C.U.SHAH UNIVERSITY – Wadhwan City

FACULTY OF: -Technology & Engineering (Diploma Engineering)
DEPARTMENT OF: -Electronics & Communication Engineering
SEMESTER: - III **CODE**: -2TE03EMI1
NAME – Electronics Measurement & Measuring Instruments (EMI)

Teaching & Evaluation Scheme:-

Subject Code	Subject Name	Teaching Scheme (Hours)				Credits	Evaluation Scheme							
							Theory				Practical (Marks)			Total
											Internal		University	
		Th	Tu	Pr	To		Sessional Exam		University Exam		Pr	TW	Pr	
							Marks	Hours	Marks	Hours				
2TE03EMI1	Electronics Measurement & Measuring Instruments (EMMI)	03	00	02	05	04	30	1.5	70	03	30	20	---	150

Objectives:-

- This course will help students to develop skills to become professional technician with capability to measure electrical parameters using various instruments. By learning this course students will able to know basics of various instruments, transducers & working of electronic circuits used in electronic test and measuring instruments.

Prerequisites: -

- Basic concept of Electronics Equipments.

Course Outlines:-

Sr. No.	Course Contents	Hours
1	**Characteristic of Measurements and Bridges :-** Accuracy, precision, resolution, error and noise, Types of errors, Limiting of errors, Wheatstone bridge, Kelvin's double arm bridge, Maxwell's bridge, Hay bridge, Schering bridge	8
2	**Basic Parameter Measurements :-** Moving coil and moving iron type instruments, DC voltmeter, AC voltmeter using three terminal rectifier and half wave rectifier, Amplified DC meter, Electronic multimeter (DVM), Principle of DVM, Types- ramp type, integrating type and successive approximation type DVMs, Watt meter, Energy meter, clip-on meter, Hot wire instrument LCR- Q meter : Basic circuit , applications, Series and parallel connection of Capacitor and Inductor.	9
3	**Oscilloscopes :-** Block diagram of C.R.O., Cathode ray tube: construction, operation, screens, graticules, Vertical deflection system: Delay line, multiple trace CRO, Horizontal deflection system, Oscilloscope probe: structure of 1:1 and 10:1 probes, Measurement of frequency, time delay, phase angle and modulation index (trapezoidal method), Block diagram of digital storage oscilloscope and its features..	9
4	**Transducers :-** Classification of transducers, Unbounded strain gauge, Displacement transducers,	8

	Capacitive transducers, Inductive transducers, Resistive & capacitive touch screen transducer (Used in mobile), Linear variable differential transformer (LVDT) transducer, Piezo-electric transducer, Velocity transducer, Temperature measurement, Thermocouples, Seeback & Peltier Effect, Types J,K,R,S,T Thermostats, Resistance thermometer (RTDs), PTC,PT-100 (2-3-4 Wire systems-only circuit, no derivation)	
5	**Test and Measuring Instruments :-** Audio frequency signal generation (Block diagram), Sweep frequency generator(Block diagram), Pulse and square wave generator (Block diagram and circuit), Function generator (Block Diagram & Circuit), Simple frequency counter, Display counter, Cascading counters, Multiplexing of display in frequency counter, Period measurement, Digital IC tester, Block diagram and Operation of Logic Analyzer, Block diagram and Operation of Spectrum analyzer, Block diagram and operation of Harmonic distortion analyzer, Block diagram & operation of Field strength meter (dB meter)	**8**

Experiment List:-

- Measure various parameters viz. voltage, current, resistance using Digital Multimeter.
- Measure the value of unknown resistor using Wheatstone
- Obtain characteristic of LVDT.
- Obtain characteristics of strain gauge.
- Obtain characteristics of thermocouple.
- Obtain characteristics of thermistor.
- Obtain characteristics of RTD transducer.
- Control temperature using RTD in any specific application.
- Measure voltage, frequency, phase and modulation index (trapezoidal method) using CRO.
- Measure Unknown frequency using Lissajous patterns.
- Demonstrate features of digital storage oscilloscope.
- Analyse sine/square wave in frequency domain using spectrum analyser.
- Test various digital IC using I.C. Tester.

Learning Outcomes:-

- Measure various electrical parameters with accuracy, precision, resolution.
- Apply AC & DC bridges for relevant parameter measurement.
- Select appropriate passive or active transducers for measurement of Physical phenomenon.
- Use Signal Generator, frequency counter, CRO and digital IC tester for appropriate easurement.
- Test and troubleshoot electronic circuits using various measuring instruments.
- Maintain various types of test and measuring instruments.

Books Recommended:-

- Electronic Instruments and Measurement Techniques , **Cooper**, W.D.Halfrick, A.B. PHI,
- Electrical & Electronic Measurements, **Sahani**, A.K. Dhanpat Rai, 2001, or latest edition
- Elements of Electronic Instrumentation and Measurement, **Joseph**, J.Carr Pearson, 13E, 2013
- Electronic Instrumentation, **David**, Bell PHI, 2006

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FACULTY OF: -Technology & Engineering (Diploma Engineering)
DEPARTMENT OF: -Electronics & Communication Engineering
SEMESTER: - III **CODE**: -2TE03EDC1
NAME – Electronics Devices (EDC)

Teaching & Evaluation Scheme:-

Subject Code	Subject Name	Teaching Scheme (Hours)				Credits	Evaluation Scheme							
							Theory				Practical (Marks)			Total
											Internal		University	
		Th	Tu	Pr	To		Sessional Exam		University Exam		Pr	TW	Pr	
							Marks	Hours	Marks	Hours				
2TE03EDC1	Electronics Devices (EDC)	04	00	02	06	05	30	1.5	70	03	30	20	---	150

Objectives:-

- To developed the basic knowledge & concept of Electronics Devices.
- Understanding of working principle of Different types Transistor amplifiers (Voltage amplifier & Power amplifiers) and FET.

Prerequisites:-

- Basic knowledge of Electronics Devices
- Basic knowledge of Transistor Amplifiers
- Basic knowledge of FET.

Course Outlines:-

Sr. No.	Course Contents	Hours
1	**Transistor Amplifiers :-** Principle of an amplifier, Transistor common base amplifier working, D.C. load line & operating point in CB amplifier, Determination of Av, Ai, Ap, Ri, Ro in CB amplifier, Transistor common emitter amplifier, Load line consideration & operating point in CE Amplifier, Determination of Av, Ai, Ap, Ro, Ri in CE amplifier, Transistor common collector amplifier, Comparison of CB, CE and CC amplifier, Darlington pair.	10
2	**Transistor Biasing Circuits And Thermal Stability :-** Transistor biasing circuits, Reasons for thermal instability, Stability factor, Stability factor of a CE amplifier, Collector to base biasing methods for stabilisation, Emitter biasing methods for stabilisation and emitter bypass capacitor, Potential divider method of biasing, Thermal resistance & requirements of heat sink.	8
3	**Frequency Response Of Small Signal Transistor Amplifier :-** Different methods of coupling in amplifier, Circuits of R.C. coupled amplifier. using single stage (CE), Two stage RC coupled amplifier, Low frequency response of R-C coupled CE Amplifier, Low frequency response and effect of coupling and emitter bypass capacitor, Low frequency response to a pulse, High frequency response to a pulse, High frequency Model for CE Amplifier.	8
4	**Feedback In Transistor Amplifier And Oscillator :-** Introduction to feedback. Negative feedback Effect and advantages of negative feedback. Types of negative feedback in transistor circuits. Effect of positive feedback.	9

	Requirements for oscillation. Types of Oscillators: R.C. phase shift oscillator, Wein-bridge oscillator, Harley oscillator, Colpitts oscillator, Crystal oscillator.	
5	**Transistor Power Amplifier :-** Class-A operation with transformer coupled load. Class-B operation, Push-pull circuit Phase inverter, cross over distortion. Class AB push-pull operation. Class-B efficiency, Complimentary Symmetry push-pull Amplifier.	**9**
6	**Field-Effect Transistor :-** Field Effect Transistor: Construction, Operation, Characteristics and parameters. FET amplifiers: Common source, Common drain, Common gate. MOSFET: Depletion type: construction and operation, Enhancement type: construction and operation. Comparison of Bipolar Junction transistor, FET and MOSFET. IGBT: Construction, characteristics and application.	**10**

Experiment List:-

- Test & Perform Transistor common Emitter amplifier.
- Test & Perform Transistor common Collector amplifier.
- Test & Perform Transistor common Base amplifier.
- Study & perform Frequency response of R.C. coupled amplifier.
- Study & perform Frequency response of two stage R.C. coupled amplifier.
- Build & test colpitt's oscillator.
- Build & test hartely oscillator.
- Build & test Wien's bridge oscillator.
- Obtain the frequency response of negative feedback amplifier.
- Obtain the frequency response of non-inverting OPAMP circuit.
- Obtain the frequency response of inverting OPAMP circuit.

Learning Outcomes:-

- Application & importance of Electronics Devices.
- Knowledge of Transistor Amplifiers and power amplifiers.
- Knowledge of Pulse Circuits and FET.
- Knowledge of Linear Integrated Circuits.

Books Recommended:-

- Electronic devices & circuits - **Robert Boylestad, Louis Nashelsky** – Pearson
- Electronic Devices and Circuits - **Allen Motershed** – MGH
- Electronic Principles **A.P.Malvino** – TMH
- Principles of Electronics - **V. K. Mehta** – S.Chand
- Integrated Electronics - **Millman & Halkias** – TMH
- Op-Amps and Linear Integrated Circuits – **Gayakwad** - Pearson

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FACULTY OF: -Technology & Engineering (Diploma Engineering)
DEPARTMENT OF: -Electronics & Communication Engineering
SEMESTER: - III **CODE**: -2TE03DLD1
NAME – Digital Logic Design (DLD)

Teaching & Evaluation Scheme:-

Subject Code	Subject Name	Teaching Scheme (Hours)				Credits	Evaluation Scheme							
							Theory				Practical (Marks)			Total
											Internal		University	
		Th	Tu	Pr	To		Sessional Exam		University Exam		Pr	TW	Pr	
							Marks	Hours	Marks	Hours				
2TE03DLD1	Digital Logic Design (DLD)	04	00	02	06	05	30	1.5	70	03	30	20	---	150

Objectives:-

- This course provides information about the basic introduction of Digital logic circuits it helps to understand binary coding and combinational and sequential circuits.

Prerequisites: -

- Basic knowledge of Electronics devices and circuits

Course Outlines:-

Sr. No.	Course Contents	Hours
1	**Number System :-** Binary number system, Binary arithmetic: addition, subtraction, multiplication and division, Complements: 1's, 2's, 9's and 10's , Subtraction using complements, Octal number system, Hexadecimal number system, Conversion among binary, octal, decimal and hexadecimal number systems, Codes: BCD, Gray, Excess-3, ASCII, EBCDIC	10
2	**Logical Circuits :-** AND, OR, NOT Gates: symbol, operation and truth-table, NAND, NOR, EX-OR, EX-NOR gates: symbol, operation and truth-table, Positive and negative logic system, Saturated and non-saturated logic, Introduction to RTL and DTL logic families, Characteristics of TTL family, types of TTL, Characteristics of MOS and CMOS families, Comparison of different logic families, Two input NAND gate circuit using DTL, TTL, MOS and CMOS families	10
3	**Boolean Algebra :-** De Morgan's theorems, The universal building blocks, NAND and NOR, Laws and theorems of Boolean algebra, Algebraic simplification of Boolean expression, Fundamental products, Sum of products and product of sums expression, AND-OR network, Truth table and karnaugh maps, Four variable karnaugh maps and their simplification techniques, Don't care condition, NAND-NAND networks	10
4	**Combinational Logic Circuits :-** Arithmetic Circuits Half adder, full adder, parallel binary adder, 1's complement subtractor circuit, 2's complement subtractor/adder circuits, 8421 adder, half and full subtractor, parallel binary subtractor, Bin to gray and gray to bin code converters Decoder and Encoder, Comparator, Multiplexer and Demultiplexers, Parity Generators and	12

	Checkers	
5	**Sequential Circuits :-** S-R flip-flops asynchronous and synchronous S R flip flops. D flip flop and T flip flop edge triggered, J K flip flop and J K master slave flip flop, Introduction to Registers and Shift Registers, types of Registers, Introduction to counter circuits, types of counter, Memory classification, A to D converter, D to A converter	**12**

Experiment List:-

- To Study & Perform the basic logic gates.
- To Study & Perform the NAND gate as a universal building block
- To Study & Perform the NOR gate as a universal building block
- To Study & Perform the HALF ADDER circuit.
- To Study & Perform Full Adder circuit.
- To Study & Perform the Half subtractor circuit.
- To Study & Perform a Full subtractor circuit.
- To Study & Perform the S-R Flip Flop.
- To Study & Perform the J-K Flip Flop.
- To Study & Perform the D Flip Flop.
- To Study & Perform the T Flip Flop.
- To test the Ripple counter

Learning Outcomes:-

- Student can acquire the basic Knowledge of Digital logic circuits.
- Students will be able to know about number system, code conversion, adder, subtractor , flip-flop, counter etc..

Books Recommended:-

- Digital Electronics - **Morris Mano**, Pearson
- Digital Electronics, **Gothmen**, PHI
- Digital Electronics Principles, **Malvino & Leech**, MGH
- Digital fundamentals, **Thomes L.Floyd and Jain** , Pearson

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FACULTY OF: -Technology & Engineering (Diploma Engineering)
DEPARTMENT OF: -Electronics & Communication Engineering
SEMESTER: - III **CODE**: - 2TE03ACM1
NAME – Analog Communication (ACM)

Teaching & Evaluation Scheme:-

Subject Code	Subject Name	Teaching Scheme (Hours)				Credits	Evaluation Scheme							
							Theory				Practical (Marks)			Total
											Internal		University	
		Th	Tu	Pr	To		Sessional Exam		University Exam		Pr	TW	Pr	
							Marks	Hours	Marks	Hours				
2TE03ACM1	Analog Communication (ACM)	03	00	02	05	04	30	1.5	70	03	30	20	---	150

Objectives:-

- To developed the basic knowledge & concept of Analog Communication Systems.
- Understanding of working principle of Different types of Modulation and Demodulation Techniques.

Prerequisites: -

- Basic knowledge of Communication, Analog Modulation and Demodulation Techniques.

Course Outlines:-

Sr. No.	Course Contents	Hours
1	**Introduction To Communication Systems :-** Block diagram of general communication system, Modulation : definition, needs and types, Bandwidth requirements, Noise : types, sources, signal-to-noise ratio and noise figure	8
2	**Amplitude Modulation :-** Mathematical expression for AM signal, Frequency spectrum of the AM signal, Modulation Index: definition, equation and numerical, Carrier and modulating signal power relation: equation and numerical, Generation of AM, Low level and High Level Modulation, Block diagram of AM broadcasting Transmitter	9
3	**AM Radio Receiver :-** Characteristic of radio receiver : Sensitivity, Selectivity, fidelity - Tuned Radio frequency receiver, Super heterodyne Receiver, RF Amplifier section, RF Converters and RF Mixers, IF amplifier section, AM Detection, Automatics gain control, AF Sections	8
4	**Frequency And Phase Modulation :-** Mathematical expression for FM signal, Modulation Index : definition, equation and numerical, Phase Modulation, Comparison between FM and AM, Comparison of wideband and Narrowband of FM, Pre-emphasis de-emphasis networks, Generation of FM : Basic reluctance modulation, Varactor diode Modulation and Transistor redandance modulation, Stabilized Reactance Modulation, Indirect Method generation of FM (Armstrong Method), Block diagram of FM broadcasting Transmitter	9
5	**FM Receiver :-**	8

	FM receiver block diagram, Comparison of FM receiver with AM receiver, Amplitude Limiting, Basic FM demodulators : Slop detection, Balanced slop detection, Phase discriminator and Ratio detector and balanced ratio detector	

Experiment List:-

- To study about the Standard Signal Generator.
- To perform the operation of Amplitude Modulation Circuit and draw the Modulated output waveform.
- To perform the operation of Amplitude Demodulation Circuit and draw the Demodulated output waveform.
- To measure Modulation Index for AM wave using CRO.
- To perform the operation of Frequency Modulation Circuit and draw the Modulated output waveform.
- To perform the operation of Frequency Demodulation Circuit and draw the Demodulated output waveform.
- To study about Pre-emphasis and De-emphasis Networks.
- To study about the Principle and working of Radio Receiver.
- To study the fault finding procedure on AM receiver trainer kit.

Learning Outcomes:-

- Application & importance of Analog Communication.
- Definition & identification of various Analog Communication Terms.
- Knowledge of different types of AM-FM generator and Receivers.

Books Recommended:-

- Electronic Communication systems, **George Kennedy,** MGH
- Electronic Communications, **Dennis Roddy & John Coolen**, Pearson
- Electronic Communication, **Sanjeev Gupta**

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FACULTY OF: -Technology & Engineering (Diploma Engineering)
DEPARTMENT OF: -Electronics & Communication Engineering
SEMESTER: - III **CODE**: - 2TE03CNW1
NAME – Circuits & Networks (CNW)

Teaching & Evaluation Scheme:-

Subject Code	Subject Name	Teaching Scheme (Hours)				Credits	Evaluation Scheme							
							Theory				Practical (Marks)			Total
											Internal		University	
		Th	Tu	Pr	To		Sessional Exam		University Exam		Pr	TW	Pr	
							Marks	Hours	Marks	Hours				
2TE03CNW1	Circuits & Networks (CNW)	04	00	02	06	05	30	1.5	70	03	30	20	---	150

Objectives:-

- To developed the basic knowledge of resistance in series and parallel, resonance frequencies, filter circuits, Attenuator, Equalizer.

Prerequisites: -

- Basic concept of Electronics Components like resistor, inductor, capacitor, voltage source, current source etc., knowledge of basic terms like frequency, voltage, current etc.

Course Outlines:-

Sr. No.	Course Contents	Hours
1	**Network Elements and Network Topology :-** Conversion of voltage source to Current Source (Ideal and Practical) and vice versa, Resistors connected in series, parallel and in combination, Capacitors connected in series, parallel and in combination, Inductors connected in series, parallel and in combination, Voltage and Current division method, Branch, Node, Loop, Mesh and terms related to network topology , Passive and Active network, Linear and Non- linear , Lumped and Distributed , Unilateral and Bilateral, Symmetrical and Asymmetrical, Single port and Double port, Three and Four terminals, Transfer Impedance, Driving point Impedance, Image Impedance and Terminating Impedance, Input and Output Impedances, Characteristic Impedance of standard T and π networks (Z_{OT} and $Z_{O\pi}$) and relation between them ,T to π and π to T networks conversion or Star to Delta and Delta to Star conversion	10
2	**Network Theorems :-** Kirchhoff's Voltage and Current law(KVL and KCL), Mesh Analysis and Nodal Analysis of Networks, Super Position Theorem, Thevenin's Theorem, Norton's Theorem, Maximum Power Transfer Theorem, Reciprocity Theorem	14
3	**Resonance and Coupled Circuits :-** Quality factor or Q-factor of coil and capacitor, Series and parallel resonant circuit, resonance frequency, impedance at resonance, bandwidth and selectivity of series and parallel resonance circuit, Coupled circuit**,** mutual inductance, Transformers: Iron core, Air core, single tuned and double tuned air core transformer used in tuned circuit	10
4	**Attenuators, Equalizers & Filters :-** Attenuators, T and π attenuators, Lattice attenuators, Series and Shunt amplitude Equalizers, Bridge T and Lattice Phase equalizers, Passive Filters: Constant 'k' and 'm' derived type T	12

	and π sections – Low Pass, High Pass, Band pass and band stop filters	
5	**Two Port Network :-** Definition, Impedance Parameters, Admittance Parameters, Hybrid Parameters, Transmission Parameters, Cascaded Two Port Networks, Examples	**08**

Experiment List:-

- For a given multisource network, determine the output impedance and voltage and verify it using Thevinin's Theorem.
- For a given multisource network, determine the value of current in the specified branch and verify it using Superposition theorem
- For a given multisource network, determine the output impedance and voltage and verify it using Norton's Theorem
- For a given multisource network, determine the output impedance and voltage and verify it using Maximum power transfer theorem.
- For series resonance circuit, determine the frequency response curve to obtain the resonant frequency, resonant impedance, Bandwidth (BW) and Quality factor for series resonance circuit.
- For a parallel resonance circuit, determine the frequency response curve to obtain the resonant frequency, resonant impedance, Bandwidth (BW) and Quality factor.
- Build and test T-type, π-type attenuator for given attenuation.
- Build and test Lattice attenuator for given attenuation.
- Measure Transfer Impedance, Driving point Impedance, Image Impedance and Terminating Impedance, Input and Output Impedances for given two-port network.
- For the given parameters, build constant k-low pass filter (T and π sections)
- For the given parameters, build constant k-high pass filter (T and π sections)
- Obtain the frequency response curve for the given m -derived low pass and high pass filter.

Learning Outcomes:-

- Identification of various Electronics Components.
- Measure Current in any branch using Different types of Theorems.
- Basic Ideas of Attenuator, Equalizer, filter circuits etc.

Books Recommended:-

- Network Analysis, **M.E.Van Valkenburg,** Prentice Hall Inc. 2011 or latest edition
- Network Analysis and Synthesis, **Chakraborti A.** , Dhanpat Rai Publication,2009 or latest edition
- Network Analysis, **Mithal G. K. ,** Khanna Publication , 2008 or latest edition

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FACULTY OF: -Technology & Engineering (Diploma Engineering)
DEPARTMENT OF: -Electronics & Communication Engineering
SEMESTER: - III **CODE**: - 2TE03EPS1
NAME – Electronics Practices (EPS)

Teaching & Evaluation Scheme:-

Subject Code	Subject Name	Teaching Scheme (Hours)				Credits	Evaluation Scheme							
							Theory				Practical (Marks)			Total
											Internal		University	
		Th	Tu	Pr	To		Sessional Exam		University Exam		Pr	TW	Pr	
							Marks	Hours	Marks	Hours				
2TE03EPS1	Electronics Practices (EPS)	00	00	02	02	01	00	00	00	00	50	50	---	100

Objectives:-

- To developed the basic knowledge & concept of Electronics Equipments and measurement of electrical as well as electronic quantities like voltage, current, resistance, inductance, capacitance etc. The student can identify, measure the value of different types of electronics components.

Prerequisites: -

- Basic concept of Electronics Components.

Course Outlines:-

Sr. No.	Course Contents	Hours
1	**Electronic Components, Measuring Instruments and Tools :-** Passive components: Different types of: resistors, inductors, capacitors, potentiometers, Thermistor, Transformer, auto transformer, Active components: Diode, Zener diode, Varactor diode, LED, Photo diode, BJT, Photo transistor, FET, LDR, Solar cell, Photocell, Optocoupler, Voltage Sources: DC battery (Pencil cell :1.5V, AAA,AA Type, +9V, Rechargeble Cell, Mobile battery) AC power supply, DC power supply, Measuring Instruments: Different types of Voltmeters, Ammeters, Watt meters, multimeter, LCR-Q meter, CRO, DSO, Function Generator, Frequency counter, Electronic Workshop Tools: Bread board, Copper clad laminate sheet, Solder iron, solder-stand, solder-wire, flux, flexible wire, hookup wire, cables, relays, switches, connectors, fuses, Cutter, plier, screwdriver set, wire stripper, desolder pump, De-solder wick, drilling machine.	10
2	**Building, Wiring, Soldering and Testing of Electronic Circuits :-** Electronic circuit Drawing**:** Series and Parallel network using Resistors, Capacitors, T-type/ π-type attenuator, Circuit diagram for: forward/reverse biased PN Junction diode, Half wave, Full wave and Bridge Rectifier using diode, characteristics of Zener diode/ LED/ Photo diode/LDR, Transistor characteristics in CE/CB configuration, Zener diode as shunt regulator, Transistorized shunt/ series regulators, +5V, -5V, +/-5V dc regulated power supply using IC 78XX / 79XX with LED indication, LM317 variable voltage regulator, Clipper/Clamper, Low pass filter, High pass filter, Band pass filter, Band elimination filter, Light operated Relay, Transistorized touch control switch, Rain drop detector, Electronic circuit on bread board, Soldering/desoldering, electronic circuit on general purpose PCB	10

3	**Use of Data sheets for Component Selection and Specification :-** Manufacturer's Datasheet of: Diodes IN4001 to 07, IN4148; 2N5402, 2N5408, BY127, Zener Diode, Photo diode, LED, Varactor diode, Seven segment LED, Transistors BC107, BC177, BC547/548, SL100, SK100, AC127/128, BF194, TIP122, Phototransistor, voltage regulator IC78XX, 79XX, LM317, Packages of various SMD components: Resistor, Capacitor, Inductor, Diode-LL4148, SM4007, Chip transistor, Chip Darlington transistor, Bridge rectifier	**6**
4	**Schematic, Layout and Tracing of Electronic Circuits :-** Manually Prepare PCB layout on graph paper, PCB design software, PCB layout - Component side and copper side, Tracing for PCB Fabrication, Tracing of circuit on PCB	**8**
5	**Mini Project :-** Fabrication of PCB, component mounting, Soldering, testing & troubleshooting of circuits on PCB	**8**

Experiment List:-

- Draw symbols of various electronic components on drawing sheet.
- Draw circuit diagrams of various (Simple to Complex) electronic circuirs od drawing sheet.
- Compare the values with the measured by using measuring instruments like Digital Multimeter, LCR-Q Meter: Resistors inductors, capacitors, potentiometers, Trimmers, Thermistor, Transformer, auto transformer.
- Identify the terminals of the following components: Diode, Zener diode, Varactor diode, LED, Photo diode, BJT**,** Photo transistor, FET, LDR, Solar cell, Photocell, Opto-coupler,7 Segment Display, Relays.
- Use the following instruments to measure the parameters of any electronic circuit : Function Generator, Frequency counter, CRO, and DSO, with all safety precautions.
- Provide some exercises so that the following electronics hardware tools and materials are learned to be used by the students (as a guideline only):
  (a) Bread board (b) Copper clad laminate sheet (c) Solder iron, solder-stand (d) Solder-wire, flux (e) Flexible wire (f) Hookup wire (g) Cutter (h) Nose plier (i) Screwdriver set (j) Wire stripper (k) De-solder pump (l) De-solder wick (m) Drilling machine .
- Sketch, mount and test at least six from following electronic circuit on bread board (Circuits given as a guideline only):
  (a) T type attenuator (b) π-type attenuator (c) Forward/reverse biased PN Junction diode (d) Zener diode as shunt regulator (e) Opto coupler using LED & Photo diode (f) Half wave Rectifier, Full wave & Bridge rectifier (g) Light operated relay (h) Diode clipper (i) Diode clamper (j) Transistorized series regulator (k) +/- 5V Regulated power supply with LED indication (l) Low pass filter, High pass filter (m) Band pass filter, Band elimination filter (n) Variable power supply using LM317.
- Sketch, mount, wire, solder and test at least six from electronic circuits (mentioned in S.No. 9 above) on general purpose board.
- De-solder given circuit(s) from general purpose printed circuit board.
- Find Specifications and package of following components from Datasheet. (as a guideline only):
  (a) Diodes IN4001 to 1N4007, IN4148, 2N5402, 2N5408,BY127 (b) Zener Diode - 5V6 (c) Photo diode - BPW10 (d) LED - LED 55 (e) Varactor diode (f) Seven segment LED (g) Transistors BC107, BC177, BC547/548, (h) Transistors SL100, SK100, AC127/128, BF194, TIP122 (i) IC 78XX, 79XX (j) LM317 (k) SMD components: Resistor, Capacitor, Inductor & Diode- LL4148, SM4007, Chip transistor, Chip Darlington transistor, Bridge rectifier.

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- 1.Prepare layout (Manually) of a given circuit on paper.
  2.Create schematic and layout of given electronic circuit using any PCB design software:
  (a) +/-12V Regulated Power supply Using 7812 & 7912 (b) Light operated Relay (c) TV remote checker using transistor ,IR photo diode, red LED (d) Touch switch using transistor (e) Door safety using Reed and magnet (f) Water level alarm using single transistor (g) Opaque Object sensing alarm using LDR, transistor & Buzzer
- Trace electronic circuit from the given PCB layout of an electronic circuit.
- **Mini project 1**
  Create schematic, layout and fabricate PCB for given electronic circuit and prepare brief report on it.
- **Mini project 2**
  Build experiment board (at least one) from following on Hylem sheet and wooden casing in group of five students maximum. (as a guideline only):
  a) PN junction diode characteristics b) Zener diode characteristics c) LED characteristics d) Half wave, full wave, bridge rectifiers e) Transistor characteristics f) LDR characteristics g) +/-5V dc regulated power supply using LM7805 &LM7905.
- **Mini project 3**
  Build extension board with four 5-pin socket, four switches, fuse and indicating lamp. (This is for guideline only; faculty can allot other required electrical wiring related project).

Learning Outcomes:-

- Identification of various Electronics Terms.
- Knowledge of different types of Electronics Devices.
- How to measure the value of resistor, inductor and capacitor.

Books Recommended:-

- Printed Circuit Boards: Design and Technology **– Bossart,** TMH, 2008 or latest edition
- Build Your Own Printed Circuit Board- **Al Williams,** Mc GrawHill, 2003 or latest edition
- Making Printed Circuit Boards- **Jan Axelsen,** Mc GrawHill, 1993 or latest edition