Government Polytechnic Mumbai

(Academically Autonomous Institute, Government of Maharashtra)

Programme Name	**Diploma In Rubber Technology**		
Programme Code	**RT**	**Year**	**2023-24**
Duration Of Programme	**6 Semester**	**Duration**	**16 WEEKS**
Semester	**First**	**Scheme**	**P23**

SR.NO	CourseTitle	Course Type	course code	Learning Scheme: Total IKS Hrs.for sem	Atual contact Hrs./Week: CL	TL	LL	self learning (TW+ASSIGNMENT)	Notional learning /week	credits	paper Duration	ExaminationScheme(Marks): Theory: FA-TH T1 MAX	FA-TH T2 MAX	SA-TH MAX	Total MAX	Total MIN	BASED ON LL & TL: PRACTICAL: FA-PR MAX	FA-PR MIN	SA-PR: PR MAX	PR MIN	OR MAX	OR MIN	Based on Self learning: SLA MAX	SLA MIN	TOTAL MARKS
								Total				MAX	MAX	MAX	MAX	MIN	MAX	MIN	MAX	MIN	MAX	MIN	MAX	MIN	
1	**Basic Mathematics**	AEC	SC23501	6	4	2		2	8	4	3	20	20	60	100	40	25	10	_		-	-	25	10	**150**
2	**Basics of Electrical Engineering**	DSC	EE23102	2	2	-	2	2	6	3	-	-	-	-	-	-	50	20	50	20	-	-	25	10	**125**
3	**Engineering Chemistry**	DSC	SC23105	4	3	-	2	1	6	3	3	20	20	60	100	40	25	10	25#	10	-	-	25	10	**175**
4	**Engineering Drawing I**	DSC	ME23103	2	3	-	4	1	8	4	-	-	-	-	-	-	50	20	50#	20	-	-	50	10	**150**
5	**Basics of Organic Chemistry**	DSC	SC23106	3	3	-		3	6	3	3	20	20	60	100	40			25@	10	-	-			**125**
6	**UHVI**	VEC	UV23301	4	1	-		1	2	1	-	-	-	-	-	-			_	-	-	-	50	20	**50**
7	**Libre office Spoken**	SEC	SL23601	-	-	-		4	4	2	-	-	-	-	-	-	-		_	-	-	-		-	
	Total			**21**	**16**	**2**	**8**	**14**	**40**	**20**					**300**		**150**		**150**				**175**		**775**

Abbreviations : CL- Classroom Learning , TL- Tutorial Learning, LL-Laboratory Learning, FA - Formative Assessment,SA -Summative Assessment, IKS - Indian Knowledge System, SLA - Self Learning Assessment

Legends : @ Internal Assessment, # External Assessment

Note: 1. FA-TH represents two class tests of 20 marks each conducted during the semester.

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

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

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

5. 1 credit is equivalent to 30 Notional hrs.

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

Course Category : Discipline Specific Course Core (DSC) : 2, Discipline Specific Elective (DSE) : 0, Value Education Course (VEC) : 1, Intern./Apprenti./Project./Community (INP) : 0,

AbilityEnhancement Course (AEC) : 2, Skill Enhancement Course (SEC) : 2, GenericElective (GE) : 0

	Programme : Diploma in EE / EC / IS / CE / ME / CO / IF/AI & ML / RT												
Course Code:SC23501						**Course Title :BASIC MATHEMATICS**							
	Compulsory / Optional: Compulsory												
Teaching Scheme and Credits						**Examination Scheme**							
CL	**TL**	**LL**	**SLH**	**NLH**	**Credits**	**FA-TH**		**SA-TH (3Hrs.)**	**FA-PR**	**SA**		**SLA**	**Total**
						T1	**T2**			**PR**	**OR**		
4	2	--	2	8	4	20	20	60	25	--	--	25	150

Total IKS Hrs. for course: 06 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

Basic Mathematics plays a crucial role in diploma programmes as it fosters the development of critical thinking skills, enhances quantitative literacy, prepares students for higher education, promotes problem-solving abilities, cultivates logical and abstract thinking and fosters mathematical literacy. By engaging with Mathematics, students acquire logical reasoning, problem-solving techniques and analytical thinking, which are valuable for lifelong learning and professional growth. Calculus is a branch of Mathematics that calculates how matter, particles and heavenly bodies actually move. Derivatives are useful to find maxima and minima of the function, velocity and acceleration are also useful for many engineering optimization problems. Statistics can be defined as a type of mathematical analysis which involves the method of collecting and analyzing data and then summing up the data into a numerical form for a given set of factual data or real-world observations. It equips individuals with the ability to interpret numerical information, make informed decisions and navigate real-world situations. Moreover, Mathematics provides a foundation for further studies in various disciplines and prepares students to tackle complex challenges. By exploring abstract concepts and logical structures, students develop their ability to reason, make connections, and approach problems with clarity and precision. Furthermore, studying Mathematics helps students appreciate the historical and cultural significance of Mathematics and its applications in diverse fields, thereby fostering mathematical literacy and a deeper understanding of the world. Hence the course provides the insight to analyze engineering problems scientifically using logarithms, matrices, trigonometry, straight line, differential calculus and statistics. By incorporating these topics, students comprehend to approach engineering problems from a mathematical perspective, enabling them to devise efficient and effective solutions and this leads to preparing Diploma graduates well-rounded, adaptable and capable of making significant contributions to the branch-specific problems.

II. Industry / Employer Expected Outcome

Apply the concept of Mathematics to solve industry-based technology problems.

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

CO1	Apply the concepts of algebra to solve engineering (discipline) related problems.
CO2	Utilize trigonometry to solve branch specific engineering problems.
CO3	Solve area specific engineering problems under given conditions of straight lines.
CO4	Apply differential calculus to solve discipline specific problems.
CO5	Use techniques and methods of statistics to crack discipline specific problems.

Course Content Details:

Unit No.	Theory Learning Outcomes (TLO's)aligned to CO's.	Topics / Sub-topics
1	TLO 1.1 Solve the given simple problem based on laws of logarithm. TLO 1.2 Solve given system of linear equations using matrix inversion method. TLO 1.3 Obtain the proper and improper partial fraction for the given simple rational function. TLO 1.4 Solve simultaneous equations by using concept given in Ancient Indian Mathematics	**Unit - I Algebra** 1.1 Logarithm: Concept and laws of logarithm. 1.2 Matrices: Matrices, algebra of matrices, transpose,value of determinant of matrix of order 3x3, adjoint and inverse of matrices. 1.3 Matrices: Solution of simultaneous equations by matrix inversion method. 1.4 Partial Fractions: Types of partial fraction based onnature of factors and related Problems. 1.5 Algebra in Indian Knowledge System: Solution ofsimultaneous equations (Indian Mathematics)..
	Course Outcome : CO1	**Teaching Hours :12 hrs** **Marks: 12**
2	TLO 2.1 Apply the concept of Compound angle, allied angle and multiple angles to solve the given simple engineering problem(s). TLO 2.2 Apply the concept of Sub- multiple angle to solve the given simple engineering related problem(s). TLO 2.3 Apply concept of factorization and de-factorization formulae to solve the given simple engineering problem(s). TLO 2.4 Investigate given simple problems by utilizing inverse trigonometric ratios. TLO 2.5 Use concept given in Ancient Indian Mathematics for trigonometry to solve given problems.	**Unit - II Trigonometry** 2.1 Trigonometric ratios of allied angles, compound angles, multiple angles (2A, 3A), submultiples angles.(without proof) 2.2 Factorization and De factorization formulae.(without proof). 2.3 Inverse Trigonometric Ratios and relatedproblems. 2.4 Principle values and relation between trigonometric and inverse trigonometric ratios. 2.5 Trigonometry in Indian Knowledge System: TheEvolution of Sine Function in India. 2.6 Indian Trigonometry: Basic Indian Trigonometry-Introduction and Terminology (From Ancient Beginnings to Nilakantha). 2.7 Trigonometry in Indian Knowledge System:Pythagorean triples in Sulabasutras.
	Course Outcome : CO2	**Teaching Hours :16 hrs** **Marks: 12**
3	TLO 3.1 Calculate angle between given two straight lines. TLO 3.2 Formulate equation of straight lines related to given engineering problems. TLO 3.3 Identify perpendicular distance from the given point to the line. TLO 3.4 Calculate perpendicular distance between the given two parallel lines. TLO 3.5 Use geometry given in Sulabasutras to	**Unit - III Straight Line** 3.1 Straight line and slope of straight line: Angle between two lines, Condition of parallel and perpendicular lines. 3.2 Various forms of straight lines: Slope point form, two-point form, Double intercept form, General form. 3.3 Perpendicular distance from a point on the line. 3.4 Perpendicular distance between two parallel lines. 3.5 Geometry in Sulabasutras in Indian Knowledge System (construction of square, circling the square).

	solve the given problems.	(Indian Mathematics).
	Course Outcome : CO3 **Teaching Hours :6 hrs** **Marks: 06**	
4	TLO 4.1 Solve the given simple problems based on functions. TLO 4.2 Solve the given simple problems based on rules of differentiation. TLO 4.3 Obtain the derivatives of composite, implicit, parametric, inverse, logarithmic, exponential functions. TLO 4.4 Apply the concept of differentiation to find given equation of tangent and normal. TLO 4.5 Apply the concept of differentiation to calculate maxima, minima and radius of curvature for given function. TLO 4.6 Familiar with concept of calculus givenin Indian Mathematics.	**Unit - IV Differential Calculus** 4.1 Functions and Limits: Concept of function andsimple examples. 4.2 Functions and Limits: Concept of limits withoutexamples. 4.3 Derivatives: Rules of derivatives such as sum,Product, Quotient of functions. 4.4 Derivatives: Derivative of composite functions(chain Rule), implicit and parametric functions. 4.5 Derivatives: Derivatives of inverse, logarithmicand exponential functions. 4.6 Applications of derivative: Second order derivativewithout examples, Equation of tangent and normal, Maxima and minima, Radius of curvature. 4.7 Calculus in Indian Knowledge System: The Discovery of Calculus by Indian Astronomers.(IndianMathematics).
	Course Outcome : CO4 **Teaching Hours :16 hrs** **Marks: 18**	
5	TLO 5.1 Obtain the range and coefficient of range of the given grouped and ungrouped data. TLO 5.2 Calculate mean and standard deviation of ungrouped and grouped data related to the given simple engineering problem(s). TLO 5.3 Determine the variance and coefficient of variance of given grouped and ungrouped data. TLO 5.4 Justify the consistency of given simple sets of data.	**Unit - V Statistics** 5.1 Range, coefficient of range of discrete and grouped data. 5.2 Mean deviation and standard deviation from meanof grouped and ungrouped data. 5.3Variance and coefficient of variance. 5.4 Comparison of two sets of observation.
	Course Outcome : CO5 **Teaching Hours :10 hrs** **Marks: 12**	

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 Solve simple problems of Logarithmsbased on given applications.	1	Solve simple problems of Logarithms based on givenapplications.	2	CO1
LLO 2.1 Solve elementary problems on Algebraof matrices for branch specific engineering related applications.	2	Solve elementary problems on Algebra of matrices forbranch specific engineering related applications.	2	CO1
LLO 3.1 Apply the concept of matrix to solveengineering problems.	3	Solve solution of Simultaneous Equation usinginversion method.	2	CO1
LLO 4.1 Apply the concept of matrix to solveengineering problems.	4	Apply Matrix Inversion method to determine currents through various branches of given electrical networks.	2	CO1
LLO 5.1 Apply the concept of matrix to solveengineering problems.	5	Determine inverse of a non-singular matrix by usingopen source software.	2	CO1
LLO 6.1 Apply the concept of partial fraction tosolve engineering problems.	6	Resolve into partial fraction using linear non-repeated,repeated, and irreducible quadratic factors.	2	CO1
LLO 7.1 Solve problems on Compound, Allied,multiple and sub multiple angles for related shapes.	7	Solve problems on Compound, Allied, multiple and submultiple angles for related shapes.	2	CO2
LLO 8.1 Utilize the concept of trigonometry tosolve engineering problems.	8	Practice problems on factorization and de factorization.	2	CO2
LLO 9.1 Utilize the concept of trigonometry tosolve engineering problems.	9	Solve problems on inverse trigonometric ratios basedon applications.	2	CO2

LLO 10.1 Solve branch specific engineeringproblems under given conditions of straight lines.	10	Practice problems on equation of straight lines usingdifferent forms.	2	CO3
LLO 11.1 Solve branch specific engineering problems under given conditions of straight lines.	11	Solve problems on perpendicular distance, distance between two parallel lines and angle between two lines.	2	CO3
LLO 12.1 Solve branch specific engineeringproblems under given conditions of straight lines.	12	Use given form of straight line to calculate the speed,distance and time of moving object.	2	CO3
LLO 13.1 Apply the concept of derivative tosolve engineering problems.	13	Solve problems to find derivatives of implicit functionand parametric function.	2	CO4
LLO 14.1 Apply the concept of derivative tosolve engineering problems.	14	Solve problems to find derivative of logarithmic andexponential functions for engineering applications.	2	CO4
LLO 15.1 Apply the concept of equation oftangent and normal to solve engineering problems.	15	Solve problems based on finding equation of tangentand normal for engineering applications.	2	CO4
LLO 16.1 Apply the concept of maxima,minima and radius of curvature to solve engineering problems.	16	Solve problems based on finding maxima, minima offunction and radius of curvature at a given point for engineering applications.	2	CO4
LLO 17.1 Apply the concept of equation oftangent and normal to solve engineering problems.	17	Use the concept of tangent and normal to solve thegiven problem of Engineering Drawing.	2	CO4
LLO 18.1 Apply the concept of Maxima andMinima to solve engineering problems.	18	Use the concept of Maxima and Minima to obtainoptimum value for given engineering problem.	2	CO4
LLO 19.1 Apply the concept of radius ofcurvature to solve engineering problems.	19	Use the concept of radius of curvature to solve givenbranch specific engineering problem.	2	CO4
LLO 20.1 Utilize the concept of derivative tosolve engineering problems.	20	Use the concept of derivative to find the slope of abending curve for given engineering problem.	2	CO4
LLO 21.1 Use concept of range and mean deviation to crack branch specific problems.	21	Solve problems on finding range, coefficient of rangeand mean deviation for given applications.	2	CO5
LLO 22.1 Use concept of standard deviation andcoefficient of variance to crack branch specific problems.	22	Solve problems on standard deviation, coefficient ofvariation and comparison of two sets.	2	CO5
LLO 23.1 Use concept of standard deviation tocrack branch specific problems.	23	Calculate the Standard Deviation for Concrete with thegiven data for given engineering applications.	2	CO5

Note: 1. Take any 10-12 tutorials out of 23 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):

- Collect examples based on real world applications of logarithm and prepare a pdf file.
- Solve the simultaneous system of equation in two variables by Matrix Inversion Method. Write down a Mathematical programmingusing any open source software to verify the result.
- Collect an examples on coding theory using applications of matrices and prepare a pdf file.
- Represent the Graph of Trigonometric function, Logarithmic function on Geogebra and interpret the nature of graph and Make a pdffile.
- Measure height of trees in surrounding locations using trigonometry and prepare presentation.
- Find the derivative of y= x^sinx and visualize the graph of the function and its derivative using any open source software geometrically.
- Find height of room or distance between two pillars by using concept of

straight line.
- Collect at least 10 examples based on real world applications of standard deviation/variance.
- Collect at least 10 examples based on real world uses of applications of derivative.
- 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	Algebra	2	4	6	12
2	Trigonometry	2	4	6	12
3	Straight Line	2	2	2	6
4	Differential Calculus	2	8	8	18
5	Statistics	2	4	6	12
	Total	**10**	**22**	**28**	**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
CO1	3	1	--	1	--	1	1	2	1
CO2	3	1	--	--	1	1	1	2	1
CO3	3	--	--	--	--	--	--	1	2
CO4	3	1	1	1	--	1	--	2	2
CO5	3	2	1	1	1	1	1	2	1

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	Khanna publication New Delhi , 2013 ISBN:8174091955
2	Dutta. D	A text book of Engineering Mathematics	New age publication New Delhi, 2006 ISBN: 978-81-224-1689-3
3	Kreysizg, Ervin	Advance Engineering Mathematics	Wiley publication New Delhi 2016 ISBN: 978-81-265-5423-2
4	Das H.K.	Advance Engineering Mathematics	S Chand publication New Delhi 2008 ISBN:9788121903455
5	Marvin L. Bittinger David J. Ellenbogen Scott A. Surgent	Calculus and Its Applications	Addison-Wesley 10th Edition ISBN-13: 978-0-321-69433-1
6	C. S. Seshadri	Studies in the History of Indian Mathematics	Hindustan Book Agency, New Delhi 110016. ISBN978-93-80250-06-9
7	George Gheverghese Joseph	Indian Mathematics Engaging with the World from Ancient to Modern Times	World Scientific Publishing Europe Ltd. 57 ISBN978-17-86340-61-0
8	Deepak Singh	Mathematics-I	Khanna Book Publishing Co. (P) Ltd. ISBN: 978-93-91505-42-4
9	Garima Singh	Mathematics-II	Khanna Book Publishing Co. (P) Ltd. ISBN: 978-93-91505-52-3
10	Gareth James, Daniela Witten, Trevor Hastie Robert and Tibshirani	An Introduction to Statistical Learning with Applications in R	Springer New York Heidelberg Dordrecht London ISBN 978-1-4614-7137-0 ISBN 978-1-4614-7138-7 (eBook)
11	Gunakar Muley	Sansar Ke Mahan Ganitagya	First Edition, Rajkamal Prakashan, ISBN-10.8126703571, ISBN-13. 978-8126703579.
12	T.S. Bhanumurthy	A Modern introduction to Ancient Indian Mathematics	New Age International Private Limited, 1 January2008 ISBN- 10. 812242600X, ISBN-13. 978-8122426007
13	M.P. Trivedi and P.Y. Trivedi	Consider Dimension and Replace Pi	Notion Press; 1st edition (2018), ISBN-978-1644291795

VIII. Learning Websites & Portals

Sr.No	Link /Portal	Description
1	http://nptel.ac.in/courses/106102064/1	Online Learning Initiatives by IITs and IISc
2	www.scilab.org/ -SCI Lab	Signal processing, statistical analysis, imageenhancement.
3	www.mathworks.com/product/matlab/ -MATLAB	Applications of concepts of Mathematics tocoding.
4	Spreadsheet Applications	Use of Microsoft Excel, Apple Numbers, GoogleSheets.
5	https://ocw.mit.edu/	MIT Course ware
6	https://www.khanacademy.org/math?gclid=CNqHuabCys4CFdOJaddHoPig	Concept of Mathematics through video lecturesand notes
7	http://ocw.abu.edu.ng/courses/mathematics/	List of Mathematical Courses.

8	https://libguides.furman.edu/oer/subject/mathematics	Open Education Resources (OER) inMathematics.
9	https://phet.colorado.edu/en/simulations/filter?subjects=math&type=html,prototype	Phet Simulation for Mathematics.
10	https://libguides.cmich.edu/OER/mathematics	Mathematics with OER.

IX.Academic Consultation Committee/Industry Consultation Committee:

Sr. No	Name	Designation	Institute/Organization
1	Mrs.Sanchita Datta	Lecturer in Mathematics (Selection Grade)	St.Xavier's Institute of Technology,Mahim
2	Mr.Abhijit Sadashiv Patil	Lecturer in Mathematics	Government Polytechnic,Mumbai
3	Mr.Vinod Shantaram Patil	Lecturer in Mathematics	Government Polytechnic,Mumbai

Coordinator,
Curriculum Development,
Department of _____ Engineering

Head of Department
Department of _____ Engineering

I/C, Curriculum Development Cell

Principal

Programme: Diploma in ME/CE/RT													
Course Code: SC23105					**Course Title: Engineering Chemistry**								
Compulsory / Optional: Compulsory													
Learning Scheme						**Assessment Scheme**							
CL	**TL**	**LL**	**SLH**	**NLH**	**Credits**	**FA-TH**		**SA-TH (2.5 Hrs.)**	**FA-PR**	**SA**		**SLA**	**Total**
						TS1	**TS2**			**PR**	**OR**		
3	-	2	1	6	3	20	20	60	25	25#	-	25	175

Total IKS Hrs. for course: 4 Hrs.

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

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

Note:
1. FA-TH represents an class tests marks each conducted during the term.
2. SA-TH represents the end term examination.

I. Rationale

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

II. Industry / Employer Expected Outcome

This course is to be taught and implemented with the aim to develop in the student, the course outcomes (COs) leading to the attainment of following industry identified outcome expected from this course:

Apply principles of chemistry 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	Explain the structure, properties and behavior of molecules and compounds based on the types of chemical compound.
CO2	Apply the concepts of electrochemistry in engineering field and corrosion preventive measures in industry.
CO3	Select relevant metallurgical process related to industrial application.
CO4	Apply relevant water treatment process to solve industrial problem.
CO5	Use relevant fuel in relevant application

Course Content Details:

Unit No.	Theory Learning Outcomes (TLO)	Topics / Sub-topics
1	**TLO 1.1** Explain the Indian chemistry **TLO 1.2** Explain the properties of given material based on the bond formation. **TLO 1.3** Describe the molecular structure of given solid, liquid and gases. **TLO 1.4** Describe the crystal structure of the given solids and Explain Properties of metallic solid.	**Unit-I Atomic Structure and Chemical bonding** 1.1 Indian Chemistry: -Philosophy of atom by Acharya Kanad. 1.2 Introduction of atom, Molecules, Fundamental Particles, Proton, Neutron, Electron. Their mass, charge, location. And symbol Bohr's theory, Postulates, Structure of modern atom. Atomic number and atomic mass number. Atomic weight Numerical based on atomic number & atomic mass number. Electronic configuration of element up to 30 elements 1.3 Electronic theory of valency: Assumptions, Chemical bonds: Types and characteristics of electrovalent bond, covalent bond, coordinate bond, hydrogen bond, and metallic bond. 1.4 Molecular arrangement in solid, liquid and gases. Structure of solids: crystalline and amorphous solids Properties of metallic solid, Unit cell: simple cubic, body center cubic (BCC), face center cubic (FCC), hexagonal close pack crystals. **Course Outcome: CO1 Teaching Hours: 7hrs. Marks: 10**
2	**TLO 2.1** Describe mechanism of electrolysis of CuSO4 solution by using cu and pt rods **TLO 2.2** Solve numerical based on Faraday's first and second law of electrolysis. **TLO 2.3** Distinguish between primary and secondary cell. **TLO 2 4** Describe the phenomenon of the given type of corrosion and its prevention. **TLO 2.5** Identify the different factors affecting rate of corrosion for the given type of material and Select the	**Unit –II Electro chemistry and Metal Corrosion and its prevention** 2.1 Electrolyte- Types of electrolytes, ionization and dissociation, Cathode, Anode, Electrode potential: oxidation and reduction, Mechanism of electrolysis: Electrolysis, Electrochemical series for cations and anions. Mechanism of electrolysis of CuSO4 solution 2.2 Faraday's laws of electrolysis: Faraday's first and second law, relation between electrochemical equivalent and chemical equivalent, Numerical. Applications of electrolysis: Electro-refining of copper and Electroplating 2.3 Difference between primary and secondary cell. 2.4 Corrosion: Definition and Types of corrosion Dry corrosion: Mechanism, Types of oxide film, Wet corrosion

	protective measures to prevent the corrosion in the given corrosive medium.	: Mechanism hydrogen evolution in acidic medium, oxygen absorption in neutral or alkaline medium, Galvanic cell action by Daniel cell. 2.5 Factors affecting the rate of corrosion. Corrosion control: Modification of environment, Use of protective coatings, coating of less active metal like Tin (Tinning), coating of more active metal like Zinc (Galvanizing), Anodic and cathodic protection, Choice of material-using pure metal and using metal alloy **Course Outcome: CO2 Teaching Hours :9 hrs. Marks: 12**
3	**TLO 3.1** Explain the terminologies related to hard water **TLO 3.2** Explain the effects of hard water in industrial application **TLO 3.3** Describe the given process for softening of the given water sample. **TLO 3.4** Describe purification of potable water. **TLO3.5** Describe waste water treatment process.	**Unit–III: Water** 3.1 Water: Soft water, hard water, Hardness; Classification 3.2 Hard water in boilers and prevention: Boiler corrosion, caustic embrittlement, priming and foaming, scales and sludges 3.3 Water softening: lime soda process (hot lime soda and cold lime soda process), zeolite process, ion exchange process (cation exchange and anion exchange). 3.4 Potable water treatment: Sedimentation, coagulation, filtration and sterilization. 3.5 Waste water treatment: sewage treatment, BOD and COD of sewage water; Reverse Osmosis, recycling of waste water. **Course Outcome: CO3 Teaching Hours :9 hrs. Marks: 12**
4	**TLO 4.1** Explain the terminologies involved in metallurgy and working of the given type of furnace. **TLO 4.2** Describe the extraction process of the given ore with chemical reaction. **TLO 4.3** Explain purposes and preparation methods of making the given alloy. **TLO 4.4** Select the relevant alloy for the given application stating the properties with justification. **TLO 4.5** Describe the constituents, hardening and setting process of the given type of cement. **TLO 4.6** Describe the constituents, hardening and setting process of the given type lime.	**Unit–IV: Metals, alloys and Cement,** 4.1 Metallurgy: Mineral, ore, gangue, flux, slag. Types of furnaces: Muffle furnace, Blast furnace. 4.2 Extraction processes of Hematite, copper pyrite ores: Crushing, concentration, reduction, refining. Properties of iron and copper: Hardness, tensile strength, toughness, malleability, ductility, refractoriness, fatigue resistance. specific gravity, specific heat, brazing, castability, stiffness. 4.3 Preparation of alloys (Fusion and compression method). 4.4 Ferrous alloys: Low carbon, medium carbon, high carbon steels. Non-ferrous alloy: Brass, Bronze, Duralumin, Tinman Solder, Woods metal. 4.5 Cement: Types; Bio cement and Port land cement; constituents, setting and hardening, applications 4.6 Lime: classification, constituents, Setting and hardening, applications. **Course Outcome: CO4 Teaching Hours :12 hrs. Marks: 16**

5	**TLO 5.1** Describe salient properties of the given type of fuel. **TLO 5.2** Explain the given type of analysis of the given type of coal. **TLO 5.3** Calculate the calorific value of the given solid fuel using Bomb calorimeter. **TLO 5.4** Describe composition, properties of given gaseous fuel with their applications. **TLO 5.5** Calculate the mass and volume of air required for complete combustion of the given fuel.	**Unit–V: Fuel** 5.1 Fuel: Calorific value and Ignition temperature, classification. 5.2 Solid fuels: Coal, Classification and composition, proximate analysis, Ultimate analysis, 5.3 Bomb calorimeter. Carbonization of coke by Otto Hofmann's oven. 5.4 Liquid fuels: Fractional distillation of crude petroleum, boiling range, composition, properties. Knocking, cracking, octane number and cetane number. 5.5 Gaseous fuels: Biogas, LPG, and CNG. Combustion equation of gaseous fuels, mass and volume of air required for Complete combustion **Course Outcome: CO5** **Teaching Hours :8 hrs.** **Marks: 10**

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

Sr No	Laboratory Learning Outcomes	Laboratory Experiment / Practical Titles / Tutorial Titles	Number of hrs.	Relevant COs
1	**LLO 1.1** Follow safety rules in chemistry laboratory.	Introduction to chemistry laboratory instruments and glassware	2	CO1
2	**LLO 2.1** Identify cation and anion in given ionic solutions by performing selective test	Identification of cation in given ionic solutions. ($Cu^{++,}$ Fe^{++}, $Fe^{+++,}$ Cr^{+++}, Mn^{++}, Ni^{++}, $Zn^{++,}$ $Ca^{++,}$ $Ba^{++,}$ Mg^{++} $NH4^{+)}$	2	CO1
3	**LLO 3.1** Identify cation and anion in given ionic solutions by performing selective test	Identification of anion in given ionic solutions. Cl^-, Br^-, I^-, CO_3, SO_4, NO_3	2	CO1
4	**LLO 4.1.** Prepare Electrolyte Solution And Setup Daniel Cell. **LLO 4.2.** Determine the voltage generated from chemical reaction of Daniel cell	Determination of the voltage generated from chemical reaction using Daniel Cell.	2	CO2
5	**LLO 5.1.** Determine the extent of corrosion of iron or aluminum rod in acidic and basic media **LLO 5.2.** Compare the corrosion behavior of Aluminum / Iron in acidic and basic media	Preparation of corrosive medium for Aluminium at different temperature. Determination of rate of corrosion at different temperatures for Aluminium iron rod in acidic and Basic medium and plot a graph of rate of	2	CO2

		corrosion.		
6	**LLO 6.1.** Explain acidic and Basic solution. **LLO 6.2.** Determine pH of given sample solution.	To find out pH of different solutions using Lovibond comparator, pH paper, pH meter.	2	CO2
7	**LLO 7.1.** Prepare required chemical of definite concentration. **LLO 7.3.** Determine total hardness, of given water sample.	Determine total hardness, temporary hardness and permanent hardness of water sample by EDTA method.	2	CO3
8	**LLO 8.1.** Prepare required chemical of definite concentration. **LLO 8.2.** Determine alkalinity of given water sample.	Determine the alkalinity of given water sample.	2	CO3
9	**LLO 9.1.** Prepare required chemical of definite concentration. **LLO 9.2.** Determine chloride content in given water sample.	Determine the chloride content of given water sample.	2	CO3
10	**LLO 10.1.** Explain Redox reaction.. **LLO 10.1.** Determine the percentage of Iron from Hematite ore by Redox titration.	Standardization of $KMnO_4$ solution using standard oxalic acid and Determine the percentage of iron present in given Hematite ore by $KMnO_4$ solution	2	CO4
11	**LLO 11.1.** Explain complexometric titration. **LLO 11.1.** Determine the percentage of Copper from copper ore.	Determine the percentage of copper in given copper ore.	2	CO4
12	**LLO 12.1.** Explain Role of Calcium in Cement. **LLO 12.2.** Determine the percentage of calcium in given cement sample.	Determine the percentage of calcium in given cement sample.	2	CO4
13	**LLO 13.1.** Describe proximate analysis of coal sample. **LLO 13.2.** Explain working of Oven. **LLO 13.3.** Determine ash content in coal sample.	Determine the moisture and ash content in given coal sample using proximate analysis.	2	CO5
14	**LLO 14.1.** Describe Ostwald's Viscometer. **LLO 14.2.** Determine the coefficient of viscosity of lubricant.	Determination of coefficient of viscosity of given oil (Glycerin) by using Ostwald's Viscometer.	2	CO5
15	**LLO 15.1.** Determine Acid value of given lubricant.	To find out acid value of given lubricant.	2	CO5

Note: if any

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

Assignment

1. Describe modern atomic structure.
2. Named four quantum numbers and their functions.
3. Write any four postulates of Bohrs atomic theory.
4. Explain covalent bond, ionic bond, coordinate bond, hydrogen bond.
5. Explain Corrosion with suitable example.
6. Demonstrate Mechanism of wet corrosion by waterline corrosion
7. Named the various factors affecting rate of corrosion.
8. Explain galvanizing and tinning.
9. Describe Hardness of water and their Types.
10. Enlist various chemicals responsible for hardness of water.
11. Explain Soda lime and zeolite process of softening of water.
12. Describe various steps involved in potable water treatment process.
13. Demonstrate waste water treatment.
14. Define mineral, ore, gangue, flux and slag.
15. Describe extraction of Iron Metal from hematite ore.
16. Explain various alloys and their application.
17. Describe Portland cement and their chemical constituent.
18. list various Types of Lime and their application.
19. Define calorific value, ignition temperature, octane number, cetane number, flash point and pour point.
20. Describe fractional distillation of crude oil.
21. Explain gaseous fuel with their chemical composition.
22. Explain carbonization of coke.

VI. Specification Table:

Unit No	Topic Title	Distribution of Theory Marks			
		R Level	U Level	A Level	Total Marks
1	**Atomic Structure and Chemical bonding**	2	4	4	**10**
2	**Metal Corrosion and its prevention**	2	4	6	**12**
3	**Water**	2	4	6	**12**
4	**Metals, alloys and cement**	4	6	6	**16**
5	**Fuel**	2	4	4	**10**
	Total	**12**	**22**	**26**	**60**

VII. Assessment Methodologies/Tools

Formative assessment (Assessment for Learning)

Rubrics for continuous assessment based on process and product related performance indicators **(TH 40 marks + 25 PR)**

Two-unit tests of 20 marks and total of two-unit tests.

- For laboratory learning 25 marks.

Summative Assessment (Assessment of Learning)

End term examination, Viva-voce, Workshop performance **(60 TH + 25 PR marks)**

- End semester assessment of 25 marks for laboratory learning marks).
- End semester assessment of 60 marks through end semester examination.

VIII. Suggested COs - POs Matrix Form

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

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

IX. Suggested Learning Materials / Books

Sr.No	Author	Title	Publisher
1	NCERT	NCERT XI and XII text book	NCERT ISBN 81-7450-648-9 (Part I) 81-7450-716-7 (Part II)
2	Jain and Jain	Engineering Chemistry	Dhanpat rai Publishing ISBN New Delhi, 2010, ISBN: 8174505083
3	Dr.S.S. Dara, Dr. S.S. Umare	Engineering Chemistry	S. Chand publication 1986, ISBN: 978-81-219-0359-2
4	Anju Rawley, Devdatta V.Saraf	Applied Chemistry with Lab Manual	Khanna Book Publishing Co. (P) Ltd. NewDelhi, 2021, ISBN- 978-93-91505-44-8
5	V.P. Mehta,	Polytechnic Chemistry	Jain Brothers, Delhi ISBN: 978-81-8360-093-X

X. Learning Websites & Portals

Sr. No	Link / Portal	Description
1	www.chem1.com	Chemistry instruction and education
2	www.onlinelibrary.wiley.com	Materials and corrosion
3	www.chemtube3d.com	Atomic structure and engineering material
4	www.ferrofchemistry.com	Metals
5	www.chemistryclassroom.com	Chemical boding
6	www.sciencejoywagon.com/	Electrochemistry
7	www.chem1.com	Chemistry instruction and education
8	www. chemistry.org	Virtual Labs, simulation
9	www.swayam.gov.in	Chemistry for engineer

XI.Academic Consultation Committee/Industry Consultation Committee:

Sr. No	Name	Designation	Institute/Organization
1	Mrs. Leena Khadke	Lecturer In Chemistry	Govt. Polytechnic Thane
2	Mrs. Sneha Suvarna	Lecturer In Chemistry	SBM Polytechnic Mumbai
3	Mr. Santosh Mulye	Lecturer In Chemistry	VES Polytechnic Mumbai
4	Mr. Pravin Meshram	Lecturer In Chemistry	Govt. Polytechnic Mumbai

Coordinator,
Curriculum Development,
Department of _____ Engineering

Head of Department
Department of _____ Engineering

I/C, Curriculum Development Cell

Principal

Programme : Diploma in Rubber Technology													
Course Code: ME23103					**Course Title: Engineering Drawing-I**								
Compulsory / Optional: Compulsory													
Teaching Scheme and Credits						**Examination Scheme**							
CL	**TL**	**LL**	**SLH**	**NLH**	**Credits**	**FA-TH**		**SA-TH (3Hrs.)**	**FA-PR**	**SA**		**SLA**	**Total**
						T1	**T2**			**PR**	**OR**		
3	-	4	2	10	5	-	-	-	50	50#	-	50	150

Total IKS hrs. for course: 2

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 an average of two class tests of 30 marks each conducted during the term.
2. SA-TH represents the end term examination.

I. Rationale

Engineering Drawing is the graphical language of engineers, technicians and workers to express engineering ideas and concepts. Correct interpretation of engineering drawings is one of the basic abilities of First Line Supervisors in industries. Study of Engineering Drawing induces the concepts of accuracy and exactness of information necessary for the production of engineering component. It also develops judgements about distances and angles.

This basic course aims at building a foundation for the further courses in drawing and other allied courses. This course introduces the concept of reference planes and the projections. The self -Learning activities indicated in the curriculum are helpful for students to revise the learned concepts and will develop their self-confidence in course learning.

This course is useful in developing imagination, drafting and sketching skills of the students.

II. Industry / Employer Expected Outcome

To prepareand interpret the technical drawings.

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

CO1	Draw geometrical constructions using drawing instruments.
CO2	Draw engineering curves using drawing instruments.
CO3	Apply principles of orthographic projections to draw orthographic views of given object.
CO4	Apply principles of isometric projections to draw isometric view from given orthographic views.
CO5	Draw the free hand sketches of given engineering objects/elements

Course Content Details:

Unit No.	Theory Learning Outcomes (TLO's)aligned to CO's.	Topics / Sub-topics
1	1.1 Draw engineering figures using geometric constructions with the help of drawinginstruments. 1.2 Use IS SP-46 for dimensioning 1.3 Use different types of lines.	**Basics of Engineering Drawing** 1.1 Drawing instruments and their uses, Standard sizes of drawing sheets (ISO-A series), Letters and numbers(single stroke vertical), Types of lines and their applications, Drawing Scales (reduced, enlarge and full size), Methods of Dimensioning: Chain, parallel and coordinate dimensioning (Refer SP-46Code) 1.2 Simple Geometrical Constructions, Redrawing figures using geometrical constructions **CourseOutcome-CO1 Teaching Hours – 08 Marks –07**
2	2.1 Draw different engineering curves from given data. 2.2 Plot loci of points from given data.	**Engineering Curves and Loci of Points** 2.1 Method to draw Ellipse by Arcs of Circle Method and Concentric Circle Method 2.2 Method to draw Parabola and Hyperbola by Directrix and Focus Method. 2.3 Methods to draw Involutes of circle and pentagon, 2.4 Methods to draw Cycloid, 2.5 Loci of Points of Single Slider Crank Mechanism **CourseOutcome-CO2 Teaching Hours – 10 Marks –07**
3	3.1 Draw top, front and side views of givenpictorial view. 3.2 Draw the top, front and side sectional orthographic views from given pictorial view.	**Orthographic Projections** 3.1 Introduction to orthographic projections, Symbol of First Angle Projection and Third angle projection, Conversion of pictorial view into orthographic views –Top, Front and side View of objects.Objects involving plain surfaces, slant surfaces, slots, ribs, cylindrical surfaces. 3.2.Sectional Orthographic Views and conversion of pictorial view into sectional Orthographic views

Unit No.	Theory Learning Outcomes (TLO's)aligned to CO's.	Topics / Sub-topics
		(Objects involving plain surfaces, slant surfaces, slots, ribs, cylindrical surfaces, threads etc.) **(First Angle Projection Method Only)** **Course Outcome- CO3 Teaching Hours – 16 Marks –14**
4	4.1 Draw isometric scale. 4.2 Draw isometric views from given orthographic view using natural and isometric scale.	**Isometric projections** 4.1 Isometric scale, Natural scale. 4.2Conversion of Orthographic Views into Isometric View/Projection (Objects involving plain surfaces, slant surfaces, slots, ribs, cylindrical surfaces, holes etc.) **Course Outcome- CO4 Teaching Hours – 10 Marks –14**
5	5.1 Draw proportionate free-hand sketches of given elements.	**Free hand sketches** 5.1Drawing of proportional freehand sketches of – Different types of thread profile, nuts, bolts, screws, washers and foundation bolts (Rag and Lewis type) **Course Outcome- CO5 Teaching Hours – 06 Marks –08**

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

Sr No	Laboratory Learning Outcome **(LLO)** aligned to CO's.	**Laboratory Experiment / Practical Titles / Tutorial Titles**	**Number of hrs.**	**Relevant COs**
1	1.1 Prepare Lettering, 1.2 Draw types of lines. 1.3 Redraw the given figure. 1.4 Apply IS code provisions for to dimensioning.	Basics of Engineering Drawing Drawing sheet containing types of lines, Lettering, Redrawing given figure, dimensioning	10	CO1
2	2.1 Draw Engineering curves using given data.	Engineering curves and loci points(minimum 4 problems)	10	CO2
3	3.1Apply method of projection for drawing orthographic views.	Orthographic projections Using first angle method of projections (minimum 2 problems)	12	CO3
4	4.1Apply method of projection for drawing sectional orthographic views.	Sectional Orthographic projections Using first angle method of projection (minimum 2 problems)	10	CO3
5	5.1Draw isometric projections using natural and isometric	Isometric Projections Using isometric scale (1 objects) and natural	08	CO4

Sr No	Laboratory Learning Outcome **(LLO)** aligned to CO's.	**Laboratory Experiment / Practical Titles / Tutorial Titles**	**Number of hrs.**	**Relevant COs**
	scale.	scale (1 object)		
6	6.1Draw standard discipline-oriented components using free hand	Free hand sketches To draw free hand sketches of different types of threads forms, nuts, bolts and screws, foundation bolts.	06	CO5
7	7.1Collect information of an ancient Indian culture related to engineering graphics	Correlate ancient Indian sculptures, Indian temples, Monuments, etc. with Engineering Graphics.	04	C01

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

Each student has to maintain a A3 size sketch book and complete following assignments for assessment of self-learning activity.

1. Draw horizontal, vertical, 30º, 45º, 60º, 75ºusing set square and drafter, and geometric constructions
2. Draw different types of lines &redraw two figures
3. Two problems on orthographic projections (out of which one problem on sectional orthographic)
4. Two problems on isometric projections
5. Free hand sketches
6. Co-relate ancient Indian sculptures, Indian temples, monuments etc. with engineering drawing

VI. Specification Table:

Unit No	Topic Title	Distribution of Theory Marks			
		R Level	**U Level**	**A Level**	**Total Marks**
1	**Basics of Engineering Drawing**	-	-	07	07
2	**Engineering Curves and Loci of Points**	-	-	07	07
3	**Orthographic Projections**	-	-	14	14
4	**Isometric projections**	-	-	14	14
5	**Free Hand Sketches**	-	-	08	08
	Total	-	-	**50**	**50**

VII. 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)

End term practical examination of TWO hrs. (50 marks)

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VIII. 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	-	-	03	-	-	02	01	-
CO2	03	-	-	03	-	-	02	01	-
CO3	03	-	-	03	-	-	02	03	02
CO4	03	-	-	03	-	-	02	03	02
CO5	03	-	-	03	-	-	02	02	02
Legends: - High:03, Medium:02, Low:01, No Mapping: --									

IX. Suggested Learning Materials / Books

Sr.No	Author	Title	Publisher
1	N.D.Bhatt	Engineering Drawing	Charotar Publishing House
2	P.J. Shah	Engineering Graphics	S. Chand
3	Amar Pathak	Engineering Drawing	Wiley Publication
4	D.Jolhe	Engineering Drawing	Tata McGraw Hill Education
5	K.L.Narayan,P.Kannaiah	Textbook on Engineering Drawing	Scitech publications
6	BIS	IS Code SP-46, Engineering Dawing practice For school and colleges	BIS

X. Learning Websites & Portals

Sr.No	Link / Portal	Description

1	https://ocw.mit.edu/courses/2-007-design-and-manufacturing-i-spring-2009/pages/related-resources/drawing_and_sketching/	MIT Open courseware describing basics of engineering drawing
2	https://archive.nptel.ac.in/courses/112/104/112104172/	Lectures on Technical Drawing
3	https://www.youtube.com/watch?v=3WXPanCq9LI	Projection of lines
4	https://www.youtube.com/watch?v=fvjk7PlxAuo	Introduction to Graphics (GTU)

XI. Academic Consultation Committee/Industry Consultation Committee:

Sr. No	Name	Designation	Institute/Organization
1	Mr. K.B. Salunke	Lecturer in Mechanical Engineering	Government Polytechnic, Thane
2	Dr. V.P. Rathod	Lecturer in Mechanical Engineering	Government Polytechnic, Thane
3	Mr. U.A. Agnihotri	Lecturer in Mechanical Engineering	Government Polytechnic, Mumbai
4	Mr. S. B. Bidgar	Lecturer in Mechanical Engineering	Government Polytechnic, Mumbai
5	Mr. E.C. Dhembare	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

Programme : Diploma in Rubber Technology												
Course Code:SC23106					**Course Title: Basics of Organic Chemistry**							
Compulsory / Optional: Compulsory												
Teaching Scheme and Credits						**Examination Scheme**						
CL	**TL**	**LL**	**SLH**	**NLH**	**Credits**	**FA-TH**	**SA-TH (3 Hrs.)**	**FA-PR**	**SA**		**SLA**	**Total**
									PR	**OR**		
3	-	-	3	6	3	30	70				25@	125

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 an average of two class tests of 30 marks each conducted during the term.
2. SA-TH represents the end term examination.

I. Rationale

Rubber Technology is typically based on organic chemistry and as a part of new curriculum it is our responsibility to teach 10 pass students basic of organic chemistry so that students become familiar with fatty acids, monomer, polymers and few reactions in organic chemistry.

II. Industry / Employer Expected Outcome

This course is to be taught and implemented with the aim to develop in the student, the course outcomes (COs) leading to the attainment of following industry identified outcome expected from this course:

Apply the knowledge of basic organic chemistry in rubber technology.

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

CO1	Classify organic compound on the basis of chemical structure.

CO2	Explain the nature and use of olefins in rubber chemistry.
CO3	Select relevant alcohols, ethers and amine in relevant synthesis.
CO4	Use relevant fatty acids and esters in relevant rubber synthesis.
CO5	Apply the concept of monomer and polymerization in relevant engineering process.

Course Content Details:

Unit No.	Topics / Sub-topics
1	**Unit I: Introduction of organic Chemistry:** 1.1 Organic chemistry, 1.2 molecular formula, empirical formula, 1.3 Valency: valency of hydrogen, carbon, nitrogen and oxygen atom, 1.4 Homologous series of normal paraffin, Iso paraffin group. 1.5 Classification of organic compound aliphatic or open chain and alicyclic or ring compounds, 1.6 0Aromatic compounds and heterocyclic compounds. 1.7 functional group **Course Outcome: CO1 Teaching Hours :8 hrs Marks: 12**
2	**Unit II: Aliphatic compounds: Alkanes and olefin** 1.1 Definition, general formula and chemical structure of aliphatic compounds 1.2 Saturated compounds Methane, ethane, propane 1.3 Unsaturated compound, ethylene, propylene, 1.4 General physical and chemical properties of olefins 1.5 chemical Structure and IUPAC nomenclature of methylene, ethylene, propylene, butylene, butadiene, isoprene, their uses 1.6 hydrocarbons with conjugated double bonds 1.7 Nomenclature of various olefins used in rubber chemistry, **Course Outcome: CO2 Teaching Hours :9hrs Marks: 15**
3	**Unit III: Alcohols, Ethers and amine** 1.1 Definition, general formula, Chemical structure and nomenclature of alcohols, Ethers and amine. 1.2 Primary, secondary and tertiary alcohol their structure IUPAC nomenclature and their uses 1.3 Polyhydric alcohol: Glycerol, glycol their properties and uses 1.4 Primary, secondary and tertiary amine their structure IUPAC nomenclature and their uses 1.5 aliphatic and aromatic amines the structure and nomenclature 1.6 Uses of amines in rubber chemistry as accelerator and antioxidants, Characteristic reactivity of aliphatic amine and aromatic amines in rubber synthesis **Course Outcome: CO3 Teaching Hours :9hrs Marks: 15**

4	**Unit IV: Fatty acids , Esters, Aldehydes and Ketones** 1.1 Definition, general formula, Origin, nomenclature of acids, esters, aldehydes and ketones. 1.2 General properties, homologous series of fatty acid from formic to stearic acid, 1.3 C1-C6, C7-C12, C13-C22 fatty acids their nomenclature, physical state, use in synthesis of rubber 1.4 Esters of fatty acids their applications and uses in rubber Technology 1.5 Saponification **Course Outcome: CO4 Teaching Hours :7hrs Marks: 10**
5	**Unit V: Polymer** 1.1 Definition and structure of Monomer, polymer, copolymer, terpolymer 1.1 Physical and chemical properties, origin, 1.2 classification of polymers: natural polymer, semi synthetic polymer and synthetic polymer 1.3 Thermoplastic and thermosetting polymer 1.4 Addition polymer and condensation polymer 1.5 Chemical structure and synthesis of Polyisoprene, natural rubber, polychloroprene, polyvinyl chloride, styrene. 1.6 Chemical structure and synthesis of rubber, proteins, cellulose, nitrocellulose, cell acetate, nylon Bakelite, 1.7 Difference Between Rubber and plastic **Course Outcome : CO5 Teaching Hours :12hrs Marks: 18**

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

Sr No	Laboratory Experiment / Practical Titles / Tutorial Titles	Number of hrs.	Relevant COs
1	**Introduction of organic Chemistry:**	8	12
2	**Aliphatic compounds: Alkanes and olefin**	9	15
3	**Alcohols, Ethers and amine**	9	15
4	**Fatty acids and Esters:**	7	10
5	**Polymer**	12	18

Note: if any

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

1.Describe Organic Chemistry.
2.Classify organic compounds on various basis.

3.Explain valency of H, C, N and O, with suitable example.
4.Explain Saturated and unsaturated organic compounds.
5.Classify alcohols with suitable example.
6.Named various alcohols and amines used in variety of rubber synthesis.
7.Identify various acids, esters aldehydes and ketones used in synthesis of polymer.
8.Describe saponification process.
9.Describe the term monomer and polymer.
10. Distinguish between addition and condensation polymer.
11.Describe thermosetting and thermoplastic polymer with suitable example.
12.Prepare chart showing classification of polymer.
13.Describe synthesis of nylon and Bakelite.
14.Describe structure of isoprene unit and named the polymer which contain isoprene.
15.Distinguish between plastic and rubber.

VI. Specification Table:

Unit No	Topic Title	Distribution of Theory Marks			
		R Level	U Level	A Level	Total Marks
1	Introduction of organic Chemistry:	2	4	6	12
2	Alcohols, Ethers and amine	2	6	7	15
3	Alcohols, Ethers and amine	2	6	7	15
4	Fatty acids and Esters:	2	4	4	10
5	Polymer	4	6	8	18
	Total	12	26	32	**70**

VII. Assessment Methodologies/Tools

Formative assessment (Assessment for Learning)

- Rubrics for continuous assessment based on process and product related performance indicators **(30Th + 25 SLA marks)**

Summative Assessment (Assessment of Learning)

- End term examination, Viva-voce, Workshop performance (70 Th marks)

VIII. Suggested COs - POs Matrix Form

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

IX. Suggested Learning Materials / Books

Sr.No	Author	Title	Publisher
1	NCERT	NCERT XI and XII text book	NCERT ISBN 81-7450-648-9 (Part I) 81-7450-716-7 (Part II)
2	Polymer Science	V.R. Gowarikar	New Age International Publishers
3	Polytechnic Chemistry	V.P. Mehta,	Jain Brothers, Delhi
4	Text book of organic Chemistry	I.L. Finar,	ELBS publication
5	Chemistry in Engineering and technology Volume 1 and 2	J.C. Kurlacose, J. Jairam Tata Mcgraw hill.	9780074517352

X. Learning Websites & Portals

Sr.No	Link / Portal	Description
1	www.chem1.com	Chemistry instruction and education
2	www.onlinelibrary.wiley.com	Materials and corrosion
3	www.chemtube3d.com	Atomic structure and engineering material
4	www.sciencejoywagon.com/	Electrochemistry

5	www. chemistry.org	Virtual Labs, simulation
6	www.swayam.gov.in	Chemistry for engineer

XI.Academic Consultation Committee/Industry Consultation Committee:

Sr. No	Name	Designation	Institute/Organization
1	Mrs. Leena Khadke	Lecturer In Chemistry	Govt. Polytechnic Thane
2	Mrs. Sneha Suvarna	Lecturer In Chemistry	SBM Polytechnic Mumbai
3	Mr. Santosh Mulye	Lecturer In Chemistry	VES Polytechnic Mumbai
4	Mr. Pravin Meshram	Lecturer In Chemistry	Govt. Polytechnic Mumbai

Coordinator,
Curriculum Development,
Department of _____ Engineering

Head of Department
Department of _____ Engineering

I/C, Curriculum Development Cell

Principal

Programme : Diploma in Rubber Technology (Sandwich Pattern)												
Course Code: EE23102					**Course Title : Basic of Electrical Engineering**							
Compulsory / Optional: Compulsory												
Teaching Scheme and Credits						**Examination Scheme**						
CL	**TL**	**LL**	**SLH**	**NLH**	**Credits**	**FA-TH**	**SA-TH (3Hrs.)**	**FA-PR**	**SA**		**SLA**	**Total**
									PR	**OR**		
2	-	2	2	6	3	-	-	50	50	--	25	125

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 an average of two class tests of 30 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 forfor operating machines of Rubber industry

II. Industry / Employer Expected Outcome: The aim of this course is to help the student to attain the followingindustry identified outcome through various teaching learning experiences: 1)To know the basic elements of electrical engineering2) Understand operations of various electrical machines.

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

CO1	Define basic terminologies related to electrical engineering
CO2	State concepts of ac fundamentals
CO3	Understand use of Electric Heating in rubber industry.
CO4	Enlist different types and uses of induction motor
CO5	Identify various types of wiring
CO6	Practice safety precautions

Course Content Details:

Unit No.	Topics / Sub-topics
1	**Fundamental concept: (DC Current only)** 1.1 Source of DC Electric Current , Electric potential, Terminal voltage, Potential Difference, E.M.F., 1.2 Resistance, Factors affecting resistance, Electrical power and energy concepts and Units (Simple numerical) 1.3 Classification of Electric Current, Effects of an Electric Current. 1.4 Concept of Electromagnetic Induction (units and measurement and graphical representation of above quantitiesStandard symbols.) **Course Outcome : CO1,CO2 Teaching Hours :6 hrs**
2	**A.C. Fundamentals** 2.1 Generation of emf, Equation of AC voltage and AC current. 2.2 Important terms and symbols : instantaneous value, waveform, cycle, Periodic Time, frequency, amplitude,Average value, R.M.S value. 2.3 Concept of Power, types and equations of power and power factor, 2.4 Three phase Power: need, Type of connections in balanced load (Star , Delta), Line and Phase quantities ofvoltages , currents and their relationship 2.5 Specification of single phase and three phase AC supply **Course Outcome : CO1,CO2 Teaching Hours :5 hrs**
3	**Measuring Instruments & their Uses:** 3.1 Analog Ammeters, Voltmeters, Watt meters, Energy Meters, Insulation Tester (connection diagram & use). 3.2 Digital Multimeter, Energy Meter, clip-on Ammeters (uses) 3.3 Introduction of Tariff, simple example of calculation of Energy bill. **Course Outcome: CO3 Teaching Hours : 4 hrs**
4	**Electric Motors:** 4.1 Three Phase induction motor: Types, Specification and Application in rubber industry . 4.2 Necessity and Types of starters (DOL, Star- Delta, autotransformer and soft starter) three phase inductionmotor 4.3 Need and Reversal of Induction Motor 4.4 Duty Cycle of Induction Motor 4.5 Type of Enclosures, mountings 4.6 Single phase Induction motor : Schematic representation &application i) Split phase motor ii) Capacitor start/capacitor run . **Course Outcome: CO4 Teaching Hours : 6 hrs**

5	**Electric Heating** 5.1 Advantages of Electric Heating. 5.2 Modes of Transfer of Heat: 5.3 Classification of Electric Heating Methods 5.4 Resistance Heating: Construction & Operation, Direct Resistance Heating, Indirect Resistance Heating:Resistance Ovens, Applications of Resistance Heating. **Course Outcome: CO4** **Teaching Hours : 4 hrs**
6	**Electrical Wiring & Safety** 6.1 Types and size of wire and wiring systems 6.2 Location & function of: a) Current Switching Devices: Switches, Switch Fuse unit b) Circuit interrupting devices: HRC Fuse & Circuit Breakers: MCB,ELCB, MCCB. 6.3 Wiring diagram: a) control of one lamp by means of one switch. b)Stair case wiring. c) Godown wiring. 6.4 Earthing: Definition, necessity of earthing, types of earthing. 6.5 Electrical Safety precautions in indoor and outdoor installations. **Course Outcome: CO5** **Teaching Hours : 5 hrs**

IV. List of Laboratory Experiment.

Sr No	Laboratory Experiment	Number of hrs.	Relevant COs
1	To measure DC current, DC voltage, calculation of power using lamp load	4	CO1
2	To measure current, voltage, power and energy in single-phase AC load	2	CO1
3	Demonstration of induced emf in a coil and reverse its polarity.	2	CO1
4	To measure line & phase values for star & delta connected balanced load	2	CO2
5	Demonstration of use of Clip on meter, multimeter, Insulation tester	2	CO3
6	Demonstration of reversal of direction of rotating shaft of induction motor	2	CO4
7	Demonstrate different types of starters of three phase induction motor.	2	CO4
8	Demonstration of resistance furnaces	2	CO5
9	Demonstration of SPN, TPN, MCB, ELCB, Timer, Contactor, HRC Fuse , Rewirable fuse, Control & Distribution panel.	4	CO6
10	Prepare a) control of one lamp by means of one switch. b) Stair case wiring.	2	CO6
11	Demonstration of different types of wire, wire size, cables and wiring accessories,write their rating	2	CO6
12	First Aid Treatment: Precautions if person receives an electric shock, Methods of artificial respiration (Video Demonstration)	2	CO6

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

1. Enlist Types of Resistor with application
2. Differentiate AC and DC supply electrical quantities.
3. Explain various types of AC/ DC meters
4. Explain applications of Faraday's law of electromagnetic Induction
5. Write information on different Inventors in electricity
6. Draw Electrical Symbol.
7. Write report on Artificial Respiration methods recommended by WHO

II. 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)

III. Suggested COs - POs Matrix Form

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

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

IV. 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	J . B. Gupta	Electrical Installation, Estimating and Costing	S. K. Kataria and Sons

V. Learning Websites & Portals

Sr.No	Link / Portal	Description
1	https://archive.nptel.ac.in/courses/108/105/108105112/	Videos on basic concept, DC Circuit and AC fundamental
2	https://www.khanacademy.org	Videos on basic concept
3	https://www.electronics-tutorials.ws/electromagnetism/electromagnetic- induction.html	Laws of Electromagnetic Induction

VI. Academic Consultation Committee/Industry Consultation Committee:

Sr. No	Name	Designation	Institute/Organization
1	Mr. Rahul H Shewale	Assistant Engineer	Mumbai Inspection Division Industry Energy and Labour Dept.Govt. of Maharashtra Mumbai Central
2	Mrs.S.P.Phadnaik	Lecturer in Electrical Engineering	G.P.Pune
3	Mr. I. N. Khuspe	Lecturer in Electrical Engineering	G.P.Mumbai
4	Mrs. D. R. Kirtane	Lecturer in Electrical Engineering	G.P.Mumbai

Coordinator,
Curriculum Development,
Department of Electrical Engineering

Head of Department
Department of Electrical Engineering

I/C, Curriculum Development Cell

Principal

Programme : Diploma in ME/CE/EE/CO/IF/IS/EC/RT/LT/LG (Sandwich Pattern), AIML												
Course Code: UV23301					**Course Title : Universal Human Values-I**							
Compulsory / Optional: Compulsory												
Teaching Scheme and Credits						**Examination Scheme**						
CL	**TL**	**LL**	**SLH**	**NLH**	**Credits**	**FA-TH**	**SA-TH**	**FA- PR**	**SA**		**SLA**	**Total**
									PR	**OR**		
01	–	–	01	02	01	–	–	–	–	–	50	50

Total IKS Hrs. for course: 04

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, *# Online Examination, @$ Internal Online Examination

Note:

1. FA-TH represents an average of two class tests of 30 marks each conducted during the term.
2. SA-TH represents the end term examination.

Rationale:

Human beings have materially developed to a great extent through technological development. Still the scarcity of happiness and satisfaction result in personal and social conflicts. The value system develops the frame of reference of the individual to benchmark his/ her behavioral pattern respecting the righteousness during life. The appreciation and inculcation of a value system can develop a person as a creative contributor for society, nation and by-large the world.

By inculcating universal values, not only can a person resolve the personal, social and professional situations positively but also can lead toward an enriched life. Once these values are inculcated in a student's personality, it will result in the sustainable development of a student.

This course is designed to make the student think that by observing the universally accepted human values, it is easy to become a good human being, a good citizen and make their own life goal-oriented, cladded with happiness and satisfaction. The core universal values to be inculcated: personal values, social values and professional values. The aspirations and concerns to be explored at the level of individual, at the level of family, at the level of society and at the level of nature.

Industry / Employer Expected Outcome

To demonstrate value based behavior at the workplace.

Course Outcomes:

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

CO1	Appreciate universal human values to ensure sustained happiness and prosperity, which are the core aspirations of all human beings.
CO2	Develop a holistic approach to environment, family and society.
CO3	Develop more confidence in self .
CO4	Derive joy of giving .
CO5	Improve understanding and perform acts of kindness.

Course Content Details:

Sr. No.	CO	Activity	Related Value/s	Methodology of Implementation	Student's Role	Mentor's role	Resources Required
01	**CO1 CO3**	Prepare a self-introduction sheet i)Name, School passed from, achievements up to 10th standard ● What are your goals in your life? ● What are your expectations from institute, Family, Society? ● Information of family members ● Most happy moments and difficult moments in your life, Special trips, Hobbies , Sports, Music , etc	Honesty, Self-exploration	Preparing a note and presenting in front of peers	Thoughtfully answer the questions in an honest manner.	Provide information about the institute and motivate students to honestly express themselves.	Official website of the institute

02	**CO1 CO2**	List behavioral characteristics and analyze self, friend, family members, ● Do you like these characters yes/no – why	Self-exploration, Honesty	Preparing a presentation	Honestly and sincerely analyse self and others	Create a stress-free environment and see that there will be no conflict of expression.	Provide a list of character traits by referring to various resources like internet, books, etc. For e.g. https://www.teachervision.com/writing/character-traits-list-examples
03	**CO2 CO3**	Identify your needs and desires	Honesty Self-exploration	Making a list of needs and desires	Reflect and identify needs and desires.	Stay wary of controversial subjects	list of historical personalities who set the example.
04	**CO2 CO5**	Singing a patriotic song in group ● Make group, select song, explain meaning, use music/karaoke and demonstrate to class	Patriotism	Forming group of interested students Students will rehearse the activity and will perform in groups	Diligently practice and cooperate with others.	Manage the logistics of creating groups and assigning roles.	Music system, list of patriotic songs.

05	**CO1 CO3**	Essay writing • My dreams as an Engineer • India a Super power in my views • Society & I • Indian culture and values • My role models in life **IKS hours-** Religious and cultural history of India- Indus civilization	Self – exploration Patriotism Accountability	Selecting a topic from the list and writing an essay on it	Thoughtfully write the essay on a selected topic.	Display the best essays on the notice board.	notice board, panel of judges
06	**CO2 CO3**	Play Music instruments/ Singing/ Drawing/Any stage performance/ photography/any creative art **IKS hours -** History of Indian classical music.	Derive the joy	**Present to peers**	Pursue your creative interest	Identify and categorize students. Create groups accordingly	logistical support
07	**CO2 CO4 CO5**	Visit a nature park, identify the flora & fauna, ecological factors & their role in our life. (e.g Maharashtra nature park society , Dharavi , Mumbai)	Environment Conservation	Students to arrange visit under supervision of mentor	Study various flora & fauna in a disciplined manner.	Assure safety of students and manage activities.	**https://maharashtranaturepark.org/**
08	**CO2 CO4**	Tree plantation and caring for it.	Environment Conservation	Students to arrange activity under supervision of mentor	Plant the appropriate saplings according to instructions.	Assure safety of students and provide adequate instructions.	saplings, soil, shovels, fertilizer

09	**CO3**	List the distractors which are responsible to deviate you from integrity and find out the solution	Integrity, Righteousness	Observation and identification of common distracters.	Identify distracters like TV shows, movies and bad habits	Provide historical case studies of previous students.	Case studies
10	**CO2 CO5**	Prepare the chart DOs and DONTs for different situations like local trains, travel, public place, classroom, examination, etc.	Conscientiousness, honesty, social gratitude	Preparing the chart	Identify DOs and DONTs and prepare various charts	Create groups and assign topics.	Official websites of respective administrations like railways, Municipal corporation, etc.,
11	CO4	Beach cleaning, institute cleaning	Environment conservation, Health consciousness	Organizing a visit to clean the venue.	Clean the venue as per instructions.	Assure safety and aid in organization.	**https://www.unitedwaymumbai.org/cleanshores**

12	CO4 CO5	a) To prepare a first aid box to be kept at home b) Preparation of a report on industrial accident	Care for others, accountability	Collection of information from various available sources and use it for intended purpose.	a) Prepare a list of contents for a first aid box to be kept at home b) Prepare a first aid box as per prepared list c) Prepare a list of various accidental hazards at home. d) Prepare a display of safety precautions for use of gas stove. e) Collect information of one industrial accident , its effects, probable causes from various resources and prepare a report.	To explain and monitor the task	Medicine, Box, paper

Methodology:

1. The course teacher will be the mentor.
2. In consultation and under supervision of a mentor, the student/ Group of students has to complete the activity.
3. The mentor will work as a facilitator/ advisor.
4. The strategies to learn the course is “Self- Exploratory” and “Experiential Learning”
5. The onus of responsibility for completing the activities is with students.
6. The student has to complete at least **five** no. of activities throughout the term. Each activity carries 10 marks.

Assessment methodologies/Tools:

Formative Assessment (Assessment for Learning)
The student has to complete at least **five** no. of activities throughout the term. Each activity carries 10 marks

Criterion No.	Criterion	Max. Marks	Not Satisfactory	Satisfactory	Good	Excellent
1	Attendance	02	0	1	2	2
2	Knowledge	04	1	2	3	4
3	Presentation / Performance	04	1	2	3	4
	Total	10				

Suggested CO-PO 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	-	-	-	-	2	1	3	2	1
CO2	-	1	1	-	1	1	2	2	2
CO3		1	-	-	1	1	2	2	1
CO4	-	-	-	-	1	-	2	1	2
CO5	-	-	-	-	1	-	2	1	2

Legends :- High:03, Medium:02,Low:01, No Mapping: -
*CO PSOs mapping to be formulated at department level

References/ Books:

Sr. No.	Title	Author, Publisher, Edition and Year Of publication	ISBN
1	A Foundation Course in Human Values and Professional Ethics	R.R. Gaur, R. Sangal, G.P. Bagaria, Excel Books, New Delhi, 2010	978-8-174-46781-2
2	Human Values	A.N. Tripathy, New Age International Publishers, 2003	978-8-122-42589-5
3	Teacher's Manual - A Foundation Course in Human Values and Professional Ethics	R.R. Gaur, R. Sangal, G.P. Bagaria, Excel Books, New Delhi, 2010	-
4	Science and Humanism, Towards a Unified World View	PL Dhar, RR Gaur, Commonwealth Publications, 1992	978-8-171-69222-4
5	Education for values in schools- a framework	NCERT	
6	Value oriented education	E N Gawande	

E-References:

1) **https://youtu.be/kOJu1vj_BVk (The 10 MostImportant Human Values)**
2) **Dr. Prakash Baba Amte- Movie**
3) **https://youtu.be/QeogOlzG2ls (Value of Education -short film)**

E-References for mentors:

1) **https://www.edutopia.org/**

2) **https://sdgs.un.org/goals**

Consultation Committee:

Sr. No	Name	Designation	Institute/Organisation
1	Dr. L.A. Patil	Principal (Retired)	Pratap College, Amalner
2	Dr. Nitin Deshpande	Lead Consulatnt	Dnyanpeeth Academy, Pune
3	Dr. Chandrakant Shahasane	Founder Trustee	Karnala Charitable Trust, Pune
4	Mr. Sunil V. Joshi	Ex- Sr. Lecturer, Mechanical Engineering,	Government Polytechnic, Mumbai
5	Mrs. Swati D. Deshpande	Principal	Government Polytechnic, Mumbai
6	Mr. U.A. Agnihotri	Lecturer, Mechanical Engineering	Government Polytechnic, Mumbai
7	Mr. K. V. Patil	Lecturer, Mechanical Engineering	Government Polytechnic, Mumbai
8	Mrs. P. A. Khande	Lecturer, Electronics Engineering	Government Polytechnic, Mumbai

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