GOVERNMENT POLYTECHNIC, PUNE

'120 – NEP' SCHEME

PROGRAMME	DIPLOMA IN EE/ET
PROGRAMME CODE	02/03
COURSE TITLE	APPLIED CHEMISTRY
COURSE CODE	SC11202
PREREQUISITE COURSE CODE & TITLE	NA

I. LEARNING & ASSESSMENT SCHEME

Course Code	Course Title	Course Type	Learning Scheme					Credits	Assessment Scheme											
			Actual Contact Hrs./Week			SLH	NLH		Paper Duration Hrs.	Theory				Based on LL &TSL				Based on SL		Total Marks
														Practical						
			CL	TL	LL					FA-TH	SA-TH	Total		FA-PR		SA-PR		SLA		
										Max	Max	Max	Min	Max	Min	Max	Min	Max	Min	
SC11202	APPLIED CHEMISTRY	DSC	3	0	2	1	6	3	2	30	70*#	100	40	25	10	25@	10	25	10	175

Total IKS Hrs for Term: 02 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,*# - Online Examination,@$ - Internal Online Examination

Note:

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

1. If a candidate is not securing minimum passing marks in FA-PR (Formative Assessment - Practical) of any course, then the candidate shall be declared as **'Detained'** in that semester.
2. If a candidate does not secure minimum passing marks in SLA (Self Learning Assessment) of any course, then the candidate shall be declared as **'fail'** and will have to repeat and resubmit SLA work.
3. **Notional learning hours** for the semester are (CL + LL + TL + SL) hrs. * 15 Weeks
4. **1 credit** is equivalent to **30 Notional hours.**
5. * Self-learning hours shall not be reflected in the Timetable.
6. *Self-learning includes micro-projects/assignments/other activities.

II. RATIONALE:

Applications of Material Science and Chemical Principles have resulted in the development of new materials used in modern medicines and automobiles, synthetic fibers, polymers, alloys, new energy sources and many other important products and processes. Material Science is an important and expanding branch in the scientific engineering and economic field of our society.

The topic of atomic structure includes the basic structure of matter, which governs the Mechanical, Electrical and Magnetic properties of matter. Corrosion and methods of prevention will make students realize the importance of care and maintenance of machines and equipment. The study of different polymers, insulators, and adhesives and their chemical behaviour will be useful in their applications in electrical appliances and electronics industries. The study of impurities and hardness in water and methods for water softening will help the students make proper use of water.

Nanomaterials are widely used in the engineering field. It will help to understand the need for nanomaterials in different engineering fields.

III. COURSE-LEVEL LEARNING OUTCOMES (CO'S)

Students will be able to achieve and demonstrate the following CO's on completion of course-based learning

CO1: Distinguish materials based on atomic structure.
CO2: Apply the concepts of electrochemistry to solve engineering problems
CO3: Select metals and non-metals for given applications.
CO4: Select the relevant insulating material for various engineering problems.
CO5: Use corrosion preventive measures in the industry.
CO6: Use the appropriate engineering material in various engineering applications.

IV. THEORY LEARNING OUTCOMES AND ALIGNED COURSE CONTENT:

Sr. No	Theory Learning Outcomes (TLO'S) aligned to CO's.	Learning content mapped with TLO's.	Suggested Learning Pedagogies	Relevant COs
	UNIT-I ATOMIC STRUCTURE (CL Hrs-6, Marks-12)			
1.	**TLO 1.1** Explain the Characteristics of fundamental particles of an atom. **TLO 1.2** Distinguish between atomic number and atomic mass number **TLO1.3** Distinguish between orbit and orbital. **TLO 1.4** Explain the significance of quantum numbers. **TLO 1.5** Explain the formation of a given molecule **TLO 1.6** State Aufbau's principle and Hund's rule. **TLO 1.7** Define Electrovalent and covalent bonds with examples.	1.1.**Indian Chemistry:** -Philosophy of atom by Acharya Kanad. 1.2.Definition of an atom, structure of atom, Characteristics of fundamental particles of an atom, definition of atomic number, atomic mass number and their difference 1.3.Orbits; Bohr's energy levels, sub-energy levels, s, p, d, f orbital, shapes and description of s and p orbital. Definition and significance of quantum numbers 1.4.Aufbau's principle, Hund's rule, orbital electronic configurations (s, p, d, f) of elements having atomic numbers 1 to 30. 1.5.Definitions of valence electrons, valency, types of valencies, Definition of electrovalency, positive and negative electrovalency 1.6. Formation of Electrovalent compounds-Nacl Alcl3 Definition of covalency, single, double and triple covalent bonds, formation of Covalent compounds H2O, CO2, N2	Chalk and board Improved lecture, Tutorial Assignment Demonstration	CO1
	UNIT-II ELECTROCHEMISTRY (CL Hrs -8, Marks-14)			
2	**TLO 2.1** Explain the assumptions of Arrhenius's theory of electrolytic dissociation. **TLO 2.2.** Describe the process of electroplating taking a suitable example **TLO 2.3** Explain the mechanism	2.1. Definition of electrolyte, electrolysis, ionization, Arrhenius theory, Difference between atom and ion 2.2. Activity series, mechanism of electrolysis of CuSO4 using Pt electrode and Cu electrode 2.3. Applications of electrolysis: electroplating, electro-refining,	Chalk and board Improved lecture, Tutorial Assignment Demonstration	CO2

Sr. No	Theory Learning Outcomes (TLO'S) aligned to CO's.	Learning content mapped with TLO's.	Suggested Learning Pedagogies	Relevant COs
	of electrolysis for the given electrolyte. **TLO 2.4** Calculate CE, ECE, the weight of substance deposited or liberated, and time in the given numerical. **TLO 2.5** Distinguish between metallic conductor and electrolytic conductor. **TLO 2.6** Describe the construction and working of cells. **TLO 2.7** Explain applications of Cells **TLO 2.8** Explain the care and maintenance of a battery	2.4. Faraday's laws of electrolysis and numerical. 2.5. Types of conductors: metallic conductors, electrolytic Conductors (definition and difference) 2.6. Conductance in metals, conductance in electrolytes, Factors affecting conductance: nature of solute, nature of the solvent, temperature, concentration of solution. 2.7. Primary and secondary cell: Difference between primary cell and secondary cell, Construction, working and applications of Daniel cell (porous vessel and salt bridge), Dry cell, lead acid cell, Ni-Cd cell, Lithium-ion battery Maintenance of battery		
	UNIT-III METALS AND ALLOYS (CL Hrs-08, Marks-10)			
3	**TLO 3.1** Draw the flow chart showing different processes in metallurgy. **TLO 3.2** Classify carbon steel giving properties and application of each **TLO 3.3.** Explain the purposes of heat treatment methods. **TLO 3.4** Explain the purposes of making alloys. **TLO 3.5** Classify alloys with suitable examples of each. **TLO 3.6** Write the composition, properties and uses of alloys. .	3.1. Occurrence of metals, definitions of mineral, ore, flux, matrix, slag and metallurgy, mechanical properties of metal. 3.2. Flow chart showing different processes in metallurgy, classification, properties and application of carbon steel, heat treatment (definition, purposes and methods) 3.3. Definition of alloy, purposes of making alloys with examples, classification of alloys(ferrous and non-ferrous), 3.4 Composition properties application of copper-zinc alloy, cadmium copper alloy, chromium copper alloy, brass, bronze, duralumin, wood's metal, and babbit metal.	Chalk and board Improved lecture, Tutorial Assignment Demonstration	CO3
	UNIT- IV INSULATING MATERIALS (CL Hrs-8, Marks-12)			
4	**TLO 4.1** Describe the formation of a given polymer **TLO4.2**.Distinguish between thermo-softening and thermosetting plastics. **TLO 4.3.** Explain the applications of Plastic based on its properties **TLO 4.4** Explain the vulcanization process of natural rubber. **TLO 4.5** Distinguish between synthetic and natural rubber. **TLO 4.6** Explain the preparation, properties and applications of given	**Plastic** 4.1. Definition of monomer and polymer, polymerization, classification of plastic based on monomer, based on thermal behaviour, on basis of monomer structure, 4.2. Types of polymerization (Addition, and Condensation) applications of Plastic based on its properties. 4.3. Synthesis, properties and applications of- polythene, PVC, Teflon, Bakelite, and polystyrene. **Rubber:** 4.4. Types of rubber, processing of natural rubber, properties of rubber, drawbacks of	Chalk and board Improved lecture, Tutorial Assignment Demonstration	CO4

Sr. No	Theory Learning Outcomes (TLO'S) aligned to CO's.	Learning content mapped with TLO's.	Suggested Learning Pedagogies	Relevant COs
	synthetic rubber **TLO 4.7** Explain the properties and application of thermal insulators **TLO 4.8** Explain the properties and application of electrical insulators	natural rubber, vulcanization of rubber. 4.5. Synthetic rubber – preparation, properties and application of BUNA-S, BUNA-N, neoprene, Thiokol. **Thermal insulators :** 4.6. Properties and application of thermocol and glass wool. **Electrical insulators:** 4.7. Properties and applications of Ceramics, silicon fluid, nitrogen gas.		
	UNIT –V CORROSION (CL Hrs-7, Marks-10)			
5	**TLO 5.1** Explain different types of oxide films. **TLO 5.2** Explain the mechanism of electrochemical corrosion **TLO 5.3** Explain the factors affecting the rate of atmospheric corrosion and electrochemical corrosion. **TLO 5.4** Describe the galvanization process of protection of metal from corrosion. **TLO 5.5** Distinguish between galvanizing and tinning **TLO 5.6** Describe the given process of protection of metal from corrosion.	5.1. Definition, causes of corrosion types of corrosion definition (atmospheric and electrochemical) Types of oxide films 5.2. Mechanism of atmospheric and electrochemical corrosion (evolution of hydrogen, absorption of oxygen). 5.3. Factors affecting the rate of atmospheric corrosion and electrochemical corrosion. 5.4. Protection Methods-anodic and cathodic protection, galvanizing and tinning process, sherardizing process.	Chalk and board Improved lecture, Tutorial Assignment Demonstration	CO5
	UNIT - VI ENGINEERING MATERIALS (CL Hrs-8, Marks-12)			
	TLO 6.1 Explain the properties and applications of nanomaterials. **TLO6.2** Explain the properties and applications of Magnetic Material. **TLO 6.3** Distinguish between diamagnetic and paramagnetic materials. **TLO 6.4** Explain the properties and applications of semiconducting materials. **TLO 6.5** Differentiate between N-type and P-type semiconductors. **TLO 6.6** Describe the properties	6.1. **Nanomaterials**- properties and application of fullerene, graphene. 6.2. **Magnetic Material:** properties and applications of diamagnetic materials, paramagnetic materials and ferromagnetic materials. 6.3. **Semiconducting materials:** Definition, Applications of Semiconducting materials, Examples of Semiconductors commonly used, Intrinsic and extrinsic semiconductors, N-type and P-type semiconductors, Difference between N-type and P-type semiconductors, **6.4 Resistor material**: Definition, Properties of three groups of resistor materials, Properties and applications of resistor materials: Tungsten, Carbon, Nichrome, Manganin, Eureka, and Platinum.	Chalk and board Improved lecture, Tutorial Assignment Demonstration	CO6

Sr. No	Theory Learning Outcomes (TLO'S) aligned to CO's.	Learning content mapped with TLO's.	Suggested Learning Pedagogies	Relevant COs
	of three groups of resistor materials. **TLO 6.7** Describe the properties and applications of Resistor material			

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

Sr. No	Practical/Tutorial/Laboratory Learning Outcome (LLO)	Laboratory Experiment / Practical Titles /Tutorial Titles	Number of hrs.	Relevant COs
1	LLO 1 Write the electronic configuration of atoms from Z=1 to Z=30	Write the electronic configuration of atoms from Z=1 to Z=30	2	CO1
2	LLO 2 Write the formation of compounds NaCl, $AlCl_3$, H_2O, CO_2, N_2	Write the formation of compounds NaCl, AlCl3, H2O, CO2, N2	2	CO 1
3	LLO 3 Determine basic radicals from given ionic solutions by performing a selective test	Determination of basic radical from given ionic solution	2	CO 1
4	LLO 4 Determine acidic radicals given ionicsolutions by performing a selective test	Determination of acidic radical from given ionic solution.	2	CO 1
5	LLO 5 Determine the electrochemical equivalent of copper metal using Faraday's first law and Faraday's second law.	Determination of electrochemical equivalent of copper metal using Faraday's first law and Faraday's second law.	2	CO 2
6	LLO 6 Use a Hydrometer for testing the Battery	Use a Hydrometer for testing Battery	2	CO 2
7	LLO 7 Measure the voltage developed due to chemical reactions by setting up of Daniel cell	Measurement of the voltage developed due to chemical reactions by setting up of Daniel cell	2	CO 2
8	LLO 8 Determine the percentage of iron in a given steel sample by redox titration.	Determination of the percentage of iron in a given steel sample by redox titration.	2	CO3
9	LLO 9 Prepare phenol formaldehyde resin.	Preparation of phenol formaldehyde resin.	2	CO 4
10	LLO 10 Determine the acid value of the given resin	Determination of acid value of given resin	2	CO4
11	LLO 11 Determine the electrode potential of various metals to study their tendency to corrosion.	Determination of electrode potential of various metals to study their tendency to corrosion.	2	CO 5

Sr. No	Practical/Tutorial/Laboratory Learning Outcome (LLO)	Laboratory Experiment / Practical Titles /Tutorial Titles	Number of hrs.	Relevant COs
12	LLO 12 Determine the rate of corrosion of Aluminium in acidic and basic medium.	Determination of the rate of corrosion of Aluminium in acidic and basic medium.	2	CO 5

Note: A suggestive list of practical LLOs is given in the table, more such practical LLOs can be added to attain the COs and competency. A Compulsory 12 experiments or more for chemistry practicals for LLOs needs to be performed so that the student reaches the 'Precision Level' of Dave's 'Psychomotor Domain Taxonomy' as generally required by the industry. ii. Hence, the 'Process' and 'Product' related skills associated with each LLOs of the laboratory work are to be assessed according to a suggested sample of Performance Indicators (Weightage in %) as follows:

1) Preparation of experimental set up 20%
2) Setting and operation 20%
3) Safety measures 10%
4) Observations and Recording 10%
5) Interpretation of result and Conclusion 20%
6) Answer to sample questions 10%
7) Submission of the report in time 10%.

VI. SUGGESTED MICROPROJECT/ASSIGNMENT/ACTIVITIES FOR SPECIFIC LEARNING/SKILLS DEVELOPMENT(SELF-LEARNING)

Micro Project /Assignment/Activity is planned to be undertaken by a student assigned to him/her at the beginning of the semester. She/He ought to submit it by the end of the semester to develop industry-oriented COs. Each micro-project should encompass two or more COs. The Micro-Project could be industry application-based, internet-based, workshop-based, laboratory-based or field-based. The assessment of the micro-project is to be done under Practical (FA-PR) Assessment. The Micro Project is preferably assigned to a group of (4-6) students or an individual taking into consideration the capabilities and circumstances at the time.

A suggested list is given here. A similar micro-project/ Assignment could be added by the concerned faculty.

Micro project:

- Types of bonds: Prepare a chart and models displaying different types of bonds with examples.
- Metals and Alloys: Prepare a chart showing the composition, properties application of Ferrous Alloys & non ferrous alloys.
- Insulating materials: Prepare a chart including different synthetic materials Plastic and Rubber and list their uses.
- Cells & batteries: Prepare a chart including the mechanism of different cells & batteries.
- Batteries: Collect and analyse different types of batteries.
- Corrosion: Prepare a Chart displaying images of observed corrosion processes in the surrounding
- Materials: Collect information by library survey regarding engineering materials used in various industries.
- Engineering material: Collect information by library survey regarding engineering materials used in various industries.

Assignment:

1. Explain covalent bonds and ionic bonds with examples
2. Distinguish between plastic and rubber.
3. Write the electronic configuration of atoms
4. Write the formation of compounds NaCl, $AlCl_3$, H_2O, CO_2, N_2
5. Compare between Thermoplastics and Thermosetting
6. State properties and applications of thermocol and glass wool.
7 Explain types of alloys with examples.
8. Demonstrate the Mechanism of the Hydrogen Evolution process.
9. Write properties and applications of engineering materials.
10. Write properties and applications of insulating materials.

VII. LABORATORY EQUIPMENT/INSTRUMENTS/TOOLS/SOFTWARE REQUIRED

Sr. No	Equipment Name with Broad Specifications	Relevant LLO Number
1	Hydrometer	6
2	Electronic balance with the scale range of 0.001 gm to 500 gm	All

VIII. SUGGESTED WEIGHTAGE TO LEARNING EFFORTS AND ASSESSMENT PURPOSE

(Specification Table)

Sr. No	Unit	Unit Title	Aligned COs	Learning Hours	R - Level	U - Level	A - Level	Total Marks
1	I	Atomic structure	CO 1	06	04	06	02	12
2	II	Electrochemistry	CO 2	08	04	04	06	14
3	III	Metals and alloys	CO 3	08	02	02	06	10
4	IV	Insulating materials	CO 4	08	04	02	06	12
5	V	Corrosion	CO 5	07	04	02	04	10
6	VI	Engineering Materials	CO 6	08	02	04	06	12
Grand Total				**45**	**20**	**20**	**30**	**70**

IX. ASSESSMENT METHODOLOGIES/TOOLS

Formative assessment (Assessment for Learning)	Summative Assessment (Assessment of Learning)
Two Unit Tests of 30 marks and the average of two unit tests. For Laboratory Learning 25 Marks. SLA assessment of 25 marks.	End Semester assessment of 25 marks for laboratory learning. End Semester assessment of 70 marks (Online)

X. SUGGESTED COs- POsMATRIXFORM

Course Outcomes (COs)	Programme Outcomes (POs)							Programme Specific Outcomes * (PSOs)		
	PO-1 Basic and Discipline - Specific Knowledge	PO-2 Problem Analysis	PO-3 Design/ Development of Solutions	PO-4 Engineering Tools	PO-5 Engineering Practices for Society, Sustainability and Environment	PO-6 Project Management	PO-7 Life Long Learning	PSO-1	PSO-2	PSO-3
CO1	3	-	-	-	1	-	2			
CO2	3	2	-	-	1	1	2			
CO3	3	-	-	2	-	-	1			
CO4	3	2	-	2	1	1	1			
CO5	3	-	-	1	1	1	1			
CO6	3	2	-	3	1	1	1			

Legends:-High:03,Medium:02,Low:01,NoMapping:-
*PSOs are to be formulated at the institute level

XI.SUGGESTED LEARNING MATERIALS/BOOKS

Sr.No.	Author	Title	Publisher with ISBN Number
1	Dara S.S. Umare S.S.	Engineering Chemistry	S. Chand and Co publication, New Delhi, 201, ISBN: 8121997658
2	Jain and Jain	Engineering Chemistry	Dhanpat Rai and Sons, New Delhi,2015, ISBN: 9352160002
3	Vairam. S	Engineering Chemistry	Wiley Indian Pvt. Ltd, New Delhi, 2013 ISBN: 9788126543342
4	Agnihotri, Rajesh	Chemistry for Engineers	Wiley Indian Ptd. Ltd, New Delhi, 2014, ISBN: 9788126550784
5	Agrawal Shikha	Engineering Chemistry	Cambridge University Press, New Delhi, 2015 ISBN: 97811074764
6	V. P. Mehta	Polytechnic Chemistry	Jain brothers, New Delhi.2012818360093X

XII. LEARNING WEBSITES & PORTALS

Sr.No	Link/Portal	Description
1	www.chemistryteaching.com	Physical, inorganic and organic chemistry.
2	www.chemcollective.org	Virtual Labs, simulation
3	www.chem1.com	Chemistry instruction and education
4	www.onlinelibrary.wiley.com	Materials and corrosion
5	www.chemcollective.org	Collection of virtual labs, scenario-based learning activities

Sr.No	Link/Portal	Description
6	https://www.ancient-origins.net/history-famous-people/indian- sage-acharya-Kanad-001399	IKS Philosophy of atom by AacharyaKanad.

Name & Signature: **Smt. Rupali S. Patil** Lecturer in Chemistry (Course Experts)	
Name & Signature: **Dr. S. S. Bharatkar** (Programme Head)	Name & Signature: **Shri. S.B. Kulkarni** (CDC In-charge)

GOVERNMENT POLYTECHNIC, PUNE

'120 – NEP' SCHEME

PROGRAMME	DIPLOMA IN CE/EE/ET/ME/MT/CM/IT
PROGRAMME CODE	01/02/03/04/05/06/07
COURSE TITLE	APPLIED MATHEMATICS
COURSE CODE	SC11207
PREREQUISITE COURSE CODE & TITLE	BASIC MATHEMATICS (SC11205/SC11206)

I. LEARNING & ASSESSMENT SCHEME

Course Code	Course Title	Course Type	Learning Scheme					Credits	Assessment Scheme										
			Actual Contact Hrs./Week			SLH	NLH		Paper Duration	Theory				Based on LL &TSL				Based on SL		Total Marks
														Practical						
			CL	TL	LL					FA-TH	SA-TH	Total		FA-PR		SA-PR		SLA		
										Max	Max	Max	Min	Max	Min	Max	Min	Max	Min	
SC11207	APPLIED MATHEMATICS	AEC	3	1	-	-	4	2	3	30	70	100	40	-	-	-	-	-	-	100

Total IKS Hrs for Term: 6 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,*# - Online Examination,@$ - Internal Online Examination

Note:

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

1. If a candidate is not securing minimum passing marks in **FA-PR** (Formative Assessment - Practical) of any course, then the candidate shall be declared as **'Detained'** in that semester.
2. If a candidate does not secure minimum passing marks in SLA (Self Learning Assessment) of any course, then the candidate shall be declared as **'fail'** and will have to repeat and resubmit SLA work.
3. **Notional learning hours** for the semester are **(CL + LL + TL + SL) hrs. * 15 Weeks**
4. **1 credit** is equivalent to **30 Notional hours.**
5. * Self-learning hours shall not be reflected in the Timetable.
6. *Self-learning includes micro-projects/assignments/other activities.

II. 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.

III. COURSE-LEVEL LEARNING OUTCOMES(CO'S)

Studentswillbeabletoachieve&demonstratethefollowing CO'soncompletionofcourse-basedlearning

CO1 - Apply 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. THEORY LEARNING OUTCOMES AND ALIGNED COURSE CONTENT

Sr. No	Theory Learning Outcomes (TLO'S) aligned to CO's.	Learning content mapped with TLO's.	Suggested Learning Pedagogies	Relevant COs
UNIT-I Indefinite Integration (CL Hrs-15, Marks-20)				
1.	TLO1.1 Solve the given simple problem(s) based on rules of integration. TLO1.2 Evaluate the given simple integral(s) using substitution method. TLO1.3 Integrate given simple functions using the integration by parts TLO1.4 Solve the given simple integral bypartial 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	CO1
Unit - II Definite Integration (CL Hrs-08, Marks-12)				
2.	TLO2.1 Solve given examples based on DefiniteIntegration. TLO2.2 Use properties of definite integration tosolve 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	CO2
Unit - III Differential Equation (CL Hrs-08, Marks-12)				
3.	TLO3.1 Find the order and degree of givendifferential equations. TLO3.2 Form simple differential equation for given elementary engineering problems. TLO3.3 Solve given differential equations using the methods of Variable separable and Exact Differential Equation (Introduce the concept of partial differential equation). TLO3.4 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	CO3

Sr. No	Theory Learning Outcomes (TLO'S) aligned to CO's.	Learning content mapped with TLO's.	Suggested Learning Pedagogies	Relevant COs
	Unit - IV Numerical Methods (CL Hrs-06, Marks-14)			
4.	TLO4.1 Find roots of algebraic equations by using appropriate methods. TLO4.2 Solve the system of equations in three unknowns by iterative methods TLO4.3 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)		**CO4**
	Unit - V Probability Distribution (CL Hrs-08, Marks-12)			
5.	TLO5.1 Solve given problems based on repeated trials using Binomial distribution TLO5.2 Solve given problems when number of trials are large and probability is very small. TLO5.3 Utilize the concept of normal distribution to solve related engineeringproblems	**Unit - V Probability Distribution** 5.1 Binomial distribution. 5.2 Poisson's distribution. 5.3 Normal distribution.		**CO5**

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

Sr. No	Practical/Tutorial/Laboratory Learning Outcome (LLO)	Laboratory Experiment / Practical Titles /Tutorial Titles	Number of hrs.	Relevant COs
1	LLO 1.1 Solve simple problems of Integration by substitution	*Integration by substitution	1	CO1
2	LLO 2.1 Solve integration using by parts	*Integration by parts	1	CO1
3	LLO 3.1 Solve integration by partial fractions(only linear non repeated factors at denominator of proper fraction).	Integration by partial fractions.	1	CO1
4	LLO 4.1 Solve examples on Definite Integral based on given methods.	Definite Integral based on given methods.	1	CO2
5	LLO 5.1 Solve problems on properties of definite integral.	*Properties of definite integral	1	CO2
6	LLO 6.1 Solve given problems for finding the area under the curve and volume of revolution.	* #Area under the curve and volume of revolution.(Only for Civil, Mechanical Metallurgical Engineering)	1	CO2

Sr. No	Practical/Tutorial/Laboratory Learning Outcome (LLO)	Laboratory Experiment / Practical Titles /Tutorial Titles	Number of hrs.	Relevant COs
7	LLO 7.1 Solve examples on mean value and root mean square value.	* #Mean value and root mean square value. (Only for Information Technology, Computer, Electrical and Electronics Engineering)	1	CO2
8	LLO 8.1 Solve examples on order, degree and formation of differential equation.	Order, degree and formation of differential equation.	1	CO3
9	LLO 9.1 Solve first order first degree differential equation using variable separable method.	Variable separable method.	1	CO3
10	LLO 10.1 Solve first order first degree differential equation using exact differential equation and linear differential equation.	*Exact differential equation and linear differential equation.	1	CO3
11	LLO 11.1 Solve engineering application problems using differential equation.	*Applications of differential equations.(Take programme specific problems)	1	CO3
12	LLO 12.1 Solve problems on Bisection method and Regula falsimethod.	*Bisection method and Regula falsi method.	1	CO4
13	LLO 13.1 Solve problems on Newton-Raphson method.	Newton- Raphson method.	1	CO4
14	LLO 14.1 Solve problems on Jacobi's method and Gauss Seidal Method.	Jacobi's method and Gauss Seidal Method.	1	CO4
15	LLO 15.1 Use Bakhshali iterative methods for finding approximate value of square root. (IKS)	*Bakhshali iterative methods for finding approximate value of square root. (IKS)	1	CO4
16	LLO 16.1 Solve engineering problems using Binomial distribution.	*Binomial Distribution	1	CO5
17	LLO 17.1 Solve engineering problems using Poisson distribution.	*Poisson Distribution	1	CO5
18	LLO 18.1 Solve engineering problems using Normal distribution.	Normal Distribution	1	CO5
19	LLO 19.1 Solve problems on Laplace transform and properties of Laplace transform.	* # Laplace transform and properties of Laplacetransform.(Only for Electrical and Electronics Engineering)	1	CO2
20	LLO 20.1 Solve problems on Inverse Laplace transform and properties of Inverse Laplace transform.	* # Inverse Laplace transform and properties ofInverse Laplace transform.(Only for Electrical and Electronics Engineering)	1	CO2

Note : Out of above suggestive LLOs –

1. '*' Marked Practicals (LLOs) Are mandatory.
2. Minimum 80% of above list of Tutorials are to be performed.
3. Judicial mix of LLOs are to be performed to achieve desired outcomes

VI. SUGGESTED MICROPROJECT/ASSIGNMENT/ACTIVITIES FOR SPECIFIC LEARNING/SKILLS DEVELOPMENT (SELF-LEARNING)

Micro-project
NA

Assignment
NA

VII. LABORATORY EQUIPMENT/INSTRUMENTS/TOOLS/SOFTWARE REQUIRED

Sr. No	EquipmentNamewithBroadSpecifications	Relevant LLO Number
1	Open-source software like SageMaths, MATHS3D, GeoGebra, Graph, DPLOT and Graphing Calculator (GraphEq2.13), ORANGE can be used for Algebra, Calculus, Trigonometry and Statistics respectively.	All

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

Sr. No	Unit	Unit Title	Aligned COs	Learning Hours	R-Level	U-Level	A-Level	Total Marks
1	I	Indefinite Integration	CO1	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**

IX. ASSESSMENT METHODOLOGIES/TOOLS

Formative assessment (Assessment for Learning)	Summative Assessment (Assessment of Learning)
1. Tests	1. End Term Exam

X. SUGGESTED COS- POS MATRIX FORM

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

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

XI.SUGGESTED LEARNING MATERIALS/BOOKS

Sr. No	Author	Title	Publisher
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 DavidJ.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 RobertandTibshirani	An Introduction to StatisticalLearning with Applications in R	Springer New York Heidelberg Dordrecht LondonISBN 978-1-4614-7137-0 ISBN 978-1-4614-7138-7 (eBook)

XIII. LEARNING WEBSITES & PORTALS

Sr. No	Link/Portal	Description
1	http://nptel.ac.in/courses/106102064/1	Online Learning Initiatives by IITs and IISc
2	https://www.khanacademy.org/math?gclid=CNqHuabCys4CFdOJaddHo Pig	Concept of Mathematics through video lectures andnotes
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 explanationsof mathematical concepts
6	https://www.mathsisfun.com/	Explanations and interactive lessons covering variousmath topics, from basic arithmetic to advanced
7	http://tutorial.math.lamar.edu/	Comprehensive set of notes and tutorials covering awide range of mathematics topics.
8	https://www.purplemath.com/	Purplemath is a great resource for students seeking helpwith algebra and other foundational mathematics to improve learning.
9	https://www.brilliant.org/	Interactive learning in Mathematics

Sr. No	Link/Portal	Description
10	https://www.edx.org/	Offers a variety of courses
11	https://www.coursera.org/	Coursera offers online courses in applied mathematicsfrom universities and institutions around the globe.
12	https://ocw.mit.edu/index.htm	The Massachusetts Institute of Technology (MIT) offersfree access to course materials for a wide range of mathematical courses.

Name & Signature:

Shri. Vitthal B. Shinde
Lecturer in Mathematics

Shri. Sachin B. Yede
Lecturer in Mathematics

(Course Experts)

Name & Signature:	Name & Signature:
Shri. S. S. Bharatkar (Programme Head)	**Shri.S.B.Kulkarni** (CDC In-charge)

GOVERNMENT POLYTECNIC, PUNE

'120–NEP' SCHEME

PROGRAMME	DIPLOMA IN ELECTRICAL ENGINEERING
PROGRAMME CODE	02
COURSE TITLE	FUNDAMENTALS OF ELECTRICAL ENGINEERING
COURSE CODE	EE21201
PREREQUISITE COURSE CODE & TITLE	NA

I. LEARNING& ASSESSMENT SCHEME

Course Code	Course Title	Course Type	Learning Scheme					Credits	Assessment Scheme										
			Actual Contact Hrs./Week			SLH	NLH		Paper Duration in Hrs.	Theory				Based on LL & TSL				Based on SL		Total Marks
														Practical						
			CL	TL	LL					FA-TH	SA-TH	Total		FA-PR		SA-PR		SLA		
										Max	Max	Max	Min	Max	Min	Max	Min	Max	Min	
EE21201	FUNDAMENTALS OF ELECTRICAL ENGINEERING	DSC	4	0	4	2	10	5	3	30	70	100	40	25	10	25@	10	25	10	175

Total IKS Hrs for Term:0Hrs

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:@-InternalAssessment,#-ExternalAssessment,*#-OnlineExamination,@$-InternalOnlineExamination

Note:

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

1. If a candidate is not securing minimum passing marks in **FA-PR** (Formative Assessment - Practical) of any course, then the candidate shall be declared as **'Detained'** in that semester.
2. If a candidate does not secure minimum passing marks in SLA(Self Learning Assessment) of any course, then the candidate shall be declared as **'fail'** and will have to repeat and resubmit SLA work.
3. **Notional learning hours** for the semester are **(CL+LL +TL+SL)hrs.*15 Weeks**
4. **1credit** is equivalent to **30 Notional hours.**
5. *Self-learning hours shall not be reflected in the Timetable.
6. *Self-learning includes micro-projects/assignments/other activities.

II. RATIONALE:

This is an entry course to Electrical Engineering Diploma Programme. The basic concepts, rules and laws of Electric and Magnetic Circuits must be studied and understood by students before studying Electrical Engineering Diploma Course. This course covers fundamentals of D.C. Circuits, Electrostatics, Magnetic Circuits and Electromagnetic Induction. The outcome of this course is useful in linking the further courses of diploma curriculum.

III. COURSE-LEVEL LEARNING OUTCOMES (CO'S)

Students will be able to achieve & demonstrate the following CO's on completion of course-based learning

CO1: Use the basic principles and different effects of electrical current in electrical Engineering field.

CO2: Solve simple D.C. circuits by applying different methods and theorems.

CO3: Determine the value of capacitor in electrical circuit using basic concepts and principles

CO4: Use the principles of magnetism & electro magnetism in electrical circuits.

CO5: Determine various parameters of A.C. quantities.

IV. \THEORY LEARNING OUTCOMES AND ALIGNED COURSE CONTENT

Sr. No	Theory Learning Outcomes (TLO'S)aligned to CO's.	Learning content mapped with TLO's.	Suggested Learning Pedagogies	Relevant COs
	UNIT-I BASIC ELECTRICAL PARAMETERS		**(CL Hrs-12, Marks-12)**	
1.	**TLO 1.1** Define & calculate the various basic electrical parameters. **TLO 1.2** Apply ohm's law to calculate internal resistance of the given circuit. **TLO 1.3** Calculate work, power & energy for the given circuit. **TLO 1.4** Describe the effects of electric current with relevant applications. **TLO 1.4** Explain the concept of ideal and practical voltage and current sources. **TLO 1.5** Convert the given Voltage source into Current source and Current source into Voltage source	1.1 Review of the definitions- Charge, Current, Potential, Potential difference, Voltage, Electrical Resistance, Electromotive force, Terminal voltage and their Units. 1.2 Ohm's Law : applications and limitations 1.3 Specific Resistance and its unit 1.4 Definitions of Work, Power and Energy 1.5 Effects of electric current with relevant applications- Chemical effect, Magnetic effect, Heating effect 1.6 Parameters affecting the resistance, Effect of temperature on resistance of Conductors, Insulators and Alloys, Temperature co-efficient of resistance 1.7 Different types of resistors and their application. 1.8 Concept of Ideal and Practical Current Source and voltage source. 1.9 Source conversion. 1.10 Simple numerical on all above topics.	• Chalk-Board • Presentations • Demonstration • Video	**CO1**
	UNIT-II D.C. CIRCUITS & ELECTROSTATICS		**(CL Hrs-14, Marks-16)**	
2	**TLO 2.1** Identify various types of networks. **TLO 2.2** Apply voltage division rule for series circuit and current division rule for parallel circuits. **TLO 2.3** Apply Kirchhoff's laws to determine current and voltage of the given circuits. **TLO 2.4** Define dielectric strength, breakdown voltage, permittivity. **TLO 2.5** Calculate the capacitance and the energy stored in Capacitors. **TLO 2.6** Plot the charging & discharging curves of given capacitor / capacitive circuit	**D.C. CIRCUITS** 2.1 Definitions- Circuit, Network, Mesh, Node, Active and passive circuit, Unilateral and bilateral circuit, Linear and nonlinear circuit. 2.2 Series circuit- Effective resistance, Voltage division rule (for two series resistances only), Applications. 2.3 Parallel circuit- Effective resistance, Current division rule (for two parallel resistances only) , Applications. 2.4 Kirchhoff's current law, Kirchhoff's voltage law (Upto two simultaneous equations i. e. two loop circuit) **ELECTROSTATICS** 2.5 Define : Dielectric strength, Breakdown voltage and Permittivity with respect to capacitor. 2.6 Energy stored in capacitance (No Derivation). 2.7 Charging and discharging of a capacitor through resistor. 2.8 Simple Numerical on all above topics.	• Chalk-Board • Presentations • Demonstration • Video	**CO1, CO2, CO3**

	UNIT- III MAGNETIC CIRCUITS		**(CL Hrs-12, Marks-16)**	
4	**TLO 3.1** Describe the various basic parameters of Magnetic field. **TLO 3.2** Explain Laws and Rules applicable to the magnetic field produced by current carrying conductor. **TLO 3.3** Give the comparison between Electric and Magnetic circuit. **TLO 3.4** Compare Series and parallel magnetic circuits. **TLO 3.5** Describe Leakage Flux, Useful Flux & Fringing. **TLO 3.6** Describe the significance of Magnetization curve and Hysteresis loop. **TLO 3.7** State and explain Fleming's left hand rule with its application.	3.1 Definitions -Magnetic field, Magnetic flux, Magnetic flux density, Magnetic field strength, Magneto motive force, Reluctance, Permeability, Factors affecting Reluctance. 3.2 Rules applied to magnetic field: -Right hand Gripping rule, Corkscrew rule. 3.3 Magnetic field produced by a straight current Carrying Conductor 3.4 Comparison between Electric and Magnetic circuit. 3.5 Series magnetic circuits 3.6 Concept of Leakage Flux, Useful Flux & Fringing, Leakage Coefficient. 3.7 Relation between B and H, Magnetization curve, Practical importance of magnetization curve 3.8 Hysteresis loop, Practical importance of Hysteresis loop , Hysteresis loss. 3.9 Force on current carrying conductor and its correlation with motor action. 3.10 Fleming's left hand rule. 3.11 Simple Numerical on all above topics.	• Chalk-Board • Presentations • Demonstration • Video	**CO1, CO4**
	UNIT–IV ELECTROMAGNETIC INDUCTION		**(CL Hrs-10, Marks-14)**	
5	**TLO 4.1** Define phenomenon of Electromagnetic induction. **TLO 4.2** State and apply Faraday's law, Lenz's law, Fleming's right hand rule. **TLO 4.3** Differentiate between Statically and Dynamically induced EMF, self and mutual inductance & numerical. **TLO 4.4** Identify the different types of inductors and explain their Applications. **TLO 4.5** Calculate the energy stored in magnetic field. **TLO 4.6** Define Eddy current and eddy current loss.	4.1 Electromagnetic Induction. 4.2 Faraday's laws of Electromagnetic Induction. 4.3 Lenz's law 4.4 Fleming's right hand rule for Generator. 4.5 Statically and dynamically induced EMF. 4.6 Self and Mutually induced EMF 4.7 Self and Mutual inductance, coefficient of coupling. 4.6 Inductances in series. 4.7 Types of Inductors and their Applications:- Air Cored Inductors, Iron Cored Inductors, Ferrite Cored Inductors 4.8 Energy stored in Magnetic field. (No derivation). 4.9 Concept of Eddy current and eddy current loss. 4.10 Simple Numerical on all above topics.	• Chalk-Board • Presentations • Demonstration • Video	**CO1, CO4**

UNIT–V AC FUNDAMENTALS (CL Hrs-12, Marks-12)			
TLO 5.1 State the Advantages of AC over DC **TLO 5.2** Describe Generation of alternating voltage by simple generator and define the related terminologies from generated voltage waveform & Numerical. **TLO 5.3** Explain the representation of alternating quantity by rotation of vector method **TLO 5.4** Explain the concept of Phase, Phase difference, Lagging and Leading quantity	5.1 Advantages of AC over DC 5.2 Generation of alternating voltage by simple generator. Derivation of EMF equation 5.3 Terminologies like Amplitude, Frequency, Time Period, Angular frequency, Cycle, Instantaneous value, RMS value, Average value, Form Factor, Peak factor. 5.4 Representation of alternating quantity by vector rotation method 5.5 Concept of Phase, Phase difference, Lagging and Leading quantity with equation, waveform representation & phasor diagram. 5.6 Simple Numerical on all above topics.	• Chalk-Board • Presentations • Demonstration • Video	CO1, CO5

V. LABORATORY LEARNING OUT COME AND ALIGNED PRACTICAL/TUTORIAL EXPERIENCES. (ANY 20)

Sr. No	Practical/Tutorial/ Laboratory Learning Outcome(LLO)	Laboratory Experiment / Practical Titles/Tutorial Titles	Number of hrs.	Relevant COs
1	LLO1 Draw layout of electrical laboratory.	Know your Electrical engineering laboratory.	2	CO1
2	LLO2 Verify Ohm's Law	Verification of Ohm's Law	2	CO1
3	LLO3 Connect and read multi range analog meters(Ammeter, Voltmeter)	Read analog meters for measurement of various electrical quantities in AC/DC circuits.	2	CO1
4	LLO4 Use of Multimeter for the measurement of AC/DC Current, Voltage and Resistance in the given circuit	Operate Multimeter for the measurement of AC/DC Current, Voltage and Resistance in the given circuit	2	CO1 CO2
5	LLO5 Observe frequency, Time period, Peak Value and Average Value of the given A.C. wave on CRO	Observe and note the frequency, Time period, Peak Value and Average Value of the given A.C. wave on CRO.	2	CO1 CO5
6	LLO6 Verify Kirchoff's Voltage Law	Verification of Kirchoff's Voltage Law for the given circuit.	2	CO1 CO2
7	LLO7 Verification of Kirchoff's Current Law.	Verification of Kirchoff's Current Law for the given circuit.	2	CO1 CO2
8	LLO8 Use the rheostat as current regulator and potential divider	Use rheostat as current regulator and potential divider in the given circuit.	2	CO1 CO2
9	LLO9 Determine relation between EMF, Terminal Voltage and internal resistance of DC source .	Determination of relation between EMF, Terminal Voltage and internal resistance of DC source .	2	CO1 CO2
10	LLO10 Verify the properties of series connected resistive circuit.	Verification of parameters of two / three resistances connected in series.	2	CO1 CO2
11	LLO11 Verify the properties of parallel connected resistive circuit.	Verification of parameters of two/three resistances connected in Parallel.	2	CO1 CO2

Sr. No	Practical/Tutorial/ Laboratory Learning Outcome(LLO)	Laboratory Experiment / Practical Titles/Tutorial Titles	Number of hrs.	Relevant COs
12	LLO12 Determine the time constant(RC) by plotting the charging curves of a capacitor(C) through resistor (R)	Plot the charging characteristics of capacitor and find the time constant(RC) for the given circuit.	2	CO1 CO3
13	LLO13 Determine the time constant (RC)by plotting the discharging curves of a capacitor(C) through resistor (R)	Plot the discharging characteristics of capacitor and find the time constant(RC) for the given circuit. (Use different value of time constant)	2	CO1 CO3
14	LLO14 Find the equivalent capacitance in the series connected capacitive circuits.	Verification of the equivalent capacitance in series connected capacitive circuits.	2	CO1 CO3
15	LLO15 Find equivalent capacitance of the parallel connected capacitive circuits	Verification of equivalent capacitance of the parallel connected capacitive circuits	2	CO1 CO3
16	LLO16 Find B-H curve for the given magnetic material	Plot B-H curve for the given magnetic material (Use DC generator with suitable prime mover) .	2	CO1 CO4
17	LLO17 Obtain magnetization curve for magnetic material	Plot magnetization curve for magnetic core (Use Transformer).	2	CO1 CO4
18	LLO18 Plot Hysteresis Loop for the given transformer coil	Study of Hysteresis loop for the given transformer coil	2	CO1 CO4
19	LLO19 Verify Faraday's Law of Electromagnetic Induction (Statically Induced EMF)	Verification of Faraday's Law of Electromagnetic Induction (Statically Induced EMF)	2	CO1 CO4
20	LLO20 Verify Faraday's Law of Electromagnetic Induction (Dynamically Induced EMF)	Verification of Faraday's Law of Electromagnetic Induction (Dynamically Induced EMF)	2	CO1 CO4
21	LLO21 Verify Fleming's Right Hand Rule	Verification of Fleming's Right Hand Rule	2	CO1 CO4
22	LLO22 Verify Fleming's Left Hand Rule	Verification of Fleming's Left Hand Rule	2	CO1 CO4
23	LLO23 Verify the effect of temperature on resistance of conductor.	Verification of effect of temperature on resistance of conductor.	2	CO1

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

A suggested list is given here. A similar micro-project/ Assignment could be added by the concerned faculty

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. Prepare power point presentation related to basics of electrical engineering related to various topics stated above.
b. Prepare a chart of electric circuit elements and relevant industrial application.
c. Prepare question bank referring previous examination question papers.

Micro-project

a. Types of Electrical equipment: Prepare chart showing real-life examples indicating various types of electrical equipment
b. Resistance: Collect samples of resistances and prepare models of simple series circuit and parallel circuit.
c. Capacitance: Collect samples of capacitance and prepare models of simple series circuit and parallel circuit.
d. Inductance: Collect samples of inductance and prepare models of simple series circuit and parallel circuit.

Note :
"These are the just suggestive topics. Faculty must design Microproject/Activities/Assignments based on Course Outcome requirements".

VII. LABORATORYEQUIPMENT/INSTRUMENTS/TOOLS/SOFTWAREREQUIRED

Sr.No	Equipment Name with Broad Specifications	Relevant LLO Number
1	1.DC Supply, AC Supply of suitable range 2 .Voltmeter: Suitable Voltage range,1No. 3 Ammeter: Suitable current range,1No. 4 Single phase dimmerstat, 1 No. 5 Multimeter, 1 No. 6. Lamp load	3, 4
2	1. CRO with probe,10Hz-30MHz,01No 2. Rheostat of suitable rating 3. Autotransformer of suitable rating	5
3	1.DC Supply of suitable range 2.Voltmeter:Suitable Voltagerange,2No. 3.Ammeter: Suitable current range,1 No 4. Resistor: Suitable range resistance in ohm,2 or 3 No.	10,11
4	1.DC Supply of suitable range 2Voltmeter: Suitable voltage,1No. 3Ammeter: Suitable current,1 No. 4.Capacitors: Suitable capacitor,1 No. 5.Resistance: Suitable resistance ,1 No. 6.Stop watch: Suitable stop watch 1 No.	12,13
5	1.DC Supply of suitable range 2.Voltmeter : Suitable Voltage,1No. 3.Ammeter :Suitable Current,1 No. 4.Capacitor:SuitableCapacitor in Farad,3No.	14,15
6	1.AC Supply of suitable range 2.Voltmeter: Suitable voltage,1No. 3.Ammeter: Suitable current,1 No. 4.Inductive coil: Suitable Inductor1No.	16
7	1.AC Supply of suitable range 2Voltmeter: Suitable Voltage,1No. 3Ammeter : Suitable current,1 No. 4.Transformer.: Transformer of Suitable range 1No.	17
8	1.DC Supply of suitable range 2.DC motor: Suitable motor:1No	22

Sr.No	Equipment Name with Broad Specifications	Relevant LLO Number
9	1.AC Supply of suitable range 2:Voltmeter: Suitable Voltage,1 No. 3:Ammeter: Suitable current,1 No. 4.Transformer:(0.5/1kVA)Suitable transformer,1No. 5Single phase dimmerstat, 1 No.	19
10	1. Centre zero galvanometer:1No. 2.Bar magnet: 1 No. 3.No volt coil / Suitable inductor,1No.	20
11	1: AC Supply of suitable range 2:Voltmeter: Suitable Voltage,1 No. 3:Ammeter: Suitable current,1 No. 4.Transformer:(0.5/1kVA)Suitable transformer,1No. 5.Single phase dimmerstat, 1 No.	18
12	Various meters to understand Make, Rating, Least count	1
13	1.DC Supply of suitable range 2.VoltmeterSuitablevoltage1No. 3.Ammeter: Suitable current1 No. 4.Rheostat : Suitable load in ohm,1 No. 5. Resistive Load,1No	9
14	1.DC Motor Generator set: Suitable rating,1No	21
15	1.DC Supply of suitable range 2.D.C.Voltmeter of SuitableRange,3No 3. Rheostat of Suitable Range,3No	6,7
16	1.DC Supply of suitable range 2. Voltmeter: Suitablevoltage1No. 3.Ammeter: Suitable current1 No. 4.Rheostat : Suitable load in ohm,1 No. 5.Motor field winding or any suitable conductor	23
17	1.DC Supply of suitable range 2. Voltmeter: Suitablevoltage1No. 3.Ammeter: Suitable current1 No. 4.Rheostat : Suitable load in ohm,2 No.	2
18	1.DC Supply of suitable range 2.Voltmeter Suitable voltage1No. 3.Ammeter: Suitable current1 No. 4.Rheostat : Suitable load in ohm,1 No. 5.Resistive Load,1No	8

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

Sr. No	Unit	Unit Title	AlignedCOs	LearningHours	R-Level	U-Level	A-Level	TotalMarks
1	I	Basic electrical parameters	CO1	12	4	4	4	12
2	II	D.C.circuits & Electrostatics	CO2, CO3	14	4	6	6	16
3	III	Magnetic circuits	CO4	12	4	6	6	16
4	IV	Electromagnetic induction	CO4	10	4	6	4	14
5	V	AC Fundamentals	CO5	12	4	4	4	12
		GrandTotal		**60**	**20**	**26**	**24**	**70**

X. ASSESSMENTMETHODOLOGIES/TOOLS

Formative assessment(Assessment for Learning)	Summative Assessment(Assessment of Learning)
1. Tests 2. Rubrics for COs 3. Assignment 4. Mid term Exam 5. Self-Learning 6. Term Work 7. Seminar/Presentation	1. End Term Exam 2. Micro-project 3. Tutorial Performance

XI.SUGGESTED CO-PO- PSO MATRIX FORM

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

Legends:-High:03,Medium:02,Low:01,NoMapping:-
*PSOs are to be formulated at the institute level

XIII. SUGGESTEDLEARNINGMATERIALS/BOOKS

Sr. No	Author	Title	Publisher
1	B. L .Theraja	Electrical Technology Vol.I	S. Chand Publication, Delhi ISBN-9788121924405
2	V.N. Mittle	Basic Electrical Engineering	Tata McGraw Hill Publishing Company Ltd., New Delhi. ISBN- 0074516329, 9780074516324
3	Edward Hughes	Electrical Technology	Low Price Edition ISBN-9780582405196
4	H. Cotton	Electrical Technology	CBS Publishers& Distributors ISBN-8123909284, 9788123909288
5	S.B. Lal Saksena and Kaustuv Dasgupta	Fundamentals of Electrical Engineering Part-1	Cambridge University Press, New Delhi ISBN : 9781107464353

XIII. LEARNING WEBSITES & PORTALS

Sr.No	Link/Portal	Description
1.	https://www.electrical4u.com/electrical-engineering-articles/basic-electrical/	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-parameters-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=xpZDAiX3-_7xrnnr	Basics Magnetic Circuits
10.	https://archive.nptel.ac.in/courses/117/106/117106108/	Basic Electrical Circuits

Name & Signature:

1) **Smt. Sujala P. Phadnaik**
Lecturer in Electrical

2) **Smt. Madhuri H. Bilgi**
Lecturer in Electrical

(Course Experts)

Name & Signature:	Name & Signature:
Dr. S .S. Bharatkar (Programme Head)	**Shri. S. B .Kulkarni** (CDC In-charge)

GOVERNMENT POLYTECHNIC, PUNE

'120 – NEP' SCHEME

PROGRAMME	DIPLOMA IN EE
PROGRAMME CODE	02
COURSE TITLE	COMPUTATIONAL LABORATORY
COURSE CODE	EE21205
PREREQUISITE COURSE CODE & TITLE	NA

I. LEARNING & ASSESSMENT SCHEME

Course Code	Course Title	Course Type	Learning Scheme					Credits	Assessment Scheme										
			Actual Contact Hrs./Week			SLH	NLH		Paper Duration	Theory				Based on LL & TSL				Based on SL	Total Marks
														Practical					
			CL	TL	LL					FA-TH	SA-TH	Total		FA-PR		SA-PR		SLA	
										Max	Max	Max	Min	Max	Min	Max	Min	Max	Min
EE21205	COMPUTATIONAL LABORATORY	SEC	2	0	2	0	4	2	-	0	0	0	0	50	20	50@	20	-	-	100

Total IKS Hrs for Term: 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,*# - Online Examination,@$ - Internal Online Examination

Note:

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

1. If a candidate is not securing minimum passing marks in **FA-PR** (Formative Assessment - Practical) of any course, then the candidate shall be declared as **'Detained'** in that semester.
2. If a candidate does not secure minimum passing marks in SLA (Self Learning Assessment) of any course, then the candidate shall be declared as **'fail'** and will have to repeat and resubmit SLA work.
3. **Notional learning hours** for the semester are **(CL + LL + TL + SL) hrs. * 15 Weeks**
4. **1 credit** is equivalent to **30 Notional hours**.
5. * Self-learning hours shall not be reflected in the Timetable.
6. * Self-learning includes micro-projects/assignments/other activities.

II. RATIONALE:

For any engineering, computer software skills are mandatory. Computer has become important part of any learning process. Therefore, it is necessary for any engineering student to have basic idea about computer languages. 'C' is most widely used general purpose powerful, efficient and compact language. This subject covers C as a basic logic development language. SCILAB is said to be the language of engineers. It is widely used in mathematics, science and engineering. The SCILAB is used in this subject to solve common mathematical problems and to write simple program for analysis of electrical circuits and to plot simple response graph.

III. COMPETENCY :

The aim of this course is to attend following industry identified competency through various teaching learning experiences:

• Using C Programming and SCILAB Software to analysis the electrical circuit and build the mathematical model of electrical system.

IV. COURSE-LEVEL LEARNING OUTCOMES (CO'S)

The practical experiences and relevant soft skills associated with this course are to be taught and implemented, so that the student demonstrates the following industry oriented COs associated with the above mentioned competency:

1. Know the basic concepts of C programming.
2. Execute the C programs
3. Debug different types of errors.
4. Know the main features and importance of programming environment of the SCILAB.
5. Draw plots and subplots of electrical different waveforms and response using SCILAB
6. Apply working knowledge of SCI LAB Simulink package to simulate and \ solve Electrical Circuits.

V. THEORY LEARNING OUTCOMES AND ALIGNED COURSE CONTENT:

Sr. No	Theory Learning Outcomes (TLO'S) aligned to CO's.	Learning content mapped with TLO's.	Suggested Learning Pedagogies	Relevant COs
		UNIT 1. BASICS OF C(CL HRS-4)		
1	TLO 1a. Learn the basic concepts of C programming. TLO1b.Distinguish different programming approaches.	1.1 History of C. 1.2 Steps involved in problem solving using Algorithms and Flowcharts. 1.3 Basic structure of C program, Steps to be followed for– Creation, Compilation and Execution of a C program, use of simple scanf( ) and printf( ) functions. 1.4 C Character set, keywords and identifiers, constants, variables, data types. 1.5 Operators and expressions, Library functions. (Arithmetic, Relational, Logical). 1.6 Managing input-output operations – using functions like get char( ) – reading a character, putchar( ) –writing a character, scanf( ) – formatted input and printf( ) – formatted output	Hands-on Demonstration	CO1
		UNIT 2 DECISION MAKING(CL HRS-4)		
2	TLO 2a. Distinguish different programming approaches. TLO 2b.Write C programs and execute. TLO 2c. Debug different types of errors..	2.1 Decision making & branching using If, If-Else, multi branch If, nested If statement, switch -case statement. 2.2 Decision making using loop statements like while, do while, for.	Hands-on Demonstration	CO2
		UNIT 3 ARRAYS(CL HRS-6)		
3	TLO 3a. Distinguish different programming approaches. TLO 3b.Write C programs and execute. TLO 3c.Debug different types of errors..	3.1Declaring one dimensional array. 3.2 Simple programs on arrays such as largest of array, sorting array. 3.3 Strings – initializing string, manipulating strings of charaters.	Hands-on Demonstration	CO3
		UNIT-4 SCILAB ENVIRONMENT (CL HRS-4)		
4	TLO 4 Learn the basic concepts of SCILAB/MATLAB.	4.1 Command window, Command history, Workspace, Edit window, Help window 4.2 SCILAB/MATLAB Basic: common operators, common functions, special constants, command line, data structures, string, saving and loading variables. 4.3. Commands, general, directory, workshop, termination	Hands-on Demonstration	CO4

		UNIT-5 MATRICES IN SCILAB(CL HRS-04)		
5	**TLO** 5.a.Distinguish different programming approaches. **TLO** 5b.Write programs and execute it. **TLO** 5c Debug different types of errors.	5.1 Entering data in Matrices, calculating sum, mean, length, max and min. Matrix Subscripts, Colon operator. 5.3 Solving Linear system	Hands-on Demonstration	**CO5**
		UNIT 6 PROGRAMMING & GRAPHICS IN SCILAB(CL HRS-06)		
6	**TLO** 6a Distinguish different programming approaches. **TLO** 6b Write programs and execute it. **TLO** 6c Debug different types of errors. **TLO** 6d Distinguish different plotting approaches 6f Program based on plot and subplot command	6.1 Editor: Creating Function file and subprograms 6.2 PLOTS : printing labels, grid and axes box, entering text in a plot , axis control 6.3 Subplot, Multiple plots using plot , hold ,line commands, Specialized 2 D plots using Polar, area, bar, pie, stem function	Hands-on Demonstration	**CO6**
		UNIT 7 FUNDAMENTALS OF SIMULINK IN SCILAB USING XCOS(CL HRS-4)		
7	TLO 7a. Program to create simulink model by using XCOS.	7.1 Collecting blocks to create a model. 7.2 Modifying block parameters, labeling blocks. 7.3 Simulink the model.	Hands-on Demonstration	**CO6**

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

Sr No	Practical/Tutorial/Laboratory Learning Outcome (LLO)	Laboratory Experiment / Practical Titles /Tutorial Titles	Number of hrs.	Relevant Cos
1	**LLO** 1a. Learn the basic concepts of C programming. **LLO** 1b. Distinguish different programming approaches.	1) Write a Program to print the text "Welcome to C programming"	2	CO1
		2) Write a program to find the area and circumference of a circle.	2	CO1,2, 3
2	**LLO** 2a. Distinguish different programming approaches. 2b.Write C programs and execute. **LLO** 2c. Debug different types of errors.	3) Write a program to calculate the instantaneous value of an AC quantity like v=Vm sinωt	2	CO1,2, 3
		4) Write a program to display the electrical units in the following format:	2	CO1,2, 3
		Electrical quantity | Unit Resistance | Ohm Current | Ampere Voltage | Volt Power | Watt		
3.	**LLO** 3a.Write C programs and execute. **LLO** 3b. Debug different types of errors.	5) Write a program to find equivalent resistance when resistors are connected in series, equivalent capacitance when capacitors are connected in parallel.	2	CO1,2, 3

		6) Write a program to find impedance in series RLC circuit	2	CO1,2, 3
		7) Write a program to generate the electricity bill according to the units consumed for lighting installation as per present tariff	2	CO1,2, 3
		8) Write a program using switch – case to calculate i. Power dissipated in resistance ii. Energy stored in capacitor iii. Energy stored in inductor	2	CO1,2, 3
		9) A. Using for loop find the current through a resistor, for voltage varying from 5V to 20V in steps of 5V, using Ohm's Law	2	CO1,2, 3
		10) B. Using while loop find the current through a resistor, for voltage varying from 50V to 100V in steps of 10V, using Ohm's Law	2	CO1,2, 3
		11) C. Using do While loop find the current through a resistor, for voltage varying from 16V to 8V in steps of 4V, using Ohm's Law	2	CO1,2, 3
		12) Write a program to input 10 numbers to an array and display the greatest number	2	CO1,2, 3
4	LLO 4. Learn the basic concepts of SCILAB/MATLAB	**13)** Understand general, Directory, Workspace, Termination, Help commands in SCILAB, Such as General Commands, clock, date, ver Directory commands, wd,cd,dir,ls,path,mk dir Workspace commands , who, whos, clearall, clc, clf Termination commands. Ctrl C, quit, exit Help Commands, help, help topic, demo.	2	CO4
		14) Use SCILAB to enter a data in matrix and practice the functions such as sum, mean, length, max and min	2	CO4
5	LLO 5.a.Distinguish different programming approaches. LLO 5b.Write programs and execute it. LLO 5c Debug different types of errors	**15)** Write commands to create two matrices of 3 * 3 size and perform addition, subtraction, multiplication, right division, left division using SCILAB	2	CO5
		16) Write a program in SCILAB to plot a curve given by equation y = sin(x), y=cos(x), y=x^2 (Use hold command)	2	CO5
6	LLO 6a Distinguish different programming approaches. LLO 6b Write programs and execute it. LLO 6c Debug different types of errors. LLO 6d Distinguish different plotting approaches LLO 6e Program based on plot and subplot command	17) Create a Simulink model to analyze the performance of R L, RC, and RLC circuits	2	CO6

Perform any 12 practical. All CO's should be covered in the perform practical.

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

NA

VIII. LABORATORY EQUIPMENT/INSTRUMENTS/TOOLS/SOFTWARE REQUIRED

Sr. No	Equipment Name with Broad Specifications	Relevant LLO Number
1	C- Programming Software	1-12
2	PC , 8GB RAM, 80 GB HDD, i5 Processor	1-17
3	SCILAB Software	13-17

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

NA

X. ASSESSMENT METHODOLOGIES/TOOLS

Formative assessment (Assessment for Learning)	Summative Assessment (Assessment of Learning)
Lab performance, Assignment, Self-learning and Seminar/Presentation	Lab. Performance, viva voce

XI. SUGGESTED COS- POS MATRIX FORM

Course Outcomes (COs)	Programme Outcomes(POs)							Programme Specific Outcomes *(PSOs)			
	PO-1 Basic and Discipline-Specific Knowledge	PO-2 Problem Analysis	PO-3 Design/ Development of Solutions	PO-4 Engineering Tools	PO-5 Engineering Practices for Society, Sustainability and Environment	PO-6 Project Management	PO-7 Life Long Learning	PSO-1	PSO-2	PSO-3	PSO-4
CO1	1	1	1	--	--	1	2	--	1	--	--
CO2	1	2	2	--	1	2	2	1	1	--	--
CO3	1	2	2	--	--	1	1	1	--	--	--
CO4	1	--	--	--	1	1	2	1	--	--	--
CO5	1	2	1	--	--	--	1	1	--	--	--
CO6	1	1	1	1	--	--	--	--	--	--	--

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

XII. SUGGESTED LEARNING MATERIALS/BOOKS

Sr. No	Author	Title	Publisher
1	Brian W. Kernighan, Dennis M. Ritchie, 2nd Edition, Prentice Hall of India	The C Programming Language	ISBN-81-203-0596-5
2	Yashavant P. Kanetkar , Twelfth edition , BPB Publications,	Let Us C	ISBN- 978-81-8333-163-0
3	E. Balagurusamy , Seventh Edition , Mc. Graw Hill Education	Programming in Ansi C	ISBN -978-93-392-1966-6 ISBN-93-392-1966-x
4	Henry Mullish, Herbert L. Cooper , Fifth Edition, Jaico Publishing House	The spirit of C , An Introduction to Modern Programming	ISBN- 81-7224-040-6
5	Er Hema Ramachandran , Dr Achutsankar S. Nair.	Scilab (A Free Software to Matlab)	S. Chand & Co. Ltd. ISBN: 9788121939706, 9788121939706
6	Sandeep Nagar,	Introduction to Scilab: For Engineers and Scientists	Apress; 1st ed. edition (11 November 2017) ASIN: B077GCH7KH

XIII. LEARNING WEBSITES & PORTALS

Sr. No	Link/Portal	Description
1.	www.scilab.org	Open Source
2.	www.nptel.com	Open source with registration
3	https://www.tutorialspoint.com/python/index.htm	Open source with registration
4	https://spoken-tutorial.org/	Open source with registration
5	https://www.programiz.com/	Open source with registration
6	http://fresh2refresh.com/cprogramming	Open source with registration
7	http://www.learn-c.org/	Open source with registration

Name & Signature:

Smt. Nilambari V. Devarkar
Lecturer in Electrical Engineering

Smt. Archana A. Patole
Lecturer in Electrical Engineering

(Course Experts)

Name & Signature:	Name & Signature:
Dr. S. S. Bharatkar (Programme Head)	**Shri. S. B. Kulkarni** (CDC In-charge)

GOVERNMENT POLYTECHNIC, PUNE
'120-NEP' SCHEME

PROGRAMME	DIPLOMA IN EE
PROGRAMME CODE	02
COURSE TITLE	ELECTRICAL MATERIALS AND DRAWING
COURSE CODE	EE31201
PREREQUISITE COURSE CODE & TITLE	NA

I. LEARNING AND ASSESSMENT SCHEME:

Course Code	Course Title	Course Type	Learning Scheme					Credits	Assessment Scheme										
			Actual Contact Hrs./Week						Paper Duration(hrs.)	Theory				Based on LL & TL				Based on Self Learning	Total Marks
														Practical					
			CL	TL	LL	SLH	NLH			FA-TH	SA-TH	Total		FA-PR		SA-PR		SLA	
										Max	Max	Max	Min	Max	Min	Max	Min	Max	Min	
EE31201	ELECTRICAL MATERIAL AND DRAWING	SEC	03	01	02	02	08	04	03	30	70	100	40	25	10	--	--	25	10	150

Total IKS Hrs. for Semester: 0 Hrs.

Abbreviations: CL-Class Room 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, *# Online 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 bedeclared as "Detained" in that semester.
3. If candidate is not securing minimum passing marks in SLA of any course, then the candidate shall bedeclared 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/assignments / other activities.

RATIONALE:

The course is aimed to provide exposure to the various electrical materials that are used in electrical engineering and their applications in designing electrical equipment and it gives the fundamental knowledge of various materials used in electrical engineering. This course provides essential knowledge in the selection of conducting, dielectric, insulating, magnetic, semiconductor and superconductor materials during the design of electrical engineering equipment.

An electrical drawing is a type of technical drawing that shows information about power, lighting, and communication for an engineering project. Introduction of Latest Software like EPLAN will help for Electrical circuit Design.

COURSE LEVEL LEARNING OUTCOMES (CO's)

1. Recall different materials and their properties which are used in electrical equipment as conductors and their properties in electrical equipment.
2. Illustrate various types of dielectric materials, special purpose materials and their properties in various conditions.
3. Evaluate types of magnetic materials and their behavior.
4. Analyze semi-conductor and superconducting materials used in electrical engineering and the different effects associated with the materials.
5. Able to Drawing Electrical Symbols, Circuits also by using EPLAN Software

I. THEORY LEARNING OUTCOMES AND ALIGNED COURSE CONTENT

Sr. No.	Theory Learning Outcomes(TLO's) aligned to CO's.	Learning content mappedwith TLO's	Suggested Learning Pedagogies	Relevant Cos
UNIT 1: CONDUCTORS (CL Hrs.- 10, Marks –14)				
1	TLO 1.1 Explain the Classification of conductor TLO 1.2 Explain high conductivity materials and high resistivity materials TLO 1.3 Describe the Thermoelectric Effect TLO 1.4 Explain about High conducting materials TLO 1.5 Explain characteristics and applications of conductors TLO 1.6 Describe material used in AC and DC machine	1.1 Conductors Classification: High conductivity, high resistivity materials 1.2 Fundamental requirements of high conductivity materials and high resistivity materials. 1.3 Mobility of electrons in metals, factors affecting conductivity and resistivity of electrical material. 1.4 Thermoelectric Effect: Seeback effect, Peltier effect, 1.5 Commonly used high conducting materials: copper, aluminum, bronze brass properties and characteristics, constantan, platinum and nichrome properties, characteristics and applications, the material used for AC and DC machine	Chalk-Board, Presentations, Demonstration, Videos	CO1
UNIT 2: DIELECTRIC MATERIALS AND INSULATORS (CL Hrs. – 10, Marks 18)				
2	TLO 2.1 Describe the properties of Dielectric materials TLO 2.2 Explain breakdown in dielectric, mechanical & electrical materials TLO 2.3 Describe the effect of temperature on dielectric materials TLO 2.3 Explain the insulating oils, transformer oil, and capacitor oils properties. TLO 2.4 Describe the classification of insulations TLO 2.5 Explain the insulating materials	2.1 Properties of gaseous, liquid, and solid dielectric, dielectric as a field medium, electric conduction in gaseous, liquid, and solid dielectric. 2.2 Breakdown in dielectric materials, mechanical and electrical properties of dielectric materials, 2.3 Effect of temperature on dielectric materials, polarization, loss angle and dielectric loss 2.4 Petroleum-based insulating oils, transformer oil, capacitor oils and their properties. 2.5 Classification of insulation (Solid) and application in AC and DC machines 2.6 Solid electrical insulating materials, fibrous, paper boards, yarns, cloth tapes, sleeving wood, impregnation, plastics, filling, and bounding materials, fibrous, film, mica, rubber, mica-based materials, ceramic materials.	Chalk-Board, Presentations, Demonstration, Videos	CO 2

	UNIT-3 MAGNETIC MATERIALS (CL Hrs.- 10, Marks-18)			
3	TLO 3.1 Define the basic term related to magnetic materials. TLO 3.2 Describe the classification of Magnetic materials TLO 3.3 Explain Hysteresis loop, magnetic susceptibility, Coercive force, curie temperature, magneto-striction. TLO 3.4 Explain the Common magnetic materials	3.1 Magnetic Materials Basic terms 3.2 Classification of magnetic material: diamagnetic, paramagnetic, ferromagnetic, anti-ferromagnetic and amorphous material, 3.3 Hysteresis loop, magnetic susceptibility. 3.4 Coercive force, curie temperature, magneto-striction. 3.5 Factors affecting permeability and hysteresis loss 3.6 Common magnetic materials: soft and hard magnetic materials, electric steel, sheet steel, cold rolled grain-oriented silicon steel, hot rolled grain-oriented silicon steel	Chalk-Board, Presentations, Demonstration, Videos	CO 3
	UNIT-4 SEMI-CONDUCTORS AND SUPERCONDUCTORS (CL Hrs. -10, Marks-10)			
4	TLO 4.1 Describe the types of semiconductors TLO 4.2 Explain the Hall effect, drift, mobility, and diffusion in Semiconductors TLO 4.3 Describe Superconductivity, critical field, Meisser effect of superconductor TLO 4.4 Explain the properties of superconductors TLO 4.5- Describe the concept of Critical field, Meissner effect, type-I and type-II Superconductors	4.1 General concepts, energy bands 4.2 Types of semiconductors: intrinsic Semi-conductors, extrinsic Semiconductors, compound semiconductors, amorphous semiconductors, 4.3 Hall effect, drift, mobility, diffusion in Semiconductors, semiconductors, and their applications. 4.4 **Superconductors:** Superconductivity, properties of superconductors 4.5 Critical field, Meissner effect, type-I and type-II Superconductors	Chalk-Board, Presentations, Demonstration, Videos	CO 4

UNIT-5 ELECTRICAL DRAWING & EPLAN SOFTWARE (CL Hrs-08, Marks-10)				
5	TLO 5.1 Explain Electrical diagram concept also describe types of Electrical symbols TLO 5.2 Draw the different Electrical and Electronics Symbols, RLC series & Parallel circuits, types of earthing, Bridge circuits TLO 5.3 Explain the basics of EPLAN software TLO 5.4 Compare EPALN & AutoCAD Software TLO 5.5 Explain the uses of EPLAN Software TLO 5.6 Explain the EPLAN user interface & shortcut Keys	5.1 Introduction of Electrical diagram 5.2 Type of Electrical Diagram 5.3 Drawings of Different Electrical and Electronics Symbols 5.4 Drawing of RL, RC, RLC series circuit. 5.5 Drawing of RL, RC, RLC Parallel circuit. 5.6 Drawing of Types of Earthing 5.7 Drawing of Types of Bridge Circuits **EPLAN Software** 5.7 Introduction of EPLAN 5.8 Comparison of EPLAN & Similar Software 5.9 Uses of EPLAN Software 5.10 User interface: - Toolbars, Workspace 5.11 Shortcut keys used in EPLAN	Chalk-Board, Presentations, Demonstration, Videos	CO 5

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

.Sr. No.	Practical/Tutorial/Laboratory Learning Outcome (LLO)	Laboratory Experiment/Practical Titles/Tutorial Titles	No. of Hrs.	RelevantCOs
1	LLO1.1 - Collect the information regarding Conducting material	Study of Conducting material, its property, characteristics & Application	2	CO1
2	LLO 2.1 Measure insulation resistance of cables using insulation tester	Measurement of insulation resistance of cables using insulation tester	2	CO2
3	LLO 3.1 Test insulating oil for its dielectric strength.	Dielectric strength test of given insulating oil sample.	2	CO2
4	LLO 4.1 - Collect the information regarding Magnetic material	Study of Magnetic materials used in industrial area its property, characteristics & Application	2	CO3
5	LLO 5.1 - Collect the information regarding Semiconductor & Super conductor materials	Study of Semiconductor & Super conductor materials its property, characteristics & Application	2	CO4
6	LLO 6.1 - Identify different Electrical Symbols	Drawing Sheet of the Electrical Symbols	2	CO5
7	LLO 7.1 - Identify different Electronics Symbols	Drawing Sheet of the Electronics Symbols	2	CO 5
8	LLO 8.1 - Interpret the RL, RC, RLC series and Parallel circuit	Drawing Sheet of RL, RC, RLC series and Parallel circuit	2	CO 5

9	LLO 9.1- Interpret the type of earthing	Drawing sheet of Types of Earthing	2	CO 5
10	LLO 10.1- Interpret the Electrical Machine Parts	Drawing Sheet of Electrical Machine Parts	2	CO 5
11	LLO 11.1- Interpret the types of transformers	Drawing sheet of Single-phase transformer, Three-phase transformer, and Autotransformer	2	CO 5
12	LLO 12.1- Identify the Different electrical components, machines in the Electrical Laboratory	Drawing Sheet on Electrical laboratory layout	2	CO 5
13	LLO 13.1- Identify the location & Points used in the Earth mat	Drawing sheet of Earth mat used in 66kV/11kV Substation also Draw Single line diagram of 66kV/11kV Substation.	2	CO5
14	LLO 14.1- Interpret the interface of EPLAN software	Demonstration of EPLAN Software	2	CO5
15	LLO 15.1- Identify the different models used in Substation	Make a Model of any one equipment used in the Substation (i.e. Isolator, Insulator etc.)	2	CO1,2,3,4

Perform Any 12 Practical. All COs should be covered in the Perform practical.

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

Micro project:

Only one micro-project is planned to be undertaken by a student that needs to be assigned to him/her. In the first four semesters, the micro-projects are group-based. However, in the fifth and sixth semesters, it should preferably be individually undertaken to build up the skill and confidence in every student to become a problem solver so that he/she contributes to the projects of the industry. In special situations where groups must be formed for micro-projects, the number of students in the group should **not exceed Six students** or an individual taking into consideration the capabilities and circumstances at that time.

The micro-project could be industry application-based, internet-based, workshop-based, laboratory-based or field-based. Each student will have to maintain a dated work diary consisting of individual contributions to the project work and give a seminar presentation of it before submission. The total duration of the micro-project should **not be less than 16 (sixteen) student engage hours** during the course. The student ought to submit a micro-project by the end of the semester to develop the industry-oriented COs.

List of Micro-projects.

1) Model of Electrical Parts.
2) Reports on Electrical symbols with Functions & Its use
3) Reports on Electronics symbols with Functions & Its use
4) Draw the Single line diagram of any substation
5) Draw any Electrical parts with the help of EPLAN software
6) Collect information from internet or otherwise on the different Conducting materials along with the forms in which they are available and submit report on it
7) Collect information from internet or otherwise on the different Insulating materials along with the forms in which they are available and submit report on it
8) Collect information from internet or otherwise on the different electromagnetic materials along with the forms in which they are available and submit report on it
9) Collect information from internet or otherwise on the different Semiconductors & Superconductors materials along with the forms in which they are available and submit report on it

Note:- "These are the just suggestive topics. Faculty must design Micro project / Activities / Assignments based on Course Outcome requirement"

VIII. LABORATORY EQUIPMENT / INSTRUMENTS / TOOLS / SOFTWARE REQUIRED

Sr. No.	Equipment Name with broad specifications	Relevant LLO
1	Computer with EPLAN Electrical P8 software	14.1
2	Half imperial board	6.1 to 13.1
3	Manual Drawing tools: Drafter, set squares, Compasses, Lead pencil HB	6.1 to 13.1

IX. SUGGESTED FOR WEIGHTAGE TO LEARNING EFFORTS & ASSESSMENT PURPOSE

(Specification Table)

Unit	Unit Title	Aligned COs	Learning Hours	R Level	U Level	A Level	Total marks
1	**Conductors**	CO 1	10	2	8	4	14
2	**Dielectric Materials and Insulators**	CO 2	10	2	10	6	18
3	**Magnetic materials**	CO3	10	2	10	6	18
4	**Semi-Conductors and Superconductors**	CO4	10	2	6	2	10
5	**Electrical Drawing & EPLAN Software**	CO5	08	2	2	4	10
Total			48	10	50	20	70

X. ASSESSMENT METHODOLOGIES/TOOLS

Formative assessment (Assessment of learning)	Summative Assessment (Assessment of learning)
• Two-unit tests of 30 marks and an average of two-unit tests. • For laboratory learning 25 marks	• End semester assessment of 70 marks Theory examination.

XI. SUGGESTED COS- POs –PSOs MATRIX FORM

Course Outcome (COs)	Programme Outcomes(POs)						
	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
CO1	3	2	3	1	1	1	2
CO2	3	2	3	1	1	1	2
CO3	3	2	3	1	1	1	2
CO4	3	2	1	1	1	1	2
CO5	3	1	2	2	2	1	2

Course Outcome (COs)	Programme Specific Outcomes(PSOs)			
	EE			
	PSO1	PSO2	PSO3	PSO4
CO1	01	01	--	01
CO2	01	01	--	01
CO3	01	01	--	01
CO4	01	01	--	01
CO5	--	02	02	--

XII. SUGGESTED LEARNING MATERIALS / BOOKS

Sr. No	Author name	Title	Publisher
1	A.J. Dekker	Electrical Engineering Materials	PHI Publication.
2	C. S. Indulkar and S. Thiruvengadam	An Introduction to Electrical Engineering Materials	S. Chand & Co., India.
3	R K Rajput	A Course in Electrical Engineering Materials	Laxmi Publications
4	S. P. Seth and P. V. Gupta	A Course in Electrical Engineering Materials	Rai & Sons Publication
5	S.K. Bhattacharya	Electrical and Electronic Engineering Materials	Khanna Publishers, New Delhi.
6	Bernd Gischel	EPLAN Electric P8 Reference Handbook	Hanser Publishers, Munich Hanser Publications, Cincinnati
7	K.L. Narang	Electrical Engineering Drawing	Satya Publication, New Delhi

XIII. LEARNING WEBSITES & PORTALS

Sr. No.	Link/Portal	Description
1	https://www.dfliq.net/electrical-materials-products/	Information of Various Electrical materials
2	https://www.youtube.com/watch?v=vKKhxwn4P4o&list=PLz_2HXKfre3aHIfDKkNeRIcc348APdzkX	Basic information of Electrical materials
3	www.bharatskills.gov.in Directorate general of training - central repository for skills in NSQF curriculum	www.bharatskills.gov.in Directorate general of training - central repository for skills in NSQF curriculum

Name & Signature: **Mr. Makarand L. Bhagwat** Lecturer in Electrical (Course Experts)	**Mr. Ravi B. Chauthmal** Lecturer in Electrical (Course Experts)
Name & Signature **(Dr. S.S. Bharatkar)** (Program Head)	Name & Signature: **Shri. S.B. Kulkarni** (CDC In-charge)

GOVERNMENT POLYTECHNIC, PUNE

'120 – NEP' SCHEME

PROGRAMME	DIPLOMA IN CE/EE/ET/ME/MT/CM/IT/DDGM
PROGRAMME CODE	01/02/03/04/05/06/07/08
COURSE TITLE	PROFESSIONAL COMMUNICATION
COURSE CODE	HU11202
PREREQUISITE COURSE CODE & TITLE	NA

I. LEARNING & ASSESSMENT SCHEME

Course Code	Course Title	Course Type	Learning Scheme					Credits	Paper Duration	Assessment Scheme										
			Actual Contact Hrs./Week			SLH	NLH			Theory				Based on LL & TSL				Based on SL		Total Marks
														Practical						
			CL	TL	LL					FA-TH	SA-TH	Total		FA-PR		SA-PR		SLA		
										Max	Max	Max	Min	Max	Min	Max	Min	Max	Min	
HU11202	PROFESSIONAL COMMUNICATION SKILLS (PCO)	SEC	-	-	2	-	2	1		-	-	-	-	25	10	25@	10	-	-	50

Total IKS Hrs for Sem. : 0 Hrs

Abbreviations: CL- Classroom Learning, TL- Tu tutorial Learning, LL-Laboratory Learning, SL H-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, *# OnLine Examination,@$ Internal Online Examination.

Note :

1. FA-TH represents the average of two class tests of 30 marks each conducted during the semester.
2. If the candidate does not secure minimum passing marks in FA-PR of any course then the candidate shall be declared as "Detained" in that semester.
3. If the 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 timetable.
7. * Self-learning includes micro-projects/assignments / other activities.

II. RATIONALE:

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

III. COURSE-LEVEL LEARNING OUTCOMES (CO'S):

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

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

IV. THEORY LEARNING OUTCOMES AND ALIGNED COURSE CONTENT:

Sr. No	Theory Learning Outcomes (TLO'S) aligned to CO's.	Learning content mapped with TLO's.	Suggested Learning Pedagogies	Relevant COs
	UNIT-I PROFESSIONAL COMMUNICATION: AN OVERVIEW			
1	TLO 1.1 Describe the importance of professional communication in given situations. TLO 1.2 Identify the types of communication barriers in given situations and suggest remedies. TLO 1.3 Use different types of verbal and non–verbal communication for the given situation.	1.1 Definition of professional communication- Importance, relevance, Elements and process of communication,7 C's of Professional Communication (Clarity, Conciseness, correctness, coherent, concrete, courteous & Complete). 1.2 Communication barriers, Types of barriers (Linguistic, Psychological, Technological). 1.3 Types of Communication– Verbal (Oral-Written), Formal, Informal (Grapevine) and Vertical Comm.	Language lab, Role plays, Chalkboard, Reference books, Case studies.	CO1
	UNIT - II LISTENING & NOTE-TAKING			
2	TLO 2.1 Identify the difference between listening and hearing. TLO 2.2 Differentiate the types of listening in various situations. TLO 2.3 Take notes during lectures and seminars. Make use of types of note-taking and note-making for different subjects/topics.	2.1 Difference between listening & Hearing. 2.2 Types of listening a)Active listening b)Passive listening c)Selective listening. 2.3 Techniques of Note-taking, Types of note taking (Outline notes, Mind Mapping, Flowcharts).	Language Lab, Classroom learning, NPTEL, Role Play.	CO2
	UNIT - III OFFICE DRAFTING			
3	TLO 3.1 Prepare notices/agenda for the given type of meeting/information. TLO 3.2 Prepare minutes of meeting/s. TLO 3.3 Draft a circular for a particular information/event.	3.1 Format of Notice, Drafting Agenda. 3.2 Preparing Minutes of the meeting. 3.3 Format of Circular.	Whiteboard, Language Lab, Reference books, Classroom learning.	CO3
	UNIT - IV WRITING SKILLS FOR PROFESSIONAL COMMUNICATION			
4	TLO 4.1 Compose cover letter and CV / Resume for jobs. TLO 4.2 Apply E-mail Etiquettes for professional purposes. TLO 4.3 Compose Emails for different official purposes.	4.1 Job Application with Resume / CV. 4.2 E-Mail Etiquettes. 4.3 Writing official E-Mails to communicate intended purposes.	Language lab, Classroom learning NPTEL, Reference books.	CO4

Sr. No	Theory Learning Outcomes (TLO'S) aligned to CO's.	Learning content mapped with TLO's.	Suggested Learning Pedagogies	Relevant COs
	UNIT - V REPORT WRITING			
5	TLO 5.1 Compose technical reports. TLO5.2 Draft accident and Investigation.	5.1 Introduction to report writing 5.2 Accident Report and Investigation Report.	Chalk and talk, Language Lab, Collaborative learning, Classroom learning.	**CO5**

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

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

Sr. No	Practical/Tutorial/Laboratory Learning Outcome (LLO)	Laboratory Experiment / Practical Titles /Tutorial Titles	Number of hrs.	Relevant COs
12	LLO 12.1: draft complaint/enquiry letter for various situations.	Complaint and Enquiry letter	2	CO4
13	LLO 13.1: List psychological barriers to communication. LLO 13.2 Prepare case studies on any two psychological barriers and suggest remedies to overcome the barriers.	Psychological barriers to Communication.	2	CO1
14	*LLO 14.1 - Draw a flow chart and mind mapping for any topic related to the curriculum.	Listening Skills.	2	CO2
15	*LLO 15.1 - Face mock interview arranged by your teacher.	Job Application, Resume / CV & Interview.	2	CO4

Note:

- "*" marked practicals are compulsory for coverage of all course outcomes.
- The remaining practicals are recommended to provide enhanced skills/abilities.
- Any **12** assignments out of **15** are compulsory

Note:

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

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

Micro project

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

VII. LABORATORY EQUIPMENT/INSTRUMENTS/TOOLS/SOFTWARE REQUIRED:

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

VIII. SUGGESTED FOR WEIGHTAGE TO LEARNING EFFORTS & ASSESSMENT PURPOSE

(Specification Table):

N.A.

IX. ASSESSMENT METHODOLOGIES/TOOLS:

Formative assessment (Assessment for Learning)	Summative Assessment (Assessment of Learning)
1. Term Work (FA-PR) 2. Micro-project.	1. Practical Exam of 25 marks using language lab. (SA-PR)

X. SUGGESTED COs- POs MATRIX FORM:

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

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

XI.SUGGESTED LEARNING MATERIALS/BOOKS

Sr.No	Author	Title	Publisher with ISBN Number
1	M Ashraf Rizvi	Effective Communication Skills	Tata McGraw-Hill Publication-ISBN 0070599521, 9780070599529
2	Sanjay Kumar and Pushp Lata	Communication Skills	Oxford University Press ISBN 9780199457069
3	MSBTE Textbook	Communication Skills	MSBTE
4	Robert King	Effective communication Skills	Audio Book -ISBN 978181667009742
5	N P Sudharshana, C Savitha	English for Technical Communication	Cambridge-ISBN 978-13-16640-08-1
6	C. Murlikrishna, Sunita Mishra	Communication Skills for Engineers	Pearson - ISBN 978-81-317-3384-4
7	Meenakshi Raman, Sangeeta Sharma	Technical Communication, Principles and Practice	Oxford University Press -ISBN 978-1316640-08-1
8	K. K. Sinha	Business Communication	Galgotiya Publishing company, New Delhi ISBN 9789356227064
9	Rajendra Pal, J.S. Korlahalli	Essentials of Business Communication	Sultan Chand & Sons, New Delhi ISBN 9788180547294

XIII. LEARNING WEBSITES & PORTALS

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

Name & Signature:

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Lecturer in English

Dr.S.P.Palve
Lecturer in English

(Course Experts)

Name & Signature:

Dr. S. S. Bharatkar
(Programme Head)

Name & Signature:

Shri.S.B.Kulkarni
(CDC In-charge)

GOVERNMENT POLYTECHNIC, PUNE

'120 – NEP' SCHEME

PROGRAMME	DIPLOMA IN EE
PROGRAMME CODE	02
COURSE TITLE	BASIC MECHANICAL ENGINEERING
COURSE CODE	ME21202
PREREQUISITE COURSE CODE & TITLE	NA

I. LEARNING & ASSESSMENT SCHEME

Course Code	Course Title	Course Type	Learning Scheme					Credits	Assessment Scheme											
			Actual Contact Hrs./Week			SLH	NLH		Paper Duration	Theory				Based on LL & TSL				Based on SL		Total Marks
														Practical						
			CL	TL	LL					FA-TH	SA-TH	Total		FA-PR		SA-PR		SLA		
										Max	Max	Max	Min	Max	Min	Max	Min	Max	Min	
ME21202	BASIC MECHANICAL ENGINEERING	AEC	2	-	2	-	4	2	-	-	-	-	-	50	20	25@	10	-	-	75

Total IKS Hrs for Term: 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, *# - Online Examination, @$ - Internal Online Examination

Note:

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

1. If a candidate is not securing minimum passing marks in **FA-PR** (Formative Assessment - Practical) of any course, then the candidate shall be declared as **'Detained'** in that semester.
2. If a candidate does not secure minimum passing marks in SLA (Self Learning Assessment) of any course, then the candidate shall be declared as **'fail'** and will have to repeat and resubmit SLA work.
3. **Notional learning hours** for the semester are **(CL + LL + TL + SL) hrs. * 15 Weeks**
4. **1 credit** is equivalent to **30 Notional hours.**
5. * Self-learning hours shall not be reflected in the Timetable.
6. * Self-learning includes micro-projects/assignments/other activities.

II. RATIONALE:

Electrical engineering is the basic engineering branch. Electrical power supply systems are needed for operating various mechanical equipment. Hence, in mechanical industry, the electrical engineer must take care of various electrical installations with its maintenance of refrigeration and air conditioning, portable generators, industrial material handling system and power generation plants. This course will help us to understand various mechanical systems for identifying different mechanical faults.

III. COURSE-LEVEL LEARNING OUTCOMES (CO's)

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

CO1: Understand the working of Power Plant equipment's.
CO2: Select different components used in Material handling system.
CO3: Use of Hydraulic turbine and Hydraulic pumps.
CO4: Understand working of Air compressor and Refrigeration system.
CO5: Identify different faults in the above mechanical equipment.

IV. THEORY LEARNING OUTCOMES AND ALIGNED COURSE CONTENT

Sr. No	Theory Learning Outcomes (TLO'S) aligned to CO's.	Learning content mapped with TLO's.	Suggested Learning Pedagogies	Relevant COs
	UNIT-I Power plants equipment and prime movers (CL Hrs.- 06)			
1.	TLO 1.1. List components of steam boilers and turbines. TLO 1.2 Explain working of portable generator. TLO 1.3 Identify different faults in different power plant equipment.	1.1 Layout of Thermal Power Plant, Major thermal power plants in India 1.2 Introduction to steam boilers- Babcock-Wilcox boilers, Lamont and Loeffler boilers 1.3 Introduction to steam Turbines- Impulse and reaction turbine 1.4 Introduction, Classification of I.C Engines, working of four stroke cycle petrol and diesel engine, Working of two stroke cycle petrol engine. 1.5 Introduction to portable generators: Basic elements of Portable Generator, Manufacturers, and specifications of portable generator 1.6 Mechanical parameters measurement- Introduction to Pressure measurement: Bourdon tube pressure gauge, *Temperature measurement: Optical pyrometer, Thermocouple, Heat measurement: Calorimeter Speed measurement of rotating elements: Tachometer, Stroboscope 1.7 Preliminary mechanical faults occurred in steam boilers, turbines, and IC engines.	Demonstrate various models/Charts of boilers and turbines.	CO1
	UNIT-II Industrial Material handling systems (CL Hrs-06)			
2.	TLO 2.1 Use mechanical components in simple Machines/ equipment. TLO 2.2 Select appropriate material handling system. TLO 2.3 Identify faults in Industrial Material handling systems.	2.1 Mechanical components for motion and power transmission: Types and uses of • Gears • Belt drives • Chain drives, • Bearings • Couplings 2.2 Introduction to material handling systems: Manufacturers, specifications, construction and working of • Material transfer lifts, • Conveyors, • Overhead cranes. 2.3 Preliminary mechanical faults occurred in Industrial Material handling systems.	Demonstration of various mechanical components using charts and models	CO2 CO5

Sr. No	Theory Learning Outcomes (TLO'S) aligned to CO's.	Learning content mapped with TLO's.	Suggested Learning Pedagogies	Relevant COs
	UNIT-III Hydraulic Machines (CL Hrs- 06)			
3.	TLO 3.1 List different components of hydraulic turbines and Pumps. TLO 3.2 Explain working of hydraulic pumps. TLO 3.3 Identify faults in hydraulic equipment.	3.1 Layout of Hydraulic Power Plant, Major hydraulic power plants in India 3.2 Introduction to hydraulic turbines: construction and working of Pelton wheel, Franci's turbine, Kaplan turbine 3.3 Introduction to hydraulic pumps: construction and working centrifugal pump, reciprocation pump and submersible pump. 3.4 Preliminary mechanical faults occurred in Centrifugal, reciprocating, and submersible pumps	Demonstrate working of Hydraulic power plant. /Pumps using Chart/models	CO3 CO5
	UNIT- IV Refrigeration and Air conditioning (CL Hrs- 06)			
4.	TLO 4.1 Explain working of air compressor. TLO 4.2 List different components of refrigerator and air conditioner. TLO 4.3 Explain working of refrigerator and air conditioner. TLO 4.4 Identify faults in Refrigeration and air conditioning equipment system	4.1 Introduction to Compressor-Manufacturers, Specifications, construction and working of reciprocating compressor, screw compressor. Hermetically sealed compressor. 4.2 Introduction to Refrigeration and Air conditioning: Vapor compression cycle, Construction and working of simple domestic refrigerator and window air conditioner, Manufacturers, and specification. 4.3 Preliminary mechanical faults occurred in reciprocating compressor and Refrigeration and air conditioning equipment	Demonstrate air compressor, Refrigeration system and air conditioning system using charts.	CO4 CO5

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

Sr. No	Practical/Tutorial/Laboratory Learning Outcome (LLO)	Laboratory Experiment / Practical Titles /Tutorial Titles	Number of hrs.	Relevant COs
1	LLO 1.1 Identify different components of Thermal Power Plants	Identify steam boilers using models and charts.	2	CO1
2	LLO 2.1 Use temperature, pressure, and speed measuring devices.	Measure temperature, pressure and speed of different equipment using appropriate measuring devices.	2	CO1
3	LLO 3.1 Observe working of portable generator.	Demonstrate working of steam turbine.	2	CO1
4	LLO 4.1 Select different drive system for given application with justification	Calculate speed ratio of Belt Drive used in air compressor and Driven Motor.	2	CO2

Sr. No	Practical/Tutorial/Laboratory Learning Outcome (LLO)	Laboratory Experiment / Practical Titles /Tutorial Titles	Number of hrs.	Relevant COs
5	LLO 5.1 Identify different components of material handling system used in Industry.	Demonstrate working of lift / conveyor used in Industry.	2	CO2
6	LLO 6.1 Observe working of material handling system used in Industry.	Demonstrate working of Overhead Crane used in Industry	2	CO2
7	LLO 7.1 Observe working of Hydraulic power plant.	Demonstrate Working of Hydraulic Power plant.	2	CO3
8	LLO 8.1 Use of centrifugal pump for given application	Identify different components of Centrifugal Pump.	2	CO3 CO5
9	LLO 9.1 Use of reciprocating pump for given application.	Identify different components of Reciprocating Pump.	2	CO3 CO5
10	LLO 10.1 Use of reciprocating compressor for given application.	Identify different components of Reciprocating compressor.	2	CO4 CO5
11	LLO 11.1 Identify different components of refrigeration and air conditioning system.	Demonstrate working of household refrigerator and window air conditioner for identifying different components and type.	2	CO4 CO5
12	LLO 12.1. Collect information related to water lifting systems in ancient India.(IKS)	Collect information of water lifting systems in ancient India relation with Hydraulic pumps (IKS).	2	CO4

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

Micro project:

a. **Steam boiler and Turbines:** Draw electrical layout of any one power plant.
b. **I C Engine:** collect leaflet of diesel engine generator sets from the market. Analyze and compare the specifications.
c. **Hydraulic Turbine:** Prepare a chart showing parts of different type of commonly used hydraulic turbine from reference book.
d. **Refrigeration system:** student will make chart of wiring diagram of latest 02 each refrigeration/ Window air conditioner available in market.
e. **Refrigeration control:** - make model of refrigeration controls demonstrating their functioning (at least 02) in the institute / laboratory under the guidance of teacher.

Assignment: -

a. Prepare seminar on boilers used in power plants.
b. Prepare seminar on Application of I.C. Engine.
c. Make troubleshooting chart for Refrigerator and Air conditioners.
d. Collect manufacturer specification for various Refrigerator and Air conditioners
e. Prepare power point presentation for Hydraulics and Steam turbine.
f. Make troubleshooting chart for Centrifugal Pump.

VII. LABORATORY EQUIPMENT/INSTRUMENTS/TOOLS/SOFTWARE REQUIRED

Sr.No	Equipment Name with Broad Specifications	Relevant LLO Number
1	Model of Babcock Wilcox Boiler	1
2	Charts of Thermal power Plant, Steam Boilers, Steam turbines	1
3	Mercury/Alcohol Thermometers (Range 0 to 150 °C)	2
4	Optical Thermometer/Pyrometer (Range 30 to 400 °C)	2
5	Bourdon Tube Pressure Gauge (Range 0 to 15 bar)	2
6	Portable generator with load bank minimum capacity 2.2 kVA	3
7	Digital Tachometer (Max. speed 10000 rpm)	2
8	Stroboscope (Max. speed 10000 rpm)	2
9	Models of Different gears- Spur, Helical, Bevel, Worm and worm, Rack and Pinion	4,5,6
10	Models of Belt drive- Open and Cross Flat Belt, V belt	4,5,6
11	Models of Chain Drive- Sprockets and chain	4,5,6
12	Deep groove Ball bearings – Single row, self-aligned, Roller	4,5,6
13	Centrifugal pump -minimum up to single phase 0.5 HP	7,8,9
14	Reciprocating pump-minimum up to 1 HP	7,8,9
15	Household refrigerator- minimum up to 165 liter	10,11
16	Air Compressor- Multistage reciprocating, pressure up to 12 bar, Motor- 1 HP	10,11
17	Window air conditioner capacity minimum 1.5 TR	11

VIII. SUGGESTED FOR WEIGHTAGE TO LEARNING EFFORTS & ASSESSMENT PURPOSE : NOT APPLICABLE

IX. ASSESSMENT METHODOLOGIES/TOOLS:

NOT APPLICABLE

X. SUGGESTED COs- POs MATRIX FORM

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

Legends:- High:03, Medium:02, Low:01, NoMapping: -
*PSOs are to be formulated at the institute level

XI. SUGGESTED LEARNING MATERIALS/BOOKS

Sr.No	Author	Title	Publisher with ISBN Number
1	P.K.Nag	Power Plant Engineering	McGraw Hill Education ,ISBN: 978-9339204044
2	R.K. Rajput	Power Plant Engineering	Tata-McGraw Hill Education. ISBN : 9788131802557
3	K. Subramanya	Hydraulic Machines	McGraw Hill Education (India) Private, ISBN, 1259006840, 9781259006845
4	S.S.Rattan	Theory of Machines	Tata-McGraw Hill Education. ISBN, 1283187124, 9781283187121
5	C. P. Arora	Refrigeration and Air conditioning	Tata-McGraw Hill Education ISBN-13: 978-0-07-008390-5

XII. LEARNING WEBSITES & PORTALS

Sr.No	Link/Portal	Description
1.	https://www.youtube.com/watch?v=IdPTuwKEfmA	Steam Power Plant working animation
2.	https://www.youtube.com/watch?v=fk3DjD9gSsk	Principle and working of Steam boiler animation
3.	https://www.youtube.com/watch?v=dVBoZ4PfZmE	Working of Steam boiler animation
4.	https://www.youtube.com/watch?v=SPg7hOxFItI	Working of Steam turbine animation
5.	https://www.youtube.com/watch?v=N70vbRbF36A	Mechanical Drive System
6	https://www.youtube.com/watch?v=hhE_2oVIZiI	Manual Material Handling system
7	https://www.youtube.com/watch?v=o_C2XISZ3Uc	Belt conveyor animation

8	https://www.youtube.com/watch?v=-hooifWJ1jY	Hydraulic Power Plant animation
9	https://www.youtube.com/watch?v=BaEHVpKc-1Q	Principle of Centrifugal Pump
10	https://www.youtube.com/watch?v=XpcCUtYzwy0	Centrifugal Pump working animation
11	https://www.youtube.com/watch?v=41vb6T42_Tk	Reciprocating Pump - Construction and working
12	https://www.youtube.com/watch? v=3BCiFeykRzo&t=155s	Water turbine (Francis)
13	https://www.youtube.com/watch?v=7NwxMyqUyJw	Refrigerator system working animation
14	https://www.youtube.com/watch?v=FzydmAmZM54	Window Air Conditioner working animation
15	https://www.youtube.com/watch?v=PjcdqAkP0UA	Vapour compression system construction and working
16	https://www.youtube.com/watch?v=_qyF1yolDgY	Problems & Remedies of Centrifugal Pump
17	https://www.youtube.com/watch?v=k0NOLbZXSNc	Refrigeration - System Troubleshooting

Name &Signature:

Dr. Sunil Adhau
Lecturer in Mechanical Engineering

Mr. B. B. Dome
Lecturer in Mechanical Engineering

(Course Experts)

Name & Signature:	Name & Signature:
Dr. S. S. Bharatkar (Programme Head)	**Shri.S.B.Kulkarni** (CDC In-charge)

GOVERNMENT POLYTECHNIC, PUNE

'120 – NEP' SCHEME

PROGRAMME	DIPLOMA IN CE/EE/ET/ME/MT/CM/IT/DDGM
PROGRAMME CODE	01/02/04/05/05/06/07/08
COURSE TITLE	YOUTH LEADERSHIP FOR CLIMATE ACTION
COURSE CODE	HU21202
PREREQUISITE COURSE CODE AND TITLE	NO

I. LEARNING & ASSESSMENT SCHEME

Course Code	Course Title	Course Type	Learning Scheme					Credits	Assessment Scheme											
			Actual Contact Hrs./Week			SLH	NLH		Paper Duration Hrs.	Theory				Based on LL &TSL				Based on SL		Total Marks
														Practical						
			CL	TL	LL					FA-TH	SA-TH	Total		FA-PR		SA-PR		SLA		
										Max	Max	Max	Min	Max	Min	Max	Min	Max	Min	
HU21202	YOUTH LEADERSHIP FOR CLIMATE ACTION	VEC	-	-	-	2	2	1	-	-	-	-	-	-	-	-	-	50	20	50

Total IKS Hrs for Term: 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,*# - Online Examination,@$ - Internal Online Examination

Note:

1. FA-TH represents an average of two class tests of 30 marks each conducted during the semester.
2. If a candidate is not securing minimum passing marks in FA-PR (Formative Assessment - Practical) of any course, then the candidate shall be declared as **'Detained'** in that semester.
3. If a candidate does not secure minimum passing marks in SLA (Self Learning Assessment) 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 hours.**
6. * Self-learning hours shall not be reflected in the Timetable.

6.*Self-learning includes micro-projects/assignments/other activities.

II. RATIONALE:

Climate change is a global phenomenon that transcends borders. Climate change poses significant threats to biodiversity, ecosystems, and natural resources. Its impacts, such as rising temperatures, extreme weather events, and sea-level rise, affect communities worldwide. Addressing climate change is a collective responsibility to safeguard the planet and its ecosystems for current and future generations. Climate change exacerbates social and economic inequalities, affecting vulnerable communities disproportionately. With increasing climate risks, and exposure to hazards, citizens need to improve clean and green skills.

Mitigating climate change and taking climate action is essential for preserving the Earth's biodiversity, maintaining ecosystem services, and ensuring the sustainability of vital resources upon which human societies depend. By taking climate action, societies can enhance resilience, reduce vulnerability, and promote social and economic stability. Sustainable practices help protect, preserve, and sustain the environment, as well as stimulate economic growth in sectors such as renewable energy and energy efficiency.

Climate action involves transitioning to more sustainable and resource-efficient practices. This includes adopting clean energy sources, improving energy efficiency, and promoting circular economies. Imparting skills to the human resources in the clean and green sectors is also a climate action. Such measures not only mitigate climate change but also contribute to the efficient use of resources and the reduction of environmental degradation.

The national, state, and multilateral efforts, such as the Mission Life, State Climate Action Planning, Paris Agreement, etc. provide a framework for countries to work together in reducing greenhouse gas emissions, adapting to climate impacts, and fostering technology transfer for sustainable development.

III. COURSE-LEVEL LEARNING OUTCOMES (CO's)

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

CO1: Demonstrate a comprehensive understanding of the science behind climate change, its causes, and its impacts on the environment, economy and society.
CO2: Understand the principles of water resource management (WRM), water conservation and its application in the context of climate change.
CO3: Understand the relationship between climate change and waste management, including the issues and impacts of waste management practices on greenhouse gas emissions.
CO4: Demonstrate a comprehensive understanding of energy systems, including sources, distribution, and consumption patterns
CO5: Advocate for and implement energy conservation practices at individual, community, and organizational levels to reduce overall energy demand.
CO6: Develop a comprehensive understanding of the intricate interconnections between biodiversity and climate, and recognize the reciprocal impacts each has on the other.

IV. THEORY LEARNING OUTCOMES AND ALIGNED COURSE CONTENT:

Sr. No	Theory Learning Outcomes(TLO'S) aligned to COs.	Learning content mapped with TLOs.	Suggested Learning Pedagogies	Relevant COs
	UNIT-I LIVING WITH CLIMATE CHANGE			
	SUBUNIT 1: CLIMATE CHANGE PHENOMENON AND SCIENCE			
1.1	**TLO 1.1.1** Able to articulate the fundamental differences between weather and climate **TLO 1.1.2** Understanding of the basic principles of climate change, including the greenhouse effect, human-induced factors, and the consequences of a warming planet. **TLO 1.1.3** Able to define the concept of a carbon footprint, understanding it as the total amount of greenhouse gases.	1.1.1 Understanding Climate: Weather versus Climate 1.1.2 Climate and the Greenhouse Effect 1.1.3 Natural and Human-induced Climate Change 1.1.4 Carbon footprint	Video Lectures (Online Mode: Link https://www.mahayouthnet.in/)	1
	SUB UNIT 2: CLIMATE CHANGE IMPACTS			
1.2	**TLO 1.2.1** Grasp the foundational science behind climate change, including the greenhouse effect, human-induced emissions, and the role of feedback mechanisms in global warming. **TLO 1.2.2** Identify and analyze key indicators of climate change, such as rising global temperatures, changing precipitation patterns, sea level rise, and the frequency of extreme weather events. **TLO 1.2.3** Understand the diverse climate patterns across India's biogeographic regions, including the Himalayas, Indo-Gangetic Plains, Western Ghats, Eastern Ghats, Deccan Plateau, and coastal regions.	1.2.1Global impacts and uncertainties 1.2.2 Effects on India and its various biogeographic regions 1.2.3Impacts on livelihoods and economy: Agriculture and Horticulture 1.2.4Impacts on Vulnerable Communities: Fishing Communities	Video Lectures (Online Mode: Link https://www.mahayouthnet.in/)	1

	SUB UNIT 3: CLIMATE ACTION			
1.3	**TLO1.3.1** Understand the concept of climate change mitigation and adaptation and its role in preparing for and responding to the impacts of climate change. **TLO1.3.2** Understand the concept of sustainable development and its three dimensions: economic, social, and environmental. **TLO1.3.3** Identify and articulate the connections between climate change impacts and existing social, economic, and environmental inequalities. **TLO1.3.4** Understand the importance of community-based climate action and initiatives led by local communities in India. **TLO 1.3.5** Understand the concepts of green skills and green work, emphasizing their role in promoting sustainability and environmentally conscious practices in various industries.	1.3.1 Mitigation and Adaptation 1.3.2 Intergovernmental processes 1.3.3 Sustainable Development Goals 1.3.4 Climate Justice 1.3.5 India's journey towards Climate Action 1.3.6 Majhi Vasundhara and Other Initiatives 1.3.7 Role of Individuals 1.3.8 Green Skills and Green Work	Video Lectures (Online Mode: Link https://www.mahayouthnet.in/)	2
	UNIT-II WATER MANAGEMENT FOR CLIMATE CHANGE			
	SUB UNIT 1: THE NEED OF WATER MANAGEMENT AND CONSERVATION			
2.1	**TLO 2.1.1** Understand the concept of water management and its significance in addressing water-related challenges. **TLO 2.1.2** Describe the water cycle and its role in the distribution and availability of water. **TLO 2.1.3** Identify regions facing water scarcity and understand the factors contributing to water shortages. **TLO 2.1.4** Analyze patterns of human water consumption and its impact on local and global water resources. **TLO 2.1.5**Examine water quality issues, including pollution sources, contaminants, and their effects on ecosystems and human health. **TLO 2.1.6** Recognize the role of community engagement in water conservation efforts and sustainable water management practices. **TLO 2.1.7** Understand the	2.1.1 Water - the basis of life. 2.1.2 The water cycle and freshwater availability. 2.1.3 Water use in India and the importance of groundwater. 2.1.4 Water Resources in Maharashtra. 2.1.5 Use of water in our lives. 2.1.6 Virtual Water. 2.1.7 Traditions of water use and management. 2.1.8 Water Quality - an important dimension. 2.1.9 Wastewater: a problem and a potential resource.	Video Lectures (Online Mode: Link https://www.mahayouthnet.in/)	2

	concept of wastewater and Identify and analyze the sources of pollutants in wastewater, including industrial discharges, agricultural runoff, and urban sewage.			
	SUB UNIT 2: ISSUES AND CHALLENGES IN WATER MANAGEMENT			
2.2	**TLO 2.2.1** Understand the concept of water stress and its implications for a region's ability to meet water demand for various purposes. **TLO 2.2.2** Explore the role of agriculture in water stress, including irrigation practices, cropping patterns, and the impact of changing agricultural practices. **TLO 2.2.3** Understand the concept of water pollution and differentiate between various types of pollutants affecting water bodies. **TLO 2.2.4** Understand the environmental, ecological, and public health impacts of different pollutants in water, such as nutrients, heavy metals, pathogens, and synthetic chemicals. **TLO 2.2.5** Identify common waterborne diseases, such as cholera, typhoid, dysentery, and gastroenteritis, and understand their causative agents. **TLO 2.2.6** Define the challenges associated with inadequate sanitation, including issues related to open defecation, lack of access to sanitary facilities, and the impact on public health.	2.2.1 Water Stress in India. 2.2.2 Water resources limitation and increasing use. 2.2.3 Water stress in agriculture. 2.2.4 Water pollution and contamination. 2.2.5 Health impacts of poor water quality. 2.2.6 Water management and climate change. 2.2.7 The global challenge of water and sanitation. 2.2.8 Summary - causes of water stress.	Video Lectures (Online Mode: Link https://www.mahayouthnet.in/)	2
	SUB UNIT 3:TOWARDS SUSTAINABLE WATER MANAGEMENT			
2.3	**TLO 2.3.1** Understand and define the concept of sustainable water management, considering its ecological, social, and economic dimensions. **TLO 2.3.2** Understand the significant initiatives launched by the Government of India/State government which focuses on water resources and management.	2.3.1 Towards sustainable water management 2.3.2 Swachh Bharat - The Mission for a Clean India 2.3.3 Jal Jeevan Mission - Water for All 2.3.4 Atal Bhujal Yojana - Replenish Groundwater 2.3.5 Mission Amrit Sarovar - Rejuvenate Water bodies 2.3.6 Jalyukt Shivar Abhiyan – Waterscapes.	Video Lectures (Online Mode: Link https://www.mahayouthnet.in/)	2

	SUB UNIT 4: INDIVIDUAL AND COMMUNITY ACTIONS FOR WATER AND WASTEWATER MANAGEMENT			
2.4	**TLO 2.4.1** Understand the concept of a water audit and its significance in assessing water use, efficiency, and conservation. **TLO 2.4.2** Analyze water use patterns in common household activities, including bathing, washing dishes, laundry, and gardening. **TLO 2.4.3** Understand the definition of greywater and Recognize common sources of greywater in households, including bathroom sinks, showers, bathtubs, and washing machines. **TLO 2.4.4** promote awareness within communities about the benefits of greywater management and its potential impact on water conservation. **TLO 2.4.5** Understand the concept of rainwater harvesting and its significance in sustainable water management. **TLO 2.4.6** Learn different methods used to calculate rainwater harvesting potential	2.4.1 Conduct water audits 2.4.2 Save water at home 2.4.3 Promote greywater management at home and in the community 2.4.4 Spread the word on sustainable water management 2.4.5 Calculate Rainwater Harvesting Potential.		2
	UNIT III: WASTE MANAGEMENT AND CLIMATE ACTION			
	SUBUNIT 1: WHAT IS WASTE?			
3.1	**TLO 3.1.1** Understand the term "domestic waste" and distinguish it from other types of waste generated in different contexts. **TLO 3.1.2** Classify domestic waste into different categories such as organic waste, recyclables, hazardous waste, and non-recyclables. **TLO 3.1.3** Learn various methods used to quantify household waste, including direct measurement, sampling, and estimation techniques. **TLO 3.1.4** Identify specific waste patterns associated with different generations and lifestyles **TLO 3.1.5** Understand the Sustainable Development Goals (SDGs)	3.1.1 Define and enlist types of waste 3.1.2 List the components of domestic waste 3.1.3 Differentiate between biodegradable and non-biodegradable waste 3.1.4 Assess the quantum of waste generated at home 3.1.5 Changes in Waste generation over human generations 3.1.6 Review lifestyle choices 3.1.7 SDGs and Link of Waste with SDGs	Video Lectures (Online Mode: Link https://www.mahayouthnet.in/)	3

	TLO 3.1.6 Analyze the critical role of waste management in achieving multiple SDGs			
SUBUNIT 2: ISSUES IN WASTE MANAGEMENT				
3.2	**TLO 3.2.1** Emphasizing waste impact on the environment, human health, and overall sustainability. **TLO 3.2.2** Identify health risks associated with improper waste disposal, such as the spread of diseases and exposure to hazardous materials. **TLO 3.2.3** Analyze how waste, particularly organic waste in landfills, contributes to greenhouse gas emissions and climate change.	3.2.1 Why is waste an issue? 3.2.2 Health impacts from mismanagement of waste 3.2.3 Work conditions of waste workers 3.2.4 Waste of natural resources and increased greenhouse gas emissions	Video Lectures (Online Mode: Link https://www.mahayouthnet.in/)	3
SUBUNIT 3: APPROACHES TO WASTE MANAGEMENT				
3.3	**TLO 3.3.1** Clearly define the waste management hierarchy **TLO 3.3.2** Waste management hierarchy role in guiding sustainable waste management practices such as source reduction, reuse, recycling, energy recovery, and disposal.	3.3.1 Hierarchy of waste management 3.3.2 Waste segregation at source 3.3.3 Reduce, Reuse, Recycle and Recover 3.3.4 Recycling of waste materials 3.3.5 Principle of circular economy 3.3.6 Avoiding waste by design 3.3.7 Composting	Video Lectures (Online Mode: Link https://www.mahayouthnet.in/)	3
SUBUNIT 4: LEGISLATIONS RELATED TO WASTE MANAGEMENT				
3.4	**TLO 3.4.1** Familiarize yourself with major national and international legislation related to waste management. **TLO 3.4.2** Define Extended Producer Responsibility (EPR) and explain its concept in the context of environmental management. **TLO 3.4.3** Define biomedical waste and distinguish it from other types of waste. Identify the various sources and types of biomedical waste generated in healthcare facilities.	4.1 Municipal Solid Waste Management Rules 2016 4.2 Plastic Waste Management Rules 4.3 Extended Producer Responsibility (EPR) 4.4 Biomedical Waste Management 4.5 Preventive Measures for Manual Scavenging	Video Lectures (Online Mode: Link https://www.mahayouthnet.in/)	3
SUBUNIT 5: ACTION FOR IMPROVING WASTE MANAGEMENT				
3.5	**TLO 3.5.1** Develop skills in data collection methods for waste assessment, such as waste audits, surveys, and interviews.	5.1 Waste assessment in your community or town 5.2 Setting up a compost unit	Video Lectures (Online Mode: Link https://www.mahayouthnet.in/)	3

	TLO 3.5.2 Analyze collected data to identify patterns, trends, and areas for improvement in waste management practices. **TLO 3.5.3** Define composting and explain the biological processes involved in the decomposition of organic matter. **TLO 3.5.4** Explore different composting methods, such as aerobic and anaerobic composting, and choose the most suitable technique for the compost unit. **TLO 3.5.5** Explore different biogas production technologies, such as continuous stirred tank reactors (CSTR) and anaerobic digesters.	5.3 Biogas: Is it a possibility?		
UNIT IV: ENERGY MANAGEMENT AND CLIMATE ACTION				
SUBUNIT 1: ENERGY IN OUR LIVES				
4.1	**TLO 4.1.1** Identify the key principles of efficient energy use and conservation. **TLO 4.1.2** Familiarize yourself with different energy sources, including renewable and non-renewable options. **TLO 4.1.3** Understand the connection between energy production, consumption, and climate change. **TLO 4.1.4** Understand India's commitments to sustainable energy at the national and international levels, including agreements	4.1.1 Energy and quality of life 4.1.2 Sources of energy 4.1.3 Energy and C Change 4.1.4 Judicious use of non-renewable energy resources 4.1.5 A Just Transition 4.1.7 India's commitment to sustainable energy 4.1.8 Policies and Programs for Energy Management 4.1.9 Clean Energy for Cooking	Video Lectures (Online Mode: Link https://www.mahayouthnet.in/)	4

SUBUNIT 2: YOUTH ACTION TO IMPROVE ENERGY MANAGEMENT				
4.2	**TLO 4.2.1** Recognize the role of youth in driving positive change in energy management. **TLO 4.2.2** Understand how youth-led initiatives can influence energy policies, behaviours, and practices. **TLO 4.2.3** Identify and promote energy-efficient practices in daily life, schools, and communities.	4.1.1 Avoid energy wastage 4.2.2 Energy-efficient appliances 4.2.3 Renewable Energy-Specific Policies and Schemes 4.2.4 Low Carbon Lifestyles book	Video Lectures (Online Mode: Link https://www.mahayouthnet.in/)	4
SUBUNIT 3: PROMOTE SUSTAINABLE ENERGY AT HOME, INSTITUTION AND IN THE COMMUNITY				
4.3	TLO 4.3.1 Identify and calculate energy requirements at the household level and enlist ways of efficient energy usage TLO 4.3.2 Identify opportunities for improving public energy use in their village or town TLO 4.3.3 Design surveys that effectively capture data on energy-efficient appliance availability and usage patterns. TLO 4.3.4 Identify and analyze emerging technologies within the energy sector that require specialized skills. TLO 4.3.5 Demonstrate the ability to map existing skills within the energy sector workforce. TLO 4.3.6 Analyze skill gaps and their implications for the industry.	4.3.1 Energy audit at home or institution 4.3.2 Energy saving opportunities 4.3.3 Energy access survey 4.3.4 Surveys of energy-efficient appliance availability and use 4.3.5 Survey of renewable energy use 4.3.6 Survey energy sector skilling opportunities 4.3.7 Share study findings with policymakers	Video Lectures (Online Mode: Link https://www.mahayouthnet.in/)	5
UNIT V: BIODIVERSITY CONSERVATION AND CLIMATE ACTION				
SUBUNIT 1: BIODIVERSITY IN OUR LIVES				
5.1	**TLO 5.1.1** Understand the concept of biodiversity and its components **TLO 5.1.2** Clearly define the concept of biocultural diversity, explaining the interconnectedness of biological diversity (biodiversity) and cultural diversity. **TLO 5.1.3** Clearly define the concept of human dependence on biodiversity, outlining the various ways in which humans rely on	**5.1.1** What is biodiversity? **5.1.2** What is Biocultural diversity? **5.1.3** Nature of Human Dependence on Biodiversity **5.1.4** Biodiversity resources in your landscape	Video Lectures (Online Mode: Link https://www.mahayouthnet.in/)	6

	diverse ecosystems for survival and well-being. **TLO 5.1.4** Develop the ability to identify and categorize the various forms of biodiversity present in the specific landscape, including plants, animals, microorganisms, and their interactions.			
	SUBUNIT 2: THREATS TO BIODIVERSITY			
5.2	**TLO 5.2.1** Categorize and differentiate between natural and anthropogenic threats to biodiversity, including habitat loss, pollution, climate change, invasive species, and overexploitation. **TLO 5.2.2** Clearly define the concepts of biocultural diversity and climate change, highlighting the interconnectedness between biological diversity, cultural diversity, and changing climatic conditions.	**5.2.1 Threats to biodiversity** **2.2.2 Biocultural diversity and climate change**	Video Lectures (Online Mode: Link https://www.mahayouthnet.in/)	6
	SUBUNIT 3: CONSERVING BIODIVERSITY			
5.3	**TLO 5.3.1** Clearly define the concept of biodiversity conservation, emphasizing its importance in maintaining ecological balance and supporting human well-being. **TLO 5.3.2** Explore the historical background that led to the development of forest acts, considering factors such as colonial influences, resource extraction, and changing societal attitudes towards forests. **TLO 5.3.3** Clearly define the concept of biodiversity conservation actions, emphasizing the multifaceted approaches and strategies employed to protect and sustain biodiversity.	5.3.1 Approaches to conservation of biodiversity. 5.3. Key legislations for biodiversity conservation 5.3.3 Actions for biodiversity conservation at various levels, including awareness raising and advocacy in the community	Video Lectures (Online Mode: Link https://www.mahayouthnet.in/)	6

Note: All above Units are Mandatory units. (In Online mode, only Units nos 1 and 2 are Mandatory and units nos 3,4, and 5 are Elective/optional)

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

NOT APPLICABLE

VI. SUGGESTED MICROPROJECT/ASSIGNMENT/ACTIVITIES FOR SPECIFIC LEARNING/SKILLS DEVELOPMENT (SELF-LEARNING)

Table 01: Individual Activities

Sr. No	Unit Name	Activity	Activity Details
1	Living with Climate Change	Calculation of your carbon footprint online	To Calculate your carbon footprint online at https://www.unfccc.int/ https://www.carbonfootprint.com/ Use two carbon footprint calculators available online to Prepare your report for Carbon footprint. Compare the calculators used and suggest which is the better calculator with the reasons.
2	Water Management and Climate Action	Conducting water audits	To conduct a Personal-level water audit. 1. Track your overall water usage: a) Read your water meter, b) Estimate usage without a meter 2. Measure individual fixture flow rates: a) Faucet and showerhead flow b) Toilet flush: 3. Monitor your water habits: a) Keep a water use log b) Observe your routines 4. Analyze your findings: a) Compare your usage to benchmarks, b) Identify potential leaks c) Prioritize areas for improvement 5. Implement water-saving strategies: a) Install water-efficient fixtures b) Shorten showers and bath times c) Run appliances only when full d) Fix leaky faucets promptly e)Utilize alternative water sources
3	Waste Management and Climate Action	Surveying Home waste	To find out How much waste is generated in your home every day conduct a home survey for a weekAnalyze as per the following: a) What makes up the maximum part of the waste? b) How much of what was thrown out could have been reused or recycled? c) Could the amount of garbage be reduced? List the ways to reduce waste at home. Calculate: a) Waste generated over a week (in grams) divided by 7= waste (gms)/ day, b) Waste (gms)/ day divided by the number of persons in your house= Waste (gms)/ day/capita Using your survey results, you can calculate the approximate waste generated by the entire population of a block of flats, township, village, town, city, etc.
4	Energy Management and Climate Action	Preparation of Survey report on energy-efficient appliances.	To prepare a Survey report on energy-efficient appliances, their availability and use. 1. Availability of Energy-Efficient Appliances: 2. Use of Energy-Efficient Appliances 3. Government Policies and Incentives 4. Technological Advancements 5. Environmental Impact and Consumer Trends
5	Biodiversity Conservation and Climate Action	Preparation of a Survey report on Biodiversity resources in your landscape	To prepare a Survey report on Biodiversity resources in your landscape based on any one point among the list given below. 1. List of trees, plants, and shrubs in the village/ town outskirts, their classification, occurrence, and usage study. 2. Draw a biocultural map of the landscape of the village/ town, the diversity of trees (mother trees) and those who maintain it 3. A village called Tree: Understand a tree as an ecosystem and the biodiversity associated with the tree. 4. Ranmeva special study 5. Dietary diversity across three generations, a 'change over time' study.

Table 2: Group Activity

Sr. No.	Unit Name	Community Project Name	Activity Details
1.	Living with Climate Change	Conduction of Feasibility Study of Renewable Energy	Conduct a feasibility study on implementing renewable energy sources (such as solar, wind, or hydroelectric power) for a specific area or institution. Analyze costs, benefits, environmental impacts, and logistics involved in transitioning to renewable energy.
2.	Water Management and Climate Action	Preparation of water audit for the college campus.	To prepare a water audit for the college campus based on the following points 1. Gather Information: 2. Identify Water Use Areas: 3. Assess Indoor Water Usage: 4. Evaluate Outdoor Water Usage: 5. Measurements and Inspections: 6. Data Analysis: 7. Recommendations for Conservation: 8. Cost-Benefit Analysis: 9. Create an Action Plan: 10. Implementation and Monitoring: 11. Educational Outreach: 12. Documentation and Reporting:
3.	Waste Management and Climate Action	Conduction of survey on Waste assessment in your locality.	1. Conduct a survey of waste management systems in your town/ locality. Observe all the stages of waste management, and note who is involved at each stage viz. Waste collection Transport Processing in different ways Disposal etc. 2. Analysis of waste management in your /locality. 3. Assessment of Waste Segregation in your /locality.
4	Energy Management and Climate Action	Conduction of energy audit at home or Institute	To conduct an energy audit at home or Institute based on the following points. Analyze your findings based on the energy audit and suggest necessary actions to minimize energy consumption. 1. Gather information and Create a checklist about the following. **1. Lighting:** • Turn off lights in unoccupied rooms. • Replace incandescent bulbs with LEDs. • Utilize natural light whenever possible. **2. Heating and Cooling:** • Set your thermostat to energy-efficient temperatures (25°C in summer, 20°C in winter). • Seal air leaks around windows and doors. • Clean or replace air filters regularly. **3. Appliances:** • Unplug electronics and chargers when not in use. • Wash clothes and dishes in cold water whenever possible. • Use energy-efficient appliances when purchasing new ones **4. Insulation:** • Check your attic and basement for proper insulation. • Seal any gaps or cracks around pipes and vents. 5. Suggest corrective actions.

Sr. No.	Unit Name	Community Project Name	Activity Details
5.	Biodiversity Conservation and Climate Action	Preparation of report on Bio-Cultural Diversity Conservation	Prepare a report on Bio-Cultural Diversity Conservation. The report should include : **a) Introduction** i) What is biodiversity? ii)What is its importance in our life? iii) Connections of human beings with their nonliving surrounding and with living forms. **b) Biodiversity resources in your landscape -:** List of trees, plants, and shrubs in the village/ town outskirts, their classification, occurrence, and usage study. **c) Understand a tree as an ecosystem and the biodiversity associated with the tree.**

Note: (1) Individual activities:

The student should complete **any Three activities** among the list given in Table No. 01. above. **(Total Marks: 30 i.e. 10 Marks for each activity)**

(2) Group activity:

Students should complete **any One Community Project** among the list given in Table No. 02 above. **(Total Marks: 20)**

VII. LABORATORY EQUIPMENT/INSTRUMENTS/TOOLS/SOFTWARE REQUIRED

Sr.No	Equipment Name with Broad Specifications	Relevant LLO Number
1	NIL (SLA Course)	NIL

VIII. SUGGESTED FOR WEIGHTAGE TO LEARNING EFFORTS & AND ASSESSMENT PURPOSE

(Specification Table)

NOT APPLICABLE

IX. ASSESSMENT METHODOLOGIES/TOOLS

Formative assessment (Assessment for Learning)	Summative Assessment (Assessment of Learning)
Individual activities and group activities. (50 marks)	Online Examination and issue of online certificate. (Total 4 Certificates)

Note: Student will be awarded 1 credit only upon submission of certificates

i) **One Certificate on combined completion of Units 1 and 2 and**

ii) **One Certificate each on completion of Units nos. 3,4, and 5.**

A total of 4 Certificates are needed to be submitted which will be issued online along with the submission of Individual activities and Group activities.

X. SUGGESTED COs- POs MATRIX FORM

NOT APPLICABLE

XI. SUGGESTED LEARNING MATERIALS/BOOKS

Sr.No	Description	Mode	Remarks
1	Learning material.	Learning material is available in PDF form	Learning material is available for all units in PDF form at the institute website.

XII. LEARNING WEBSITES & PORTALS

Sr.No	Web Link /Portal	Description
1	(Online Mode: Link https://www.mahayouthnet.in/)	Learning material is available online in the course menu after registration for this online course for all units.

XIII. ROLE OF STUDENT AND FACULTY:-

(a) ROLE OF STUDENT.

1. i)**Course Registration:** Students should register for this course by adopting the normal procedure for registration as applicable for other courses, as per the schedule declared in the academic calendar through his/her MIS login.
   ii) Online Registration: Online registration for this **Self-paced course "YOUTH LEADERSHIP FOR CLIMATE ACTION" in online mode by using the URL as under.**

   " URL for online registration: https://www.mahayouthnet.in/

   Students may join the course by scanning the QR Code as mentioned below.

(Important Note: **Students must complete both actions "a" and "b" as mentioned above. Merely completing the registration process in the Institute MIS will not get the student registered for this course.)**

2. Students should complete the **Module No. 01 and 02** of this course in online mode and complete the online assignments as available in the online module. Upon completion of these activities, the student will receive a certificate of completion for Units No. 1 and 2. (Will be generated Online from The portal)

3. Students should take up online **Module Nos. 03, 04 and 05 (which are available as "Elective Modules" in the same online module, No separate registration is needed for these modules)** and complete all unit-wise assignments as available in the online module. Upon completion of these activities, students will receive a separate certificate of completion for each unit i.e. **Units 03,04 and 05) i.e. three certificates.** (Will be generated Online from The portal)

4. Student must submit all 4 certificates (first certificate upon completing units nos. 1 and 2 and individual certificates upon completing units nos 3,4 and 5. A Total 4 certificates are needed to be submitted to the concerned faculty assigned for this course by the Concerned Head of the Department)

5. **Most Important Note regarding the award of 1 credit for this course: student must complete any 3 individual activities among the list of activities mentioned in table no 1 above AND must complete any 1 group activity AND submit all 4 certificates (generated in online mode upon completion of all 5 units in online study mode). Upon satisfying these conditions, the student will be awarded 1 credit for this course (SLA).**

7. **Detention/ Fail:**

The student shall be declared as "Detained" if he belongs to any of the following cases.

Case 1: If a candidate does not secure minimum passing marks in the SLA (Self Learning Assessment) course due to incomplete submission of assignments in offline mode despite producing 4 certificates from online mode, then the candidate shall be declared as **"Detained"** and will have to repeat and resubmit assignments in offline mode as SLA work in next semester.
Case 2: If a candidate does not submit 4 certificates from online mode though he/she has submitted all assignments in Offline mode, then the candidate shall be declared as **"Detained"** and will have to produce 4 certificates before the End-term Examination of the subsequent term.
Case 3: If a candidate fails to produce 4 certificates from online mode as well as fails to submit assignments in offline mode, then the candidate shall be declared as **"Detained"** and will have to repeat and resubmit assignments in offline mode as SLA work and he/she will be required to submit 4 certificates from the online mode in next semester.
Most Important Note: Students must complete any 3 individual activities among the list of activities AND must complete any 1 group activity AND submit all 4 certificates (generated in online mode upon completion of all 5 units in online study mode). Upon satisfying these conditions, the student will be awarded 1 credit for this course (SLA).

(b) ROLE OF FACULTY:

1. **i) Regarding confirmation of Course Registration:** Faculty should confirm that the course registration has been confirmed by the concerned registration in charge and HOD from their MIS login.

   ii) Online Registration for the course: Faculty should confirm that the student has registered for the course in online mode by scanning the QR code OR through the link provided by the portal for registering for the **Self-paced course "YOUTH LEADERSHIP FOR CLIMATE ACTION"** in online mode. Faculty should collect screenshots from the students and maintain a record of such screenshots for the concerned semester/term.

2. **Regarding submissions to be accepted:** The faculty should ensure that the student has completed all 5 modules as mentioned above. The faculty should get the 4 certificates (per student) submitted as submission against completion of the online self-paced course **"YOUTH LEADERSHIP FOR CLIMATE ACTION"** during the term/semester for which, the student have registered. Also, the Faculty should accept the submissions from each student regarding the completion of the group activities as well as individual activities as mentioned above. This activity of submission must be completed before the last date of submission for other courses. ie before the provisional detention schedule as per the academic calendar for that term.

3. **Regarding SLA assessment and allocation of Marks:** Faculty should assess the submission

with following guidelines.

i) Upon submission of online generated all 4 certificates (upon completion of online modules from the portal), the student should be considered eligible for the award of 1 credit along with satisfying the following conditions. (Faculty must not assess the individual activities and group activities if the student fails to submit all 4 certificates as proof of completion of the online course)

ii) Upon accepting the submission concerning individual activities and group activities, the assessment of these activities should be done by the faculty as per the assessment norms mentioned above in **"VI"** titled **"SUGGESTED MICROPROJECT/ASSIGNMENT/ACTIVITIES FOR SPECIFIC LEARNING/SKILLS DEVELOPMENT (SELF-LEARNING)"**

iii) Faculty should preserve the record of student-wise allotted marks in the rubrics provided for SLA assessment.

iv) FACULTY should fill UP the marks of the student in the MIS mark sheet, only if the student has completed the online course (submitted all 4 certificates) and assessment of the group activities along with individual activities has been completed within the term schedule.

v) In case the student fails to complete " iv" above, the faculty should fill up the marks obtained by the student for the part-submission and fill up those marks in the MIS mark sheet.

Name & Signature:		
Shri. Nitin D. Toradmal Lecturer in Electronics Govt. Polytechnic, Pune	**Shri. Balaji Vharkat** UNICEF, Maharashtra	**Shri. Girish W. Sonone** Lecturer in Electronics Govt. Polytechnic, Mumbai
Name & Signature: **Dr.S.S.Bharatkar** (Programme Head)	Name & Signature: **Shri.S.B.Kulkarni** (CDC In-charge)	