

# GOVERNMENT POLYTECHNIC MUMBAI

(Academically Autonomous Institute, Government of Maharashtra)

## Teaching and Examination Scheme

(P22)with effect from AY 2022-23

**Programme: Diploma in Rubber Technology (Sandwich Pattern)**

**Term / Semester - II**

Course Code	Course Title	Teaching Hours/Contact Hours				Credits	Examination Scheme (Marks)						
		L	P	TU	Total		Theory			PR	OR	TW	Total
							TH	TS1	TS2				
SC19102	Engineering Physics	3	2	--	5	5	60	20	20	25*		25	150
SC22105	Basic Mathematics II	4	--	--	4	4	60	20	20	--	--	--	100
RT22206	Basic of Mechanical Engg.	3	2	--	5	5	60	20	20		25*	25	150
RT22201	Polymer Science	3	--	--	3	3	60	20	20		--		100
RT22207	Machine Drawing and Computer Aided Drafting	2	4	--	6	6	--	--	--	50	--	100	150
HU19R105	Business Communication	2	2	--	4	4	60	20	20		--	50	150
HU22104	Environmental Studies (MOOC-II)	--	4	--	4	4	--	--	--	--	--	--	--
UV22102	Universal Human Values-II	--	2	--	2	2	--	--	--	--	--	--	--
	<b>Total</b>	<b>17</b>	<b>16</b>	<b>--</b>	<b>33</b>	<b>33</b>	<b>300</b>	<b>100</b>	<b>100</b>	<b>75</b>	<b>25</b>	<b>200</b>	<b>800</b>
Student Centered Activity (SCA)					<b>03</b>								
Total Contact Hours					<b>36</b>								

Abbreviations: L- Theory Lecture, P-Practical, TU-Tutorial, TH- Theory Paper TS1 & TS2- Term Tests, PR-Practical, OR-Oral, TW: Term Work (progressive assessment)

\* Indicates assessment by External Examiner else internal assessment, # indicates self, on- line learning Mode, @ indicates on line examination

Note: Duration of Examination--TS1&TS2 -1hour, TH- 2:30 hours, PR/OR – 3 hours per batch, SCA- Library - 1 hour, Sports- 2 hours, Creative Activity-2 hours Self, online learning Mode through MOOCS /Spoken Tutorials / NPTEL / SWAYAM / FOSSEE etc.

Coordinator,  
Curriculum Development,  
Department of Rubber Technology

In-Charge  
Curriculum Development Cell

Head of Departments  
Department of Rubber Technology

Principal

Programme : <b>Diploma in Rubber Technology</b>										
Course Code: <b>SC22105</b>				Course Title: <b>BASIC MATHEMATICS-II</b>						
Compulsory / Optional: Compulsory										
Teaching Scheme and Credits				Examination Scheme						
TH	PR	TU	Total	TH (2 Hrs 30 Min.)	TS1 (1 Hr)	TS2 (1Hr)	PR	OR	TW	Total
<b>4</b>	--	--	<b>4</b>	<b>60</b>	<b>20</b>	<b>20</b>	--	---	--	<b>100</b>

Abbreviations: TH- Theory; PR-Practical; TU-Tutorial; TS1 and TS2- Term Tests; OR-Oral Exam; TW: Term Work (progressive assessment), \* Indicates assessment by External Examiner else internal assessment  
Note: For Minimum passing marks under various heads, refer, examination rule AR26.

### Rationale:

This subject is kept under the branch of sciences. This subject intends to teach student basic facts, concepts, principles, and procedure of mathematics as a tool to analyze engineering problems and as such lays down foundation for understanding the engineering and core technology subject.

**Course Outcomes:** Student should be able to

CO1	Define the basic principles of function, limits to solve simple problems.
CO2	Calculate the equation of tangent, maxima ,minima, radius of curvature by differentiation
CO3	Solve the given problems of integration using suitable method and Apply the concept of integration to find area.
CO4	Define the basic concept of complex number and apply rules and properties to solve the problem.

### Course Content Details:

Unit No	Topics / Sub-topics
1	<p><b>1. Function and Limits</b></p> <p>1.1 Definition of function, value of function and types of functions and simple examples</p> <p>1.2 Concept of Limits without example.</p> <p><b>Course Outcome: CO1 Teaching Hours : 12 hrs Marks: 10 (R- 4, U-4, A-2)</b></p>
2	<p><b>2. Derivatives &amp; Application of derivative</b></p> <p>2.1 Definition of the derivative.</p> <p>2.2 Derivatives of standard function.( No proof by first principle)</p> <p>2.3 Differentiation of sum, difference, product and quotient of two or more functions</p> <p>2.4 Differentiation of composite function with simple example.</p> <p>2.5 Derivative of Inverse, Logarithmic and exponential function</p> <p>2.6 Second order derivative without examples.</p> <p>2.7 Geometrical Meaning of Derivative &amp; Tangents , Normals to the curve</p> <p>2.8 Maxima &amp; minima of the function,</p> <p>2.9 Radius of curvature</p> <p><b>Course Outcome: CO2 Teaching Hours : 20 hrs Marks:20 (R-8 , U- 8 , A-4 )</b></p>
3	<p><b>3.Integration &amp; Application of integration</b></p> <p>3.1 Simple Integration: Rules of integration and integration of Standard functions</p> <p>3.2 Methods of Integration</p> <p>a) Integration by Substitution</p> <p>b) Integration by parts</p> <p>c ) Integration by partial fractions</p> <p>3.3 Definition of definite integral</p> <p>a) Simple examples</p> <p>b) Properties of definite integral (without proof) and simple examples.</p> <p>3.4 Application of Integration</p> <p>a) Area under the curve</p> <p>b) Area bounded by two curves</p> <p><b>Course Outcome: CO3 Teaching Hours :20 hrs Marks: 20 (R-8, U- 8 , A-4 )</b></p>
4	<p><b>4 .Complex Number:-</b></p> <p>4.1 Definition of complex number Cartesian ,Polar ,Exponential form of complex number</p> <p>4.2 Algebra of complex number :-Equality , addition ,Subtraction ,Multiplication &amp; Division with simple examples</p> <p>4.3 De-Moivre's Theorem , Roots of complex numbers</p> <p>4.4 Circular Functions, Hyperbolic functions</p> <p>4.5 Relation between Circular and Hyperbolic functions</p> <p><b>Course Outcome: CO4 Teaching Hours :12 hrs Marks:10 (R- 2 , U-4 , A-4 )</b></p>

**Suggested Specifications Table (Theory):**

Unit No	Topic Title	Distribution of Theory Marks			
		R Level	U Level	A Level	Total Marks
1	Function and Limits	04	04	02	10
2	Derivatives & Application of Derivatives	08	08	04	20
3	Integration & Application of Integration	08	08	04	20
4	Complex Number	02	04	04	10
<b>Total</b>		<b>22</b>	<b>24</b>	<b>14</b>	<b>60</b>

**References/ Books:**

Sr. No.	Title	Author, Publisher, Edition and Year Of publication	ISBN
1	Mathematics for Polytechnic Students	S.P.Deshpande, Pune Vidyavardhini Graha Prakashan	-
2	Mathematics for Polytechnic Students ( Volume I )	H.K.Dass, S.Chand Prakashan	9788121935241
3	Companions to Basic Maths	G.V.Kumbhojkar, Phadke Prakashan	10-B07951HJDQ 13-B07951HJDQ
4	Applied Mathematics	N.Raghvendra Bhatt late, Tata McGraw Hill Publication Shri R Mohan Singh	9789339219567, 9339219562

**E-References:**

1. [www.math-magic.com](http://www.math-magic.com)
2. [www.Scilab.org/-SCI](http://www.Scilab.org/-SCI) Lab
3. [www.mathworks.com/Products/Matlab/-MATLAB](http://www.mathworks.com/Products/Matlab/-MATLAB)
4. [www.wolfram.com/mathematica/-Mathematica](http://www.wolfram.com/mathematica/-Mathematica)
5. <https://www.khanaacademy.org/math?gclid=CNqHuabCys4CFdoJaAoddHoPig>
6. [www.dplot.com/-Dplot](http://www.dplot.com/-Dplot)
7. [www.allmathcad.com/-Math](http://www.allmathcad.com/-Math) CAD
8. [www.easycalculation.com](http://www.easycalculation.com)
9. <https://www.vedantu.com/ncert-solutions/ncert-solutions-class-12-maths>
10. MYCBSEGUIDE

## CO Vs PO and CO Vs PSO Mapping (Rubber Technology)

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

## Industry Consultation Committee:

Sr. No	Name	Designation	Institute/Organisation
1	Mr. G.D.Rao	Sr. Engineer	Evershine PVT.Ltd.Mumbai
2	Mr. Pranshant Anvekar	Sr. Engineer	Innovative Energy Services, Mumbai
3	Mr. Abhijit Patil	Lecturer in Mathematics	Government polytechnic Mumbai
4	Mr. Vinod Patil	Lecturer in Mathematics	Government polytechnic Mumbai

Coordinator,  
Curriculum Development,  
Department of Sci. & Humanities

Head of Departments  
Department of Sci. & Humanities

I/C, Curriculum Development Cell

Principal

Programme: <b>Diploma in Rubber Technology</b>										
Course Code: <b>RT22206</b>				Course Title: <b>Basic of Mechanical Engineering</b>						
Compulsory / Optional: Compulsory										
Teaching Scheme and Credits				Examination Scheme						
TH	PR	TU	Total	TH (2 Hrs 30Min)	TS1 (1 Hr)	TS2 (1Hr)	PR	OR	TW	Total
<b>03</b>	<b>02</b>	<b>--</b>	<b>05</b>	<b>60</b>	<b>20</b>	<b>20</b>		<b>25*</b>	<b>25</b>	<b>150</b>

Abbreviations: L- Theory Lecture, P-Practical, TU-Tutorial, TH- Theory Paper TS1 & TS2- Term Tests, PR-Practical, OR-Oral, TW: Term Work (progressive assessment) , \* Indicates assessment by External Examiner else internal practical skill test , # indicates Self, on- line learning Mode, @ indicates on line examination

Note: For Minimum passing marks under various heads, refer, examination rule AR26. Two practical skill tests are to be conducted. First skill test at midterm and second skill test at the end of the term

### 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	<p><b>Topic Title: Introduction to Thermodynamics</b></p> <p><b>1.1</b> Types of Systems, Thermodynamic Equilibrium, Properties, State, Process and Cycle,  <b>1.2</b> Introduction to Zeroth, First and Second laws of thermodynamics, Heat and Work Interactions for various non-flow and flow processes;  <b>1.3</b> Concept of Heat Engine, Heat Pump &amp; Refrigerator, Efficiency/ COP; Kelvin-Planck and Clausius Statements, Carnot Cycle, Carnot Efficiency, T-S and P-V Diagrams,</p>

	<p>Concept of Entropy (Definition only).</p> <p><b>Course Outcome: CO1    Teaching Hours: 08 hrs    Marks: 10 (R- 02, U-04, A-04)</b></p>
2	<p><b>Topic Title: Heat transfer &amp; Thermal Power Plant</b></p> <p>2.1. Modes of Heat Transfer; Conduction: Composite Walls and Cylinders, Combined Conduction and Convection</p> <p>2.2. Thermal Power Plant Layout; Rankine Cycle; Fire Tube and Water Tube boilers, Babcock &amp; Wilcox, Cochran Boilers;</p> <p>2.3. Boiler accessories like Feed pump, Economizer, Super heater, Air preheater</p> <p><b>Course Outcome: CO2    Teaching Hours: 06 hrs    Marks: 08 (R-02 , U- 04, A-02 )</b></p>
3	<p><b>Topic Title: Materials and Manufacturing Processes</b></p> <p>3.1. Engineering Materials, Classification, and their Properties;</p> <p>3.2. Metal Casting, Moulding, Patterns,</p> <p>3.3. Metal Working: Hot Working and Cold Working,</p> <p>3.4. Metal Forming: Extrusion, Forging, Rolling, Drawing, Gas Welding, Arc Welding, Soldering, and Brazing.</p> <p><b>Course Outcome: CO3    Teaching Hours : 07 hrs    Marks: 10 (R-04, U- 04, A-02 )</b></p>
4	<p><b>Topic Title: Machine Tools and Machining Processes.</b></p> <p>4.1. Machine Tools: Lathe Machine and types, Lathe Operations</p> <p>4.2. Milling Machine and types, Milling Operations</p> <p>4.3. Shaper and Planer Machines: Quick-Return Motion Mechanism</p> <p>4.4. Drilling Machine: Operations</p> <p>4.5. Grinding Machine: Operations</p> <p><b>Course Outcome: CO4    Teaching Hours : 07 hrs    Marks: 10 (R-04 , U- 04, A-02)</b></p>
5	<p><b>Topic Title: Introduction to Machine Drives</b></p> <p>5.1. Machine elements in Transmission of Motion and Power. Shaft, coupling and bearing</p> <p>5.2. Different methods of power transmission. Power transmission by belt drive, gear drive, chain drive. (Simple Numerical on belt drive)</p> <p><b>Course Outcome: CO5    Teaching Hours : 07 hrs    Marks: 10 (R-02 , U- 04, A-04 )</b></p>
6	<p><b>Topic Title: Simple Mechanics and Center of Gravity</b></p> <p>6.1. Definition, Mechanical advantage, velocity ratio, Efficiency, Law of machine, Reversible and non-reversible machine, Friction in machine</p> <p>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</p> <p>6.3. Moments and couples, Varignon's theorem, Reaction of simply supported beam subjected to concentrated and uniformly distributed load.</p> <p><b>Course Outcome: CO6    Teaching Hours : 10 hrs    Marks: 12 (R-04, U-06 , A- 02 )</b></p>

**Suggested Specifications Table (Theory):**

Unit No	Topic Title	Distribution of Theory Marks			
		R Level	U Level	A Level	Total Marks
1	Introduction to Thermodynamics	02	04	04	10
2	Heat transfer & Thermal Power Plant	02	04	02	08
3	Materials and Manufacturing Processes	04	04	02	10
4	Machine Tools and Machining Processes.	04	04	02	10
5	Introduction to Machine Drives	02	04	04	10
6	Simple Mechanics and Center of Gravity	04	06	02	12
<b>Total</b>		<b>14</b>	<b>20</b>	<b>16</b>	<b>50</b>

**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
<b>Total</b>				<b>30</b>



**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 Promoters 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](http://www.nptel.ac.in/courses)
2. [www.learnerstv.com](http://www.learnerstv.com)
3. [www.ni.com/multisim](http://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:**

<b>Sr. No</b>	<b>Name</b>	<b>Designation</b>	<b>Institute/Organisation</b>
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,  
Curriculum Development,  
Department of Mechanical Engineering

Head of Department  
Department of Mechanical Engineering

I/C, Curriculum Development Cell

Principal

<b>Programme : Diploma in CE/ME/IT/CO/IS/EE/EC/LG/LT/RT (Sandwich Pattern)</b>										
<b>Course Code: HU19R105</b>				<b>Course Title: Business Communication</b>						
Compulsory / Optional: <b>Compulsory</b>										
Teaching Scheme and Credits				Examination Scheme						
TH	PR	TU	Total	TH (2 Hrs. 30 Min.)	TS1 (1 Hr)	TS2 (1Hr)	PR	OR	TW	Total
<b>02</b>	<b>02</b>	<b>-</b>	<b>04</b>	<b>60</b>	<b>20</b>	<b>20</b>	<b>-</b>	<b>-</b>	<b>50</b>	<b>150</b>

Abbreviations: TH- Theory; PR-Practical; TU-Tutorial; TS1 and TS2- Term Tests; OR-Oral Exam; TW: Term Work (progressive assessment), \* Indicates assessment by External Examiner else internal assessment

Note: For Minimum passing marks under various heads, refer, examination rule AR26.

**Rationale:** Communication plays a vital and decisive role in career development. It is very important for the smooth functioning of any business or organization. Effective business communication is how employees & Management interact with each other to reach organizational goals & be more aligned with the core company / business values. This course introduces not only basic concepts of communication like types of communication, barriers in communication, group discussion, interview skills, presentation skills but also Business Correspondence which will well equip students to express themselves effectively in all forms of communication especially in written form. It will enhance the skills to communicate effectively and skillfully at workplace. It will guide and direct students to develop a good personality and improve communication skills.

**Course Outcomes:** Student should be able to

<b>CO1</b>	Apply proper communication technique to cope up with the challenges of the modern world.
<b>CO2</b>	Interpret feedback at various situations by using appropriate body language and avoid the barriers in effective communication.
<b>CO3</b>	Able to participate in Group Discussion and Acquire the practical knowledge of an interview.
<b>CO4</b>	Able to develop PowerPoint Presentation and Business correspondence.
<b>CO5</b>	Write letters, circulars, memos, notices, reports and communicate effectively in written communication.

**Course Content Details:**

<b>Unit No</b>	<b>Topics / Sub-topics</b>
<b>1</b>	<p><b>Introduction to Communication</b></p> <p>1.1 Elements of Communication</p> <p>1.2 Communication Cycle</p> <p>1.3 Types of communication</p> <p>1.4 Definition and Types of Barriers-</p> <p>a)Mechanical</p> <p>b)Physical</p> <p>c)Language</p> <p>d)Psychological</p> <p>1.5 Ways to overcome Barriers</p> <p><b>Course Outcome: CO1      Teaching Hours :6 hrs      Marks: 14 (R- 2, U-4, A-8)</b></p>
<b>2</b>	<p><b>Non- verbal Communication</b></p> <p>2.1 Meaning and Importance of Non-verbal Communication</p> <p>2.2 Body Language</p> <p>2.3 Aspects of Body Language</p> <p>2.4 Graphic language</p> <p><b>Course Outcome: CO2      Teaching Hours :6 hrs      Marks: 12 (R- 4, U-4, A-4)</b></p>
	<p><b>Group Discussion And Interview Skills</b></p> <p>3.1 Need and Importance of Group Discussion</p>

<b>3</b>	3.2 Use of Knowledge and Logical sequence of ideas in Group Discussion 3.3 Types of Interview 3.4 Preparing for an Interview  <b>Course Outcome: CO3      Teaching Hours :6 hrs      Marks: 10 (R-2, U-4, A-4)</b>
<b>4</b>	<b>Presentation Skills</b> 4.1 Presentation Skills - Tips for effective presentation 4.2 Guidelines for developing PowerPoint presentation

	4.3 Business Etiquette  <b>Course Outcome: CO4      Teaching Hours :4 hrs      Marks: 08 (R- 2, U-2, A-4)</b>
<b>5</b>	<b>Business Correspondence</b> 5.1 Office Drafting – a) Notice b) Circular c) Memo d) Email-writing – Email etiquette, drafting formal / informal email 5.2 Personal Letter 5.3 Job Application with resume. 5.4 Business Letters – a) Enquiry b) Order c) Complaint 5.5 Report Writing – a) Fall in Production b) Accident Report  <b>Course Outcome: CO5      Teaching Hours: 8 hrs      Marks: 16 (R- 4, U-4, A-8)</b>

**Suggested Specifications Table (Theory):**

Unit No	Topic Title	Distribution of Theory Marks			
		R Level	U Level	A Level	Total Marks
1	Introduction to Communication	2	4	8	14
2	Non- verbal Communication	4	4	4	12
3	Group Discussion And Interview Skills	2	4	4	10
4	Presentation Skills	2	2	4	8
5	Business Correspondence	4	4	8	16
<b>Total</b>		<b>14</b>	<b>18</b>	<b>28</b>	<b>60</b>

**List of Assignments :**

Sr. No.	List of Experiments	COs	Hours
1	Listening Practice	CO1	03
2	Reading Practice	CO1	03
3	Writing Practice and E-Note	CO5	03
4	Communication Practice and Impromptu Communication.	CO4	03
5	Introduction to Vocabulary	CO5	03
6	Conversation between students on various situations.	CO2	03
7	Non- Verbal Communication.	CO2	03
8	Group Discussion	CO3	03
9	Mock Interview	CO3	03
10	Grammar <ul style="list-style-type: none"> <li>• Tenses</li> <li>• Transformation of sentences</li> <li>• Articles</li> <li>• Subject Pronoun - Singular &amp; Plural</li> <li>• Verbs</li> </ul>	CO5	03
	<b>Total</b>		<b>30</b>

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.

#### References / Books:

Sr. No.	Title	Author, Publisher, Edition and Year Of publication	ISBN
1	Communication Skills	Joyeeta Bhattacharya - Reliable Series	9780000176981, 0000176982
2	Communication Skills	Sanjay Kumar, PushpaLata- Oxford University Press	13: 978-0199488803
3	Successful presentation Skills	Andrew Brad bury- The Sunday Times	13: 9780749456627
4	Business Communication Using Computers	Dr.Yogesh T.Malshette Sonali Malshette Nirali Prakashan	

#### E-References:

1. Website: [www.mindtools.com/page8.html-99k](http://www.mindtools.com/page8.html-99k)
2. Website: [www.inc.com/guides/growth/23032.html-4](http://www.inc.com/guides/growth/23032.html-4)
3. Website: [www.khake.com/page66htm/-72k](http://www.khake.com/page66htm/-72k)
4. <https://www.vedantu.com/ncert-solutions/ncert-solutions-class-12-English>
5. Website: [www.letstak.co.in](http://www.letstak.co.in)
6. <https://infyspringboard.onwingspan.com/>

7. <http10s://learnenglishteens.britishcouncil.org/skills>**CO Vs PO and CO Vs PSO Mapping (CIVIL ENGINEERING)**

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3	PSO4
CO1	1	1	2	1	2	3	2	----	2	----	----
CO2	1	2	2	2	2	3	2	----	2	----	----
CO3	2	2	2	2	2	3	2	----	2	----	----
CO4	2	3	2	2	2	3	2	----	2	----	----
CO5	1	1	2	2	3	3	3	----	2	----	----

**CO Vs PO and CO Vs PSO Mapping (MECHANICAL ENGINEERING)**

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

**CO Vs PO and CO Vs PSO Mapping (ELECTRONICS ENGINEERING)**

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3
CO1	3	3	2	3	2	3	2	----	2	----
CO2	3	3	2	3	2	3	2	----	----	2
CO3	3	2	2	1	2	3	2	----	2	----
CO4	3	3	2	1	2	3	2	----	----	----
CO5	3	3	2	1	2	3	2	----	----	----

**CO Vs PO and CO Vs PSO Mapping (ELECTRICAL ENGINEERING)**

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3
CO1	3	3	2	3	2	3	2	1	2	2
CO2	3	3	2	3	2	3	2	2	2	2
CO3	3	2	2	1	2	3	2	----	1	1

CO4	3	3	2	1	2	3	2	1	3	3
CO5	3	3	2	1	2	3	2	2	2	2

**CO Vs PO and CO Vs PSO Mapping (INSTRUMENTATION ENGINEERING)**

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

**CO Vs PO and CO Vs PSO Mapping (COMPUTER ENGINEERING)**

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3
CO1	3	3	2	3	2	3	2	1	2	1
CO2	3	3	2	3	2	3	2	1	2	1
CO3	3	2	2	1	2	3	2	1	2	1
CO4	3	3	2	1	2	3	2	----	2	----
CO5	3	3	2	1	2	3	2	----	2	---

**CO Vs PO and CO Vs PSO Mapping (INFORMATION TECHNOLOGY)**

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3
CO1	3	3	2	3	2	3	2	2	2	2
CO2	3	3	2	3	2	3	2	1	1	1
CO3	3	2	2	1	2	3	2	1	2	2
CO4	3	3	2	1	2	3	2	2	2	1
CO5	3	3	2	1	2	3	2	1	2	1



**CO Vs PO and CO Vs PSO Mapping (LG/LT ENGINEERING)**

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3
CO1	3	3	2	3	2	3	2	1	----	2
CO2	3	3	2	3	2	3	2	1	----	2
CO3	3	2	2	1	2	3	2	1	1	2
CO4	3	3	2	1	2	3	2	1	----	2
CO5	3	3	2	1	2	3	2	1	----	2

**Industry Consultation Committee:**

Sr. No	Name	Designation	Institute/Organisation
1	Neelamkumar R. Sawant	State Head, Technical Services	JSW Cement Ltd. Mumbai Head Office
2	Shri. Ritesh Bharambe	Manager-Sales	JAI Instruments and Systems Pvt.Ltd
3	Shri. Aniket Mhala	Global Head – Technology & Innovation Hub	Oracle financial services and software
4	Mrs. S. S. Kulkarni	Lecturer in English	Government Polytechnic Pune
5	Mrs. K.S.Pawar	Lecturer in English	Government polytechnic Mumbai
6	Ms. N. N. Dhake	Lecturer in English	Government polytechnic Mumbai

Coordinator,

Head of Departments

Curriculum Development,

Department of Science And Humanities\_\_\_\_\_

Department of Science And Humanities\_\_\_\_\_

I/C, Curriculum Development Cell

Principal  
Government Polytechnic Mumbai







Programme : <b>Diploma in Rubber Technology (Sandwich pattern)</b>										
Course Code: SC19102				Course Title: <b>Engineering Physics</b>						
Compulsory / Optional: <b>Compulsory</b>										
Teaching Scheme and Credits				Examination Scheme						
L	P	TU	Total	TH (2Hrs.30 minutes)	TS1 (1 Hr.)	TS2 (1Hr.)	PR	OR	TW	Total
<b>3</b>	<b>2</b>	<b>--</b>	<b>5</b>	<b>60</b>	<b>20</b>	<b>20</b>	<b>25*</b>	<b>--</b>	<b>25</b>	<b>150</b>

Abbreviations: L- Theory Lecture, P-Practical, TU-Tutorial, TH- Theory Paper TS1 & TS2- Term Tests, PR Practical, OR-Oral, TW: Term Work (progressive assessment) , \* Indicates assessment by External Examiner else internal practical skill test, # indicates Self, on- line learning Mode, @ indicates on line examination

Note: For Minimum passing marks under various heads, refer, examination rule AR26. Two practical skill tests are to be conducted. First skill test at midterm and second skill test at the end of the term

### Rationale:

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

**Course Outcomes:** Student should be able to

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

**Course Content Details:**

<b>Unit No</b>	<b>Topics / Sub-topics</b>
<b>1</b>	<p><b>Units and Measurements</b></p> <p>1.1 Fundamental Physical quantities, examples.            1.2 Derived physical quantities, examples.            1.3 Definition and requirements of unit            1.4 System of units, C. G. S., M. K. S. and S. I. units.            1.5 Rules to write the unit and conventions of units and Significant figures, rules to write significant figures.            1.6 Error – Definition, types of errors and estimation of errors            1.7 Numerical</p> <p><b>Course Outcome: CO1 Teaching Hours: 8 hrs. Marks: 6 (R- 2, U-2, A-2)</b></p>
<b>2</b>	<p><b>Motions</b></p> <p><b>2.1 Linear motion</b> –Definition – distance, displacement, velocity, equation of motions, acceleration due to gravity and under gravity, numerical  <b>2.2</b> Periodic motions : a)Oscillatory motion, b)Vibratory motion, c) S.H.M            d) Circular motion. (only definition and examples),  <b>2.3 Angular motion:</b> a) Definition: Time period, frequency, amplitude, wavelength, and phase. Uniform circular motion, Radius vector, linear velocity, Angular velocity , Angular acceleration, Numerical.            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.  <b>2.4 Kinetics</b>            2.4.1 Definition Kinetics , momentum, impulse, impulsive force            2.4.2 Newton’s laws of motion with equation            2.4.3 Application of Newton’s laws of motion            2.4.4 Definition and unit - work power energy            2.4.5 Work energy principle            2.4.6 Numerical.</p> <p><b>Course Outcome: CO2 Teaching Hours :10 hrs. Marks: 10 (R- 2 , U-4 , A-4 )</b></p>
<b>3</b>	<p><b>General Properties of Matter</b></p> <p><b>3.1 Elasticity:</b>            3.1.1 Deforming force, restoring force, Elastic, plastic and 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 of rigidity</p>

	<p>Definition and relation among them.</p> <p>3.1.6 Factor of safety.</p> <p>3.1.7 Applications of elasticity</p> <p>3.1.8 Numerical.</p> <p><b>3.2 Liquid Friction</b></p> <p>3.2.1 Friction liquid, pressure</p> <p>3.2.2 pressure height relation</p> <p>3.3.3 Pascal's law, Archimedes' Principle and application of it.</p> <p><b>3.3 Viscosity</b></p> <p>3.3.1 Concept and Definition of viscosity, velocity gradient.</p> <p>3.3.2 Newton's law of viscosity, Co-efficient of viscosity, unit of viscosity</p> <p>3.3.3 Stokes' law, terminal velocity, derivation of Stokes' formula.</p> <p>3.3.4 Streamline flow, turbulent flow, critical velocity, examples.</p> <p>3.3.5 Reynolds' number and its significance.</p> <p>3.3.6 Applications of viscosity.</p> <p>3.3.7 Numerical.</p> <p><b>3.4 Surface Tension:</b></p> <p>3.4.1 Concept of surface tension.</p> <p>3.4.2 Adhesive and cohesive forces, examples.</p> <p>3.4.3 Laplace's Molecular theory of surface tension</p> <p>3.4.4 Angle of contact, its significance.</p> <p>3.4.5 Expression for surface tension by capillary rise method.</p> <p>3.4.6 Effect of impurity and temperature.</p> <p>3.4.7 Applications of surface tension.</p> <p>3.4.8 Numerical.</p> <p><b>Course Outcome: CO3 Teaching Hours: 12 hrs. Marks: 18 (R- 4 , U- 6 , A- 8 )</b></p>
4	<p><b>Sound and Acoustic</b></p> <p><b>4.1 Sound Waves:</b></p> <p>4.1.1 Wave motion, types of waves – progressive, longitudinal and transverse waves.</p> <p>4.1.2 Characteristics of longitudinal and transverse waves and comparison.</p> <p>4.1.3 Free or natural vibrations and forced vibrations, resonance – definition and examples.</p> <p>4.1.4 Determination of velocity of sound by resonance method.</p> <p><b>4.1.5 Numerical.</b></p> <p><b>4.2 Acoustics:</b></p> <p>4.2.1 Definition of echo, reverberation, reverberation time and acoustic</p> <p>4.2.2 Sabine's formula for reverberation time (no derivation)</p> <p>4.2.3 Factors affecting acoustics of sound.</p> <p>4.2.4 Acoustical planning of building.</p> <p>4.2.5 Numerical.</p> <p><b>Course Outcome: CO4 Teaching Hours: 8 hrs. Marks: 10 (R- 2 , U- 4 , A- 4 )</b></p>

<b>5</b>	<p><b>Optics and Optical Fiber</b></p> <p><b>5.1 Optics:</b></p> <p>5.1.1 Revision of reflection and refraction of light.</p> <p>5.1.2 Laws of refraction, Snell's law.</p> <p>5.1.3 Determination of refractive index.</p> <p>5.1.4 Dispersion, dispersive power, Prism formula ( derivation)</p> <p>5.1.5 Critical angle, Total internal reflection. Examples and applications.</p> <p>5.1.6 Numerical.</p> <p><b>5.2 Optical Fiber:</b></p> <p>5.2.1 Principle of propagation of light through optical fiber.</p> <p>5.2.2 Structure of optical fiber.</p> <p>5.2.3 Applications.</p> <p>5.2.4 Difference between optical fiber cable and electric cable wire</p> <p><b>Course Outcome: CO5 Teaching Hours : 4 hrs. Marks: 10 (R- 2 , U- 4 , A- 4)</b></p>
<b>6</b>	<p><b>LASER</b></p> <p>6.1 LASER introduction,</p> <p>6.2 Properties of laser,</p> <p>6.3 Spontaneous and stimulated emission,</p> <p>6.4 Population inversion, Optical pumping,</p> <p>6.5 Applications of LASER.</p> <p><b>Course Outcome: CO5 Teaching Hours : 3 hrs. Marks: 6 (R- 2 , U- 2 , A-2 )</b></p>

Suggested Specifications Table (Theory):

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



**List of experiments:**

Sr. No.	Unit No	CO	List of Experiments	Hours
1	1	CO 1	To know your Physics laboratory and use of scientific calculator.	2
2	1	CO 1	To measure the dimensions of given objects and to determine their Volume using Vernier caliper.	2
3	2	CO 2	To determine Acceleration due to gravity by simple pendulum	2
4	3	CO 3	To determine coefficient of viscosity of liquid by Stokes' method	2
3	3	CO 3	To determine the surface tension of liquid using capillary rise method.	2
6	4	CO 4	To determine velocity of sound by resonance method.	2
7	5	CO 5	To determine refractive index by using pin method	2
8	1	CO 1	To measure the dimensions of given objects and to determine their Volume using micrometer screw gauge.	2
9	2	CO 2	To determine stiffness constant by using helical spring	2
10	3	CO 3	To determine the Young's modulus of elasticity of wire using Young's apparatus	2
11	3	CO 3	To verify the relation between radius of capillary tube and height of liquid in a capillary tube.	2
12	4	CO 4	To determine velocity of sound by using sonometer.	2
13	6	CO 5	Experiment on LASER	2
14	5	CO 5	To demonstrate spectrometer	2
15	ALL	CO 1	Showing Video on different applications related to units,	2
<b>Total</b>				<b>30</b>

**Note: Experiments No. 1 to 10 are compulsory and should map all units and Cos. Remaining 5 experiments are to be performing on the importance of topic.**

**References/ Books:**

Sr. No.	Title	Author, Publisher, Edition and Year Of publication	ISBN
1	Applied Physics	Manikpure & Deshpande ,S.Chand & Company	10:8121919541 13:9788121919548
2	Applied Physics	B.G. Bhandarkar, Vrinda Publication	0071779795
3	Optics & Optical Fibers	Brijlal Subramanyam	978-3-662-52764-1
4	Engineering Physics	Gaur and S.L. Gupta S. Chand &Company	0-07-058502
5	Physics	Resnick and Halliday Tata McGraw Hills	978-0-07-175548- 3
6	Physics part I & II	H.C. Varma	9788177091878
7	Properties of Matter	D.S. Mathur	13: 978- 8121908153

**E-References:**

1. [www. Physics.org](http://www.Physics.org)
2. [www.physicsclassroom.com](http://www.physicsclassroom.com)
3. [www.youtube/physics](http://www.youtube/physics)
4. [www.ferrophysics.com](http://www.ferrophysics.com)
5. <http://hperphysics.phastr.gsu.edu/hbase/hph.htm>
6. [www.sciencejoywagon.com/physicszone](http://www.sciencejoywagon.com/physicszone)
7. <https://www.vedantu.com/ncert-solutions/ncert-solutions-class-12-physics>
8. MYCBSEGUIDE
9. <https://ndl.iitkgp.ac.in/>

**CO Vs PO and CO Vs PSO Mapping (CIVIL ENGINEERING)**

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3
CO1	3	1	1	2	1	1	1	2	1	
CO2	3	--	1	---	1	1	1	2	1	1
CO3	3	1	1	---	1	1	1	1	1	
CO4	3	1	1	2	1	1	1	2	1	1

**CO Vs PO and CO Vs PSO Mapping (MECHANICAL ENGINEERING)**

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2
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	---

**Industry Consultation Committee:**

Sr. No	Name	Designation	Institute/organization
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2	Mr. Y.A. Mahajan	Lecturer in Physics	Bhauasaheb Vartak Polytechnic, Vasai west,
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Coordinator,  
Curriculum Development,  
Department of Sci. & Humanities

Head of Departments  
Department of Sci. & Humanities

I/C, Curriculum Development Cell

Principal

Programme : <b>Diploma in Rubber Technology (Sandwich Pattern)</b>										
Course Code: <b>RT22207</b>				Course Title: <b>Machine Drawing &amp; Computer Aided Drafting</b>						
Compulsory / Optional: Compulsory										
Teaching Scheme and Credits				Examination Scheme						
L	P	TU	Total	TH (2Hrs 30 min)	TS1 (1 Hr)	TS2 (1Hr)	PR	OR	TW	Total
<b>02</b>	<b>04</b>	--	<b>06</b>	--	--	--	<b>50</b>	--	<b>100</b>	<b>150</b>

Abbreviations: L- Theory Lecture, P-Practical, TU-Tutorial, TH- Theory Paper TS1 & TS2- Term Tests, PR-Practical, OR-Oral, TW: Term Work (progressive assessment) , \* Indicates assessment by External Examiner else internal practical skill test , # indicates Self, on- line learning Mode, @ indicates on line examination Note: For Minimum passing marks under various heads, refer, examination rule AR 26.

### Rationale:

A Rubber Engineer, irrespective of their field of operation in an industry, is expected to possess a thorough 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 perform day 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 management environment.

**Course Outcomes:** Student should be able to

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

**Course Content Details:**

Unit No	Topics / Sub-topics
1	<p><b>Limits, Fits and Tolerances</b></p> <p>1.1 Introduction to ISO system of tolerance, dimensional tolerances, elements of interchangeablesystem, hole &amp; shaft basis system, limits, fits &amp; allowances. Selection of fit. (Simple Numerical)</p> <p>1.2 Geometrical tolerances, tolerances of form and position and its geometric representation.</p> <p>1.3 Characteristics of surface roughness - Indication of machining symbol showing direction of lay, roughness grades, machining allowances, manufacturing methods.</p> <p><b>Course Outcome: CO1</b></p>
2	<p><b>Production Drawing Basics</b></p> <p>2.1 Conventional Representations using SP – 46 (1988)</p> <p>2.1.1 Materials C.I., M.S, Brass, Bronze, Aluminum, wood, Glass, Concrete and Rubber</p> <p>2.1.2 Long and short break in pipe, rod and shaft.</p> <p>2.1.3 Ball and Roller bearing, pipe joints, cocks, valves, internal / external threads.</p> <p>2.1.4 Various sections- Half, removed, revolved, offset, partial and aligned sections.</p> <p>2.1.5 Knurling, serrated shafts, splined shafts, and chain wheels.</p> <p>2.1.6 Springs with square and flat ends, Gears, sprocket wheel</p> <p>2.1.7 Countersunk &amp; counter bore.</p> <p>2.1.8 Tapers</p> <p>2.2 <b>Welded Joints:</b> Representation of the following weld &amp; preparing working drawing showing the size of weld, weld length, flush finish etc. Fillet</p> <p>2.2.1 Square butt</p> <p>2.2.2 Single and double U</p> <p>2.2.3 Single and double V</p> <p>2.2.4 Single and double J</p> <p>2.2.5 Bevel butt</p> <p>2.2.6 Edge / seam / bead</p> <p>2.2.7 Spot weld</p> <p>2.2.8 All round weld</p> <p>2.2.9 Flush finish weld</p> <p><b>Course Outcome: CO2</b></p>
3	<p><b>Introduction to Computer Aided Drafting:</b></p> <p>3.1 Various Software's for Computer Aided Drafting.</p> <p>3.2 CAD initial settings command.</p> <p>3.3 Object Selection methods</p> <p><b>Course Outcome: CO3</b></p>
4	<p><b>Basic Commands in CAD</b></p> <p>4.1 Zoom and formatting Commands:</p> <p>4.1.1 Zoom Commands – all, previous, out, in, extent, real-time, dynamic, window, pan.</p> <p>4.1.2 Formatting commands - Layers, block, line type, line weight, color.</p> <p>4.2 Draw and Enquiry commands:</p> <p>4.2.1 Draw Command - Line, arc, circle, rectangle, polygon, ellipse, point, spline, block, hatchetc.</p> <p>4.2.2 Enquiry commands - distance, area, volume, and list command.</p> <p>4.3 Edit and Modify commands:</p> <p>4.3.1 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.</p>

	<p>4.4 Dimensioning, Text and Plot Commands:</p> <p>4.4.1 Dimensioning commands - Dimension styles, Dimensional Tolerances and Geometrical Tolerances, dedit.</p> <p>4.4.2 Text commands – Text style, dtext, mtext command.</p> <p>4.4.3 Plotting &amp; Publishing a drawing – creating standard template, title block, creating table, Billplot Commands.</p> <p>4.5 Drawing the given Sketches &amp; Production Drawing of machine components.</p> <p><b>Course Outcome: CO4</b></p>
5	<p><b>Assembly drawing</b></p> <p>5.1 Assembly to Details: Introduction – basic principles of dismantling process. Preparation of detailed working drawing from given assembly, indicating proper type of fit &amp; tolerance relevant to that fit and the grade of surface finish required. The drawing to be self-explanatory for manufacturing of the components.</p> <p>The objects may be selected from the following &amp; not containing more than 8 parts:</p> <p>5.1.1 Lathe Tail Stock</p> <p>5.1.2 Jigs &amp; Fixtures</p> <p>5.1.3 Piston &amp; connecting rod assembly</p> <p>5.1.4 Gland and Stuffing box Assembly</p> <p>5.1.5 Valves: Steam Stop Valve &amp; Non – Return Valve</p> <p>5.1.6 Fast &amp; loose pulley</p> <p>5.2 Details to Assembly: Preparation of the assembly drawings from the given detailed drawings of the parts of machine unit. Objects may be selected from the following &amp; not containing more than 8 parts.</p> <p>5.2.1 Couplings – Universal couplings &amp; Oldham’s Coupling</p> <p>5.2.2 Bearing – Foot Step Bearing &amp; Pedestal Bearing</p> <p>5.2.3 Lathe tool Post, Tail stock</p> <p>5.2.4 Machine vice &amp; Pipe Vice</p> <p>5.2.5 Screw Jack</p> <p>5.2.6 Jigs and Fixtures</p> <p>5.2.7 Valves: Steam stop valves &amp; Non Return Valves,</p> <p><b>Course Outcome: CO5</b></p>
6	<p>Isometric and 3D Drawings:</p> <p>6.1 Drawing of Isometric Views from orthographic views of objects using CAD.</p> <p>6.2 Drawing of 3D (pictorial) objects from the Two/Three views of the objects using CAD.</p> <p><b>Course Outcome: CO6</b></p>

**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

Sr. No	Unit No	COs	Title of the Experiments	Hrs
7	2	CO3	Generation of production drawings of the machine parts and assembly With 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
<b>Total</b>				<b>60</b>

**References/ Books:**

Sr. No.	Title	Author, Publisher, Edition and Year Of publication	ISBN
1	Machine Drawing	N. D. Bhatt, Charotar Publishing House, 50 <sup>th</sup> edition, 2016	978-9385-0392-32
2	Production Drawing	L. K. Narayanan, P. Kannaich, K. Venkat Reddy, New Age International Publication, 3 <sup>rd</sup> edition, 2006	978-8122-4251-85
3	Machine Drawing	N Sidheswar, P Kannaiah & V V S Sastry, Tata McGraw Hill Education 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, Engineering Drawing 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 Cengage Learning (31 January 1998)	978-0766-8012-95
7	Machine Drawing with AutoCAD	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:**

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- [http://www.caddprimer.com/AutoCAD\\_training\\_tutorial/AutoCAD\\_training\\_lessons.htm](http://www.caddprimer.com/AutoCAD_training_tutorial/AutoCAD_training_lessons.htm)
- <http://www.autocadmark.com/>
- <http://www.autocadtutorials.net/>

6. [www.youtube.com](http://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](mailto:directsales@infiniteskills.com)

**CO Vs PO and CO Vs PSO Mapping**

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2
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	2	2	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

**Industry Consultation Committee:**

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1	Mr. A.G. Joshi	Lecturer in Mechanical Engineering	Govt. Polytechnic, Ahmednagar
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Coordinator,  
Curriculum Development,  
Department of Rubber Technology

Head of Department  
Department of Rubber Technology

I/C, Curriculum Development Cell

Principal





Program: Diploma in Rubber Technology (Sandwich Pattern)										
Course Code: <b>RT22201</b>				Course Title: <b>Polymer Science</b>						
Compulsory / Optional: Compulsory										
Teaching Scheme and Credits				Examination Scheme						
L	P	TU	Total	TH (2.30 Hrs.)	TS1 (1Hr)	TS2 (1Hr)	PR	OR	TW	Total
<b>3</b>	--	--	<b>3</b>	<b>60</b>	<b>20</b>	<b>20</b>	---	---	---	<b>100</b>

Abbreviations: L- Theory Lecture, P-Practical, TU-Tutorial, TH- Theory Paper TS1 & TS2- Term Tests,

PR-Practical, OR-Oral, TW: Term Work (progressive assessment) , \* Indicates assessment by External Examiner else internal practical skill test , # indicates Self, on- line learning Mode, @ indicates on line examination

Note: For Minimum passing marks under various heads, refer, examination rule AR26.

#### Rationale:

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

**Course Outcomes:** Student should be able to

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.

**Course Content Details:**

Unit No	Topics / Sub-topics
1	<p><b>Introduction to Polymer Science:</b></p> <ul style="list-style-type: none"> <li>I. Definition of Monomers, Oligomer, Polymer</li> <li>II. Classification of polymers- (Natural &amp; Synthetic Polymers, Organic &amp; Inorganic Polymers, Thermoplastics &amp; Thermosetting polymers)</li> <li>III. Average Molecular Weight</li> <li>IV. Number -Average &amp; Weight-Average Molecular Weight</li> </ul> <p><b>Course Outcome: CO1 Teaching Hours: 6 hrs Marks: 8 (R- 2, U-4 , A-2 )</b></p>
2	<p><b>Polymer Structure:</b></p> <ul style="list-style-type: none"> <li>I. Homopolymer</li> <li>II. Copolymer</li> <li>III. Terpolymer</li> <li>IV. Linear, Branched, Cross linked polymer</li> <li>V. Random, Block Copolymers</li> <li>VI. Graft Copolymers</li> <li>VII. Geometrical Isomerism</li> </ul> <p><b>Course Outcome: CO2 Teaching Hours: 6 hrs Marks: 8 (R- 2 , U-4 , A-2 )</b></p>
3	<p><b>Types of Polymerisations:</b></p> <ul style="list-style-type: none"> <li>I. Chain Polymerisation. (Free-Radical Polymerisation, Ionic Polymerisation, Coordination Polymerisation)</li> <li>II. Step Polymerisation (Polycondensation, Polyaddition Polymerisation, Ring-opening Polymerisation)</li> <li>III. Miscellaneous Polymerisation Reactions- (Electrochemical Polymerisation, Metathetical Polymerisation, Group Transfer Polymerization)</li> </ul> <p><b>Course Outcome: CO3 Teaching Hours: 10 hrs Marks: 14 (R-4 , U- 46 , A-4 )</b></p>
4	<p><b>Polymerisation Techniques:</b></p> <ul style="list-style-type: none"> <li>I. Mass Polymerisation</li> <li>II. Bulk Polymerisation</li> <li>III. Solution Polymerisation</li> <li>IV. Emulsion Polymerisation</li> <li>V. Suspension Polymerisation</li> </ul> <p><b>Course Outcome: CO4 Teaching Hours: 10 hrs Marks: 12 (R-4 , U- 4 , A-4 )</b></p>

5	<p><b>Glass Transition Temperature and order in crystalline Rubbers &amp; Polymers:</b></p> <p>I. Introduction            II. Glassy Solids &amp; Glass Transition            III. Transition &amp; Associated Properties            IV. Glass Transition Temperature &amp; Molecular Weight            V. Glass Transition Temperature &amp; Melting Point            VI. Importance Of Glass Transition Temperature            VII. Degree of Crystallinity            VIII. Crystallites            IX. Effect of Crystallinity on the properties of polymers,</p> <p><b>Course Outcome: CO5 Teaching Hours :6 hrs Marks: 8 (R-2, U- 4, A-2)</b></p>
6	<p><b>Polymer Degradation:</b></p> <p>I. Introduction,            II. Types of degradation,            III. thermal degradation,            IV. mechanical degradation,            V. degradation by ultra-sonic waves,            VI. photo-degradation,            VII. degradation by high-energy radiation,            VIII. oxidative degradation,            IX. hydrolytic degradation.            X. Ozone oxidation degradation</p> <p><b>Course Outcome: CO6 Teaching Hours: 6 hrs Marks: 10 (R-4 , U- 4 , A-2)</b></p>

**Suggested Specifications Table (Theory):**

Unit No	Topic Title	Distribution of Theory Marks			
		R Level	U Level	A Level	Total Marks
1	<b>Introduction to Polymer Science</b>	02	04	02	08
2	<b>Polymer Structure</b>	02	04	02	08
3	<b>Types of polymerisations</b>	04	06	04	14
4	<b>Polymerisation Techniques</b>	04	04	04	12
5	<b>Glass Transition Temperature and order in crystalline Rubbers &amp; Polymers</b>	02	04	02	08
6	<b>Polymer Degradation</b>	04	04	02	10
<b>Total</b>		14	28	18	60

**References/ Books:**

Sr. No.	Title	Author, Edition and Year Of publication	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

**E-References:**

[https://www.mlsu.ac.in/econtents/1061\\_unit-5%20\(Polymerization%20techniques\).pdf](https://www.mlsu.ac.in/econtents/1061_unit-5%20(Polymerization%20techniques).pdf)

<https://mgcub.ac.in/pdf/material/20200405103131b1a374e0f3.pdf>

[https://en.wikipedia.org/wiki/Polymer\\_degradation](https://en.wikipedia.org/wiki/Polymer_degradation)

**CO Vs PO and CO Vs PSO Mapping (Rubber Technology)**

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

**Industry Consultation Committee:**

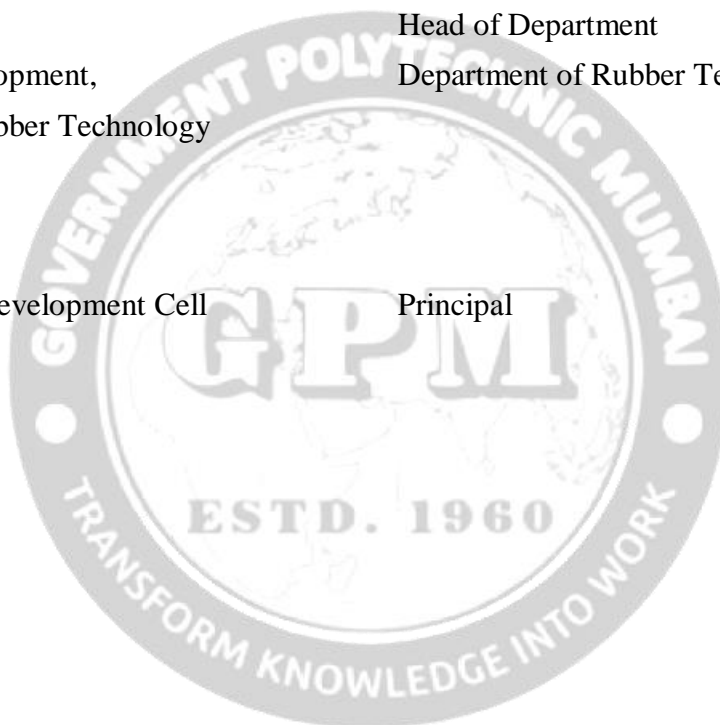
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1	Mr. Ravindra Barade	Industry Expert	
2	Mr. Dharmesh Dhanani	Industry Expert	Elphiepoly
3	Mr. Sahil Ranoliya	Lecturer in Rubber Technology	AIRIA
4	Mr. Sahil Soliya	Lecturer in Rubber Technology	AIRIA

Coordinator,  
Curriculum Development,  
Department of Rubber Technology

Head of Department  
Department of Rubber Technology

I/C, Curriculum Development Cell

Principal



Programme : <b>Diploma in ME/CE/EE/CO/IF/IS/EC/RT/LT/LG (Sandwich Pattern), AIML</b>										
Course Code: UV19R102				Course Title: Universal Human Values-II						
Compulsory / Optional: Compulsory										
Teaching Scheme and Credits				Examination Scheme						
L	P	TU	Total (Credit)	TH (2 Hrs 30min)	TS1 (1 Hr)	TS2 (1Hr)	PR	OR	TW	Total
--	--	-	<b>02</b>	-	-	-	--	--	--	--

Abbreviations: L- Theory Lecture, P-Practical, TU-Tutorial, TH- Theory Paper TS1 & TS2- Term Tests, PR- Practical, OR-Oral, TW: Term Work (progressive assessment) , \* Indicates assessment by External Examiner else internal practical skill test , # indicates Self, on- line learning Mode, @ indicates on line examination  
 Note: For Minimum passing marks under various heads, refer, examination rule AR26. Two practical skill tests are to be conducted. First skill test at mid-term and second skill test at the end of the term.

### Rationale:

Universal Human Values-I course helped students to discover themselves and comfortably connect with their peers. Students experienced living in harmony with nature by visiting a nature park and participating in activities like tree plantation, beach cleaning and institute cleaning.

Universal Human Values-II course is more focused on helping students to create health consciousness and experience living in harmony with their bodies. It will help to create a holistic perspective based on self-exploration about themselves, family, society and nature.

Interactions with underprivileged sections of society will help to inculcate values like empathy, accountability and social gratitude. Patriotic values will be imbibed by learning about the constitution of India. Through experiential learning, an ideal personality will be developed to excel in the field of work. It is the journey of thought process from -my familyøto -world familyø

**Course Outcomes: On completion of this course, student should be able to**

CO1	Develop empathy for others.
CO2	Understand and appreciate duties and civic responsibilities.
CO3	Develop health consciousness
CO4	Develop respect and recognition for others work.
CO5	Understand the importance of living in harmony with nature and society.

## Course Content Details:

Sr. No	Activity	Related Value/s	Methodology of Implementation	Student's Role	Mentor's role	Resources Required
01	<p>Essay writing</p> <p>i)Role of engineer in development of nation</p> <p>ii)Global warming and its remedies</p> <p>iii)My favorite book</p> <p>iv)Bad and good of social media</p> <p>v)My best friend</p> <p>Mentor can add more essay topics related to mentioned values.</p>	Social gratitude, Harmony in behavior, Accountability	Selecting a topic from the list and writing an essay on it	Thoughtfully write the essay on a selected topic.	Display the best essays on the notice board.	Notice board, panel of judges
02	<p>Visiting under-privileged children of less or same age group - understand their life, difficulties, compare with your life, ÷give ÷them what you can</p> <p>i)Blind school</p> <p>ii)Slums</p> <p>iii)Physically handicapped schools</p> <p>iv)Adiwasi pada</p>	Empathy Compassion Accountability Joy of Giving Social Gratitude	Students to arrange visit under supervision of mentor. Identify and impart technical skills needed to improve their lives.	Interact with the children, Observe their life pattern. Make them aware about technologies used in daily life.	Verify the visit plan and arrangements done by students see that discipline and safety is maintained during visit.	Traveling facilities, food and sufficient drinking water
03	Read preamble of constitution and list down duties and responsibilities of a citizen	Patriotism Integrity Loyalty Harmony Righteousness	Read preamble of constitution of India from internet website	Brainstorm to understand importance of preamble.	Motivate students to present different stories related to Indian constitution	<a href="https://www.constitutionofindia.net/constitution_of_india/preamble">https://www.constitutionofindia.net/constitution_of_india/preamble</a>
04	To visit war memorial/Hutatma smarak in city	Patriotism Respect	Students to arrange activity under supervision of mentor	List available war memorial/Hutatma smarak in nearby area	Scrutinize and monitor the visit plan made by students	Traveling facilities, food and sufficient drinking water
05	Prepare your own SWOT Analysis	Self-exploration, Honesty	Analysis and report writing	Thoughtfully analyze self	Explain process of SWOT analysis	Case studies



06	Student will prepare a diet chart, analyze food consumption habit-List food consumed during last 3 days and identify its nutritional effects on body	Health consciousness	Balanced diet chart preparation	Find out the ways to maintain balanced diet chart	Provide information resources	Internet websites, Professional dietician
07	Identify 5 personalities from the areas like sports, defence, politics,, businesses and social work who have demonstrated great spirit of integrity in their life and write a report. e.g. <b>Rajendra singh-</b> Water man of india, <b>Dr. A P J Abdul kalam-</b> scientist and former president of india. <b>Mohammed Yunus-</b> Bangladeshi social entrepreneur, <b>Kapil Dev-</b> Cricketer of the century. <b>David Packard-</b> Chairman of Hewlett-Packard (HP)	Integrity , respect	Information collection and analysis	Identify personalities and study their extraordinary work	Guide students to identify various dimensions of the personality	Internet websites, Institute Library
08	Spend an hour with the local municipal corporation disaster management cell.	Recognition of others work	Visit disaster management cell of local municipal corporation in groups	Interact with the officers and staff	Distribute different groups of students in different local municipal corporations	List of local municipal corporations
09	Spend a day in a local housing society to spread awareness about efficient use of energy while using elevators and home appliances as well as during transportation	Environment Conservation	Interaction with society residents and office bearers	Identify local housing society, interact with people and write report	Make students aware about energy audit	Energy auditor

<b>10</b>	Study the Sustainable Development Goals of the United Nations for peace and prosperity of people and the planet, now and into the future by visiting the following website: <a href="https://sdgs.un.org/goals">https://sdgs.un.org/goals</a>	Social Gratitude, Empathy, Compassion, Accountability	Visit the website, study history and List 17 sdgs	Study the sdg in detail (assigned to your group by mentor), prepare presentation	Assign 17 sdgs to different groups of students	Local NGOs working for UN
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**Methodology:**

1. The course is Non Examination, Credit Course.
2. The course will be introduced during the student induction programme (orientation programme) of one week duration. Most of the activities are to be completed during induction programme and to be continued throughout the term during SCA hours under the guidance of mentor.
3. The mentor will be assigned to the student for a group of 20 students each.
4. In consultation and under supervision of a mentor, the student/ Group of students has to complete the activity.
5. Activities no.2, 7, 8 and 10 can be performed in collaboration with related government organizations or industries (under CSR activity).
6. All events will be organized and managed by students. The mentor will work as a facilitator/ advisor.
7. The strategies to learn the course is “Self- Exploratory” and “Experiential Learning”
8. The onus of responsibility for completing the activities is with students.
9. The student has to complete at least **five** no. of activities throughout the term to earn the credits.

**References/ Books:**

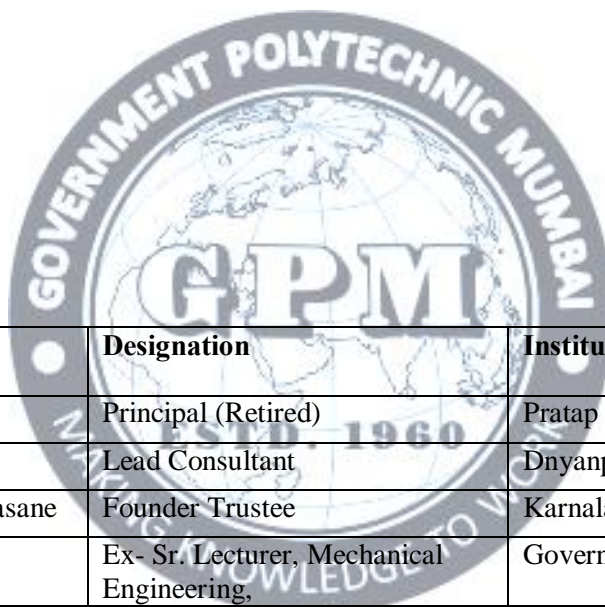
Sr. No.	Title	Author, Publisher, Edition and Year Of publication	ISBN
1	A Foundation Course in Human Values and Professional Ethics	R.R. Gaur, R. Sangal, G.P. Bagaria, Excel Books, New Delhi, 2010	978-8-174-46781-2
2	Human Values	A.N. Tripathy, New Age International Publishers, 2003	978-8-122-42589-5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

**E-References:**

- 1) [https://youtu.be/k0Ju1vj\\_BVk](https://youtu.be/k0Ju1vj_BVk) (The 10 Most Important Human Values)
- 2) Dr. Prakash Baba Amte- Movie
- 3) <https://youtu.be/Qeog0lzG2ls> (Value of Education -short film)
- 4) [https://www.constitutionofindia.net/constitution\\_of\\_india/preamble](https://www.constitutionofindia.net/constitution_of_india/preamble)
- 5) <https://slidemodel.com/personal-swot-analysis-quick-guide/>
- 6) <https://possible.in/balanced-diet-chart.html>

**E-References for mentors:**

- 1) <https://www.edutopia.org/>
- 2) <https://sdgs.un.org/goals>

**Consultation Committee:**

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1	Dr. L.A. Patil	Principal (Retired)	Pratap College, Amalner
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3	Dr. Chandrakant Shahasane	Founder Trustee	Karnala Charitable Trust, Pune
4	Mr. Sunil V. Joshi	Ex- Sr. Lecturer, Mechanical Engineering,	Government Polytechnic, Mumbai
5	Mrs. Swati D. Deshpande	Ex-Principal	Government Polytechnic, Mumbai
6	Mr. U.A. Agnihotri	Lecturer, Mechanical Engineering	Government Polytechnic, Mumbai
7	Mr. K. V. Patil	Lecturer, Mechanical Engineering	Government Polytechnic, Mumbai

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