Programme Name/s	**: Architecture Assistantship/ Automobile Engineering./ Artificial Intelligence/ Agricultural Engineering/ Artificial Intelligence and Machine Learning/ Automation and Robotics/ Architecture/ Cloud Computing and Big Data/ Civil Engineering/ Chemical Engineering/ Computer Technology/ Computer Engineering/ Civil & Rural Engineering/ Construction Technology/ Computer Science & Engineering/ Fashion & Clothing Technology/ Digital Electronics/ Data Sciences/ Electrical Engineering/ Electronics & Tele-communication Engg./ Electrical Power System/ Electronics & Communication Engg./ Electronics Engineering/ Food Technology/ Computer Hardware & Maintenance/ Instrumentation & Control/ Industrial Electronics/ Information Technology/ Computer Science & Information Technology/ Instrumentation/ Interior Design & Decoration/ Interior Design/ Civil & Environmental Engineering/ Mechanical Engineering/ Mechatronics/ Medical Electronics/ Production Engineering/ Printing Technology/ Polymer Technology/ Textile Technology/ Electronics & Computer Engg./ Textile Manufactures**
Programme Code	**: AA/ AE/ AI/ AL/ AN/ AO/ AT/ BD/ CE/ CH/ CM/ CO/ CR/ CS/ CW/ DC/ DE/ DS/ EE/ EJ/ EP/ ET/ EX/ FC/ HA/ IC/ IE/ IF/ IH/ IS/ IX/ IZ/ LE/ ME/ MK/ MU/ PG/ PN/ PO/ TC/ TE/ TX**
Semester	**: First**
Course Title	**: BASIC SCIENCE**
Course Code	**: 311305**

I. RATIONALE

Diploma engineers have to deal with various materials and machines. This course is designed with fundamental information to help the diploma engineering students to apply the basic concepts and principles of physics and chemistry to solve broad- based engineering problems. The basic concepts and principles of sciences related to heat, electricity, magnetism, optics, semiconductors, engineering materials will help in understanding the technology courses where emphasis is on the applications of these in various technology domain applications

II. INDUSTRY / EMPLOYER EXPECTED OUTCOME

This course is to be taught and implemented with the aim to develop in the student, the course outcomes (COs) leading to the attainment of following industry identified outcome expected from this course: Apply principles of physics and chemistry to solve broad based relevant engineering problems.

III. COURSE LEVEL LEARNING OUTCOMES (COS)

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

- CO1 - Use basic instruments to measure the physical quantities in various engineering situations.

- CO2 - Apply the basic principles of electromagnetics to solve given engineering problems.
- CO3 - Apply basic principles of thermometry and fibre optics to solve engineering problems.
- CO4 - Predict the structure, properties and behaviour of molecules and compounds based on the types of chemical bond.
- CO5 - Apply the concepts of electrochemistry and corrosion preventive measures in industry.
- CO6 - Use the appropriate engineering material and catalyst appropriately.

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	
311305	BASIC SCIENCE	BSC	DSC	4	-	4	2	10	5	1.5	30	70*#	100	40	50	20	50@	20	50	20	250

Total IKS Hrs for Sem. : 4 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.

♦ Candidate remaining absent in practical examination of any one part of Basic Science course i.e. Physics,Chemistry will be declare as Absent in Mark List and has to appear for examination. The marks of the part for which candidate was present will not be processed or carried forward.

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.

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 Explain physical quantities and its types with examples. TLO 1.2 Differentiate between scalar and vector quantities with examples. TLO 1.3 Apply dimensional analysis to check correctness of equation and conversion of units in different systems . TLO 1.4 Estimate the errors in the measurement for the give problem. TLO 1.5 Explain the working of ancient astronomical instruments to measure distance , time and hour angle . TLO 1.6 Explain the procedure of measuring the dimension of a given object by using vernier calipers and screw gauge .	**Unit - I Units and Measurements** 1.1 Unit, physical quantities: fundamental and derived quantities and their units Systems of units: CGS, MKS and SI . 1.2 Scalar and Vector Physical Quantities. 1.3 Dimensions, dimensional formula ,Applications of dimensional analysis; correctness of physical equations ,conversion factor for interconversion of units in different systems of units. 1.4 Errors, types of errors: instrumental, systematic and random error, estimation of errors: absolute, relative and percentage error, significant figures. 1.5 Ancient astronomical instruments:Chakra, Dhanuryatra , Yasti and Phalaka yantra . 1.6 Applications of Vernier calipers , Screw gauge .	Chalk and board Improved lecture, Tutorial Assignment Demonstration
2	TLO 2.1 Explain electric field, potential and potential difference. TLO 2.2 Explain magnetic intensity and flux with their units. TLO 2.3 Apply laws of series and parallel combination to the given electrical circuits.Explain the heating effect of electric current. TLO 2.4 Distinguish between conductors, semiconductors and insulators on the basis of energy bands. TLO 2.5 Explain the I-V characteristics and applications of p-n junction diode.	**Unit - II Electricity, Magnetism and Semiconductors** 2.1 Concept of charge, Coulomb's inverse square law, Electric field, Electric field intensity, potential and potential difference. 2.2 Magnetic field and magnetic field intensity and its units, magnetic lines of force, magnetic flux . 2.3 Electric current, Ohm's law, specific resistance, laws of series and parallel combination of resistance, conversion of galvanometer into ammeter and voltmeter, Heating effect of electric current . 2.4 Conductors, Insulators and Semiconductors, Energy bands, intrinsic and extrinsic semiconductors, minority and majority charge carriers. 2.5 p-n junction diode, Depletion layer I-V characteristics of p-n junction, static and dynamic resistance, applications of p-n junction diode ,: Half wave rectifier.	Chalk and board Improved lecture, Tutorial Assignment Demonstration Educational Games

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 Convert temperature in different temperature scales. TLO 3.2 Compare different modes of heat transfer with examples. TLO 3.3 Inter-relate the characteristics of the three gas laws. TLO 3.4 Inter-relate the characteristics of the three gas laws. TLO 3.5 Explain total internal reflection in optical fiber. TLO 3.6 Differentiate between types optical fibber with applications.	**Unit - III Thermometry and Fiber Optics** 3.1 Heat, temperature, temperature scale: Degree Celsius, degree Kelvin, degree Fahrenheit. 3.2 Modes of heat transfer: Conduction , Convection and Radiation , Applications in daily life . 3.3 Boyle's law, Charle's law, Gay Lussac's law, perfect gas statements equations and simple numerical. 3.4 Law of thermal conductivity ,Newton's law of cooling. 3.5 Law of refraction, total internal reflection. 3.6 Optical fibber: Principle, construction and working Types of Optical fibers;Single mode step index, Multimode step index, Multimode graded index Applications of optical fibers.	Chalk and board Improved lecture, Tutorial Assignment Demonstration Flip classroom Educational Games
4	TLO 4.1 Explain the properties of given material based on the bond formation. TLO 4.2 Describe the molecular structure of given solid, liquid and gases. TLO 4.3 Describe the crystal structure of the given solids. TLO 4.4 Explain Properties of metallic solid.	**Unit - IV Chemical bonding** 4.1 Indian Chemistry:-Philosophy of atom by Acharya Kanad. 4.2 Electronic theory of valency: Assumptions , Chemical bonds: Types and characteristics of electrovalent bond, covalent bond, coordinate bond, hydrogen bond, metallic bond and Intermolecular forces of attraction. 4.3 Molecular arrangement in solid, liquid and gases. 4.4 Structure of solids: crystalline and amorphous solids ,Properties of metallic solid, Unit cell: simple cubic, body center cubic (BCC) , face centre cubic (FCC), hexagonal close pack crystals.	Simulation, Model Display, Demonstration Chalk and board , PPT, ect

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.
5	TLO 5.1 Describe mechanism of electrolysis of CuSO4 solution by using cu and pt rods TLO 5.2 Solve numerical based on Faraday's first and second law of electrolysis. TLO 5.3 Distinguish between primary and secondary cell TLO 5.4 Describe the phenomenon of the given type of corrosion and its prevention. TLO 5.5 Identify the different factors affecting rate of corrosion for the given type of material. TLO 5.6 Select the protective measures to prevent the corrosion in the given corrosive medium.	**Unit - V Electro chemistry and Metal Corrosion, its prevent ion** 5.1 Electrolyte- Types of electrolyte, ionization and dissociation ,Cathode, Anode, Electrode potential: oxidation and reduction, Mechanism of electrolysis :Electrolysis, Electrochemical series for cations and anions. Mechanism of electrolysis of CuSO4 solution 5.2 Faraday's laws of electrolysis: Faraday's first and second law, relation between electrochemical equivalent and chemical equivalent, Numerical. Applications of electrolysis: Electro-refining of copper and Electroplating. 5.3 Difference between primary and secondary cell. 5.4 Corrosion: Definition and Types of corrosion Dry corrosion: Mechanism, Types of oxide film, Wet corrosion :Mechanism hydrogen evolution in acidic medium, oxygen absorption in neutral or alkaline medium ,Galvanic cell action by Daniel cell. 5.5 Factors affecting the rate of corrosion. 5.6 Corrosion control: Modification of environment, Use of protective coatings, coating of less active metal like Tin (Tinning), coating of more active metal like Zinc (Galvanizing), Anodic and cathodic protection, Choice of material-using pure metal and using metal alloy	Simulation, Demonstration, Flipped Classroom, Collaborative Learning, Case Study, On-site/Industrial Visit ,chalk and board etc.

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.
6	TLO 6.1 Identify the ingredients of the given paints. TLO 6.2 List out salient properties of the given paint and varnish. TLO 6.3 Describe the properties of insulating materials for the given application. TLO 6.4 Differentiate the given types of structural polymers. TLO 6.5 Describe the polymerization process of the given polymer. TLO 6.6 Explain the properties and uses of the given polymer, elastomer and adhesive. TLO 6.7 Describe the application of relevant adhesives required for the given material. TLO 6.8 Suggest the lubricant for various types of machines in industry. TLO 6.9 Select the relevant catalyst for given application.	**Unit - VI Engineering Materials and Catalysis** 6.1 Paints: Purposes of applying paint, Characteristics of paints, Ingredients of paints, Function and examples of each ingredient. 6.2 Varnish: Types, Difference between paint and varnishes. 6.3 Insulators: Characteristics, Classification,Properties and Application of Glass wool Thermocol. 6.4 Polymer and Monomer : Classification on the basis of Molecular structure, on the basis of monomers (homo polymer and copolymer), on the basis of Thermal behavior(Thermoplastics and Thermosetting). 6.5 Types Polymerization Reaction, Addition Polymerization, Condensation Polymerization, Synthesis, properties and application of Polyethylene, Polyvinyl chloride, Teflon, Polystyrene, Phenol formaldehyde, Epoxy Resin. 6.6 Adhesives: Characteristics, Classification and their uses 6.7 Lubricants: Classification, properties and Applications. 6.8 Catalysis: Types of catalysis homocatalysis ,heterocatalysis . 6.9 Catalyst: Types of Catalyst Positive, Negative and Auto-catalyst, Catalytic Promoter and Catalytic inhibitor, Industrial application of catalyst.	Simulation, Demonstration, On-site Visit ,Chalk and Board, etc.

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 Use Vernier caliper to : Measure dimensions of given objects. Measure the dimensions of objects of known dimensions. LLO 1.2 Estimate the errors in measurement.	1	Measurements of dimensions of given object by Vernier caliper.	2	CO1
LLO 2.1 Use Micrometer Screw gauge to: Measure dimensions of given objects. Measure the dimensions of objects of known dimensions. LLO 2.2 Estimate the errors in measurement.	2	Measurements of dimensions of given objects by micrometer screw gauge.	2	CO1
LLO 3.1 Apply Ohm's law to solve circuit problems.	3	Determination of resistance by Ohm's law.	2	CO2

Practical / Tutorial / Laboratory Learning Outcome (LLO)	Sr No	Laboratory Experiment / Practical Titles / Tutorial Titles	Number of hrs.	Relevant COs
LLO 4.1 Determine the specific resistance of given wire.	4	Determination of specific resistance of given wire.	2	CO2
LLO 5.1 Verify law of series connection of resistors.	5	Determination of equivalent resistance in series connection of resistors.	2	CO2
LLO 6.1 Verify law of parallel connection of resistors.	6	Determination of equivalent resistance in parallel connection of resistors.	2	CO2
LLO 7.1 Use magnetic compass to draw the magnetic lines of forces of magnet of different shapes and determine neutral points.	7	Determination of neutral points by magnetic compass.	2	CO2
LLO 8.1 Use P -N junction diode to draw forward bias and reverse bias I-V characteristics LLO 8.2 Find out static and dynamic resistance of given P N junction diode	8	Determination of static and dynamic resistance of given P N junction diode.	2	CO2
LLO 9.1 Determine forbidden energy band gap in semiconductors	9	Determination of forbidden energy band gap in semiconductors.	2	CO2
LLO 10.1 Use Joule's calorimeter to determine Joule's mechanical equivalent of heat	10	Determination of Joule's mechanical equivalent of heat by Joule's law.	2	CO3
LLO 11.1 Determine the pressure-volume relation using Boyle's law	11	Determination of pressure-volume relation using Boyle's law.	2	CO3
LLO 12.1 Use Newton"s law of cooling to determine the rate of heat loss due to convection phenomena	12	Determination of the rate of heat loss due to convection by Newton's law of cooling.	2	CO3
LLO 13.1 Use Searle's thermal conductivity apparatus to find coefficient of thermal conductivity of given material (Virtual Lab)	13	Determination of Coefficient of thermal conductivity.	2	CO3
LLO 14.1 Determine the refractive index of glass slab using TIR phenomenon.	14	Determination of the refractive index of glass slab.	2	CO3
LLO 15.1 Determine the Numerical Aperture (NA) of a given step index optical fibre	15	Determination of the Numerical Aperture (NA) of a given step index optical fiber.	2	CO3
LLO 16.1 Identify cation in given ionic solutions by performing selective test	16	Identification of cation in given ionic solutions.	2	CO4
LLO 17.1 Identify anion in given ionic solutions by performing selective test	17	Identification of anion in given ionic solutions.	2	CO4
LLO 18.1 Identify states of matter of materials by using simulation. by Appling heating and cooling Techniques. LLO 18.2 Relate temperature-pressure diagram	18	Identification of states of matter.	2	CO4
LLO 19.1 Determine the electrode potential of copper metal. by setting Electrochemical Cell LLO 19.2 Measure electrode potential of Cu Using Voltmeter. LLO 19.3 Measure the cell potential for various conditions.	19	Determination of electrode potential of copper.	2	CO5

Practical / Tutorial / Laboratory Learning Outcome (LLO)	Sr No	Laboratory Experiment / Practical Titles / Tutorial Titles	Number of hrs.	Relevant COs
LLO 20.1 Determine the electrode potential of Iron metal. by setting Electrochemical Cell LLO 20.2 Measure electrode potential of Fe Using Voltmeter LLO 20.3 Measure the cell potential for various conditions.	20	Determination of electrode potential of Iron metal.	2	CO5
LLO 21.1 Determine the voltage generated from chemical reaction using Daniel Cell. LLO 21.2 Set up Daniel Cell. Prepare Electrolyte Solution LLO 21.3 Measure voltage accurately	21	Determination of the voltage generated from chemical reaction using Daniel Cell.	2	CO5
LLO 22.1 Prepare Electrolyte Solution of CuSO 4 of known concentration LLO 22.2 Set up electrolysis apparatus LLO 22.3 Control various parameters of electrolysis. LLO 22.4 Determine electrochemical equivalent of Cu metal using Faraday's first law.	22	Determination of electrochemical equivalent of Cu metal using Faraday's first law.	2	CO5
LLO 23.1 Prepare Electrolyte Solution of the given metal of known concentration LLO 23.2 Set up electrolysis apparatus LLO 23.3 Control various parameters of electrolysis LLO 23.4 Analyze the data obtained from the experiment. LLO 23.5 Verify Faraday second law	23	Determination of equivalent weight of metal using Faraday's second law.	2	CO5
LLO 24.1 Prepare corrosive solutions LLO 24.2 Determine the extent of corrosion.	24	Preparation of corrosive medium for Aluminium at different temperature.	2	CO5
LLO 25.1 Prepare corrosive solutions. LLO 25.2 Determine the extent of corrosion LLO 25.3 Compare the corrosion behaviour of Aluminum at different temperatures.	25	Determination of rate of corrosion at different temperatures for Aluminium.	2	CO5
LLO 26.1 Determine the effect of temperature on viscosity for given lubricating oil using Redwood viscometer-	26	Determination of effect of temperature on viscosity for given lubricating oil using Redwood viscometer-I.	2	CO6
LLO 27.1 Determine the steam emulsification number of given lubricating oil. LLO 27.2 Measure the steam flow duration	27	Determination of the steam emulsification number of given lubricating oil.	2	CO6
LLO 28.1 Calculate the flash and fire point of given lubricating oils using Cleveland open cup apparatus	28	Determination of flash and fire point of given lubricating oils using Cleveland open cup apparatus.	2	CO6
LLO 29.1 Determine the flash point of given lubricating oil using Abel's closed cup apparatus.	29	Determination of flash point of given lubricating oil using Abel's closed cup apparatus.	2	CO6
LLO 30.1 Determine thinner content in oil paint. using electric oven	30	Determination of thinner content in oil paint.	2	CO6

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

Note : out of above suggestive LLOs -

- Minimum 12 for 2 LL Hrs./Week or 24 for 4 LL hrs./Week are to be Performed.
- '*' Marked Practicals (LLOs) Are mandatory
- Judicial mix of LLOs are to be performed to complete minimum requirement of 12 / 24 as applicable

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

Micro project

- Series and parallel resistances: Prepare models for combination of series and parallel resistances.
- Magnetic flux: Prepare models to demonstrate magnetic lines of lines of forces of different types of magnet.
- Vernier Calipers: Prepare prototype vernier caliper of desired least.count using card sheet.
- Conductivity: Collect different materials such as metal, plastics, glass etc. and prepare models.
- Gas laws: Prepare models to demonstrate Boyle's laws, Charle's Law and Gay Lussac’s law using household objects.
- Carbon resistors: Determine the resistance and tolerance of carbon resistors using color codes and measure values.
- Thermal conductivity: Take different metallic plates of various metals and calculate rate of flow of heat.
- Temperature sensor : Use Temperature sensor IC LM 35 to measure temperature of given body in various temperature scales
- Mobile applications : Use mobile applications for measurements of different physical quantities.
- Optical Fiber and TIR: Prepare model to demonstrate total internal reflection and the propagation of light.
- Convert given galvanometer into ammeter of desired range.
- Convert given galvanometer into voltmeter of desired range.
- LDR: Use Light dependent resistor for measuring the intensity of light.
- Types of bonds: Prepare chart and models displaying different types of bonds with examples.
- Prepare a chart for showing different types of bonds or molecules.
- Crystal Structure: Prepare Models of SC,FCC,HCP,BCC.
- Ionization: Prepare chart displaying ionization phenomenon.
- Corrosion-Prepare Chart displaying images of observed corrosion processes in the surrounding.
- Adhesives: Prepare chart or model to demonstrate the applications of various adhesives.
- Polymer: Collect the samples of different polymers and list their uses.
- Collect information based on market survey of different Polymer and compare the following points. i) Structure ii) Properties.
- Collect information by library survey regarding engineering material used in various industries.

Assignment

- Convert the units of a given physical quantity from one system of units to another.
- Measure room temperature of hot baths / bodies by using mercury thermometer and convert it into different scales.
- Prepare a chart to summarize units and measurements
- Enlist information like band gap, material used, dimension etc about different semiconductor devices.
- Give details about the explanation of concept like electrostatics, magnetic domain, current electricity.
- Demonstrate the variation of angle of refraction with respect to refractive index using online tools.
- Use a digital vernier caliper and micrometer screw gauge for measurements.(lab- based).
- Applications of optical fibers in civil, mechanical , electrical engineering etc.
- Applications of semiconductors in civil, mechanical , electrical engineering etc.

- Explain covalent bond, ionic bond, coordinate bond, hydrogen bond, intermolecular forces
- Draw Crystal structures of SC,BCC, FCC,HCP.
- Distinguish between paints and varnishes.
- Solve numerical based on Faraday's first and second law of electrolysis.
- Enlist various Adhesives with properties and applications.
- Compare between Thermoplastics and Thermosetting.
- State properties and applications thermocol and glass wool.
- Differentiate the given types of structural polymers and list out their applications.
- Demonstrate Mechanism of wet corrosion by waterline corrosion.
- Prepare chart showing mechanism of electrolysis of CuSO4 solution by using Cu and Pt electrodes.
- Write properties and applications of solid, semisolid and liquid lubricant.

VIII. LABORATORY EQUIPMENT / INSTRUMENTS / TOOLS / SOFTWARE REQUIRED

Sr.No	Equipment Name with Broad Specifications	Relevant LLO Number
1	Vernier Calipers: Range : 0-150mm , Resolution: 0.1mm	1
2	Micrometer screw gauge : Range : 0-25mm, Resolution: 0.01mm, Accuracy ±0.02mm or better	2
3	Digital multimeter : 3 1/2 digit display, 9999 counts, digital multimeter measures: Vac, Vdc (1000V max) , DC A, AC A(10 amp max), Resistance (0 - 100 MOhm	3,4,5,6
4	Resistance Box: 4 decade ranges from 1 ohm to 1K,accuracy 0.1 % - 1 %	3,4,5,6
5	Battery eliminator : 0- 12 V ,2A	3,4,5,6,8,9,10,12
6	Boyle's apparatus: U tube manometer , barometer	11
7	Joule's calorimeter : well insulated "mechanical equivalent of heat apparatus" in wooden box, , digital / analog thermometer,	10,12
8	Electronic balance, with the scale range of 0.001g to 500gm pan size 100 mm; response time 3-5 sec.: power requirement 90-250 V, 10 watt	19,20,21,22,23,24,25,30
9	Electric oven inner size 18''x18''x18''; temperature range 100 to 2500 C. with the capacity of 40 lt.	30
10	Ammeter 0-2 amp voltmeter-0-5v DC	19,20,21,22,23
11	Redwood viscometer-I	26
12	Cleveland open cup apparatus	28
13	Abel's close cup apparatus	29

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	Units and Measurements	CO1	7	2	3	4	9
2	II	Electricity, Magnetism and Semiconductors	CO2	13	3	5	6	14
3	III	Thermometry and Fiber Optics	CO3	10	2	4	6	12
4	IV	Chemical bonding	CO4	6	2	3	4	9
5	V	Electro chemistry and Metal Corrosion, its prevent ion	CO5	12	3	4	5	12
6	VI	Engineering Materials and Catalysis	CO6	12	3	5	6	14

Sr.No	Unit	Unit Title	Aligned COs	Learning Hours	R-Level	U-Level	A-Level	Total Marks
Grand Total				60	15	24	31	70

X. ASSESSMENT METHODOLOGIES/TOOLS

Formative assessment (Assessment for Learning)

- Two unit tests of 30 marks (Physics 15 marks,Chemistry-15 marks) and average of two unit tests.
- For laboratory learning 50 marks (Physics 25 marks,Chemistry-25 marks).

Summative Assessment (Assessment of Learning)

- End semester assessment of 50 marks for laboratory learning (Physics 25 marks,Chemistry-25 marks).
- End semester assessment of 70 marks through online MCQ examination.

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

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	Narlikar J. V. ;Joshi , A. W.; Mathur , Anuradha ; et al	Physics Textbook Part I - Class XI	National Council of Education Research and Training, New Delhi, 2010, ISBN : 8174505083
2	Narlikar, J.V.;Joshi , A. W.; Mathur , Anuradha ; et al	Physics Textbook Part II - Class XI	National Council of Education Research and Training, New Delhi, 2015, ISBN : 8174505660

Sr.No	Author	Title	Publisher with ISBN Number
3	Narlikar J.V.;Joshi , A. W.; Ghatak A.K. et al	Physics Textbook Part I - Class XII	National Council of Education Research and Training, New Delhi, 2013, ISBN : 8174506314
4	Narlikar, J.V.;Joshi , A. W.; Ghatak A.K. et al	Physics Textbook Part II - Class XII	National Council of Education Research and Training, New Delhi, 2013, ISBN : 8174506713
5	Haliday, David; Resnik, Robert and Walker, Jearl	Fundamentals of Physics	John Wiley & sons, Hoboken, USA, 2014 ISBN : 812650823X
6	Jain and Jain	Engineering Chemistry	National Council of Education Research and Training, New Delhi, 2010, ISBN : 8174505083
7	Dara S. S.	Engineering Chemistry	National Council of Education Research and Training, New Delhi, 2015, ISBN : 8174505660
8	Bagotsky V.S.	Fundamental of electrochemistry	National Council of Education Research and Training, New Delhi, 2013, ISBN : 8174506314
9	Jain and Jain	Engineering Chemistry	National Council of Education Research and Training, New Delhi, 2013, ISBN : 8174506713
10	Aryabhatta.	The Surya Siddhanta	Baptist Mission press ,Calcutta
11	Steeramula Rajeswara Sarma	The Archaic And The Exotic : Studies In The History Of Indian Astronomical Instruments	Published by Manohar Book Service, 2008 ISBN 10: 8173045712 / ISBN 13: 9788173045714
12	Anju Rawlley,Devdatta V. Saraf	Applied Chemistry with Lab Manual	Khanna Book Publishing Co. (P) Ltd. New Delhi, 2021, ISBN- 978-93-91505-44-8
13	Dr. Hussain Jeevakhan	Applied Physics - II	Khanna Book Publishing, (2021), ISBN: 978-93-91505-57-8

XIII . LEARNING WEBSITES & PORTALS

Sr.No	Link / Portal	Description
1	www.sciencejoywagon.com/physicszone	Electricity, Magnetism and Semiconductors , basic of fiber optics
2	https://phet.colorado.edu	Electricity, Magnetism and Semiconductors ,Thermometry and basic of fiber optics
3	www.physicsclassroom.com	concepts of basic physics
4	http://nptel.ac.in/course.php?disciplineId=104	concepts of basic physics
5	http://hperphysics.phy-astr.gsu.edu/hbase/hph.html	concepts of basic physics
6	https://www.youtube.com/results?search_query=amruta+university+physics+expts	concepts of basic physics
7	k. https://www.youtube.com/results?search_query=physics+class+11+chapter+1	concepts of basic physics
8	l. https://www.youtube.com/watch?v=zRGh9_a1J7s	concepts of basic physics

Sr.No	Link / Portal	Description
9	https://iksindia.org	IKS physics
10	www.chem1.com	Chemistry instruction and education
11	ww.onlinelibrary.wiley.com	Materials and corrosion
12	www.rsc.org	Catalysis
13	www.chemcollective.org	Virtual Labs, simulation
14	https://www.ancient-origins.net/history-famous-people/indian -sage-acharya-kanad-001399	IKS Philosophy of atom by Acharya Kanad.
15	https://phet.colorado.edu/en/simulations/filter?subjects=che mistry&type=html,prototype	Identify states of matter of materials by using simulation.

Programme Name/s	**: Architecture Assistantship/ Automobile Engineering./ Artificial Intelligence/ Agricultural Engineering/ Artificial Intelligence and Machine Learning/ Automation and Robotics/ Architecture/ Cloud Computing and Big Data/ Civil Engineering/ Chemical Engineering/ Computer Technology/ Computer Engineering/ Civil & Rural Engineering/ Construction Technology/ Computer Science & Engineering/ Fashion & Clothing Technology/ Dress Designing & Garment Manufacturing/ Digital Electronics/ Data Sciences/ Electrical Engineering/ Electronics & Tele-communication Engg./ Electrical Power System/ Electronics & Communication Engg./ Electronics Engineering/ Food Technology/ Computer Hardware & Maintenance/ Instrumentation & Control/ Industrial Electronics/ Information Technology/ Computer Science & Information Technology/ Instrumentation/ Interior Design & Decoration/ Interior Design/ Civil & Environmental Engineering/ Mechanical Engineering/ Mechatronics/ Medical Laboratory Technology/ Medical Electronics/ Production Engineering/ Printing Technology/ Polymer Technology/ Surface Coating Technology/ Textile Technology/ Electronics & Computer Engg./ Travel and Tourism/ Textile Manufactures**
Programme Code	**: AA/ AE/ AI/ AL/ AN/ AO/ AT/ BD/ CE/ CH/ CM/ CO/ CR/ CS/ CW/ DC/ DD/ DE/ DS/ EE/ EJ/ EP/ ET/ EX/ FC/ HA/ IC/ IE/ IF/ IH/ IS/ IX/ IZ/ LE/ ME/ MK/ ML/ MU/ PG/ PN/ PO/ SC/ TC/ TE/ TR/ TX**
Semester	**: Second**
Course Title	**: PROFESSIONAL COMMUNICATION**
Course Code	**: 312002**

I. RATIONALE

Communication is key to smooth and efficient functioning of any industry or business . Professional communication is the need of every organization to maintain ethics, quality and standards. The efficacy of business communication skills are essential for engineering professionals to instruct, guide and motivate peers/ subordinates to achieve desired goals at work place. Thus, this course has been designed to enhance the professional communication skills for effective presentation both in written and oral forms at workplace.'

II. INDUSTRY / EMPLOYER EXPECTED OUTCOME

• Communicate effectively at workplace.

III. COURSE LEVEL LEARNING OUTCOMES (COS)

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

- CO1 - Communicate effectively (oral & Written) in various formal and informal situations minimizing the barriers.
- CO2 - Develop listening skills through active listening and note taking.
- CO3 - Write circulars, notices and minutes of the meeting.
- CO4 - Draft enquiry letter, complaint letter , Job application with resume / CV, Compose effective E mails .
- CO5 - Write Industrial reports.

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	
312002	PROFESSIONAL COMMUNICATION	PCO	SEC	-	-	2	-	2	1		-	-	-	-	25	10	25@	10	-	-	50

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.

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 the importance of professional communication in given situations TLO 1.2 Identify the types of communication barriers in given situations and suggestive remedies TLO 1.3 Use different types of verbal and non–verbal communication for the given situation	**Unit - I Professional Communication : An Overview** 1.1 Definition of professional communication- Importance, relevance, Elements and process of communication 1.2 7 C's of Professional Communication (Clarity, Conciseness, correctness, coherent, concrete, courteous & Complete) 1.3 Types –Verbal (Oral-Written),Formal, Informal (Grapevine), Vertical 1.4 Barriers to communication 1.5 Types of barriers (Linguistic, Psychological, Technological)	Language lab Role plays Chalk board Reference books Case studies
2	TLO 2.1 Identify the difference between listening and hearing TLO 2.2 Differentiate the types of listening in various situations TLO 2.3 Take notes during lectures, seminars . Make use of types of note taking and note making for different subjects / topics	**Unit - II Listening & Note Taking** 2.1 Difference between listening & Hearing 2.2 Types of listening a)Active listening b)Passive listening c)Selective listening 2.3 Techniques of Note taking , Types of note taking (Outline notes, Mind Mapping, Flowcharts)	Language Lab Classroom learning NPTEL Role Play
3	TLO 3.1 Prepare notices / agenda for the given type of meeting / information TLO 3.2 Prepare minutes of meeting/s TLO 3.3 Draft a circular for a particular information/ event	**Unit - III Office Drafting** 3.1 Format of Notice 3.2 Drafting Agenda 3.3 Preparing Minutes of meeting 3.4 Format of Circular	white board Language Lab Reference books Classroom learning
4	TLO 4.1 Compose cover letter and CV / Resume for jobs TLO 4.2 Apply E mail Etiquettes for professional purposes TLO 4.3 Compose E- mails for different official purposes	**Unit - IV Writing Skills for Professional Communication** 4.1 Job Application with Resume / CV 4.2 E-Mail Etiquettes 4.3 Writing official E Mails to communicate intended purposes 4.4 Drafting Enquiry letter and Complaint letter	Language lab Classroom learning NPTEL Reference books
5	TLO 5.1 Compose technical reports TLO 5.2 Draft accident / Investigation/ progress reports	**Unit - V Report Writing** 5.1 Introduction to report writing 5.2 Accident Report 5.3 Investigation Report 5.4 Progress Report	Chalk and talk Language Lab Collaborative learning Classroom learning

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

Practical / Tutorial / Laboratory Learning Outcome (LLO)	Sr No	Laboratory Experiment / Practical Titles / Tutorial Titles	Number of hrs.	Relevant COs
LLO 1.1 * Draw communication cycle using real life examples and explain process of communication.	1	Communication Process and Cycle	2	CO1
LLO 2.1 Undertake the Role play / Group discussion to illustrate types / barriers to communication	2	Role plays and Group Discussion	2	CO1
LLO 3.1 * Listen to audios in the language lab and make notes of it.	3	Active Listening	2	CO2
LLO 4.1 * Give a presentation / Seminar using 7 C's of Communication.	4	Presentations / Seminars	2	CO1
LLO 5.1 * Explain the types of note taking with examples and make notes on any one topic related to your curriculum.	5	Note taking & Note Making	2	CO2
LLO 6.1 * Prepare agenda for meeting and draft minutes of the meeting.	6	Agenda and Minutes of the meeting	2	CO3
LLO 7.1 * Draft circulars for the given situation .	7	Office Drafting	2	CO3
LLO 8.1 * Respond to job advertisements referring newspapers, LinkedIn. Write cover letter with resume /CV.	8	Job Application with Resume / CV	2	CO4
LLO 9.1 * Write Four (formal) E-mails using ethics and etiquette.	9	E- Mail writing	2	CO4
LLO 10.1 * Write a detailed report on Accident/ Progress/ Investigation .	10	Technical Report writing	2	CO5
LLO 11.1 * Prepare a case study related to linguistic barriers : language ,pronunciation, punctuation, technical jargon and suggest remedies for the same.	11	Barriers to Communication	2	CO1
LLO 12.1 draft complaint / enquiry letter for various situations	12	Complaint and Enquiry letter	2	CO4
LLO 13.1 List psychological barriers to communication LLO 13.2 Prepare case studies on any two psychological barriers and suggest remedies to overcome the barriers	13	Psychological barriers to Communication	2	CO1
LLO 14.1 * Draw flow chart and mind mapping for any topic related to the curriculum.	14	Listening Skills	2	CO2
LLO 15.1 * Face mock interview arranged by your teacher.	15	Job Application , Resume / CV & Interview	2	CO4

Note : out of above suggestive LLOs -

- Minimum 12 for 2 LL Hrs./Week or 24 for 4 LL hrs./Week are to be Performed.
- '*' Marked Practicals (LLOs) Are mandatory
- Judicial mix of LLOs are to be performed to complete minimum requirement of 12 / 24 as applicable

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

Micro project

- Conduct an interview of any person and follow the procedure (interview questions, photo with the interviewee etc.)
- Listening and Speaking are life long learnings . Explain with appropriate examples and real life case studies.
- Collect (four to five) emails with technical jargons, barriers, make required corrections and keep a record of both the mails (original and Corrected one)
- Complete any one certification course of (Two Weeks duration) from (MOOC/ NPTEL/ Coursera/ any other source)related to Communication Skills / Personality Development.
- Prepare a report on aspects of body language
- Prepare a case study on Technological /Psychological barriers to communication

Note :

Only one micro-project is planned to be undertaken by a student that needs to be assigned to him/her in the beginning of the semester. S/he ought to submit it by the end of the semester to develop the industry oriented COs. Each micro-project should encompass two or more COs. The micro-project could be industry application based, internet-based, workshop-based, laboratory-based or field-based. Each student will have to maintain dated work diary consisting of individual contribution in the project work and give a seminar presentation of it before submission. The total duration of the micro-project should not be less than 15 (fifteen) student engagement hours during the course. In the first four semesters, the micro-project could be group-based. However, in higher semesters, it should be individually undertaken to build up the skill and confidence in every student to become problem solver so that s/he contributes to the projects of the industry. A suggestive list is given here. Similar micro-projects could be added by the concerned faculty.

VIII. LABORATORY EQUIPMENT / INSTRUMENTS / TOOLS / SOFTWARE REQUIRED

Sr.No	Equipment Name with Broad Specifications	Relevant LLO Number
1	Language Lab with software and internet facility	All
2	LCD Projector	All
3	Smart Board with networking	All
4	Printer	All

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

X. ASSESSMENT METHODOLOGIES/TOOLS

Formative assessment (Assessment for Learning)

- Term Work, Micro Project

Summative Assessment (Assessment of Learning)

- Practical Exam of 25 marks using language lab

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	1	1	1		1	3	1			
CO2	1	1				3	1			
CO3	1					3	1			
CO4		1				3	1			
CO5		1	1			3	1			

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	M Ashraf Rizvi	Effective Communication Skills	Tata McGraw-Hill Publication-ISBN 0070599521, 9780070599529
2	Sanjay Kumar and Pushp Lata	Communication Skills	Oxford University Press ISBN 9780199457069
3	MSBTE Textbook	Communication Skills	MSBTE
4	Robert King	Effective communication Skills	Audio Book -ISBN 978181667009742
5	N P Sudharshana , C Savitha	English for Technical Communication	Cambridge-ISBN 978-13-16640-08-1
6	C. Murlikrishna , Sunita Mishra	Communication Skills for Engineers	Pearson - ISBN 978-81-317-3384-4
7	Meenakshi Raman, Sangeeta Sharma	Technical Communication, Principles and Practice	Oxford University Press -ISBN 978-13-16640-08-1
8	K. K. Sinha	Business Communication	Galgotiya Publishing company, New Delhi - ISBN 9789356227064
9	Rajendra Pal, J.S. Korlahalli	Essentials of Business Communication	Sultan Chand & Sons, New Delhi ISBN 9788180547294

XIII . LEARNING WEBSITES & PORTALS

Sr.No	Link / Portal	Description
1	https://www.britishcouncil.in	conversations
2	https://www.coursera.org	certification courses
3	https://www.udemy.com	Communication skills training courses
4	http://www.makeuseof.com	Dale Carnegie's free resources

Semester - 2, K Scheme

Programme Name/s	**: Automation and Robotics/ Digital Electronics/ Electronics & Tele-communication Engg./ Electronics & Communication Engg./ Electronics Engineering/ Instrumentation & Control/ Industrial Electronics/ Instrumentation/ Medical Electronics/ Electronics & Computer Engg.**
Programme Code	**: AO/ DE/ EJ/ 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

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

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 block diagram of SMPS TLO 3.2 List the types of UPS TLO 3.3 Use of Temperature controlled soldering iron for SMD components	**Unit - III SMPS, UPS and Soldering Desoldering** 3.1 SMPS: Introduction, Various Blocks, observe waveforms at output of each block 3.2 UPS: Introduction, Types- offline, online, UPS ratings, relation between KVA rating and battery backup 3.3 SMD Soldering: Introduction, Soldering of SMD components 3.4 DeSoldering of SMD components	Teacher input Hands on practice Demonstration video
4	TLO 4.1 Classify the various types of connectors TLO 4.2 List the various types of relays TLO 4.3 List the applications of various types of switches TLO 4.4 Explain the procedure of setting up a network using network cables	**Unit - IV Connectors, Relays, Switches and Network cables** 4.1 Connectors: Need, Types and Identification 4.2 Relays: Need, Types and Identification 4.3 Switches: Need, Types and Identification 4.4 Cables: Need, Types and Identification 4.5 Network cables: Types and connection	Teacher input Hands on practice Demonstration video
5	TLO 5.1 Classify various types of Sensors TLO 5.2 Describe the operation of LDR TLO 5.3 Describe the operation of Hygrometer TLO 5.4 Describe the operation 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 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

Practical / Tutorial / Laboratory Learning Outcome (LLO)	Sr No	Laboratory Experiment / Practical Titles / Tutorial Titles	Number of hrs.	Relevant COs
LLO 6.1 Generate square/sine/triangular wave of specified frequency and amplitude and observe on CRO/DSO	6	* Generate the different types of waveform by using function generator on CRO/DSO	2	CO2
LLO 7.1 Identify the single colour and multi colour LED. LLO 7.2 Test multicolor LED using DMM and D C power supply.	7	* Testing of multi colour LEDS	2	CO2
LLO 8.1 Set LCR Q meter for Quality factor measurement LLO 8.2 Measure Q of given L using LCR Q meter LLO 8.3 Measure Q of given C using LCR Q meter	8	*Determine Q factor of given component by using LCR Q meter	2	CO2
LLO 9.1 Test the continuity of printed track on a PCB using multi- meter	9	* Use of continuity tester	2	CO2
LLO 10.1 Measure the input and output voltage of transformer	10	Testing of transformer	2	CO2
LLO 11.1 Identify the various types of capacitors LLO 11.2 Determine its value of capacitor by color code LLO 11.3 Interpret the value of capacitor by reading information printed on it.	11	Determine the value of capacitor .	2	CO2
LLO 12.1 Observe input output wave forms of given pulse transformer	12	*Testing of pulse transformer	2	CO2
LLO 13.1 Identify opto electronic devices LLO 13.2 Plot transfer transfer characteristics of the Optocoupler	13	Opto electronic devices	2	CO2
LLO 14.1 Identify type of fiber optic cable LLO 14.2 Set up analog link to test optic cable connectivity	14	*Optical Fiber analog link	2	CO2
LLO 15.1 Identify the various tools: wire cutter, wire stripper, screwdrivers, testers, IC plucker used in electronics laboratories 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

Practical / Tutorial / Laboratory Learning Outcome (LLO)	Sr No	Laboratory Experiment / Practical Titles / Tutorial Titles	Number of hrs.	Relevant COs
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 dentify 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 Use various Identify type of cables: RCA, HDMI, display port LLO 24.2 Select appropriate cable for given applications	24	* Types of cables	2	CO4
LLO 25.1 Identify the computer network cable LLO 25.2 Test network cable: CAT5, CAT6 Cable, using cable tester LLO 25.3 Prepare cable for network connection using crimping tools,	25	* Computer Networking Cables	4	CO4
LLO 26.1 Identify various temperature sensors such as RTD, Thermocouple, Thermistor and IC based temperature sensors, LLO 26.2 Plot the characteristics of temperature sensor IC LM335	26	* Temperature sensor	2	CO5
LLO 27.1 Measure humidity in the environment	27	Use of hair hygrometer to measure humidity	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/ store to storage device	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 -

- Minimum 12 for 2 LL Hrs./Week or 24 for 4 LL hrs./Week are to be Performed.
- '*' Marked Practicals (LLOs) Are mandatory
- Judicial mix of LLOs are to be performed to complete minimum requirement of 12 / 24 as applicable

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 :

A suggestive list of micro project and assignment is given here. Similar activities could be added by the course teacher . For this course 2 hr per week are allocated in L A scheme. By considering 30 hr self learning work course teacher has to allocate one or two task may be combination of assignments and / or micro projects. Micro project is expected to complete as a group activity.Course teacher can assign specific learning or any other skill development task . According to task assign , course teacher can set rubrics for continuous (formative) type assessment. SLA marks shall be awarded as per continuous assessment record.

VIII. LABORATORY EQUIPMENT / INSTRUMENTS / TOOLS / SOFTWARE REQUIRED

Sr.No	Equipment Name with Broad Specifications	Relevant LLO Number
1	ESD equipment: ESD Table Mat Color: BLUE Material: antistatic Thickness: 2mm Mat Size: Can be provide as per requirement Pattern: Plain Length: 2M X 15M Shape: Roll 2m X 15m,can be provided in As per requirement Usage: ESD protection	1,2
2	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
3	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
4	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
5	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
6	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
7	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

Sr.No	Equipment Name with Broad Specifications	Relevant LLO Number
8	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
9	opto-isolators : withstand input-to-output voltages up to 10 kV and voltage transients with speeds up to 25 kV/?s	13
10	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
11	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
12	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
13	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
14	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
15	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
16	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
17	PCB layout software: Circuitmaker	20

Sr.No	Equipment Name with Broad Specifications	Relevant LLO Number
18	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

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 examination, Viva-voce, Workshop performance

XI. SUGGESTED COS - POS MATRIX FORM

Course Outcomes (COs)	Programme Outcomes (POs)							Programme Specific Outcomes* (PSOs)		
	PO-1 Basic and Discipline Specific Knowledge	PO-2 Problem Analysis	PO-3 Design/ Development of Solutions	PO-4 Engineering Tools	PO-5 Engineering Practices for Society, Sustainability and Environment	PO-6 Project Management	PO-7 Life Long Learning	PSO-1	PSO-2	PSO-3
CO1	2	2	-	3	-	1	3			
CO2	3	3	3	2	-	2	3			
CO3	2	2	2	2	1	2	3			
CO4	2	-	-	3	-	2	3			
CO5	2	2	2	3	2	1	3			

Legends :- High:03, Medium:02,Low:01, No Mapping: -
*PSOs are to be formulated at institute level

XII. SUGGESTED LEARNING MATERIALS / BOOKS

Sr.No	Author	Title	Publisher with ISBN Number

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

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					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	
312013	WEB PAGE DESIGN	WET	SEC			4	2	6	3		-	-	-	-	25	10	50@	20	25	10	100

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, Cantered 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

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.
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
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

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.
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
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

Practical / Tutorial / Laboratory Learning Outcome (LLO)	Sr No	Laboratory Experiment / Practical Titles / Tutorial Titles	Number of hrs.	Relevant COs
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 l	9	Use of different types or Ordered and Unordered 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 contains images, align image at center, left, right and ALT attribute. LLO 12.2 Align one image to center and the other one to left. Assign the second image as hyperlink to another webpage.	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 Web page containing any image and add a hyperlink to another Web page. Use width and height property for an image.	15	* Insert images with hyperlink and set image width and height property of image	2	CO3
LLO 16.1 Create a web page with background properties a) Set the background color of the page to line n. b) Set border to h1 tag. c) Set background image to a page. d) Set background image to parag LLO 16.2 Create a web page with background properties: a) Repeat the image vertically only. b) Repeat the image horizontally only. c) Show the background image at top right position.	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 Inset 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

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

- Minimum 12 for 2 LL Hrs./Week or 24 for 4 LL hrs./Week are to be Performed.
- '*' Marked Practicals (LLOs) Are mandatory
- Judicial mix of LLOs are to be performed to complete minimum requirement of 12 / 24 as applicable

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) Create a web page for music store, where the first step is to create a music page to include an appropriate background image and brief description contents. Different menus along with the list of songs according to attributes like genre, year, singer, album etc. can be found header part of the page. Also include link of registration form.
2) Build a static web page that display information about an event Webinar. The event page will include event location

with image, photographs, list of speakers and photographs with links will be in the header section. Divide the page into smaller sections. Apply appropriate background color, font, style as per the web page requirement.
3) Develop a sample website of Student's / Teacher's Choice.

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

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	-	3			
CO5	2	2	3	2	3	3	3			

CO6	3	3	3	3	3	3	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	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

Programme Name/s	**: Architecture Assistantship/ Automobile Engineering./ Artificial Intelligence/ Agricultural Engineering/ Artificial Intelligence and Machine Learning/ Automation and Robotics/ Architecture/ Cloud Computing and Big Data/ Civil Engineering/ Chemical Engineering/ Computer Technology/ Computer Engineering/ Civil & Rural Engineering/ Construction Technology/ Computer Science & Engineering/ Digital Electronics/ Data Sciences/ Electrical Engineering/ Electronics & Tele-communication Engg./ Electrical Power System/ Electronics & Communication Engg./ Electronics Engineering/ Computer Hardware & Maintenance/ Instrumentation & Control/ Industrial Electronics/ Information Technology/ Computer Science & Information Technology/ Instrumentation/ Interior Design & Decoration/ Interior Design/ Civil & Environmental Engineering/ Mechanical Engineering/ Mechatronics/ Medical Electronics/ Production Engineering/ Electronics & Computer Engg./**
Programme Code	**: AA/ AE/ AI/ AL/ AN/ AO/ AT/ BD/ CE/ CH/ CM/ CO/ CR/ CS/ CW/ DE/ DS/ EE/ EJ/ EP/ ET/ EX/ HA/ IC/ IE/ IF/ IH/ IS/ IX/ IZ/ LE/ ME/ MK/ MU/ PG/ TE/**
Semester	**: Second**
Course Title	**: APPLIED MATHEMATICS**
Course Code	**: 312301**

I. RATIONALE

An Applied Mathematics course, covering integration, definite integration, differential equations, numerical methods, and probability distribution, equips engineering students with essential problem-solving tools. It enables them to model and analyze complex systems, make informed decisions and address real-world engineering challenges effectively.

II. INDUSTRY / EMPLOYER EXPECTED OUTCOME

Engineers applying Mathematics should proficiently solve complex real-world problems, enhancing decision-making, design and innovation with precision and efficiency.

III. COURSE LEVEL LEARNING OUTCOMES (COS)

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

- CO1 - Solve the broad-based engineering problems of integration using suitable methods.
- CO2 - Use integration to find area, volume, mean value and root mean square value for given engineering related problems.
- CO3 - Apply the differential equation to find the solutions of given programme specific problems.
- CO4 - Employ numerical methods to solve programme specific problems.
- CO5 - Use probability distributions to solve elementary engineering problems.

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	
312301	APPLIED MATHEMATICS	AMS	AEC	3	1	-	-	4	2	3	30	70	100	40	-	-	-	-	-	-	100

Total IKS Hrs for Sem. : 2 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 Solve the given simple problem(s) based on rules of integration. TLO 1.2 Evaluate the given simple integral(s) using substitution method. TLO 1.3 Integrate given simple functions using the integration by parts. TLO 1.4 Solve the given simple integral by partial fractions.	**Unit - I Indefinite Integration** 1.1 Simple Integration: Rules of integration and integration of standard functions 1.2 Integration by substitution. 1.3 Integration by parts. 1.4 Integration by partial fractions.	Improved Lecture Demonstration Chalk-Board Presentations Video Demonstrations

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.
2	TLO 2.1 Solve given examples based on definite Integration. TLO 2.2 Use properties of definite integration to solve given problems. TLO 2.3 Utilize the concept of definite integration to find the following (a) Area under the curve (b) Area between given two curves (c) Volume of revolution (d) Mean value (e) Root mean square value	**Unit - II Definite Integration and Applications** 2.1 Definite Integration: Definition, rules of definite integration with simple examples. 2.2 Properties of definite integral (without proof) and simple examples. 2.3 Applications of integration: area under the curve, area between given two curves, volume of revolution, mean value and root mean square value.	Video Simulation Chalk-Board Improved Lecture Presentations
3	TLO 3.1 Find the order and degree of given differential equations. TLO 3.2 Form simple differential equation for given elementary engineering problems. TLO 3.3 Solve given differential equations using the methods of Variable separable and Exact Differential Equation(Introduce the concept of partial differential equation). TLO 3.4 Solve given Linear Differential Equation. TLO 3.5 Solve given programme specific problems using the category of differential equation.	**Unit - III Differential Equation** 3.1 Concept of Differential Equation. 3.2 Order, degree and formation of Differential equations 3.3 Methods of solving differential equations: Variable separable form, Exact Differential Equation, Linear Differential Equation. 3.4 Application of differential equations and related engineering problem(s).	Video Demonstrations Presentations Chalk-Board Improved Lecture Presentations
4	TLO 4.1 Find roots of algebraic equations by using appropriate methods. TLO 4.2 Solve the system of equations in three unknowns by using given methods. TLO 4.3 Apply the concept of numerical integration to solve given engineering problems. TLO 4.4 Solve problems using Yuktibhasa iterative methods for finding approximate square root. (IKS)	**Unit - IV Numerical Methods and Numerical Integrations** 4.1 Solution of algebraic equations: Bisection method, Regula falsi method and Newton –Raphson method. 4.2 Solution of simultaneous equations containing three Unknowns by Gauss elimination method. 4.3 Solution of simultaneous equations containing three Unknowns by iterative methods: Gauss Seidal and Jacobi's method. 4.4 Numerical Integration: Trapezoidal rule, Simpson's 1/3 rd rule, Simpson's 3/8 th rule. (Without proof) 4.5 Yuktibhasa iterative methods for finding approximate square root. (IKS)	Video SCILAB Spreadsheet Chalk-Board Improved Lecture Presentations

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.
5	TLO 5.1 Solve given problems based on repeated trials using Binomial distribution. TLO 5.2 Solve given problems when number of trials are large and probability is very small. TLO 5.3 Utilize the concept of normal distribution to solve related engineering problems.	**Unit - V Probability Distribution** 5.1 Binomial distribution. 5.2 Poisson's distribution. 5.3 Normal distribution.	Video ORANGER Chalk-Board Improved Lecture Presentations

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 Solve simple problems of Integration by substitution	1	*Integration by substitution	1	CO1
LLO 2.1 Solve integration using by parts	2	*Integration by parts	1	CO1
LLO 3.1 Solve integration by partial fractions	3	*Integration by partial fractions.	1	CO1
LLO 4.1 Solve examples on Definite Integral based on given methods.	4	Definite Integral based on given methods.	1	CO2
LLO 5.1 Solve problems on properties of definite integral.	5	*Properties of definite integral	1	CO2
LLO 6.1 Solve given problems for finding the area under the curve, area between two curves and volume of revolution.	6	Area under the curve, area between two curves and volume of revolution.	1	CO2
LLO 7.1 Solve examples on mean value and root mean square value.	7	Mean value and root mean square value.	1	CO2
LLO 8.1 Solve examples on order, degree and formation of differential equation.	8	Order, degree and formation of differential equation.	1	CO3
LLO 9.1 Solve first order first degree D.E. using variable separable method and homogeneous method.	9	*Variable separable method and homogeneous method.	1	CO3
LLO 10.1 Solve first order first degree D.E. using exact differential equation and linear differential equation.	10	*Exact differential equation and linear differential equation.	1	CO3
LLO 11.1 Solve engineering application problems using differential equation.	11	Applications of differential equations.	1	CO3
LLO 12.1 Solve problems on Bisection method and Regula falsi method.	12	*Bisection method and Regula falsi method.	1	CO4
LLO 13.1 Solve problems on Newton-Raphson method and Gauss elimination method.	13	Newton- Raphson method and Gauss elimination method.	1	CO4
LLO 14.1 Solve problems on Jacobi's method and Gauss Seidal Method.	14	Jacobi's method and Gauss Seidal Method.	1	CO4
LLO 15.1 Solve examples on Trapezoidal rule, Simpson's 1/3 rd rule and Simpson's 3/8 th rule.	15	Trapezoidal rule, Simpson's 1/3 rd rule and Simpson's 3/8 th rule.	1	CO4

Practical / Tutorial / Laboratory Learning Outcome (LLO)	Sr No	Laboratory Experiment / Practical Titles / Tutorial Titles	Number of hrs.	Relevant COs
LLO 16.1 Solve problems on Bisection method, Regula falsi method, Newton-Raphson method using spreadsheet .	16	Bisection method, Regula falsi method, Newton- Raphson method problems using spreadsheet.	1	CO4
LLO 17.1 Use Yuktibhasa iterative methods for finding approximate value of square root and cube root. (IKS)	17	*Yuktibhasa iterative methods for finding approximate value of square root and cube root. (IKS)	1	CO4
LLO 18.1 Solve engineering problems using Binomial distribution.	18	*Binomial Distribution	1	CO5
LLO 19.1 Solve engineering problems using Poisson distribution.	19	*Poisson Distribution	1	CO5
LLO 20.1 Solve engineering problems using Binomial distribution.	20	*Normal Distribution	1	CO5
LLO 21.1 Solve problems on Laplace transform and properties of Laplace transform.	21	# Laplace transform and properties of Laplace transform.	1	CO2
LLO 22.1 Solve problems on Inverse Laplace transform and properties of Inverse Laplace transform.	22	# Inverse Laplace transform and properties of Inverse Laplace transform.	1	CO2

Note : out of above suggestive LLOs -

- Minimum 12 for 2 LL Hrs./Week or 24 for 4 LL hrs./Week are to be Performed.
- '*' Marked Practicals (LLOs) Are mandatory
- Judicial mix of LLOs are to be performed to complete minimum requirement of 12 / 24 as applicable

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

Micro project

- NA

Assignment

- NA

Note :
NA

VIII. LABORATORY EQUIPMENT / INSTRUMENTS / TOOLS / SOFTWARE REQUIRED

Sr.No	Equipment Name with Broad Specifications	Relevant LLO Number
1	Open-source software like wolfram alpha, SageMaths, MATHS3D, GeoGebra, Graph, DPLOT, and Graphing Calculator (Graph Eq2.13), ORANGE can be used for Algebra, Calculus, Trigonometry and Statistics respectively.	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	Indefinite Integration	CO1	9	2	6	4	12
2	II	Definite Integration and Applications	CO2	10	2	4	10	16
3	III	Differential Equation	CO3	10	2	6	8	16
4	IV	Numerical Methods and Numerical Integrations	CO4	8	2	4	8	14
5	V	Probability Distribution	CO5	8	2	4	6	12
Grand Total				**45**	**10**	**24**	**36**	**70**

X. ASSESSMENT METHODOLOGIES/TOOLS

Formative assessment (Assessment for Learning)

- Tests

Summative Assessment (Assessment of Learning)

- End Term Exam

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	1	-	-	1	-	1			
CO2	3	1	-	-	1	-	1			
CO3	3	2	1	1	1	1	1			
CO4	2	3	2	2	1	1	1			
CO5	2	2	1	1	2	1	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	Grewal B. S.	Higher Engineering Mathematics	Khanna publication New Delhi, 2013 ISBN: 8174091955
2	Dutta. D	A text book of Engineering Mathematics	New age publication New Delhi, 2006 ISBN: 978- 81-224-1689-3
3	Kreysizg, Ervin	Advance Engineering Mathematics	Wiley publication New Delhi 2016 ISBN: 978-81- 265-5423-2
4	Das H.K.	Advance Engineering Mathematics	S Chand publication New Delhi 2008 ISBN: 9788121903455
5	S. S. Sastry	Introductory Methods of Numerical Analysis	PHI Learning Private Limited, New Delhi. ISBN-978-81-203-4592-8
6	c. S. Seshadri	Studies in the History of Indian Mathematics	Hindustan Book Agency (lndia) P 19 Green Park Extension New Delhi. ISBN 978-93-80250-06-9
7	Marvin L. Bittinger David J.Ellenbogen Scott A. Surgent	Calculus and Its Applications	Addison-Wesley 10th Edition ISBN-13: 978-0-321-69433-1
8	Gareth James, Daniela Witten,Trevor Hastie Robert andTibshirani	An Introduction to StatisticalLearning with Applications in R	Springer New York Heidelberg Dordrecht LondonISBN 978-1-4614-7137-0 ISBN 978-1-4614-7138-7 (eBook)

XIII . LEARNING WEBSITES & PORTALS

Sr.No	Link / Portal	Description
1	http://nptel.ac.in/courses/106102064/1	Online Learning Initiatives by IITs and IISc
2	https://www.khanacademy.org/math?gclid=CNqHuabCys4CFdOJaddHoPig	Concept of Mathematics through video lectures and notes
3	https://www.wolframalpha.com/	Solving mathematical problems, performing calculations, and visualizing mathematical concepts.
4	http://www.sosmath.com/	Free resources and tutorials
5	http://mathworld.wolfram.com/	Extensive math encyclopedia with detailed explanations of mathematical concepts
6	https://www.mathsisfun.com/	Explanations and interactive lessons covering various math topics, from basic arithmetic to advanced
7	http://tutorial.math.lamar.edu/	Comprehensive set of notes and tutorials covering a wide range of mathematics topics, including calc
8	https://www.purplemath.com/	Purplemath is a great resource for students seeking help with algebra and other foundational math to
9	https://www.brilliant.org/	Interactive learning in Mathematics
10	https://www.edx.org/	Offers a variety of courses
11	https://www.coursera.org/	Coursera offers online courses in applied mathematics from universities and institutions around the
12	https://ocw.mit.edu/index.htm	The Massachusetts Institute of Technology (MIT) offers free access to course materials for a wide ra

Semester - 2, K Scheme

Programme Name/s	**: Automation and Robotics/ Digital Electronics/ Electronics & Tele-communication Engg./ Electronics & Communication Engg./ Electronics Engineering/ Instrumentation & Control/ Industrial Electronics/ Instrumentation/ Medical Electronics/ Electronics & Computer Engg.**
Programme Code	**: AO/ DE/ EJ/ ET/ EX/ IC/ IE/ IS/ MU/ TE**
Semester	**: Second**
Course Title	**: BASIC ELECTRONICS**
Course Code	**: 312314**

I. RATIONALE

Diploma engineers have to deal with the various electronic components while maintaining various electronics equipment. The study of basic operating principles and handling of various electronics devices will help them to troubleshoot electronics equipment. This course is developed in such a way that, students will be able to apply the 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 circuits 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					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	
312314	BASIC ELECTRONICS	BEL	AEC	4	-	4	-	8	4	3	30	70	100	40	50	20	25@	10	-	-	175

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 effect of temperature on the given type of diode 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 & reverse biasing& 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 & current, Parameters of rectifier: Average DC value, value of current & 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

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.
2	TLO 2.1 Describe the working principle of the given type of transistor. TLO 2.2 Solve numerical on current gain (alpha,beta,gama) 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 for the given type of transistor biasing circuit.	**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, & output) in different transistor configuration. Relation between alpha,beta,gama. Comparison between CB, CC & 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
3	TLO 3.1 Disscuss different types of ampliefiers. TLO 3.2 Describe working Single Stage Transistor Amplifier. TLO 3.3 Calculate Ic,Ib,Ie and Voltage gain, 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 FET for given application. TLO 4.2 Explain the given type of FET biasing method. TLO 4.3 Describe working of FET Amplifier. TLO 4.4 Compare the 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

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.
5	TLO 5.1 Describe the working of the given block of the DC regulated power supply in the block diagram. 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
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

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

Practical / Tutorial / Laboratory Learning Outcome (LLO)	Sr No	Laboratory Experiment / Practical Titles / Tutorial Titles	Number of hrs.	Relevant COs
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
LLO 24.1 Rectify the various faults in the Regulated DC power supply	24	* Trouble shoot given DC regulated power supply.	2	CO5

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

- Minimum 12 for 2 LL Hrs./Week or 24 for 4 LL hrs./Week are to be Performed.
- '*' Marked Practicals (LLOs) Are mandatory
- Judicial mix of LLOs are to be performed to complete minimum requirement of 12 / 24 as applicable

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.

Note :
A suggestive list of micro-projects and assignment is given here. Similar micro-projects could be added by the concerned faculty.

VIII. LABORATORY EQUIPMENT / INSTRUMENTS / TOOLS / SOFTWARE REQUIRED

Sr.No	Equipment Name with Broad Specifications	Relevant LLO Number
1	Analog multimeter& Digital multimeter	All
2	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
3	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
4	Different types of cables and connectors	All
5	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
6	LT Spice /Lab view/H Spice /P Spice /HS Spice / Multisim/ Proteus/Octeva or any other relevant open source software	17
7	DSO 30/50/100 MHz Frequency Digital read out USB interface	4,5,6,7,8,9,16,22
8	Computer System with advanced Configuration Hardware requirement as per selected software	17

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.

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

Programme Name/s	**: Automation and Robotics/ Digital Electronics/ Electronics & Tele-communication Engg./ Electronics & Communication Engg./ Electronics Engineering/ Instrumentation & Control/ Industrial Electronics/ Instrumentation/ Medical Electronics/ Electronics & Computer Engg.**
Programme Code	**: AO/ DE/ EJ/ ET/ EX/ IC/ IE/ IS/ MU/ TE**
Semester	**: Second**
Course Title	**: ELEMENTS OF ELECTRICAL ENGINEERING**
Course Code	**: 312315**

I. RATIONALE

In today's technical world, electrical Engineering knowledge is necessary. A technical person needed to work in different engineering fields and deal with various electrical machines and equipment. In order increase technical proficiency of technician, they should have the knowledge of electrical engineering elements.

II. INDUSTRY / EMPLOYER EXPECTED OUTCOME

The aim of this course is to attend following industry/ employer expected outcome through various teaching learning experiences Use electrical equipment efficiently for different electronic application in the respective industrial/employer field.

III. COURSE LEVEL LEARNING OUTCOMES (COS)

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

- CO1 - Interpret the magnetic field parameters for the particular magnetic circuits.
- CO2 - Analyze A.C. circuits for single phase and polyphase supply.
- CO3 - Select the transformer and DC motor for the given application.
- CO4 - Select the fractional horse power motor for the given application.
- CO5 - Choose the protective devices for the electrical protection.

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	
312315	ELEMENTS OF ELECTRICAL ENGINEERING	EEE	SEC	3	-	2	1	6	3	3	30	70	100	40	25	10	25@	10	25	10	175

Total IKS Hrs for Sem. : 2 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 the terms related to Magnetic circuit. TLO 1.2 Distinguish between electric and magnetic circuit. TLO 1.3 Interpret mmf in series and parallel magnetic circuit. TLO 1.4 Describe laws related to magnetic circuit. TLO 1.5 Classify the types of induced emf.	**Unit - I Magnetic circuits** 1.1 Define and state units of Magnetic flux, Flux density, Magnetomotive force, Magnetic field strength, Permeability. 1.2 Electric circuit and magnetic circuit analogy and differences. 1.3 Series and parallel magnetic circuit. 1.4 Faraday's laws of electro-magnetic induction, Lenz's law, Fleming right hand and left hand rule. 1.5 Dynamically and statically induced emf, self and mutual induced emf and its inductances.	Presentations Chalk-Board Video Demonstrations Model Demonstration

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.
2	TLO 2.1 Compare AC quantities with DC quantities. TLO 2.2 Describe terminology related to A.C. fundamentals. TLO 2.3 Describe different forms of representation for electrical quantity. TLO 2.4 Analyze A.C. circuits for different types of load. TLO 2.5 Explain generation of three phase induced emf. TLO 2.6 Analyze three phase circuit for star and delta connection.	**Unit - II A.C fundamentals for single phase and polyphase circuits** 2.1 Define A.C. and D.C. quantities, advantages of A.C over DC. 2.2 Single phase sinusoidal A.C. wave: instantaneous value, cycle, amplitude, time period, frequency, angular frequency, R.M.S. value, average value for sinusoidal waveform. 2.3 Vector, polar and complex forms representation of an ac quantity, phase angle, phase difference concept of lagging and leading. 2.4 A.C through pure resistance, inductance and capacitance. Its equation, vector diagram and waveform. 2.5 Define polyphase system and advantages of three phase system over single phase system. 2.6 Generation of three phase induced emf and its waveform. 2.7 Phase and line currents, phase and line voltages in star connected and delta connected balanced load system.	Video Demonstrations Presentations Chalk-Board
3	TLO 3.1 Explain construction and working principle of given type of transformer. TLO 3.2 Select different types of transformer for the particular application. TLO 3.3 Describe construction and the working of DC motor. TLO 3.4 Select the type of DC motor for given application.	**Unit - III Transformers and DC motors** 3.1 Transformer construction and working principle, emf equation, voltage ratio, transformation ratio. 3.2 Auto-transformer, Pulse transformer and Isolation transformer construction, working principle and applications. 3.3 DC motor construction and working principle. 3.4 Different types of DC motors with its schematic diagram. 3.5 Applications of DC motors.	Chalk-Board Model Demonstration Video Demonstrations Presentations
4	TLO 4.1 Explain the construction and working principle of the given type of FHP motor. TLO 4.2 Select relevant FHP motor for the respective application. TLO 4.3 Describe the procedure to connect given motor for the given application.	**Unit - IV Fractional horse power motors** 4.1 Construction, working principle, specification and application of split phase induction motors. 4.2 Construction, working principle, application, specification and specification of universal motor and reversal of direction of rotation. 4.3 Construction, working principle, application, specification and specification of stepper motor. Only concept of speed control, reversal of direction of rotation of stepper motor. 4.4 Construction, working principle, specification and application of linear induction motor	Chalk-Board Model Demonstration Presentations Video Demonstrations

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.
5	TLO 5.1 Explain different types of protective devices. TLO 5.2 Select the different types of protective devices. TLO 5.3 Draw circuit connection diagram of protective devices. TLO 5.4 Explain general safety rule of electrical system. TLO 5.5 Describe earthing system and related terms.	**Unit - V Electrical protective devices** 5.1 Type of fuses, operation, connection diagram and application of fuses. 5.2 MCB, MCCB, ELCB operation, connection diagram and general specification 5.3 Electrical general safety rules 5.4 Need of earthing, method of earthing, types of earthing and factors affecting earthing as per IE rule.	Model Demonstration Chalk-Board Hands-on Video Demonstrations

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 Use Faraday's law of electro-magnetic induction. LLO 1.2 Classify types of induced emf.	1	*Demonstration of Faraday's law of electro-magnetic induction for statically and dynamically induced emf.	2	CO1
LLO 2.1 Use Faraday's law of electro-magnetic induction. LLO 2.2 Observe mutual induced emf in transformer.	2	*Demonstration of Mutually induced EMF by using single-phase transformers.	2	CO1
LLO 3.1 Use cathode ray oscilloscope. LLO 3.2 Identify different parameters on CRO.	3	*Measure frequency, Time period, Peak value, RMS value of sinusoidal AC waveform using CRO.	2	CO2
LLO 4.1 Identify phase angle and phase difference of given quantities. LLO 4.2 Identify the nature of power factor for the respective circuit.	4	Observe the phase difference between voltage and current on CRO for resistive, inductive, and capacitive load and comment on the nature of the power factor (Lagging, Leading, Unity).	2	CO2
LLO 5.1 Connect star connected three phase load. LLO 5.2 verify relationship between line and phase quantities.	5	*Connect three phase star connected balanced load and verify the relationship between line voltage and phase voltage, line current and phase current.	2	CO2
LLO 6.1 Connect delta connected three phase load. LLO 6.2 verify relationship between line and phase quantities.	6	Connect three phase delta connected balanced load and verify the relationship between line voltage and phase voltage, line current and phase current.	2	CO2

Practical / Tutorial / Laboratory Learning Outcome (LLO)	Sr No	Laboratory Experiment / Practical Titles / Tutorial Titles	Number of hrs.	Relevant COs
LLO 7.1 Calculate transformation ratio of transformer. LLO 7.2 Connect transformer to given load.	7	*Determine the transformation ratio current ratio of single phase transformer.	2	CO3
LLO 8.1 Identify pin configuration of pulse transformer. LLO 8.2 Check electrical isolation between input and output of pulse transformer.	8	Demonstration of working of pulse transformer by oberving input pulse and output pulse of pulse transformer on CRO.	2	CO3
LLO 9.1 Identify different parts DC motor. LLO 9.2 Identify different types of DC motor.	9	Identify different types of DC motor by observing terminal connections and also identify different parts of DC motor.	2	CO3
LLO 10.1 Connect DC motor to DC supply. LLO 10.2 Select particular starter for particular motor starting.	10	*Start any DC motor using corresponding starter and observe speed on tachometer.	2	CO3
LLO 11.1 Connection single phase induction motor to the supply. LLO 11.2 Change the direction of rotation of single phase induction.	11	*Start single phase induction motor and reverse the direction of rotation of it.	2	CO4
LLO 12.1 Connection the universal motor to the supply. LLO 12.2 Change the direction of rotation of universal motor.	12	Start universal motor and reverse the direction of rotation of it.	2	CO4
LLO 13.1 Connect the linear induction motor to the supply. LLO 13.2 Observe linear motion of induction motor.	13	Identify dirrent parts of linear induction motor and start it.	2	CO4
LLO 14.1 Select fuse for particular application. LLO 14.2 Select circuit breaker for particular application.	14	*Identify different types of fuses and circuit breakers. State their specification for suitable application.	2	CO5
LLO 15.1 Explain connection of earthing for domestics application. LLO 15.2 Test available of earthing for given switch board.	15	Testing of earthing using a test lamp and comment on it.	2	CO5

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

Note : out of above suggestive LLOs -

- Minimum 12 for 2 LL Hrs./Week or 24 for 4 LL hrs./Week are to be Performed.
- '*' Marked Practicals (LLOs) Are mandatory
- Judicial mix of LLOs are to be performed to complete minimum requirement of 12 / 24 as applicable

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

To build a simple electrical circuit

- To build a simple electrical circuit Delete 1) Construct a closed circuit using, one dry cell battery, one small light bulb holder, one small light bulb, small wire stripper tape (scotch, masking, or electrical) b) What is voltage? c) How many connections to the battery are necessary for the light bulb to light up? 2) Prepare a switchboard to control one lamp, one socket with protection and indication.
- 1) Construct a closed circuit using,

one dry cell battery, one small light bulb holder, one small light bulb, small wire
stripper tape (scotch, masking, or electrical)
Answer the following questions:
a) What is the difference between an open and a closed circuit?
b) What is voltage?
c) How many connections to the battery are necessary for the light bulb to light up?
2) Prepare a switchboard to control one lamp, one socket with protection and indication.

Assignment

- 1) Search the different types of applications in which a transformer is required and prepare a report on it.

2) Prepare a report on different types of applications of single-phase motors. State the types of motors with their particular applications.
3) Prepare a PowerPoint presentation or animation to show the working of the DC motor.
4) Observe the different types of switchgear used at home and write a report on their types, ratings and applications.

Micro project

- **1) Magnetic circuits**: Collect the information for different types of magnetic materials and draw a B-H curve for the respective material.

2) A.C. Fundamentals: Visit a nearby industry and observe the different parameters such as frequency, voltage, current, power and prepare a report based on it.
3) Polyphase circuits: Observe the three-phase power distribution panel in their institute and prepare a report on it.
4) Transformer: Collect information regarding different types of transformers available in the laboratory and prepare a report on it.
5) Fractional horsepower motor: Visit the local market or use the internet and prepare a report based on i) Manufacturers ii) Technical specifications iii) Earthing arrangement iv)Price range.
6) Visit your institute workshop and prepare a report on the different types of machines used, their specifications and manufacturers, different types of motors used.

Note :

A suggestive list of micro project , assignment and industrial visit is given here. Similar activities could be added by the course teacher . For this course 1 hr per week is allocated for SL (Self Learning) in learning scheme. By considering 15 hr self learning work course teacher has to allocate one or two task may be combination of assignments and / or micro projects and / or Industrial visit. Microproject is expected to complete as a group activity. Course teacher can assign specific learning or any other skill development task . According to task assign , course teacher can set rubrics for continuous (formative) type assessment. SLA marks shall be awarded as per continuous assessment record.

VIII. LABORATORY EQUIPMENT / INSTRUMENTS / TOOLS / SOFTWARE REQUIRED

Sr.No	Equipment Name with Broad Specifications	Relevant LLO Number
1	Single Phase 230/115 V, 50Hz, 1 or 5 kVA Transformer	2,7
2	Single Phase 0-270V, 50Hz, 10A Auto-transformer	2,7,11
3	Cathode Ray Oscilloscope (CRO) 20MHz, Dual channel	3,4,8
4	Single phase 230V, 10A Resistive Load bank	4,5,6
5	Single phase 230V, 50Hz, 2A Inductive Load bank	4
6	Single phase 230V, 50Hz, 2A Capacitive Load bank	4
7	Pulse transformer 1:1:1 4503 or 1:1 4502	8
8	Different types of DC motor	9,10
9	Single phase 230V, 50Hz, 1Hp Induction motor	11
10	Single phase 230V, 50Hz, 1/4Hp Universal motor	12
11	Single or three phase linear induction motor	13

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	Magnetic circuits	CO1	8	4	4	4	12
2	II	A.C fundamentals for single phase and polyphase circuits	CO2	11	4	6	8	18
3	III	Transformers and DC motors	CO3	8	6	4	4	14
4	IV	Fractional horse power motors	CO4	10	4	4	6	14
5	V	Electrical protective devices	CO5	8	4	4	4	12
Grand Total				**45**	**22**	**22**	**26**	**70**

X. ASSESSMENT METHODOLOGIES/TOOLS

Formative assessment (Assessment for Learning)

- 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 semester exam based on observations and recording of the particular experiments

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	3	3	1	2	-	2			
CO2	2	3	2	-	2	3	2			
CO3	3	2	3	2	2	-	2			
CO4	2	2	3	3	2	2	2			
CO5	3	3	2	2	3	2	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	Theraja B.L.	Electrical Technology Vol-I	S.Chand and Co., new Delhi, ISBN:9788121924405
2	Theraja B.L.	Electrical Technology Vol-II	S.Chand and Co., new Delhi, ISBN:9788121924375
3	V. N. Mittle and Arvind Mittal	Basic Electrical Engineering	McGraw Hill, New Delhi, ISBN:978-0070593572
4	U.A.Bakshi	Basic Electrical Engineering	Technical Publications, ISBN:9789333220392
5	DP Kothari and I J Nagrath	Basic Electrical Engineering	Mc Graw Hill, New Delhi, ISBN: 978-9353165727
6	J.B. Gupta	A Course in Electrical Installation Estimating & Costing	S.K. Kataria & Sons, ISBN: 978-93-5014-279-0
7	K. B. Raina and S. K. Bhattacharya	Electrical design, estimation and costing, Second edition	New age international limited publisher, New Delhi, ISBN:978-8122443585

XIII . LEARNING WEBSITES & PORTALS

Sr.No	Link / Portal	Description
1	https://nptel.ac.in/courses	NPTEL study materials
2	Electrical4U	All about electrical circuits

Sr.No	Link / Portal	Description
3	https://instrumentationtools.com/category/electrical-animation/	Animation of basic electrical engineering quantities
4	https://www.udemy.com/course/crash-course-electric-circuits-for-electrical-engineering/	Flip classroom learning material
5	http://www.ece.umn.edu/users/riaz/animations/listanimations.html	Animation of electrical machines
6	https://www.services.bis.gov.in/php/BIS_2.0/bisconnect/get_is_list_by_category_id/5	IS standard