																						1	0-06-2025	10:59:40 AM
						Ma	hara	shtr	a Sta	te Board Of Techni	cal Education	, Mum	bai											
						Learni	ng a	nd A	sses	sment Scheme for P	ost S.S.C Dipl	loma C	ourses											
Pro	gramme Name	è	: Dip	loma In 🛛	Electrical	Engineer	ing / i	Elect	rical	Power System														
Pro	gramme Code		: EE	/ EP						With E	ffect From Aca	demic Y	ear	: 2023	-24									
Dur	ration Of Prog	ramme	: 6 Se	emester			Duration : 16 WEEKS																	
Sen	nester		: Sec	ond	NCrF	Entry Lev	el : 3	.0		Schem	: K													
										Learning Scheme				_		A	ssess	ment	t Sch	eme				
Sr	Sr Course Title Abbrevation Course Type		Abbrevation Course (e Course	Total IKS Hrs	C Hr	Actual Contact Hrs./Week		Self Learning (Activity/	Notional	Credits	Paper	Theory				Based on LL & TI		t TL	Based on Self Learning 7		Total	
No			Туре	Code	for Sem.	CL	TL	LL	Assignment /Micro Project)	Learning Hrs /Week		Duration (hrs.)	FA- TH	SA- TH	То	tal	FA-	Prac -PR	SA-	PR	SL	.A	Marks	
												Max	Max	Max	Min	Max	Min	Max	Min	Max	Min			
(All Compulsory)						-																		
1	APPLIED MA	THEMATICS	AMS	AEC	312301	2	3	1	-	-	4	2	3	30	70	100	40	-	-	-	-	-	-	100
1	APPLIED PHYSICS	DSC	212208	312308	4	2	-	2	0	0	4	15	20	70*#	100	40	25	10	25@	10			200	
2	SCIENCE	APPLIED CHEMISTY	ASC D CY	DSC	512508	4	2	-	2	0	8	4	1.5	50	70 #	100	40	25	10	25@	10	-	-	200
3	ELEMENTS C ELECTRONIC	DF CS	EOE	DSC	312309	-	4	-	4	2	10	5	3	30	70	100	40	25	10	25@	10	25	10	175
4	4 ELECTRICAL ENGINEERING		FEE	DSC	312310	-	4	-	4	2	10	5	3	30	70	100	40	25	10	25#	10	25	10	175
5 PROFESSIONAL COMMUNICATION		РСО	SEC	312002	-	-	-	2	-	2	1	-	-	-	-	-	25	10	25@	10	-	-	50	
6	SOCIAL AND	LIFE SKILLS	SFS	VEC	312003	-	-	-	-	2	2	1	-	-	-	-	-	-	-	-	-	50	20	50
7	7 BASIC MECHANICAL ENGINEERING		BME	SEC	312006	2	2	-	2	-	4	2	-	-	-	-	-	50	20	50@	20	-	-	100
		Tota	al			8	17	1	16	6		20		120	280	400		175		175		100		850

									Learning Scheme						A	Assess	ment So	cher	ne			
Sr	Course Title	Abbrevation	Course	Course Code	Total IKS Hrs for Sem.	Actual Contact Hrs./Week		ıl ct eek	Self Learning (Activity/ Assignment /Micro	Notional	Credits	Paper	Theory			Based on LL & TL		L & TL	Base Se Lear	d on lf ning	Total	
No			Туре					Learning Hrs		Duration				1		Pr	acti	cal		0	Marks	
						CL	TL	LL	Project)	/Week		(hrs.)	FA- TH	SA- TH	То	otal	FA-PF	Ł	SA-PR	SL	A	
													Max	Max	Max	Min	Max M	in N	1ax Min	Max	Min	

Abbreviations : CL- Classroom Learning , TL- Tutorial Learning, LL-Laboratory Learning, FA - Formative Assessment, SA - Summative Assessment, IKS - Indian Knowledge System, SLA - Self Learning Assessment Legends : @ Internal Assessment, # External Assessment, *# On Line Examination , @\$ Internal Online Examination

Note :

1. FA-TH represents average of two class tests of 30 marks each conducted during the semester.

2. If candidate is not securing minimum passing marks in FA-PR of any course then the candidate shall be declared as "Detained" in that semester.

3. If candidate is not securing minimum passing marks in SLA of any course then the candidate shall be declared as fail and will have to repeat and resubmit SLA work.

4. Notional Learning hours for the semester are (CL+LL+TL+SL)hrs.* 15 Weeks

5. 1 credit is equivalent to 30 Notional hrs.

6. * Self learning hours shall not be reflected in the Time Table.

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

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

• For the course Applied Science - candidate will have to appear for pre-examination of both physics & chemistry. If absent in any one section (physics / chemistry) student will be declared as absent & fail for the course and marks will not be processed or carried forward.

	10-06-2025 10:58:26 AM
APPLIED SCIENCE	Course Code : 312308
Programme Name/s	: Automobile Engineering./ Agricultural Engineering/ Automation and Robotics/ Civil Engineering/ Civil & Rural Engineering/ Construction Technology/ Electrical Engineering/ Electrical Power System/ Instrumentation & Control/ Instrumentation/ Civil & Environmental Engineering/ Mechanical Engineering/ Mechatronics/ Production Engineering
Programme Code	: AE/ AL/ AO/ CE/ CR/ CS/ EE/ EP/ IC/ IS/ LE/ ME/ MK/ PG
Semester	: Second
Course Title	: APPLIED SCIENCE
Course Code	: 312308

I. RATIONALE

Diploma engineers have to deal with various processes, materials and machines. The comprehension of concepts and principles of Science like Elasticity, motion, Oscillation, Photoelectricity, X rays ,LASER, Nanomaterials, metals, alloys, water treatment ,fuel and combustion, cells and batteries will help the students to use relevant materials ,processes and methods for various engineering applications .

II. INDUSTRY / EMPLOYER EXPECTED OUTCOME

The aim of this course is to attain following industry/ employer expected outcome through various teaching learning experiences. Apply the principles of physics and chemistry to solve broad-based 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 Select relevant material in industries by analyzing its physical properties .
- CO2 Apply the concept of simple harmonic motion, resonance and ultrasonic sound for various engineering applications.
- CO3 Apply the concept of modern Physics (X-rays, LASER, Photosensors and Nanotechnology) for various engineering applications.
- CO4 Use the relevant metallurgical processes in different engineering applications.
- CO5 Use relevant water treatment processes to solve industrial problems.
- CO6 Use appropriate fuel and electrolyte for engineering applications.

IV. TEACHING-LEARNING & ASSESSMENT SCHEME

	Course Title		Course	L	earı	ning	Sche	Scheme		Assessment Scheme											
Course Code		Abbr		A Co Hrs	Actual Contact rs./Week				Credits	Paper	Theory		Based on LL & TL			Based on SL		Total			
		l.	Category/s	CL	TL	LL	ып		11	Duration	FA- TH	SA- TH	To	tal	FA-	PR	SA-	PR	SL	A	Marks
											Max	Max	Max	Min	Max	Min	Max	Min	Max	Min	
312308	APPLIED SCIENCE	ASC	DSC	4	-	4	-	8	4	1.5	30	70*#	100	40	50	20	50@	20	<i>a</i>		200

APPLIED SCIENCE

Course Code : 312308

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 Applied 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.

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 Apply the concept of elasticity and plasticity to select the material for engineering applications. TLO 1.2 Establish relation between given types of moduli of elasticity. TLO 1.3 Predict the behavior of the given metallic wire. TLO 1.4 Explain the relevant Newton's laws of motion for the given moving object. TLO 1.5 Calculate the work, power, energy for the given situation.	 Unit - I Properties of matter and kinematics 1.1 Deforming Force and Restoring Force, Elasticity, Plasticity, Rigidity. 1.2 Stress and Strain and their types, elastic limit and Hooke's law, types of moduli of elasticity. 1.3 Stress -Strain diagram, Poisson's ratio, factors affecting elasticity 1.4 Newton's laws of motion, and their applications. 1.5 Angular displacement, angular velocity, angular acceleration, three equations of angular motion, projectile motion, trajectory, range of projectile angle of projection ,time of flight 1.6 Work, power and energy: potential energy, kinetic energy, work –energy principle. 	Improved lecture Video Demonstrations Model Demonstration

V. THEORY LEARNING OUTCOMES AND ALIGNED COURSE CONTENT

APPL	IED SCIENCE	Cou	rse Code : 312308
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 Find the parameters required to analyze the given wave motion and simple harmonic motion. TLO 2.2 Explain the concept of resonance and its applications. TLO 2.3 Describe the properties of given ultrasonic waves. TLO 2.4 Explain the given method of production of ultrasonic waves .	 Unit - II Waves and Oscillations 2.1 Sound waves, amplitude, frequency, time - period, wave-length and velocity of wave, relation between velocity, frequency and time - period of wave. 2.2 Simple Harmonic Motion , Uniform Circular Motion as Simple Harmonic Motion, Equation of simple harmonic motion , Phase of Simple Harmonic Motion. 2.3 Resonance , Application of resonance. 2.4 Resonance concept in prehistoric times, concept of different frequencies (Mantras) used to ignite different chakras in body (IKS). 2.5 Ultrasonic waves, properties of ultrasonic waves. 2.6 Piezoelectric and Magnetostriction method to produce ultrasonic waves . 2.7 Applications of ultrasonic waves. 	Improved lecture Demonstration Video Demonstrations
3	TLO 3.1 Explain properties of photon on basis Planck's hypothesis. TLO 3.2 Explain the construction and working of given photoelectric device. TLO 3.3 Explain the method to produce X-Rays with its properties and engineering applications. TLO 3.4 Differentiate between LASER and ordinary light. TLO 3.5 Explain the given terms related to LASER. TLO 3.6 Describe the properties of nanomaterials and its various applications.	 Unit - III Modern Physics (Photoelectricity, X rays, LASER and nanotechnology) 3.1 Planck's hypothesis, properties of photons. 3.2 Photo electric effect: threshold frequency, threshold wavelength, stopping potential, Work function, characteristics of photoelectric effect, Einstein's photoelectric equation 3.3 Photoelectric cell and LDR : principle ,Working and applications 3.4 Production of X-rays by modern Coolidge tube, properties and engineering applications. 3.5 Laser: properties, absorption, spontaneous and stimulated emission, 3.6 Population inversion, active medium, optical pumping, three energy level system, He-Ne Laser. 3.7 Engineering applications of Laser. 3.8 Nanotechnology : Properties of nanomaterials (optical, magnetic and dielectric properties) , applications of nanomaterials, Metallic Bhasma (Ancient Ayurveda, IKS). 	Improved lecture Presentations Demonstration Video Demonstrations

Semester - 2, K Scheme

APPL	IED SCIENCE	Cou	Course Code : 312308						
Sr.No	Theory Learning Outcomes (TLO's)aligned to CO's.	Learning content mapped with Theory Learning Outcomes (TLO's) and CO's.	Suggested Learning Pedagogies.						
4	TLO 4.1 Describe the extraction process of the ore. TLO 4.2 Explain Mechanical properties of metals. TLO 4.3 State purposes of making alloys. TLO 4.4 Describe methods of preparation of alloys. TLO 4.5 State Composition ,properties and applications of ferrous and nonferrous alloys.	 Unit - IV Metals and Alloys 4.1 Ancient Indian Metallurgy (IKS) 4.2 Metals: Occurrence of metals in free and combined state. Basic concepts : Mineral, ore, gangue, flux and slag, metallurgy. 4.3 Metallurgy:Extraction processes of metal from ore Concentration : Gravity separation, electromagnetic separation, froth floatation, calcination and roasting, Reduction : Smelting, aluminothermic process, Refining, poling , electrorefining. 4.4 Mechanical properties of metals :Hardness, ductility, malleability, tensile strength, toughness, machinability, weldability, forging, soldering, brazing, castability. 4.5 Alloys: Purposes of making alloys with examples. 4.6 Preparation methods of alloys : Fusion, compression. 4.7 Classification of alloys :Ferrous and non-ferrous alloys Ferrous alloys: Composition ,properties and applications of low carbon, medium carbon, high carbon steels. Non-ferrous alloy:Composition ,properties and applications of Brass, Bronze, Duralumin, Tinman Solder, Woods metal. 	Chalk-Board Demonstration Case Study Video Demonstrations						
5	TLO 5.1 Explain types of hardness of water. TLO 5.2 List salts causing temporary and permanent hardness to water. TLO 5.3 Describe boiler corrosion and caustic embrittlement. TLO 5.4 Explain the given type of water softening process. TLO 5.5 Describe the Wastewater treatment and potable water treatment. TLO 5.6 Solve numerical based on pH and pOH.	 Unit - V Water Treatment 5.1 Hard and soft water, causes of hardness, types of hardness 5.2 Hard water in boilers and prevention: Boiler corrosion, caustic embrittlement, priming and foaming, scales and sludges, and methods of prevention of boiler corrosion. 5.3 Methods of water softening: lime soda process (hot lime soda and cold lime soda process), zeolite process, ion exchange process. 5.4 Potable water treatment: Sedimentation, coagulation, filtration and sterilization . 5.5 Wastewater treatment: Sewage treatment, BOD and COD of sewage water. 5.6 pH and pOH: Concept of pH, pOH, pH Scale, Numerical. 	Chalk-Board Demonstration Case Study Video Demonstrations						

Semester - 2, K Scheme

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APPL	IED SCIENCE	Cou	10-06-2025 10:58:26 AN
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 Describe the properties of the given type of fuel. TLO 6.2 Describe Proximate analysis and Ultimate analysis of coal samples. TLO 6.3 Calculate the calorific value of the given solid fuel using Bomb calorimeter. TLO 6.4 Describe fractional distillation of crude petroleum. TLO 6.5 Explain properties of liquid fuels. TLO 6.6 Describe composition, properties of given gaseous fuel with their applications. TLO 6.7 Describe production of green hydrogen by electrolysis. TLO 6.8 Describe construction and working of given cells and batteries.	 Unit - VI Fuels and Combustion 6.1 Fuel: Calorific value and ignition temperature, classification. 6.2 Solid fuels: Coal, Classification and composition, Proximate analysis, Ultimate analysis, Calorific value of coal by Bomb calorimeter. 6.3 Liquid fuels: Fractional distillation of crude petroleum, boiling range, composition, propertie Knocking, cracking, octane number and cetane number. 6.4 Gaseous fuels: Biogas, LPG, and CNG. Combustion equation of gaseous fuels, mass and volume of air required for complete combustion. 6.5 Green hydrogen: Producing green hydrogen by electrolysis from renewable sources, Advantages and disadvantages of green hydrogen. 6.6 Electrical conductance in metals and electrolytes, specific conductance, equivalent conductance, cell constant 6.7 Cells and batteries :Construction ,working and applications of dry cell, lead acid storage cell H2 - O2 fuel cell, Ni-Cd battery and Lithium ion battery 	Chalk-Board Demonstration Case Study 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 Searle's method to determine the Young's modulus of given wire	1	* Determination of Young's modulus of given wire.	2	CO1
LLO 2.1 Compare young's modulii of different materials of wires .	2	Comparison of Young's modulii of given materials of wires.	2	CO1
LLO 3.1 Use of inclined plane to find the downward force.	3	* Determination of relationship between angle of inclination and downward force using inclined plane.	2	CO1
LLO 4.1 Use projectile motion to find the range from initial launch speed and angle	4	*Determination of range of projectile	2	CO1
LLO 5.1 Use helical spring to find force constant.	5	* Determination of force constant using helical spring.	2	CO2
LLO 6.1 Use resonance tube method to determine velocity of sound	⁶ 6	* Determination of velocity of sound using resonance tube method.	2	CO2
LLO 7.1 Use Simple pendulum to find acceleration due to gravity .	7	* Determination of acceleration due to gravity by using simple pendulum.	2	CO2
LLO 8.1 Use ultrasonic distance – meter to measure distance of object .	8	Determination of distance of object using ultrasonometer.	2	CO2

MSBTE Approval Dt. 01/10/2024

Semester - 2, K Scheme

APPLIED SCIENCE		С	ourse Cod	e: 312308
Practical / Tutorial / Laboratory Learning Outcome (LLO)	Sr No	Laboratory Experiment / Practical Titles / Tutorial Titles	Number of hrs.	Relevant COs
LLO 9.1 Use ultrasonic interferometer to determine velocity of sound	9	Determination of velocity of ultrasonic sound waves in different liquids using ultrasonic interferometer.	2	CO2
LLO 10.1 Use photo electric cell to find dependence of the stopping potential on the frequency of given light source.	10	Determination of the dependence of the stopping potential on the frequency of given light source .(Virtual Lab)	2	CO3
LLO 11.1 Determine I-V characteristics of the given photo electric cell.	11	* Determination of I-V characteristics of photoelectric cell.	2	CO3
LLO 12.1 Determine I-V characteristics of given light dependent resistor.	12	* Determination of I-V characteristics of LDR.	2	CO3
LLO 13.1 Find divergence of given laser .	13	Determination of the divergence of laser beam.	2	CO3
LLO 14.1 Use LASER beam to find the refractive index of glass plate	14	Determination of refractive index of glass plate using laser beam. (Virtual Lab)	2	CO3
LLO 15.1 Find the wavelength of given laser.	15	Determination of wavelength of helium neon laser (Virtual Lab)	2	CO3
LLO 16.1 Prepare KMnO4 solution. LLO 16.2 Prepare standard oxalic acid. LLO 16.3 Standardize KMnO4 solution.	16	Standardization of KMnO4 solution using standard oxalic acid and preparation of Fe alloy sample.	2	CO4
LLO 17.1 Set up titration Assembly. LLO 17.2 Record the observations. LLO 17.3 Calculate percentage of iron in haematite ore by titration method .	17	* Determination of the percentage of iron present in given Haematite ore by KMnO4 solution.	2	CO4
LLO 18.1 Prepare Cu ore sample. LLO 18.2 Calculate percentage of Cu.	18	* Determination of percentage of copper in given copper ore.	2	CO4
LLO 19.1 Prepare EDTA solution of known concentration. LLO 19.2 Determine total hardness of water by titration.	19	*Calculation of total hardness, temporary hardness and permanent hardness of water sample by EDTA method.	2	CO5
LLO 20.1 Prepare acid solution of known concentration. LLO 20.2 Determine alkalinity of water sample.	20	* Determination of the alkalinity of a given water sample.	2	CO5
LLO 21.1 Determine turbidity by using a Nephelometer or simulation.	21	Determination of turbidity of a given water sample by Nephelometric method by using Nephelometer or simulation.	2	CO5
LLO 22.1 Set up titration Apparatus LLO 22.2 Record the observations. LLO 22.3 Calculate dissolved oxygen.	22	Determination of dissolved oxygen in the given water sample.	2	CO5

APPLIED SCIENCE		C	ourse Cod	e: 312308
Practical / Tutorial / Laboratory Learning Outcome (LLO)	Sr No	Laboratory Experiment / Practical Titles / Tutorial Titles	Number of hrs.	Relevant COs
LLO 23.1 Prepare AgNO3 Solution of known concentration. LLO 23.2 Calculate chloride content in water sample.	23	Determination of chloride content in the given water sample by Mohr's method.	2	CO5
LLO 24.1 Use universal indicator for PH values. LLO 24.2 Calculate PH value by using PH meter.	24	* Determination of pH value of given solution using pH meter and universal indicator.	2	CO5
LLO 25.1 Use of oven for appropriate temperature settings. LLO 25.2 Calculate moisture and ash content in coal samples.	25	* Determination of the moisture and ash content in a given coal sample using proximate analysis.	2	CO6
LLO 26.1 Set up a Bomb Calorimeter. LLO 26.2 Calculate calorific value.	26	* Determination of calorific value of given solid fuel using Bomb calorimeter.	2	CO6
LLO 27.1 Use gravimetric analysis method LLO 27.2 calculate the percentage of Sulphur.	27	Calculate the percentage of Sulphur in a given coal sample by ultimate analysis. (Gravimetric analysis)	2	CO6
LLO 28.1 Standardize conductivity meter. LLO 28.2 Measure the conductance of given solutions.	28	Determination of conductance of given electrolyte by using a conductivity meter.	2	CO6
LLO 29.1 Set up conductometric titration assembly. LLO 29.2 Record conductance. LLO 29.3 Determine specific conductance and equivalence conductance.	29	* Determination of specific conductance and equivalence conductance of given salt sample solution.	2	CO6
LLO 30.1 Set up conductometric titration assembly. LLO 30.2 Record conductance. LLO 30.3 Determine equivalence point.	30	Determination of equivalence point of acetic acid and ammonium hydroxide using conductivity meter.	2	CO6
Note : Out of above suggestive LLOs -				
 '*' Marked Practicals (LLOs) Are man Minimum 80% of above list of lab exit 	dato oerin	ry. nent are to be performed.		

Judicial mix of LLOs are to be performed to achieve desired outcomes.

VII. SUGGESTED MICRO PROJECT / ASSIGNMENT/ ACTIVITIES FOR SPECIFIC LEARNING / SKILLS DEVELOPMENT (SELF LEARNING) : NOT APPLICABLE

VIII. LABORATORY EQUIPMENT / INSTRUMENTS / TOOLS / SOFTWARE REQUIRED

Sr.No	Equipment Name with Broad Specifications	Relevant LLO Number
1	Searle's apparatus(with slotted mass of 0.5 kg each)	1,2
2	Experimental setup for characteristics of LDR, optical bench .Source of light ,LDR .	11
3	Laser Source (He Ne, diode laser), optical bench, graph paper, glass plate	12,13,14
4	Nephelometer ; Auto-ranging from 20-200 NTU,+/- 2% of reading plus 0.1 NTU, power 220 Volts +/- 10% AC 50 Hz	21

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APPL	IED SCIENCE Cour	rse Code : 312308
Sr.No	Equipment Name with Broad Specifications	Relevant LLO Number
5	pH meter reading up to pH14; ambient temp40 to 700 C.; pH/mV resolution:13 bit	24
6	Electric oven inner size 18"x18"x18"; temperature range 100 to 2500 C with the capacity of 40 lt.	25
7	Bomb calorimeter Temperature Resolution:0.001°C Oxygen Filling Automatic /Manual	26
8	Conductivity meter; conductivity range – 0.01 uS /cm to 200 mS/cm, Cell constant – digital 0.1 to 2.00; Temp. range – 0 to 100°C	28,29,30
9	An inclined plane, a trolly or a roller, pan, weight box, spring balance spirit level, strong thread, meter scale.	
10	Retort stand, helical spring, 6 slotted weight of 50 grams ., scale, stop watch.	4
11	Resonance tube, Tuning forks of different frequencies	5
12	Metallic bob, strong thread, stopwatch.	6
13	Ultrasonometer	7
14	ultrasonic interferometer	8
15	Experimental setup for characteristics of photoelectric cell	9,10
16	Electronic balance, with the scale range of 0.001g to 500g. pan size 100 mm; response time 3-5 sec.; power requirement 90-250 V, 10 watt.	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	Ι	Properties of matter and kinematics	CO1	9	3	4	4	11				
2	II	Waves and Oscillations	CO2	10	3	5	4	12				
3	III	Modern Physics (Photoelectricity, X rays, LASER and nanotechnology)	CO3	11	3	5	4	12				
4	IV	Metals and Alloys	CO4	10	2	3	5	10				
5	V	Water Treatment	CO5	8	3	4	4	11				
6	VI	Fuels and Combustion	CO6 0	12	3	5	6	14				
	Grand Total 60 17 26 27 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

APPLIED	SCIENCE						Course	Code	: 3123	308
			Progra	amme Outco	mes (POs)			Pro S Ou	ogram pecifi itcom PSOs	ime ic es*
Course Outcomes (COs)	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	1	1	2			
CO2	3	1	1	1	1	- 1	2			
CO3	3	2	1	1	1		2			
CO4	3	1		1	2	2	1			
CO5	3	2	1	2	2	2	1			
CO6	3	1	-	1	2	2	1			
Legends : *PSOs ar	:- High:03, N e to be form	/ledium:02 ulated at i	2,Low:01, No nstitute level	Mapping: -			Q.			

XII. SUGGESTED LEARNING MATERIALS / BOOKS

Sr.No	Author	Title	Publisher with ISBN Number				
1	Haliday, David; Resnik, Robert and Walker, Jearl	Fundamentals of Physics	John Wiley & sons, Hoboken, USA, 2014 ISBN : 812650823X.				
2	Hussain Jeevakhan	Applied Physics II	Publisher: Khanna Book Publishing ISBN: 9789391505578.				
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	Aryabhatta	The Surya Siddhanta	Baptist mission press, Calcutta				
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	Agnihotri Rajesh	Chemistry for Engineers	Wiley India Pvt. Ltd. New Delhi, 2014, ISBN: 9788126550784.				
10	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				
11	Vairam S.	Engineering Chemistry	Wiley India Pvt. Ltd. New Delhi, 2013, ISBN: 9788126543342				

XIII . LEARNING WEBSITES & PORTALS

Sr.No	Link / Portal	Description
1	https://www.iberdrola.com/sustainability/green-hydrogen	Green hydrogen

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APPLI	ED SCIENCE	Course Code : 312308
Sr.No	Link / Portal	Description
2	https://vedicheritage.gov.in/vedic-heritage-in-present-conte xt/metallurgy	Ancient indian metallurgy (IKS)
3	https://vlab.amrita.edu/?sub=2&brch=193∼=575&cnt=4	Determine turbidity by using a simulation
4	https://www.britannica.com/science/metallurgy	Metals and alloy
5	https://phet.colorado.edu/en/simulations/ph-scale	PH and POH
6	https://archive.nptel.ac.in/courses/103/105/103105110/	Solid fuel
7	www.physicsclassroom.com	Concepts of Physics
8	www.fearofphysics.com	Fundamental terms in Physics
9	https://iksindia.org	IKS
Note : • T o	eachers are requested to check the creative common license status/finan nline educational resources before use by the students	cial implications of the suggested

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Semester - 2, K Scheme

APPLIED MATHEMATICS

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 and Electronics Engineering/ 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/ Computer Science/ Electronics & Computer Engg.
Programme Code	: AA/ AE/ AI/ AL/ AN/ AO/ AT/ BD/ CE/ CH/ CM/ CO/ CR/ CS/ CW/ DE/ DS/ EE/ EJ/ EK/ EP/ ET/ EX/ HA/ IC/ IE/ IF/ IH/ IS/ IX/ IZ/ LE/ ME/ MK/ MU/ PG/ SE/ 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 decisionmaking, 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 definite integration to solve given engineering related problems.
- CO3 Apply the concept of differential equation to find the solutions of given engineering 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 : 312301

APPLIED MATHEMATICS

		L	ear	ning	g Sche	eme					A	ssess	ment	Sche	eme		Ä				
Course	Course Title Abbr Course Course Actual Contact Hrs./Week Category/s SLH NLH Credits Paper Duration	Actual Contact rs./Week		ts Paper Based on LL &			Theory		&	Based on SL		Total									
Code		CL TL LL SLH NLH Duration FA- SA- TH TH TH Total FA-PR S	tical		Ma		Marks														
					FA- TH	SA- TH	Tot	tal	FA-	PR	SA-	PR	- SL	A							
						· · · · · ·					Max	Max	Max	Min	Max	Min	Max	Min	Max	Min	
312301	APPLIED MATHEMATICS	AMS	AEC	3	1		-	4	. 2	3	30	70	100	40	1	-1		- '	· _ ·		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 (only linear non repeated factors at denominator of proper fraction).	Improved Lecture Demonstration Chalk-Board Presentations Video Demonstrations		
2	TLO 2.1 Solve given examples based on Definite Integration. TLO 2.2 Use properties of definite integration to solve given problems.	Unit - II Definite Integration 2.1 Definite Integration: Definition, rules of definite integration with simple examples. 2.2 Properties of definite integral (without proof) and simple examples.	Video Simulation Chalk-Board Improved Lecture Presentations		

APPL	IED MATHEMATICS	Course Code : 312301					
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 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.	 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. 	Video Demonstrations Presentations Chalk-Board Improved Lecture Flipped Classroom				
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 iterative methods. TLO 4.3 Solve problems using Bakhshali iterative method for finding approximate square root. (IKS)	Unit - IV Numerical Methods 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 iterative methods: Gauss Seidal and Jacobi's method. 4.3 Bakhshali iterative method for finding approximate square root. (IKS)	Video SCILAB Spreadsheet Chalk-Board Flipped Classroom Presentations				
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 ORANGE 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(only linear non repeated factors at denominator of proper fraction).	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

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APPLIED MATHEMATICS Course Code : 312							
Practical / Tutorial / Laboratory Learning Outcome (LLO)	Sr No	Laboratory Experiment / Practical Titles / Tutorial Titles	Number of hrs.	Relevant COs			
LLO 6.1 Solve given problems for finding the area under the curve and volume of revolution.	6	* #Area under the curve and volume of revolution.(Only for Civil and Mechanical Engineering Group)	1	CO2			
LLO 7.1 Solve examples on mean value and root mean square value.	7	* #Mean value and root mean square value.(Only for Computer, Electrical and Electronics Engineering Group)	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 differential equation using variable separable method.	9	Variable separable method.	1	CO3			
LLO 10.1 Solve first order first degree differential equation 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.(Take programme specific problems)	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.	,1 [,] 3,	Newton- Raphson 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 Use Bakhshali iterative methods for finding approximate value of square root. (IKS)	15	*Bakhshali iterative methods for finding approximate value of square root. (IKS)	1	CO4			
LLO 16.1 Solve engineering problems using Binomial distribution.	16	*Binomial Distribution	1	CO5			
LLO 17.1 Solve engineering problems using Poisson distribution.	17	*Poisson Distribution	1	CO5			
LLO 18.1 Solve engineering problems using Normal distribution.	18	Normal Distribution	1	CO5			
LLO 19.1 Solve problems on Laplace transform and properties of Laplace transform.	19	* # Laplace transform and properties of Laplace transform.(Only for Electrical and Electronics Engineering Group)	1	CO2			
LLO 20.1 Solve problems on Inverse Laplace transform and properties of Inverse Laplace transform.	20	* # Inverse Laplace transform and properties of Inverse Laplace transform.(Only for Electrical and Electronics Engineering Group)	1	CO2			
Note : Out of above suggestive LLOs	-						

- '*' Marked Practicals (LLOs) Are mandatory.
- Minimum 80% of above list of lab experiment are to be performed.
 Judicial mix of LLOs are to be performed to achieve desired outcomes.

APPLIED MATHEMATICS

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

Micro project

• NA

Assignment

• NA

Note :

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

VIII. LABORATORY EQUIPMENT / INSTRUMENTS / TOOLS / SOFTWARE REQUIRED

Sr.No	Equipment Name with Broad Specifications	Relevant LLO Number
1	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	Ι	Indefinite Integration	CO1	15	2	6	12	20
2	II -	Definite Integration	CO2	8	2	4	6	12
3	III	Differential Equation	CO3	8	2	4	6	12
4	IV	Numerical Methods	CO4	6	2	4	8	14
5	V	Probability Distribution	CO5	8	2	4	6	12
		Grand Total		45	10	22	38	70

X. ASSESSMENT METHODOLOGIES/TOOLS

Formative assessment (Assessment for Learning)

• Tests

Summative Assessment (Assessment of Learning)

APPLIED MATHEMATICS

Course Code: 312301

• End Term Exam

XI. SUGGESTED COS - POS MATRIX FORM

			Progra	amme Outco	mes (POs)			Programme Specific Outcomes* (PSOs)			
Course Outcomes (COs)	PO-1 Basic and Discipline Specific Knowledge	PO-2 Problem Analysis	PO-3 Design/ Development of Solutions		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 : *PSOs are	- High:03, N e to be form	/ledium:02 ulated at i	2,Low:01, No nstitute level	Mapping: -			2.				

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 (India) 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 and Tibshirani	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

APPL	IED MATHEMATICS	Course Code : 312301
Sr.No	Link / Portal	Description
2	https://www.khanacademy.org/math? gclid=CNqHuabCys4CFdOJaddHo Pig	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.
8	https://www.purplemath.com/	Purplemath is a great resource for students seeking help with algebra and other foundational mathematics to improve learning.
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 globe.
12	https://ocw.mit.edu/index.htm	The Massachusetts Institute of Technology (MIT) offers free access to course materials for a wide range of mathematical courses.
Note		

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

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Semester - 2, K Scheme

YOGA AND MEDIT.	ATION	Course Code : 311003
YOGA AND MEDIT	 Arthon : Architecture Assistantship/ Automobile Engineering Agricultural Engineering/ Artificial Intelligence and Machine Learning/ Automa Cloud Computing and Big Data/ Civil Engineering/ Chemical Engineering/ Computer Engineering/ Civil & Rural Engineering/ Construction Technology. Engineering/ Fashion & Clothing Technology/ Dress Designing & Garment Manufacturing/ Digital 1 Electrical Engineering/ Electronics & Tele-communication Engg./ Electrical a Electrical Power System/ Electronics & Communicati Electronics Engineering/ Food Technology/ Instrumentation & Control/ Industrial Electronics/ In Science & Information Technology/ Instrumentation/ Interior Design & Decoration/ Inter Engineering/ Mechanical Engineering/ Mechatronics/ Medical Lab 	Course Code : 311003 g./ Artificial Intelligence/ ation and Robotics/ Architecture/ Technology/ Computer / Computer Science & Electronics/ Data Sciences/ and Electronics Engineering/ ion Engg./ r Hardware & Maintenance/ Hotel nformation Technology/ Computer rior Design/ Civil & Environmental
	Electronics/ Production Engineering/ Printing Technology/ Polym Technology/ Computer Science/ Textile Technology/ Electronics & Tourism/ Textile Manufactures	er Technology/ Surface Coating Computer Engg./ Travel and
Programme Code	: AA/ AE/ AI/ AL/ AN/ AO/ AT/ BD/ CE/ CH/ CM/ CO DS/ EE/ EJ/ EK/ EP/ ET/ EX/ FC/ HA/ HM/ IC/ IE/ I ME/ MK/ ML/ MU/ PG/ PN/ PO/ SC/ SE/ TC/ TE/ TI	D/ CR/ CS/ CW/ DC/ DD/ DE/ F/ IH/ IS/ IX/ IZ/ LE/ R/ TX
Semester	: First	
Course Title	: YOGA AND MEDITATION	
Course Code	: 311003	

I. RATIONALE

Diploma Graduate needs a sound body and mind to face the challenging situations in career as employee or as an entrepreneur. Yoga and Meditation brings about the holistic development of an individual and equips with necessary balance to handle the challenges. The age of polytechnic student is appropriate to get introduced to yoga practice as this will help them in studies as well as his professional life. Moreover, Yoga inculcates discipline in all walks of the life of student. Pranayama practice regulates breathing practices of the student to improve stamina, resilience. Meditation empowers a student to focus and keep calm to get peace of mind. World Health Organization (WHO) has also emphasized the role of yoga and meditation as stress prevention measure. National Education Policy -2020 highlights importance of yoga and meditation amongst students of all ages. Therefore, this course for Diploma students is designed for the overall wellbeing of the student and aims to empower students to adopt and practice "Yoga" in daily life .

II. INDUSTRY / EMPLOYER EXPECTED OUTCOME

Practice basic Yoga and Pranayama in daily life

III. COURSE LEVEL LEARNING OUTCOMES (COS)

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

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YOGA AND MEDITATION

Course Code : 311003

- CO1 Practice basic Yoga and Pranayama in daily life to maintain physical and mental fitness.
- CO2 Practice meditation regularly for improving concentration and better handling of stress and anxiety.
- CO3 Follow healthy diet and hygienic practices for maintaining good health.

IV. TEACHING-LEARNING & ASSESSMENT SCHEME

			-										-								
				L	ear	ning	Sche	eme	1		1.1		Α	ssess	ment	Sche	eme		12		
Course Code	Course Title	Abbr	Course Category/s	A Co Hrs	ctu onta s./W	al ict 'eek	SLH	NLH	Credits	Paper		The	eory		Ba	sed o T Prac	n LL L tical	&	Base S	d on L	Total
				ÇL	TL	LL				Duration	FA- TH	SA- TH	То	tal	FA-	PR	SA-	PR	SI	A	Marks
							. 1			-	Max	Max	Max	Min	Max	Min	Max	Min	Max	Min	
311003	YOGA AND MEDITATION	YAM	VEC	-		1	1	2	1	-			-	-	25	10	-	-	25	10	50

Total IKS Hrs for Sem. : 1 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	Learning content mapped with Theory	Suggested Learning
51.110	(TLO's)aligned to CO's.	Learning Outcomes (TLO's) and CO's.	Pedagogies.

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 Practice warming up for Yoga.	1	Introduction :- Presentations on Introduction to Yoga and its History. Lab Exp: 1. Perform warming up exercises to prepare the body from head to toe for Yoga.	5	CO1

COGA AND MEDITATIONCourse Code : 311003							
Practical / Tutorial / Laboratory Learning Outcome (LLO)	Sr No	Laboratory Experiment / Practical Titles / Tutorial Titles	Number of hrs.	Relevant COs			
LLO 2.1 Practice Surya Namaskar	2	Lab Exp: 2. Perform all the postures of Surya Namaskar one by one in a very slow pace, after warm up. Lab Exp 3. Perform multiple Surya Namaskar (Starting with three and gradually increasing it to twelve) in one go. Experiment 2 to 4 must be followed by shavasana for self relaxation.	7	CO1 CO2			
LLO 3.1 Practice basic Asanas	3	Lab Exp: 4 Perform Sarvangasna,Halasana,Kandharasana (setubandhasana) Lab Exp: 5 Perform Bhujangasana,Naukasana,Mandukasana Lab Exp: 6 Perform Paschimottasana,Baddhakonasana,Bharadwajasana. Lab Exp: 7 Perform Veera Bhadrasana,Vrukshasana,Trikonasana. Follow up experiment 5 to 7 with shavasana for self relaxation	8	CO2			
LLO 4.1 Practice basic pranayama	4	Lab Exp: 8 Perform Bhastrika, Anulom Vilom Pranayam Kriya Lab Exp: 9 Practice Kapalbhati Pranayam Kriya Lab Exp:10 Practice Bhramary Pranayam.	5	CO3			
LLO 5.1 Practice meditation	5	Lab Exp: 11 Perform sitting in Dhyan Mudra and meditating.Start with five minute and slowly increasing to higher durations. (Trainer will explain the benefits of Meditation before practice)	5	CO3			
Note : Out of above	sug	gestive LLOs -	1.2				
 '*' Marked Pract 	ical	(IIOs) Are mandatory					

- ticals (LLOs) Are mandatory.
- Minimum 80% of above list of lab experiment are to be performed.
- Judicial mix of LLOs are to be performed to achieve desired outcomes.

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

Micro project

Maintain a diary indicating date wise practice done by the student with a photograph of self in yogic posture.

Assignment

Prepare Diet and nutrition chart for self

Self Learning

- Practice at least thrice a week.
- Read books on different methods to maintain health, wellness and to enhance mood
- Watch videos on Yoga Practices.

YOGA AND MEDITATION

Note :

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

VIII. LABORATORY EQUIPMENT / INSTRUMENTS / TOOLS / SOFTWARE REQUIRED

Sr.No	Equipment Name with Broad Specifications	Relevant LLO Number
	Yoga and Meditation kits :	1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1
1	Yoga Mats, Yoga Rollers, Yoga Blocks, Aero Yoga Clothing Blankets, Cloth Straps,	All
	Bolsters, Wheels	Carl Start

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

X. ASSESSMENT METHODOLOGIES/TOOLS

Formative assessment (Assessment for Learning)

• Lab performance, Self-learning and Terms work

Summative Assessment (Assessment of Learning)

Actual Practical Performance

XI. SUGGESTED COS - POS MATRIX FORM

		Programme Specific Outcomes* (PSOs)								
Course Outcomes (COs)	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					
CO2		-	-	_	3	-	-	${\mathcal A} = {\mathcal A}^{(1)}$		
CO3	-	-	-	-	3	-	- 1			

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Semester - 1, K Scheme

YOGA AND MEDITATION

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	Swami Vivekananda	Patanjalis Yoga Sutras	Fingerprint Publishing (2023) Prakash Books India Pvt Ltd, New Delhi ISBN-13?: ? 978-9354407017
2	Luisa Ray, Angus Sutherland	Yoga for Every Body: A beginner's guide to the practice of yoga postures, breathing exercises and me	Vital Life Books (2022) ISBN-13?: ? 978-1739737009
3	Swami Saradananda	Mudras for Modern Living: 49 inspiring cards to boost your health, enhance your yoga and deepen your	Watkins Publishing (2019) ISBN-13?: ? 978-1786782786
4	Martha Davis, Elizabeth Robbins, Matthew McKay, Eshelman MSW	The Relaxation and Stress Reduction Workbook	A New Harbinger Self-Help Workbook (2019)
5	Ann Swanson	Science of Yoga: Understand the Anatomy and Physiology to Perfect Your Practice	ISBN-13?: ? 978-1465479358

XIII. LEARNING WEBSITES & PORTALS

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Healthy Living -
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Note :

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

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Semester - 1, K Scheme

Course Code : 311003

Programme Name/s	: Automobile Engineering./ Chemical Engineering/ Electrical Engineering/ Electrical Power System/ Food Technology/ Mechanical Engineering/ Mechatronics/ Production Engineering/ Printing Technology/ Polymer Technology
Programme Code	: AE/ CH/ EE/ EP/ FC/ ME/ MK/ PG/ PN/ PO
Semester	: First
Course Title	: ENGINEERING WORKSHOP PRACTICES (Mechanical, Electrical and allied branches)
Course Code	: 311005

I. RATIONALE

Workshop Practice is a basic engineering course. The knowledge of basic shops like wood working, fitting, welding, plumbing and sheet metal shop is essential for technician to perform his/her duties in industries. Students are able to perform various operations using hand tool equipment and machineries in various shops. Working in workshop develops the attitude of group working and safety awareness. This course provides industrial environment in the educational institute.

II. INDUSTRY / EMPLOYER EXPECTED OUTCOME

Use different engineering tools for performing shop floor activities.

III. COURSE LEVEL LEARNING OUTCOMES (COS)

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

- CO1 Use firefighting tools and equipment.
- CO2 Prepare job using different tools in fitting shop.
- CO3 Perform various operations using plumbing and carpentry tools.
- CO4 Prepare various welding joints.
- CO5 Produce simple job using different sheet metal operations.

IV. TEACHING-LEARNING & ASSESSMENT SCHEME

				L	earı	ning	g Sche	eme					A	ssess	ment	Sch	eme				
Course Code	e Course Title	Course Title Abbr Cou		Actual Contact Hrs./Week y/s S		SLH NLH		Credits	Paper	Theory		Based on LL & TL Practical		&	Based on SL		Total Marks				
				CL	TL	LL				Duration	FA- TH	SA- TH	To	tal	FA-	PR	SA-	PR	SI	A	IVIAI KS
		11.1						· · · · ·		1. S. S. S. S. S.	Max	Max	Max	Min	Max	Min	Max	Min	Max	Min	
311005	ENGINEERING WORKSHOP PRACTICES (Mechanical, Electrical and	EWP	SEC		-	4	-	4	2	3					50	20	50@	20	-	-	100

Course Code : 311005

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 Follow safety practices TLO 1.2 Explain the different types of fire extinguisher and their uses TLO 1.3 Use firefighting equipment TLO 1.4 Locate various machines and equipment in workshop TLO 1.5 Follow good housekeeping	Unit - I General Workshop Practice 1.1 Safety Practices, Causes of accidents, General safety rules, Safety signs and symbols 1.2 First Aid 1.3 Fire, Causes of Fire, Basic ways of extinguishing the fire, Classification of fire, Class A,B,C,D, Firefighting equipment, fire extinguishers, and their types . 1.4 Workshop Layout 1.5 Issue and return system of tools, equipment and consumables	Demonstration Collaborative learning Role Play
2	TLO 2.1 Identify fitting tools TLO 2.2 Explain operation of fitting shop machines TLO 2.3 Use fitting tools TLO 2.4 Operate machineries. TLO 2.5 Perform fitting operations TLO 2.6 Maintain tools, equipment and machineries.	 Unit - II Fitting 2.1 Fitting hand tools bench vice, hammers, chisels, files, hacksaw, surface plate, punch, v block, angle plate, try square, marking block , steel rule, twist drills, reamers, tap set, die set and their Specifications 2.2 Operation of fitting shops machineries - Drilling machine, Power saw, grinder their specifications and maintenance. 2.3 Basic process chipping, filling, scraping, grinding, marking, sawing, drilling, tapping, dieing, reaming etc. 	Model Demonstration

r.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 Identify plumbing tools. TLO 3.2 Explain operation of fitting shop machines. TLO 3.3 Use plumbing tools TLO 3.4 Operate machineries. TLO 3.5 Perform plumbing operations TLO 3.6 Maintain tools, equipment and machineries.	Unit - III Plumbing 3.1 Plumbing hand tools pipe vice, pipe bending equipment, pipe wrenches, dies and their Specifications 3.2 Pipe fittings- bends, elbows, tees, cross, coupler, socket, reducer, cap, plug, nipple and their Specifications 3.3 Operation of Machineries in plumbing shops- pipe bending machine their specifications and maintenance. Basic process cutting, threading.	Model Demonstration
4	TLO 4.1 Identify metal joining tools. TLO 4.2 Explain gas and arc welding procedure TLO 4.3 Use metal joining tools. TLO 4.4 Perform welding, soldering, brazing operations TLO 4.5 Maintain tools, equipment and machineries.	 Unit - IV Metal Joining 4.1 Gas welding hand tools- welding torch, welding tip, pressure regulator, oxygen and acetylene cylinders, spark lighter and their Specifications 4.2 Arc welding hand tools- electrode holder, cable connector, cable lugs, chipping hammer, earthing clamp, wire brush and their Specifications 4.3 Operation of machineries in welding shops- arc welding transformer their specifications and maintenance. 4.4 Welding Electrode, filler rod, fluxes, and solders. 4.5 Basic process welding, brazing and soldering. 	Video Demonstrations Demonstration
5	TLO 5.1 Select wood working tools as per job/ requirement. TLO 5.2 Explain operation of wood working machines TLO 5.3 Use furniture making tools TLO 5.4 Operate machineries. TLO 5.5 Perform wood working operations TLO 5.6 Maintain tools, equipment and machineries.	 Unit - V Carpentry 5.1 Types of artificial woods such as plywood, block board, hardboard, laminated boards, Veneer, fiber Boards and their applications. 5.2 Wood working hand tools carpentry vice, marking and measuring tools, saws, claw hammer, mallet, chisels, plans, squares, and their specifications 5.3 Operation of wood working machineries - Wood turning lathe, circular saw, their specifications and maintenance. 5.4 Basic process- marking, sawing, planning, chiseling, turning, grooving, boring. 	Demonstration

Semester - 1, K Scheme

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Course	Code	:	311	005

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 sheet metal tools. TLO 6.2 Explain operation of sheet metal machineries. TLO 6.3 Use sheet metal tools TLO 6.4 Operate sheet metal machineries. TLO 6.5 6.5 Perform bending operations Maintain tools, equipment and machineries.	 Unit - VI Sheet Metal 6.1 Sheet metal hand tools snip, shears sheet gauge, straight edge, L square, scriber, divider, trammel, punches, pliers, stakes, groovers, limit set and their Specifications 6.2 Operation of machineries in sheet metal shops-sheet cutting and bending machine their specifications and maintenance. Basic process- marking, bending, folding, edging, seaming, staking, riveting. 	Demonstration

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 fire extinguisher	1	Identify fire extinguisher according to their specification.	2	CO1
LLO 2.1 Operate fire extinguisher	2	* Perform mock drill session in group of minimum 10 students for extinguishing fire.	2	CO1
LLO 3.1 Identify different tools used in workshop.	3	* Identify different tools used in workshop.	2	CO1 CO2 CO3 CO4 CO5
LLO 4.1 Select proper fitting tools LLO 4.2 Prepare fitting job using different tools.	4	* Prepare job using following operations:part1 a. Marking operation as per drawing b. punching operation as per drawing c. Filing operation as per drawing d. sawing operation as per drawing e. drilling operation as per drawing f. tapping operation as per drawing	6	CO2
LLO 5.1 Select proper plumbing tools LLO 5.2 Use plumbing operations for preparing plumbing joints	5	Prepare T joint pipe fitting job as per given drawing (individually)	4	CO3
LLO 6.1 Select proper plumbing tools LLO 6.2 Use plumbing operations for preparing plumbing joints	6	* Prepare elbow joint pipe fitting job as per given drawing(individually)	4	CO3
LLO 7.1 Develop list of different components as per the specification.	7	* Prepare bill of material for given pipeline layout (individually)	2	CO3

		Co	urse Code	e : 311005				
Practical / Tutorial / Laboratory Learning Outcome (LLO)	Sr No	Laboratory Experiment / Practical Titles / Tutorial Titles	Number of hrs.	Relevant COs				
LLO 8.1 Obey safety rules employed in welding shop.	8	* Practice different safety rules in welding shop as per given instruction.	2	CO4				
LLO 9.1 Prepare various welded joints using different welding processes.	9	Prepare lap joint using gas welding as per given drawing (individually)	4	CO4				
LLO 10.1 Prepare various welded joints using different welding processes.	10	Prepare butt joint using gas welding as per given drawing (individually)	4	CO4				
LLO 11.1 Assemble utility jobs using different manufacturing processes.	11	* Prepare utility job (like stool, benches, tables or similar jobs) involving arc welding and artificial wood as per given drawing (in group of 4 to 5 students) Fabrication operation involve measuring, marking, cutting, edge preparation, welding	8	CO3 CO4				
LLO 12.1 Select proper sheet metal tools LLO 12.2 Prepare sheet metal component using different operations.	12	* Prepare sheet metal utility job using following operations a. Cutting And Bending b. Edging c. End curling d. Lancing e. Soldering f. Riveting	6	CO5				
LLO 13.1 Collect information about ancient tools for understanding Indian Knowledge.	13	* Draw sketches of various ancient tools	2	CO1 CO2 CO3 CO4 CO5				
 Note : Out of above suggestive LLOs - '*' Marked Practicals (LLOs) Are mandatory. Minimum 80% of above list of lab experiment are to be performed. Judicial mix of LLOs are to be performed to achieve desired outcomes 								

VII. SUGGESTED MICRO PROJECT / ASSIGNMENT/ ACTIVITIES FOR SPECIFIC LEARNING / SKILLS DEVELOPMENT (SELF LEARNING) : NOT APPLICABLE

VIII. LABORATORY EQUIPMENT / INSTRUMENTS / TOOLS / SOFTWARE REQUIRED

Sr.No	Equipment Name with Broad Specifications	Relevant LLO Number
1	Fire buckets of standard size.	1,2
2	Fire extinguisher A,B and C types	1,2
3	Wood Turning Lathe Machine, Height of Centre: 200mm, Distance between Centers: 1200mm, Spindle Bore: 20mm with Taper, Range of Speeds: 425 to 2800 with suitable Motor Drive. with all accessories	11
4	Circular Saw Machine, Diameter of saw blade 200 mm, Maximum Depth of Cut 50 mm, Table Size -350 x 450 mm, Table Tilting - 450	11

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Semester - 1, K Scheme

	Course	code: 311005
Sr.No	Equipment Name with Broad Specifications	Relevant LLO Number
5	Wood working tools- marking and measuring tools, saws, claw hammer, mallet, chisels, plans, squares	11
6	Carpentry Vice 200 mm	11
7	Sheet Bending Machine	12
8	Sheet Cutting Machine	12
9	Brazing Equipment	12
10	Sheet metal hand tools- snip, shears sheet gauge, straight edge, L square, scriber, divider, trammel, punches, pliers, stakes, groovers, limit set	12
11	Fitting tools - hammers, chisels, files, hacksaw, surface plate, punch, v block, angle plate, try square, marking block, steel rule, twist drills, reamers, tap set, die set.	3,4
12	Plumbing tools- pipe vice, pipe bending equipment, pipe wrenches, dies.	3,5,6
13	Work Benches- size:1800 x 900 x 750 mm	4
14	Bench Drilling machine (upto 13 mm drill cap.) with ½ H.P. Motor, 1000 mm height.	4
15	Power Saw machine 350 mm mechanical with 1 HP Motor & all Accessories.	4
16	Bench Grinder 200 mm Grinding Disc diameter 200 mm. with 25 mm. bore 32 mm. with $\frac{1}{2}$ HP/1HP Motor.	4
17	Portable Hammer Drill Machine 0-13 mm A.C. 230 V, 2.5Amp, Pistol type, having different types of bits	4
18	Surface Plate 600 x 900 mm Grade I	4,5
19	Angle Plate 450 x 450 mm	4,5
20	Vernier height Gauge 450 mm	4,5,6,8
21	Pipe Bending Machine	5,6
22	Pipe Vice – 100 mm	5,6
23	Pipe Cutter- 50 mm	5,6
24	Bench Vice 100 mm	5,6
25	Welding machine 20 KVA 400A welding current 300A at 50, 100, 200, 250, 300 with std. Accessories and Welding Cable 400 amp. ISI with holder	8,9,10,11
26	Oxygen and acetylene gas welding and cutting kit with cylinders and regulators.	8,9,10,11
27	Gas welding hand tools- welding torch, welding tip, pressure regulator, oxygen and acetylene cylinders, spark lighter	8,9,10,11
28	Arc welding hand tools- electrode holder, cable connector, cable lugs, chipping hammer, earthing clamp, wire brush.	8,9,10,11

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

X. ASSESSMENT METHODOLOGIES/TOOLS

Formative assessment (Assessment for Learning)

• Assignment and Terms work

Summative Assessment (Assessment of Learning)

• Lab performance

Course Code : 311005

XI. SUGGESTED COS - POS MATRIX FORM

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

XII. SUGGESTED LEARNING MATERIALS / BOOKS

Sr.No	Author	Title	Publisher with ISBN Number
1	Bawa, H.S.	Workshop Practice	McGraw Hill Education, Noida; ISBN-10: 0070671192 ISBN-13: 978-0070671195
2	Gupta, J.K.; Khurmi, R.S.	A Textbook of Manufacturing Process (Workshop Tech.)	S.Chand and Co. New Delhi ISBN:81-219- 3092-8
3	Hegde, R.K.	Workshop Practice Manual For Engineering Diploma & ITI Students	Sapna Book House, 2012, ISBN:13: 9798128005830
4	Singh, Rajender	Introduction to Basic Manufacturing Process & Workshop Technology	New Age International, New Delhi; 2014, ISBN: 978-81-224-3070-7
5	Hajra; Choudhary	Elements of Workshop Technology	Media Promoters and Publishers Mumbai, 2009, ISBN: 10-8185099146
6	Sarathe, A.K	Engineering Workshop Practice	Khanna Book Publishing CO(P) LTD, New Delhi, ISBN No. 978-93-91505-51-6

XIII. LEARNING WEBSITES & PORTALS

Sr.No	Link / Portal	Description
1	http://www.asnu.com.au	Basic engineering tools.
2	http://www.abmtools.com/downloads/Woodworking%20Carpentry%20 Tools.pdf	Wood working
3	http://www.weldingtechnology.org	Welding techniques
4	http://www.newagepublishers.com/samplechapter/001469.pdf	Basic engineering tools.
5	http://www.youtube.com/watch?v=TeBX6cKKHWY	Welding techniques

	C	ourse Code : 311005
Sr.No	Link / Portal	Description
6	http://www.youtube.com/watch?v=QHF0sNHnttw&feature=related	Welding techniques
7	http://www.youtube.com/watch?v=Kv1zo9CAxt4&feature=relmfu	Wood working
8	http://www.piehtoolco.com	Basic engineering tools.
9	http://sourcing.indiamart.com/engineering/articles/materials -used-hand-tools/	Basic engineering tools.
10	https://www.youtube.com/watch?v=9_cnkaAbtCM	Basic engineering tools.
Note :		

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

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Semester - 1, K Scheme

ENGINEERING GRA	APHICS (Civil, Electrical, Mechanical and allied branches) Course Code : 311006
Programme Name/s	: Automobile Engineering./ Agricultural Engineering/ Civil Engineering/ Chemical Engineering/ Civil & Rural Engineering/ Construction Technology/ Fashion & Clothing Technology/ Electrical Engineering/ Electrical Power System/ Food Technology/ Civil & Environmental Engineering/ Mechanical Engineering/ Mechatronics/ Production Engineering/ Printing Technology/ Polymer Technology/ Textile Technology/ Textile Manufactures
Programme Code	: AE/ AL/ CE/ CH/ CR/ CS/ DC/ EE/ EP/ FC/ LE/ ME/ MK/ PG/ PN/ PO/ TC/ TX/
Semester	: First
Course Title	: ENGINEERING GRAPHICS (Civil, Electrical, Mechanical and allied branches)
Course Code	: 311006

I. RATIONALE

Engineering graphics is the language of engineers. The concepts of graphical language are used in expressing the ideas, conveying the instructions, which are used in carrying out the jobs on the sites, shop floor etc. This course is useful in developing drafting and sketching skills in the student. It covers the knowledge & application of drawing instruments & also familiarizes the learner about Bureau of Indian Standards related to engineering drawing. The curriculum aims at developing the ability to draw and read various engineering curves, projections and dimensioning styles. The subject mainly focuses on use of drawing instruments, developing imagination and translating ideas into sketches. The course also helps to develop the idea of visualizing the actual object or part on the basis of drawings and blue prints. This preliminary course aims at building a foundation for the further courses related to engineering drawing and other allied courses in coming semesters

II. INDUSTRY / EMPLOYER EXPECTED OUTCOME

Prepare engineering drawing manually using prevailing drawing instruments.

III. COURSE LEVEL LEARNING OUTCOMES (COS)

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

- CO1 Draw geometrical figures and engineering curves.
- CO2 Apply principles of orthographic projections for drawing given pictorial views.
- CO3 Draw isometric views of given component or from orthographic projections.
- CO4 Use various drawing codes, conventions and symbols as per IS SP-46 in engineering drawing.
- CO5 Draw free hand sketches of given engineering elements.

IV. TEACHING-LEARNING & ASSESSMENT SCHEME

		1.7		Learning Scheme					Assessment Scheme												
Course Code	Course Title	Abbr	br Course Actual Contact Hrs./Week	ctual ontact S./Week		Credits	Paper	Theory			Based on LL & TL			Based on SL		Total					
		P				SLHNLH			Duration-	FA- TH	SA- TH	То	tal	FA-	Prac PR	SA-	PR	SI	A.	Marks	
											Max	Max	Max	Min	Max	Min	Max	Min	Max	Min	
311006	ENGINEERING GRAPHICS (Civil, Electrical, Mechanical and allied branches)	EGR	DSC	2		4	-	6	3	-	-	-	-	-	50	20	50@	20			100

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ENGINEERING GRAPHICS (Civil, Electrical, Mechanical and allied branches) Course Code : 311006

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.

Suggested **Theory Learning Outcomes** Learning content mapped with Theory Learning Sr.No Learning (TLO's)aligned to CO's. Outcomes (TLO's) and CO's. Pedagogies. **Unit - I Basic Elements of Drawing** TLO 1.1 Prepare drawing 1.1 Drawing Instruments and supporting material: using drawing instruments. method to use them with applications. TLO 1.2 Use IS SP-46 for 1.2 Standard sizes of drawing sheets (ISO-A series) dimensioning 1.3 I.S. codes for planning and layout. TLO 1.3 Use different types 1.4 Letters and numbers (single stroke vertical) Model 1 of lines. 1.5 Convention of lines and their applications. Demonstration TLO 1.4 Draw regular 1.6 Scale - reduced, enlarged & full size geometrical figures. 1.7 Dimensioning techniques as per SP-46 (Latest TLO 1.5 Draw figures edition) – types and applications of chain, parallel and having tangency coordinate dimensioning constructions. 1.8 Geometrical constructions. Unit - II Engineering curves & Loci of Points. 2.1 Concept and understanding of focus, directrix, vertex TLO 2.1 Explain different and eccentricity. Conic sections. engineering curves with 2.2 Methods to draw an ellipse by Arcs of circle method areas of application. & Concentric circles method. TLO 2.2 Draw different 2.3 Methods to draw a parabola by Directrix-Focus conic sections. method & Rectangle method TLO 2.3 Draw involute and 2.4 Methods to draw a hyperbola by Directrix-Focus 2 Demonstration cycloidal curves. method. TLO 2.4 Draw helix and 2.5 Methods to draw involutes: circle & pentagon spiral curves from given 2.6 Methods to draw Cycloidal curve: cycloid, epicycloid data and hypocycloid TLO 2.5 Plot Loci of points 2.7 Methods to draw Helix & Archimedean spiral. from given data. 2.8 Loci of points on Single slider crank mechanism with given specifications.

V. THEORY LEARNING OUTCOMES AND ALIGNED COURSE CONTENT

Semester - 1, K Scheme

ENGI	NEERING GRAPHICS (Civ	il, Electrical, Mechanical and allied branches) Cou	urse Code : 311006
Sr.No	Theory Learning Outcomes (TLO's)aligned to CO's.	Learning content mapped with Theory Learning Outcomes (TLO's) and CO's.	Suggested Learning Pedagogies.
3	TLO 3.1 Explain methods of Orthographic Projections. TLO 3.2 Draw orthographic views of simple 2D entities containing lines, circles and arcs only. TLO 3.3 Draw the orthographic views from given pictorial views. TLO 3.4 Use of IS code IS SP-46 for dimensioning technique.	Unit - III Orthographic Projections 3.1 Introduction of projections-orthographic, perspective, isometric and oblique: concept and applications.(No question to be asked in examination) 3.2 Introduction to orthographic projection, First angle and Third angle method, their symbols. Conversion of pictorial view into Orthographic Views – object containing plain surfaces, slanting surfaces, slots, ribs, cylindrical surfaces. (use First Angle Pr	Model Demonstration Video Demonstrations
4	TLO 4.1 Prepare isometric scale. TLO 4.2 Draw isometric views of simple 2D entities containing lines, circles and arcs only. TLO 4.3 Interpret the given orthographic views. TLO 4.4 Draw Isometric views from given orthographic views	 Unit - IV Isometric Projections 4.1 Introduction to Isometric projection. 4.2 Isometric scale and Natural Scale. 4.3 Isometric view and isometric projection. 4.4 Ilustrative problems related to simple objects having plain, slanting, cylindrical surfaces and slots on slanting surfaces. 4.5 Conversion of orthographic views into isometric View/projection. (For branches other than mechanical Engineering, the teacher should select branch specific elements) 	Model Demonstration Video Demonstrations
5	TLO 5.1 Sketch proportionate freehand sketches of given machine elements. TLO 5.2 Select proper fasteners and locking arrangement.	Unit - V Free Hand Sketches of Engineering Elements 5.1 5.1 Free hand sketches of machine elements: Thread profiles, nuts, bolts, studs, set screws, washers, Locking arrangements. (For branches other than mechanical Engineering, the teacher should select branch specific elements for free hand sketching)	Model Demonstration

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 of drawing instruments	1	 * Draw horizontal, vertical, 30 degree, 45 degree, 60 & 75 degrees lines using Tee and Set squares/ drafter. (Sketch Book). 	2	CO1
LLO 2.1 Use of IS code related to dimensioning standard	2	* Draw different types of lines, dimensioning styles (Sketch Book)	2	CO1
LLO 3.1 Practice of drawing as per given sketch		* Draw one figure showing dimensioning techniques, two problems on redraw the figures and one problem on loci of points - slider crank mechanism. (Sketch Book)	2	CO1
LLO 4.1 Use IS Standard for drawing different figures	4	* Draw one figure showing dimensioning techniques, two problems on redraw the figures and one problem on loci of points - slider crank mechanism. (01 Sheet)	4	CO1

Semester - 1, K Scheme

ENGINEERING GRAPHICS (Civil, Electrical, Mechanical and allied branches) Course Code : 311006										
Practical / Tutorial / Laboratory Learning Outcome (LLO)	Sr No	Laboratory Experiment / Practical Titles / Tutorial Titles	Number of hrs.	Relevant COs						
LLO 5.1 Identify different Engineering curves	5	* Draw any four Engineering Curves (Sketchbook)	2	CO1						
LLO 6.1 Identify different Engineering curves	6	* Draw any four Engineering Curves – (01 Sheet)	4	CO1						
LLO 7.1 Apply method of projection for drawing simple orthographic views	7	* Draw two problems on orthographic projections using first angle method of projection having plain surfaces, slanting surfaces and slots etc (Sketchbook)	2	CO2 CO4						
LLO 8.1 Apply method of projection for drawing simple orthographic views	8	Draw two problems on orthographic projections using first angle method of projection having plain surfaces, slanting surfaces and slots etc (01 Sheet)	4	CO2 CO4						
LLO 9.1 Apply method of projection for drawing complex orthographic views	9	Draw two problems on orthographic projections using first angle method of projection having cylindrical surfaces, ribs etc. (Sketchbook)	2	CO2 CO4						
LLO 10.1 Apply method of projection for drawing complex orthographic views	10	* Draw two problems on orthographic projections using first angle method of projection having cylindrical surfaces, ribs etc (01 Sheet)	4	CO2 CO4						
LLO 11.1 Draw simple isometric projections	11	* Draw two problems on Isometric view of simple objects having plain and slanting surfaces by using natural scale. (Sketchbook)	2	CO3 CO4						
LLO 12.1 Apply different scales for drawing isometric projections.	12	Draw two problems on Isometric view of simple objects having plain and slanting surfaces by using natural scale. (01 sheet)	4	CO3 CO4						
LLO 13.1 Draw simple isometric projections	13	Draw two problems on Isometric Projection of objects having cylindrical surfaces and slots on slanting surfaces by using isometric scale.(Sketchbook)	2	CO3 CO4						
LLO 14.1 Apply different scales for drawing isometric projections	14	* Draw two problems on Isometric Projection of objects having cylindrical surfaces and slots on slanting surfaces by using isometric scale. (01 sheet)	4	CO3 CO4						
LLO 15.1 Draw Orthographic views of a given object.	15	Problem Based Learning: Given the orthographic views of at least three objects with few missing lines, the student will try to imagine the corresponding objects, complete the views and draw these views (sketch book).	2	CO2 CO4						
LLO 16.1 Draw standard discipline oriented components using free hand.	16	* Draw freehand Sketches of 12 different standard components (Sketch book)	2	CO5						
LLO 17.1 Draw standard discipline oriented components using free hand.	17	Draw freehand Sketches of 12 different standard components (1 Sheet)	2	CO5						
LLO 18.1 Collect information of an ancient Indian culture related to engineering graphics	18	* Correlate ancient Indian sculptures, Indian temples, Monuments, etc. with Engineering Graphics	2	CO1 CO2 CO3 CO4 CO5						

ENGINEERING GRAPHICS (Civil, Electrical, Mechanical and allied branches) Course Code : 311006								
Practical / Tutorial / Laboratory Learning Outcome (LLO)	Sr No	Laboratory Experiment / Practical Titles / Tutorial Titles	Number of hrs.	Relevant COs				
Note : Out of above suggest	ive L	LOs -						
• '*' Marked Practicals (L	LOs)	Are mandatory.						
• Minimum 80% of above list of lab experiment are to be performed.								
 Judicial mix of LLOs are to be performed to achieve desired outcomes. 								
				- I				

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

• not Applicable

Note :

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

Sr.No	Equipment Name with Broad Specifications	Relevant LLO Number
1	Models/ Charts of objects mentioned in unit no. 5	16,17
2	Models of objects for orthographic / isometric projections	7,8,9,10,11,12,13,14,15
3	Drawing Table with Drawing Board of Full Imperial/ A1 size.	All
4	Set of various industrial drawings being used by industries.	All
5	Set of drawings sheets mentioned in section 6.0 could be developed by experienced teachers and made used available on the MSBTE portal to be used as reference/standards.	All
6	Drawing equipment and instruments for class room teaching-large size: a. T-square or drafter (Drafting Machine). b. Set squires (450 and 300-600) c. Protector. d. Drawing instrument box (containing set of compasses and dividers). Drawing sheets, Drawing pencils, Eraser, Drawing pins / clips	All

VIII. LABORATORY EQUIPMENT / INSTRUMENTS / TOOLS / SOFTWARE REQUIRED

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	Ι	Basic Elements of Drawing	CO1	3	0	0 -	6	6

ENG	NEE	RING GRAPHICS (Civil, Electrical,	and allied branches) Course Code : 311						
Sr.No	Unit	Unit Title	Aligned COs	Learning Hours	R- Level	U- Level	A- Level	Total Marks	
2	II	Engineering curves & Loci of Points.	CO1	-6	0	0	6	6	
3	III	Orthographic Projections	CO2,CO4	7	0	0 0	14	14	
4	IV	Isometric Projections	CO3,CO4	-8	0	0	14	14	
5	V	Free Hand Sketches of Engineering Elements	CO4,CO5	6	0	0	10	10	
		Grand Total	30	0	0	50	50		

X. ASSESSMENT METHODOLOGIES/TOOLS

Formative assessment (Assessment for Learning)

• Term work

Summative Assessment (Assessment of Learning)

• Practical

XI. SUGGESTED COS - POS MATRIX FORM

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

XII. SUGGESTED LEARNING MATERIALS / BOOKS

Sr.No	Author	Title	Publisher with ISBN Number
1	Bureau of Indian Standards.	Engineering Drawing Practice for Schools and Colleges IS: SP-46	Third Reprint, October 1998 ISBN No. 81- 7061-091-2
2	Bhatt, N.D.	Engineering Drawing	Charotar Publishing House, 2010 ISBN No. 978-93-80358-17-8
3	Bhatt, N.D.; Panchal, V. M	Machine Drawing	Charotar Publishing House, 2010 ISBN No. 978-93-80358-11-6

ENGINEERING GRAPHICS (Civil, Electrical, Mechanical and allied branches) Course Code : 311006

Sr.No	Author	Title	Publisher with ISBN Number
4	Jolhe, D.A.	Engineering Drawing	Tata McGraw Hill Edu. New Delhi, 2010, ISBN No. 978-0-07-064837-1
5	Dhawan, R. K.	Engineering Drawing	S. Chand and Company New Delhi, ISBN No. 81-219-1431-0
6	Pradhan, S.K Jain, K.K	Engineering Graphics	Khanna Book Publishing CO(P) LTD, New Delhi, ISBN No. 978-93-91505-50-9

XIII. LEARNING WEBSITES & PORTALS

Sr.No	Link / Portal	Description
1	https://www.youtube.com/watch?v=dmt6_n7Sgcg	Free Hand Sketches
2	https://www.youtube.com/watch?v=_MQScnLXL0M	Orthographic Projection
3	https://www.youtube.com/watch?v=3WXPanCq9LI	Basics of Projection
4	https://www.youtube.com/watch?v=fvjk7PlxAuo	Introduction to Engineering Graphics
5	https://www.youtube.com/watch?v=8j7l1OWhMlE	Isometric Projection

Note :

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

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Semester - 1, K Scheme

ELEMENTS OF ELECTRONICS

Programme Name/s	: Electrical Engineering/ Electrical Power System
Programme Code	: EE/ EP
Semester	: Second
Course Title	: ELEMENTS OF ELECTRONICS
Course Code	: 312309

I. RATIONALE

Diploma in Electrical Engineering students need to maintain and operate electronics systems. This course deals with basic operating principles and handling of electronics devices to troubleshoot electronics circuits used in Electrical system.

II. INDUSTRY / EMPLOYER EXPECTED OUTCOME

Use electronic components and circuits in electrical equipment and systems

III. COURSE LEVEL LEARNING OUTCOMES (COS)

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

- CO1 Identify various electronic components
- CO2 Use semiconductor diodes in different applications.
- CO3 Use semiconductor transistors in different applications.
- CO4 Use different types of Oscillators as per requirement
- CO5 Test operation of regulated power supply.

IV. TEACHING-LEARNING & ASSESSMENT SCHEME

				Learning Scheme							Assessment Scheme										
Course Code	Course Title	Abbr	Abbr	Course Category/s	Actual Contact Hrs./Week		SLHNLI		Credits	Paper	Theory			Based on LL & TL Practical			&	Based on SL		Total	
				CL	TL	LL	1.1			Duration	FA- TH	SA- TH	То	tal	FA-	PR	SA-	PR	SI	A	19121 K5
				- 1	1			· · · · · ·			Max	Max	Max	Min	Max	Min	Max	Min	Max	Min	
312309	ELEMENTS OF ELECTRONICS	EOE	DSC	4	•	4	2	10	5	3	30	70	100	40	25	10	25@	10	25	10	175

ELEMENTS OF ELECTRONICS

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.	earning Demes Learning content mapped with Theory Learning Outcomes ligned to (TLO's) and CO's. 's.							
1	TLO 1.1 Differentiate between given active and passive electronic components. TLO 1.2 Calculate value of given resistor and capacitor using colour code and printed information. TLO 1.3 Interpret with sketches given signal. TLO 1.4 Compare characteristics of given voltage and current source	 Unit - I Electronic components and Signals 1.1 Active and passive components 1.2 Resistor, Capacitor, inductor, symbols, applications, colour codes, specifications 1.3 Concept of Unipolar and Bipolar Devices. 1.4 Classification of signals-sinusoidal, triangular and square 1.5 Signal waveform, Time and Frequency domain, Representation, Amplitude, Frequency, phase, wavelength 1.6 Voltage and current source Ideal and non ideal Sources Dependent voltage and current sources. 	Chalk-Board Assignment Demonstrations Hands-on						

ELEN	IENTS OF ELECTRO	ONICS Cour	se Code : 312309
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 TLO 2.1 Check the operation of the given diode TLO 2.2 TLO 2.2 Plot V-I characteristic of the given diode TLO 2.3 TLO 2.3 Describe working Principle of given type of Rectifier without and with Filter. TLO 2.4 TLO 2.4 Explain given type of wave shaping circuits	 Unit - II Semiconductor Diodes 2.1 Construction, symbol, working principle, specification, applications ,types of biasing and V-I characteristic of Zener diode ,LED , Photo diode. Working principle and applications of OLED 2.2 Rectifiers- Full wave center tapped and Bridge Rectifier, circuit diagram, wave forms ,working principle . Rectifier IC KBU 808 Pin diagram and applications 2.3 Parameters of rectifier: Average DC value of current and voltage, ripple factor, PIV of diode, TUF and efficiency of rectifier. 2.4 Need of filters ,Types- C,LC,CLC,L ,circuit diagram wave forms and working principle. 2.5 Wave shaping circuits Linear and non linear wave shaping - RC integrator, RC Differentiator, Diode based Clipper circuits , Diode based Clamper. Circuits 	Chalk-Board Assignment Presentations Hands-on
3	TLO 3.1 Describe the working of the given type of transistors TLO 3.2 Compare the performance of three type of transistor configurations. TLO 3.3 Solve simple numerical on Current gains. TLO 3.4 Use transistor for various applications (Amplifier and Switch). TLO 3.5 Explain working of given type of JFET and MOSFET.	 Unit - III Semiconductor Transistors 3.1 Current operating Devices, Bipolar Junction Transistor- Types NPN, PNP, symbol, construction and working principle. 3.2 Need of biasing ,Types- Fixed bias and Voltage divider bias 3.3 Regions of operation and their significance - Cut off region , Active region and Saturation region 3.4 Transistor configurations: CB, CE, CC, working , comparison and applications 3.5 Transistor parameters- Alpha, Beta, Gama, Input, and output resistance, Relationship between alpha and beta, numerical on same. 3.6 Applications- Transistor as an amplifier- Small signal and power amplifier , Class A, Class B, Class C, Class AB Amplifier , Transistor as a switch , 3.7 Voltage operating devices, Construction Of JFET(N-Channel and P channel), symbol , working principle, different parameters of JFET and applications. 3.8 MOSFET: Construction , symbol , working principle of Enhancement and Depletion MOSFET, and their applications. 	Chalk-Board Assignment Demonstration Hands-on

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ELEN	ELEMENTS OF ELECTRONICS Co		rse Code : 312309
Sr.No	Theory Learning Outcomes (TLO's)aligned to CO's.	Learning content mapped with Theory Learning Outcomes (TLO's) and CO's.	Suggested Learning Pedagogies.
4	TLO 4.1 Explain working principle of Oscillator with its need. TLO 4.2 Compare the performance of the given feedback. TLO 4.3 Explain Barkhausen's criterion. TLO 4.4 Describe working of the given type of oscillator with circuit diagram.	 Unit - IV Oscillators 4.1 Oscillator: Need, Definition 4.2 Types of feedback: Positive feedback, Negative feedback. Barkhausen's criterion 4.3 Oscillator: Circuit Diagram , working and comparison of RC ,LC, and Crystal oscillator. 4.4 Types of RC oscillator- Wien bridge and RC Phase shift Oscillator Frequency calculation 4.5 Types of LC oscillator-Colpitts oscillators ,Hartley oscillators.Frequency calculation 	Chalk-Board Assignment Demonstration Hands-on
5	TLO 5.1 Explain parameters of voltage regulators. TLO 5.2 Calculate output voltage of the given regulator. TLO 5.3 Check the working of the given type of regulator ICs. TLO 5.4 Explain working of SMPS.	 Unit - V Regulators and power supply. 5.1 Voltage regulation Load and line regulation :Definition, formulae 5.2 Block diagram, Construction, and operation of DC Regulated power supply 5.3 Basic Zener diode as a voltage regulator. 5.4 Regulator IC's: IC's 78XX,79XX ,IC 723 as fixed, variable and Dual Regulated DC power supply 5.5 Switch mode power supply: Need, block diagram and working. 	Chalk-Board Assignment Demonstration Hands-on

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

Practical / Tutorial / Laboratory Learning Outcome (LLO)	Sr No	Laboratory Experiment / Practical Titles / Tutorial Titles	Number of hrs.	Relevant COs
LLO 1.1 Identify active and passive components in given circuit LLO 1.2 Measure the value of given resistors on Digital Multimeter(DMM) LLO 1.3 Test Diode and LED on Digital Multimeter.	1	Identification of Active and Passive components and DMM handeling.	4	CO1
LLO 2.1 Measure amplitude, time period and frequency of given signal on CRO	2	Measurement of amplitude, time period and frequency of given signal on CRO	2	CO1
LLO 3.1 Check PN junction Diode in forward bias. and Plot the V-I characteristics of PN junction diode and determine cut in voltage.	3	Check the performance of PN Junction diode.	2	CO2
LLO 4.1 Check the performance of Zener diode in forward and reverse biasing	4	* Check performance of Zener diode.	2	CO2
LLO 5.1 Build the circuit for Photo Diode and Observe the change in current with change in light intensity of the source	5	Test the performance of photo diode by varying the light intensity as well as the distance of the light source.	2	CO2

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ELEMENTS OF ELECTRONICS Course Code : 312309					
Practical / Tutorial / Laboratory Learning Outcome (LLO)	Sr No	Laboratory Experiment / Practical Titles / Tutorial Titles	Number of hrs.	Relevant COs	
LLO 6.1 Construct and test half wave rectifier on breadboard .	6	* Construct and Test the half wave rectifier.	2	CO2	
LLO 7.1 Prepare the circuit for Half Wave Rectifier with LC filter/ pi filter using PN junction Diode . LLO 7.2 Observe and draw input & output waveforms for sinusoidal wave .	7	*Prepare and Test the half wave rectifier with LC filter/ π filter	2	CO2	
LLO 8.1 Build the circuit for Full Wave Centre Tapped Rectifier using PN junction Diode. LLO 8.2 Observe and draw input & output waveform for sinusoidal wave	8	*Build and Test the full wave rectifier using two diodes	2	CO2	
LLO 9.1 Construct the circuit for Full Wave Bridge Rectifier using PN junction Diodes LLO 9.2 Observe and draw input and output waveform for sinusoidal wave	9	* Construct and Test the full wave Bridge rectifier on bread board using four diodes	2	CO2	
LLO 10.1 Build the circuit for Full Wave Rectifier using PN junction Diode with LC/Pi filter LLO 10.2 Calculate ripple factor for given setup.	10	*Use LC/ π filter with full wave rectifier to measure ripple factor.	2	CO2	
LLO 11.1 Prepare the circuit for full wave rectifier using IC KBU 808 with filter LLO 11.2 Observe and draw input & output waveform for sinusoidal wave.	11	* Prepare and Test the full wave rectifier on bread board using IC KBU 808 with filter.	2	CO2	
LLO 12.1 Build/Test positive Clipper circuit. LLO 12.2 Build/Test negative Clipper circuit.	12	*Build clipper circuit and observe the waveforms.	2	CO2	
LLO 13.1 Construct and Test Positive Clamper Circuit LLO 13.2 Construct and Test negative Clamper Circuit	13	* Construct clamper circuit and observe waveforms.	2	CO2	
LLO 14.1 Identify the terminals of the PNP and NPN transistor for TO-5, TO-220, TO- 66 LLO 14.2 Selection of transistor for different parameters as max. voltage, current and switching speed	14	Identify and select transistors for given application using datasheets	2	CO3	
LLO 15.1 Build the circuit for BJT in common base configuration LLO 15.2 Plot input and output characteristics of common base configuration	15	Build and Test the performance of BJT in CB mode	2	CO3	

mont / Proctical	Number	Relevant	
0	ourse Cod	e: 312309	
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ELEMENTS OF ELECTRONICS	ourse Cod	e : 312309		
Practical / Tutorial / Laboratory Learning Outcome (LLO)	Sr No	Laboratory Experiment / Practical Titles / Tutorial Titles	Number of hrs.	Relevant COs
LLO 16.1 Construct the circuit for BJT in common emitter configuration. LLO 16.2 Plot input and output characteristics of common emitter configuration.	16	* Construct and test the circuit for BJT in common emitter configuration.	2	CO3
LLO 17.1 Test the performance parameters of BJT as Switch LLO 17.2 Identify Cutoff and saturation regions.	17	*Test the performance parameters of BJT as Switch	2	CO3
LLO 18.1 Build the circuit for FET in common source configuration. LLO 18.2 Plot characteristics for drain to source voltage VDS verses drain current ID for different Values of VGS	18	* Check the performance of FET drain Characterstics.	2	CO3
LLO 19.1 Build the circuit for FET in common source configuration LLO 19.2 Plot characteristics for Gate to source voltage VGS verses drain current ID and calculate transconductance.	19	Test the performance of FET transfer characteristics and calculate transconductance.	2	CO3
LLO 20.1 Build the circuit and measure the frequency of given LC Oscillator circuit LLO 20.2 Build the circuit and measure the frequency of given RC Oscillator circuit	20	Measure the frequency of given Oscillator circuit	2	CO4
LLO 21.1 Test the voltages &waveforms at various Test points of regulated dc power supply. LLO 21.2 Identify the various faults in the Regulated DC power supply	21	*Find out faults at different stages of regulated DC power supply	2	CO5
LLO 22.1 Rectify the various faults in the Regulated DC power supply.	22	*Trouble shoot given DC regulated power supply	2	CO5
LLO 23.1 Build Zener voltage regulator for given voltage. LLO 23.2 Calculate load and line regulation.	23	*Build and Test the performance of Zener voltage regulator for given voltage.	2	CO5
LLO 24.1 Construct the circuit for Positive voltage regulator using 78XX IC. LLO 24.2 Calculate load and line regulation.	24	* Construct and Test the performance of Positive voltage regulator using 78XX , three terminal IC for given voltage.	2	CO5
LLO 25.1 Prepare the circuit for Dual voltage regulator using 78XX and 79XX IC LLO 25.2 Calculate load and Line regulation.	25	* Prepare and Test the performance of Dual voltage regulator using 78XX and 79XX, three terminal IC for given voltage	2	CO5
LLO 26.1 Build LOW/High voltage regulator circuit using IC LM723. Calculate load and line regulation	26	*Test the performance of IC 723 as Regulator.	2	CO5

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ELEMENTS OF ELECTRONICS		C	Course Cod	e : 312309	
Practical / Tutorial / Laboratory Learning Outcome (LLO)	Sr No	Laboratory Experiment / Practical Titles / Tutorial Titles	Number of hrs.	Relevant COs	
Note : Out of above suggestive LLOs -					
 '*' Marked Practicals (LLOs) Are manda Minimum 80% of above list of lab expe Judicial mix of LLOs are to be performed 	atory rime ed to	nt are to be performed. achieve desired outcomes.			

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

Micro project

- Transistor as switch- Build /Test transistor switch circuit on General purpose PCB for various input signals
- Diode: Build a circuit on general purpose PCB to clip a positive half cycle at 1.5 v of a waveform with input signal 5Vpp, and prepare the report
- Diode: Build a circuit on general purpose PCB to clamp a waveform at 3.0 V using diode and passive components.
- Photodiode: Build a circuit on breadboard to turn the relay on and off by using photo diode and prepare a report.
- Rectifier: Build a half wave rectifier for 6V, 500mA output current on general purpose PCB.
- Rectifier: Build a full wave bridge rectifier with capacitor filter for 6V, 500mA output current on general purpose PCB
- Using Data sheets compare various electronic parameters of different types of JFET and MOSFET.
- Transistor as switch- Build /Test transistor switch circuit on General purpose PCB for various input signals
- Transistor- Build a circuit to switch on and off the LED using BJT as a switching component
- Voltage Regulator: Build a circuit of DC regulated power supply on general purpose PCB for 9V and 500mA output
- Oscillator: Build circuit to generate audio frequency.
- Prepare display boards/models/charts to visualize the appearance of electronic active and passive components.

Assignment

- Study Different types of Rectifier ICs available.
- Study working of OLED Display.

Note :

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

VIII. LABORATORY EQUIPMENT / INSTRUMENTS / TOOLS / SOFTWARE REQUIRED

Sr.No

Equipment Name with Broad Specifications

Relevant LLO Number

ELEN	IENTS OF ELECTRONICS	Course Code : 312309
Sr.No	Equipment Name with Broad Specifications	Relevant LLO Number
1	Function Generator 0-2 MHz with Sine, square and triangular output with variable frequency and amplitude.	2,5,6,7,8,9,10
2	Variable DC power supply 0-30V, 2A, SC protection, display for voltage and current.	3,4,11,12,16,17,18,19
3	Lux meter 3000 Lumen. Battery operated hand held type	4
4	Cathode Ray Oscilloscope Dual Trace 20Mhz. 1 5Mega ohm Input impedance	5,6,7,8,9,10
5	Trainer Kits/Breadboard for Rectifiers, Regulators, Transistors, JFET	5,6,7,8,9,10,11,13,14,16,17,18,19
6	Digital Multimeter: 3 1/2 digit display, 9999 counts digital multimeter measures: Vae Vee (1000V max), Ade- Aae (10 amp max), Resistance (0-100 MS2). Capacitance and Temperature measurement	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	Ι	Electronic components and Signals	CO1	10	4	4	4	12
2	II	Semiconductor Diodes	CO2	14	4	6	6	16
3	III	Semiconductor Transistors	CO3	14	4	6	6	16
4	IV	Oscillators	CO4	12	4	4	6	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)

- Each practical will be assessed considering 60% weightage to process and 40% product based on the nature of practicals.
- Two formative assessment tests for 30 marks and average of two unit tests.

Summative Assessment (Assessment of Learning)

- End semester assessment of 25 marks for laboratory learning
- End semester assessment of 70 marks

XI. SUGGESTED COS - POS MATRIX FORM

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ELEMEN	TS OF ELE	CTRON	ICS				Course	Code	: 3123	309
	Programme Outcomes (POs)							Programme Specific Outcomes* (PSOs)		
Course Outcomes (COs)	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	1		2			
CO2	2	7 - 1	1	1	2	V 92 0	-2			
CO3	2	1	1	1	2	1	2	~		
CO4	2	1	1	1	2	1	2			
CO5	2	1 .	1	. 1.	2	1	2	1		
Legends :	- High:03, N	Aedium:02	2,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	V.K. Mehta ,Rohit Mehta	Principles of Electronics	S.Chand and Company Ram Nagar, New Delhi-110 055,11th edition 2014, ISBN 9788121924504
2	B.L.Theraja	Basic Electronics	S. Chand Publishing, 2007, ISBN: 9788121925556
3	R.S.Sedha	A textbook of Applied Electronics	S Chand, New Delhi 2008, ISBN:978-8121927833
4	Mottershead, Allen	Electronic Devices and Circuit: An introduction	Goodyear Publishing Co. New Delhi ISBN: 9780876202654
5	Horowitz, Paul Hill, Winfield	The Art of Electronics	Cambridge University Press, New Delhi 2015 ISBN: 9780521689175
6	Bell, David	Fundamentals of Electronic Devices and Circuits	Oxford University Press, International edition, USA,2015,ISBN:9780195425239
7	Vijay Baru, Rajendra Kaduskar, Sunil T. Gaikwad	Basic Electronic Engineering	Dreamtech press,New Delhi,2015,ISBN:9789350040126

XIII. LEARNING WEBSITES & PORTALS

Sr.No	Link / Portal	Description
1	https://www.youtube.com/watch?v=Fwj_d3uO5g8	Diodes
2	http://www.eleccircuit.com	Electronic circuit
3	https://www.electroschematics.com/tools/	Electronic tools
4	www.futurlec.com	Electronic tools/components
5	www.alldatasheet.com	Datasheets
6	www.nptel.iitm.ac.in	Electronic circuits
7	www.electronics-tutorials	Electronic circuits
8	https://www.learningaboutelectronics.com/	Voltage Regulator

ELEMI	ENTS OF ELECTRONICS	Course Code : 312309				
Sr.No	Link / Portal	Description				
9	https://www.animations.physics.unsw.edu.au/	Electronic tools/components/Circuit				
Note : • Te	 Note : Teachers are requested to check the creative common license status/financial implications of the suggested online educational resources before use by the students 					

MSBTE Approval Dt. 01/10/2024

Semester - 2, K Scheme

Programme Name/s	: Electrical Engineering/ Electrical Power System
Programme Code	: EE/ EP
Semester	: Second
Course Title	: FUNDAMENTAL OF ELECTRICAL ENGINEERING
Course Code	: 312310

I. RATIONALE

Technologists in electrical engineering are expected to handle electrical machines, instruments, devices and equipment. The basic aim of this course is that, the student must understand the basic concepts, principles and laws of electric and magnetic circuits and practical thereof. The basic aim of this course is that the student must develop the basic concepts, fundamental laws of electric circuits, magnetic circuits, electromagnetic induction, Capacitors, Batteries and practical thereof. This course will enable the students to apply the fundamental concepts of electrical engineering to understanding of other higher level subjects in further study.

II. INDUSTRY / EMPLOYER EXPECTED OUTCOME

Apply basic principles of electrical engineering to solve the simple electrical 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 Determine various parameters used in electric circuit.
- CO2 Use basic laws of electrical engineering in D.C. Circuits.
- CO3 Use capacitor and battery in electrical circuits.
- CO4 Use principles of magnetism in Magnetic Circuits.
- CO5 Apply Laws of electromagnetism in electrical circuit and systems.

IV. TEACHING-LEARNING & ASSESSMENT SCHEME

		Learning Scheme				Assessment Scheme															
Course Code	Course Title	Abbr	Course Category/s	A Co Hrs	ctua onta ./W	al ict 'eek	SLH	NLH	Credits	Paper		The	ory		Ba	sed o T Prac	on LL L ctical	&	Base S	d on L	Total Morie
				CL	TL	LL				Duration	FA- TH	SA- TH	То	tal	FA-	PR	SA-	PR	SL	A	Marks
											Max	Max	Max	Min	Max	Min	Max	Min	Max	Min	
312310	FUNDAMENTAL OF ELECTRICAL ENGINEERING	FEE	DSC	4		4	2	10	5	3	30	70	100	40	25	10	25#	10	25	10	175

Course Code : 312310

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.

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 Interpret the given electric parameters. TLO 1.2 Explain the given terms of electric circuit. TLO 1.3 Explain the given effect of the electric current TLO 1.4 Calculate work, power and energy for the given circuit.	Unit - I Basic Electrical Parameters 1.1 Direct Current (DC), Alternating Current (AC), Voltage Source and Current Source: Ideal and Practical. 1.2 Electric Current, Electric Potential, Potential Difference(PD), Electro-Motive Force(EMF) 1.3 Electrical Work, Power and Energy. 1.4 Resistance, Resistivity, Conductivity, Effect of Temperature on Resistance 1.5 Types of Resistor and their application 1.6 Heating Effect, Magnetic Effect, Chemical Effect of Electric current	Chalk-Board Presentations Demonstration Model Demonstration Video Demonstrations
2	TLO 2.1 Apply Ohm's law to calculate internal resistance of the given circuit. TLO 2.2 Calculate equivalent resistance for the given circuit. TLO 2.3 Categorize the given type of network TLO 2.4 Apply the Kirchhoff's current law and Kirchhoff's voltage law to calculate the electrical quantities in the given circuit.	 Unit - II D.C. Circuits 2.1 Ohm's Law, Internal resistance of source, internal voltage drop, Terminal Voltage. 2.2 Resistance in Series, Resistance in Parallel. (theory and numerical) 2.3 Active, Passive, Linear, Non-linear Circuit, Unilateral Circuit and Bi-lateral Circuit, Passive and Active Network, Node, Branch, Loop, Mesh. 2.4 Comparison of Kirchhoff's Current Law, Kirchhoff's Voltage Law (Simple numericals). 	Chalk-Board Demonstration Video Demonstrations Presentations

V. THEORY LEARNING OUTCOMES AND ALIGNED COURSE CONTENT

FUND	AMENTAL OF ELECTRICAL EN	ourse Code : 312310	
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 construction of the given type of capacitor. TLO 3.2 Explain the working of the capacitor in the given circuit. TLO 3.3 Calculate equivalent capacitance in the given D.C. circuit. TLO 3.4 Define Battery and state its types and connections TLO 3.5 Plot charging and discharging curves for the given capacitor and battery.	 Unit - III Capacitors and Battery 3.1 Capacitor, it's construction, Parallel Plate Capacitor 3.2 Various connections of capacitor. 3.3 Energy Stored in Capacitor. 3.4 Charging and Discharging of Capacitor. 3.5 Breakdown voltage and Di-electric strength. 3.6 Applications of Capacitor 3.7 Types of battery, Construction, series and parallel connection of Battery 3.8 Charging and Discharging of Capacitor and battery 	Chalk-Board Video Demonstrations Presentations Model Demonstration Hands-on
4	TLO 4.1 Interpret the terms related to a magnetic circuit. TLO 4.2 Calculate various parameters of the given magnetic circuit. TLO 4.3 Compare the series and parallel magnetic circuit based on the given criteria. TLO 4.4 Plot B-H curve and hysteresis loop of the given magnetic materials.	Unit - IV Magnetic Circuits 4.1 Magnetic lines of force, Flux, Flux density, Magnetic flux intensity. 4.2 Magneto-Motive-Forces (MMF), Ampere Turns (AT), Reluctance, Permeance, Reluctivity. 4.3 Electric and Magnetic circuit: Series Magnetic and Parallel Magnetic Circuit. 4.4 Magnetization Curve (B-H Curve) 4.5 Magnetic Hysteresis, Hysteresis Loop, Applications.	Chalk-Board Video Demonstrations Demonstration Model Demonstration Presentations
5	TLO 5.1 Describe the use of Faraday's laws of electromagnetic induction in the given application. TLO 5.2 Distinguish between the given type of e.m.fs. TLO 5.3 Apply Faraday's laws to calculate induced e.m.f. in the given circuit. TLO 5.4 Calculate self-inductance and energy stored in the magnetic field of the given circuit.	 Unit - V Electromagnetic Induction 5.1 Development of Induced e.m.f. and Current, Faraday's Laws of Electromagnetic Induction. 5.2 Static and dynamic emf, Lenz's Law, Fleming's Right hand rule 5.3 Self Inductance, Coefficient of Self- inductance (L), Mutual inductance, Coefficient of Mutual inductance (M), self induced e.m.f. and mutually induced e.m.f, Coefficient of Coupling. 5.4 Inductance in series 5.5 Types of inductor, their application and Energy Stored in Magnetic Field 	Chalk-Board Model Demonstration Video Demonstrations 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 *Draw layout of Electrical Engineering laboratory.	1	Preparation of Layout of Electrical Engineering Laboratory.	2	CO1
LLO 2.1 *Operate the fire extinguishers and prepare charts of the safety rules to be followed in the electrical lab	2	Operation of fire extinguisher and preparation of safety rules charts	2	CO1

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Practical / Tutorial / Laboratory Learning Outcome (LLO)	Sr No	Laboratory Experiment / Practical Titles / Tutorial Titles	Number of hrs.	Relevant COs
LLO 3.1 *Use relevant electric tools for various applications	3	Check lab supply system and make use of relevant electric tools for various applications.	2	CO1
LLO 4.1 *Verify Ohm's Law	4	Verification of Ohm's Law	2	CO1 CO2
LLO 5.1 *Able to connect and read multi range analog meters (Ammeter, Voltmeter)	5	Read analog meters for measurement of various electrical quantities in AC/DC circuits.	2	CO1
LLO 6.1 *Operate Multimeter and Clip-On meter for the measurement of AC/DC Current, Voltage and Resistance in the given circuit.	6	Use of Multimeter and Clip-On meter for the measurement of AC/DC Current, Voltage and Resistance in the given circuit	2	CO1 CO2
LLO 7.1 *Check frequency, Time period, Peak Value and Average Value of the given A.C. wave on CRO	7	Measurement of frequency, Time period, Peak Value and Average Value of the given A.C. wave on CRO.	2	CO1 CO2
LLO 8.1 *Verify Kirchoff's Voltage Law	8	Verification of Kirchoff's Voltage Law	2	CO1
LLO 9.1 *Verification of Kirchoff's Current Law.	9	Verification of Kirchoff's Current Voltage Law	2	CO1 CO2
LLO 10.1 ** Use rheostat as current regulator and potential divider.	10	Use of rheostat as current regulator and potential divider	2	CO1 CO2
LLO 11.1 *Determine PD,EMF and internal resistance of DC source .	11	Determination of PD,EMF and internal resistance of DC source.	2	CO1 CO2
LLO 12.1 *Verify the properties of circuit of series connected resistance.	12	Verification of parameters of two/three resistances connected in series connection.	2	CO1 CO2
LLO 13.1 *Verify the properties of circuit of parallel connected resistance.	13	Verification of parameters of two/three resistances connected in parallel connection.	2	CO1 CO2
LLO 14.1 Determine the time constant (RC) by plotting the charging curves of a capacitor(C) through resistor (R)	14	Plot the charging characteristics of capacitor and find the time constant (RC).	2	CO1 CO3
LLO 15.1 Determine the time constant (RC) by plotting the discharging curves of a capacitor(C) through resistor (R)	15	Plot the discharging characteristics of capacitor and find the time constant (RC).	2	CO1 CO3
LLO 16.1 * Find the equivalent capacitance in the series connected circuits	16	Verification of the equivalent capacitance in series connected circuits	2	CO1 CO3
LLO 17.1 *Find equivalent capacitance of the parallel connected circuits	17	Verification of equivalent capacitance of the parallel connected circuits	2	CO1 CO3
LLO 18.1 Determine the Rise characteristics of Electric current in a circuit consisting of resistance and inductance in the circuit.	18	Plot the Rise characteristics of Electric current in a circuit consisting of resistance and inductance in the circuit.	2	CO1 CO4
LLO 19.1 Determine the Decay characteristics of Electric current in a circuit consisting of resistance and inductance in the circuit.	19	Plot the decay characteristics of Electric current in a circuit consisting of resistance and inductance in the circuit.	2	CO1 CO4
LLO 20.1 *Find B-H curve for the given magnetic material	20	Plot B-H curve for the given magnetic material.	2	CO4

FUNDAMENTAL OF ELECTRICAL ENG	ourse Cod	e : 312310		
Practical / Tutorial / Laboratory Learning Outcome (LLO)	Sr No	Laboratory Experiment / Practical Titles / Tutorial Titles	Number of hrs.	Relevant COs
LLO 21.1 *Obtain magnetization curve for magnetic material	21	Plot magnetization curve for magnetic core	2	CO4
LLO 22.1 *Plot Hysteresis Loop for the given transformer coil	22	Study of Hysterisis loop for the given transformer coil	2	CO4
LLO 23.1 *Verify Faraday's Law of Electromagnetic Induction (Statically Induced EMF)	23	Verification of Faraday's Law of Electromagnetic Induction (Statically Induced EMF)	2	CO4 CO5
LLO 24.1 *Verify Faraday's Law of Electromagnetic Induction (Dynamically Induced EMF)	24	Verification of Faraday's Law of Electromagnetic Induction (Dynamically Induced EMF)	2	CO4 CO5
LLO 25.1 Verify Fleming's Right Hand Rule	25	Verification of Fleming's Right Hand Rule	2	CO4 CO5
LLO 26.1 Verify Fleming's Left Hand Rule	26	Verification of Fleming's Left Hand Rule	2	CO4 CO5
LLO 27.1 *Determine Charging and discharging Curves of Battery.	27	Plot the Charging and discharging Curves of Battery	2	CO1 CO3

Note : Out of above suggestive LLOs -

- '*' Marked Practicals (LLOs) Are mandatory.
- Minimum 80% of above list of lab experiment are to be performed.
- Judicial mix of LLOs are to be performed to achieve desired outcomes.

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

Micro project

- a. Types of Electrical equipment: Prepare chart showing real-life examples indicating various types of electrical equipment.
- b. Resistance: Collect samples of resistors and prepare models of simple series circuit and parallel circuit.
- c. Capacitance: Collect samples of capacitors and prepare models of simple series circuit and parallel circuit.
- d. Inductance: Collect samples of inductors and prepare models of simple series circuit and parallel circuit.
- e. Batteries : Collect samples and specifications of various batteries of different make and prepare chart of the same.
- f. EV-Batteries : Collect samples and specifications of various EV-batteries of different make and prepare chart of the same.
- g. Connect battery in series connection and measure voltage across each battery and total voltage .
- h. Connect battery in parallel connection and measure voltage across each battery and total voltage

Assignment

- a. Numerical based on Voltage and Current Source.
- b. Numerical based on Resistance, Resistivity, Effect of temperature on Resistance.
- c. Numerical based on Equivalent Resistance of Series and Parallel connection of Resistances in given D.C. Circuits.
- d. Numerical based on Equivalent Capacitance in given D.C. Circuits.
- e. Numerical based on calculation of various parameters of given magnetic circuit.
- f. Numerical based on calculation of self Inductance.
- g. Numerical based on Energy Stored in Magnetic Field.

Suggested Student Activity

- a. Illustrate situations wherein electrical energy is required.
- b. Prepare models in the form of mini-projects.
- c. Prepare power point presentation related to basics of electrical engineering.
- d. Prepare a chart of electric circuit elements and relevant industrial application.
- e. Prepare question bank referring old MSBTE question papers.

Note :

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

VIII. LABORATORY EQUIPMENT / INSTRUMENTS / TOOLS / SOFTWARE REQUIRED

Sr.No	Equipment Name with Broad Specifications	Relevant LLO Number
1	Electrical Drawing of the Laboratory	1
2	 1.EMF source: Ampere:0-1A, Voltage:0-20V ,1 No. 2.Voltmeter Suitable voltage1 No. 3.Ammeter: Suitable current1 No. 4.Rheostat : Suitable load in ohm,1 No. 5. Resistive Load,1No 	10
3	 1.EMF source: Ampere=0-1A ,Voltage=0-20V ,1 No. 2 Voltmeter: Suitable Voltage range,2 No. 3 Ammeter: Suitable current range,1 No 4 Series resistance: Suitable resistance in ohm,2 No. 	12
4	 1.EMF source: Ampere:0-1A ,Voltage:0-20V ,1 No. 2 Voltmeter: Suitable Voltage range,2 No. 3 Ammeter: Suitable current range,1 No. 4 Parallel resistance: Suitable resistance in ohm,2 No. 	13
5	 1.EMF source: Ampere=0-1uA, Voltage=0-20V,1 No. 2.Voltmeter: Suitable voltage,1 No. 3. Ammeter: Suitable current,1 No. 4.Capacitors: Suitable capacitor,1 No. 5.Resistance: Suitable resistance ,1 No. 6.Stop watch: Suitable stop watch 1 No. 	14
6	 1.EMF source: Ampere=0-1uA, Voltage=0-20V,1 No. 2.Voltmeter: Suitable voltage,1 No. 3. Ammeter: Suitable current,1 No. 4.Capacitors: Suitable capacitor,1 No. 5.Resistance: Suitable resistance ,1 No. 6.Stop watch: Suitable stop watch 1 No. 	15

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Sr.No	Equipment Name with Broad Specifications	Relevant LLO Number
7	 1.EMF source: Ampere=0-1A, Voltage=0-20V :1 No. 2.Voltmeter : Suitable Voltage,1 No. 3.Ammeter :Suitable Current,1 No. 4.Capacitor:Suitable Capacitor in Farad ,3 No. 	16
8	 1.EMF source: Ampere=0-1A, Voltage=0-20V :1 No. 2.Voltmeter : Suitable Voltage,1 No. 3.Ammeter :Suitable Current,1 No. 4.Capacitor:Suitable Capacitor in Farad ,3 No. 	17
9	 Battery or D.C. Supply: Suitable Range Single Pole Two Way Switch Multi-meter Stopwatch A Choke Coil or a resistor in series with inductor 	18
10	 Battery or D.C. Supply: Suitable Range Single Pole Two Way Switch Multi-meter Stopwatch A Choke Coil or a resistor in series with inductor 	19
11	Fire Extinguisher Kit	2
12	 1.EMF source: Ampere: 0-1A, Voltage:0-300V ,1 No. 2. Voltmeter: Suitable voltage:1 No. 3.Ammeter: Suitable current: 1 No. 4.Inductive coil: Suitable inductor,1 No. 	20
13	 1.EMF source: Ampere: 0-1A,Voltage:0-300V ,1 No. 2. Voltmeter: Suitable voltage:1 No. 3.Ammeter: Suitable current: 1 No. 4.Inductive coil: Suitable inductor,1 No. 	21
14	1:EMF source: Ampere: 0-1A, Voltage:0-300V ,1 No. 2:Voltmeter:Suitable Voltage,1 No. 3:Ammeter: Suitable current,1 No. 4.Transformer :(0.5/1kVA)Suitable transformer,1 No.	22
15	 1.EMF source : Ampere:0-1A, Voltage:0-300V ,1 No. 2.Voltmeter : Suitable voltage,1 No. 3.Ammeter: Suitable current,1 No. 4.Inductive coil :Suitable Inductor 1 No. 	23
16	 1.EMF source: Ampere=0-1A, Voltage:0-300V ,1 No. 2.Voltmeter:Suitable Voltage,1 No. 3.Ammeter :Suitable current,1 No. 4.Inductive coil: Suitable inductor,1 No. 	24
17	1.DC Generator: Suitable rating,1No	25
18	1.DC motor: Suitable motor:1No	26
19	 1.EMF source: Ampere=0-1uA,Voltage=0-20V,1 No. 2.Voltmeter: Suitable voltage,1 No. 3. Ammeter: Suitable current,1 No. 4.Capacitors: Suitable capacitor,1 No. 5.Resistance: Suitable resistance ,1 No. 6.Stop watch: Suitable stop watch 1 No. 7. Suitable EV-Battery Data 	27

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FUNDAMENTAL OF ELECTRICAL ENGINEERING Course Code : 312310 **Relevant LLO** Sr.No **Equipment Name with Broad Specifications** Number Stripper, Hammer, Plier, Nose Plier, Multi-meter, tester, Tachometer, Megger, Standard 20 3 Wire Gauge crimping tool, wire gauge etc Rheostat (0-90 Ohm,5A), Nichrome wire wound rheostat on epoxy resin or class F 21 4 insulating tube with two fixed and one sliding contact, DC Source, Milliameter 22 Lugs, Wire crimping tool, Soldering Gun, Banana clips 5 23 Multi-meter, Clip -On Meter, Ammeter, Voltmeter, Rheostat, etc 6 1.CRO with probe.10Hz-30MHz.01No 2.Rheostat of suitable rating 7 24 3. Autotransformer of suitable rating 1. D.C. Dual Power Supply, 1No 2.D.C. Voltmeter of Suitable Range, 3No 8 25 3. Rheostat of Suitable Range, 3No 1.Rheostat of suitable range, 3 No 9 26 2.D.C. Dual Power Supply, suitable range, 1 No 3.D.C. milli-Ammeter, suitable range, 3 No

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	Ι	Basic Electrical Parameters	CO1	10	2	6	4	12
2	II	D.C. Circuits	CO2	12	4	6	4	14
3	III	Capacitors and Battery	CO3	12	4	6	4	14
4	IV	Magnetic Circuits	CO4	12	4	4	6	14
5	V	Electromagnetic Induction	CO5	14	4	4	8	16
		Grand Total		60	18	26	26	70

X. ASSESSMENT METHODOLOGIES/TOOLS

Formative assessment (Assessment for Learning)

- Two unit tests of 30 marks will be conducted and average of two unit tests considered.
- For formative assessment of laboratory learning 25 marks.

Each practical will be assessed considering appropriate % weightage to process and product and other instructions of assessment.

Summative Assessment (Assessment of Learning)

- End semester summative assessment of 25 marks for laboratory learning.
- End semester assessment of 70 marks through offline mode of examination.

XI. SUGGESTED COS - POS MATRIX FORM

10-06-2025 10:58:54 AM FUNDAMENTAL OF ELECTRICAL ENGINEERING Course Code : 312310 Programme Specific **Programme Outcomes (POs) Outcomes*** (PSOs) Course **PO-5 Outcomes** PO-1 Basic Engineering **PO-3 PO-7** (COs) and **PO-2 PO-4 Practices for** PO-6 Project Design/ Life PSO-PSO-PSO Discipline Problem Development Engineering Society, Management Long 1 2 3 Specific Analysis Tools Sustainability of Solutions Learning Knowledge and Environment CO1 3 1 1 2 ---

1

2

2

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2

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2

Legends :- High:03, Medium:02,Low:01, No Mapping: -

1

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1

1

1

1

*PSOs are to be formulated at institute level

3

3

3

3

CO2

CO3

CO4

CO5

XII. SUGGESTED LEARNING MATERIALS / BOOKS

Sr.No	Author	Title	Publisher with ISBN Number
1	Theraja, B. L. Theraja, A. K.	A Text Book of Electrical Technology Vol-I	S.Chand and Co. New Delhi 2014 ISBN: 9788121924405
2	Mittle, V. N.	Basic Electrical Engg.	Tata McGraw-Hill, New Delhi ISBN : 978-0-07-0088572-5
3	Hughes, Edward	Electrical Technology	Pearson Education, New Delhi ISBN-13: 978-0582405196
4	S. B. Lal Seksena and Kaustuv Dasgupta	Fundamentals of Electrical Engineering Part-1	Cambridge University Press, New Delhi ISBN : 9781107464353
5	Jegathesan V., Vinoth Kumar K., Saravanakumar R.	Basic Electrical and Electronics Engineering	Wiley India, New Delhi 2014 ISBN : 97881236529513
6	Husain Ashfaq	Fundamentals of Electrical Engineering	Dhanpat Rai & Co. (p) Ltd-delhi, ISBN: 978-8177000436

XIII. LEARNING WEBSITES & PORTALS

Sr.No	Link / Portal	Description
1	https://www.electrical4u.com/electrical-engineering-articles	Basic Electrical Parameters
2	https://en.wikipedia.org/wiki/Capacitor	Capacitor
3	https://www.corsi.univr.it/documenti/OccorrenzaIns/matdid/ma tdid441904.pdf	D.C. Circuits
4	https://www.slideshare.net/ChetanPatil396/basic-electrical-p arameters-basic-electrical-engineering	Basic Electrical Parameters
5	https://www.britannica.com/science	Magnetic Circuits
6	https://en.wikipedia.org/wiki/Magnetic_circuit	Magnetic Circuits
7	https://en.wikipedia.org/wiki/Electromagnetic_induction	Electromagnetic Induction
8	https://youtu.be/XT-UmPviH64?si=MLIZBB5BgOA2SWBk	Electromagnetic Induction
9	https://youtu.be/M-QfX2fvpp4?si=xpZDAiX37xrnnr	Basics Magnetic Circuits
LODE		

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Sr.No	Link / Portal	Description
10	https://archive.nptel.ac.in/courses/117/106/117106108/	Basic Electrical Circuits
11	https://en.wikipedia.org/wiki/Electric_battery	Battery
 Teachers are requested to check the creative common license status/financial implications of the suggested online educational resources before use by the students 		

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