



Department of Mechanical Engineering

P-23 Curriculum  
(Sandwich Pattern)

**Semester-II**  
(Course Contents)

(2023-24)

GOVERNMENT POLYTECHNIC, MUMBAI																									
(Academically Autonomous Institute, Government of Maharashtra)																									
Programme: Diploma in Mechanical Engineering (Sandwich Pattern)																									
Learning and Assessment Scheme (P23)										With Effect From Academic Year : 2023-24															
Duration Of Programme : 6 Semester										Duration: 16 Weeks															
Semester: Second										Scheme : P23															
Sr. No.	Course Code	Course Title	Course Type	Total IKS Hrs for Sem	Learning Scheme					Credits	Assesment Scheme														Total Marks
					Actual Contact Hrs/Week			Self Learning (TW + Assignme nt)	Notional Larning Hrs / Week		Paper Duration (hrs.)	Theory					Based on LL & TL						Based on Self Learning		
					CL	TL	LL					FA-TH	SA-TH	Total			FA-PR		SA-PR		SA-OR		SLA		
														Max	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	
					T1	T2	Max	Max	Min			Max	Min	Max	Min	Max	Min	Max	Min	Max	Min				
1	SC23102	Engineering Physics	DSC	2	3	-	2	1	6	3	2 Hrs 30Min	20	20	60	100	40	25	10	25#	10	-	-	25	10	175
2	SC23502	Engineering Mathematics	AEC	6	3	2		1	6	3	2 Hrs 30Min	20	20	60	100	40	25	10	-	-	-	-	25	10	150
3	ME23104	Fundamentals of Electrical Technology & Electronics	DSC	2	4	-	4	-	8	4	2 Hrs 30Min	20	20	60	100	40	25	10	-	-	-	-	-	-	125
4	AM23101	Engineering Mechanics	DSC	2	3	-	2	1	6	3	2 Hrs 30Min	20	20	60	100	40	25	10	-	-	-	-	25	10	150
5	ME23119	Engineering Drawing II	DSC	2	4	-	4	2	10	5	3 Hrs 30 Min	20	20	60	100	40	50	20	-	-	-	-	50	20	200
6	ME23501	Basics of Python Programming	AEC	-	2	-	2	-	4	2	-	-	-	-	-	-	25	10	25@	10	-	-	-	-	50
<b>Total</b>				<b>14</b>	<b>19</b>	<b>2</b>	<b>14</b>	<b>5</b>	<b>40</b>	<b>20</b>	<b>-</b>	<b>100</b>	<b>100</b>	<b>300</b>	<b>500</b>	<b>200</b>	<b>175</b>	<b>70</b>	<b>50</b>	<b>20</b>	<b>-</b>	<b>-</b>	<b>125</b>	<b>50</b>	<b>850</b>
Abbreviations : CL-Classroom Learning, TL-Tutorial Learning, LL- Laboratory Learning, FA-Formative Assessment, SA-Summative Assessment, IKS-Indian Knowledge System, SLA-Self Learning Assessment																									
<b>Legends:</b> - @ Internal Assessment, # External Assessment, *# On Line Examination , @\$ Internal Online Examination																									
<b>Note</b>	1. FA-TH represents two class tests of 20 marks each conducted during semester.																								
	2. If candidate is not securing minimum passing marks in FA-PR of any course then the candidate shall be declared as "Detained" in that semester.																								
	3. If candidate is not securing minimum passing marks in SLA of any course then candidate shall be declared as fail & will have to repeat & resubmit SLA work.																								
	4. Notional Learning hours for the semester are (CL+LL+TL+SL)hrs.*15Weeks																								
	5. 1 credit is equivalent to 30 Notional hrs.																								
	6. *Self learning hours shall not be reflected in the TimeTable.																								
<b>Course Category :</b>																									
Discipline Specific Course (DSC): 4, Discipline Specific Elective (DSE): 0, Value Education Course(VEC): 0, Intern./Apprenti./Project./ Community(INP): 0, Ability Enhancement Course (AEC) : 2, Skill Enhancement Course (SEC) : 2, Inter Disciplinary Elective (IE) : 0																									

Department Coordinator  
Curriculum Development Cell

Head of Department  
Department of Mechanical Engineering

In-Charge  
Curriculum Development Cell

Principal  
Government Polytechnic, Mumbai

<b>Programme: Diploma in CE/ME/RT</b>													
<b>Course Code:SC23102</b>						<b>Course Title: Engineering Physics</b>							
<b>Compulsory / Optional: Compulsory</b>													
<b>Teaching Scheme and Credits</b>						<b>Examination Scheme</b>							
CL	TL	LL	SLH	NLH	Credits	FA-TH		SA-TH (2:30Hrs.)	FA-PR	SA		SLA	Total
										PR	OR		
3	-	2	1	6	3	20	20	60	25	25#	-	25	175

**Total IKS Hrs. for course: 2hrs.**

**Abbreviations:** CL- Class Room Learning, TL- Tutorial Learning, LL- Laboratory Learning, SLH-Self Learning Hours, NLH-Notional Learning Hours, FA - Formative Assessment, SA -Summative assessment, SLA- Self Learning Assessment

**Legends:** @ Internal Assessment, # External Assessment, \*# On Line Examination, @\$ Internal Online Examination

**Note:**

1. FA-TH represents two class tests of 20 marks each conducted during the term.
2. SA-TH represents the end term examination.
3. FA-PR represents the term work.
4. SA-PR represents the end term practical examination.

**I.Rationale**

The subject is included under the category of science. The special feature of the subject is to develop the laboratory skill using principles of scientific phenomenon. This course will serve to satisfy the need of the technical students for their development in technical field. The course is designed by selecting the topics which will develop intellectual skills of the students and will guide students to solve broad based engineering problems. Ultimately the focus of the course is to develop psychomotor skills in the students.

**II. Industry / Employer Expected Outcome**

Physics is a fundamental science that plays a crucial role in various industries and has numerous outcomes that benefits society: Apply principles of physics to solve broad based relevant engineering problems.

**III. Course Outcomes:** Students will be able to achieve & demonstrate the following COs on completion of course based learning

CO1	Classify the different physical quantities identify the proper unit of it and to estimate in the measurement of physical quantities.
CO2	Apply laws of motion in various engineering applications.
CO3	Identify the properties of solid, liquid such as elasticity, liquid friction, viscosity and surface tension
CO4	Analyze types of waves.
CO5	Create awareness about the properties and application of light in engineering field.

**Course Content Details:**

Unit No.	Theory Learning Outcomes (TLO's) aligned to CO's	Topics / Sub-topics
1.	<p><b>TLO 1a.</b> Explain physical quantities and its types with examples.</p> <p><b>TLO 1b.</b> Differentiate between scalar and vector quantities with examples.</p> <p><b>TLO 1c.</b> Apply dimensional analysis to check correctness of equation and conversion of units in different systems.</p> <p><b>TLO 1d.</b> Estimate the errors in the measurement for the give problem.</p> <p><b>TLO 1e.</b> Explain the working of ancient astronomical instruments to measure distance, time and hour angle</p>	<p><b>Units and Measurements</b></p> <p>1.1 Fundamental Physical quantities, examples.</p> <p>1.2 Derived physical quantities, examples.</p> <p>1.3 Scalar and Vector Physical Quantities.</p> <p>1.4 Definition and requirements of unit</p> <p>1.5 System of units, C. G. S., M. K. S. and S. I. units.</p> <p>1.6 Dimensions, dimensional formula</p> <p>1.7 `Rules to write the unit and conventions of units and Significant figures, rules to write significant figures</p> <p>1.8 Error – Definition, types of errors and estimation of errors.</p> <p>1.9 Ancient astronomical instruments: Chakra, Dhanyata, Yasti and Phalak yantra, Numerical</p> <p><b>Course Outcome: CO1</b></p> <p><b>Teaching Hours :5 hrs.</b></p> <p><b>Marks: 8</b></p>
2.	<p><b>TLO2a.</b> Differentiate between velocity and speed. Identify changes in motion that produce acceleration. Able to calculate speed, velocity and acceleration of an object, analytically, Classify acceleration as positive, negative, and zero.</p> <p><b>TLO2b.</b> Identify different periodic motion with examples such as oscillatory motion, Vibratory motion, circular motion.</p> <p><b>TLO2c.</b> Explain angular motion with equation of angular motion, explain relation between linear velocity and angular Velocity, understand the concept of centripetal and centrifugal force</p> <p><b>TLO2d.</b> Describe real-life situations that illustrate each of Newton's laws of motion.</p> <p><b>TLO2e.</b> Explain the ancient theory of gravitation and</p>	<p><b>Motions</b></p> <p>2.1 <b>Linear motion</b> –Definition – distance, displacement, velocity, acceleration, retardation, equation of motions, acceleration due to gravity and equation motion under gravity, numerical</p> <p>2.2 <b>Periodic motions:</b> a) Oscillatory motion, b) Vibratory motion, c) S.H.M. d) Circular motion. (only definition and examples) , terms related to S.H.M. : Definition: Time period, frequency, amplitude, wavelength, and phase</p> <p>2.3 <b>Angular motion:</b> a) Definition: angular motion, Uniform circular motion, Radius vector, linear velocity, Angular velocity, Angular acceleration, b) Relation between linear velocity and angular Velocity(derivation), Radial or centripetal acceleration, Three equations of motion (no derivations), Centripetal</p>

	laws of motion.	<p>and Centrifugal force, examples and applications.</p> <p>2.4. Laws of Motion and it's applications.</p> <p>2.5. Ancient theory of Gravitation and laws of motion, Numerical.</p> <p><b>Course Outcome: CO2</b>  <b>Teaching Hours :12hrs</b>  <b>Marks: 14</b></p>
	<p><b>TLO a.</b> Calculate elastic constants and state their significance</p> <p><b>TLO b.</b> Distinguish between elasticity, surface tension &amp; viscosity</p> <p><b>TLO d.</b> Determine surface tension &amp; viscosity of fluid</p> <p><b>TLO e.</b> Deforming force, restoring force, elasticity, plasticity &amp; rigidity, factors affecting elasticity, stress &amp; strain with their types, elastic limit, Hooke's law &amp; elastic constants, factor of safety, application of elasticity,</p> <p><b>TLO f.</b> Learn about liquid pressure and find application of liquid pressure in daily life.</p> <p><b>TLO g.</b> Explain applications of Pascal's law, Archimedes principle.</p> <p><b>TLO h.</b> Classify types of flow of fluid</p> <p><b>TLO I.</b> Identify applications of elasticity, surface tension and viscosity</p>	<p><b>General Properties of Matter</b></p> <p><b>3.1 Elasticity:</b></p> <p>3.1.1 Deforming force, restoring force, Elastic, plastic and rigid substances, and their examples.</p> <p>3.1.2 Definition of elasticity, stress, strain and its types.</p> <p>3.1.3 Hooke's Law and elastic limit.</p> <p>3.1.4 Stress - Strain curve, yield point, breaking point.</p> <p>3.1.5 Young's Modulus, Bulk modulus and Modulus of rigidity, Definition and relation among them.</p> <p>3.1.6 Factor of safety.</p> <p>3.1.7 Applications of elasticity</p> <p>3.1.8 Numerical.</p> <p><b>3.2 Viscosity</b></p> <p>3.2.1 Concept and Definition of viscosity, velocity gradient.</p> <p>3.2.2 Newton's law of viscosity, Co-efficient of viscosity, unit of viscosity</p> <p>3.2.3 Stokes' law, terminal velocity, derivation of Stokes' formula.</p> <p>3.2.4 Streamline flow, turbulent flow, critical velocity, examples.</p> <p>3.2.5 Reynolds' number and its significance.</p> <p>3.2.6 Applications of viscosity.</p> <p>3.2.7 Numerical.</p> <p><b>3.3 Surface Tension:</b></p> <p>3.3.1 Concept of surface tension.</p> <p>3.3.2 Adhesive and cohesive forces, examples.</p> <p>3.3.3 Laplace's Molecular theory of surface tension</p> <p>3.3.4 Angle of contact, its significance.</p> <p>3.3.5 Expression for surface tension by capillary rise method.</p> <p>3.3.6 Effect of impurity and temperature.</p> <p>3.3.7 Applications of surface tension.</p> <p>3.3.8 Numerical.</p> <p><b>Course Outcome: CO3</b>  <b>Teaching Hours: 14hrs.</b>  <b>Marks: 16</b></p>

4.	<p><b>TLO a.</b> Identify various properties of sound waves.</p> <p><b>TLO b.</b> Differentiate between sound and other types of waves.</p> <p><b>TLO b.</b> Describe how sound wave properties affect how sound is perceived.</p>	<p><b>Sound</b></p> <p>4.1 Sound Waves:</p> <p>4.1.1 Wave motion, types of waves – progressive, longitudinal and transverse waves.</p> <p>4.1.2 Characteristics of longitudinal and transverse waves and comparison.</p> <p>4.1.3 Free or natural vibrations and forced vibrations, resonance – definition and examples.</p> <p>4.1.4 Determination of velocity of sound by resonance method.</p> <p>4.1.5 Numerical.</p> <p>4.1.6 Resonance concept in prehistoric times, concept of different frequencies (Mantras) used to ignite different chakras in body (IKS).</p> <p><b>Course Outcome: CO4</b>  <b>Teaching Hours: 5 hrs.</b>  <b>Marks: 8</b></p>
5.	<p><b>TLO 5a.</b> Explain refraction and reflection of light.</p> <p><b>TLO 5b.</b> Explain refraction of lit through prism.</p> <p><b>TLO 5c.</b> Estimate refractive index of material of prism.</p> <p><b>TLO 5d.</b> Derive Prism Formula.</p> <p><b>TLO 5e.</b> Explain the phenomenon of total internal reflection.</p> <p><b>TLO 5f.</b> Describe the workings and uses of fibre optics.</p> <p><b>TLO 5g.</b> 6 Describe the nanotechnology and properties of nanomaterials and its various applications.</p>	<p><b>Optics, Optical Fiber and Nanotechnology</b></p> <p><b>5.1 Optics:</b></p> <p>5.1.1 Revision of reflection and refraction of light.</p> <p>5.1.2 Laws of refraction, Snell's law.</p> <p>5.1.3 Determination of refractive index.</p> <p>5.1.4 Dispersion, Prism formula (derivation)</p> <p>5.1.5 Critical angle, Total internal reflection. Examples and applications.</p> <p>5.1.6 Numerical.</p> <p><b>5.2 Optical Fiber:</b></p> <p>5.2.1 Principle of propagation of light through optical fiber.</p> <p>5.2.2 Structure of optical fiber.</p> <p>5.2.3 Applications.</p> <p>5.2.4 Difference between optical fiber cable and electric cable wire.</p> <p><b>5.3 Nanotechnology</b></p> <p>5.3.1 Introduction to nanotechnology.</p> <p>5.3.2 Definition of Nano scale, manometer and nanoparticles, Nanotechnology.</p> <p>5.3.3 Definition and examples of nanostructured materials, Physical and chemical properties of nanomaterial.</p> <p>5.3.4 Applications of nanotechnology in different fields -</p> <p>a) electronics, b) automobile, c) medical, d) textile, e) Cosmetics, f) environmental,</p> <p><b>Course Outcome: CO5</b>  <b>Teaching Hours: 8 hrs.</b>  <b>Marks: 14</b></p>

## 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	<b>LLO a.</b> Use of measuring instruments <b>LLO b.</b> Find the least count and range of the instruments. <b>LLO c.</b> Interpretation of graph and use of scientific calculator.	To know your Physics laboratory and use of scientific calculator.	2	CO1
2	<b>LLO a.</b> Use Vernier caliper to Measure dimensions of given objects. Measure the dimensions of objects of known dimensions. <b>LLO b.</b> Estimate the errors in measurement.	To measure the dimensions of given objects and to determine their Volume using Vernier caliper.	2	CO1
3	<b>LLO a.</b> Identify types of motion <b>LLO b.</b> Determine the value of acceleration due to gravity.	To determine Acceleration due to gravity by simple pendulum	2	CO2
4	<b>LLO a.</b> Explain Elastic moduli. <b>LLO b.</b> Understand the relation between Young's modulus, Bulk modulus and rigidity modulus of elasticity	To determine Elastic moduli of a given wire by using Searle's apparatus.	2	CO1
5	<b>LLO a.</b> Study properties of liquid <b>LLO b.</b> Calculate coefficient of viscosity of liquid	To determine coefficient of viscosity of liquid by Stokes' method	2	CO3
6	<b>LLO a.</b> Understand the theory of the surface tension of liquids. <b>LLO b.</b> Correlate the property of surface tension with different natural phenomena. <b>LLO c.</b> Understand the concept of capillarity in liquids. <b>LLO d.</b> Relate surface tension and capillarity. Find the value of surface tension of a given liquid.	To determine the surface tension of liquid using capillary rise method.	2	CO3
7	<b>LLO a.</b> Understand the concept of sound waves and the various terms related to them <b>LLO b.</b> Understand transverse and longitudinal waves. Find the velocity of sound in air.	To determine velocity of sound by resonance method.	2	CO4
8	<b>LLO a.</b> Explain refraction of light. <b>LLO b.</b> Determine refractive index of a given prism	To determine refractive index by using pin method	2	CO5
9	<b>LLO a.</b> Use Micrometer Screw gauge to: Measure dimensions of given objects. Measure the dimensions of objects of known dimensions. <b>LLO b.</b> Estimate the errors in measurement.	To measure the dimensions of given objects and to determine their Volume using micrometer screw gauge.	2	CO1
10	<b>LLO a.</b> Identify type of motion <b>LLO b.</b> Calculate the stiffness constant	To determine stiffness constant by using helical spring	2	CO2
11	<b>LLO a.</b> Study the properties of light TIR <b>LLO b.</b> Determine the critical angle	To study total internal reflection and to determine the critical angle.	2	CO5

12	<b>LLO a.</b> Understand the concept of sound waves and the various terms related to them <b>LLO b.</b> Understand transverse and longitudinal waves. Find the velocity of sound in air.	To determine velocity of sound by using sonometer.	2	CO4
13	<b>LLO a.</b> Study the types of motion. <b>LLO b.</b> Use of projectile motion in sport.	To study projectile motion	2	CO2
14	<b>LLO a.</b> Apply engineering and physics concepts to the nano-scale and non-continuum domain. <b>LLO b.</b> To apply mathematics and science in engineering applications.	To study applications of nanotechnology in engineering field.	2	CO5
15	<b>LLO a.</b> Define unit and classify into different types of units	Showing Video on different applications related to units,	2	CO1

**Note: 10 to 12 experiments should be performed in a term for completion of TW.**

### V. Suggested Micro Project / Assignment/ Activities for Specific Learning / Skills Development (Self Learning):

1. Convert the units of a given physical quantity from one system of units to another
2. Measure room temperature of hot baths / bodies by using mercury thermometer and convert it into different units.
3. Prepare a chart to summarize units and measurements
4. Use a digital vernier calliper and micrometre screw gauge for measurements. (Lab- based).
5. Make a paper scale of least count e.g. 0.01 cm, 0.2cm, 0.5cm.
6. What is the difference between speed and velocity?
7. What is motion? Describe Straight line motion.
8. Explain Average speed and Average velocity.
9. Write in detail about your experience of various, types of motion while riding a bicycle on a road.
10. Identify the types of motion.
  - (a) Movement of the earth around the sun: .....
  - (b) Movement of a ceiling fan: .....
  - (c) A meteor falling from the sky: .....
  - (d) A rocket launched from the ground: .....
  - (e) A fish swimming in water: .....
  - (f) The plucked string of a sitar: ...
11. Compare elastic body and plastic body (lab based).
12. Write the practical applications of Elasticity.
13. Write the practical applications of Viscosity.
14. Compare streamline and turbulent flow with examples.
15. Write T for True and F for false statements:
  1. Sound is produced by a vibrating body.
  2. All objects produce same type of sound.



3. Guitar is a musical instrument.
  4. The number of complete waves or cycles produced by a vibrating body in one second is called frequency.
  5. The pitch of a sound is independent of the frequency of vibrations.
  6. Flute is a stringed instrument.
  7. The loudness of sound is a measure of the sound energy reaching the ear per second.
  - 8.. Loudness of a sound depends on the area of vibrating body only.
  9. Hertz is the unit to measure the intensity of loudness.
  10. Noise pollution can cause permanent hearing loss.
16. What is noise pollution? Write a note on the ill effects of noise pollution.
17. Why is the sound of siren in an ambulance or a Fire tender different from the horns used by other vehicles?
18. Circle the odd one out.
1. Tabla, Drums, Mridangam, Guitar
  2. Flute, Saxophone, Sitar, Shehnai
  3. Vacuum, Amplitude, Frequency, Loudness
  4. Veena, Drum, Sitar, Violin
  5. Sound of birds, Sound of a fan, Sound of a baby, Sound of a cracker
  6. Drums, Shehnai, Speaker, Guitar
  7. Hertz, Decibel, Frequency, Watt
  8. Temperature, Amplitude of Vibrations, Area off Vibrating body, Distance from listener
19. Match the columns.

1. Hertz	a. Unit to measure intensity of sound
2. A stringed instrument	b. An overtone and a fundamental tone at a fixed interval
3. Pitch	c. Loudest and lowest notes
4. Membrane instrument	d. Guitar
5. Monotone	e. SI unit of frequency
6. Decibel	f. Drums
7. Harmonics	g. Sensation of a frequency
8. Fundamentals	h. Sound with single tone

20. To demonstrate T.I.R and working of optical fiber (lab based)

**VI. Specification Table:**

Unit No	Topic Title	Distribution of Theory Marks			
		R Level	U Level	A Level	Total Marks
1	Units and Measurements	2	4	2	8
2	Motions	4	4	8	16
3	General properties of matter	4	6	8	18
4	Sound Waves	2	4	2	8
5	Optics and Optical fiber	2	4	4	10
<b>Total</b>		<b>14</b>	<b>22</b>	<b>24</b>	<b>60</b>

**VII. Assessment Methodologies/Tools****Formative assessment (Assessment for Learning)**

- ♦ Rubrics for continuous assessment based on process and product related performance indicators (25 marks)

**Summative Assessment (Assessment of Learning)**

- ♦ End term examination, Viva-voce (25 marks)

**VIII. Suggested COs - POs Matrix Form(CIVIL ENINEERING)**

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

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

## VIII. Suggested COs - POs Matrix Form(MECHANICAL ENGINEERING)

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

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

## VIII.Suggested COs - POs Matrix Form(RUBBER TECHNOLOGY)

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

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

**IX. Suggested Learning Materials / Books**

Sr.No	Author	Title	Publisher
1	R K Gaur & S L Gupta	Engineering Physics	Dhan pat Rai Pub.
2	Prof. Arthur Beiser	Applied Physics	Tata McGraw hill Pub.
3	D K Bhattacharya	Engineering Physics	Oxford University press
4	NCERT / MSBSHSE	Physics 1 & 2	NCERT/MSBSHSE
5	Halliday & Resnick Wiley	Physics Vol 1 & 2	Wiley India
6	Brijlal & Subrahmanyam	Principle of physics	S. CHAND & COMPANY
7	R K Gaur & S L Gupta.	Engineering Physics	Dhan pat Rai Pub.

**X. Learning Websites & Portals**

Sr.No	Link / Portal	Description
1	<a href="https://sunitathorat1310.wixsite.com/website-1">https://sunitathorat1310.wixsite.com/website-1</a>	Unit and measurement, Motion, Electrostatics, Electricity and Electromagnetism, Optics and Optical fiber,
2	<a href="http://www.physicsclassroom.com">www.physicsclassroom.com</a>	Concept of basic physics
3	<a href="http://www.physics.org">www.physics.org</a>	Concept of basic physics
4	<a href="http://www.physics.brown.edu">www.physics.brown.edu</a>	Concept of basic physics
5	<a href="http://www.amazon.com/Basic-Physics">www.amazon.com/Basic-Physics</a>	Concept of basic physics
6	<a href="http://scienceworld.wolfram.com/physics/">http://scienceworld.wolfram.com/physics/</a>	Concept of basic physics
7	<a href="http://en.wikipedia.org/wiki">http://en.wikipedia.org/wiki</a>	Concept of basic physics
8	<a href="http://hyperphysics.phy-astr.gsu.edu/hbase">http://hyperphysics.phy-astr.gsu.edu/hbase</a>	Concept of basic physics

9	<a href="http://www.msu.edu/~brechtjo/physics">www.msu.edu/~brechtjo/physics</a>	Concept of basic physics
10	<a href="http://www.answers.com/topic/list-of-basic-physics-topics">www.answers.com/topic/list-of-basic-physics-topics</a>	Concept of basic physics
11	<a href="http://www.answers.com/topic">www.answers.com/topic</a>	Unit and Measurements. Motion, Electrostatics, Electricity and Electromagnetism. Optics and Optical fiber,
12	<a href="http://www.vlab.amrita.edu">www.vlab.amrita.edu</a>	All Experiments video
13	<a href="http://www.olabs.edu.in">www.olabs.edu.in</a>	All Experiments video
14	<a href="https://praxilabs.com/en/">https://praxilabs.com/en/</a>	All Experiments video
15	<a href="http://www.phet.colorado.edu">www.phet.colorado.edu</a>	Simulation of Topics



**XI. Academic Consultation Committee/Industry Consultation Committee:**

Sr. No	Name	Designation	Institute/Organization
1	Mr. Y.A. Mahajan	Selection grade Lecturer in physics	Bhauasaheb Vartak Polytechnic, Vasai
2	Mr. S.S. Salve	Senior Lecturer in physics	S.B.M. Polytechnic, Vile -Parle
3	Mrs. B.J. Chaudhari	Lecturer in physics	Government Polytechnic, Thane
4	Mrs. S.A. Thorat	Lecturer in physics	Government Polytechnic, Mumbai

Coordinator,  
Curriculum Development,  
Department of \_\_\_\_\_ Engineering

Head of Department  
Department of \_\_\_\_\_ Engineering

I/C, Curriculum Development Cell

Principal



<b>Programme : Diploma in EE / EC / IS / CE / ME / CO / IF/AI &amp; ML / RT</b>													
<b>Course Code: SC23502</b>						<b>Course Title: ENGINEERING MATHEMATICS</b>							
<b>Compulsory / Optional: Compulsory</b>													
<b>Learning Scheme and Credits</b>						<b>Assessment Scheme</b>							
CL	TL	LL	SLH	NLH	Credits	FA-TH		SA-TH (2Hrs.30 Min)	FA- PR	SA		SLA	Total
						T1	T2			PR	OR		
3	2	--	1	6	3	20	20	60	25	--	--	25	150

**Total IKS Hrs. for course: 01 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, SLA- Self Learning Assessment

**Legends:** @ Internal Assessment, # External Assessment, \*# On Line Examination, @\$ Internal Online Examination

**Note:**

1. FA-TH represents Total of two class tests of 20 marks each conducted during the term.
2. FA-PR represents Tutorial Term work of 25 Marks
3. SLA represents self learning Assessment of 25 Marks
4. SA-TH represents the end term examination of 60 Marks

### I. Rationale

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

### II. Industry / Employer Expected Outcome

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

**III. Course Outcomes:** Students will be able to achieve & demonstrate the following COs on completion of course based learning.

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

**Course Content Details:**

<b>Unit No.</b>	<b>Theory Learning Outcomes (TLO's) aligned to CO's.</b>	<b>Topics / Sub-topics</b>
1	TLO 1.1 Solve the given simple problem(s) based on rules of integration. TLO 1.2 Evaluate the given simple integral(s) using substitution method. TLO 1.3 Integrate given simple functions using the integration by parts. TLO 1.4 Solve the given simple integral by partial fractions.	<b>Unit-I Indefinite Integration</b> 1.1 Simple Integration: Rules of integration and integration of 1.2 standard functions 1.3 Integration by substitution. 1.4 Integration by parts. 1.5 Integration by partial fractions
<b>Course Outcome : CO1</b>		<b>Teaching Hours : 9</b>
		<b>Marks: 10</b>
2	TLO 2.1 Solve given examples based on definite Integration. TLO 2.2 Use properties of definite integration to solve given problems. TLO 2.3 Utilize the concept of definite integration to find the following (a) Area under the curve (b) Area between given two curves (c) Volume of revolution (d) Mean value (e) Root mean square value	<b>Unit- II Definite Integration and Applications</b> 2.1 Definite Integration: Definition, rules of definite integration with simple examples 2.2 Properties of definite integral (without proof) and simple examples. 2.3 Applications of integration: area under the curve, area between given two curves, volume of revolution, mean value and root mean square value.
<b>Course Outcome : CO2</b>		<b>Teaching Hours : 10</b>
		<b>Marks: 14</b>
3	TLO 3.1 Find the order and degree of given Differential equations. TLO 3.2 Form simple differential equation for given elementary engineering problems. TLO 3.3 Solve given differential equations using the methods of Variable separable and Exact Differential Equation (Introduce the concept of partial differential equation). TLO 3.4 Solve given Linear Differential Equation. TLO 3.5 Solve given programme specific problems using the category of differential equation.	<b>Unit-III Differential Equation</b> 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, Homogeneous D.E., Exact Differential Equation, Linear Differential Equation 3.4 Application of differential equations and related engineering problem(s).
<b>Course Outcome : CO3</b>		<b>Teaching Hours : 10</b>
		<b>Marks: 14</b>



4	TLO 4.1 Find roots of algebraic equations by using appropriate methods. TLO 4.2 Solve the system of equations in three unknowns by using given methods. TLO 4.3 Apply the concept of numerical integration to solve given engineering problems. TLO 4.4 Solve problems using Yukti bhasa iterative methods for finding approximate square root. (IKS)	<b>Unit-IV: Numerical Methods and Numerical Integrations</b>  4.1 Solution of algebraic equations: Bisection method, Regula falsi method and Newton—Raphson method. 4.2 Solution of simultaneous equations containing three Unknowns by Gauss elimination method. 4.3 Solution of simultaneous equations containing three Unknowns by iterative methods: Gauss Seidal and Jacobi's method. 4.4 Numerical Integration: Trapezoidal rule, Simpson's 1/3rd rule, Simpson's 3/8 th rule. (Without proof) 4.5 Yukti bhasa iterative methods for finding approximate square root. (IKS)
	<b>Course Outcome : CO4</b>	<b>Teaching Hours : 8</b>
5	TLO 5.1 Solve given problems based on repeated trials using Binomial distribution. TLO 5.2 Solve given problems when number of trials are large and probability is very small. TLO 5.3 Utilize the concept of normal distribution to solve related engineering problems.	<b>Unit-V: Probability Distribution</b>  5.1 Binomial distribution. 5.2 Poisson's distribution. 5.3 Normal distribution.
	<b>Course Outcome : CO5</b>	<b>Teaching Hours : 8</b>

#### IV. Laboratory Learning Outcome and Aligned Practical / Tutorial Experiences.

Practical / Tutorial / Laboratory Learning Outcome (LLO)	Sr No	Laboratory Experiment / Practical Titles / Tutorial Titles	Number of hrs.	Relevant COs
LLO1.1 Solve simple problems of Integration by substitution	1	Integration by substitution	2	CO1
LLO2.1 Solve integration using by parts	2	Integration by parts	2	CO1
LLO3.1 Solve integration by Partial fractions	3	Integration by partial fractions.	2	CO1
LLO4.1 Solve examples on Definite Integral Based on given methods.	4	Definite Integral based on given methods.	2	CO2
LLO5.1 Solve problems on properties of Definite integral.	5	Properties of definite integral	2	CO2
LLO6.1 Solve given problems for finding The area under the curve, area between two curves and volume of revolution.	6	Area under the curve, area between two curves and volume of revolution.	2	CO2
LLO7.1 Solve examples on mean value and Root mean square value.	7	Mean value and root mean square value.	2	CO2
LLO8.1 Solve examples on order, degree And formation of differential equation.	8	Order, degree and formation of differential equation.	2	CO3
LLO9.1 Solve first order first degree D.E. Using variable separable method	9	Variable separable method and homogeneous method.	2	CO3

and homogeneous method.				
LLO10.1 Solve first order first degree D.E. Using exact differential equation and linear differential equation.	10	Exact differential equation and linear differential equation.	2	CO3
LLO11.1 Solve engineering application Problems using differential equation.	11	Applications of differential equations.	2	CO3
LLO12.1 Solve problems on Bisection Method and Regula falsi method.	12	Bisection Method and Regula Falsi Method	2	CO4
LLO13.1 Solve problems on Newton-Raphson method and Gauss elimination method.	13	Newton-Raphson method and Gauss elimination method.	2	CO4
LLO14.1 Solve problems on Jacobi's method and Gauss Seidal Method.	14	Jacobi's method and Gauss Seidal Method.	2	CO4
LLO 15.1 Solve examples on Trapezoidal rule, Simpson's 1/3rd rule and Simpson's 3/8th rule.	15	Trapezoidal rule, Simpson's 1/3rd rule And Simpson's 3/8th rule.	2	CO4
LLO16.1 Solve problems on Bisection method, Regula falsi method, Newton-Raphson method using spread sheet .	16	Bisection method, Regula falsi method, Newton-Raphson method problems using spreadsheet.	2	CO4
LLO17.1 Use Yukti bhasa iterative methods For finding approximate value of square root and cube root. (IKS)	17	Yukti bhasa iterative methods for Finding approximate value of square root and cube root. (IKS)	2	CO4
LLO18.1 Solve engineering problems using Binomial distribution.	18	Binomial Distribution	2	CO5
LLO19.1 Solve engineering problems using Poisson distribution.	19	Poisson Distribution	2	CO5
LLO20.1 Solve engineering problems using Binomial distribution.	20	Normal Distribution	2	CO5

**Note:** 1. Take any 10-12 tutorials out of 20 and ensured that all the units are covered. 2. Take tutorial in the batch size of 20 to 30 students. 3. Give students at least 10 problems to solve in each tutorial.

### **Suggested Micro Project / Assignment/ Activities for Specific Learning / Skills Development (Self Learning):**

- Choose a real world problem and formulate a differential equation to model it.
- Solve the formulated differential equation and interpret the solution in the context of the problem
- Collect examples based on real world applications of Integration
- Collect examples based on real world applications of Definite Integration
- Consider a fair six-sided die. Define a discrete random variable  $X$  as the number obtained when rolling the die. Construct the probability distribution table for  $X$
- Collect examples based on real world applications of Newton Raphson Method.
- Collect examples based on real world applications of Binomial Distribution.
- Collect examples based on real world applications of Poisson Distribution.
- Collect examples based on real world applications of Normal Distribution.

- Collect examples based on real world applications of Differential Equations
  - Collect examples based on real world applications of Gauss Seidal Method.
  - Collect examples based on real world applications of Gauss Jacobi's Method
- Attempt any 5-7 Assignment, out of the given list

**V. Specification Table:**

Unit No	Topic Title	Distribution of Theory Marks			
		R Level	U Level	A Level	Total Marks
1	Indefinite Integration	2	4	4	10
2	Definite Integration and Applications	2	4	8	14
3	Differential Equation	2	4	8	14
4	Numerical Methods and Numerical Integrations	2	4	6	12
5	Probability Distribution	2	4	4	10
<b>Total</b>		10	20	30	60

**VI. Assessment Methodologies/Tools****Formative assessment (Assessment for Learning)**

- TH- Progressive /Periodic Test test each of 20 Marks
- TL - Continuous Assessment of Tutorials for 25 Marks
- SL - Continuous Assessment of Self Learning for 25 Marks

**Summative Assessment (Assessment of Learning)**

- TH - Term End examination of 60 Marks

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: --

**VII. Suggested Learning Materials / Books**

Sr.No	Author	Title	Publisher
1	Grewal B.S.	Higher Engineering Mathematics	KhannapublicationNewDelhi,2013ISBN : 8174091955
2	Dutta. D	A text book of Engineering Mathematics	NewagepublicationNewDelhi,2006 ISBN:978-81-224-1689-3
3	Kreysizg, Ervin	Advance Engineering Mathematics	WileypublicationNewDelhi2016ISBN: 978-81-265-5423-2
4	Das H.K.	Advance Engineering Mathematics	SChandpublicationNewDelhi2008 ISBN: 9788121903455
5	S.S. Sastry	Introductory Methods of Numerical Analysis	PHILearning Private Limited, NewDelhi. ISBN-978-81-203-4592-8
6	C.S. Seshadri	Studies in the History of Indian Mathematics	Hindustan Book Agency (India) P19 Green Park Extension NewDelhi.ISBN978-93- 80250-06-9
7	Marvin L.Bittinger David J.E Ienbogen ScottA. Surgent	Calculus and Its Applications	Addison-Wesley10thEditionISBN-13: 978-0-321-69433-1
8	Gareth James, Daniela Witten,Trevor Hastie Robert and Tibshirani	An Introduction to Statistical Learning with Applications in R	Springer NewYork Heidelberg Dordrecht LondonISBN978-1-4614-7137-0ISBN 978-1-4614-7138-7(eBook)

### VIII. Learning Websites & Portals

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

**IX. Academic Consultation Committee/Industry Consultation Committee:**

<b>Sr. No</b>	<b>Name</b>	<b>Designation</b>	<b>Institute/Organization</b>
1	Mr.Santosh Bhandekar	Lecturer in Mathematics	Government Polytechnic, Osmanabad
2	Mr.Abhijit S.Patil	Lecturer in Mathematics	Government Polytechnic ,Mumbai
3	Mr.Vinod S.Patil	Lecturer in Mathematics	Government Polytechnic ,Mumbai

Coordinator,  
Curriculum Development,  
Department of Science & Humanities

Head of Department  
Department of Science & Humanities

I/C, Curriculum Development Cell

Principal



<b>Programme: Diploma in Mechanical Engineering (Sandwich Pattern)</b>													
<b>Course Code: ME23 104</b>						<b>Course Title: Fundamental of Electrical Technology and Electronics</b>							
<b>Compulsory / Optional: Compulsory</b>													
<b>Learning Scheme and Credits</b>						<b>Assessment Scheme</b>							
CL	TL	LL	IKS Hrs	NLH	Credits	FA-TH		SA-TH (2.30 Hrs.)	FA-PR	SA		SLA	Total
						T1	T2			PR	OR		
4	--	4	2	8	4	20	20	60	25	--	--		125

**Total IKS Hrs. for course:**

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

**Legends:** @ Internal Assessment, # External Assessment, \*# On Line Examination, @\$ Internal Online Examination

**Note:**

1. FA-TH represents two class tests of 20 marks each conducted during the term.
2. SA-TH represents the end term examination.

- I. Rationale:** Knowledge of fundamentals of electrical is essential to apply on all type of electrical machines, instruments, devices, and equipment's. The basic aim of this course is that, the student must learn facts, concepts, principles and procedures in electrical engineering. The knowledge of this course will be useful for understanding the higher-level knowledge in the field of mechanical engineering
- II. Industry / Employer Expected Outcome:** The aim of this course is to help the student to attain the following industry identified outcome through various teaching learning experiences: 1) To know the basic elements of electrical engineering 2) Apply principles and basic laws of electrical engineering for solving electric and magnetic circuit.
- III. Course Outcomes:** Students will be able to achieve & demonstrate the following COs on completion of course based learning

CO1	Describe principles and basic laws of electrical engineering
CO2	Identify constructional part of single phase and three phase transformers
CO3	Choose electric machine for specific application.
CO4	Describe the fundamentals of Diode and their applications
CO5	Illustrate the working of regulated power supply.
CO6	State different types of Power devices and their applications

**Course Content Details:**

Unit No.	Theory Learning Outcomes (TLO's) aligned to CO's	Topics / Sub-topics
1	1.1 State and apply Basic concepts of electricity. 1.2 Define resistance and explain the factors affecting resistance 1.3 state and explain classification of Electric current. 1.4 Identify the effects of electric current in an appliances 1.5 State concept of Electrical work, power, and Energy 1.6 Solve DC resistive network using rules and laws 1.7 Identify difference in phasor relationship of current and voltage for load 1.8 State types of power and power factor 1.9 Define and explain various terms related to magnetic circuit 1.10 State Faradays law of Electromagnetic Induction 1.11 explain types of induced emf. 1.12 Explain rule and laws for induced emf	<b>Basic Concept</b> 1.1 Concept of Electric current, Electric Potential, Potential difference, E.M.F. Difference between E.M.F and Potential Difference 1.2 Resistance, factors affecting Resistance, Effect of Temperature on Resistance. Temperature Co-efficient of Resistance 1.3 Classification of Electric Current, compare DC with AC 1.4 Effects of Electric Current (only Introduction with application) 1.5 Concept of Electrical Work, Power & Electrical energy (Simple Problems) 1.6 Equation for equivalent resistance connected in i) series ii) parallel, comparison between series and parallel circuit. (Simple numerical) 1.7 Phasor relationship of current and voltage, waveform of pure resistance, pure inductance, and pure capacitance 1.8 Concept types of Power and power factor 1.9 Magnetic circuit, Magnetic flux, properties of magnetic lines of force, magnetic flux density 1.10 Faraday's Laws of Electromagnetic Induction. 1.11 Types of Induced E.M.F. 1.12 Direction of induced E.M.F i) Fleming Right Hand Rule ii) Lenz's Law <b>Course Outcome: CO1 Teaching Hrs :12 hrs Marks: 10 (R-2 , U-4, A-4)</b>
2	2.1 State principal of transformer 2.2 Identify constructional parts of transformer and types of transformers 2.3 Define terminology related to transformer 2.4 State losses, efficiency, and regulation of transformer 2.5 Enlist types of three phase transformer 2.6 Compare single phase and three phase transformers.	<b>Transformer</b> 2.1 Working Principal of transformer. 2.2 Construction of Single-phase Transformer and types of transformers depending on construction and transformation ratio. 2.3 EMF equation (No derivation): voltage ratio, Turns ratio Transformation ratio (simple numerical) 2.4 Transformer losses, Efficiency, and regulation of transformer 2.5 Three phase transformer: types of three phase transformer depending on connection. 2.6 Comparison between single phase and three phase transformer <b>Course Outcome: CO2 Teaching Hours: 8 Marks: 8 (R- 2, U- 4, A- 2 )</b>

3	<p>3.1 State working principal of three phase I.M</p> <p>3.2 State and explain construction, working of three phase Squirrel cage induction motor</p> <p>3.3 State and explain construction, working of three phase Slipring induction motor</p> <p>3.4 Solve example on slip and speed</p> <p>3.5 State how to reverse the direction of three phase I.M</p> <p>3.6 Draw torque-slip characteristic and specify rating of three phase I.M</p> <p>3.7 Describe speed control of three phase I.M</p> <p>3.8 Explain working principle of single phase I.M</p> <p>3.9 Compare single phase I.M with Three phase I.M</p>	<p><b>3: Induction Motor</b></p> <p>3.1 Working principle of Induction motor</p> <p>3.2 3ph Squirrel cage induction motor – construction, working and application</p> <p>3.3 Slip Ring Induction motor – construction, working and application</p> <p>3.4 Synchronous speed, % slip [simple problems]</p> <p>3.5 Reversal of Induction Motor</p> <p>3.6 Torque – Slip characteristics, Rating and Specification of three phase induction motor.</p> <p>3.7 Speed control: Voltage control, Rotor resistance control &amp; frequency control</p> <p>3.8 Single phase Induction motor: working principal and Types only</p> <p>3.9 Comparison between three phase and single-phase Induction Motor</p> <p><b>Course Outcome: CO3 Teaching Hours: 10 Marks: 12 (R- 2, U- 6, A- 4)</b></p>
4	<p>4.1 State functions of Basic passive Components of Electronics.</p> <p>4.2 Study V-I characteristics of PN junction diode.</p> <p>4.3 Describe working of Half wave, center tapped full wave and Bridge full wave rectifier with neat diagram.</p> <p>4.4. State need of filters.</p> <p>4.5. Explain working of Pi filter</p>	<p><b>Diode and applications:</b></p> <p>4.1 Introduction of Basic Electronics passive Components (Resistor, Capacitor &amp; Inductor)</p> <p>4.2 PN junction diode and Zener diode: Construction, working &amp; V-I characteristics.</p> <p>4.3 Rectifier: Definition, Types, Circuit diagram, waveforms, and Working of Half wave rectifier (b) Full Wave rectifier (Centre Tapped) (c) Full wave Bridge rectifier.</p> <p>4.4 Filters: Definition, Necessity, classification (Shunt C, L and Pi), Circuit diagram and wave forms of Pi filter.</p> <p><b>Course Outcome: CO4 Teaching Hours: 10 hrs Marks: 10 (R- 2, U-6, A- 2)</b></p>
5	<p>5.1 Describe working of DC regulated power supply.</p> <p>5.2 Explain Zener diode as voltage regulator</p> <p>5.3. Describe working of voltage regulator IC's.</p>	<p><b>Regulated Power supply:</b></p> <p>5.1 Block diagram of DC regulated power supply.</p> <p>5.2 Load regulation and line regulation.</p> <p>5.3 Zener diode as voltage regulator.</p> <p>5.4 Types of IC voltage regulator: Fixed and variable (introduction)</p> <p>5.5 78XX ,79XX ICs: Pin diagram, working and specifications.</p> <p>5.6 Block diagram of Uninterrupted power supply.</p> <p><b>Course Outcome: CO5 Teaching Hours :8 hrs Marks: 8 (R- 2, U-2, A- 4)</b></p>



6	6.1 Compare SCR, TRIAC and DIAC. 6.2 Describe working of NPN transistor 6.3 Describe working of general purpose relay. 6.4 State applications of power devices	<b>Power devices:</b> 6.1 Symbol, working, characteristics and application of SCR, TRIAC and DIAC. 6.2 Bipolar Junction Transistor: Symbol, Construction and working of NPN transistor and applications. 6.3 Relay: symbol, contacts, working, applications of general purpose relay.	<b>Course Outcome:CO6 Teaching Hours :12 hrs Marks: 12 (R- 4, U-6, A- 2)</b>

### Laboratory Learning Outcome and Aligned Practical / Tutorial Experiences.

#### I- Electrical Engineering.

Sr No	Practical / Tutorial / Laboratory Learning Outcome (LLO)	Laboratory Experiment / Practical Titles / Tutorial Titles	Number of hrs.	Relevant COs
1	Identify electrical measuring instruments/apparatus/equipment	Identify electrical measuring instruments, supply sources, ICDP/ITDP, switches, loads, wires and Prepare Charts of electrical safety	4	CO1
2	Calculate efficiency and regulation of transformer.	To verify efficiency and regulation of transformer	4	CO2
3	Calculate % slip of 3-phase induction motor	To measure slip of 3-phase induction motor.	4	CO3
4	Calculate temperature coefficient of resistance.	To verify the effect of temperature on resistance of copper conductor	2	CO1
5	Calculate total resistance for series /parallel circuit.	To determine the equivalent resistance (Req.) of Series and Parallel connected resistances	4	CO1
6	Calculate transformation ratio and Identify types of transformers	Measure the voltage ratio and transformation ratio of transformer	2	CO2
7	Draw speed torque characteristics of 3 phase I.M	To plot speed Torque characteristics of 3- phase induction motor	2	CO3
8	Calculate energy consumed in single phase circuit.	To measure current, voltage, power and energy in single phase circuit	4	CO1
9	Measure AC/DC voltage, resistance, continuity	Use of Multimeter /Multirange meter for measurement of AC & DC voltage, resistance, continuity	2	CO1
10	Reverse the direction of 3-phase induction motor	To reverse the direction of three phase Induction motor.	2	CO3

#### II. Electronics Engineering

11	To plot V-I Characteristics of P-N junction diode and find cut in voltage.	Test performance of semiconductor P-N diode.	2	CO4
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12	To plot V-I characteristics of zener diode and identify zener region .	Test performance of Zener diode	2	CO4
13	To observe and analyse output waveforms of half wave rectifier and Bridge rectifier	Build /Test half wave rectifier on bread board.	2	CO4
14	To observe output waveform of Pi filter with rectifier	Build /test $\pi$ filter with Bridge rectifier	2	CO4
15	Identify region of operation of transistor.	To test performance of Transistor as switch.	2	CO6
16	LLO a. Identify different sections of D.C power supply LLO b. Explain specifications of 78xx and 79xx IC	Build /Test specified voltage DC supply using 78XX/ 79XX IC.	2	CO5
17	Plot V-I characteristics of SCR and identify operating regions.	Test performance of SCR	2	CO6

### I. Suggested Micro Project / Assignment/ Activities for Specific Learning / Skills Development

### II. Specification Table:

Unit No	Topic Title	Distribution of Theory Marks			
		R Level	U Level	A Level	Total Marks
1	Basic Concept	2	4	4	10
2	Transformer	2	4	2	8
3	Induction Motor	2	6	4	12
4	Diode and application	2	6	2	10
5	Regulated Power supply	2	2	4	8
6	Power devices	4	6	2	12
<b>Total</b>		14	28	18	60

### III. Assessment Methodologies/Tools

#### Formative assessment (Assessment for Learning)

- Rubrics for continuous assessment based on process and product related performance indicators( 25 marks)

#### Summative Assessment (Assessment of Learning)

End term examination, Viva-voce, Workshop performance ( 25 marks)

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### IV. 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	--	3	3	3	-
CO2	3	3	--	2	2	--	3	3	3	3
CO3	3	3	--	2	2	--	3	3	3	3
CO4	3	1	1	2	-	-	1	2	1	1
CO5	3	2	2	2	-	-	2	3	2	1
CO6	3	2	1	1	-	-	1	1	-	1

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

#### V. Suggested Learning Materials / Books

Sr.No	Author	Title	Publisher
1	M.N. Mittal	Fundamentals of Electrical Engineering	Everest Publishing House
2	B. L. Theraja and A. K. Theraja	Electrical Technology (Volume I)	S. Chand and Co. Ltd.
3	V. K. Mehta and Rohit Mehta	Basic Electrical Engineering	S. Chand and Co. Ltd.
4	Edward Hughes	Electrical Technology	ELBS Publications
5	Malvino, Albert Paul, David	Electronics Principles	(McGraw Hill Education)
6	Mehta V.K., Mehta Rohit	Principles of Electronics	(S. Chand and Company)
7	Bell, David	Fundamentals of Electronic Devices and Circuits	(Oxford University Press)
8	Sedha R.S.	Fundamentals of Electronic Devices and Circuits	(S. Chand)

#### VI. Learning Websites & Portals

Sr.No	Link / Portal	Description
1	<a href="https://archive.nptel.ac.in/courses/108/105/108105112/">https://archive.nptel.ac.in/courses/108/105/108105112/</a>	Videos on basic concept, DC circuit, Capacitor and ac fundamental
2	<a href="https://www.khanacademy.org">https://www.khanacademy.org</a>	Videos on basic concept

3	<a href="https://www.electronics-tutorials.ws/electromagnetism/electromagnetic-induction.html">https://www.electronics-tutorials.ws/electromagnetism/electromagnetic-induction.html</a>	Laws of Electromagnetic Induction
1	<a href="https://ndl.iitkgp.ac.in/">https://ndl.iitkgp.ac.in/</a>	National digital library of India.
2	<a href="http://www.electronicshub.org/tutorials/">www.electronicshub.org/tutorials/</a>	Basic electronics Tutorials related to capacitors, resistors, filters, Op-amp
3	<a href="http://www.tutorialspoint.com/">www.tutorialspoint.com/</a>	Online tutorials, Courses and Le library
4	<a href="http://www.youtube.com">www.youtube.com</a>	
5	<a href="https://phet.colorado.edu/en/simulation/legacy/semiconductor">https://phet.colorado.edu/en/simulation/legacy/semiconductor</a>	Concepts of semiconductors, diodes & transistor.

### VII. Academic Consultation Committee/Industry Consultation Committee:

Sr. No	Name	Designation	Institute/Organization
3	Miss A.V. Patil	Lecturer in Electrical Engineering	G.P.Mumbai
1	Smt. Sisodiya S.H	Lecturer in Electronics	G.P.Mumbai
2	Smt. Padavi.T.Y	Lecturer in Electronics	G.P.Mumbai

Coordinator,  
Curriculum Development,  
Department of Mechanical Engineering

Head of Department  
Department of Mechanical Engineering

I/C, Curriculum Development Cell

Principal

<b>Programme : Diploma in CE/ME</b>													
<b>Course Code: AM 23101</b>						<b>Course Title: ENGINEERING MECHANICS</b>							
<b>Compulsory / Optional: Compulsory</b>													
<b>Learning Scheme and Credits</b>						<b>Assessment Scheme</b>							
CL	TL	LL	SLH	NLH	Credits	FA-TH		SA-TH (2:30 Hrs.)	FA- PR	SA		SLA	Total
						TS1	TS2			PR	OR		
3	-	2	1	6	3	20	20	60	25	-	-	25	150

**Total IKS Hrs. for course: 4**

**Abbreviations:** CL- Class Room Learning, TL- Tutorial Learning, LL- Laboratory Learning, SLH-Self Learning Hours, NLH-Notional Learning Hours, FA - Formative Assessment, SA -Summative assessment, SLA- Self Learning Assessment

**Legends:** @ Internal Assessment, # External Assessment, \*# On Line Examination, @\$ Internal Online Examination

**Note:**

1. FA-TH represents two class tests of 20 Marks each conducted during the semester.
2. SA-TH represents the end term examination.

**I. Rationale**

In day to day life we come across different structures, at the time of design of structures, analysis plays an important role. Perfect analysis is possible only when one knows the types and effect of forces acting on the structure. This course provides knowledge about the different types of forces/loads, their effects while acting in different conditions/systems. The course also provides the knowledge about basic concepts of laws of engineering, their application to different engineering problem. The principles of mechanics are fundamental to Mechanical and Civil Engineering and related programs such as Mechatronic Engineering, Naval Architecture, Aerospace, Manufacturing as well as Biomedical engineering. This course is needed as a prerequisite for the courses at higher level such as Mechanics of Structures, Strength of Materials, Design of Structures, Theory of Machines, etc.

**II. Industry / Employer Expected Outcome**

This course is to be taught and implemented with the aim to develop in the student, the course outcomes (COs) leading to the attainment of industry identified outcome expected from this course and they can demonstrate the understanding of basic and fundamental concepts needed for design of machine elements as well as structures and beams.

**III. Course Outcomes:** Students will be able to achieve & demonstrate the following COs on completion of course based learning

CO1	Apply principles of simple machines
CO2	Determine unknown forces of various force system
CO3	Apply the principles of equilibrium to engineering problems.
CO4	Apply the principle of friction in various conditions.
CO5	Calculate centroid and centre of gravity for various geometrical figures.
CO6	Apply the principles of dynamics.

**Course Content Details:**

Unit No.	Theory Learning Outcomes (TLO)	Topics / Sub-topics
1	<p><b>TLO 1.1</b> Describe Definitions of Simple &amp; Compound Machines</p> <p><b>TLO 1.2</b> Explain terminology related to machines and its various parameters such as MA, VR etc</p> <p><b>TLO 1.3</b> Explain the Law of Machines and Reversibility of Machines</p> <p><b>TLO 1.4</b> Describe and compute the Velocity Ratio and other parameters for Different Simple Machines</p>	<p><b>Simple Machines:</b></p> <p>1.1 Definitions</p> <p>1.2 Simple machine, compound machine , load , effort , mechanical advantage , velocity ratio , input of a machine ,output of a machine efficiency of a machine , ideal machine, ideal effort and ideal load, load lost in friction, effort lost in friction</p> <p>1.3 Analysis: Law of machine, maximum mechanical advantage and maximum efficiency of a machine, reversibility of a machine, condition for reversibility of a machine, self-locking machine, simple numerical problems.</p> <p>1.4 Velocity Ratio for simple machines : Simple axle and wheel, differential axle and wheel, Weston's differential pulley block, single purchase crab, double purchase crab, worm and worm wheel, geared pulley block, screw jack, calculation of mechanical advantage, efficiency, identification of type such as Reversible or not etc.</p> <p><b>Course Outcome : CO1      Teaching Hours :6 hrs</b></p>

<p><b>2</b></p>	<p><b>TLO 2.1</b> Explain the basics of Statics, Forces &amp; Force Systems</p> <p><b>TLO 2.2</b> Explain the method of resolution of force</p> <p><b>TLO 2.3</b> Explain algebraic method for determination of resultant force</p> <p><b>TLO2.4</b> Describe the graphical method for finding the resultant of a force system.</p>	<p><b>Force systems:</b></p> <p>2.1 Fundamentals and Force systems: Definitions engineering mechanics, statics, Dynamics. Classification of force system according to plane coplanar and non-coplanar, sub classification of coplanar force system- collinear, concurrent, non-concurrent, parallel, Definition of a force, representation of a force by vector and by Bow's notation method. Characteristics of a force, effects of a force, principle of transmissibility.</p> <p>2.2 Resolution of a force and Moment of a force: Definition, Method of resolution, along mutually perpendicular direction and along two given direction. Definition of moment, classification of moments, sign convention, law of moments, Varignon's theorem of moment and its use, definition of couple, properties of couple</p> <p>2.3 Composition &amp; resolution of forces : Definition of Resultant force, methods of composition of forces, Law of parallelogram of forces, Algebraic method for determination of resultant for various force system.</p> <p>2.4 Graphical method: Space diagram, vector diagram, polar diagram, and funicular polygon. Resultant of concurrent and parallel force system only.</p> <p><b>Course Outcome: CO2 Teaching Hours :10 hrs</b></p>
<p><b>3</b></p>	<p><b>TLO3.1</b> Explain the concept of Equilibrant force, Lami's Theorem</p> <p><b>TLO3.2</b> Describe Beams and their types as well finding support reaction for different end supports</p>	<p><b>Equilibrium:</b></p> <p>3.1 Equilibrant and Lami's Theorem: Definition of equilibrant, relation between resultant and equilibrant, equilibrant of concurrent and non-concurrent force system. Analytical, free body and free body diagram. Statement and explanation of Lami's theorem and Application.</p> <p>3.2 Beams: Definition, Types of beams (cantilever, simply supported, overhanging, fixed, continuous), Types of end supports (simple support, hinged, roller), classification of loads, point load, inclined point load, uniformly distributed load. Analytical method to determine reactions of simply supported, cantilever and over hanging beam subjected to point loads and UDL and graphical method to determine reactions for beams subjected to vertical point loads &amp;UDL only</p> <p><b>Course Outcome: CO3 Teaching Hours :8 hrs</b></p>
<p><b>4</b></p>	<p><b>TLO4.1</b> Explain the concept of Friction and Coefficient of Friction</p> <p><b>TLO4.2</b> Describe equilibrium of a body on horizontal &amp; inclined plane as well as ladder friction</p> <p><b>TLO4.3</b> Describe basic of Dynamic</p>	<p><b>Friction:</b></p> <p>4.1 Definition: Friction, Types of friction, limiting frictional force, coefficient of friction, angle of friction, angle of repose, relation between angle of friction, angle of repose and coefficient of friction. Cone of friction, advantages and disadvantages of friction.</p> <p>4.2 Equilibrium of body on Horizontal and inclined plane: Equilibrium of body on horizontal plane subjected to horizontal and inclined force. Equilibrium of body on inclined plane subjected to forces applied</p>

	Friction	parallel to the plane only. Concept of ladder friction. 4.3 Introduction (only) -Dynamic friction <b>Course Outcome:CO4 Teaching Hours :8 hrs</b>
5	<b>TLO5.1</b> Explain & plot the Centroid for different geometrical sections <b>TLO5.2</b> Explain & plot the CG for different geometrical sections	<b>Centroid and Centre Of Gravity:</b>  5.1 Centroid: Definition of centroid. Moment of an area about an axis. Centroid of basic geometrical figures such as square, rectangle, triangle, circle, semicircle and quarter circle. Centroid of composite figure with not more than three geometrical figures. 5.2 Center of gravity: Definition, center of gravity of simple solids such as cylinder, sphere, hemisphere, cone, cube, and rectangular block. Centre of gravity of composite solids with not more than Two simple solids. (Hollow solids are expected.)  <b>Course Outcome:CO5 Teaching Hours :8 hrs</b>
6	<b>TLO 6.1</b> Explain the kinetics and the different laws of motion <b>TLO 6.2</b> Explain the kinematics and the different laws of motion <b>TLO 6.3</b> Describe the concepts of Angular Motion, Displacement & Acceleration <b>TLO 6.4</b> Explain and analyse the different types of Motion under gravity.	<b>Dynamics :</b>  6.1 Kinetics: Definition of kinetics, Newton's laws of motion and its applications. 6.2 Kinematic: Definition of kinematics, Basic concepts of motion, rectilinear motion, displacement, velocity, speed, acceleration. 6.3 Angular motion : Introduction, definition of angular velocity, angular acceleration, angular displacement, (Simple Numericals ) 6.4 Motion under gravity. (No numerical on this subtopic)

#### IV. Laboratory Learning Outcome and Aligned Practical / Tutorial Experiences.

Sr No	Laboratory Learning Outcomes (LLO)	Laboratory Experiment / Practical Titles / Tutorial Titles	Number of hrs.	Relevant COs
1	<b>LLO 1.1</b> To determine MA, VR, Efficiency, & other experimental parameters for Differential axle & wheel and for Simple Screw jack.	To determine MA, VR, Efficiency, Ideal Effort, Effort lost in friction for Differential axle & wheel and for Simple screw jack.	2	CO1
2	<b>LLO2.1</b> To determine MA, VR,	To determine MA, VR, Efficiency, Ideal Effort, Effort lost in friction for single purchase crab and for double	2	CO1



	Efficiency, & other experimental parameters for single purchase crab and for double purchase crab.	purchase crab.		
3	<b>LLO 3.1</b> To experimentally verify Law of Polygon of Forces	Verify law of polygon of forces	2	CO2
4	<b>LLO 4.1</b> To Graphically determine resultant of concurrent and non-concurrent force system	Graphically determine resultant of concurrent and non-concurrent force system.	4	CO2
5	<b>LLO 5.1</b> To Graphically determine resultant of parallel force system.	Graphically determine resultant of parallel force system.	2	CO2
6	<b>LLO 6.1</b> To experimentally verify law of moments.	To verify law of moments.	2	CO2
7	<b>LLO 7.1</b> To experimentally verify Lami's theorem	To verify of Lami's theorem	2	CO3
8	<b>LLO 8.1</b> To experimentally verify the Equilibrium of parallel forces – simply supported beam reactions	To verify the Equilibrium of parallel forces – simply supported beam reactions	2	CO3
9	<b>LLO 9.1</b> To experimentally determine coefficient of friction for motion on horizontal plane.	To determine coefficient of friction for motion on horizontal plane.	4	CO4
10	<b>LLO 10.1</b> To find and plot the Centroid of basic geometrical figures	Determination of Centroid of basic geometrical figures such as square, rectangle, triangle, circle & Centre of gravity of simple solids such as cylinder, sphere, cone, cube.	4	CO5
11	<b>LLO 11.1</b> To find and plot the Centroid of basic geometrical figures	Numericals on Angular motion	4	CO6

**Note: if any**

**V. Suggested Micro Project / Assignment/ Activities for Specific Learning / Skills Development (Self Learning):**

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**Formative assessment (Assessment for Learning) for PR and SLA**

- ♦ Rubrics for continuous assessment based on process and product related performance indicators(\_\_\_\_ marks)

### Summative Assessment (Assessment of Learning)

End term examination, Viva-voce, Workshop performance ( \_\_marks)

- ♦

#### a) Suggested COs - POs Matrix Form

#### CO vs PO and CO vs PSO Mapping (CIVIL ENGINEERING)

Course Outcomes (COs)	Programme Outcomes (POs)							Programme Specific Outcomes (PSOs)		
	PO1 Basic and Discipline specific knowledge	PO2 Problem analysis	PO3 Design/development of solutions	PO4 Engineering Tools, Experimentation and Testing	PO5 Engineering practices for society, sustainability and environment	PO6 Project Management	PO7 Life-long learning	PS O1	PSO 2	PSO 3
CO1	3	3	3	2	1	2	2	3	2	-
CO2	3	3	3	2	1	1	2	3	--	-
CO3	3	3	3	2	1	1	2	3	--	-
CO4	3	3	3	2	1	1	2	3	--	-
CO5	3	3	3	2	1	1	2	3	--	-
CO6	3	3	3	2	1	1	2	3	--	-

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

#### CO vs PO and CO vs PSO Mapping (MECHANICAL ENGINEERING)

Course Outcomes (COs)	Programme Outcomes (POs)							Programme Specific Outcomes (PSOs)	
	PO1 Basic and Discipline specific knowledge	PO2 Problem analysis	PO3 Design/development of solutions	PO4 Engineering Tools, Experimentation and Testing	PO5 Engineering practices for society, sustainability and environment	PO6 Project Management	PO7 Life-long learning	PSO1	PSO2
CO1	3	3	3	2	1	2	2	3	2

<b>CO2</b>	3	3	3	2	1	1	2	3	3
<b>CO3</b>	3	3	3	2	1	1	2	3	3
<b>CO4</b>	3	3	3	2	1	1	2	3	3
<b>CO5</b>	3	3	3	2	1	1	2	3	3
<b>CO6</b>	3	3	3	2	1	1	2	3	3

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

**b) Suggested Learning Materials / Books**

Sr.No	Author	Title	Publisher
1	R.S.Khurmi,	Engineering Mechanics 10-9352833961	S. Chand & Company Ltd.
2	Shames and Rao,	Engineering Mechanics 13-978-0133569087	Pearson Education.
3	R.C.Hibbeler,	Engineering Mechanics 13-978-0133073577	Pearson Education.
4	S. Ramamruthum,	Applied Mechanics 10-935216427X	Dhanpat Rai & Sons, Delhi.

c)

**d) Learning Websites & Portals**

Sr.No	Link / Portal	Description
1	<a href="mailto:support@swayam.gov.in">support@swayam.gov.in</a>	-
2	<a href="mailto:arunasis@iitg.ernet.in">arunasis@iitg.ernet.in</a>	-
3	<a href="http://www.google.com">www.google.com</a>	-
4	<a href="http://www.youtube.com">www.youtube.com</a>	-
5	<a href="http://www.nationallibrary.gov.in">http://www.nationallibrary.gov.in</a>	-

**e) Academic Consultation Committee/Industry Consultation Committee:**

Sr. No	Name	Designation	Institute/Organization
1	Shri Shivkumar Aade	Deputy Chief Engineer	Mhada
2	Shri Sharad Sonawane	Director	Om Ajay Constructions

3	Smt Yaxika Soni	Sr.Lecturerin Civil Engineering	S.B.M.Polytechnic
4	Smt Sanjana Londhe	Lecturer in Civil Engineering	G.P.Mumbai
5	Shri Mangesh Jadhav	Lecturer in Applied Mechanics	G.P.Mumbai

Coordinator,  
Curriculum Development,  
Department of \_\_\_\_\_ Engineering

Head of Department  
Department of \_\_\_\_\_ Engineering

I/C, Curriculum Development Cell

Principal



<b>Programme : Diploma in Mechanical Engineering</b>													
<b>Course Code: ME23119</b>						<b>Course Title: ENGINEERING DRAWING-II</b>							
<b>Compulsory / Optional: Compulsory</b>													
<b>Learning Scheme and Credits</b>						<b>Assessment Scheme</b>							
CL	TL	LL	SLH	NLH	Credits	FA-TH		SA-TH (3:30 Hrs.)	FA- PR	SA		SLA	Total
						T1	T2			PR	OR		
4	--	4	2	10	5	20	20	60	50	--	--	50	200

**Total IKS Hrs. for course: 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, SLA- Self Learning Assessment

**Legends:** @ Internal Assessment, # External Assessment, \*# On Line Examination, @\$ Internal Online Examination

**Note:**

1. FA-TH represents Total of two class tests of 20 marks each conducted during the term.
2. FA-PR represents Term work of 50 Marks
3. SLA represents self-learning Assessment of 50 Marks
4. SA-TH represents the end term examination of 60 Marks

**I. Rationale**

Engineering drawing is the fundamental language of mechanical engineering. Being able to accurately communicate design ideas through technical drawings is crucial for mechanical engineers. This course aims to equip students with the necessary technical drawing skills required such as visualization skills and 3D to 2D translation abilities. This course will build a foundation for further course in machine drawing and other allied courses, useful in developing imagination, drafting and sketching skills of students.

**II. Industry / Employer Expected Outcome**

To imagine, understand, develop and prepare drawings of different objects.

**III. Course Outcomes:** Students will be able to achieve & demonstrate the following COs on completion of course based learning.

CO1	Draw the projection of different models of regular solids.
CO2	Draw the projection of different cut models of regular solids.
CO3	Draw the development of lateral surfaces for different solids.
CO4	Draw Curves of intersection of the surfaces of different solids.
CO5	Draw the missing views and sectional missing views.
CO6	Draw the auxiliary views of different objects.

**Course Content Details:**

<b>Unit No.</b>	<b>Theory Learning Outcomes (TLO's) aligned to CO's.</b>	<b>Topics / Sub-topics</b>
<b>1</b>	TLO 1.1 Imagine and draw projections of Prism, Pyramid, Cone, Cylinder, Tetrahedron, Cube. TLO 1.2 Imagine and draw projections of Prism and Cone using auxiliary plane method.	<b>Unit-I Projection of Solids</b> 1.1 Projections of Prism, Pyramid, Cone, Cylinder, Tetrahedron, Cube with their axes inclined to one reference plane and parallel to other plane. 1.2 Projections of Prism and Cone using auxiliary plane method.
	<b>Course Outcome : CO1</b> <b>Teaching Hours : 10</b> <b>Marks: 08</b>	
<b>2</b>	2.1 Understand and draw sectional views of solids such as Cone, Pyramid, Prism & Cylinder. 2.2 Draw true shape of section of solids.	<b>Unit- II Sections of Solids</b> 2.1 Draw the sectional views of solid for a cutting plane parallel to one plane, perpendicular to other plane 2.2 Cone, Pyramid, Prism & Cylinder resting on their base on Horizontal Plane. 2.3 Prism, Cylinder: a) Axis parallel to both the reference plane. b) Axis perpendicular to and parallel to other plane
	<b>Course Outcome : CO2</b> <b>Teaching Hours : 10</b> <b>Marks: 12</b>	
<b>3</b>	3.1 Understand and draw development of lateral surfaces of solids such as cube, prism, cylinder, pyramid and cone. 3.2 Understand and draw development of surfaces of the objects such as funnel, Chimney and pipe bends.	<b>Unit-III Developments of Surfaces</b> 3.1 Draw the development of lateral surfaces of cube, prism, cylinder, pyramid and cone. 3.2 Development of surfaces such as funnel, Chimney and pipe bends.
	<b>Course Outcome : CO3</b> <b>Teaching Hours : 08</b> <b>Marks: 10</b>	
<b>4</b>	4.1 Understand and draw curves of Intersection of solids such as Prism with prism, Cylinder with cylinder, Prism with Cylinder. 4.2 Understand and draw curves of Intersection of solids, Cylinder with Cone.	<b>Unit-IV: Intersection of solids</b> 4.1 Prism with prism, Cylinder with cylinder, Prism with Cylinder When (i) The axes are at 90° and intersecting. (ii) The axes are at 90° and Offset. 4.2 Cylinder with Cone: - Cone resting on base on HP and with axis intersecting and offset from axis of cylinder.
	<b>Course Outcome : CO4</b> <b>Teaching Hours : 12</b> <b>Marks: 10</b>	
<b>5</b>	5.1 Imagine and draw the missing view for a given orthographic views. 5.2 Imagine and draw the sectional missing view for a given orthographic views.	<b>Unit-V: Missing views</b> 6.1 Draw the missing view for a given orthographic views 6.1 Draw the sectional missing view for a given orthographic views

	<b>Course Outcome : CO5</b>	<b>Teaching Hours : 10</b>	<b>Marks: 10</b>
<b>6</b>	6.1 Understand the Concept of auxiliary plane.	<b>Unit-V: Auxiliary views</b>	6.4 Concept of auxiliary plane
	6.2 Understand and draw Projection of object on auxiliary plane.		6.5 Projection of object on auxiliary plane
	6.3 Draw and Complete the auxiliary views with the help of given views.		6.6 Completing the auxiliary views with the help of given views
	<b>Course Outcome : CO6</b>	<b>Teaching Hours : 10</b>	<b>Marks: 10</b>

#### IV. Laboratory Learning Outcome and Aligned Practical / Tutorial Experiences.

Practical / Tutorial / Laboratory Learning Outcome (LLO)	Sr . No	Laboratory Experiment / Practical Titles / Tutorial Titles	Number of hrs.	Relevant COs
LLO 1.1 Draw projections of solids.	1	Sheet No:1 Projection of Hexahedron/pyramid/prism /cone (one problem)	06	CO1
LLO 2.1 Draw projections of solids using auxiliary method	2	Sheet No:1 Projection of prism /cone with auxiliary method (one problem)	06	CO1
LLO 3.1 Apply method of projections of solids and section of solids.	3	Sheet No:2 Sections of Solids such as cone/pyramid/cylinder/prism when true shape of the section is given (one problem)	06	CO2
LLO 4.1 Apply method of projections of solids and section of solids when cutting section is given.	4	Sheet No:2 Sections of Solids such as cone/pyramid/cylinder/prism when cutting section is given (one problem)	06	CO2
LLO 5.1 Develop the surfaces of solids by considering given cutting section.	5	Sheet No:3 Developments of Surfaces such as cone/pyramid/cylinder/prism when cutting section is given (one problem)	04	CO3
LLO 6.1 Apply methods of development of surfaces to draw development of different elements.	6	Sheet No:3 Developments of Surfaces such as Funnel/ Elbow/Pipe Joints (one problem)	04	CO3
LLO 7.1 Apply the methods of projections of solids and sections of solids, imagine intersection of solids and draw curves of intersection.	7	Sheet No:4 Intersection of solids: interpenetrating solid intersecting their axis such as prism with prism or cylinder with cylinder or cone with cylinder (Two problems)	06	CO4
LLO 8.1 Apply the methods of projections of solids and sections of solids, imagine intersection of solids with offset in their axis and draw curves of intersection.	8	Sheet No:4 Intersection of solids interpenetrating solid with offset in their axis such as prism with prism or cylinder with cylinder or cone with cylinder (Two problems)	04	CO4
LLO 9.1 Apply the methods of orthographic projections to imagine and draw missing views from given orthographic views.	9	Sheet No:5 Missing views (Two problems)	04	CO5

LLO 10.1 Apply the methods of orthographic projections to imagine and draw missing views from given sectional orthographic views.	10	Sheet No:6 Missing sectional views (Two problems)	04	CO5
LLO 11.1 Apply methods of orthographic projections, imagine and understand position of object on auxiliary planes to draw auxiliary views.	11	Sheet No:7Auxiliary views (Two problems)	04	CO6
LLO 12.1 Apply methods of orthographic projections, imagine and understand position of object on auxiliary planes to complete and draw given auxiliary views.	12	Sheet No:8 Complete the Top view/ Front view when auxiliary view is given (Two problems)	04	CO6
LLO 13.1 Collect information of an ancient Indian culture related to Engineering Drawing.	13	Study ancient Indian monastery, monuments, ancient tools etc. and correlate it with Engineering drawing. (Prepare a Report)	02	CO1 CO2 CO3 CO4 CO5 CO6

**Note:** All Sheets and Assignments are compulsory.

**Suggested Micro Project / Assignment/ Activities for Specific Learning / Skills Development (Self Learning):**

1. Prepare models of the objects such as Hexahedron/pyramid/prism /cone using cardboards/ waste materials.
2. Prepare developments of surfaces of the objects such as cone/pyramid/cylinder/prism/ or frustum of cone/pyramid of real world objects using paper.
3. Visit different laboratories of Mechanical Engineering Department, identify the intersecting/ interpenetrating objects and draw curves of intersection. (Any two Objects)
4. Visit different laboratories of Mechanical Engineering Department, identify the objects having auxiliary planes and draw its auxiliary views. (Any two Objects)
5. Search any two websites of manufacturing industries and download production drawings available and draw it on drawing sheets/sketchbook.
6. Visit workshop of this institute observed different machines available, select any two parts of the machines /Mechanism available, take approximate measurements and draw their orthographic views.
7. Visit workshop of this institute observed different machines available, select any two parts of the machines / Mechanism available, take approximate measurements and draw development of their surfaces.

**V. Specification Table:**

Unit No	Topic Title	Distribution of Theory Marks			
		R Level	U Level	A Level	Total Marks
1	Projection of Solids	0	0	08	08
2	Sections of Solids	0	0	12	12
3	Developments of Surfaces	0	0	10	10
4	Intersection of solids	0	0	10	10
5	Missing views	0	0	10	10
6	Auxiliary views	0	0	10	10
<b>Total</b>				60	60



**VI. Assessment Methodologies/Tools****Formative assessment (Assessment for Learning)**

Each sheet/ self-learning assignment to be assessed on following rubrics (10 marks)

Attendance & Regularity	Technical Understanding & Interpretation of given problem	Line work, Accuracy, Presentation	Total
02 Marks	04 Marks	04 Marks	10 Marks

**Summative Assessment (Assessment of Learning)**

- **TH** - Term End examination of 60 Marks

**VII. 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
CO1	03	02	--	02	--	--	--	01	01
CO2	03	02	--	02	--	--	--	01	01
CO3	03	02	03	02	--	--	--	02	02
CO4	03	02	--	02	--	--	--	01	01
CO5	03	03	02	02	--	--	--	02	02
CO6	03	03	02	02	--	--	--	02	02

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

**VIII. Suggested Learning Materials / Books**

Sr.No	Author	Title	Publisher
1	N.D.Bhatt	Engineering drawing	Charotar PublishingHouse, 53 <sup>rd</sup> Edition, 2016 ISBN:978-9380-3581-78
2	P.J. Shah	Engineering Graphics	S. Chand, revisededition,2014 ISBN: 978-8121-9296-79

3	Amar Pathak	Engineering Drawing	Wiley Publication, 1 <sup>st</sup> Ed. 2010 ISBN: 978-9350-0401-64
4	D.Jolhe	Engineering drawing	Tata McGraw Hill Education, 2017 ISBN: 978-0070-6483-71
5	K.L.Narayan, P.Kannaiah	Textbook on engineering drawing	Scitech publications, 24 <sup>th</sup> reprint, 2010, ISBN-978-8183-7142-28
6	K. Venugopal, V. Prabhu Raja	A Textbook of Engineering Graphics	New Age International Publications ISBN- 978-81-224-2457-7
7	IS Code SP-46	Engineering drawing practice For school and colleges	

### IX. Learning Websites & Portals

Sr .No	Link /Portal	Description
1	<a href="https://ocw.mit.edu/courses/drawing">https://ocw.mit.edu/courses/drawing</a>	Student can go through free courses available related to Engineering Drawing II
2	<a href="https://nptel.in/courses/drawing">https://nptel.in/courses/drawing</a>	Student can go through free courses available related to Engineering Drawing II
3	<a href="https://www.youtube.com/watch?v=mU50gT0QpyU">https://www.youtube.com/watch?v=mU50gT0QpyU</a>	Projection of solids
4	<a href="https://www.youtube.com/watch?v=AzFz8A5HgiQ&amp;list=PLDN15nk5uLiBrAkdOhEvkmVPs2UtwfGao&amp;index=1">https://www.youtube.com/watch?v=AzFz8A5HgiQ&amp;list=PLDN15nk5uLiBrAkdOhEvkmVPs2UtwfGao&amp;index=1</a>	Section of solid & Developments of Surfaces
5	<a href="https://www.youtube.com/watch?v=u-7rmrAcFb8&amp;list=PLDN15nk5uLiBrAkdOhEvkmVPs2UtwfGao&amp;index=2">https://www.youtube.com/watch?v=u-7rmrAcFb8&amp;list=PLDN15nk5uLiBrAkdOhEvkmVPs2UtwfGao&amp;index=2</a>	Section of solid & Developments of Surfaces
6	<a href="https://www.youtube.com/watch?v=sNFCIgbDQeI">https://www.youtube.com/watch?v=sNFCIgbDQeI</a>	Intersection of solids
7	<a href="https://www.youtube.com/watch?v=qxGfTNxaHEc">https://www.youtube.com/watch?v=qxGfTNxaHEc</a>	Missing views
8	<a href="https://www.youtube.com/watch?v=FEJ4gzgp7Tw">https://www.youtube.com/watch?v=FEJ4gzgp7Tw</a>	Auxiliary views

### X. Academic Consultation Committee/Industry Consultation Committee:

Sr. No	Name	Designation	Institute/Organization
1	Mr. Nilesh Sawant	Director	Jayshree Molds and Technologies PVT LTD, Thane
2	Dr. A. G. Patil	Sel. Grade Lecturer in Mechanical Engineering	Government Polytechnic, Thane

3	Mr. K. V. Patil	Sel. Grade Lecturer in Mechanical Engineering	Government Polytechnic Mumbai
4	Mr. K. Z. Dhangare	Lecturer in Mechanical Engineering	Government Polytechnic Mumbai

Coordinator,  
Curriculum Development,  
Department of Mechanical Engineering

Head of Department  
Department of Mechanical Engineering

I/C, Curriculum Development Cell

Principal

<b>Programme : Diploma in Artificial Intelligence and Machine Learning</b>													
<b>Course Code: AI23101</b>						<b>Course Title : Basics Of Python Programming</b>							
<b>Compulsory / Optional: Compulsory</b>													
<b>Learning Scheme and Credits</b>						<b>Assessment Scheme</b>							
CL	TL	LL	SLH	NLH	Credits	FA-TH		SA-TH (2Hrs. 30 Min)	FA- PR	SA		SLA	Total
						T1	T2			PR	OR		
02	-	02	-	04	02	-	-	-	25	25	--	-	50

**Total IKS Hrs. for course:**

**Abbreviations:** CL- Class Room Learning, TL- Tutorial Learning, LL- Laboratory Learning, SLH-Self Learning Hours, NLH-Notional Learning Hours, FA - Formative Assessment, SA -Summative assessment, SLA- Self Learning Assessment

**Legends:** @ Internal Assessment, # External Assessment, \*# On Line Examination, @\$ Internal Online Examination

**Note:**

1. FA-TH represents two class tests of 20 marks each conducted during the term.
2. SA-TH represents the end term examination.
3. FA-PR represents Term work of 25 Marks.
4. SA-PR represents Term End practical Exam of 25 Marks.

**I. Rationale**

Python is a high-level, interpreted, interactive and object-oriented scripting language. It supports multiple programming paradigms. Python uses dynamic typing and a combination of reference counting and a cycle-detecting garbage collector for memory management. It is the leading language of many data scientists. Due to its power and simplicity, Python has become the scripting language of choice for many large organizations, including Google.

**II. Industry / Employer Expected Outcome**

1	To acquire programming skills in core Python.
2	To acquire Object Oriented Skills in Python
3	To understand why Python is a useful scripting language for developers.
4	To learn how to read and write files in Python.
5	To learn how to design and program Python applications.
6	To develop the skill of designing Data visualization in Python

**III. Course Outcomes:** Students will be able to achieve & demonstrate the following COs on completion of course based learning

CO1	Install & understand the working of python IDE.
CO2	Understand various operators, looping in Python.
CO3	Develop functions & apply them in Python.
CO4	Perform various operations on data structures using Python.
CO5	Perform File Handling operations.
CO6	Perform various operations Using python tools.

**Course Content Details:**

Unit No.	Theory Learning Outcome( TLO) aligned to CO	Topics / Sub-topics
1	Students will able to learn: TLO1.1: Features of prog. Languages TLO1.2: Installation and working of IDE TLO1.3: Use of python building blocks TLO1.4: learn to write simple programs and Data types	<p><b>1. Introduction to Python Programming</b> 1.1 Features: Open source, Interactive, Object-oriented, Platform independent Installation &amp; working of IDE. 1.2 Python building blocks: Identifiers, Indentation, Comments, Variables. 1.3 Running simple Python script to display “Welcome” message. 1.4 Data Types: Numbers, String, Tuples, List, Dictionary and declaration</p> <p><b>Course Outcome : CO1    Teaching Hours :5hrs    Marks: 8</b></p>
2	Students will able to learn: TLO2.1: Understand and use arithmetic operators in Python TLO2.2: Learn how to use the if statement for making decisions in code TLO2.3: Explore loop manipulation techniques, TLO2.4: Learn how to use the for loop to iterate over elements of sequences	<p><b>2. Python Operators &amp; Control flow statements</b> 2.1: Arithmetic, Comparison(Relational), Assignment, Logical, Bitwise, Membership, Identity Operators &amp; Python operator precedence. 2.2: Decision making: if, else if statement. 2.3 Looping: while loop, for loop, Nested loops. Loop manipulation using continue, pass, break etc</p> <p><b>Course Outcome: CO2    Teaching Hours :06 hrs    Marks:12</b></p>
3	Students will able to learn: TLO3.1: Understand and utilize built-in functions in Python TLO3.2: Learn how to create your own Python modules to organize and reuse code in separate files TLO3.3: Learn what packages are and how they help organize multiple related modules into a directory hierarchy.	<p><b>3. Python Functions, Modules &amp; Packages.</b> 3.1 Functions: Use of built-in functions, data conversion functions, math functions. User defined functions: Function definition, function calling, parameter passing, return Statement. Scope of variables: Global &amp; Local variables. 3.2 Modules: Writing modules, importing modules, Importing objects from modules, python built- in modules, namespace &amp; scoping. 3.3 Python packages: Introduction, writing python packages, user defined packages.</p> <p><b>Course Outcome: CO3    Teaching Hours : 08 hrs    Marks:10</b></p>

4	Students will able to learn: TLO4.1: Apply theoretical principles to analyze and solve problems. TLO4.2: Synthesize information from various theories to support arguments or explanations. TLO4.3: Understand how to perform essential database operations using Python	<b>4. Data visualization and Databases</b> 4.1 Matplotlib creation of various plots, including line plots, scatter plots, bar plots, histograms, and pie charts, need for effective data visualization in Python. 4.2 Database Access: Python's Database Connectivity, Types of Databases Used with Python, MySQL database Connectivity with Python, Performing Insert, Deleting & Update operations on database <b>Course Outcome CO4 Teaching Hours :08hrs Marks: 10</b>
5	Students will able to learn: TLO5.1: Understand the concept of exceptions in Python TLO5.2: Learn how to use the try and except statements to handle exceptions TLO5.3: Learn how to read input from the keyboard using functions TLO5.4: Understand file modes (e.g., read, write, append) and how to open files	<b>5. Exception Handling and File I/O Handling.</b> 5.1 Exception Handling: Introduction, try: except statement, raise statement. Users denied exceptions. 5.2 I/O operations: Reading keyboard input, Printing on screen. 5.3 File Handling: Opening file in different modes, accessing file contents, reading & writing into files, renaming & deleting files, file & directory related standard functions. <b>Course Outcome CO5 Teaching Hours :08hrs Marks: 12</b>
6	Students will able to learn: TLO6.1: Understand the basics of NumPy arrays and learn how to create multi-dimensional arrays using NumPy. TLO6.2: Learn advanced techniques for indexing and slicing NumPy arrays TLO6.3: Learn the fundamentals of the Pandas library, including its primary data structures TLO6.4: Explore the Pandas Series and DataFrame data structures and their capabilities for data analysis and manipulation.	<b>6. Introduction NumPy and Pandas</b> 6.1 NumPy: Creating NumPy arrays, Indexing and slicing in NumPy, creating multidimensional arrays, NumPy Data types, Array Attribute, Indexing and Slicing, Creating array views copies, Manipulating array shapes I/O 6.2 Pandas: Basics of Pandas, Using multilevel series, Series and Data Frames, Grouping, aggregating, Merge Data Frames <b>Course Outcome: CO6 Teaching Hours : 10 hrs Marks: 8</b>

#### IV. Laboratory Learning Outcome and Aligned Practical / Tutorial Experiences.

Sr No	Lab Learning Outcomes	Laboratory Experiment / Practical Titles / Tutorial Titles	Number of hrs.	Relevant COs
1	Students will able to: LLO1.1 Learn about different Python IDEs available, such as PyCharm, Visual Studio Code, Jupyter Notebook, and others. LLO1.2 Explore the IDE's settings and preferences to configure LLO1.3 Learn how to create and manage virtual environments within the IDE to isolate project dependencies	<b>Install &amp; configure Python IDE</b>	2	CO1
2	LLO2.1 Gain a basic understanding of Python operators LLO2.2 Use comparison operators to implement conditional statements	<b>Write a simple Python program using Operators</b>	2	CO2
3	LLO3.1 Gain a basic understanding of Python's math built-in functions LLO3.2 Understand how to import the math module in Python to access its mathematical functions.	<b>Write a Python program to demonstrate math built-in functions</b>	2	CO3

	LLO3.3: Using Math Functions: Write a Python program that demonstrates the use of various math functions			
4	LLO4.1 Understand how to create a Python list by defining a sequence of elements LLO4.2 Learn how to access elements in a list using indexing. Understand that Python uses zero-based indexing LLO4.3: Demonstrate the ability to modify list elements by reassigning new values to specific indices within the list.	<b>Write a Python program to perform following operations on list: a) Create b)Access c)Update d) Delete</b>	2	CO4
5	LLO5.1 Gain a fundamental understanding of exception handling in Python LLO5.2 Write a Python program that demonstrates the use of try and except statements to handle exceptions LLO5.3: Learn how to run the program, intentionally trigger exceptions, and observe how the try and except statements	<b>Write a program in Python to use try except statement</b>	2	CO5
6	LLO1.1 Python offers web frameworks like Django, Flask, and Pyramid for building web applications LLO1.2 Python is widely used in data science and machine learning due to its extensive libraries like NumPy, Pandas, Matplotlib, and SciPy. Its clean syntax simplifies data manipulation and analysis LLO1.3: Python is favored for scientific computing due to its ability to work with complex mathematical operations.	<b>Study various application domains of Python along with its features.</b>	2	CO1
7	LLO2.1 Gain a basic understanding of conditional statements in Python, including the if and if-else statements, LLO2.2 Understand how to take input from the user or define specific values to be used in the conditional statements. LLO2.3: Learn how to run the program, verify that the if and if-else statements work correctly	<b>Write a Python program to demonstrate the use of if and if else.</b>	2	CO2
8	LLO3.1 Gain a fundamental understanding of Python functions LLO3.2 Learn how to define a custom Python function using the def keyword LLO3.3: Write a Python function that takes one or more parameters (input values) as arguments	<b>Develop a user defined Python function to demonstrate the use of parameterized function &amp; value return functions.</b>	2	CO3
9	LLO4.1 Understand how to create a Python tuple by defining a sequence LLO4.2 Learn how to access elements in a tuple using indexing, just like in lists. LLO4.3: Recognize that tuples are immutable, meaning their elements cannot be modified after creation	<b>Write a Python program to perform following operations on Tuples: a) Create b) Access c) Update d)Delete</b>	2	CO4
10	LLO5.1 Gain a basic understanding of how input is read from the keyboard and output is printed to the screen in a Python program LLO5.2 Use the input() function in Python to read text input from the user via the keyboard LLO5.3: Display the user's input on the screen by using the <b>print()</b> function, showing the text the user entered	<b>a) Create b) Access c) Update d)Delete Write a Python program to read keyboard input &amp; print it to the screen</b>	2	CO5
11	LLO1.1 Gain a basic understanding of how output is displayed on the screen in a Python program LLO1.2 Understand how to use the print () function in Python to output text to the screen. LLO1.3: Displaying a Message on the screen.	<b>Write a Python program to display a message on the screen.</b>	2	CO1
12	LLO2.1 Gain a basic understanding of Python's looping statements, which include for and while loops LLO2.2 Understand how to use looping control statements like	<b>Write a Python program to demonstrate the use of looping statements.</b>	2	CO2

	break and continue LLO2.3: Learn how to run the program, verify that the loops execute correctly			
13	LLO3.1 Gain a fundamental understanding of Python packages LLO3.2 Python program that demonstrates the use of built-in Python packages LLO3.3: Extend the program to include user-defined packages (custom modules)	<b>Write a Python program to demonstrate the use of built-in packages &amp; user defined packages</b>	2	CO3
14	LLO4.1 Gain a basic understanding of Python sets, an unordered collection of unique elements, and the various set operations that can be performed. LLO4.2 Learn how to create sets in Python using curly braces {} or the set () constructor. LLO4.3: Python program that demonstrates the set operations	<b>Write a Python program to perform operations on Sets.</b>	2	CO4
15	LLO5.1 Gain a basic understanding of how data can be extracted from CSV LLO5.2 Understand how to import libraries like csv or standard Python file handling for reading LLO5.3: Extend the program to include the ability to read data from text files in various formats, such as plain text	<b>Write a program in Python to extract data from csv /txt</b>	2	CO5

#### V. Suggested Micro Project / Assignment/ Activities for Specific Learning / Skills Development (Self Learning):

##### Welcome to Python Script

- Create a simple Python script that displays a "Welcome" message using the print function. This project will help students practice the basics of Python scripting and running code.

##### Calculator Using Python Operators

- Build a basic calculator program that can perform arithmetic operations such as addition, subtraction, multiplication, and division. This project will reinforce the use of Python operators and control flow statements.

- **Library Management System (With a Console Interface)**

Develop a small library management system that allows users to add, remove, and search for books in a library. This project will introduce students to functions, modules, and working with dictionaries.

- **Simple GUI To-Do List**

Create a simple graphical user interface (GUI) application using Tkinter that allows users to add and manage tasks in a to-do list. This project will introduce students to GUI programming and event handling.

- **Database CRUD Operations**

Build a program that connects to a MySQL database and performs basic CRUD (Create, Read, Update, Delete) operations on a table. This project will cover database connectivity, SQL operations, and exception handling.

- **Data Analysis with Pandas**

Introduce students to data analysis using Pandas. Provide a dataset and guide them through tasks like data cleaning, aggregation, and visualization. This project will focus on NumPy and Pandas for data manipulation and analysis.



**VI. Specification Table:**

Unit No	Topic Title	Distribution of Theory Marks			
		R Level	U Level	A Level	Total Marks
1	Introduction to Python Programming	2	4	2	8
2	Python Operators & Control flow statements	2	4	6	12
3	Python Functions, Modules & Packages.	2	4	4	10
4	Data visualization and Databases	2	4	4	10
5	Exception Handling and File I/O Handling	2	6	4	12
6	Introduction NumPy and Pandas	2	2	4	8
<b>Total</b>		<b>16</b>	<b>26</b>	<b>28</b>	<b>70</b>

**VII. Assessment Methodologies/Tools****Formative assessment (Assessment for Learning)**

- ♦ Rubrics for continuous assessment based on process and product related performance indicators(\_\_\_ marks)

**Summative Assessment (Assessment of Learning)**

- ♦ End term examination, Viva-voce, Workshop performance (\_\_marks)

**VIII. Suggested COs - POs Matrix Form****IX.**

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	1	2	-	-	-	-	-	-	-
CO2	-	2	3	2	-	2	-	-	2
CO3	1	3	3	2	3	4	2	1	2
CO4	1	2	2	4	3	3	3	1	2
CO5	1	3	-	4	3	4	4	1	2
Legends: - High:03, Medium:02, Low:01, No Mapping: --									

**X. Suggested Learning Materials / Books**

Sr.No	Author	Title	Publisher
1	Rao, K. Nageshwara, Shaikh Akbar	Python Programming	Scitech Publications(India) Pvt.
2	Lutz, Mark	Learning Python	O'Reilly Publication, 5th Edition
3	Paul, Barry	Head First Python	O'Reilly Publication, 2nd Edition
4	Beazley, David	Python Essential Reference	Addison-Wesley Professional, 4th Edition

**XI. Learning Websites & Portals**

Sr.No	Link / Portal	Description
1	1. <a href="http://www.math-magic.com">www.math-magic.com</a>	
2	2. <a href="https://www.w3schools.com/python/">https://www.w3schools.com/python/</a>	
3	3. <a href="https://www.tutorialspoint.com/python/index.htm">https://www.tutorialspoint.com/python/index.htm</a>	
4	4. <a href="https://www.python.org/downloads/">https://www.python.org/downloads/</a>	
5	5. <a href="http://www.nptel.ac.in/courses/117106113/344">www.nptel.ac.in/courses/117106113/344</a> .	

**XII. Academic Consultation Committee/Industry Consultation Committee:**

Sr. No	Name	Designation	Institute/Organization
1	Dr. Biplab Banerjee	Professor , Computer Science Department	IIT Bombay
2	Dr. F. Kazi	Professor & Head Innovation, Mumbai University	VJTI, Mumbai
3	Dr.S. S. Udmale	Asst. Professor, Computer Engineering	VJTI, Mumbai
4	Mr. Z. H. Zaidi	Sr. Engineer	NIC, India

Coordinator,  
Curriculum Development,  
Department of AIML Engineering

Head of Department  
Department of AIML Engineering

I/C, Curriculum Development Cell

Principal