Government Polytechnic, Mumbai

(Academically Autonomous Institute, Government of Maharashtra)

Name of the Programme : Diploma In Rubber Technology (Sandwich Pattern)

Learning and Assessment Scheme (P23)		**With Effect from Academic Year: 2023-24**	
Duration Of Programme: 6 Semester		**Duration: 16 WEEKS**	
Semester: Second		**Scheme: (P23)**	

Sr. No	Course Title	Course Type	Course Code	Total IKS Hrs for Sem.	Learning Scheme					Credits	Paper Duration (hrs.)	Assessment Scheme													
					Actual Contact Hrs./Week			Self-Learning (Term Work + Assignment)	Notional Learning Hrs/Week			Theory					Based on LL & TL Practical					Basedon Self Learning		Total Marks
												FA-TH		SA-TH	Total		FA-PR		SA-PR			SLA		
					CL	TL	LL					T1	T2	Max	Max	Min	Max	Min	Max		Min	Max	Min	
																			PR	OR				
1	**Communication Skill**	**SEC**	**HU23501**	**0**	**3**	**-**	**2**	**1**	**6**	**3**	**2.5**	**20**	**20**	**60**	**100**	40	**25**	10	-	-	-	**25**	10	**150**
2	**Engg. Mathematics**	**AEC**	**SC23502**		**3**	**2**	**-**	**1**	**6**	**3**	**2.5**	**20**	**20**	**60**	**100**	40	**25**	10	-	-	-	**25**	10	**150**
3	**Basic of Mechanical Engineering**	**DSC**	**RT23206**	**2**	**2**	**-**	**2**	**2**	**6**	**3**	-	-	-	-	-	-	**50**	20		**25**	10	**25**	10	**100**
4	**Engineering Physics**	**DSC**	**SC23102**	**0**	**3**	**-**	**2**	**1**	**6**	**3**	**2.5**	**20**	**20**	**60**	**100**	40	**25**	10	**25**		10	**25**	10	**175**
5	**Machine Drawing and CAD**	**DSC**	**RT23207**	**2**	**2**	**-**	**4**	**2**	**8**	**4**	-	-	-	-	-	-	**50**	20	**50**	-	20	**25**	10	**125**
6	**Polymer Science**	**DSC**	**RT23201**	**3**	**4**	-			**4**	**2**	**2.5**	**20**	**20**	**60**	**100**	40	-	-	-	-	-	-	-	**100**
7	**Workshop Practice**	**DSC**	**WS23602**				**4**	-	**4**	**2**	-	-	-	-	-	-	**50**	20	**50#**	-	20	-	-	**100**
TOTAL				**7**	**17**	**2**	**14**	**7**	**40**	**20**		**80**	**80**	**240**	**400**	200	**225**	90	**125**	**25**	60	**125**	50	**900**

Abbreviations: CL- Classroom Learning, TL- Tutorial Learning, LL-Laboratory Learning, FA - Formative Assessments -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 average of two class tests of 30 marks each conducted during the semester.

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

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

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

5. 1 credit is equivalent to 30 Notional hrs.

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

Course Category : Discipline Specific Course Core (DSC) : 2, Discipline Specific Elective (DSE) : 0, Value Education Course (VEC) : 1, Intern./Apprentice./Project./Community (INP) : 0, Ability Enhancement Course (AEC) : 2, Skill Enhancement Course (SEC) : 2, Generic Elective (GE) : 0

Coordinator, Curriculum Development,
Department of Rubber Technology

Head of Department,
Department of RubberTechnology

In-Charge
Curriculum Development, Cell

Principal

Programme : Diploma in _ CE/ME/EE/EC/IS/CO/IF/AIML/LG/LT/RT													
Course Code:HU23501					**Course Title: Communication Skills (CMS)**								
Compulsory / Optional: Compulsory													
Learning Scheme and Credits						**Assessment 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 1 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 Nonverbal 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	TLO 1.1 Define communication. TLO 1.2 Describe the process of Communication. TLO 1.3 Differentiate between types of communication. TLO 1.4 Identify the type of Barriers and suggest Remedies. TLO 1.5 Describe and apply 7 C's of effective Communication. TLO 1.6 Describe the non-verbal communication.	Unit I Communication Theory and Practice **1.1** Introduction, meaning and definition and importance of communication. **1.2** Elements/process of communication. **1.3** Types of communication: formal , informal, verbal (oral and written), non-verbal (visual and auditory), vertical, horizontal and Diagonal communication. **1.4** Barriers in Communication and ways to overcome **a)** Mechanical Barrier **b)** Physical Barrier **c)** Psychological Barrier **d)** Linguistic Barrier **1.5** 7 C's of effective communication (Considerate, concrete, concise, clear, complete, correct, courteous) **1.6** Introduction to Non-verbal communication (Aspects of Body Language & Graphic Communication) Course Outcome : CO1 Teaching Hours :10hrs Marks: 18

2	TLO 2.1 Formulate paragraphs with synchronized sentence structure on the given situation / topic TLO 2.2 Develop dialogues to practice language skill in a structured and meaningful way.	UNIT II Paragraph and Dialogue Writing **2.1** Types of paragraphs: Technical ,Descriptive , Narrative **2.2** Dialogue Writing: i. Greetings ii.Development iii. Closing Sentence. Course Outcome : CO2 Teaching Hours :06hrs Marks: 08
3	TLO 3.1 Express thoughts freely during group discussion. TLO 3.2 Participate in interview confidently . TLO 3.3 Prepare Group Discussion to practice language skills and leadership qualities in a structured and meaningful way. TLO 3.4 Understand Non Verbal Communication in interview.	UNIT III Group Discussion And Interview Skills **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 Course Outcome : CO3 Teaching Hours :10hrs Marks: 10
4	TLO 4.1 Prepare power point presentation TLO 4.2 Use appropriate body language for effective communication	Unit - IV Presentation Skills **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. Course Outcome : CO4 Teaching Hours :09hrs Marks: 08
5	TLO 5.1 Draft business letters in the given situation. TLO 5.2 Respond to given job advertisement by writing application letter with resume. TLO 5.3 Draft office correspondence in given format. TLO 5.4 Prepare reports of the given types of events.	UNIT V PROFESSIONAL WRITING **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 Course Outcome : CO5 Teaching Hours :10hrs Marks: 16

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 tough ts 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 Leasing 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. **Power point 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)

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VIII. Suggested COs - POs Matrix Form

Course Outcomes (COs)	Programme Outcomes (POs) RUBBER TECHNOLOGY								
	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	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**

I. 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 Excellence to complete Basic level and Level1

I. 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. Bhagubai Mafatlal Polytechnic, 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

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

Total IKS Hrs. for course: 01 Hrs

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

I. Rationale

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

II. Industry / Employer Expected Outcome

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

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

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

Course Content Details:

Unit No.	Theory Learning Outcomes (TLO's)aligned to CO's.	Topics / Sub-topics
1	TLO 1.1 Solve the given simple problem(s)based on rules of integration. TLO 1.2 Evaluate the given simple integral(s) using substitution method. TLO 1.3 Integrate given simple functions using the integration by parts. TLO 1.4 Solve the given simple integral by partial fractions.	**Unit-I Indefinite Integration** 1.1 Simple Integration: Rules of integration and integration of 1.2 standard functions 1.3 Integration by substitution. 1.4 Integration by parts. 1.5 Integration by partial fractions
	Course Outcome : CO1	**Teaching Hours : 9** **Marks: 10**
2	TLO 2.1 Solve given examples based on definite Integration. TLO 2.2 Use properties of definite integration to solve given problems. TLO2.3Utilize the concept of definite integration to find the following (a)Area under the curve (b)Area between given two curves (c) Volume of revolution (d) Mean value (e) Root mean square value	**Unit- II Definite Integration and Applications** 2.1 Definite Integration: Definition, rules of definite integration with simple examples 2.2 Properties of definite integral (without proof) and simple examples. 2.3 Applications of integration: area under the curve, area between given two curves, volume of revolution, mean value and root mean square value.
	Course Outcome : CO2	**Teaching Hours : 10** **Marks: 14**
3	TLO3.1 Find the order and degree of given Differential equations. TLO3.2 Form simple differential equation for given elementary engineering problems. TLO3.3 Solve given differential equations using the methods of Variable separable and Exact Differential Equation (Introduce the concept of partial differential equation). TLO3.4 Solve given Linear Differential Equation. TLO3.5 Solve given programme specific problems using the category of differential equation.	Unit-**III** Differential Equation 3.1 Concept of Differential Equation. 3.2 Order, degree and formation of Differential equations 3.3 Methods of solving differential equations:Variable separable form, Homogeneous D.E., Exact Differential Equation, Linear Differential Equation 3.4 Application of differential equations and related engineering problem(s).
	Course Outcome : CO3	**Teaching Hours : 10** **Marks: 14**

4	TLO 4.1 Find roots of algebraic equations by using appropriate methods. TLO 4.2 Solve the system of equations in three unknowns by using given methods. TLO 4.3 Apply the concept of numerical integration to solve given engineering problems. TLO 4.4 Solve problems using Yukti bhasa iterative methods for finding approximate square root. (IKS)	**Unit-IV: Numerical Methods and Numerical Integrations** 4.1 Solution of algebraic equations: Bisection method, Regula falsi method and Newton—Raphson method. 4.2 Solution of simultaneous equations containing three Unknowns by Gauss elimination method. 4.3 Solution of simultaneous equations containing three Unknowns by iterative methods: Gauss Seidal and Jacobi's method. 4.4 Numerical Integration: Trapezoidal rule, Simpson's 1/3rd rule, Simpson's 3/8 th rule. (Without proof) 4.5 Yukti bhasa iterative methods for finding approximate square root. (IKS)
	Course Outcome : CO4	**Teaching Hours : 8** **Marks: 12**
5	TLO 5.1 Solve given problems based on repeated trials using Binomial distribution. TLO 5.2 Solve given problems when number of trials are large and probability is very small. TLO 5.3 Utilize the concept of normal distribution to solve related engineering problems.	**Unit-**V: **Probability Distribution** 5.1 Binomial distribution. 5.2 Poisson's distribution. 5.3 Normal distribution.
	Course Outcome : CO5	**Teaching Hours : 8** **Marks: 10**

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

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

LLO9.1Solve first order first degree D.E. Using variable separable method and homogeneous method.	9	Variable separable method and homogeneous method.	2	CO3
LLO10.1Solve first order first degree D.E. Using exact differential equation and linear differential equation.	10	Exact differential equation and linear differential equation.	2	CO3
LLO11.1Solve engineering application Problems using differential equation.	11	Applications of differential equations.	2	CO3
LLO12.1Solve problems on Bisection Method and Regula falsi method.	12	Bisection Method and Regula Falsi Method	2	CO4
LLO13.1Solve problems on Newton-Raphson method and Gauss elimination method.	13	Newton-Raphson method and Gauss elimination method.	2	CO4
LLO14.1Solve problems on Jacobi's method and Gauss Seidal Method.	14	Jacobi's method and Gauss Seidal Method.	2	CO4
LLO 15.1 Solve examples on Trapezoidal rule,Simpson's1/3rd rule and Simpson's3/8 th rule.	15	Trapezoidal rule,Simpson's 1/3rd rule And Simpson's 3/8thrule.	2	CO4
LLO16.1Solve problems on Bisection method, Regula falsi method, Newton- Raphson method using spread sheet .	16	Bisection method, Regula falsi method, Newton-Raphson method problems using spreadsheet.	2	CO4
LLO17.1UseYukti bhasa iterative methods For finding approximate value of square root and cube root. (IKS)	17	Yukti bhasa iterative methods for Finding approximate value of square root and cube root. (IKS)	2	CO4
LLO18.1Solve engineering problems using Binomial distribution.	18	Binomial Distribution	2	CO5
LLO19.1Solve engineering problems using Poisson distribution.	19	Poisson Distribution	2	CO5
LLO20.1Solve engineering problems using Binomial distribution.	20	Normal Distribution	2	CO5

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

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

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

- Collect examples based on real world applications of Poisson Distribution.
- Collect examples based on real world applications of Normal Distribution.
- Collect examples based on real world applications of Differential Equations
- Collect examples based on real world applications of Gauss Seidal Method.
- Collect examples based on real world applications of Gauss Jacobi's Method

Attempt any 5-7 Assignment, out of the given list

V. Specification Table:

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

VI.Assessment Methodologies/Tools

Formative assessment (Assessment for Learning)

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

Summative Assessment (Assessment of Learning)

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

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

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

VII. Suggested Learning Materials / Books

Sr.No	Author	Title	Publisher
1	Grewal B.S.	Higher Engineering Mathematics	KhannapublicationNewDelhi,2013ISBN: 8174091955
2	Dutta. D	A text book of Engineering Mathematics	NewagepublicationNewDelhi,2006 ISBN:978-81-224-1689-3
3	Kreysizg, Ervin	Advance Engineering Mathematics	WileypublicationNewDelhi2016ISBN: 978-81-265-5423-2
4	Das H.K.	Advance Engineering Mathematics	SChandpublicationNewDelhi2008 ISBN: 9788121903455
5	S.S. Sastry	Introductory Methods of Numerical Analysis	PHIL earning Private Limited, New Delhi. ISBN-978-81-203-4592-8
6	C.S. Seshadri	Studies in the History of Indian Mathematics	Hindustan Book Agency (lndia) P19 Green Park Extension NewDelhi.ISBN978-93- 80250-06-9
7	Marvin L. Bittinger David J.E lenbogen ScottA. Surgent	Calculus and Its Applications	Addison-Wesleyl0thEditionISBN-13: 978-0-321-69433-1
8	Gareth James, Daniela Witten, Trevor Hastie Robert and Tibshirani	An Introduction to Statistical Learning with Applications in R	Springer New York Heidelberg Dordrecht LondonISBN978-1-4614-7137-0ISBN 978-1-4614-7138-7(eBook)

VIII. Learning Websites & Portals

Sr .No	Link /Portal	Description
1	https://www.wo1frama1pha.com/	Solving mathematical problems, performing calculations, and visualizing mathematical concepts.
2	http://www.sosmath.com/	Free resources and tutorials
3	http://mathworld.wolfram.com/	Extensive math encyclopedia with detailed explanations of mathematical concepts
4	https://www.mathsisfun.com/	Explanations and interactive lessons covering various math topics, from basic arithmetic to advanced
5	http://tutorial.math.1amar.edu/	Comprehensive set of notes and tutorials covering a wide range of mathematics topics, including calculus
6	https://www.purplemath.com/	Purple math is a great resource for students seeking help with algebra and other foundational math
7	https://www.brilliant.org/	Interactive learning in Mathematics
8	https://www.edx.org/	Offers a variety of courses
9	https://www.coursera.org/	Coursera offers online courses in applied mathematics from universities and institutions around the
10	https://ocw.mit.edu/index.htm	The Massachusetts Institute of Technology (MIT) offers free access to course materials for a wide range

IX.Academic Consultation Committee/Industry Consultation Committee:

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

Coordinator,
Curriculum Development,
Department of _____ Engineering

Head of Department
Department of _____ Engineering

I/C, Curriculum Development Cell

Principal

Programme : Diploma in Mechanical Engineering (Sandwich Pattern)													
Course Code: RT23206					**Course Title :** Basic of Mechanical Engineering								
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**		
02	--	02	02	06	03	-	-	-	50	-	25	25	100

Total IKS 2 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.

Rationale:

A basic of Mechanical Engineering involves the basic concepts of mechanical engineering. It offers students an insight into the methods of exploring engineering problems. It consists of introduction to thermodynamics, Heat transfer, Materials and manufacturing processes, Machine Tools and Machining Processes, Machine Drives, Simple Mechanics, and Center of Gravity, regarding the information necessary to produce an engineering component. It will develop the basic knowledge that is essential to the creation of successful technician.

Course Outcomes: Student should be able to

CO1	Describe the basic concepts of thermodynamics.
CO2	Understand modes of heat transfer.
CO3	Understand basic materials and manufacturing processes.
CO4	Understand machining processes.
CO5	Understand modes of transmission of motion.
CO6	Understand simple machines.

Course Content Details:

Unit No	Topics / Sub-topics
1	**Topic Title**: **Introduction to Thermodynamics** **1.1** Types of Systems, Thermodynamic Equilibrium, Properties, State, Process and Cycle, **1.2** Introduction to Zeroth, First and Second laws of thermodynamics, Heat and Work Interactionsfor various non-flow and flow processes; **1.3** Concept of Heat Engine, Heat Pump & Refrigerator, Efficiency/ COP; Kelvin-Planck andClausius Statements, Carnot Cycle, Carnot Efficiency, T-S and P-V Diagrams, Concept of Entropy (Definition only). **Course Outcome: CO1 Teaching Hours: 06 hrs**
2	**Topic Title: Heat transfer & Thermal Power Plant** **2.1.** Modes of Heat Transfer; Conduction: Composite Walls and Cylinders, Combined Conduction and Convection **2.2.** Thermal Power Plant Layout; Rankine Cycle; Fire Tube and Water Tube boilers, Babcock & Wilcox, Cochran Boilers; **2.3.** Boiler accessories like Feed pump, Economizer, Super heater, Air preheater **Course Outcome: CO2 Teaching Hours: 06 hrs**
3	**Topic Title: Materials and Manufacturing Processes** **3.1.** Engineering Materials, Classification, and their Properties **3.2.** Metal Casting, Moulding, Patterns 3.3 Metal Working: Hot Working and Cold Working, **3.4.** Metal Forming: Extrusion, Forging, Rolling, Drawing, Gas Welding, Arc Welding, Soldering, and Brazing. **Course Outcome: CO3 Teaching Hours : 04 hrs**
4	**Topic Title**: **Machine Tools and Machining Processes.** 4.1 Machine Tools: Lathe Machine and types, Lathe Operations 4.2 Milling Machine and types, Milling Operations 4.3 Shaper and Planer Machines: Quick-Return Motion Mechanism 4.4 Drilling Machine: Operations 4.5 Grinding Machine: Operations **Course Outcome: CO4 Teaching Hours : 06 hrs**

5	**Topic Title: Introduction to Machine Drives** 5.1 Machine elements in Transmission of Motion and Power. Shaft, coupling and bearing 5.2 Different methods of power transmission. Power transmission by belt drive, gear drive, chain 5.3 drive. (Simple Numerical on belt drive) **Course Outcome: CO5 Teaching Hours : 03 hrs)**
6	**Topic Title: Simple Mechanics and Center of Gravity** 6.1Definition, Mechanical advantage, velocity ratio, Efficiency, Law of machine, Reversible and non-reversible machine, Friction in machine 6.2 Centroid and center of gravity, Definition of centroid, Center of gravity, Centroid of regular planes, center of gravity of simple solids like cube, cylinder cone, sphere, and prism 6.3 Moments and couples, Varignon's theorem, Reaction of simply supported beam subjected to concentrated and uniformly distributed load.. **Course Outcome: CO6 Teaching Hours : 5 hrs**

List of experiments:

Sr. No.	Unit No	COs	Title of the Experiments	Hours
1	1	CO1	Assignment on fundamental concepts of thermodynamics.	02
2	2	CO2	Assignment on Laws of Thermodynamics.	04
3	2	CO2	Demonstration of working of different types of boilers.	02
4	3	CO2	Study of boiler of mountings and boiler accessories.	04
5	3	CO3	Assignment on Metal casting	02
6	3	CO3	Assignment on Metal forming processes	02
7	4	CO4	Assignment on Lathe machine and lathe operations	02
8	4	CO4	Assignment on milling machine and milling operations	02
9	4	CO4	Assignment on drilling machine and grinding machine.	02
10	5	CO5	Assignment on Transmission of Motion and Power.	02
11	6	CO6	To find Reaction of simply supported beam subjected to concentrated and uniformly distributed load.	02
12	6	CO6	To find Mechanical advantage, velocity ratio and Efficiency of machine	04
		Total		**30**

References/ Books:

Sr. No.	Title	Author, Publisher, Edition and Year Of publication	ISBN
1	Engineering Thermodynamics	PK Nag; Tata McGraw Hill,Delhi, 6th Ed, 2005	9978-9352-6064-29
2	Thermal Engineering	R.S. Khurmi,& J.K.Gupta S. Chand Technical Publication, 2006	978-8121-9257-30
3	Introduction to Manufacturing Processes	Jhon Schey, Mcgraw Hills, 2012	978-0071-1691- 10
4	Elements of Workshop Technology Vol. II (Machine Tools)	Hajra Chawdhury, Media Promotors and Publications Pvt. Ltd. 15th Ed, 2008	978-8185099156
5	A course in of Workshop Technology Volume. I	B S Raghuwanshi, Dhanpatrai & Sons, 201705	978-1020092015
6	Theory of Machines	R. S. Khurmi and J. K. Gupta, S. Chand and Co. Ltd., 14th edition, 19765	978-8121-9252-42
7	A Textbook of Engineering Mechanics	R.K. Bansal Laxmi Publications, 2005	978-8170-0830-54

E-References:

1. **www.nptel.ac.in/courses**
2. **www.learnerstv.com**
3. **www.ni.com/multisim**

CO Vs PO and CO Vs PSO Mapping

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2
CO1	2	2	2	1	2	1	3	2	1
CO2	2	3	3	1	2	2	3	3	1
CO3	3	3	3	2	2	2	3	3	1
CO4	**3**	3	3	2	2	2	3	3	1
CO5	3	3	3	2	2	2	3	3	1
CO6	3	3	3	2	2	2	3	3	1

Industry Consultation Committee:

Sr. No	Name	Designation	Institute/Organisation
1	Mr. Prashant Chavan	Lecturer in Mechanical Engineering	Government Polytechnic Nanded
2	Mr. Atul Pawar	Lecturer in Mechanical Engineering	VIVA College of Diploma Engineering & Technology, Virar
3	Mr. Amit Khatale	Team Leader	Tata Technologies Pune
4	Mr. Tushar Mestry	Deputy Manager Production	Jurchen Technology India Pvt LTD, Boiser
5	Mr. K. Z. Dhangare	Lecturer in Mechanical Engineering	Government Polytechnic Mumbai
6	Mr. E. C. Dhembare	Lecturer in Mechanical Engineering	Government Polytechnic Mumbai

Coordinator,
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Department of Mechanical Engineering

Head of Department
Department of Mechanical Engineering

I/C, Curriculum Development Cell

Principal

GOVERNMENT POLYTECHNIC MUMBAI
GPM
ESTD. 1960
TRANSFORM KNOWLEDGE INTO WORK

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

Total IKS Hrs. for course: 2hrs.

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

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

Note:

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

I. Rationale

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

II. Industry / Employer Expected Outcome

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

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

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

Course Content Details:

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

		acceleration, b) Relation between linear velocity and angular Velocity(derivation), Radial or centripetal acceleration,Three equations of motion (no derivations), Centripetal and Centrifugal force, examples and applications. 2.4. Laws of Motion and it's applications. 2.5. Numerical. **Course Outcome: CO2Teaching Hours :12hrs Marks: 14**
3	**TLO a.** Calculate elastic constants and state their significance **TLO b.** Distinguish between elasticity, surface tension and viscosity **TLO d.** Determine surface tension and viscosity of fluid **TLO e.** Deforming force, restoring force, elasticity, plasticity and rigidity, factors affecting elasticity, stress and strain with their types, elastic limit, Hooke's law **TLO h.** Classify types of flow offluid	**General Properties of Matter** **3.1 Elasticity:** 3.1.1 Deforming force, restoring force, Elastic, plasticand rigid substances, and their examples. 3.1.2 Definition of elasticity, stress, strain and its types. 3.1.3 Hooke's Law and elastic limit. 3.1.4 Stress - Strain curve, yield point, breaking point. 3.1.5 Young's Modulus, Bulk modulus and Modulus ofrigidity, Definition and relation among them. 3.1.6 Numerical. **3.2 Viscosity** 3.2.1 Concept and Definition of viscosity, velocitygradient. 3.2.2 Newton's law of viscosity, Co-efficient ofviscosity, unit of viscosity 3.2.3 Stokes' law, terminal velocity, derivation ofStokes' formula. 3.2.4 Streamline flow, turbulent flow, critical velocity,examples. 3.2.5 Reynolds' number and its significance. 3.2.6 Numerical. **3.3 Surface Tension:** 3.3.1 Concept of surface tension. 3.3.2 Adhesive and cohesive forces, examples. 3.3.3 Laplace's Molecular theory of surface tension 3.3.4 Angle of contact, its significance. **Course Outcome: CO3** **Teaching Hours: 14hrs.Marks: 16**

4.	**TLO a.** Identify various properties of sound waves. **TLO b.** Differentiate between sound and other types of waves. **TLO b.** Describe how sound wave properties affect how sound is perceived.	**Sound** 4.1 Sound Waves: 4.1.1 Wave motion, types of waves – progressive, longitudinal and transverse waves. 4.1.2 Characteristics of longitudinal and transversewaves and comparison. 4.1.3 Free or natural vibrations and forced vibrations,resonance – definition and examples. 4.1.4 Determination of velocity of sound by resonancemethod. 4.1.5 Numerical. 4.1.6 Resonance concept in prehistoric times, concept ofdifferent frequencies (Mantras) used to ignite different chakras in body (IKS). **Course Outcome: CO4Teaching Hours: 5 hrs. Marks: 8**
5	**TLO 5a.** Explain refraction and reflection of light. **TLO 5b**. Explain refraction of lit through prism. **TLO 5c.** Estimate refractive index of material of prism. **TLO 5d.** Derive Prism Formula. **TLO 5e.** Explain the phenomenon of total internalreflection. **TLO 5f.** Describe the workings and uses of fibre optics. **TLO 5g.** Describe the nanotechnology and properties of nanomaterials and its various applications.	**Optics, Optical Fiber and Nanotechnology** **5.1 Optics:** 5.1.1 Revision of reflection and refraction of light. 5.1.2 Laws of refraction, Snell's law. 5.1.3 Determination of refractive index. 5.1.4 Dispersion, Prism formula (derivation) 5.1.5 Critical angle, Total internal reflection. Examples and applications. 5.1.6 Numerical. **5.2 Optical Fiber:** 5.2.1 Principle of propagation of light through optical fiber. 5.2.2 Structure of optical fiber. 5.2.3 Applications. 5.2.4 Difference between optical fiber cable and electric cable wire. **5.3 Nanotechnology** 5.3.1 Introduction to nanotechnology. 5.3.2 Definition of Nano scale, manometer and nanoparticles, Nanotechnology. 5.3.3 Definition and examples of nanostructured materials, Physical and chemical properties of nanomaterial. 5.3.4 Applications of nanotechnology in different fields - a) electronics, b) automobile, c) medical, d) textile, e) Cosmetics, f) environmental, **Course Outcome: CO5** **Teaching Hours: 9 hrs.** **Marks: 14**

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

Sr No	Practical / Tutorial / Laboratory LearningOutcome (LLO)	Laboratory Experiment / PracticalTitles / Tutorial Titles	Numberof hrs.	RelevantCOs
1	**LLO a.** Use of measuring instruments **LLO b.** Find the least count and range of theinstruments. **LLO c.** Interpretation of graph and use ofscientific calculator.	To know your Physics laboratory and use ofscientific calculator.	2	CO1
2	**LLO a.** Use Vernier caliper to Measure dimensions of given objects.Measure the dimensions of objects ofknown dimensions. **LLO b.** Estimate the errors inmeasurement.	To measure the dimensions of givenobjects and to determine their Volume using Vernier caliper.	2	CO1
3	**LLO a.** Identify types of motion **LLO b.** Determine the value ofacceleration due to gravity.	To determine Acceleration due to gravityby simple pendulum	2	CO2
4	**LLO a.** Explain Elastic moduli. **LLO b.** Understand the relation betweenYoung's modulus, Bulk modulus and rigiditymodulus of elasticity	To determine Elastic moduli of a givenwire byusing Searle's apparatus.	2	CO3
5	**LLO a.** Study properties of liquid **LLO b.** Calculate coefficient of viscosity ofliquid	To determine coefficient of viscosity of liquidby Stokes' method	2	CO3
6	**LLO a.** Understand the theory of the surfacetension of liquids. **LLO b.** Correlate the property of surface tension with different natural phenomena. **LLO c.** Understand the concept of capillarity inliquids. **LLO d.** Relate surface tension and capillarity.Find the value of surface tension of a given liquid.	To determine the surface tension of liquidusing capillary rise method.	2	CO3
7	**LLO a.** Understand the concept of sound wavesand the various terms related to them **LLO b.** Understand transverse and longitudinalwaves. Find the velocity of sound in air.	To determine velocity of sound by resonancemethod.	2	CO4

8	**LLO a.** Explain refraction of light. **LLO b.** Determine refractive index of a givenprism	To determine refractive index by using pinmethod	2	CO5
9	**LLO a.** Use Micrometer Screw gauge to: Measure dimensions of given objects. Measure the dimensions of objects of known dimensions. **LLO b.** Estimate the errors in measurement.	To measure the dimensions of given objectsand to determine their Volume using micrometer screw gauge.	2	CO1
10	**LLO a.** Identify type of motion **LLO b.** Calculate the stiffness constant	To determine stiffness constant by using helical spring	2	CO2
11	**LLO a.** Study the properties of light TIR **LLO b.** Determine the critical angle	To study total internal reflection and to determine the critical angle.	2	CO5
12	**LLO a.** Understand the concept of sound wavesand the various terms related to them **LLO b.** Understand transverse and longitudinalwaves. Find the velocity of sound in air.	To determine velocity of sound by using sonometer	2	CO4
13	**LLO a.** Study the types of motion. **LLO b.** Use of projectile motion in sport.	To study projectile motion	2	CO2
14	**LLO a.** Apply engineering and physicsconcepts to the nano-scale and non- continuum domain. **LLO b.** To apply mathematics and science in engineering applications.	To study applications of nanotechnology inengineering field.	2	CO5
15	**LLO a.** Define unit and classify into differenttypes of units	Showing Video on different applicationsrelated to units,	2	CO1

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

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

1. Convert the units of a given physical quantity from one system of units to another
2. Measure room temperature of hot baths / bodies by using mercury thermometer and convert it into different units.
3. Prepare a chart to summarize units and measurements
4. Use a digital vernier calliper and micrometre screw gauge for measurements. (Lab- based).
5. Make a paper scale of least count e.g. 0.01 cm, 0.2cm, 0.5cm.
6. What is the difference between speed and velocity?
7. What is motion? Describe Straight line motion.
8. Explain Average speed and Average velocity.
9. Write in detail about your experience of various, types of motion while riding a bicycle on a road.
10. Identify the types of motion.

(a) Movement of the earth around the sun: ..... .
(b) Movement of a ceiling fan: .....
(c) A meteor falling from the sky: ..... .
(d) A rocket launched from the ground: .....
(e) A fish swimming in water: .....
f) The plucked string of a sitar: ...

11. Compare elastic body and plastic body (lab based).
12. Write the practical applications of Elasticity.
13. Write the practical applications of Viscosity.
14. Compare streamline and turbulent flow with examples.
15. Write T for True and F for false statements:

1. Sound is produced by a vibrating body.
2. All objects produce same type of sound.
3. Guitar is a musical instrument.
4. The number of complete waves or cycles produced by a vibrating body in one second is called frequency.
5. The pitch of a sound is independent of the frequency of vibrations.
6. Flute is a stringed instrument.
7. The loudness of sound is a measure of the sound energy reaching the ear per second.8.. Loudness of a sound depends on the area of vibrating body only.
9. Hertz is the unit to measure the intensity of loudness.
10. Noise pollution can cause permanent hearing loss.

16. What is noise pollution? Write a note on the ill effects of noise pollution.
17. Why is the sound of siren in an ambulance or a Fire tender different from the horns used by other vehicles?
18. Circle the odd one out.

1. Tabla, Drums, Mridangam, Guitar
2. Flute, Saxophone, Sitar, Shehnai
3. Vacuum, Amplitude, Frequency, Loudness
4. Veena, Drum, Sitar, Violin
5. Sound of birds, Sound of a fan, Sound of a baby, Sound of a cracker
6. Drums, Shehnai, Speaker, Guitar
7. Hertz, Decibel, Frequency, Watt
8. Temperature, Amplitude of Vibrations, Area off Vibrating body, Distance from listener

19. Match the columns.

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

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

VI. Specification Table:

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

VII. Assessment Methodologies/Tools

Formative assessment (Assessment for Learning)

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

Summative Assessment (Assessment of Learning)

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

VIII. Suggested COs - POs Matrix Form(RUBBER TECNOLOY)

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

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

IX . Suggested Learning Materials / Books

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

X. Learning Websites & Portals

Sr.No	Link / Portal	Description
1	https://sunitathorat1310.wixsite.com/website-1	Unit and Measurements. Motion, properties of matter, Sound wave, Optics and Optical fiber, Nanotecnoloy
2	www.physicsclassroom.com	Concept of basic physics
3	www.physics.org	Concept of basic physics
4	www.physics.brown.edu	Concept of basic physics
5	www.amazon.com/Basic-Physics	Concept of basic physics
6	http: //scienceworld.wolfram.com/physics/	Concept of basic physics
7	http: //en.wikipedia.org/wiki	Concept of basic physics
8	http: //hyperphysics.phy-astr.gsu.edu/hbase	Concept of basic physics
9	www.msu.edu/~brechtjo/physics	Concept of basic physics
10	www.answers.com/topic/list-of-basic-physics-topics	Concept of basic physics
11	www.answers.com/topic	Unit and Measurements. Motion, properties of matter, Sound wave, Optics and Optical fiber, Nanotecnoloy
12	www.vlab.amrita.edu	All Experiments video
13	www.olabs.edu.in	All Experiments video
14	https: //praxilabs.com/en/	All Experiments video
15	www.phet.colorado.edu	Simulation of Topics

XI. Academic Consultation Committee/Industry Consultation Committee:

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

Coordinator,
Curriculum Development,
Department of_____Engineering

Head of Department
Department of_____Engineering

I/C, Curriculum Development Cell

Principal

GPM
Estd. 1960
TRANSFORM KNOWLEDGE INTO WORK

Programme : Diploma in Rubber Technology												
Course Code: RT22307					**Course Title: Machine Drawing and Computer Aided Drafting**							
Compulsory / Optional: Compulsory												
Learning Scheme and Credits						**Assessment Scheme**						
CL	**TL**	**LL**	**SLH**	**NLH**	**Credits**	**FA-TH**	**SA-TH (3Hrs.)**	**FA-PR**	**SA**		**SLA**	**Total**
									PR	**OR**		
02	-	04	02	08	04	-	-	50	50#	-	25	125

Total IKS Hrs.2 Hrs. for course:

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

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

Note:

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

I. Rationale

A Rubber Engineer, irrespective of their field of operation in an industry, is expected to possess athorough understanding of drawing, which includes clear visualization of objects and the proficiency in reading and interpreting a wide variety of production drawings. Besides, they are also expected to possess certain degree of drafting skills depending upon job function, to performday to day activity i.e. communicating and discussing ideas with supervisors and passing on instructions to subordinates unambiguously.

In the engineering world, CAD is revolutionized modern day engineering and widely used to design and develop products to be used by consumers. CAD allows for the easier development of products and product management integration. CAD drawings offer the flexibility to draft and design in a digital sphere, which were previously done by hand. The digital format makes data handling easier, safer, and quicker. Prior hand drawn blueprints can be scanned and then can be expanded upon digitally. Many CAD programs are now using three-dimensional drawings to maximize productivity and provide quicker, better product results, allowing for the development of the tiniest details. CAD's excellent ability for comprehensive documentation and communication allows for an easier product

II. Industry / Employer Expected Outcome

Use different engineering tools for performing shop floor activities.

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

CO1	Apply appropriate limits, fits, tolerances & surface finish on drawing.
CO2	Use standard conventions of mechanical elements as per SP-46(1988).
CO3	Interpret & Draw production drawings of components/parts for a given assembly.
CO4	Visualize details of components and draw assembly of components.
CO5	Draw 2-D drawings, assembly drawings using layers, and Print/Publish the drawings.
CO6	Create Isometric, 3-D drawings of mechanical components & Print /Publish the drawings

IV. Course Content Details:

Unit No.	Theory Learning Outcomes(TLO's)	Topics / Sub-topics
1	1.1 Understand what are limitfits 1.2 Understand the use of tolerance 1.3 Use in drawing tolerance with surfacefinish	**Unit – I Limits, Fits and Tolerances** 1.1 Introduction to ISO system of tolerance, dimensional tolerances, elements of interchangeable system, hole & shaft basissystem, limits, fits & allowances. Selectionof fit. (Simple Numerical) 1.2 Geometrical tolerances, tolerances of form and position and its geometric representation. 1.3 Characteristics of surface roughness - Indication of machining symbol showingdirection of lay, roughness grades, machining allowances, manufacturing methods. **Course Outcome: CO1 Teaching Hours :04hrs.** .
2	2.1 Learn to use symbolic conventionalrepresentation 2.2 learn to use conventional representation in drawing 2.3 learn to use welding join symbolsfor representation	**Unit – II Production Drawing Basics** 2.1 Conventional Representations using SP – 46(1988) 2.1.1 Materials C.I., M.S, Brass, Bronze, Aluminum, wood, Glass, Concrete andRubber 2.1.2 Long and short break in pipe, rod andshaft. 2.1.3 Ball and Roller bearing, pipe joints, cocks, valves, internal / external threads. 2.1.4 Various sections- Half, removed, revolved, offset, partial and alignedsections. 2.1.5 Knurling, serrated shafts, splined shafts,and chain wheels. 2.1.6 Springs with square and flat ends, Gears,sprocket wheel 2.1.7 Countersunk & counter bore. 2.1.8 Tapers 2.2 Welded Joints: Representation of the following weld & preparing working drawing showing the size of weld, weld

		length, flush finish etc. Fillet 2.2.1 Square butt 2.2.2 Single and double U 2.2.3 Single and double V 2.2.4 Single and double J 2.2.5 Bevel butt 2.2.6 Edge / seam / bead 2.2.7 Spot weld 2.2.8 All round weld 2.2.9 Flush finish weld 2.1.6 **Course Outcome: CO2Teaching Hours :06 hrs**
3	**3.1**understand the commands in autocad bury 3.2 use appropriate commands Able to draw in AutoCAD software	**Unit – III Introduction to Computer AidedDrafting**: 3.1 Various Software's for Computer AidedDrafting. 3.2 CAD initial settings command. 3.3 Object Selection methods **Course Outcome: CO3 Teaching Hours :02hrs**
4	4.1 understand the commands in autocad bury 4.2 use appropriate commands 4.3 Able to draw in AutoCAD software .	**Unit - IV Basic Commands in CAD** 4.1 Zoom and formatting Commands: 4.1.1 Zoom Commands – all, previous, out, in,extent, real-time, dynamic, window, pan. 4.1.2 Formatting commands - Layers, block,line type, line weight, color. 4.2 Draw and Enquiry commands: 4.2.1 Draw Command - Line, arc, circle,rectangle, polygon, ellipse, point, spline, block, hatch etc. 4.2.2 Enquiry commands - distance, area,volume, and list command. 4.3 Edit and Modify commands: Modify Command - Erase, break, trim, copy, move, mirror, offset, fillet, chamfer, array, extend,rotate, scale, lengthen, stretch, measure, divide, explode, align, join, spline edit Commands. 4.4 Dimensioning, Text and Plot Commands: 4.4.1Dimensioning commands - Dimension styles, DimensionalTolerances and Geometrical Tolerances, ddedit. 4.4.2Text commands – Text style, d text, m text command. 4.4.3 Plotting & Publishing a drawing – creating standard template, title block, creatingtable, Billplot Commands. 4.5 Drawing the given Sketches & ProductionDrawing of machine components. **Course Outcome: CO4 Teaching Hours :06 hrs**
5		**Unit – V** **Assembly drawing** 5.1 Assembly to Details: Introduction – basic principles of dismantling process. Preparation of detailed working drawing from given assembly indicating proper type of fit & tolerance relevant to that fit and the grade of surface finish required. The drawing to be self-explanatory for Manufacturing of the components. The objects may be selected

		from the following &not containing more than 8 parts. 5.1.1 Lathe Tail Stock 5.1.2 Jigs & Fixtures 5.1.3 Piston & connecting rod assembly 5.1.4 Gland and Stuffing box Assembly 5.1.5 Valves: Steam Stop Valve & Non –Return Valve 5.1.6 Fast & loose pulley **5.2** Details to Assembly: Preparation of the assembly drawings from the given detaileddrawings of the parts of machine unit. Objects may be selected from the following & not containing more than 8 parts. 5.2.1 Couplings – Universal couplings &Oldham's Coupling 5.2.2 Bearing – Foot Step Bearing & PedestalBearing 5.2.3 Lathe tool Post, Tail stock 5.2.4 Machine vice & Pipe Vice 5.2.5 Screw Jack 5.2.6 Jigs and Fixtures 5.2.7 Valves: Steam stop valves & Non ReturnValves, **Course Outcome: CO5 Teaching Hours :10hrs**
6		**Unit - VI Isometric and 3D Drawings**: 6.1 Drawing of Isometric Views from orthographic views of objects using CAD. 6.2 Drawing of 3D (pictorial) objects from the Two/Three views of the objects using CAD **Course Outcome: CO6 Teaching Hours :02 hrs**

I. Laboratory Learning Outcome and Aligned Practical / TutorialExperiences/ List of experiments:

Sr. No	Unit No	COs	Title of the Experiments	Hrs
1	3	CO1	Assignment on Limit, Fit, Tolerances and Machining Symbols in sketch book	02
2	4	CO2	Assignment on Conventional Representation as per SP – 46 (1988)in sketch book	02
3	4	CO2	Assignment on welded joints in sketch book	02
4	4	CO3	Assignment on Redraw Figures & Isometric View in sketch book (Minimum 4 problems each)	02
5	1	CO3	Assignment on Assembly to Details in sketch book (Minimum 2 problems)	06
6	2	CO4	Assignment on Details to Assembly in sketch book (Minimum 2 problems)	06
7	2	CO3	Generation of production drawings of the machine parts and assemblyWith appropriate tolerances using layer, blocks & dimensions in CAD.	08
8	3	CO5	Draw Assembly of machine components with layer, blocks & dimensions In CAD. (Minimum 2 problems).	08

9	4	CO5	Draw Detail of assembly of machine components with layer, blocks & Dimensions in CAD. (Minimum 2 problems).	08
10	5	CO6	Draw Isometric drawing in CAD. (Minimum 08 objects)	08
11	4	CO6	Draw 3D drawings in CAD. (Minimum 06 objects),	08
			Total	**60**

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

II. Specification Table: NOT APPLICABLE

III. 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 draw appropriate Drawingby using proper instrument	04	Not able to draw appropriate Drawing correct	Able to draw appropriate Drawing but lacks preciseness in dimensions	Able to draw appropriate Drawing with understanding with preciseness in dimensions butless practices	Able to draw appropriate Drawing with understanding & substantiating with applications & conclusions of experiments performed.
Quality and completion of job in prescribed time,	04	Not able to complete the drawing in stipulated time with desired quality, do not follow basic methods	Able to complete the drawingin stipulated time with desired quality but lacks in preciseness. Lacks in following basic drawing practices	Able to complete the drawing in stipulated time with desired quality with but less application orientation. Follows improper basic drawing practices	Able to complete the drawing in stipulated time with desired quality & substantiating with applications. Follows correct basic drawing 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	Understand and Ability todraw appropriate Drawing, by using drawing Instrument.	10	Understand but Not able to draw appropriate Drawing, by using drawing Instrument. technically correct	Understand and Able to draw appropriate Drawing, by using drawing Instrument. gross understanding but lacks preciseness in answer	Understand and Able to select the tools and work holding devices withunderstanding 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 understanding and to Draw with proper line, conventions and use of it's	10	Not able to Draw with proper line, conventions and use of it's technically correct	Able to to Draw with proper line, conventions and use of it's with. gross understanding but lacks preciseness in answer	Able to Draw with proper line, conventions and use of it's 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	Understand the commonds and Use the tools, and commands in 2D autocad	10	No Understand the commonds and Use the tools, and commands in 2D autocad	Able to utilise and Understand the commonds and Use the tools, and commands in 2D autocad	Able to utilize the tools s commonds and Use the tools, and commands in 2D AutoCAD with understanding with preciseness in answer but less application orientation	Able to Draw with proper line, conventions and use of it's with technical understanding & substantiating with applications & conclusions of experiments performed.
4	Quality and completion of drawing in prescribed time as per the drawing /specification	10	Not able to complete the in stipulated time with desired quality	Able to complete the stipulated time with desired quality but lacks in preciseness	Able to complete the in stipulated time with desired quality with but less application orientation	Able to complete the in stipulated time with desired quality & substantiating with applications
5	Follow basic procedure and able to Draw assembly and details of drawing	10	Not able to Follow basic Procedure and able to Draw assembly and details of drawing	Able to Follow basic procedure able to Draw assembly and details of drawing but lacks in preciseness	Able to Follow basic maintenance practices of related tools, equipment's, and machineries butless application orientation	Able to Follow basic maintenance practices of related tools, equipment's, and machineries properly.

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	3	2	3	3	2	2	3	3	2
CO2	3	2	3	3	2	2	3	3	2
CO3	3	2	3	3	2	2	3	3	2
CO4	3	2	3	3	2	2	3	3	2
CO5	3	2	3	3	2	2	3	3	2
CO6	3	2	3	3	2	2	3	3	2
Legends: - High:03, Medium:02, Low:01, No Mapping: --									

I. Suggested Learning Materials / Books

Sr. No	Title	Author, Publisher, Editionand Year Of publication	ISBN
1	Machine Drawing	N. D. Bhatt, Charotar PublishingHouse, 50th edition, 2016	978-9385-0392-32
2	Production Drawing	L. K. Narayanan, P. Kannaich, K.Venkat Reddy, New Age International Publication, 3rd edition, 2006	978-8122-4251-85
3	Machine Drawing	N Sidheswar, P Kannaiah &V VS Sastry, Tata McGraw HillEducation Pvt. Ltd., 2010	978-0074-6033-76
4	Machine Drawing	N. D.Junnarkar, Pearson, 2006.	978-8131-7067-87
5	IS Code SP 46 (2003)	Code of practice for general engineering drawing, EngineeringDrawing Practice for School and colleges, Bureau of Indian Standards, 9 Bahadur Shah Zafar Marg, New Delhi 110002	81-7061-019-2
6	AutoCAD: A Problem-Solving Approach	Sham Tickoo, Delmar CengageLearning (31 January 1998)	978-0766-8012-95
7	Machine Drawing withAutoCAD	Gautam Purohit & Gautam Ghosh, Pearson Publication	978-1299-4461-82
8	Mastering AutoCAD and AutoCAD LT 2018	George Omura, BPB Publication	978-1119-3867-97

E-References:

1. http://www.we-r-here.com/cad/tutorials/index.htm
2. http://www.cadtutor.net/tutorials/autocad/
3. http://www.caddprimer.com/AutoCAD_training_tutorial/AutoCAD_training_lessons.htm
4. http://www.autocadmark.com/
5. http://www.autocadtutorials.net/
6. www.youtube.com
7. EKHO Institute presents Professional AutoCAD Training Videos
8. Learning AutoCAD 2012 Tutorial DVD – Publisher – Infinite Skills Inc.
   Email : directsales@infiniteskills.com

Sr. No	Name	Designation	Institute/Organisation
1	Mr. A.G. Joshi	Lecturer in Mechanical Engineering	Govt. Polytechnic, Ahmednagar
2	Mr. Mahesh Mahadik	Sr. Project Engineer	Atlas Copco India Ltd
3	Mr. Amol S. Dhawade	Lecturer in Mechanical Engineering	Indira Gandhi Polytechnic Belwandi(Sugar).Ahmadnagar
4	Mr. Vaibhav Patil	MEO Class IV, Marine Engineering Officer	Sea World Management Ltd. Monaco Italy.
5	Mr. E.C.Dhembare	Lecturer in Mechanical Engineering	Govt. Polytechnic, Mumbai
6	Mr. K.Z.Dhangare	Lecturer in Mechanical Engineering	Govt. Polytechnic, Mumbai

Coordinator,
Curriculum Development,

Department of Rubber Technology

Head of Department
Department of Rubber Technology

I/C, Curriculum Development Cell

Principal

Programme : Diploma in RT													
Course Code:RT23201					**Course Title : Polymer Science**								
Compulsory / Optional: Compulsory													
Learning Scheme and Credits						**Assessment Scheme**							
CL	**TL**	**LL**	**SLH**	**NLH**	**Credits**	**FA-TH**		**SA-TH (3 Hrs.)**	**FA - PR**	**SA**		**SLA**	**Total**
										PR	**OR**		
4	-	-	-	4	2	20	20	60	--	--	=	-	100

Total IKS Hrs. for course: 3hrs.

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.
3. FA-PR represents the term work.
4. SA-PR represents the end term practical examination.

I. Rationale

A rubber technologist must have an understanding of polymers, as rubber is a part of it, types of polymerstheir chemistry. This is a foundation course for any course in rubber, plastics, or fiber technology.

II. Industry / Employer Expected Outcome

Polymer science that plays a crucial role in various Rubber industries and has numerous outcomes thatbenefit society.

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

CO1	Understand what are polymer & Their Types.
CO2	Understand about different structure of polymers.
CO3	Understand about Different types of polymerisation Reaction.
CO4	Understand about Polymerisation Techniques.
CO5	Understand about Glass Transition Temperature and order in crystalline Rubbers &Polymers.
CO6	Understand about Polymer Degradation.

IV.Course Content Details:

Unit No.	Theory Learning Outcomes (TLO's)aligned to CO's	Topics / Sub-topics
1.	**TLO 1a.** Explain monomer , oligomer, polymer. **TLO 1b.** Differentiate between Different polymerwith examples. **TLO 1c**. To analysis of Average molecular weight . **TLO 1d.** Determination of Number -Average & Weight-Average Molecular Weight	**Introduction to Polymer Science:** 1.1 Definition of Monomers, Oligomer, Polymer 1.2 Classification of polymers- (Natural & SyntheticPolymers, Organic & Inorganic Polymers, Thermoplastics & Thermosetting polymers) 1.3 Average Molecular Weight 1.4 Number -Average & Weight-Average Molecular Weight **Course Outcome: CO1Teaching Hours :6 hrsMarks: 8**
2.	**TLO2a.** Differentiate between Homopolymer , Copolymerand Terpolymer. **TLO2b.** Identify different linear, Branched, Cross linkedpolymer. **TLO2c**. understand the concept of Random, BlockCopolymer and Graft copolymers. **TLO2d.** Explain Geometrical Isomerism.	**Polymer Structure:** 2.1 Homopolymer 2.2 Copolymer 2.3 Terpolymer 2.4 Linear, Branched, Cross linked polymer 2.5 Random, Block Copolymers 2.6 Graft Copolymers 2.7 Geometrical Isomerism **Course Outcome: CO2Teaching Hours 6 hrsMarks: 8**

3	**TLO3a.** Explain Chain Polymerisation. **TLO3b.** Understand Step polymerization. **TLO3c**. Understand the concept of MiscellaneousPolymerisation.	**Types of Polymerisations:** 3.1 Chain Polymerisation. (Free-Radical Polymerisation, Ionic Polymerisation,Coordination Polymerisation) 3.2 Step Polymerisation (Polycondensation, PolyadditionPolymerisation, Ring-openingPolymerisation) 3.3 Miscellaneous Polymerisation Reactions-(Electrochemical Polymerisation,Metathetical Polymerisation, Group Transfer Polymerization) **Course Outcome: CO3 Teaching Hours:10 hrs Marks: 14**
4	**TLO4a.**understand the concept of Mass Polymerisation, Bulk Polymerisation, Solution Polymerisation, Emulsion Polymerisation, Suspension polymerisation.	**Polymerisation Techniques:** 4.1 Mass Polymerisation 4.2 Solution Polymerisation 4.3 Emulsion Polymerisation 4.4 Suspension Polymerisation **Course Outcome: CO4 Teaching Hours:10 hrs Marks: 12**
5	**TLO5a.** Differentiate between Glassy Solids & Glass Transition. **TLO5b.** Understand Transition & Associated Properties. **TLO5c**. Analyze Glass Transition Temperature & Molecular Weight, Glass transition Temperature & MeltingPoint. **TLO5d**. Determination of Degree of Crystallinity. **TLO5e**. Understand effect of Crystallinity on the propertiesof polymers.	**Glass Transition Temperature and order incrystalline Rubbers &Polymers:** 5.1 Introduction 5.2 Glassy Solids & Glass Transition 5.3 Transition & Associated Properties 5.4 Glass Transition Temperature & Molecular Weight 5.5 Glass Transition Temperature & Melting Point 5.6 Importance Of Glass Transition Temperature 5.7 Degree of Crystallinity 5.8 Crystallites 5.9 Effect of Crystallinity on the properties of polymers, **Course Outcome: CO5 Teaching Hours: 06 hrs Marks: 8**

6	**TLO6a.** Determine types of Degradation. **TLO6b.** Understand concept of thermal and mechanicaldegradation. **TLO6c**. Analyze Degradation by ultra sonic waves.**TLO6d**. Explain Oxidative and Ozone oxidation degradation.	**Polymer Degradation:** 6.1 Introduction, 6.2 Types of degradation, 6.3 Thermal degradation, 6.4 Mechanical degradation, 6.5 Degradation by ultra-sonic waves, 6.6 Photo-degradation, 6.7 Degradation by high-energy radiation, 6.8 Oxidative degradation, 6.9 Hydrolytic degradation. 6.10 Ozone oxidation degradation **Course Outcome: CO6 Teaching Hours:07 hrs Marks: 10**

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

1. Collect the samples of polymer by Natural and Synthetic , Organic and Inorganic, Thermoplastic and Thermosetting
2. Develop a presentation on polymerization processes.
3. Make a sample kit of polymers by glass transition temperature.
4. Make a sample kit of polymers degraded by different types.

VI.Specification Table:

Unit No	Topic Title	Distribution of Theory Marks			
		R Level	U Level	A Level	Total Marks
1	**Introduction to Polymer Science**	02	04	02	08
2	**Polymer Structure**	02	04	02	08
3	**Types of polymerisations**	04	06	04	14
4	**Polymerisation Techniques**	04	04	04	12
5	**Glass Transition Temperature and order incrystalline Rubbers & Polymers**	02	04	02	08
6	**Polymer Degradation**	04	04	02	10
	Total	18	26	16	60

Suggested COs - POs Matrix Form

Course Outcomes (COs)	Programme Outcomes (POs)							Programme Specific Outcomes (PSOs)	
	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PSO-1	PSO-2
CO1	3	2	2	2	3	2	2	3	3
CO2	2	3	3	2	2	2	2	3	3
CO3	3	2	2	2	3	2	2	2	2
CO4	2	3	3	3	2	1	2	2	2
CO5	3	3	1	2	3	2	2	2	3
CO6	3	3	2	1	3	2	2	1	2
Legends: - High:03, Medium:02, Low:01, No Mapping: --									

I. Suggested Learning Materials / Books

Sr. No.	Title	Author, Edition and Year Ofpublication	Publisher,
1	Polymer Science	V.R. Gowarikar	New Age International Publishers
2	Textbook of Polymer Science	F.W Billmeyer	-------
3	Introduction to polymers science	R.J Young	-------
4	Rubber Chemistry & Technology	J.A Brydson	Applied Science Publishers Ltd.London

Learning Websites & Portals

Sr.No	Link / Portal	Description
1	https://www.mlsu.ac.in/econtents/1061_unit5%20(Polymerization%20techniques).pdf	
2	https://mgcub.ac.in/pdf/material/20200405103131b1a374e0f3.pdf	
3	https://en.wikipedia.org/wiki/Polymer_degradation	

Academic Consultation Committee/Industry Consultation Committee:

Sr. No	Name	Designation	Institute/Organization
1	Mr. Ravindra Barde	Industry Expert	Sidhhi Elasto Pvt. LTD.
2	Mr. Dharmesh Dhanani	Industry Expert	Elphiepoly
3	Mr. Sahil Ranoliya	Lecturer in Rubber Technology	AIRIA
4	Mr. Sahil Soliya	Lecturer in Rubber Technology	AIRIA

Coordinator,
Curriculum Development,

Department of Rubber Technology

Head of Department
Department of Rubber Technology

I/C, Curriculum Development Cell

Principal

Programme : Diploma in Rubber Technology (Sandwich Pattern)													
Course Code: WS23602					**Course Title : Workshop Practices (RT)**								
Compulsory / Optional: Compulsory													
Learning Scheme and Credits						**Assessment Scheme**							
CL	**TL**	**LL**	**SLH**	**NLH**	**Credits**	**FA-TH**		**SA-TH**	**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 equipment.
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 equipment, 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, filling, 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, Dismantling etc 3.4 Safety practices to be followed in plumbing shop 3.5 Preparation of pipe fitting jobs **Course Outcome : CO3 Practical Hours :08**

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

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

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

Laboratory LearningOutcome (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.

Suggested COs - POs Matrix Form

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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 DelhiISBN: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. E. C. Dhembre	LME	Government Polytechnic, Mumbai
3.	Shri. Sunil Srivastav	Senior Lecturer ,Rubber Technology	Arizona Techzeal
4.	Mr. Sahil Ranoliya	Lecturer Rubber Technology	Member, AIRIA

Head,
Department of Rubber Technology

Workshop Supdt.
Government Polytechnic, Mumbai

I/C, Curriculum Development Cell

Principal