



Department of Mechanical Engineering

P-23 Curriculum
(Sandwich Pattern)

Semester-I
(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: First

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 + Assignment)	Notional Learning 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	Min	Max	Min	Max	Min	Max	Min			
					T1	T2	Max	Max	Max		Min	Max	Min	Max	Min	Max	Min	Max	Min						
1	SC23501	Basic Mathematics	AEC	6	4	2		2	8	4	2 Hrs 30Min	20	20	60	100	40	25	10	-	-	-	-	25	10	150
2	HU23501	Communication Skills	AEC	-	3	-	2	1	6	3	2 Hrs 30Min	20	20	60	100	40	25	10	-	-	-	-	25	10	150
3	SC23105	Engineering Chemistry	DSC	4	3	-	2	1	6	3	2 Hrs 30Min	20	20	60	100	40	25	10	25#	10	-	-	25	10	175
4	ME23101	Engineering Drawing-I	DSC	2	4	-	4	2	10	5	-	-	-	-	-	50	20	50#	20	-	-	50	20	150	
5	WS23601	Workshop Practices (ME)	SEC	2	-	-	4	-	4	2	-	-	-	-	-	50	20	50@	20	-	-	-	-	100	
6	UV23301	Universal Human Values-I	VEC	4	1	-	-	1	2	1	-	-	-	-	-	-	-	-	-	-	-	-	50	20	50
7	SL23601	Libre Office (Spoken Tutorials)	SEC	-	-	-	-	4	4	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Total				18	15	2	12	11	40	20	-	60	60	180	300	-	175	-	125	-	-	-	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, *# On Line Examination , @\$ Internal Online Examination

- Note**
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.

Course Category :

Discipline Specific Course (DSC): 2, Discipline Specific Elective (DSE): 0, Value Education Course(VEC): 1, 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

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 (2Hrs 30 Min)	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 programmed 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	<p>TLO 1.1 Solve the given simple problem based on laws of logarithm.</p> <p>TLO 1.2 Solve given system of linear equations using matrix inversion method.</p> <p>TLO 1.3 Obtain the proper and improper partial fraction for the given simple rational function.</p> <p>TLO 1.4 Solve simultaneous equations by using concept given in Ancient Indian Mathematics</p>	<p>Unit - I Algebra</p> <p>1.1 Logarithm: Concept and laws of logarithm.</p> <p>1.2 Matrices: Matrices, algebra of matrices, transpose, value of determinant of matrix of order 3×3, adjoint and inverse of matrices.</p> <p>1.3 Matrices: Solution of simultaneous equations by matrix inversion method.</p> <p>1.4 Partial Fractions: Types of partial fraction based on nature of factors and related Problems.</p> <p>1.5 Algebra in Indian Knowledge System: Solution of simultaneous equations (Indian Mathematics)..</p>
Course Outcome : CO1		Teaching Hours :12 hrs
		Marks: 12
2	<p>TLO 2.1 Apply the concept of Compound angle, allied angle and multiple angles to solve the given simple engineering problem(s).</p> <p>TLO 2.2 Apply the concept of Sub- multiple angle to solve the given simple engineering related problem(s).</p> <p>TLO 2.3 Apply concept of factorization and de-factorization formulae to solve the given simple engineering problem(s).</p> <p>TLO 2.4 Investigate given simple problems by utilizing inverse trigonometric ratios.</p> <p>TLO 2.5 Use concept given in Ancient Indian Mathematics for trigonometry to solve given problems.</p>	<p>Unit - II Trigonometry</p> <p>2.1 Trigonometric ratios of allied angles, compound angles, multiple angles ($2A$, $3A$), submultiples angles.(without proof)</p> <p>2.2 Factorization and De factorization formulae.(without proof).</p> <p>2.3 Inverse Trigonometric Ratios and related problems.</p> <p>2.4 Principle values and relation between trigonometric and inverse trigonometric ratios.</p> <p>2.5 Trigonometry in Indian Knowledge System: The Evolution of Sine Function in India.</p> <p>2.6 Indian Trigonometry: Basic Indian Trigonometry-Introduction and Terminology (From Ancient Beginnings to Nilakantha).</p> <p>2.7 Trigonometry in Indian Knowledge System: Pythagorean triples in Sulabasutras.</p>
Course Outcome : CO2		Teaching Hours :16 hrs
		Marks: 12
3	<p>TLO 3.1 Calculate angle between given two straight lines.</p> <p>TLO 3.2 Formulate equation of straight lines related to given engineering problems.</p> <p>TLO 3.3 Identify perpendicular distance from the given point to the line.</p> <p>TLO 3.4 Calculate perpendicular distance between the given two parallel lines.</p> <p>TLO 3.5 Use geometry given in Sulabasutras to solve the given problems.</p>	<p>Unit - III Straight Line</p> <p>3.1 Straight line and slope of straight line: Angle between two lines, Condition of parallel and perpendicular lines.</p> <p>3.2 Various forms of straight lines: Slope point form, two-point form, Double intercept form, General form.</p> <p>3.3 Perpendicular distance from a point on the line.</p> <p>3.4 Perpendicular distance between two parallel lines.</p> <p>3.5 Geometry in Sulabasutras in Indian Knowledge System (construction of square, circling the square). (Indian Mathematics).</p>

	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 given in Indian Mathematics.	Unit - IV Differential Calculus 4.1 Functions and Limits: Concept of function and simple examples. 4.2 Functions and Limits: Concept of limits without examples. 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, logarithmic and exponential functions. 4.6 Applications of derivative: Second order derivative without 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.(Indian Mathematics).	
	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 mean of grouped and ungrouped data. 5.3 Variance 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 Logarithms based on given applications.	1	Solve simple problems of Logarithms based on given applications.	2	CO1
LLO 2.1 Solve elementary problems on Algebra of matrices for branch specific engineering related applications.	2	Solve elementary problems on Algebra of matrices for branch specific engineering related applications.	2	CO1
LLO 3.1 Apply the concept of matrix to solve engineering problems.	3	Solve solution of Simultaneous Equation using inversion method.	2	CO1
LLO 4.1 Apply the concept of matrix to solve engineering 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 solve engineering problems.	5	Determine inverse of a non-singular matrix by using open source software.	2	CO1
LLO 6.1 Apply the concept of partial fraction to solve 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 sub multiple angles for related shapes.	2	CO2
LLO 8.1 Utilize the concept of trigonometry to solve engineering problems.	8	Practice problems on factorization and de factorization.	2	CO2
LLO 9.1 Utilize the concept of trigonometry to solve engineering problems.	9	Solve problems on inverse trigonometric ratios based on applications.	2	CO2

LLO 10.1 Solve branch specific engineering problems under given conditions of straight lines.	10	Practice problems on equation of straight lines using different 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 engineering problems 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 to solve engineering problems.	13	Solve problems to find derivatives of implicit function and parametric function.	2	CO4
LLO 14.1 Apply the concept of derivative to solve engineering problems.	14	Solve problems to find derivative of logarithmic and exponential functions for engineering applications.	2	CO4
LLO 15.1 Apply the concept of equation of tangent and normal to solve engineering problems.	15	Solve problems based on finding equation of tangent and 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 of function and radius of curvature at a given point for engineering applications.	2	CO4
LLO 17.1 Apply the concept of equation of tangent and normal to solve engineering problems.	17	Use the concept of tangent and normal to solve the given problem of Engineering Drawing.	2	CO4
LLO 18.1 Apply the concept of Maxima and Minima to solve engineering problems.	18	Use the concept of Maxima and Minima to obtain optimum value for given engineering problem.	2	CO4
LLO 19.1 Apply the concept of radius of curvature to solve engineering problems.	19	Use the concept of radius of curvature to solve given branch specific engineering problem.	2	CO4
LLO 20.1 Utilize the concept of derivative to solve engineering problems.	20	Use the concept of derivative to find the slope of a bending 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 range and mean deviation for given applications.	2	CO5
LLO 22.1 Use concept of standard deviation and coefficient of variance to crack branch specific problems.	22	Solve problems on standard deviation, coefficient of variation and comparison of two sets.	2	CO5
LLO 23.1 Use concept of standard deviation to crack branch specific problems.	23	Calculate the Standard Deviation for Concrete with the given data for given engineering applications.	2	CO5

Note: 1. Take any 10-12 tutorials out of 23 and ensure 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 programming using 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 pdf file.
- Measure height of trees in surrounding locations using trigonometry and prepare presentation.
- Find the derivative of $y = x^{\sin x}$ 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	PSO-3
CO1	3	1	--	1	--	1	1			
CO2	3	1	--	--	1	1	1			
CO3	3	--	--	--	--	--	--			
CO4	3	1	1	1	--	1	--			
CO5	3	2	1	1	1	1	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	Kreyszig, 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. Sargent	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) in Mathematics.
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:

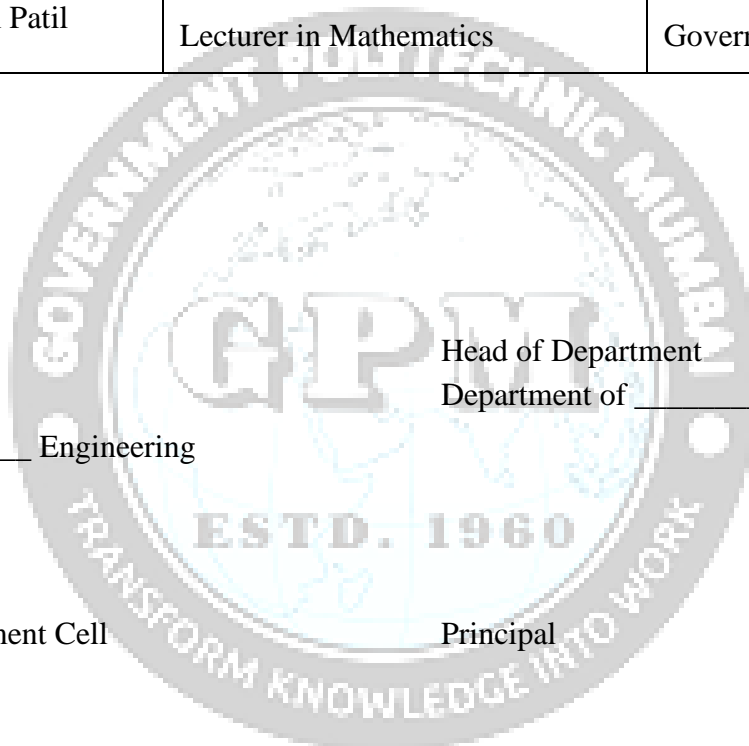
Sr. No	Name	Designation	Institute/Organization
1	Mrs.Sanchita Datta	Lecturer in Mathematics (Selection Grade)	St.Xavier's Institute of Technology,Mahim
2	Mr.Abhijit Sadashiv Patil	Lecturer in Mathematics	Government Polytechnic,Mumbai
3	Mr.Vinod Shantaram Patil	Lecturer in Mathematics	Government Polytechnic,Mumbai

Coordinator,
Curriculum Development,
Department of _____ Engineering

Head of Department
Department of _____ Engineering

I/C, Curriculum Development Cell

Principal



Programme : Diploma in _ CE/ME/EE/EC/IS/CO/IF/AI ML/LG/LT/RT													
Course Code:HU23501						Course Title :Communication Skills (CMS)							
Compulsory / Optional:													
Teaching Scheme and Credits						Examination Scheme							
CL	TL	LL	SLH	NLH	Credits	FA-TH		SA-TH (3Hrs.)	FA-PR	SA		SLA	Total
										PR	OR		
03	--	02	01	06	03	20	20	60	25	--	--	25	150

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 of 60 marks.
3. FA-PR represents practical term work of 25 marks.
4. SLA represents Self Learning Assignment of 25 marks.

I. Rationale - In this age of globalization, competition is tough. Hence effective communication skills are important. Communication skills play a vital and decisive role in career development.. It will guide and direct to develop a good personality and improve communication skills. Students will be able to utilize the skills necessary to be a competent communicator. This course will help the students to select and apply the appropriate methods of communication in various situations. Communication skills for professional purposes aim to equip the students with necessary language skills required for public speaking, presentation and negotiation. Communication skills for academic purposes will include academic writing skills and critical thinking considering the need of students to communicate in engineering domain.

II. Industry / Employer Expected Outcome

The aim of this course is to help the student to achieve the following industry identified outcome through various learning experiences: "Communicate in Verbal and Non verbal form of communication effectively at workplace".

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

CO1	Apply proper communication technique by avoiding barriers to cope up with the challenges of the modern world.
CO2	Compose paragraphs and dialogues on given situations.
CO3	Able to participate in Group Discussion and acquire the practical knowledge of an Interview.
CO4	Deliver effective presentations with apt body language by using audio visual aids.
CO5	Acquire professional writing skills for formal written business correspondence.

Course Content Details:

Unit No.	Topics / Sub-topics
1	<p>Unit I Communication Theory and Practice</p> <p>TLO 1.1 Define communication.</p> <p>TLO 1.2 Describe the process of Communication.</p> <p>TLO 1.3 Differentiate between types of communication.</p> <p>TLO 1.4 Identify the type of Barriers and suggest Remedies.</p> <p>TLO 1.5 Describe and apply 7 C's of effective Communication.</p> <p>TLO 1.6 Describe the non-verbal communication.</p> <p>1.1 Introduction, meaning and definition and importance of communication.</p> <p>1.2 Elements/process of communication.</p> <p>1.3 Types of communication: formal , informal, verbal (oral and written), non-verbal (visual and auditory), vertical, horizontal and Diagonal communication.</p> <p>1.4 Barriers in Communication and ways to overcome</p> <p>a) Mechanical Barrier</p> <p>b) Physical Barrier</p> <p>c) Psychological Barrier</p> <p>d) Linguistic Barrier</p> <p>1.5 7 C's of effective communication (Considerate, concrete, concise, clear, complete, correct, courteous)</p> <p>1.6 Introduction to Non-verbal communication (Aspects of Body Language & Graphic Communication)</p> <p>Course Outcome : CO1 Teaching Hours :10hrs</p> <p style="text-align: right;">Marks: 18</p>

2	<p>TLO 2.1 Formulate paragraphs with synchronized sentence structure on the given situation / topic</p> <p>TLO 2.2 Develop dialogues to practice language skill in a structured and meaningful way.</p>	<p>UNIT II Paragraph and Dialogue Writing</p> <p>2.1 Types of paragraphs: Technical ,Descriptive , Narrative</p> <p>2.2 Dialogue Writing: i. Greetings ii.Development iii. Closing Sentence.</p> <p>Course Outcome : CO2 Teaching Hours :06hrs Marks: 08</p>
3	<p>TLO 3.1 Express thoughts freely during group discussion.</p> <p>TLO 3.2 Participate in interview confidently .</p> <p>TLO 3.3 Prepare Group Discussion to practice language skills and leadership qualities in a structured and meaningful way.</p> <p>TLO 3.4 Understand Non Verbal Communication in interview.</p>	<p>UNIT III Group Discussion And Interview Skills</p> <p>3.1 Importance and Types of Group Discussion 3.2 Parameters of Group Discussion 3.3 Need and Types of Interview 3.4 Preparing for an Interview 3.5 Non Verbal communication during interview</p> <p>Course Outcome : CO3 Teaching Hours :10hrs Marks: 10</p>
4	<p>TLO 4.1 Prepare power point presentation</p> <p>TLO 4.2 Use appropriate body language for effective communication</p>	<p>Unit - IV Presentation Skills</p> <p>4.1 Power Point Presentation : i. Layout ii. Font size iii. Color combination. 4.2 Kinesics : i. Facial expressions ii Eye contact iii Postures iv Gestures.</p> <p>Course Outcome : CO4 Teaching Hours :09hrs Marks: 08</p>
5	<p>TLO 5.1 Draft business letters in the given situation.</p> <p>TLO 5.2 Respond to given job advertisement by writing application letter with resume.</p> <p>TLO 5.3 Draft office correspondence in given format.</p> <p>TLO 5.4 Prepare reports of the given types of events.</p>	<p>UNIT V PROFESSIONAL WRITING</p> <p>5.1 Business Correspondence: Enquiry, order, Complaint. 5.2 Job-Application with Resume 5.3 Office Drafting- notices, circulars, memorandum etc. 5.4 Report Writing: Accident and Fall in production</p> <p>Course Outcome : CO5 Teaching Hours :10hrs Marks: 16</p>

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

Sr No		Laboratory Experiment / Practical Titles / Tutorial Titles	Number of hrs.	Relevant COs
1	LLO 1.1 Enhance the understanding of word formation LLO 1.2 Enrich word power LLO 1.3 Construct words with the specific meanings	Formulate 20 words using Prefix and Suffix	2	CO1
2	LLO 2.1 Promote the development of effective communication skills LLO 2.2 .Improve non -verbal communication Skills LLO 2.3 Enhance interpersonal skills LLO 2.4 Build confidence	Enact Role Plays as per situation and context	2	CO2
3	LLO 3.1 Participate and express their thoughts confidently in group discussion. LLO 3.2 Improve speaking & listening skills	Group Discussion	2	CO3
4	LLO 4.1 Draft job application.	Job application with Resume	2	CO5
5	LLO 5 .1 Draft different types of reports on the given situation.	Report Writing	2	CO5
6	LLO 6.1 Identify different types of barriers & suggest remedies to overcome them.	Present different Types of barriers using Examples with remedies to overcome.	2	CO1
7	LLO 7.1 Face interview confidently LLO 7.2 Use appropriate body Language during interview.	Mock Interview	2	CO3
8	LLO 8.1 Identify different aspects of body language. LLO 8.2 Use appropriate body language during communication.	Mention Examples of Body Language use at Workplace with suitable pictures and images.	2	CO4
9	LLO 9.1 Express information in coherent and engaging manner LLO 9.2 Build confidence	Introduce oneself and others	2	CO4
10	LO 10.1 Develop Listening Practice	Listening Practice	2	CO1
11	LLO 11.1 Develop Reading Practice	Reading Practice	2	CO4
12	LO 12.1 Develop Writing Practice	Writing Practice	2	CO5

Note: .Students should complete all assignments & activities of Basic & Level 1 of Online course – “Business Communication Excellence” on Infosys Springboard. At the end of term, it is mandatory to submit certificates of Basic and Level 1 of Online course –“Business Communication Excellence”, on Infosys Springboard. Only after that their Term Work will be granted.

Any 10 out of 12 practicals are compulsory

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

1. Powerpoint preparation and presentations on given topic. (Mini Project)
2. Describe a given picture.
3. Impromptu Communication on given situation
4. Prepare an advertisement on any product.
5. Suggest proper dressing & grooming for the given occasion.

VI. Specification Table:

Unit No	Topic Title	Distribution of Theory Marks			
		R Level	U Level	A Level	Total Marks
1	Communication Theory and Practice	6	6	6	18
2	Paragraph and Dialogue Writing	2	2	4	08
3	Group Discussion and Mock Interview	4	2	4	10
4	Presentation Skills	2	2	4	08
5	Professional writing	2	6	8	16
Total		16	18	26	60

VII. Assessment Methodologies/Tools

Formative assessment (Assessment for Learning)

Rubrics for continuous assessment based on process and product related performance indicators(10marks)

Note : Rubric - Each Practical Carries.

- 1) 02 Marks for present, 00 Marks for Absent & 01 Marks for extra practical.
- 2) 04 Marks for Discipline & involvement in the practical.
- 3) 04 Marks for Accuracy for result & Neat clean presentation.

Summative Assessment (Assessment of Learning)

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

VIII. Suggested COs - POs Matrix Form

Course Outcomes (COs)	Programme Outcomes (POs) ELECTRICAL ENGINEERING							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	3	1		2	2	3	1	2	3
CO2					1	2	2	2		3
CO3	1	3			2	2	2	2		3
CO4					2	3	2	1		2
CO5	2				2	3	3			

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

Course Outcomes (COs)	Programme Outcomes (POs) ELECTRONICS ENGINEERING							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	3	1		2	2	3	2	2	
CO2					1	2	2	1	2	1
CO3	1	3			2	2	2	1	1	1
CO4					2	3	2	1		
CO5	2				2	3	3	1		

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

Course Outcomes (COs)	Programme Outcomes (POs) CIVIL ENGINEERING							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	PS O-1	PS O-2	PS O-3
CO1	2	3	1		2	2	3	1	2	1
CO2					1	2	2	1	2	1
CO3	1	3			2	2	2	1	2	1
CO4					2	3	2	1	2	
CO5	2				2	3	3	1	2	

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

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

Course Outcomes (COs)	Programme Outcomes COMPUTER ENGINEERING							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	PS O-1	PS O-2	PS O-3
CO1	2	3	1		2	2	3	1	2	1
CO2					1	2	2	1	2	1
CO3	1	3			2	2	2	1	2	1
CO4					2	3	2		2	
CO5	2				2	3	3		2	
Legends: - High:03, Medium:02, Low:01, No Mapping: --										

Course Outcomes (COs)	Programme Outcomes (POs) INFORMATION TECHNOLOGY							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	PS O-1	PS O-2	PS O-3
CO1	2	3	1		2	2	3	2	1	1
CO2					1	2	2	2	1	1
CO3	1	3			2	2	2	1		2
CO4					2	3	2	1		
CO5	2				2	3	3	1		
Legends: - High:03, Medium:02, Low:01, No Mapping: --										

Course Outcomes (COs)	Programme Outcomes (POs) INSTRUMENTATION ENGINEERING							PSO-1	PSO-2
	2	3	1		2	2	3		
CO1					1	2	2	1	1
CO2	1	3			2	2	2		
CO3					2	3	2		1
CO4	2				2	3	3		2
CO5	3	3	3	3	3	3	3		1

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

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

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

Course Outcomes (COs)	Programme Outcomes (POs) LEATHER GOODS & FOOTWEAR TECHNOLOGY							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	PS O-1	PS O-2	PS O-3
CO1	2	3	1		2	2	3	1		2
CO2					1	2	2	1		2
CO3	1	3			2	2	2	1	1	2
CO4					2	3	2	1		2
CO5	2				2	3	3	1		2

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

Course Outcomes (COs)	Programme Outcomes (POs) LEATHER TECHNOLOGY							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	PS O-1	PS O-2	PS O-3
CO1	2	3	1		2	2	3			
CO2					1	2	2			
CO3	1	3			2	2	2			
CO4					2	3	2			
CO5	2				2	3	3			

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

IX. Suggested Learning Materials / Books

Sr.No	Author	Title	Publisher
1	Communication Skills	Sanjay Kumar, PushpaLata- Oxford University Press	Oxford University Press
2	Kumar, E. Suresh, Sreehari, P Savitri	Effective English with CD	Pearson Education
3	Gnanamurli	English Grammar at a Glance	S. Chand
4	CBSE	English Communicative (class X)	Golden
5	Dr. Anjana Tiwari	Communication Skills in English	Khanna Publishers, New Delhi

X. Learning Websites & Portals

Sr.No	Link / Portal	Description
1	https://www.britishcouncil.in/english/learn-online	Website link is given to refer Unit 1
2	Vocabulary.com	Refer this website for interactive vocabulary quizzes, word lists
3	International Phonetic Association (IPA) Website	It offers audio examples and charts to help understand and transcribe sounds
4	grammarly.com/blog	For constructing effective paragraphs and improving clarity
5	www.newagegolden.com	Refer this website for speech writing, diary entry and paragraph writing
6	https://infyspringboard.onwingspan.com/	Refer this website for Course Business Communication Excellenceto complete Basic level and Level1

XI. Academic Consultation Committee/Industry Consultation Committee:

Sr. No	Name	Designation	Institute/Organization
1	Mrs. Sharmishta S. Kulkarni	Lecturer in English	Government Polytechnic Pune
2	Mr. B.M.Pande	Lecturer in English	Shri.BhagubaiMaftlalPolytechnic,Mumbai.

3	Mrs. K. S. Pawar	Lecturer in English	Government Polytechnic Mumbai
4	Ms. N. N. Dhake	Lecturer in English	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													
Teaching Scheme and Credits						Examination Scheme							
CL	TL	LL	SLH	NLH	Credits	FA-TH		SA-TH (2Hrs.30 Min)	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	<p>TLO 1.1 Explain the Indian chemistry</p> <p>TLO 1.2 Explain the properties of given material based on the bond formation.</p> <p>TLO 1.3 Describe the molecular structure of given solid, liquid and gases.</p> <p>TLO 1.4 Describe the crystal structure of the given solids and Explain Properties of metallic solid.</p>	<p style="text-align: center;">Unit-I Atomic Structure and Chemical bonding</p> <p>1.1 Indian Chemistry: -Philosophy of atom by Acharya Kanad.</p> <p>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</p> <p>1.3 Electronic theory of valency: Assumptions, Chemical bonds: Types and characteristics of electrovalent bond, covalent bond, coordinate bond, hydrogen bond, and metallic bond.</p> <p>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.</p> <p>Course Outcome: CO1 Teaching Hours: 7hrs.Marks: 10</p>
2	<p>TLO 2.1 Describe mechanism of electrolysis of CuSO₄ solution by using cu and pt rods</p> <p>TLO 2.2 Solve numerical based on Faraday's first and second law of electrolysis.</p> <p>TLO 2.3 Distinguish between primary and secondary cell.</p> <p>TLO 2.4 Describe the phenomenon of the given type of corrosion and its prevention.</p> <p>TLO 2.5 Identify the different factors</p>	<p>Unit –II Electro chemistry and Metal Corrosion and its prevention</p> <p>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</p> <p>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</p> <p>2.3 Difference between primary and secondary cell.</p>

	<p>affecting rate of corrosion for the given type of material and Select the protective measures to prevent the corrosion in the given corrosive medium.</p>	<p>2.4 Corrosion: Definition and Types of corrosion Dry corrosion: Mechanism, Types of oxide film, Wet corrosion : Mechanism hydrogen evolution in acidic medium, oxygen absorption in neutral or alkaline medium, Galvanic cell action by Daniel cell.</p> <p>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</p> <p>Course Outcome: CO2 Teaching Hours :9 hrs. Marks: 12</p>
3	<p>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.</p>	<p>Unit-III: Water</p> <p>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.</p> <p>Course Outcome: CO3 Teaching Hours :9 hrs. Marks: 12</p>
4	<p>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.</p>	<p>Unit-IV: Metals, alloys and Cement,</p> <p>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.</p> <p>Course Outcome: CO4 Teaching Hours :12 hrs. Marks: 16</p>

5	<p>TLO 5.1 Describe salient properties of the given type of fuel.</p> <p>TLO 5.2 Explain the given type of analysis of the given type of coal.</p> <p>TLO 5.3 Calculate the calorific value of the given solid fuel using Bomb calorimeter.</p> <p>TLO 5.4 Describe composition, properties of given gaseous fuel with their applications.</p> <p>TLO 5.5 Calculate the mass and volume of air required for complete combustion of the given fuel.</p>	<p>Unit-V: Fuel</p> <p>5.1 Fuel: Calorific value and Ignition temperature, classification.</p> <p>5.2 Solid fuels: Coal, Classification and composition, proximate analysis, Ultimate analysis,</p> <p>5.3 Bomb calorimeter. Carbonization of coke by Otto Hofmann's oven.</p> <p>5.4 Liquid fuels: Fractional distillation of crude petroleum, boiling range, composition, properties. Knocking, cracking, octane number and cetane number.</p> <p>5.5 Gaseous fuels: Biogas, LPG, and CNG. Combustion equation of gaseous fuels, mass and volume of air required for Complete combustion</p> <p>Course Outcome: CO5 Teaching Hours :8 hrs. Marks: 10</p>
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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 ⁺⁺ , NH ₄ ⁺)	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 corrosion.	2	CO2
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

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

Assignment

1. Describe modern atomic structure.
2. Name four quantum numbers and their functions.
3. Write any four postulates of Bohr's 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. Name 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 bonding
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 Science & Humanities

Head of Department
Department of Science & Humanities

I/C, Curriculum Development Cell

Principal

Programme : Diploma in Mechanical Engineering													
Course Code: ME23101						Course Title: Engineering Drawing-I							
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
						T1	T2			PR	OR		
4	-	4	2	10	5	-	-	-	50	50#	-	50	150

Total IKS hrs. for course: 2

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

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 prepare and 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 and engineering curves using drawing instruments.
CO2	Apply the principles of first angle method of projections to draw views of line and plane.
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 drawing instruments. 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-46 Code) 1.2 Simple Geometrical Constructions, Redrawing figures using geometrical constructions Course Outcome-CO1 Teaching Hours – 08 Marks –06
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 Involute of circle and pentagon, 2.4 Methods to draw Cycloid, 2.5 Loci of Points of Single Slider Crank Mechanism Course Outcome-CO1 Teaching Hours – 10 Marks –06
3	3.1 Draw top, front and side views of a line from given data. 3.2 Draw top, front and side views of a plane form given data.	Projection of lines and planes 3.1 Concepts of Reference Planes and Projections, Views – Top, Front, Side Views 3.2 Projections of Line inclined to one reference plane (H. P/V. P) and limited to both ends in one quadrant only. 3.3 Projections of simple planes of circular, rectangular, pentagonal and hexagonal shape, inclined to one reference plane and perpendicular to another plane. (First Angle Projection Method Only) Course Outcome- CO2 Teaching Hours – 10 Marks –10

Unit No.	Theory Learning Outcomes (TLO's) aligned to CO's.	Topics / Sub-topics
4	4.1 Draw top, front and side views of given pictorial view. 4.2 Draw the top, front and side sectional orthographic views from given pictorial view.	Orthographic Projections 4.1 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. 4.2 Sectional Orthographic Views and conversion of pictorial view into sectional Orthographic views (Objects involving plain surfaces, slant surfaces, slots, ribs, cylindrical surfaces, threads etc.) (First Angle Projection Method Only) Course Outcome- CO3 Teaching Hours – 16 Marks –12
5	5.1 Draw isometric scale. 5.2 Draw isometric views from given orthographic view using natural and isometric scale.	Isometric projections 5.1 Isometric scale, Natural scale. 5.2 Conversion 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 –12
6	6.1 Draw proportionate free-hand sketches of given elements.	Free hand sketches 6.1 Drawing 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 –04

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	08	CO1
2	2.1 Draw Engineering curves using given data.	Engineering curves and loci points (minimum 4 problems)	08	CO1
3	3.1 Apply the method of projection to draw views of	Projections of Lines and Planes Three cases on lines and three cases on planes	08	CO2

Sr No	Laboratory Learning Outcome (LLO) aligned to CO's.	Laboratory Experiment / Practical Titles / Tutorial Titles	Number of hrs.	Relevant COs
	lines from given data. 3.2 Apply the method of projection to draw views of planes from given data.			
4	4.1 Apply method of projection for drawing orthographic views.	Orthographic projections Using first angle method of projections (minimum 2 problems)	12	CO3
5	5.1 Apply method of projection for drawing sectional orthographic views.	Sectional Orthographic projections Using first angle method of projection (minimum 2 problems)	08	CO3
6	6.1 Draw isometric projections using natural and isometric scale.	Isometric Projections Using isometric scale (1 objects) and natural scale (1 object)	08	CO4
7	7.1 Draw 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
8	8.1 Collect information of an ancient Indian culture related to engineering graphics	Correlate ancient Indian sculptures, Indian temples, Monuments, etc. with Engineering Graphics.	02	CO1

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, 30°, 45°, 60°, 75° using set square and drafter, and geometric constructions
2. Draw different types of lines & redraw two figures
3. Solve two problems each on projections of lines and planes
4. Two problems on orthographic projections (out of which one problem on sectional orthographic)
5. Two problems on isometric projections
6. Free hand sketches
7. 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	-	-	06	06
2	Engineering Curves and Loci of Points	-	-	06	06
3	Projection of lines and planes	-	-	10	10
4	Orthographic Projections	-	-	12	12
5	Isometric projections	-	-	12	12
6	Free Hand Sketches	-	-	04	04
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)

♦
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 Drawing 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:

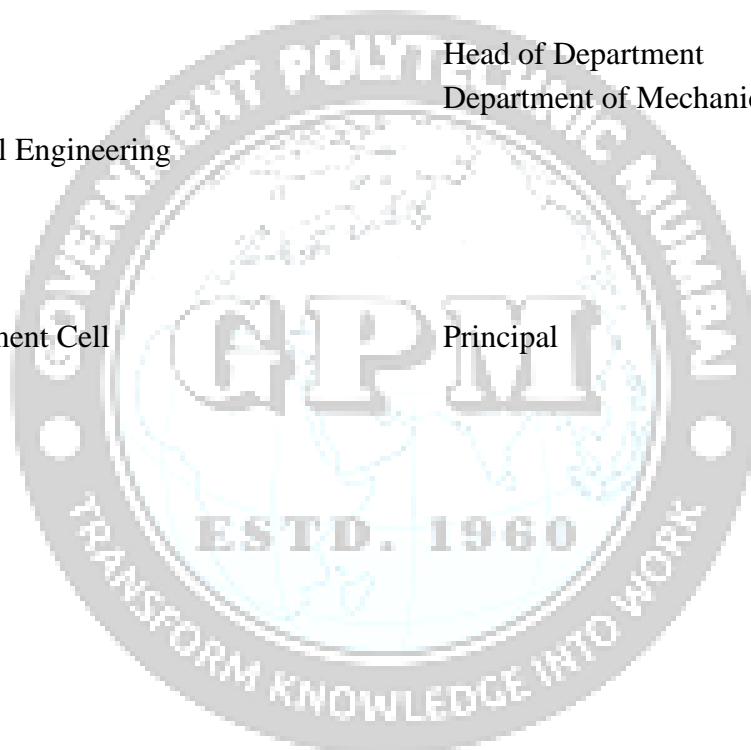
Sr. No	Name	Designation	Institute/Organization
1	Mr. K.B. Salunke	Lecturer in Mechanical Engineering	Government Polytechnic, Thane
2	Dr. V.P. Rathod	Lecturer in Mechanical Engineering	Government Polytechnic, Thane
3	Mr. U.A. Agnihotri	Lecturer in Mechanical Engineering	Government Polytechnic, Mumbai
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 Mechanical Engineering (Sandwich Pattern)													
Course Code: WS23601					Course Title : Workshop Practices (ME)								
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
						T1	T2			PR (2Hrs)	OR		
--	--	04	--	04	02	--	--	--	50	50@	--	--	100

Total IKS Hrs. for course: 02

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

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

II. Industry / Employer Expected Outcome

Use different engineering tools for performing shop floor activities.

III. Course Outcomes: At the end of the course students will be able to

CO1	Use firefighting tools and equipments.
CO2	Prepare job using different tools in fitting shop.
CO3	Prepare various welding joints and plumbing joints.
CO4	Produce a utility product/job using carpentry tools and sheet metal tools.
CO5	Produce simple job using black smithy tools.

Course Content Details:

Unit No.	Theory Learning Outcomes(TLO's)	Topics / Sub-topics
1	1.1 Locate various machines and equipment in workshop 1.2 Follow safety practices 1.3 Explain the different types of fire extinguisher and their uses 1.4 Use fire fighting equipment	Unit - I General Workshop Practice 1.1 Importance of various sections/shop of workshop, Types of jobs done in each shop, Workshop layout. 1.2 Causes of accidents, general safety rules, Safety signs and symbols. 1.3 First Aid. 1.4 Fire, Causes of Fire, Classification of fire, Basic ways of extinguishing the fire, Fire fighting equipments, fire extinguishers and their types. Course Outcome : CO1 Practical Hours :08
2	2.1 Identify fitting tools 2.2 Explain operation of fitting shop machines 2.3 Use fitting tools 2.4 Operate machineries. 2.5 Perform fitting operations , Maintain tools, equipment and machineries.	Unit - II Fitting 2.1 Fitting hand tools bench vice, hammers, chisels, files, hacksaw, surface plate, punch, v block, angle plate, try square, marking block , steel rule, twist drills,reamers, tap set, die set and their Specifications 2.2 Basic operations in fitting shop: chipping, filing, scraping, grinding, marking, sawing, drilling, tapping, reaming etc. 2.3 Fitting shops machineries: Drilling machine, Power saw, grinder their specifications. 2.4 Safety practices to be followed in fitting shop 2.5 Preparation of male, female joint. Course Outcome : CO2 Practical Hours :08
3	3.1 Identify plumbing tools. 3.2 Identify pipe fittings 3.3 Explain operation of fitting shop machines. 3.3 Use plumbing tools 3.4 Perform plumbing operations 3.5 Maintain tools, equipment and machineries.	Unit - III Plumbing 3.1 Plumbing hand tools pipe vice, pipe bending equipment, pipe wrenches, dies and their Specifications 3.2 Pipe fittings- bends, elbows, tees, cross, coupler, socket, reducer, cap, plug, nipple and their Specifications. 3.3 Basic process in plumbing shop: marking, cutting, bending, threading, assembling,

		<p>Dismantling etc</p> <p>3.4 Safety practices to be followed in plumbing shop</p> <p>3.5 Preparation of pipe fitting jobs</p> <p>Course Outcome : CO3 Practical Hours :08</p>
4	<p>4.1 Identify metal joining tools.</p> <p>4.2 Explain gas and arcwelding procedure</p> <p>4.3 Use metal joining tools.</p> <p>4.4 Perform welding operations.</p> <p>4.5 Maintain tools, equipment and machineries.</p>	<p>Unit - IV Metal Joining</p> <p>4.1 Arc welding hand tools- electrode holder, cable connector, cable lugs, chipping hammer, earthing clamp, wire brush and their Specifications.</p> <p>4.2 Gas welding hand tools- welding torch, welding tip, pressure regulator, oxygen and acetylene cylinders, spark lighter and their Specifications</p> <p>4.3 Machineries in welding shops- arc welding transformer & their specifications,</p> <p>4.4 Welding Electrode, filler rod, fluxes, and solders.</p> <p>4.5 Basic process in Welding shop: welding, brazing and soldering.</p> <p>4.6 Safety practices to be followed in welding shop</p> <p>4.7 Preparation of metal joints.</p> <p>Course Outcome : CO3 Practical Hours :08</p>
5	<p>5.1 Identify different types of woods.</p> <p>5.2 Select wood working tools as per job/ requirement.</p> <p>5.2 Explain operation of wood working machines</p> <p>5.3 Use furniture making tools</p> <p>5.4 Operate machineries.</p> <p>5.5 Perform wood working operations</p> <p>5.6 Maintain tools, equipment and machineries.</p>	<p>Unit - V Carpentry</p> <p>5.1 Types of artificial woods such as plywood, blockboard, hardboard, laminated boards, Veneer, fiber Boards and their applications.</p> <p>5.2 Wood working hand tools carpentry vice, marking and measuring tools, saws, claw hammer, mallet, chisels, plans, squares, and their specifications</p> <p>5.3 Wood working machineries – Wood turning lathe, circular saw, their specifications.</p> <p>5.4 Basic process in carpentry shop marking, sawing, planning, chiseling, turning, grooving, boring.</p> <p>5.5 Safety practices to be followed in carpentry shop</p> <p>5.6 Preparation of wooden joints.</p> <p>Course Outcome : CO4 Practical Hours :10</p>

<p>6</p>	<p>6.1 Identify sheet metal tools.</p> <p>6.2 Explain operation of sheet metal machineries.</p> <p>6.3 Use sheet metal tools</p> <p>6.4 Operate sheet metal machineries.</p> <p>6.5 Perform bending operations Maintain tools, equipment and machineries.</p>	<p>Unit - VI Sheet Metal</p> <p>6.1 Sheet metal hand tools: snip, shears sheet gauge, straight edge, L square, scribe, divider, trammel, punches, pliers, stakes, groovers, limit set and their Specifications</p> <p>6.2 Machineries in sheet metal shops - sheet cutting and bending machine their specifications.</p> <p>6.3 Basic process- marking, bending, folding, edging, seaming, staking, riveting.</p> <p>6.4 Safety practices to be followed in carpentry shop</p> <p>6.5 Preparation of sheet metal joints.</p> <p>Course Outcome : CO4 Practical Hours :08</p>
<p>7</p>	<p>7.1 Identify black smithy tools.</p> <p>7.2 Explain operation of sheet metal machineries.</p> <p>7.3 Use sheet metal tools</p> <p>7.4 Operate sheet metal machineries.</p> <p>7.5 Perform bending operations, maintain tools, equipment and machineries.</p>	<p>Unit -VII Black Smithy</p> <p>7.1 Black smithy tools anvil, hammers, Swage block, tongs, chisels, flatters etc.</p> <p>7.2 Basic processes in smithy shop: bending, setting down, bulging, Upsetting etc.</p> <p>7.3 Machineries in black smithy shop Power hammer, furnace and their specifications.</p> <p>7.4 Safety practices to be followed in black smithy shop.</p> <p>7.5 Preparation of smithy & forging job</p> <p>Course Outcome : CO5 Practical Hours :08</p>

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

Laboratory Learning Outcome (LLO)	Sr No	Laboratory Experiment / Practical Titles / Tutorial Titles	No. of hrs.	Relevant COs
1.1 Use fire extinguisher 1.2 Operate fire extinguisher	1	Identification of fire extinguishers and demonstration of extinguishing fire in a group of students	08	CO1
2.1 Select proper fitting tools 2.2 Prepare fitting job using different tools.	2	Prepare male-female type fitting job as per the drawing involving operations like marking, punching, filing, sawing, drilling and taping.	08	CO2
3.1 Select proper plumbing tools 3.2 Use plumbing operations for preparing plumbing joints.	3	Prepare T joint or Elbow joint pipe fitting job as per the drawing.	08	CO3
4.1 Obey safety rules employed in welding shop. 4.2 Prepare various welded joints using welding processes.	4	Prepare lap joint/butt joint as per the drawing using arc/gas welding.	08	CO3
5.1 Select proper carpentry tools 5.2 Prepare utility jobs/joints using different manufacturing processes.	5	Prepare utility job (like stool, benches, tables, dais or similar jobs) / carpentry joint using artificial wood/natural wood. Utility job may be preparation of new job or repairing of existing products.	10	CO4
6.1 Select proper sheet metal tools 6.2 Prepare sheet metal component using different operations.	6	Prepare utility job (like box, tray, dust bin, dust pan or similar jobs) including operations like marking, cutting, bending, edging etc.	08	CO4
7.1 Select proper black smithy tools 7.2 Prepare jobs using different black smith processes	7	Prepare a given job such as pegs (square to round) hook, hammer tongue, agro equipment's etc. involving operations like bending, setting down, bulging, upsetting etc.	08	CO5
8.1 Collect information about ancient tools for understanding Indian Knowledge.	8.	Draw sketches of various ancient tools	02	
		Total	60	

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

VI. Specification Table: NOT APPLICABLE**VII. Assessment Methodologies/Tools****Formative assessment (Assessment for Learning)**

Rubrics for continuous assessment based on process and product related performance indicators (10 marks)

Rubric Criterion	Max Marks	Not Satisfactory (1)*	Satisfactory (2)*	Good (3)*	Excellent (4)*
Ability to utilize the appropriate tools safely to perform various operations	04	Not able to select & utilize technically correct tools, safely to perform the operations	Able to select & utilize the tools safely to perform the operations but lacks preciseness in answer	Able to select & utilize the tools safely to perform the operations with understanding with preciseness in answer but less application orientation	Able to select & utilize the tools safely to perform the operations with technical understanding & substantiating with applications & conclusions of experiments performed.
Quality and completion of job in prescribed time,	04	Not able to complete the job in stipulated time with desired quality, do not follow basic maintenance practices	Able to complete the job in stipulated time with desired quality but lacks in preciseness. Lacks in following basic maintenance practices	Able to complete the job in stipulated time with desired quality with but less application orientation. Follows improper basic maintenance practices	Able to complete the job in stipulated time with desired quality & substantiating with applications. Follows correct basic maintenance practices
Attendance	02				

Summative Assessment (Assessment of term end examination)

End term Practical examination, (50 marks , 2 Hours duration)

Criterion No	Rubric Criterion	Max Marks (10)*	Not Satisfactory (1-4)*	Satisfactory (5-6)*	Good (7-8)*	Excellent (9-10)*
1	Ability to Select appropriate tools, work holding devices, & machineries.	10	Not able to select the tools and work holding devices technically correct	Able to select the tools and work holding devices with gross understanding but lacks preciseness in answer	Able to select the tools and work holding devices with understanding with preciseness in answer but less application orientation	Able to select the tools and work holding devices with technical understanding & substantiating with applications & conclusions of experiments performed. Effective communication/presentation
2	Ability of process planning i.e. sequences of operations to be performed on job.	10	Not able to plan the process technically correct	Able to plan the process with gross understanding but lacks preciseness in answer	Able to plan the process with understanding with preciseness in answer but less application orientation	Able to plan the process with technical understanding & substantiating with applications & conclusions of experiments performed.
3	Use the tools, equipments safely to perform various operations on the job	10	Not able to utilize technically correct tools, safely to perform the operations	Able to utilize the tools safely to perform the operations but lacks preciseness in answer	Able to utilize the tools safely to perform the operations with understanding with preciseness in answer but less application orientation	Able to utilize the tools safely to perform the operations with technical understanding & substantiating with applications & conclusions of experiments performed.
4	Quality and completion of job in prescribed time as per the drawing /specification	10	Not able to complete the job in stipulated time with desired quality	Able to complete the job in stipulated time with desired quality but lacks in preciseness	Able to complete the job in stipulated time with desired quality with but less application orientation	Able to complete the job in stipulated time with desired quality & substantiating with applications
5	Follow basic maintenance practices of related tools, equipment's, and machineries.	10	Not able to Follow basic maintenance practices of related tools, equipment's, and machineries	Able to Follow basic maintenance practices of related tools, equipment's, and machineries but lacks in preciseness	Able to Follow basic maintenance practices of related tools, equipment's, and machineries but less application orientation	Able to Follow basic maintenance practices of related tools, equipment's, and machineries properly.

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

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

VIII. Suggested Learning Materials / Books

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

IX. Learning Websites & Portals

Sr.No	Link / Portal	Description
1	http://www.asnu.com.au	Basic engineering tools.
2	http://www.abmtools.com/downloads/Woodworking%20Carpentry%20Tools.pdf	Wood working
3	http://www.weldingtechnology.org	Welding techniques
4	http://www.newagepublishers.com/samplechapter/001469.pdf	Basic engineering tools.
5	http://www.youtube.com/watch?v=TeBX6cKKHWY	Welding techniques
6	http://www.youtube.com/watch?v=QHF0sNHnttw&feature=related	Welding techniques
7	http://www.youtube.com/watch?v=Kv1zo9CAxt4&feature=relmfu	Wood working
8	http://www.piehtoolco.com	Basic engineering tools.
9	http://sourcing.indiamart.com/engineering/articles/materials-used-hand-tools/	Basic engineering tools.
10	https://www.youtube.com/watch?v=9_cnkaAbtCM	Basic engineering tools.

X. Academic Consultation Committee/Industry Consultation Committee:

Sr. No	Name	Designation	Institute/Organization
1.	Dr. V. U. Rathod	LME, I/C Workshop Supdt.	Government Polytechnic, Mumbai
2.	Mr. U.A. Agnihotri	LME	Government Polytechnic, Mumbai
3.	Shri. A. S. Sangwkar	LME, I/C Workshop Supdt.	Government Polytechnic, Thane
4.	Dr. W. S. Rathod	Asso. Professor, Mech. Engg. Dept., I/C Workshop Supdt.	VJTI, Mumbai

Head,
Department of Mechanical Engineering

Workshop Supdt.
Government Polytechnic, Mumbai

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 10 th standard <ul style="list-style-type: none"> ● 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, <ul style="list-style-type: none"> 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 <ul style="list-style-type: none"> 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	<p>Essay writing</p> <ul style="list-style-type: none"> ● My dreams as an Engineer ● India a Super power in my views ● Society & I ● Indian culture and values ● My role models in life <p>IKS hours- Religious and cultural history of India- Indus civilization</p>	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	<p>Play Music instruments/ Singing/ Drawing/Any stage performance/ photography/any creative art</p> <p>IKS hours - History of Indian classical music.</p>	Derive the joy	Present to peers	Pursue your creative interest	Identify and categorize students. Create groups accordingly	logistical support
07	CO2 CO4 CO5	<p>Visit a nature park, identify the flora & fauna, ecological factors & their role in our life. (e.g Maharashtra nature park society , Dharavi , Mumbai)</p>	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://maharashtra naturepark.org/
08	CO2 CO4	<p>Tree plantation and caring for it.</p>	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

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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 distractors.	Identify distractors 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/clean-shores



12	CO4 CO5	<p>a) To prepare a first aid box to be kept at home</p> <p>b) Preparation of a report on industrial accident</p>	Care for others, accountability	Collection of information from various available sources and use it for intended purpose.	<p>a) Prepare a list of contents for a first aid box to be kept at home</p> <p>b) Prepare a first aid box as per prepared list</p> <p>c) Prepare a list of various accidental hazards at home.</p> <p>d) Prepare a display of safety precautions for use of gas stove.</p> <p>e) Collect information of one industrial accident, its effects, probable causes from various resources and prepare a report.</p>	To explain and monitor the task	Medicine, Box, paper
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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	-	-
CO2	-	1	1	-	1	1	2	-	-
CO3		1	-	-	1	1	2	-	-
CO4	-	-	-	-	1	-	2	-	-
CO5	-	-	-	-	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 Most Important 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

Government Polytechnic Mumbai

Institute Coordinator,
Curriculum Development,

Principal
Government Polytechnic, Mumbai

