GOVERNMENT POLYTECHNIC, PUNE

'120 – NEP' SCHEME

PROGRAMME	DIPLOMA IN CE/ ME/MT
PROGRAMME CODE	01/04/ 05
COURSE TITLE	APPLIED PHYSICS
COURSE CODE	SC11204
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	
SC11204	APPLIED PHYSICS	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:

This course is designed with some fundamental information to help diploma engineers apply the basic concepts and principles of physics to solve broad-based engineering problems. The study of basic principles and the concepts of motion, elasticity, viscosity, surface tension, sound, heat, optics, photo electricity and X-rays will help in understanding the technology courses where emphasis is laid on the applications.

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: Estimate errors in measurement and Apply laws of motion in various applications.
CO2: Select relevant material in industries by analyzing its physical properties.
CO3: Apply the concept of simple harmonic motion, resonance and ultrasonic waves for various engineering applications.
CO4: Use basic principles of heat in related engineering problems.
CO5: Use basic principles of optics in related engineering problems.
CO6: Apply the concept of modern Physics (X-rays, LASER, Photocell) for 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 GENERAL PHYSICS (CL Hrs-7, Marks-12)			
1.	**TLO 1.1:** List fundamental and derived quantities with their unit. Explain the procedure of measuring the dimensions of a given object by using Vernier Calipers and Screw Gauge. **TLO 1.2:** Calculate the angular velocity of the given body. Derive equations of Angular motion. **TLO 1.3:** To Study range, angle of projection and maximum height of projectile.	**1.1 Units and Measurements:** Introduction, Definition of unit, Fundamental and derived units, Different System of units, Dimensions of physical quantities, measurement errors. **1.2 Angular Motion**: Definition, radius vector, angular displacement, angular velocity, angular acceleration and units, relation between linear and angular velocity, relation between linear acceleration and angular acceleration. Analytical Treatment. **1.3 Projectile motion:** Projectile motion, trajectory, range of projectile, angle of projection, time of flight.	Chalk and board Improved lecture, Tutorial Assignment Demonstration	CO1
	UNIT-II PROPERTIES OF MATTER (CL Hrs -10, Marks-14)			
2	**TLO 2.1** Apply the concept of elasticity and plasticity to select the material for engineering applications. **TLO 2.2** Apply the concept of Surface Tension to find the coefficient of Viscosity. **TLO2.3.** Establish a relation between given types of moduli of elasticity.	**2.1 Surface Tension:** Definition and unit, molecular theory of surface tension, Cohesive and adhesive forces, angle of contact and its significance, the shape of the liquid surface in a capillary tube, capillary action and examples, surface tension by capillary rise method (no derivation), effect of impurity and temperature on surface tension. analytical treatment. **2.2 Viscosity:** Definition, velocity gradient and its unit, Newton's law of viscosity, terminal velocity, Stokes law, Stokes formula, coefficient of viscosity by Stokes method (no derivation), types of flow of liquid - streamline flow, turbulent flow, Reynold's number (significance), applications and analytical treatment. **2.3 Elasticity:** Deforming Force and Restoring Force, Elasticity, Plasticity, Rigidity. Stress and Strain and their types, elastic limit and Hooke's law, types of moduli of elasticity, analytical treatment.	Chalk and board Improved lecture, Tutorial Assignment Demonstration Educational Games	CO2

Sr. No	Theory Learning Outcomes (TLO'S) aligned to CO's.	Learning content mapped with TLO's.	Suggested Learning Pedagogies	Relevant COs
	UNIT-III WAVES & OSCILLATIONS (CL Hrs-07, Marks-10)			
3	**TLO 3.1:** To study the properties of sound waves. **TLO 3.2** Find the parameters required to analyze the given wave motion and simple harmonic motion. **TLO 3.3** Explain the concept of resonance and its applications. **TLO 3.4** Describe the properties of given ultrasonic waves.	**3.1 Sound:** Sound waves, amplitude, frequency, time-period, wavelength and velocity of the wave, the relation between velocity, frequency and time-period of a wave. Analytical Treatment. **3.2 SHM:** Simple Harmonic Motion, Uniform Circular Motion as Simple Harmonic Motion, Equation of Simple Harmonic Motion, Phase of Simple Harmonic Motion. **3.3 Resonance:** Resonance concept in prehistoric times, the concept of different frequencies (Mantras) used to ignite different chakras in the body (IKS). Applications of resonance. **3.4 Ultrasonic waves:** Properties of ultrasonic waves. Applications of ultrasonic waves.	Chalk and board Improved lecture, Tutorial Assignment Demonstration.	CO3
	UNIT- IV HEAT (CL Hrs-6, Marks-10)			
4	**TLO.4.1:** To study different Gas laws. **TLO 4.2:** Distinguish Between Good Conductors and Bad Conductors of Heat. **TLO 4.3:** Introduction of Thermodynamics	**4.1 Gas Laws:** Explanation of Gas laws, Boyle's law, Charles law, Gay Lussac's law, General Gas Equation, analytical treatment, units of temperature ^0C, ^0K, ^0F with their conversion, absolute scale of temperature. **4.2 Heat:** modes of heat transfer, conduction, convection and radiation. **4.3** Introduction of Thermodynamics	Chalk and board Improved lecture, Tutorial Assignment Demonstration.	CO4
	UNIT –V OPTICS (CL Hrs-6, Marks-10)			
5	**TLO 5.1** State laws of reflection and refraction. Describe the phenomenon of total internal reflection. **TLO 5.2** Distinguish between optical fibre communication systems and ordinary systems.	**5.1 Light:** Introduction to reflection and refraction of light, laws of reflection and refraction, Snell's law, refractive index, physical significance of refractive index, critical angle, total internal reflection of light. **5.2 Fiber optics**: Propagation of light through optical fiber, the structure of the optical fiber, numerical aperture, acceptance angle, acceptance cone, types	Chalk and board Improved lecture, Tutorial Assignment Demonstration.	CO5

Sr. No	Theory Learning Outcomes (TLO'S) aligned to CO's.	Learning content mapped with TLO's.	Suggested Learning Pedagogies	Relevant COs
		of optical fibers, applications of optical fiber, comparison of optical fiber communication with electrical cable communication, analytical treatment.		
	UNIT - VI MODERN PHYSICS (CL Hrs-9, Marks-14)			
	TLO 6.1 Explain the properties of photons based on Planck's hypothesis. **TLO 6.2** Explain the construction and working of a given photoelectric device. **TLO 6.3** Explain the method to produce X-rays with its properties and engineering applications. **TLO 6.4** Differentiate between LASER and ordinary light. **TLO 6.5** Describe the properties of nanomaterials.	**6.1 Photoelectricity:** Planck's hypothesis, properties of photons.Photoelectric effect: threshold frequency, threshold wavelength, stopping potential, Work function, characteristics of the photoelectric effect, Einstein's photoelectric equation Photoelectric cell and LDR: Principle Working and applications. **6.2 X-rays:** Production of X-rays by modern Coolidge tube, properties and engineering applications. **6.3 LASER:** Laser: properties, absorption, spontaneous and stimulated emission, Population inversion, active medium, optical pumping, three energy level system, He-Ne Laser. Engineering applications of Laser. **6.4** Introduction to Nanotechnology.	Chalk and board Improved lecture, Tutorial Assignment Demonstration.	CO6

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	LLO1.1 Use of given instrument and i) Mention name and range of the given instrument. ii) Calculate the least count of the given instrument. iii) List the uses of the given instrument.	Identify the given instrument and i) Mention the name and range of the given instrument. ii) Calculate the least count of the given instrument. iii) List the uses of the given instrument.	2	CO1
2	LLO2.1 Use a Vernier caliper to Measure the dimensions of given objects. Measure the dimensions of objects of known dimensions.	Measurements of dimensions of the given object by Vernier caliper.	2	CO 1

Sr. No	Practical/Tutorial/Laboratory Learning Outcome (LLO)	Laboratory Experiment / Practical Titles /Tutorial Titles	Number of hrs.	Relevant COs
	LLO 2.2 Estimate the errors in measurement			
3	LLO3.1 Use a Micrometer Screw gauge to Measure the dimensions of given objects. Measure the dimensions of objects of known dimensions. LLO 3.2 Estimate the measurement errors.	Measurements of dimensions of given objects by micrometer screw gauge.	2	CO1
4	LLO 4.1 Study of Projectile motion.	Predict the range of the projectile from the initial launch speed and angle.	2	CO1
5	LLO5.1 Use Capillary Rise Method to study Surface Tension.	Determine surface tension by capillary rise method.	2	CO2
6	LLO6.1 Use Stokes's method to determine the coefficient of viscosity.	Measure the coefficient of viscosity of a given liquid using Stokes's method (Stokes law).	2	CO2
7	LLO7.1 Use Hooke's Law to calculate Spring constant.	Calculate the spring constant using Hooke's law.	2	CO2
8	LLO 8.1 Use a resonance tube to determine the velocity of sound. (Concept of resonance).	Determine the velocity of sound by using a Resonance Tube. (Concept of resonance).	2	CO3
9	LLO 9.1 Use a simple pendulum to determine the acceleration due to gravity.	Determination of Acceleration due to Gravity by Simple Pendulum.	2	CO3
10	LLO 10.1 Use Boyle's Law to study the relation between pressure and volume for a given gas.	Verify Boyle's law and establish a relation between pressure and volume for a given gas.	2	CO4
11	LLO 11.1 Use the Refraction Phenomenon to determine the refractive index of the glass slab.	Determination of the refractive index of the glass slab.	2	CO5
12	LLO 12.1 Use of He-Ne laser beam, to study properties of LASER.	Study the properties and working of the laser using a He-Ne laser beam.	2	CO6
13	LLO 13.1 Use photoelectric cells to study the effect of : Intensity of light on photoelectric current.	Study the effect of the Intensity of light on photoelectric current.	2	CO6

Sr. No	Practical/Tutorial/Laboratory Learning Outcome (LLO)	Laboratory Experiment / Practical Titles /Tutorial Titles	Number of hrs.	Relevant COs
14	LLO 14.1 Use photoelectric cells to study the effect of : Applied potential on photoelectric current.	Study effect of Applied potential on photoelectric current. using Photoelectric cell	2	CO6
15	LLO 15.1 Study of Divergence of LASER.	Determine the divergence of laser beam	2	CO6

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 judicial mix of a minimum of 12 or more for physics practical 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)

Only one Micro Project 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 Self Learning Assessment (SLA). 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:

- Vernier calipers: Prepare prototype vernier caliper of desired least count using card sheet
- Properties of matter: Prepare a chart of different viscous liquids.
- Sound: Prepare a chart of the velocity of sound in different materials.
- Heat: Collect good and bad conducting materials of heat
- Mobile applications: Use mobile applications for conversions of different physical quantities.
- Optical Fiber and TIR: Prepare model to demonstrate total internal reflection
- Physical quantities: Prepare a Chart on comparison of systems of units for different physical quantities.
- LASER: Prepare a chart to study Total Internal Reflection.
- X-rays/Photoelectric cell: Prepare a chart showing the properties and applications of X-rays and Photoelectric cells.

Assignment:

- Convert the units of a given physical quantity from one system of units to another.
- Prepare a chart to summarize units and measurements.
- Distinguish between transverse waves and longitudinal waves based on frequencies explain infrasonic waves, audible sound waves and ultrasonic waves.
- Collect different elastic materials and mention their Young's modulus.
- Demonstrate the variation of the angle of refraction with respect to the refractive index.
- Use a digital vernier caliper and micrometer screw gauge for measurements (lab-based).
- Applications of optical fibers in, engineering.
- Applications of X-Ray in engineering.
- Applications of LASER in engineering.
- Applications of Photoelectricity in engineering.

VII. LABORATORY EQUIPMENT/INSTRUMENTS/TOOLS/SOFTWARE REQUIRED

Sr. No	Equipment Name with Broad Specifications	Relevant LLO Number
1	Vernier Calliper : Range: 0-15 cm, Resolution 0.01 cm.	2
2	Micrometer screw gauge: Range 0-25 mm, Resolution 0.01 mm.	3
3	Simple pendulum, Stop Watch.	4
4	Glass Slab 75x50x12mm.	10
5	Travelling microscope: Range: 0.05-22 cm, Resolution 0.001 cm, Capillary tube	5
6	Battery eliminator (0-12 V, 2 A)	11,12,13
7	Voltmeter(0-10 V), ammeter (0-5 A)	1
8	Boyle's law apparatus.	10
9	Stoke's apparatus, Wooden scale, Small metal sphere.	6
10	Hooke's law apparatus	7
11	Resonance tube, Tuning fork set, Rubber pad.	8
12	Photoelectric cell.	12,13
13	He-Ne laser kit	11

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	General Physics	CO1	7	3	4	5	12
2	II	Properties of Matter	CO2	10	4	4	6	14
3	III	Waves And Oscillations	CO3	7	3	3	4	10
4	IV	Heat	CO4	6	3	4	3	10
5	V	Optics	CO5	6	3	4	3	10
6	VI	Modern Physics	CO6	9	4	5	5	14
Grand Total				**45**	**20**	**24**	**26**	**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	End Semester assessment of 25 marks for laboratory learning. End Semester assessment of 70 marks (Online)

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	2	-	1	1	1	2			
CO2	3	2	1	2	1	1	2			
CO3	3	1	1	1	1	1	2			
CO4	3	1	1	1	1	1	2			
CO5	3	1	1	1	1	1	2			
CO6	3	1	1	2	2	1	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	Narlikar J. V. ;Joshi , A. W.; Mathur , Anuradha ; et al	Physics Textbook Part I - Class XI	National Council of Education Research and Training, New Delhi, 2010, ISBN: 8174505083
2	Narlikar, J.V.;Joshi , A. W.; Mathur , Anuradha ; et al	Physics Textbook Part II - Class XI	National Council of Education Research and Training, New Delhi, 2015, ISBN: 8174505660
3	Narlikar J.V.;Joshi , A. W.; Ghatak A.K. et al	Physics Textbook Part I - Class XII	National Council of Education Research and Training, New Delhi, 2013, ISBN: 8174506314
4	Narlikar, J.V.;Joshi , A. W.; Ghatak A.K. et al	Physics Textbook Part II - Class XII	National Council of Education Research and Training, New Delhi, 2013, ISBN: 8174506713

XII. LEARNING WEBSITES & PORTALS

Sr.No	Link/Portal	Description
1	www.sciencejoywagon.com/physicszone	Electricity, Magnetism and Semiconductors, basic fiber optics
2	https://phet.colorado.edu	Electricity, Magnetism and Semiconductors, Thermometry and basic fiber optics
3	www.physicsclassroom.com	Concepts of basic physics
4	http://nptel.ac.in/course.php?disciplineId=104	Concepts of basic physics
5	http://hperphysics.phy-astr.gsu.edu/hbase/hph.html	Concepts of basic physics
6	https://www.youtube.com/results?search_query=amruta+university+physics+expts	Concepts of basic physics
7	k. https://www.youtube.com/results?search_query=physics+class+11+chapter+1	Concepts of basic physics
8	l. https://www.youtube.com/watch?v=zRGh9_a1J7s	Concepts of basic physics
9	https://iksindia.org	IKS physics
10	https://www.ancient-origins.net/history-famous-people/indian-sageacharya-kanad-001399	IKS Philosophy of atom by Acharya Kanad.

Name & Signature:

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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 Practical				Based on SL		Total Marks
			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:

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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:
Dr. V. B. Jaware (Programme Head)	**Shri. S. B. Kulkarni** (CDC In-charge)

GOVERNMENT POLYTECHNIC, PUNE

'120 – NEP' SCHEME

PROGRAMME	DIPLOMA IN CE / EE /ME/MT
PROGRAMME CODE	01/02/04/ 05
COURSE TITLE	STRENGTH OF MATERIALS
COURSE CODE	AM31201
PREREQUISITE COURSE CODE & TITLE	AM21201

I. LEARNING&ASSESSMENTSCHEME

Course Code	Course Title	Course Type	Learning Scheme					Credits	Assessment Scheme										
			Actual Contact Hrs./Week			SLA Hrs./Week	NLH		Paper Duration	Theory				Based on LL &TSL Practical				Based on SL		Total Marks
			CL	TL	LL					FA-TH	SA-TH	Total		FA-PR		SA-PR		SLA		
										Max	Max	Max	Min	Max	Min	Max	Min	Max	Min	
AM31201	Strength of Materials	DSC	03	00	02	01	06	03	03	30	70	100	40	25	10	25@	10	25	10	175

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:

Strength of Materials is a core technology subject that enables the students to understand and analyze various types of loads, stresses and strains. All Mechanical Engineering components are subjected to different types of loads and behave in a specific way. The subject is a prerequisite for understanding machine design principles and the strengths of various materials used in industries. Understanding mechanical properties and the elastic behaviour of different mechanical engineering materials will help select suitable materials for various engineering applications.

III. COURSE-LEVELLEARNINGOUTCOMES(CO'S)

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

CO1: Perform tests for evaluation of mechanical properties of different metals.
CO2: Calculate strain and deformation along all three axes, under bi and tri-axial stresses and instantaneous stress under various loading conditions.
CO3: Compute shear force and bending moment in a beam subjected to point load and UDL.
CO4: Compute the moment of inertia and bending stresses of symmetric and asymmetric structural sections
CO5: Compute dimensions of solid and hollow shafts subjected to combined loading (Twisting and Bending)

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 Simple Stresses & Strains (CL Hrs-10, Marks-16)				
1.	TLO1.1 Define various engineering properties of metals TLO1.2 Define stress and strain with their units. TLO1.3 Calculate axial strain, axial stress and Modulus of Elasticity using Hooke's law. TLO1.4 Draw stress-strain curve for ductile and brittle material in tension TLO1.5 Determine the nature and magnitude of thermal stress. TLO1.6 Calculate shear stresses for single/double/punching shear condition.	1.1 Recap of concepts of force and equilibrium. 1.2 Elastic, plastic and rigid bodies. 1.3 Mechanical properties of materials – ductility, malleability, brittleness, hardness, strength and toughness. 1.4 Stress & Strain – concept & Definitions, types of stresses and related deformationsAxial, Flexure, torsion, shear. 1.5 Hooke's Law, Young's Modulus, Axial deformation in a body and bodies in series. 1.6 Behavior of ductile and brittle materials subjected to axial tension, stress-strain or Load-deformation curve, Limit of proportionality, yielding, permanent set, yield stress, and ultimate stress. 1.7 Temperature stress and strain – concept and numerical problems on thermal stress in bodies having uniform cross-section, deformation fully prevented. 1.8 Shear stress and shear strain, Modulus of rigidity, punching shear, single and double shear.	1..Demonstration 2.Video and PPT presentation	1
UNIT-II Generalized Hooke's law & Elastic constants (CL Hrs-6, Marks-12)				

Sr.No	Theory Learning Outcomes (TLO'S) aligned to CO's.	Learning content mapped with TLO's.	Suggested Learning Pedagogies	Relevant COs
2	TLO 2.1 Define lateral and longitudinal strain, Poisson's ratio, volumetric strain and Bulk modulus TLO 2.2 Calculate strain and deformation along all three axes, under bi and triaxial stresses TLO 2.3 Compute volumetric strain and change in volume under given biaxial or triaxial stresses TLO 2.4 Estimate Resilience, Modulus of resilience, Proof Resilience. TLO 2.5 Calculate instantaneous stresses, strains and deformations under given gradual, sudden or impact loads	2.1 Linear and lateral strain, Poisson's ratio, changes in lateral dimensions. 2.2 Uni axial- Bi axial and Tri axial stress systems, strain in each direction, generalized Hooke's law 2.3 Change in the dimensions and volume, volumetric strain, volumetric stress, Bulk modulus 2.4 Relation between three moduli. 2.5 Strain Energy, Resilience, Proof Resilience and Modulus of Resilience. 2.6 Stress due to Gradual, Sudden and Impact load and corresponding deformations.	1.Demonstration 2.Video and PPT presentation	2

Sr.No	Theory Learning Outcomes (TLO'S) aligned to CO's.	Learning content mapped with TLO's.	Suggested Learning Pedagogies	Relevant COs
UNIT-III Shear Force & Bending Moment (CL Hrs10-, Marks-14)				
3	TLO 3.1 Define Shear force and The bending moment with their units and sign convention. TLO 3.2. Calculate SF and BM for the given load and beam. TLO 3.3 Draw SFD and BMD. TLO3.4. Locate point of maximum BM and point of contra flexure.	3.1 Types of Beams (Simply supported with or without overhang, Cantilever), Types of loads (Point load, Uniformly Distributed load), Bending of beam, deflected shape. 3.2 Meaning of SF and BM, Relation between them, Sign convention, 3.3 Drawing SFD and BMD, Location of point of maximum BM, Location of Point of Contra-flexure.	1. Demonstration 2. Video and PPT presentation	3
UNIT- IV Moment of Inertia & Bending Stresses (CL Hrs12-, Marks-16)				
4	TLO 4.1 Calculate Centroid, Moment of Inertia of Plane Area, radius of gyration of a given section TLO4.2 Explain Parallel and Perpendicular axes theorems TLO4.3. Calculate MI of standard shapes and composite plane figures such as I and T sections. TLO4.4. Polar MI of a given section TLO4.5 . State the assumptions of	4.1. Concept of Moment of Inertia (MI) 4.2 Parallel and Perpendicular axes theorems, Polar MI, radius of gyration 4.3 MI of standard basic shapes 4.4 Determination of MI of Composite plane figures such as I and T sections. 4.5 Theory of simple bending, Assumptions in the theory of bending, Flexural formula, concept of Neutral axis 4.6 Concept and calculation of moment of resistance, Section modulus. 4.7 Bending stress variation diagram across depth for cantilever and simply supported beams for symmetrical and unsymmetrical sections such as. Rectangular, circular, T and I sections only.	1.Demonstration 2.Video and PPT presentation	4

Sr.No	Theory Learning Outcomes (TLO'S) aligned to CO's.	Learning content mapped with TLO's.	Suggested Learning Pedagogies	Relevant COs
	the theory of bending and explain the flexural formula TLO4.5. Use a flexural formula to calculate bending stresses for a given section at a given point in a simply supported and cantilever beam. TLO4.6 Determine maximum bending stress in the given beam. TLO 4.7 Determine Section modulus and moment of resistance for the given beam			
UNIT –V Torsion in Shafts (CL Hrs-7, Marks-12)				
5	TLO 5.1 State and explain the torsional formula, TLO 5.2 Calculate torque and power transmitted by the shaft TLO 5.3 Determine shear stress and angle of twist in a shaft for given power to be transmitted/ given torque. TLO 5.4 Determine the diameter of the shaft for a given shear stress/ angle	5.1 Torsion: Concept, torsional rigidity, torsional equation and assumptions 5.2 Torsional resistance for hollow and solid circular shafts, 5.3 Power transmitted by shaft, shear stress in the shaft and angle of the twist 5.4 Solid and Hollow shaft subjected to combined loading (Twisting and Bending) ASME Code equations for shaft, Line shaft supported on two bearings with one or two pulleys (between the bearings only), and with overhang.	1.Demonstration 2.Video and PPT presentation	5

Sr.No	Theory Learning Outcomes (TLO'S) aligned to CO's.	Learning content mapped with TLO's.	Suggested Learning Pedagogies	Relevant COs
	of twist subjected to combined loading			

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

Sr. No	Practical/Tutorial/Laboratory LearningOutcome(LLO)	Laboratory Experiment / Practical Titles /TutorialTitles	Number of hrs.	Relevant COs
1	LLO1.1 Determine Stress using a tension test	Determine yield stress (or proof stress), ultimate stress and breaking stress of Mild Steel (or Tor steel) by conducting a Tension test as per IS432 (I)	2	1
2	LLO2.1 Determine the compressive strength of the material using a testing machine	Calculate the compressive strength of Ductile and brittle materials such as Mild Steel (MS), Aluminium (Al), Brass (Br), Copper (Cu) and cast Iron (CI), using a Compression testing machine as per IS 14858	2	1
3	LLO3.1 Calculate the hardness of given material using Brinell teater	Calculate the hardness of metals by conducting the Brinell Hardness Test on such as Mild Steel (MS), Aluminium (Al), Brass (Br), Copper (Cu), and Cast Iron (CI) (Any four metals) as per IS 1500	2	1
4	LLO4.1 Measure the shear strength of given material using shear stress	Determine the shear strength of various metals such as MS, Al, Br and Cu, (Any two metals) by Single & Double Shear tests as per IS 5242	2	2
5	LLO5.1 Evaluate the toughness of material	Evaluate the toughness of Ductile and brittle materials such as MS, Al, Br, CI and Cu, by conducting an Izod Impact test as per IS 1757	2	2
6	LLO6.1 Draw SFD and BMD for a given situation	Plot SFD and BMD of simply supported beams, overhanging beams and cantilever beams subjected to UDL and point loads. (2 problems on each type of beam)	2	3
7	LLO 7.1 Conduct bending test for determining flexural	Determine flexural strength by conducting a Bending Test on a timber beam of	2	4

Sr. No	Practical/Tutorial/Laboratory LearningOutcome(LLO)	Laboratory Experiment / Practical Titles /TutorialTitles	Number of hrs.	Relevant COs
	strength	Rectangular cross-section for both orientations as per IS 1708, IS 2408		
8	LLO 8.1 Calculate the diameters of the shaft for given situation	Determine dimensions of Solid and Hollow shaft subjected to combined loading (Twisting and Bending) ASME Code equations for shaft, Line shaft supported on two bearings with one or two pulleys (between the bearings only), and with overhang. (Minimum 02 numerical)	2	5

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

Microproject:

Only one micro-project is planned to be undertaken by a student that needs to be assigned to them. In special situations where groups have to be formed for microprojects, the number of students in the group should not exceed three. The micro-project could be industry application-based, internet-based, workshop-based, laboratory-based or field-based. Each micro-project should encompass two or more COs that integrate PrOs, UOs and ADOs.(Affective Domain Outcomes) .Each student must maintain an activity chart consisting of individual contributions to the project work and give a seminar presentation before submission. The student should submit a micro-project by the end of the semester to develop the industry-oriented COs

A suggestive list of micro-projects is given here. The concerned faculty could add similar micro-projects:

a. Study Compression testing machine.
b. Collect information and present in tabular form, values of Brinell Hardness and Rockwell hardness of commonly used metals
c. Prepare a demonstration model of the Torsion testing machine.
d. Prepare an Excel program for the calculation of SF and BM at any given location for Simply supported and cantilever beams.
e. Prepare a shaft model to demonstrate a relation between length and angle of twist.

Assignment: -

Students should conduct the following activities in groups and prepare reports of about five pages for each activity, also collect/record physical evidence for their (student's) portfolio, which will be helpful in their placement interviews:

a. Prepare journals based on practicals performed in a laboratory.
b. Prepare charts of maximum bending moment and shear force values in standard beams.
c. Collect information and standard values of important mechanical properties for five standard materials used in the mechanical field.
d. Present a seminar on different testing methods used in the industry.
e. Collect information comprising different machine components subjected to bending stresses.

VII. LABORATORY EQUIPMENT/INSTRUMENTS/TOOLS/SOFTWARE REQUIRED

Sr.No	Equipment Name with Broad Specifications	Relevant LLO Number
1	**Universal Testing Machine: Capacity - 100 Tons.** Type: Mechanical type digital, electrically Operated. Accessories: (1) Tensile test attachment for flat and round specimens up to32 mm. (2) Compression test attachment (3) Shear test attachment with sizes of bushes 8,10 mm, (4) Transverse test attachment with bending Punch, (5) Service tools, (6) Operation and maintenance manuals - 2 nos.	LLO1.1
2	**Digital/Mechanical Extensometer:** Least count - 0.001 mm. Max. Extension = 5 mm. Single dial gauge for 30,40 mm. 60 mm, 80 mm, 100 mm, 125 mm gauge length.	LLO1.1
3	**Brinell Hardness Testing Machine:** Test loads from 500 to 3000 kgf in steps of 250kgf; The height X Throat is 380 X 200 mm; Indentation measurement by Brinell Microscope of 25X Magnification; Special Test fixtures for odd jobs/production testing can be supplied (Optional); Computerized Brinell Impression measurement system (Optional); Manual / Optical /Computerized type Brinell Hardness testing machine are also available; Accuracy conform to IS:2281-2005 and BS:240	LLO3.1
4	**Impact Testing Machine:** IZOD Impact Test Apparatus: Pendulum drop angle: 90°-120; Pendulum effective Wt: 20-25 kg; Striking velocity of a pendulum: 3-4 m/sec; Pendulum impact energy: 168 j; Min scale graduation: 2 J; Distance of axis of pendulum rotation from center of a specimen to specimen hit by pendulum: 815 mm	LLO5.1
5	**Compression Testing Machine:** Digital display manual control compression testing; machine; Max. Capacity (KN): 2000; Max. distance between two-platen (mm): 330; Compression platen size (mm): 220×220; Column clearance (mm): 300×200; Oil pump motor power (KW): 1.5	LLO2.1
6	**Freeware** for SF and BM diagrams	LLO6.1

VIII. SUGGESTED FOR WEIGHTAGE TO LEARNING EFFORTS &ASSESSMENT PURPOSE

(SpecificationTable)

Sr.No	Unit	UnitTitle	Aligned COs	LearningHours	R-Level	U-Level	A-Level	Total Marks
1	I	**Simple Stresses & Strains**	CO1	10	2	4	10	16
2	II	**Generalized Hooke's law and elastic constants**	CO2	06	2	2	6	10
3	III	**Shear Force &**	CO3	10	2	4	10	16

Sr.No.	Unit	UnitTitle	Aligned COs	LearningHours	R-Level	U-Level	A-Level	Total Marks
		Bending Moment						
4	IV	Moment of Inertia & Bending Stresses	CO4	12	2	4	12	18
5	V	Torsion in Shafts	CO5	07	2	2	6	10
Grand Total				45	10	16	44	70

IX.ASSESSMENT METHODOLOGIES/TOOLS

Formative assessment (Assessment for Learning)	Summative Assessment (Assessment of Learning)
1. Termwork 2. Unit Tests 1 and 2	1. End Semester Practical Examination 2. End Semester Theory Examination

CO-PO MAPPING

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 Engineer-ing Tools	PO-5 Engineering Practices for Society, Sustainability and Environment	PO-6 Project Management	PO-7 Life Long Learning	PSO-1	PSO-2	PSO-3
CO1	3	3	3	2	1	1	3	1	2	NA
CO2	3	3	3	2	1	1	3	1	1	NA
CO3	3	3	3	2	1	1	3	1	1	NA
CO4	3	3	3	2	1	1	3	1	1	NA
CO5	3	3	3	2	1	1	3	1	1	NA

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	Punmia B C	Strength of Materials	Laxmi Publications (p) Ltd. New Delhi, 10/e, 2018 ISBN-10: 8131809250 ISBN-13: 978-8131809259
2	Ramamurtham S	Strength of Materials	Dhanpat Rai Publishing Company - New Delhi; Eighth edition, 2020 ISBN-10: 9384378267 ISBN-13: 978-

Sr.No	Author	Title	Publisher with ISBN Number
			9384378264
3	Stephen Timoshenko	Strength of Materials	CBS, 3 edition, 2021, ISBN-10: 8123910304 ISBN-13: 978-8123910307
4	R.S. Khurmi & N. Khurmi	A Textbook Strength of Materials	S. Chand Publishing, New Delhi, 26th edition, 2018 ISBN-10: 9789352833979 ISBN-13: 978-9352833979
5	R.S. Khurmi & J.K.Gupta	A Textbook of Machine Design	S. Chand Publishing, New Delhi, 2020 ISBN-13 978-8121925372

XII. LEARNING WEBSITES & PORTALS

Sr.No	Link/Portal	Description
1.	https://www.youtube.com/watch?v=RJXJpeH78iU	Brinell hardness test
2.	https://www.youtube.com/watch?v=G2JGNlIvNC4	Rockwell hardness test
3.	https://www.youtube.com/watch?v=dIUhX0NOqnQ	UTM
4.	https://www.youtube.com/watch?v=tpGhqQvftAo	Charpy Impact test
5.	https://www.youtube.com/watch?v=p00nMx-ULlA	Compression testing machine

Name & Signature:

Dr. **Shri. K.B. Kale**
HoD Applied Mechanics

Shri. S.V. Khadake
Lecturer in Applied Mechanics

(Course Experts)

Name & Signature:

Dr. V. B. Jaware
(Programme Head)

Name & Signature:

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

GOVERNMENT POLYTECHNIC, PUNE

'120 – NEP' SCHEME

PROGRAMME	DIPLOMA IN / ME
PROGRAMME CODE	04
COURSE TITLE	ENGINEERING DRAWING
COURSE CODE	ME21201
PREREQUISITE COURSE CODE & TITLE	ENGINEERING GRAPHICS

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	
ME21201	Engineering Drawing	SEC	3	0	4	1	8	4	4	30	70	100	40	25	10	25@	10	25	10	175

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.

I. RATIONALE:

Engineering drawing lays the foundation for visualizing the situation and delivering the essential instructions, required to carry out engineering jobs. This course aims to develop the ability to read and draw projections of lines, planes, and solids. It also aims at reading and drawing the sections of the orthographic views. Engineering drawing also intends to develop the ability to visualize and draw sectional views of solids and the true shape of sections and develop lateral surfaces of various solids.

II. 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: Apply principles of sectional orthographic projections for drawing given pictorial views.
CO2: Draw projections of lines and planes.
CO3: Draw projections of given solids for various orientations
CO4: Draw sectional views and the true shape of the section of solids.
CO5: Draw the development of lateral surfaces of various solids

III. 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 SECTIONAL ORTHOGRAPHIC VIEWS (CL Hrs-09, Marks - 14)				
1.	TLO 1.1 Draw different types of sectional views. TLO 1.2 Draw sectioning and hatching conventions. TLO1.3 Develop sectional orthographic views from the pictorial views of a given object. TLO 1.4 Interpret the given drawing.	1.1 Cutting plane line. 1.2 Types of sectional views: Full Section, half section, Partial or Broken section, Revolved section, removed section, offset section, aligned section. 1.3 Sectioning Conventions. 1.4 Hatching or section lines. 1.5 Conversion of pictorial views into sectional orthographic views (complete object involving slots, threads, ribs, etc).	Model Demonstration Video Demonstrations	CO1
UNIT-II PROJECTION OF LINES AND PLANES (CL Hrs- 09, Marks- 14)				
2	TLO 2.1 Draw different positions of lines with respect to projection planes. TLO 2.2 Draw projection of lines in various positions according to the given condition. TLO 2.3 Draw various types of planes based on their orientation. TLO 2.4 Draw projection of planes in various orientations according to the given condition.	2.1 Concept of projection of a point 2.2 Projection of straight lines involving the following positions- i. Parallel to both the planes. ii. Perpendicular to one plane. iii. Inclined to one plane and parallel to the other plane. iv. Inclined to both the planes. 2.3 Projection of planes involving the following orientations- i. Plane parallel to one principal plane and perpendicular to the other plane. ii. Plane inclined to one principal plane and perpendicular to the other plane.	Model Demonstration Video Demonstrations	CO 2
UNIT-III PROJECTION OF SOLIDS (CL Hrs- 09, Marks-14)				

Sr. No	Theory Learning Outcomes (TLO'S) aligned to CO's.	Learning content mapped with TLO's.	Suggested Learning Pedagogies	Relevant COs
3	TLO 3.1 Draw projection of given regular solids. TLO 3.2 Draw projections of regular solids according to their orientation with planes. TLO 3.3 Interpret the orientation of the axis with respect to the projection of planes of solids.	3.1 Types of solids. 3.2 Projection of the following solids- i. Regular polyhedron – Tetrahedron, Hexahedron (Cube) ii. Regular Prisms and Pyramids- Triangular, Square. iii. Regular solids of revolution- Cylinder, Cone. 3.3 Projection of given solids With Axis. a. Perpendicular to one of the principal projection planes. b. Inclined to one of the principal planes and parallel to the other. c. Parallel to both principal planes.	Model Demonstration Video Demonstrations	CO 3
UNIT- IV SECTIONS OF SOLIDS (CL Hrs- 09, Marks-14)				
	TLO4.1 Describe the cutting plane and its orientation with respect to given solid and reference planes. TLO 4.2 Draw sectional views of objects. TLO 4.3 Draw the true shape of the section.	4.1 Sectional views and true shape of section for solids like prism, pyramid, cone, and cylinder; with section plane: a) Inclined to one of the principal projection planes and perpendicular to the other. b) Parallel to one of the principal projection planes. Note: The position of the solid is restricted to the following: Axis perpendicular to one and parallel to the other principal projection plane.Axis parallel to both principal projection plane 4.2 Concept of auxiliary view while drawing the true shape of the section of any one solid	Model demonstration and Video demonstration	
UNIT –V DEVELOPMENT OF SURFACES (CL Hrs- 09, Marks-14)				
5	TLO 5.1 Draw the development of lateral surfaces of the given solid. TLO 5.2 Identify parts where the concept of development of the given surfaces is required.	5.1 Developments of lateral surfaces of cubes, prisms, cylinders, pyramids, and cones. 5.2 Applications of development of surfaces such as trays, funnel etc	Model Demonstration Video Demonstrations Hands-on to develop lateral surface from the existing solids	CO 5

IV. 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 Apply the method of projection for drawing simple sectional orthographic views.	Sheet 1: *Draw two problems on sectional orthographic projections (simple objects) using the first angle method of projection.	04	CO1
2	LLO 2.1 Apply the method of projection for drawing simple sectional orthographic views.	Sheet 2: *Draw two problems on sectional orthographic projections (object consisting of slot/rib/thread) using the first angle method of projection.	04	CO1
3	LLO 3.1 Draw the projection of lines for the given positions of lines.	Sheet 3: *Draw four problems on the projection of lines, limited to the line in the first quadrant.	04	CO2
4	LLO 4.1 Draw the projection of planes for the given orientation of the plane.	Sheet 4: *Draw two problems on the projection of planes when the plane is inclined to one principal plane and perpendicular to theother plane.	02	CO2
5	LLO 5.1 Draw the projection of planes for the given orientation of the plane.	Sheet 4: *Draw two problems on the projection of planes when the plane is inclined to one principal plane and perpendicular to the other plane, where the inclination angle of the plane is to be found using the given data.	02	CO2
6	LLO 6.1 Draw the projection of solids for the given position of the plane.	Sheet 5: *Draw two problems on the projection of solids with an axisinclined to one of the principal planes and parallel to the other.	04	CO3
7	LLO 7.1 Draw the projection of solids for the given position of the plane.	Sheet 5: *Draw two problems on the projection of solids with an axisparallel to both principal planes.	06	CO3
8	LLO 8.1 Draw Sectional views and true shape of section for given solids.	*Sheet 6: Draw two simple problems on the Sections of solids and the true shape of the section.	04	CO4

Sr. No	Practical/Tutorial/Laboratory Learning Outcome (LLO)	Laboratory Experiment / Practical Titles /Tutorial Titles	Number of hrs.	Relevant COs
9	LLO 9.1 Draw Sectional views and true shape of section for given solids.	*Sheet 7: Draw two complex problems on Sections of solids and the true shape of the section	06	CO4
10	LLO 10.1 Draw the developments of lateral surfaces of given solids.	*Sheet8: Draw four problems on developments of lateral surfaces ofprisms, cylinders, pyramids, cones, etc.	04	CO5
11	LLO 11.1 Draw the developments of sheet metal objects.	*Sheet 9: Draw four problems on developments of sheet metal objects like trays, funnel, chimneys, pipes etc.	6	CO5
12	LLO 12.1 Collect information on an ancient Indian culture related to engineering drawing.	**Assignment:** *Prepare a report on the use of various solid geometrical shapes employed in ancient Indian constructions (IKS).	2	CO1 CO2 CO3 CO4 CO5
		Total	**48**	

Note: out of the above suggestive LLOs -

- **A minimum of 12 for 2 LL Hrs./Week or 24 for 4 LL hrs./Week are to be performed.**
- **'*' Marked Practicals (LLOs) are Mandatory**
- **A judicial mix of LLOs is to be performed to complete the minimum requirement of 12 / 24 as applicable**

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

Micro project:

- Students should collect components, and jobs/samples from nearby workshops/industries and try to show the development of lateral surfaces of that.
- Any one model of wood/cardboard/wax etc on solids, sections of solids, development of surfaces

Assignment: -

- Sectional Orthographic projections. Minimum 5 problems
- Projection of Lines. Minimum 5 problems
- Projection of planes. Minimum 5 problems
- Projection of solids. One problem for each type of solid.
- Sections of solids. One problem for each type of solid.
- Development of lateral surfaces of solids. One problem for each type of solid.

Note :

Assignments are aimed at enhancing the imagination and drawing skills of students. **Separate books are recommended for assignments.**

VI. LABORATORY EQUIPMENT/INSTRUMENTS/TOOLS/SOFTWARE REQUIRED

Sr.No	Equipment Name with Broad Specifications	Relevant LLO Number
1	Drawing Table with Drawing Board of Full Imperial/ A1 size.	All
2	Models of objects for sectional orthographic.	1
3	Models/ Charts/ animated video of objects mentioned in unit no.2.	2
4	Models/charts/ animated videos of projections of different solids.	3
5	Models/charts/ animated videos of sections of various solids.	4
6	Models/charts/ animated videos of the development of lateral surfaces of various solids.	5
7	Set of various industrial drawings being used by industries.	All
8	Drawing equipment and instruments for classroom teaching size: T-square or drafter (Drafting Machine). Set squares (45°and 30°-60°) Protractor. Drawing instrument box (containing set of compasses and dividers). Drawing sheets, Drawing pencils, Eraser, Drawing pins/clips.	All

VII. 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	Sectional Orthographic Views	CO1	9	0	0	14	14
2	II	Projection of Lines and Planes	CO2	9	0	0	14	14
3	III	Projection of Solids	CO3	9	0	0	14	14
4	IV	Sections of solids	CO4	9	0	0	14	14
5	V	Development of Surfaces	CO5	9	0	0	14	14
Grand Total				**45**	**0**	**0**	**70**	**70**

VIII. ASSESSMENT/METHO/TOOLS

Formative assessment (Assessment for Learning)	Summative Assessment (Assessment of Learning)
1. Term work 2. Test	1. End term exam- Theory 2. End term exam- Practical

IX.SUGGESTED COS- POS MATRIX FORM

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

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

X. SUGGESTED LEARNING MATERIALS/BOOKS

Sr.No	Author	Title	Publisher with ISBN Number
1	Bureau of Indian Standards.	Engineering Drawing Practice forSchools and Colleges IS: SP-46	Third Reprint, October 1998 ISBN No. 81-7061-091-2
2	Bhatt, N.D.	Engineering Drawing	Charotar Publishing House, 2010 ISBN No. 978-93-80358-17-8
3	Bhatt, N.D.; Panchal, V. M	Machine Drawing	Charotar Publishing House, 2010 ISBN No. 978-93-80358-11-6
4	Jolhe, D.A.	Engineering Drawing	Tata McGraw Hill Edu. New Delhi, 2010, ISBN No. 978-0-07-064837-1
5	Dhawan, R. K.	Engineering Drawing	S. Chand and Company New Delhi, ISBN No. 81-219-1431-0
6	Agrawal Basant ,Agrawal C.M.	Engineering drawing	McGraw Hill Education, New Delhi, ISBN No. 978-1259062889
7	Narayana, K.L.,Kannaiah. P.	Engineering Drawing	SciTech Publications India, Chennai ISBNNo-978-8183714433
8	Singhania Nitin	Indian Art And Culture	McGraw Hill, ISBN No-978-9354601804

XII. LEARNING WEBSITES & PORTALS

Sr.No	Link/Portal	Description
1	https://youtu.be/3VWnhRCF_0M	Sectional Orthographic
2	https://youtu.be/3WXPanCq9LI	Projection of lines
3	https://youtu.be/44glqyyw7OM	Projection of Plane
4	https://youtu.be/RE_ZG_SSsV8	Projection of solids
5	https://youtu.be/gIRsXiTKfDo	Projection of solids
6	https://youtu.be/q4uZYDtO05s	Projection of solids
7	https://youtube.com/playlist?list=PLIhUrsYr8yHwAbiCATZUbzd_CpF0EHF3v&si=nCofUKERe-NAODax	Sections of solids
8	https://youtu.be/P5oPrynRsTI	Development of lateral surfaces
9	https://youtu.be/vqk7SnpDQvg	Development of lateral surfaces

Name &Signature:

Mr. A. M. Joshi
Lecturer in Mechanical Engineering

Mr. Mahesh Pol
Lecturer in Mechanical Engineering

(Course Experts)

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

GOVERNMENT POLYTECHNIC, PUNE

'120 – NEP' SCHEME

PROGRAMME	DIPLOMA IN ME
PROGRAMME CODE	04
COURSE TITLE	MANUFACTURING PROCESSES
COURSE CODE	WS21201
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	
WS21201	Manufacturing Processes	SEC	3	0	4	1	8	04	3	30	70	50	20	25	10	25@	10	25	10	175

Total IKS Hrs for Term: 1 Hrs

Abbreviations: **CL**-Classroom Learning, **TL**-Tutorial Learning, **LL**-Laboratory Learning, **SLH**-Self Learning Hours, **NLH**-Notional Learning Hours, **FA** - Formative Assessment, **SA** -Summative assessment, **IKS** – Indian Knowledge System, **SLA**- Self Learning Assessment

Legends: @-Internal Assessment, # - External Assessment,*# - 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:

Diploma graduates frequently encounter diverse manufacturing processes. This core manufacturing technology course aims to enhance students' comprehension of manufacturing methods, like turning, drilling, milling, casting, forming, and joining, etc.

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: Produce a part using a lathe and drilling machine as per given drawing.
CO2: Produce a part using a milling machine as per given drawing.
CO3: Produce a part using casting processes as per given drawing.
CO4: Produce a part using forming processes as per given drawing.
CO5: Produce a part using metal joining processes as per given drawing..

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 FUNDAMENTALS OF LATHE AND DRILLING MACHINE (CL Hrs- 10, Marks-16)				
1.	TLO 1.1 List various angles of single point cutting tool. TLO1.2 List accessories of lathe machine and their function. TLO1.3 Calculate machining parameters for given component. TLO 1.4 Describe construction and specification of a drilling a machine. TLO1.5 List various drilling operations	1.1 Basics of Machining: Single point cutting Tool and its nomenclature, Mechanics of Chip formation, Types of Chips. 1.2 Lathe machine: Classification, specification of centre lathe; Basic parts and accessories like chucks (three jaw, four jaw, and magnetic chuck), mandrels, rests, faceplate, centres and angle plate of centre lathe and their functions. 1.3 Lathe operations: facing, plain turning, taper turning, thread cutting, chamfering, grooving, knurling and cutting parameters like speed, feed, depth of cut and machining time. 1.4 Drill machine: Classification, specification of drilling machine Basic parts of radial drilling machine, Sensitive drilling and their function. 1.5 Drilling machine operations: Drilling, reaming, boring, counter sinking, counter boring, spot facing and Cutting parameters- speed, feed, depth of cut and machining time.	Model Demonstration Video Demonstrations	

UNIT-II MILLING MACHINES (CL Hrs- 9, Marks- 16)				
2	TLO2.1 Demonstrate working of milling machines. TLO2.2Select appropriate milling cutter for given component. TLO 2.3 Describe milling operations for given component. TLO 2.4 Illustrate procedure of indexing methods.	2.1 Milling Machine: Working principle, types of milling machines. 2.2 Milling cutter: Different types of cutters, face milling cutters end milling cutters, staggered tooth milling cutter, side and face milling cutter, form milling cutters and metal slitting saw. 2.3 Milling Process: Plain milling, face milling, side milling, end milling, straddle milling, gang milling, up and down milling. 2.4 Dividing head; Types, function of dividing head, introduction of indexing, methods of indexing.	Model Demonstration Video Demonstrations	
UNIT-III CASTING PROCESSES (CL Hrs- 9, Marks- 12)				
3	TLO3.1Describe significance of pattern allowances. TLO3.2 Describe moulding methods. TLO3.3Classify casting processes. TLO3.4 Enumerate safety guidelinesand precautions for a foundry workshop.	3.1 Pattern making: Basic steps in making pattern, types of pattern, materials and allowances of pattern, Color coding of pattern. 3.2 Moulding: Types and properties of moulding sands, moulding methods, cores and core prints, gating and risering system. 3.3 Casting: Centrifugal casting process, investment casting process, shell moulding process and its applications, Casting defects and their causes. 3.4 Safety practices/ precautions in foundry shop. 3.5 Casting in Indus valley civilization (IKS)	Chalk-Board Model Demonstration Video Demonstrations	
UNIT- IV FORMING PROCESSES (CL Hrs- 8, Marks- 10)				
4	TLO 4.1 Select the relevant forming process for given component. TLO 4.2 Differentiate rolling and forging process. TLO 4.3 List various press tool operations for given component.	4.1 Drop forging: Introduction to forging, upset forging, Press forging, open die and closed die forging operations. 4.2 Rolling: Principle of rolling, hot and cold rolling and applications, rolling mill. 4.3 Press tool operations: Various operations performed on press, press tool, simple, progressive and forming dies and applications. 4.4 Safety practices/ precautions in forging and press shop	Chalk-Board Demonstration	

Sr. No	Theory Learning Outcomes (TLO'S) aligned to CO's.	Learning content mapped with TLO's.	Suggested Learning Pedagogies	Relevant COs
	UNIT –V Metal joining processes (CL Hrs- 9, Marks- 16)			
5	TLO 5.1 Select suitable welding process for given component. TLO 5.2 Describe gas welding process. TLO 5.3 Differentiate various arc welding processes. TLO 5.4 Compare soldering and brazing process. TLO 5.5 List causes of welding defects and suggest remedies.	5.1 Welding Processes: welding and weldability, types and classification of welding processes. 5.2 Gas welding: gas welding equipments, oxy-acetylene welding, types of flame. 5.3 Arc welding: arc welding equipment equipments, flux shielded metal arc welding, TIG and MIG welding. 5.4 Soldering and brazing process, fillers, merits and applications. 5.5 Defects in welding joints: causes and remedies. 5.6 Safety practices/ precautions in welding shop.	Chalk-Board Demonstration	

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 Setup a lathe machine for given job as per operations. LLO1.2 Select suitable cutting parameters for operations as per given job. LLO 1.3 Prepare a turning job as per given drawing.	*Produce a job on a lathe machine that comprises facing, plain turning and step turning operations as per the given drawing.	4	CO1
2	LLO 2.1 Setup a lathe machine for taper turning operations. LLO 2.2 Calculate taper angle for taper turning operations as per given job. LLO 2.3 Prepare a taper turning job as per given drawing.	*Produce a job on a lathe machine that comprises taper turning and grooving operations as per the given drawing.	4	CO1
3	LLO3.1 Setup a lathe machine for chamfering and knurling operations. LLO3.2 Select suitable cutting parameters for chamfering and knurling operations.	*Produce a job on a lathe machine that comprises knurling and chamfering operations as per the given drawing.	4	CO1

COURSE TITLE :

COURSE CODE: WS21201

Sr. No	Practical/Tutorial/Laboratory Learning Outcome (LLO)	Laboratory Experiment / Practical Titles /Tutorial Titles	Number of hrs.	Relevant COs
	LLO3.3 Prepare a chamfering and knurling job as per given drawing.			
4	LLO 4.1 Setup a drill machine for given job as per operations. LLO 4.2 Prepare a drilling job as per given drawing.	*Produce a job on a drilling machine comprising drilling and reaming operations as per the given drawing.	4	CO1
5	LLO 5.1 Setup a drill machine and tool for given job as per operations. LLO 5.2 Prepare a tapping job as per given drawing.	*Produce a job on drilling a machine comprising tapping operation as per the given drawing.	4	CO1
6	LLO 6.1 Setup a drill machine and tool for given job as per operations. LLO 6.2 Prepare a counter-boring job as per given drawing.	Produce a job on a drilling machine comprising counter-boring operation as per the given drawing. (Students can use one/two jobs for practical 1 to 6)	4	CO1
7	LLO 7.1 Setup a milling machine and cutter for given job. LLO 7.2 Prepare a job on milling machine as per the given drawing	*Produce a job on a milling machine that comprises of plain milling operation as per the given drawing.	4	CO2
8	LLO 8.1 Setup a milling machine and side milling cutter for given job. LLO 8.2 Prepare a job on milling machine as per the given drawing.	*Produce a job on a milling machine that comprises of side milling operation as per given drawing. (Students can use one/two jobs for practical 7 and 8)	4	CO2
9	LLO 9.1 Setup a milling machine and cutter for given job. LLO 9.2 Use dividing head for indexing. LLO 9.3 Prepare a spur gear on milling machine as per the given drawing.	*Produce a spline shaft/spur gear/suitable job of indexing with 3 slots using indexing mechanism as per the given drawing.	4	CO2
10	LLO 10.1 Select material and tool for preparing pattern. LLO 10.2 Prepare wooden pattern as per given drawing.	Produce a simple wooden pattern for the given component.	4	CO3
11	LLO 11.1 Choose appropriate sand and tools for moulding a given pattern LLO 11.2 Prepare a mould for given pattern.	*Produce a sand mould for the given pattern.	4	CO3
	LLO 12.1 Select suitable material and		4	CO3

Sr. No	Practical/Tutorial/Laboratory Learning Outcome (LLO)	Laboratory Experiment / Practical Titles /Tutorial Titles	Number of hrs.	Relevant COs
12	melt it for required casting. LLO 12.2 Prepare casting as per given drawing.	Produce a casting from the given mould.		
13	LLO 13.1 Identify various components of forging machine. LLO 13.2 Enlist various forging operations. LLO 13.3 Identify need of safety while working in forging shop.	Demonstrate components of a forging machine and its safety considerations.	4	CO4
14	LLO 14.1 Select tool for producing given job. LLO 14.2 Prepare a bolt head/a cold chisel/hook as per given drawing.	*Demonstrate/Produce a bolt head/cold chisel/hook using forging.	4	CO4
15	LLO 15.1 Identify various components of rolling mill/machine. LLO 15.2 Enlist rolling methods used in industries. LLO 15.3 Identify need of safety while working rolling shop.	Demonstrate the various parts of rolling mill/machine and various safety aspects of it.	4	CO4
16	LLO 16.1 Identify various components of Press tool. LLO 16.2 Identify type of die used for production of washer. LLO 16.3 Identify need of safety while working in press shop.	Demostrate prduction process of washer.	2	CO4
17	LLO 17.1 Prepare material for fabricating structure. LLO 17.2 Select suitable equipment and tool for welding. LLO17.3 Fabricate structure as per given drawing.	*Fabricate structure using arc welding machine as per given drawing.	4	CO5
18	LLO 18.1 Prepare joint for soldering/brazing by applying flux. LLO 18.2 Perform soldering/brazing operations on the given components	Perform soldering/brazing operations on the given components.	2	CO5

19	LLO 19.1 Enlist various welding defects and their causes. LLO 19.2 Identify casting defects in the given welded joints.	Identify various casting defects from given castings.	2	CO5
		Total	**48**	

(Perform Any 12 LLO in total . Perform any two LLO out of LLO 16,18&19 or any one LLO out of LLO 6,10,12,13,&15. The'*' marked experiment are mandatory for performance)

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

Micro project:

- Prepare a list of machine tools available in the workshop of the institute.
- Prepare list of similar operations that can be performed on different machine tools.
- Collect specification of machine tools available in the institute workshop.
- Collect information about different welding processes required for a welding shop.
- Collect a information about operations required for key manufacturing.

Assignment: -

- Justify why lathe machine is called mother of all machines.
- Collect information regarding car bonnet manufacturing in automobile industry.
- Collect information of material used for preparation of pattern and types of patterns..
- Justify necessity of safety precaution in industries.
- Prepare a list of machine tools seen in the industry during industrial visit.

VII. LABORATORY EQUIPMENT/INSTRUMENTS/TOOLS/SOFTWARE REQUIRED

Sr.No	Equipment Name with Broad Specifications	Relevant LLO Number
1	Centre lathe machine. (Length between centers 1000 mm, swing upto 500 mm)	1,2,3
2	Drilling Machine (drill diameter up to 40 mm)	4,5,6
3	Column and knee type milling machine along with dividing head (length X width of working table upto 1000 mm X 500 mm	7,8,9
4	Pattern making, moulding and casting shop with necessary equipment.	10,11,12
5	Mini forging press (Capacity upto 1 ton)	13,14
6	Rolling mill (Laboratory type)	15
7	Mini press tool (Capacity upto 1 ton)	16
8	Arc welding machine,spot welding machine and TIG/MIG welding equipmet (upto 160 A, 240 Volts)	17,18,19

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	Fundamentals of Lathe and drilling machines	CO1	9	4	4	6	14
2	II	Milling Machines	CO2	9	2	4	8	14
3	III	Casting processes	CO3	9	2	6	6	14
4	IV	Forming processes	CO4	9	2	4	8	14
5	V	Metal joining processes	CO5	9	2	4	8	14
Grand Total				45	12	22	36	70

IX.ASSESSMENT METHODOLOGIES/TOOLS

Formative assessment (Assessment for Learning)	Summative Assessment (Assessment of Learning)
1. Tests 2. Seminar/Presentation 3. Term Work	1. Practical 2. Theory

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	2	2	3	-	2	3	-	2	-
CO2	3	2	2	3	-	2	3	-	2	-
CO3	3	2	2	3	-	2	3	-	2	-
CO4	3	2	2	3	-	2	3	-	2	-
CO5	3	2	2	3	-	2	3	-	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 N RAO	Manufacturing Technology Vol-1	McGraw Hill, New Delhi. ISBN-1259062570, 9781259062575
2	P N RAO	Manufacturing Technology Vol-2	McGraw Hill, New Delhi, ISBN: 9789353160524
3	S K Hajra Choudhury, A K Hajra Choudhury, Nirjhar Roy	Elements Of Workshop Technology Vol-1	Media Propoters & Publisher PVT. LMT. ISBN-13 5551234102415
4	S K Hajra Choudhury, A K Hajra Choudhury, Nirjhar Roy	Elements Of Workshop Technology Vol-2	Media Propoters & Publisher PVT. LMT., ISBN: 978-8-185-09915-6.
5	D.P. Agrawal	Ancient Metal Technology and Archaeology of South Asia: a Pan-Asian perspective	Aditya Prakashan, New Delhi. ISBN: 9788173051777

XII. LEARNING WEBSITES & PORTALS

Sr.No	Link/Portal	Description
1.	https://www.youtube.com/watch?v=Wc2gpWcmGK4	Lathe Machine Operations
2.	https://www.youtube.com/watch?v=DGsV6RhBnbM	Radial drilling machine
3.	https://www.youtube.com/watch?v=zzXdddrV2so	Simple Job on milling machine
4.	https://www.youtube.com/watch?v=2CIcvB72dmk	Basics of Metal Casting
5.	https://www.youtube.com/watch?v=-w7E88zox6w	Closed die forging
6.	https://www.youtube.com/watch?v=RyLvVMg84xs	Basics of welding process

Name & Signature:

Mr. P U Garge
Lecturer in Mechanical Engineering

Miss. S S Panpatil
Lecturer in Mechanical Engineering

(Course Experts)

Name & Signature:

Dr.V.B.Jaware
(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/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	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	
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:

Mr. V.V. Kulkarni
Lecturer in English

Dr. S.P. Palve
Lecturer in English

(Course Experts)

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

GOVERNMENT POLYTECHNIC, PUNE

'120 – NEP' SCHEME

PROGRAMME	DIPLOMA IN ME / MT
PROGRAMME CODE	04/05
COURSE TITLE	BASIC ELECTRICAL TECHNOLOGY
COURSE CODE	EE21203
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	
EE21203	BASIC ELECTRICAL TECHNOLOGY	AEC	2	-	2	-	4	2	-	-	-	-	-	25	10	25@	10	-	-	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:

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:

Diploma holders are expected to handle various mechanical, electrical and electronics tools. This course will develop skills in handling tools, equipment safely related electrical engineering aspects useful for manufacturing, production and mechanical engineering based processes in industries.

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: Use Principles of electrical and magnetic circuits to solve mechanical engineering broadly defined problems.

CO2: Use of Transformer and Electric motors for given applications.

CO3: Use electrical safety devices in electrical circuits.

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 ELECTRIC AND MAGNETIC CIRCUIT (CL Hrs.- 10)			
1	TLO 1.1 Explain the given technical terms related to Electric and Magnetic circuits. TLO 1.2 Identify an analogy between Electric and Magnetic Circuits. TLO 1.3 Apply Fleming's right-hand rule and Lenz's law for the determination of the direction of induced emf in the given situation. TLO 1.4 Explain attributes of the given AC quantities. TLO 1.5 Find currents and voltages in the given star & delta AC circuits. TLO 1.6 Expalin the working of batteries. TLO 1.7 Wiring specifications & Standards.	1.1 Electric circuits E.M.F, Potential difference, power, Magnetic circuits M.M.F, magnetic force, permeability. 1.2 Electromagnetic induction, Faraday's laws of electromagnetic induction, Lenz's law, dynamically induced emf. 1.3 Statically induced emf. (a) Self-induced emf (b) Mutually induced emf; Equations of self and mutual inductance. 1.4 A .C. Signal terms: Cycle, Frequency, Periodic time, Amplitude, Angular velocity,RMS value, Average value, Form Factor, Peak Factor, impedance, phase angle, and power factor. 1.5 Voltage and Current relationship in Star and Delta connections. 1.6 Batteries- Types and Working 1.7 wiring specifications and IS electrical standards for safety and appliances.	Chalk-Board Presentations Videos on Flemings Right-hand rule and Lenz Law	CO1
	UNIT-II TRANSFORMER AND THE SINGLE-PHASE INDUCTION MOTOR (CL Hrs.- 10)			
2	TLO 2.1 Explain with sketches the construction and working principle of the given type of single-phase transformer. TLO 2.2 Explain with sketches the working principle of the given autotransformer. TLO 2.3 Describe with sketches the construction of the given single-phase motor. TLO 2.4 Explain with the sketches the working principle of the given single-phase induction motors.	2.1 General construction and principle of different types of transformers, EMF equation and transformation ratio of transformers. 2.2 Auto transformers. Working Principles and Applications 2.3 Construction and Working principle of single phase AC. motor. Types of single phase motors, applications of single phase motors. 2.4 Applications of single phase Induction motors.	Chalk-Board Demonstration Hands-on	CO2
	UNIT-III ELECTRICAL SAFETY AND PROTECTIVE DEVICES (CL HRS-10)			
3	TLO 3.1 Describe the characteristics and features of different protective devices TLO 3.2 Select the relevant protective device for the given application. TLO 3.3 Select the suitable switchgear for the given situation with justification. TLO 3.4 Select the I.E rule related to be applied for a given type of earthing.	3.1 Fuse: Operation, types and applications 3.2 MCB and ELCB/RCB: Operation and general specifications 3.3 Earthing: Types, Importance of Earthing, Factors Affecting Earthing Resistance. 3.4 Measures for reducing earth resistance, I.E rules relevant to earthing.	Chalk-Board Demonstration Hands-on	CO3

VI. LABORATORY LEARNING OUTCOME AND ALIGNED PRACTICAL/TUTORIAL EXPERIENCES. (Any 12)

Sr. No	Practical/Tutorial/Laboratory Learning Outcome (LLO)	Laboratory Experiment / Practical Titles /Tutorial Titles	Number of hrs.	Relevant COs
1	LLO 1 Voltage and Current measurement	Measure voltage and current in single-phase circuits with resistive load using appropriate meters	2	CO1
2	LLO 2Power measurement of single-phase circuit	Measure power required by single phase circuit with resistive load.	2	CO1
3	LLO 3Energy measurement	Measure Energy consumed by given equipment using energy meter.	2	CO1
4	LLO 4Line and Phase voltage measurement of the star- delta connection circuit	Make a star and delta connection to measure line and phase voltage	2	CO1
5	LLO 5Battery Testing	Test given battery using a digital multimeter.	2	CO1
6	LLO 6 Input and output quantities of Single phase transformer	6.1 Connect Single phase transformer for measuring input and output quantities 6.2 Determine its turns ratio	2	CO2
7	LLO7 Continuity test of transformer- primary and secondary windings	Test primary and secondary winding to measure the continuity of the transformer.	2	CO2
8	LLO 8Autotransformer	Measure the output voltage of the autotransformer.	2	CO2
9	LLO 9Electrical wire specifications	Select the suitable gauge of wire for the given electrical application.	2	CO1
10	LLO 10 Electrical Switchboard assembly	Build the switchboard for the given requirement by connecting suitable coloured wire to respective terminals.	2	CO1
11	LLO 13 Connection of fuses in the electrical circuit.	Connect the fuse in the electrical circuit and check its operation at normal and abnormal conditions	2	CO3
12	LLO 14 Connection of MCB in the electrical circuit.	Connect MCB in the electrical circuit and check its operation at normal and abnormal conditions.	2	CO3
13	LLO 15 Connection of ELCB in electrical circuit.	Connect ELCB in the electrical circuit and check its operation at normal and abnormal conditions.	2	CO3
14	LLO 16 Study of single phase induction motor.	Study the reversal of rotation of single phase induction motor.	2	CO2

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

Micro project: NOT APPLICABLE

Assignment: - NOT APPLICABLE

IX. LABORATORY EQUIPMENT/INSTRUMENTS/TOOLS/SOFTWARE REQUIRED

Sr.No	Equipment Name with Broad Specifications	Relevant LLO Number
1	Single Phase Autotransformer: Single phase, Input 0-230,10 A, Output:0- 270 Volts	1,2,8
2	Measurement Digital Multimeter: Minimum 3 ½ digit 4 ½ digit display, multimeter measures Vac, Vdc (1000V max), Adc, Aac (10-amp max), Resistance (0-100 Mohm).	1,2,3,4,5, 6,7,8
3	Lamp Bank - 230 V 0-20 A	1,2,3,4, 6,7,8
4	Single phase Transformer-Single Phase Input 230/115V, 1KVA	6,7,8
5	Single Phase Induction Motor - 230 V 50 Hz AC supply	14
6	Wattmeter of suitable rating, Stopwatch, Energymeter, Wire gauge	2,3,9
7	Fuse, MCB, ELCB	11,12

X. SUGGESTED FOR WEIGHTAGE TO LEARNING EFFORTS & ASSESSMENT PURPOSE

(Specification Table)

NOT APPLICABLE

XI. ASSESSMENT METHODOLOGIES/TOOLS

Formative assessment (Assessment for Learning)	Summative Assessment (Assessment of Learning)
For FA_PR, Formative (Continuous) assessment shall be based on process and product-related performance indicators. Course teachers may assign 60%, weightage for process and 40% weightage for product-related LL work.	For SA PR at the end of the semester PR examination will be conducted by the course teacher and based on PR exam performance marks out of 25 will be allocated

XII. SUGGESTED COs- POs MATRIX FORM

For ME

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
CO1	3	1	-	-	-	-	1	-	-
CO2	3	1	-	-	-	-	2	-	-
CO3	2	-	-	-	-	-	3	-	-
	Legends:- High: 03, **Medium:** 02, **Low:** 01, **No Mapping:** - *PSOs are to be formulated at the institute level								

For MT

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	PSO4
CO1	3	1	-	-	-	-	1	-	-	1	-
CO2	3	1	-	-	-	-	2	-	1	1	-
CO3	2	-	-	-	-	-	3	2	2	2	-

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

XIII. SUGGESTED LEARNING MATERIALS/BOOKS

Sr. No	Author	Title	Publisher with ISBN Number
1	Mittle and Mittal	Basic Electrical Engineering	McGraw Education, New Delhi, edition 2017, ISBN-13 978-0070593572
2	Jegathesan, V	Basic Electrical and Electronics Engineering	Wiley India, New Delhi, edition-2015 ISBN 978- 8126529513
3	Sedha, R.S.	A Textbook of Applied Electronics	S.Chand New Delhi, edition-2008 ISBN-13: 978- 8121927833

XII. LEARNING WEBSITES & PORTALS

Sr. No	Link/Portal	Description
1	https://www.electrical4u.com/fleming-left-hand-rule-and-flem ing-right-hand-rule/	Flemings's hand and left-hand rule
2	https://www.electrical4u.com/lenz-law-of-electromagnetic-induction/	Lenz's Law
3	https://www.animations.physics.unsw.edu.au/jw/	Electronic components, A.C. circuits, transformer, Electric motors.
4	https://en.wikipedia.org/wiki/Transformer	Transformer
5	http://www.alpharubicon.com/altenergy/understandingAC.htm	A.C. Current

Name & Signature:

Smt. S.P. Phadnaik
Lecturer in Electrical

Smt. M. H. Bilgi
Lecturer in Electrical

(Course Experts)

Name & Signature:

Dr. Vasudev B Jaware
(Programme Head)

Name & Signature:

Mr. Sudin 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.V.B.Jaware** (Programme Head)	Name & Signature: **Shri.S.B.Kulkarni** (CDC In-charge)	