory-based or field-based as suggested by Teacher.

1) Make a music page on your website, starting with a suitable background image and a succinct explanation of the contents. This is the first stage in creating a music store website. The top section of the page contains many menus and a list of songs sorted by attributes such as artist, album, genre, year, etc. Include the registration form link as well.

2) Create a static webpage with details about a webinar event. The event website will have a header area with links, a list of speakers, an image of the event site, and photographs. Separate the page into manageable chunks. Use the right font, style, and background color for the given web page.

3) Develop any sample website suggested Teacher's or Student interest.

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	1) Computer System with all necessary Peripherals and Internet connectivity. 2) Any Office Software 3) Any Browser	All

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

X. ASSESSMENT METHODOLOGIES/TOOLS

Formative assessment (Assessment for Learning)

- Continuous assessment based on process and product related performance indicators. Each practical will be assessed considering
1) 60% weightage is to process
2) 40% weightage to product

Summative Assessment (Assessment of Learning)

- End Semester Examination, Lab Performance, Viva-voce.

XI. SUGGESTED COS - POS MATRIX FORM

WEB PAGE DESIGN   **Course Code : 312013**

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	-	-	1	-	-	1			
CO2	1	-	1	1	1	-	2			
CO3	1	-	2	1	1	-	2			
CO4	1	1	2	1	1	-	2			
CO5	2	2	3	2	2	2	2			
CO6	3	3	3	3	2	2	2			

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	Thomos Powell	HTML and CSS Complete Reference	Tata McGraw Hill ISBN: 978-0-07-174170-5
2	Lemay Colburn	Web Publishing with HTML and CSS	Pearson ISBN: 978-0672330964
3	Ivan Bayross	HTML 5 and CSS 3	BPB Publications ISBN: 978-8183334419
4	Jennifer Robbins	Learning Web Design	O'Reilly ISBN: 978-1491960202
5	Julie C. Meloni, Michael Morrison	Teach Yourself HTML & CSS in 24 Hours	Sams, ISBN:978-0672336140

XIII . LEARNING WEBSITES & PORTALS

Sr.No	Link / Portal	Description
1	https://www.geeksforgeeks.org/	HTML Basics, list, links, Images, Table, Frames and CSS
2	https://www.w3schools.com/html/	HTML Basics, list, links, Images, Table, Frames and CSS
3	https://www.tutorialspoint.com/html/	HTML Basics, list, links, Images, Table, Frames and CSS
4	https://www.javatpoint.com/	HTML Basics, list, links, Images, Table, Frames and CSS
5	https://www.programiz.com/html/	HTML Basics, list, links, Images, Table, Frames and CSS
6	https://www.shiksha.com/online-courses/	HTML Basics, list, links, Images, Table, Frames and CSS

Note :

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

BASIC ELECTRONICS   **Course Code : 312314**

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	**: BASIC ELECTRONICS**
Course Code	**: 312314**

I. RATIONALE

Diploma engineers must deal with the various electronic components while maintaining various electronic equipment/systems. The use of basic electronics components and handling of various electronics systems will help them troubleshoot electronics equipment used in industry or in the consumer market etc. This course is developed to empower the students to apply their knowledge to solve broad electronic engineering application problems.

II. INDUSTRY / EMPLOYER EXPECTED OUTCOME

The aim of this course is to attend following industry identified competency through various teaching learning experiences: • Maintain electronic equipment/systems comprising of discrete 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 relevant diode in electronics circuits.
- CO2 - Use BJT in electronics circuits .
- CO3 - Use of BJT as amplifier and switch ..
- CO4 - Use FET and MOSFET in electronics circuits..
- CO5 - Maintain DC regulated power supply.

IV. TEACHING-LEARNING & ASSESSMENT SCHEME

Course Code	Course Title	Abbr	Course Category/s	Learning Scheme						Assessment Scheme											
				Actual Contact Hrs./Week			SLH	NLH	Credits	Paper Duration	Theory				Based on LL & TL				Based on SL		Total Marks
																	Practical				
				CL	TL	LL					FA-TH	SA-TH	Total		FA-PR		SA-PR		SLA		
											Max	Max	Max	Min	Max	Min	Max	Min	Max	Min	
312314	BASIC ELECTRONICS	BEL	AEC	4	-	4	-	8	4	3	30	70	100	40	50	20	25@	10	-	-	175

BASIC ELECTRONICS   **Course Code : 312314**

Total IKS Hrs for Sem. : 0 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 Describe working principle, characteristics, and application of the given type of diode. TLO 1.2 Describe the working of given type of rectifier. TLO 1.3 Calculate ripple factor, PIV, and efficiency of the given type of filter. TLO 1.4 Describe the need and working of rectifier filter circuit.	**Unit - I Applications of Diode** 1.1 Different types of diodes and their materials: Construction, Symbol, working principle, applications, Forward and reverse biasing and V-I characteristics of following diodes: P-N junction diode, Zener diode, LED, Photo diode, Schottky diode, 1.2 Diode as rectifier: Types of Rectifiers, Half wave, Full wave (bridge rectifier and center tapped), circuit operation, Input- output waveform for voltage and current, Parameters of rectifier: Average DC value, value of current and voltage, ripple factor, ripple frequency, PIV of diode, TUF, efficiency of rectifier. 1.3 Types of Filters: Shunt capacitor, Series inductor, LC and CLC filter. 1.4 Rectifier IC – KBU 808 IC pin diagram and application .	Chalk-Board Video Demonstrations
2	TLO 2.1 Describe the working principle of the given type of transistor. TLO 2.2 Calculate current gain for given configuration of BJT TLO 2.3 Compare configuration of transistors. TLO 2.4 Justify the need of biasing method. TLO 2.5 Describe the procedure to minimize the thermal runaway effect.	**Unit - II Bipolar Junction Transistor** 2.1 Current operating device. 2.2 Different types of transistors: PNP, NPN. 2.3 Transistor configurations: CB, CE, CC Transistor characteristics (input, and output) in different transistor configuration. Relation between alpha ,beta, gama. Comparison between CB, CC and CE. 2.4 4 BJT biasing: Need of DC load Line, Operating point, stabilization, thermal runaway, heat sink. Types of biasing: fixed biasing, base bias with emitter feedback, voltage divider.	Chalk-Board Video Demonstrations

BASIC ELECTRONICS **Course Code : 312314**

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.
3	TLO 3.1 Explain with sketches the working principle of the given type of amplifier. TLO 3.2 Describe working of Single Stage Transistor Amplifier. TLO 3.3 Calculate Voltage gain and bandwidth TLO 3.4 Describe working of Multistage amplifiers TLO 3.5 Describe working of BJT as a Switch	**Unit - III BJT Amplifiers** 3.1 Classification of amplifier, BJT as an amplifier. 3.2 Single Stage Amplifier: Working , various currents (Ib, Ic,Ie), Voltage gain of CE amplifier (no derivations required), Frequency response of CE amplifier. Simple numericals. 3.3 Multistage amplifiers: General Multistage BJT based amplifiers 3.4 Types of BJT amplifier coupling: Circuit diagram, operation frequency response and applications of Direct coupled, RC coupled and transformer coupled. 3.5 BJT as a Switch	Chalk-Board Video Demonstrations
4	TLO 4.1 Explain the working of given type of FET TLO 4.2 Explain the given type of FET biasing method. TLO 4.3 Describe working of FET Amplifier. TLO 4.4 Explain working of given type of MOSFET. TLO 4.5 Differentiate working principle of FET and MOSFET on the basis of the given characteristics of curve.	**Unit - IV Field Effect Transistor** 4.1 Voltage operating device, Construction of JFET (N-channel and P- channel), symbol, working principle and characteristics (Drain and Transfer characteristics) , different parameters of FET . FET applications 4.2 FET Biasing: Source self-bias, drain to source bias. 4.3 Common source FET amplifier. 4.4 MOSFET: Construction, working principle and characteristics of Enhancement and depletion MOSFET, MOSFET handling.	Chalk-Board Video Demonstrations
5	TLO 5.1 Describe the working of the DC regulated power supply. TLO 5.2 Calculate output voltage of the given Zener voltage regulator circuit.. TLO 5.3 Describe the working of 78XX and 79XX fixed voltage IC Regulator. TLO 5.4 Describe the working of IC 723 as Low and High voltage regulator. TLO 5.5 Explain block diagram of Switch Mode Power supply.	**Unit - V Regulators and Power supply** 5.1 Need of Regulated power supply . Basic block diagram of DC regulated power supply and function of each block 5.2 Load and Line regulation. 5.3 Zener diode voltage regulator 5.4 Fixed voltage IC Regulator: Three terminal Pin diagram, working and application of 78XX and 79xx series. 5.5 Variable voltage IC Regulator : IC 723 pin diagram , block diagram, working. Low voltage regulator, High voltage regulator 5.6 Switch Mode Power supply : Need of SMPS , block diagram and functions of blocks.	Chalk-Board Site/Industry Visit

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 Test PN junction Diode in forward bias. LLO 1.2 Plot the V-I characteristics of PN junction diode and determine cut in voltage. LLO 1.3 Calculate static and Dynamic resistance of diode.	1	* Test the performance of PN Junction diode	2	CO1

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Practical / Tutorial / Laboratory Learning Outcome (LLO)	Sr No	Laboratory Experiment / Practical Titles / Tutorial Titles	Number of hrs.	Relevant COs
LLO 2.1 Test Zener Diode in reverse bias. LLO 2.2 Plot V-I characteristics of Zener Diode in reverse bias. .	2	* Test the performance of zener diode	2	CO1
LLO 3.1 Build the circuit for Photo Diode . LLO 3.2 Observe the change in current with change in light intensity of the source LLO 3.3 Plot distance VS Photo diode Current	3	* Check the performance of photo diode by varying the light intensity as well as the distance of the light source.	2	CO1
LLO 4.1 Construct the circuit for Half Wave Rectifier using PN junction Diode on. LLO 4.2 Plot Output Waveform for sinusoidal input.	4	* Construct and Test the half wave rectifier.	2	CO1
LLO 5.1 Build the circuit for Half Wave Rectifier with LC filter/ Pi filter using PN junction Diode. LLO 5.2 Obsrve and draw input & output waveforms for sinusoidal wave .	5	* Build and Test the half wave rectifier with LC filter/ π filter	2	CO1
LLO 6.1 Prepare the circuit for Full Wave Centre Tapped Rectifier using PN junction Diode. LLO 6.2 Observe and draw input & output waveform for sinusoidal wave.	6	* Prepare and Test the full wave rectifier using two diodes.	2	CO1
LLO 7.1 Build the circuit for Full Wave Bridge Rectifier using PN junction Diode LLO 7.2 Observe and draw input & output waveform for sinusoidal wave.	7	* Build and Test the full wave Bridge rectifier on bread board using two diodes.	2	CO1
LLO 8.1 Build the circuit for Full Wave Rectifier using PN junction Diode with LC/Pi filter. LLO 8.2 Calculate ripple factor for given setup.	8	* Use LC/ π filter with full wave rectifier to measure ripple factor	2	CO1
LLO 9.1 Construct the circuit for full wave rectifier using IC KBU 808 with filter LLO 9.2 Observe and draw input & output waveform for sinusoidal wave.	9	* Construct and Test the full wave rectifier on bread board using IC KBU 808 with filter.	2	CO1
LLO 10.1 Build the circuit for 7 Segment LED display FND 507/508. LLO 10.2 Observe numeric output for 0-9	10	Bulid and Test the performance parameters of 7 Segment LED display FND 507/508.	2	CO1
LLO 11.1 Identify the terminals of the PNP and NPN transistor for TO-5, TO-220, TO-66 LLO 11.2 Select of transistor for different max. voltage, current and switching speed	11	* Identify and select transistors using datasheets	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 12.1 Build the circuit for BJT in common base configuration. LLO 12.2 Plot input and output characteristics of common base configuration.	12	Build and Test the performance of BJT working in CB mode.	2	CO2
LLO 13.1 Select the specific transistor for different max. voltage, current and switchingspeed LLO 13.2 Prepare the circuit for BJT in common emitter configuration.	13	* Prepare and Test the performance of BJT working in CE mode	2	CO2
LLO 14.1 Build the circuit for BJT voltage divider bias circuit. LLO 14.2 Locate Q point on Load line.	14	* Build and Test the BJT voltage divider bias circuit for given input	2	CO2
LLO 15.1 Test the performance parameters of BJT as Switch LLO 15.2 Identify Cutoff and saturation regions	15	* Construct and Test the performance parameters of BJT as Switch.	2	CO2
LLO 16.1 Build single stage Common emitter amplifier. LLO 16.2 Plot frequency response for Common emitter amplifier.	16	* Build and Test the performance of single stage Low Power Common emitter amplifier	2	CO3
LLO 17.1 Build the circuit for BJT common emitter (CE) amplifier using simulation software (like SPICE/Multisim) LLO 17.2 Plot Output Waveform for sinusoidal input. LLO 17.3 Plot frequncy response curve .	17	Simulate and Test output waveform and frequency response of single stage common emitter (CE) amplifier using simulation software (like SPICE / Multisim)	2	CO3
LLO 18.1 Build the circuit for BJT two stage RC coupled common emitter (CE) amplifier. LLO 18.2 Plot frequency response	18	* Build and Test the performance of RC coupled two stage amplifier.	2	CO3
LLO 19.1 Build the circuit for FET in common source configuration. LLO 19.2 Plot characteristics for drain to source voltage VDS verses drain current ID for different Values of VGS	19	* Test the performance of FET drain characteristics	2	CO4
LLO 20.1 Build the circuit for FET in common source configuration. LLO 20.2 Plot characteristics for Gate to source voltage VGS verses drain current ID LLO 20.3 Calculate transconductance.	20	* Check the performance of FET transfer characteristics and calculate transconductance	2	CO4
LLO 21.1 Build the circuit for FET in common source configuration. LLO 21.2 Plot characteristics for Gate to source voltage VGS verses drain current ID	21	* Build and Test the performance of common source FET amplifier	2	CO4
LLO 22.1 Test the voltages &waveforms at various Test points of regulated dc power supply.	22	Test the various blocks of regulated dc power supply.	2	CO5
LLO 23.1 Identify the various faults in the Regulated DC power supply.	23	* Find out faults at different stages of regulated dc power supply.	2	CO5

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Practical / Tutorial / Laboratory Learning Outcome (LLO)	Sr No	Laboratory Experiment / Practical Titles / Tutorial Titles	Number of hrs.	Relevant COs
LLO 24.1 Rectify the various faults in the Regulated DC power supply	24	* Trouble shoot given DC regulated power supply.	2	CO5
LLO 25.1 Construct Zener voltage regulator for given voltage. LLO 25.2 Calculate load and line regulation.	25	Construct and test the performance of Zener voltage regulator for given voltage.	2	CO5
LLO 26.1 Build the circuit for Positive voltage regulator using 78XX IC. LLO 26.2 Calculate load and line regulation.	26	* Build and Test the performance of Positive voltage regulator using 78XX , three terminal IC for given voltage.	2	CO5
LLO 27.1 Build the circuit for Negative voltage regulator using 78XX IC. LLO 27.2 Calculate load and line regulation.	27	Build and Test the performance of Negative voltage regulator using 79XX, three terminal IC for given voltage.	2	CO5
LLO 28.1 Construct the circuit for Dual voltage regulator using 78XX and 79XX IC. LLO 28.2 Calculate load and Line regulation.	28	* Construct and test the performance of Dual voltage regulator using 78XX and 79XX ,three terminal IC for given voltage	2	CO5
LLO 29.1 Build LOW voltage regulator circuit using IC LM723 (2V-7V). LLO 29.2 Calculate load and line regulation.	29	* Build and Test the performance of LOW voltage regulator using IC LM723 for given voltage.(2 V-7V)	2	CO5
LLO 30.1 Build High voltage regulator circuit using IC LM723 (7V-30V) LLO 30.2 Calculate load and line regulation.	30	Build and Test the performance of HIGH voltage regulator using IC LM723 for given voltage.(7V-30V)	2	CO5

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

- Build Audio amplifier using BJT.
- Build the circuit for 3v battery charger.
- Build Clap switch Using transistor.
- Build audio amplifier using IC LM386.
- Build power supply using LM317.
- Prepare a chart of different types of Rectifiers showing their specifications and applications

Assignment

- Study working of OLED display.
- study of different Audio amplifier ICs (min 4).
- Study working of MOSFET as variable capacitor.
- select specific FET and Study datasheet for same.

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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	Variable DC Power supply 0-30V with display for voltage and current, 2Amp SC protection	1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16,19,20,22,23,24
2	LT Spice /Lab view/H Spice /P Spice /HS Spice / Multisim/ Proteus/Octeva or any other relevant open source software	17
3	Computer System with advanced Configuration Hardware requirement as per selected software	17
4	DSO 30/50/100 MHz Frequency Digital read out USB interface	4,5,6,7,8,9,16,22
5	CRO 20/30/100 MHz Frequency Dual Channel External Trigger CT mode facility or any other better specifications	4,5,6,7,8,9,16,22,18
6	Function Generator 0-2 MHz with Sine, square and triangular output with variable frequency and amplitude	4,5,6,7,8,9,16,22,18
7	Analog multimeter& Digital multimeter	All
8	Different types of cables and connectors	All

IX. SUGGESTED WEIGHTAGE TO LEARNING EFFORTS & ASSESSMENT PURPOSE (Specification Table)

Sr.No	Unit	Unit Title	Aligned COs	Learning Hours	R-Level	U-Level	A-Level	Total Marks
1	I	Applications of Diode	CO1	12	4	4	6	14
2	II	Bipolar Junction Transistor	CO2	12	4	4	6	14
3	III	BJT Amplifiers	CO3	14	4	6	6	16
4	IV	Field Effect Transistor	CO4	12	4	6	4	14
5	V	Regulators and Power supply	CO5	10	4	4	4	12
		Grand Total		**60**	**20**	**24**	**26**	**70**

X. ASSESSMENT METHODOLOGIES/TOOLS

Formative assessment (Assessment for Learning)

- Progrssive test ,Assignment, Microproject , Termwork
- Each practical will be assessed considering - - 60% weightage to process and - 40% weightage to product
- Continuous assessment based on process and product related performance indicators, laboratory experience.

Summative Assessment (Assessment of Learning)

- End of Term Examination, Laboratory performance.

BASIC ELECTRONICS | **Course Code : 312314**

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	1	1	1	1	1			
CO2	2	2	1	1	1	1	1			
CO3	2	2	1	1	1	1	1			
CO4	2	2	1	1	1	1	1			
CO5	2	2	2	1	2	2	2			

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	Mehta, V.K. Mehta, Rohit Mehta	Principles of Electronics	S.Chand New Delhi, edition-2008 ISBN-13: 978- 8121927833
2	Sedha, R.S.	A Text book of Applied Electronics	S.Chand (G/L) & Company Ltd; ISBN-13 978-8121904209
3	P.Ramesh Babu	Electronics Device and Circuits	Scitech Publications (India) Pvt Ltd ,ISBN-13 978-8183712156
4	Theraja B.L. (Author), Sedha R.S. (Author)	Principles of Electronic Devices and Circuits (Analog and Digital)	S Chand & Company,ISBN-13 978-8121921992
5	B.L.Theraja	Basic Electronics (solid State)	S Chand;ISBN-13 978-8121925556
6	Albert P. Malvino, David J. Bates	Electronic Principles	McGraw Hill; ISBN-13 978-9354602399
7	D. P. Kothari , I. J. Nagrath	Basic Electronics	McGraw Hill Education,ISBN-13 978-9352606467
8	Roberrt L.Boylestead	Electronics Circuit and Circuit theory	Pearson Education India, ISBN-13 978-9332542600

XIII . LEARNING WEBSITES & PORTALS

Sr.No	Link / Portal	Description
1	https://nptel.ac.in/courses/122106025	Basic Electronics and Lab, IIT Madras Prof. T.S. Natarajan
2	https://archive.nptel.ac.in/courses/108/101/108101091/	Basic Electronics, IIT Bombay
3	4. https://learn.sparkfun.com/tutorials/transistors	Transistor basics
4	https://www.multisim.com/	online multisim live software/ free student evalution software download for limited time
5	https://alternativeto.net/software/multisim/	alernative softwares to multisim
6	https://www.labcenter.com/	demo version of Proteus software
7	https://learn.sparkfun.com/tutorials/transistors	Simulation

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Sr.No	Link / Portal	Description
Note :		

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

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Semester - 2, K Scheme