

GOVERNMENT POLYTECHNIC MUMBAI

(Academically Autonomous Institute of Government of Maharashtra)



Department of Mechanical Engineering

P19R Curriculum

Second Semester

GOVERNMENT POLYTECHNIC MUMBAI

(Academically Autonomous Institute, Government of Maharashtra)

Teaching and Examination Scheme (P19R)

With effect from AY 2022-23

Programme: Diploma in Mechanical Engineering (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				
UV19R102	UNIVERSAL HUMAN VALUES - II	--	--	--	--	2	--	--	--	--	--	--	--
SC19R102	ENGINEERING PHYSICS	3	2	--	5	5	60	20	20	25*	--	25	150
SC19R110	ENGINEERING MATHEMATICS	4	--	--	4	4	60	20	20	--	--	--	100
ME19R209	FUNDAMENTALS OF ELECTRICAL & ELECTRONICS ENGINEERING	3	4	--	7	7	60	20	20	25	--	25	150
AM19R201	ENGINEERING MECHANICS	3	2	--	5	5	60	20	20	25	--	25	150
ME19R202	ENGINEERING DRAWING-II	3	3	--	6	6	60	20	20	--	--	50	150
ME19R401	C PROGRAMMING (Spoken Tutorial)	--	3#	--	3	3	--	--	--	--	--	--	--
	Total	16	14	--	30	32	300	100	100	75	--	125	700
	Student Centered Activity (SCA)				05								
	Total Contact Hours				35								

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: Duration of Examination--TS1&TS2 -1 hour, TH- 2 hours 30 min, PR/OR – 3 hours per batch, SCA- Library -1 hour, Sports- 2hours, Creative Activity-2 hours

indicates Self, on- line learning Mode through MOOCs/Spoken Tutorials /NPTEL/SWAYAM/FOSSEE etc.

Department Coordinator,
Curriculum Development,
Dept. of Mechanical Engineering

Head of Department
Dept. of Mechanical Engineering

In-Charge
Curriculum Development Cell

Principal

Programme : Diploma in ME/CE/EE/CO/IF/IS/EC/RT/LT/LG (Sandwich Pattern), AIML										
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
--	--	-	02	-	-	-	--	--	--	--

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	<p>Students to arrange visit under supervision of mentor.</p> <p>Identify and impart technical skills needed to improve their lives.</p>	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	https://www.constitutionofindia.net/constitution_of_india/preamble
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. Rajendra singh- Water man of india, Dr. A P J Abdul kalam- scientist and former president of india. Mohammed Yunus- Bangladeshi social entrepreneur, Kapil Dev- Cricketer of the century. David Packard- 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

10	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: https://sdgs.un.org/goals	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
-----------	--	---	---	--	--	---------------------------

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:

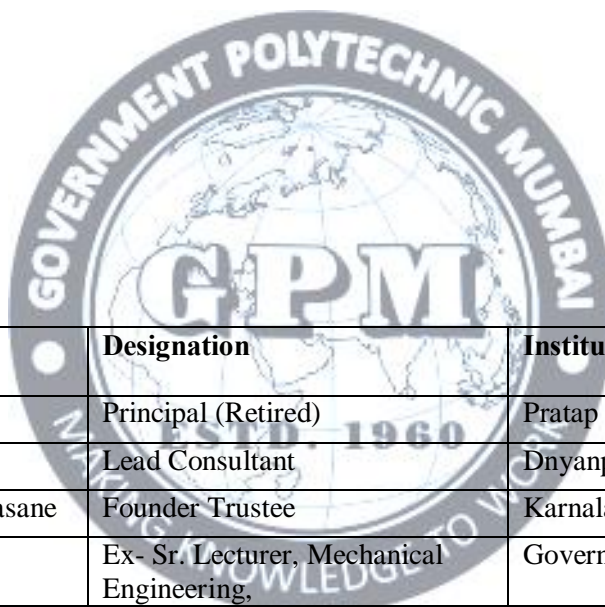
Sr. No.	Title	Author, Publisher, Edition and Year Of publication	ISBN
1	A Foundation Course in Human Values and Professional Ethics	R.R. Gaur, R. Sangal, G.P. Bagaria, Excel Books, New Delhi, 2010	978-8-174-46781-2
2	Human Values	A.N. Tripathy, New Age International Publishers, 2003	978-8-122-42589-5
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 (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
- 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:**

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

Institute Coordinator,
Curriculum Development,

Principal
Government Polytechnic, Mumbai

Programme : Diploma in CE/ ME (Sandwich pattern)										
Course Code: SC19R102				Course Title: Engineering Physics						
Compulsory / Optional: Compulsory										
Teaching Scheme and Credits				Examination Scheme						
L	P	TU	Total	TH (2Hrs.30 minutes)	TS1 (1 Hr.)	TS2 (1Hr.)	PR	OR	TW	Total
3	2	--	5	60	20	20	25*	--	25	150

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 surface tension
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:

Unit No	Topics / Sub-topics
1	<p>Units and Measurements</p> <p>1.1 Fundamental Physical quantities, examples.</p> <p>1.2 Derived physical quantities, examples.</p> <p>1.3 Definition and requirements of unit</p> <p>1.4 System of units, C. G. S., M. K. S. and S. I. units.</p> <p>1.5 Rules to write the unit and conventions of units and Significant figures, rules to write significant figures.</p> <p>1.6 Error – Definition, types of errors and estimation of errors</p> <p>1.7 Numerical</p> <p>Course Outcome: CO1 Teaching Hours : 8 hrs. Marks: 6 (R- 2, U-2, A-2)</p>
2	<p>Motions</p> <p>2.1 Linear motion –Definition – distance, displacement, velocity, equation of motions, acceleration due to gravity and under gravity, numerical</p> <p>2.2 Periodic motions : a)Oscillatory motion, b)Vibratory motion, c) S.H.M d) Circular motion. (only definition and examples),</p> <p>2.3 Angular motion: 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.</p> <p>2.4 Kinetics</p> <p>2.4.1 Definition Kinetics , momentum, impulse, impulsive force</p> <p>2.4.2 Newton’s laws of motion with equation</p> <p>2.4.3 Application of Newton’s laws of motion</p> <p>2.4.4 Definition and unit - work power energy</p> <p>2.4.5 Work energy principle</p> <p>2.4.6 Numerical.</p> <p>Course Outcome: CO2 Teaching Hours :10 hrs. Marks: 10 (R- 2 , U-4 , A-4)</p>
3	<p>General Properties of Matter</p> <p>3.1 Elasticity:</p> <p>3.1.1 Deforming force, restoring force, Elastic, plastic and rigid substances, and their examples.</p> <p>3.1.2 Definition of elasticity, stress, strain and its types.</p> <p>3.1.3 Hooke’s Law and elastic limit.</p> <p>3.1.4 Stress - Strain curve, yield point, breaking point.</p> <p>3.1.5 Young’s Modulus, Bulk modulus and Modulus of rigidity</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>3.2 Liquid Friction</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>3.3 Viscosity</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>3.4 Surface Tension:</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>Course Outcome: CO3 Teaching Hours: 12 hrs. Marks: 18 (R- 4, U- 6, A- 8)</p>
4	<p>Sound and Acoustic</p> <p>4.1 Sound Waves:</p> <p>4.1.1 Wave motion, types of waves – progressive, longitudinal and transverse waves.</p> <p>4.1.2 Characteristics of longitudinal and transverse waves and comparison.</p> <p>4.1.3 Free or natural vibrations and forced vibrations, resonance – definition and examples.</p> <p>4.1.4 Determination of velocity of sound by resonance method.</p> <p>4.1.5 Numerical.</p> <p>4.2 Acoustics:</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>Course Outcome: CO4 Teaching Hours: 8 hrs. Marks: 10 (R- 2, U- 4, A- 4)</p>

5	<p>Optics and Optical Fiber</p> <p>5.1 Optics:</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>5.2 Optical Fiber:</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>Course Outcome: CO5 Teaching Hours : 4 hrs. Marks: 10 (R- 2 , U- 4 , A- 4)</p>
6	<p>LASER</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>Course Outcome: CO5 Teaching Hours : 3 hrs. Marks: 6 (R- 2 , U- 2 , A-2)</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
Total		14	22	24	60

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
Total				30

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 Subhramanyan	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	978-0-07-1755487-3
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
3. www.youtube/physics
4. www.ferrophysics.com
5. <http://hperphysics.phastr.gsu.edu/hbase/hph.htm>
6. 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
CO5	3	1	1	1	---	---	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	---
CO5	3	1	1	1	---	---	1	1	---

Industry Consultation Committee:

Sr. No	Name	Designation	Institute/organization
1	Mr. Rajesh Masane	Sr. Engineer	L and T Mumbai
2	Mrs B.J. Choudhary	Lecturer in Physics	Govt. Polytechnic Thane
3	Mrs S.A. Thorat	Lecturer in Physics	Govt. Polytechnic Mumbai
4	Dr. D.S. Nikam	Lecturer in Physics	Govt. Polytechnic Mumbai

Coordinator,
Curriculum Development,
Department of Sci. & Humanities

Head of Departments
Department of Sci. & Humanities

I/C, Curriculum Development Cell

Principal

Programme : Diploma in CE/ME/CO/IF/EC/EE/IS										
Course Code: SC19R110				Course Title: ENGINEERING MATHEMATICS						
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
4	--	--	4	60	20	20	--	--	--	100

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, derivatives, complex number and relations between two variables.
CO2	Apply rules, concept and properties to solve the problems
CO3	Solve the given problems of integration using suitable method.

Course Content Details:

Unit No	Topics / Sub-topics
1	1. Function 1.1 Definition of variable, constant, intervals such as open, closed, semi-open etc 1.2 Definition of function, value of function and types of functions and simple examples Course Outcome: CO1 Teaching Hours : 10 hrs Marks: 10 (R- 4, U-4, A-2)
2	2. Limits 2.1 Definition of neighbourhood, concept and definition of limit 2.2 Limits of Algebraic function 2.3 Limits of Trigonometric Functions with simple examples Course Outcome: CO1 Teaching Hours : 10 hrs Marks: 10 (R- 2, U-4, A-4)
3	3. Derivatives & Application of derivative 3.1 Definition of the derivative. 3.2 Derivatives of standard function. (No proof by first principle) 3.3 Differentiation of sum, difference, product and quotient of two or more functions 3.4 Differentiation of composite function with simple example. 3.5 Second order derivative. 3.6 Geometrical Meaning of Derivative 3.7 Tangents & Normals to the curve, 3.8 Maxima & minima of the function 3.9 Radius of curvature Course Outcome: CO2 Teaching Hours : 10 hrs Marks: 10 (R-4, U-4, A-2)
4	4. Integration & Application of integration 4.1 Definition of integration as antiderivative, Integration of standard function 4.2 Rules of integration (Integration of sum, difference, scalar multiplication) without proof 4.3 Integration by substitution 4.4 Integration of composite function 4.5 Definition of definite integral 4.6 Properties of definite integral with simple problems 4.7 Area under the curve 4.8 Area bounded by two curves Course Outcome: CO3 Teaching Hours : 10 hrs Marks: 10 (R-4, U-4, A-2)
5	5. Complex Number:- 5.1 Definition of complex number Cartesian, Polar, Exponential form of complex number 5.2 Algebra of complex number :- Equality, addition, Subtraction, Multiplication & Division with simple examples Course Outcome: CO2 Teaching Hours : 10 hrs Marks: 10 (R- 2, U-4, A-4)
6	6. Numerical Analysis 6.1 Solution of Algebraic equations using – i) Bisectional method ii) Regular – Falsi method, iii) Newton- Raphson method 6.2 Solution of simultaneous equation (i) Gauss elimination method

(ii) Jacobi's method (iii) Gauss-Seidal method Course Outcome: CO2 Teaching Hours : 10 hrs Marks: 10 (R- 2 , U- 4 , A- 4)
--

Suggested Specifications Table (Theory):

Unit No	Topic Title	Distribution of Theory Marks			
		R Level	U Level	A Level	Total Marks
1	Function	04	04	02	10
2	Limits	02	04	04	10
3	Derivatives & Application of Derivatives	04	04	02	10
4	Integration & Application of Integration	04	04	02	10
5	Complex Number	02	04	04	10
6	Numerical Analysis	02	04	04	10
Total		18	24	18	60

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
2. www.Scilab.org/-SCI Lab
3. www.mathworks.com/Products/Matlab/-MATLAB
4. www.wolfram.com/mathematica/-Mathematica
5. <https://www.khanaacademy.org/math?gclid=CNqHuabCys4CFdoJaAoddHoPig>
6. www.dplot.com/-Dplot
7. www.allmathcad.com/-Math CAD
8. 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 (CIVIL ENGINEERING)

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

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

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

CO Vs PO and CO Vs PSO Mapping (ELCTRONICS ENGINEERING)

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

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

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

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

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2
CO1	3			1			1	1	1
CO2	3			1			1	1	1
CO3	3			1			1	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. A.S.Patil	Lecturer in Mathematics	Government polytechnic Mumbai
4	Mr. V.S.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 : Diploma in Mechanical Engineering (Sandwich Pattern)										
Course Code: ME19R209				Course Title: Fundamentals of Electrical and Electronics Engineering						
Compulsory / Optional: Compulsory										
Teaching Scheme and Credits				Examination Scheme						
L	P	TU	Total	TH (2 Hrs 30min)	TS1 (1 Hr)	TS2 (1Hr)	PR	OR	TW	Total
3	4	--	7	60	20	20	25	-	25	150

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:

This is the subject where the principles of electrical energy are studied. Knowledge of basics of electrical is essential to apply on all type of electrical machines, instruments, devices and equipment's. The basic aim of this course is that, the student must learn basic concepts, rules and laws of electric and magnetic circuits and practical's. The knowledge of this course will be useful for other higher-level subject

Course Outcomes: Student should be able to

CO1	Apply basic concepts of electrical engineering
CO2	Analyze performance of single-phase transformer
CO3	Select electric machine for specific application.
CO4	Describe the fundamentals of Diode and their applications
CO5	Illustrate the basic fundamentals, biasing techniques and applications of transistor
CO6	List types of power devices and their applications

Course Content Details:

Unit No	Topics / Sub-topics
1	Basic Concept
	1.1 Concept of Electric current, Electric Potential, Potential difference, E.M.F. Difference between E.M.F and Potential Difference
	1.2 Resistance, factors affecting Resistance, Effect of Temperature on Resistance. Temperature Co-efficient of Resistance
	1.3 Classification of Electric Current, compare DC with AC
	1.4 Effects of Electric Current.
	1.5 Concept of Electrical Work, Power & Electrical energy (Simple Problems)
	1.6 Equation for equivalent resistance connected in i) series ii) parallel
	1.7 Concept of current, voltage, phasor relationship of current and voltage, waveform of pure resistance, pure inductance and pure capacitance
	1.8 Concept of Power and power factor

	<p>1.9 Power triangle: Active power, Reactive power, Apparent power</p> <p>1.10 Magnetic circuit, Magnetic flux, properties of magnetic lines of force, magnetic flux density</p> <p>1.11 Faraday's Laws of Electromagnetic Induction.</p> <p>1.12 Direction of induced E.M.F i) Fleming Right Hand Rule ii) Lenz's Law</p> <p>1.13 Types of Induced E.M.F. Self & mutual Induction (no numerical)</p> <p>Course Outcome: CO1 Teaching Hours:12 Marks: 12 (R-2 , U-6,A-4)</p>
2	<p>Transformer</p> <p>2.1 Working Principal of transformer.</p> <p>2.2 Construction of Single phase Transformer and types of transformer depending on construction and transformation ratio.</p> <p>2.3 EMF equation(No derivation):voltage ratio, Turns ratio Transformation ratio</p> <p>2.4 Transformer losses, Efficiency and regulation of transformer</p> <p>2.5 specification & application of transformer</p> <p>2.6 Three phase transformer: types of three phase transformer depending on connection.</p> <p>2.7 Comparison between single phase and three phase transformer</p> <p>2.8 Construction and working of Welding transformer</p> <p>Course Outcome: CO2 Teaching Hours : 8 Marks: 7(R- 2 , U- 3 , A- 2)</p>
3	<p>Induction Motor</p> <p>3.1 Working principle.</p> <p>3.2 3ph Squirrel cage induction motor – construction, application</p> <p>3.3 Slip Ring Induction motor – construction, application</p> <p>3.4 Synchronous speed, % slip [simple problems]</p> <p>3.5 Starting of 3 ph induction motor i) DOL ii) Star Delta iii) Reduced voltage iv) Rotor resistance starter</p> <p>3.6 Torque – Slip characteristics, Rating and Specification of three phase induction motor.</p> <p>3.7 Speed control: Voltage control, Rotor resistance control & frequency control</p> <p>3.8 Reversal of Induction Motor</p> <p>3.9 Single phase Induction motor : Types only</p> <p>3.10 Comparison between three phase and single phase Induction Motor</p> <p>Course Outcome: CO3 Teaching Hours :10 Marks:11(R-2 , U-5, A-4)</p>
4	<p>Diode application</p> <p>4.1 PN junction diode: Forward and reverse bias.</p> <p>4.2 Review of Transformer: Step Up, Step down.</p> <p>4.3 Rectifier: Definition, Types, Circuit diagram, waveforms and Working of a) Half wave rectifier (b) Full Wave rectifier (Centre Tapped) (c) Full wave Bridge rectifier.</p> <p>CourseOutcome:CO4 Teaching Hours:4 Marks:10 (R-2, U-4, A-4)</p>

5	<p>Transistor Fundamentals and applications</p> <p>5.1 Bipolar Junction Transistor: Symbol, Construction and working of PNP and NPN transistors. BJT biasing: Introduction: Need of biasing, DC Operating point and load line, factors contributing to thermal instability, Effect of temperature (Thermal runaway), Stability Factor</p> <p>5.2 Voltage divider bias Application of Transistor:</p> <p>5.3 Transistor as a Switch.</p> <p>5.4 Single stage Common Emitter (CE) amplifier (circuit diagram and working) and its frequency response.</p> <p>Course Outcome:CO5 Teaching Hours:7 Marks:12(R-2, U-6, A-4)</p>
6	<p>Power devices</p> <p>6.1 Construction, symbol, characteristics and application of SCR, TRIAC and DIAC. 6.2 Relay : symbol , contacts , construction , working , applications of general purpose relay.</p> <p>Course Outcome:CO6 Teaching Hours:4 Marks: 08(R-2, U-6, A-0)</p>

Suggested Specifications Table (Theory):

Unit No	Topic Title	Distribution of Theory Marks			
		R Level	U Level	A Level	Total Marks
1	Basic Concept	2	6	4	12
2	Transformer	2	3	2	7
3	Induction Motor	2	5	4	11
4	Diode application	2	4	4	10
5	Transistor Fundamentals and applications	2	6	4	12
6	Power devices	2	6	--	08
Total		12	30	18	60

List of experiments for Electrical Engineering: Any 10 experiments out of 13

Sr. No.	Unit No	CO	List of Experiments	Hours
1	1	CO1	Use of Multimeter for measurement of AC & DC voltage, resistance, continuity	2
2	2	CO2	Measure the voltage ratio and transformation ratio of transformer	2
3	3	CO3	To measure slip of 3-phase induction motor.	2
4	1	CO1	To measure current, voltage, power and energy in single-phase circuit	2

Sr. No.	Unit No	CO	List of Experiments	Hours
5	2	CO2	To verify efficiency and regulation of transformer	4
6	3	CO3	To plot speed Torque characteristics of 3- phase induction motor	2
7	1	CO1	Measure voltages and currents in series and parallel resistive circuit.	4
8	1	CO1	To verify effect of temperature on resistance of conductor.	2
9	2	CO2	Prepare a report on types of three phase transformer depending on connection.	2
10	3	CO3	To use different types of starter to start and run three phase Induction motor. i) DOL Starter ii) star delta starter iii) Rotor resistance starter	2
11	1	CO1	To verify Faraday's First Law of electromagnetic Induction (For Dynamically & Statically Induced EMF)	2
12	2	CO2	Demonstration and Study of Welding Transformer	2
13	3	CO3	To reverse the direction of three phase Induction motor.	2
Total				30

List of experiments for Electronics Engineering:

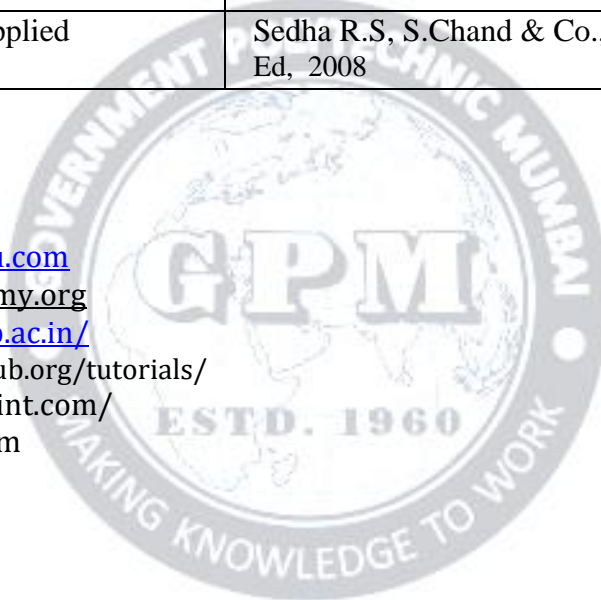
Sr. No.	Unit No	CO	List of Experiments	Hours
1	4	CO4	To plot the V-I characteristic of semiconductor P-N diode.	4
2	5	CO5	To construct transistor as switch and Observe input and output waveforms.	4
3	6	CO6	To plot the V-I characteristic of SCR	4
4	4	CO4	To observe the waveform of half wave rectifier.	2
5	4	CO4	To observe the waveform of full wave Centre tapped rectifier	2
6	4	CO4	To construct and observe the waveform of full wave bridge rectifier	2
7	5	CO5	To plot input and output characteristics of BJT in CE mode	4
8	5	CO5	To draw a frequency response of Single stage Common Emitter amplifier	4
9	6	CO6	To test the phase control / light dimmer circuit using SCR	4
Total				30

References/ Books:

Sr. No.	Title	Author, Publisher, Edition and Year Of publication	ISBN
1	Electrical Technology (Volume I and II)	B.L. Theraja, A.K. Thereja S. Chand and Co. Ltd. , 23 rd Ed., 1959	978-8121-9244-05 978-8121-9243-75
2	Basic Electrical Engineering	V. K. Mehta, Rohit Mehta, S. Chand and Co. Ltd., Revised Ed. 2006	978-8121-9087-19
3	Electronics Principles	Malvino, Albert Paul, David, McGraw Hill Education, 7th edition ,1 July 2017	978-0070634244
4	Principles of Electronics	Mehta V.K., Mehta Rohit , S. Chand and Company, 7 th Ed, 2014	978-8121-9245-04
5	Fundamentals of Electronic Devices and Circuits	Bell, David ,Oxford University Press, 5 th Ed., 2007	978-0195-4252-39
6	A text book of Applied Electronics	Sedha R.S, S.Chand & Co., 3 rd Ed, 2008	978-8121-9278-33

E-References:

- www.nptel.com
- www.electrical4u.com
- www.khanacademy.org
- <https://ndl.iitkgp.ac.in/>
- www.electronicshub.org/tutorials/
- www.tutorialspoint.com/
- www.youtube.com



CO Vs PO and CO Vs PSO Mapping

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

Industry Consultation Committee:

Sr. No	Name	Designation	Institute/Organisation
1	Mr. Sachin Dhale	Software Engineer	Tech- Mahindra
2	Mr.Prahant Hiremat	Senior Engineer	Reliance Industries, Navi Mumbai
3	Miss A. R. Hagawane	Lecturer in Mechanical Engineering	Govt. Polytechnic Mumbai
4	Miss A.V. Patil	Lecturer in Electrical Engineering	Govt. Polytechnic Mumbai
5	Mrs.Puri Sanyogeeta B.	Lecturer in Electronics Engineering	Govt. Polytechnic Mumbai

Coordinator,
Curriculum Development,
Department of Mechanical Engineering

Head of Department
Department of Mechanical Engineering

I/C, Curriculum Development Cell

Principal

Programme : Diploma in Civil Engineering Mechanical Engineering (Sandwich Pattern)										
Course Code:AM19R201				Course Title: Engineering Mechanics						
Compulsory / Optional: Compulsory										
Teaching Scheme and Credits				Examination Scheme						
L	P	TU	Total	TH (2Hrs 30min)	TS1 (1Hr)	TS2 (1Hr)	PR	OR	TW	Total
03	02	--	05	60	20	20	25	--	25	150

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. Two practical skill test are to be conducted. First skill test at mid term and second skill test at the end of the term

Rationale :

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

Course Outcomes: Student should be able to

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

Course Content Details:

Unit No	Topics / Sub-topics
1	Simple Machines: 1.1 Definitions 1.2 Simple machine, compound machine , load , effort , mechanical advantage , velocity ratio , input of a machine ,output of a machine efficiency of a machine , ideal machine,

	<p>ideal effort and ideal load, load lost in friction, effort lost in friction</p> <p>1.3 Analysis: Law of machine, maximum mechanical advantage and maximum efficiency of a machine, reversibility of a machine, condition for reversibility of a machine, self-locking machine, simple numerical problems.</p> <p>1.4 Velocity Ratio for simple machines :</p> <p>Simple axle and wheel, differential axle and wheel, Weston's differential pulley block, single purchase crab, double purchase crab, worm and worm wheel, geared pulley block, screw jack, calculation of mechanical advantage, efficiency, identification of type such as Reversible or not etc.</p> <p>Course Outcome: CO1 Teaching Hours : 6 hrs Marks: 12 (R- 2, U-4, A-6)</p>
2	<p>Force systems:</p> <p>2.1 Fundamentals and Force systems: Definitions engineering mechanics, statics, Dynamics. Classification of force system according to plane coplanar and non-coplanar, sub classification of coplanar force system-collinear, concurrent, non-concurrent, parallel, Definition of a force, representation of a force by vector and by Bow's notation method. Characteristics of a force, effects of a force, principle of transmissibility.</p> <p>2.2 Resolution of a force and Moment of a force: Definition, Method of resolution, along mutually perpendicular direction and along two given direction. Definition of moment, classification of moments, sign convention, law of moments, Varignon's theorem of moment and its use, definition of couple, properties of couple</p> <p>2.3 Composition & resolution of forces : Definition of Resultant force, methods of composition of forces, Law of parallelogram of forces, Algebraic method for determination of resultant for various force system.</p> <p>2.4 Graphical method: Space diagram, vector diagram, polar diagram, and funicular polygon. Resultant of concurrent and parallel force system only.</p> <p>Course Outcome: CO2 Teaching Hours:10hrs Marks:12(R-4, U-4, A-4)</p>
3	<p>Equilibrium:</p> <p>3.1 Equilibrant and Lami's Theorem: Definition of equilibrant, relation between resultant and equilibrant, equilibrant of concurrent and non-concurrent force system. Analytical, free body and free body diagram. Statement and explanation of Lami's theorem and Application.</p> <p>3.2 Beams: Definition, Types of beams (cantilever, simply supported, overhanging, fixed, continuous), Types of end supports (simple support, hinged, roller), classification of loads, point load, inclined point load, uniformly distributed load. Analytical method to determine reactions of simply supported, cantilever and over hanging beam subjected to point loads and UDL and graphical method to determine reactions for beams subjected to vertical point loads & UDL only</p> <p>Course Outcome:CO3 Teaching Hours:8hrs Marks:10(R-2, U-4, A-4)</p>

4	<p>Friction: 4.1 Definition: Friction, Types of friction, limiting frictional force, coefficient of friction, angle of friction, angle of repose, relation between angle of friction, angle of repose and coefficient of friction. Cone of friction, advantages and disadvantages of friction.</p> <p>4.2 Equilibrium of body on Horizontal and inclined plane: Equilibrium of body on horizontal plane subjected to horizontal and inclined force. Equilibrium of body on inclined plane subjected to forces applied parallel to the plane only. Concept of ladder friction.</p> <p>4.3 Introduction (only) -Dynamic friction</p> <p>Course Outcome: CO4 Teaching Hours:8hrs Marks:10 (R-2, U-4, A-4)</p>
5	<p>Centroid and Centre Of Gravity: 5.1 Centroid: Definition of centroid. Moment of an area about an axis. Centroid of basic geometrical figures such as square, rectangle, triangle, circle, semicircle and quarter circle. Centroid of composite figure with not more than three geometrical figures.</p> <p>5.2 Center of gravity: Definition, center of gravity of simple solids such as cylinder, sphere, hemisphere, cone, cube, and rectangular block. Centre of gravity of composite solids with not more than Two simple solids. (Hollow solids are expected.)</p> <p>Course Outcome: CO5 Teaching Hours:8hrs Marks:10 (R-2, U-2, A-6)</p>
6	<p>Dynamics : 6.1 Kinetics :Definition of kinetics, Newton's laws of motion and its applications. 6.2 Kinematics :Definition of kinematics, Basic concepts of motion, rectilinear motion, displacement, velocity, speed, acceleration.</p> <p>6.3 Angular motion :Introduction, definition of angular velocity, angular acceleration, angular displacement, (Simple Numericals)</p> <p>6.4 Motion under gravity. (No numerical on this subtopic)</p> <p>Course Outcome: CO6 Teaching Hours:5hrs Marks:6 (R-2, U-0, A-4)</p>

Suggested Specifications Table (Theory):

Unit No	Topic Title	Distribution of Theory Marks			
		R Level	U Level	A Level	Total Marks
1	Simple Machines	2	4	6	12
2	Force Systems	4	4	4	12
3	Equilibrium	2	4	4	10
4	Friction	2	4	4	10
5	Centroid and Centre Of Gravity	2	2	6	10
6	Dynamics	2	--	4	6
Total		14	18	28	60

List of experiments:

Sr. No.	Unit No	COs	Title of the Experiments	Hours
1	01	CO1	To determine MA, VR, Efficiency, Ideal Effort, Effort lost in friction for Differential axle & wheel and for Simple screw jack.	02
2	01	CO1	To determine MA, VR, Efficiency, Ideal Effort, Effort lost in friction for single purchase crab and for double purchase crab.	02
3	02	CO2	Verify law of polygon of forces	02
4	02	CO2	Graphically determine resultant of concurrent and non-concurrent force system.	04
5	02	CO2	Graphically determine resultant of parallel force system.	02
6	02	CO2	To verify law of moments.	02
7	03	CO3	To verify of Lami's theorem	02
8	03	CO3	To verify the Equilibrium of parallel forces – simply supported beam reactions	02
9	04	CO4	To determine coefficient of friction for motion on horizontal plane.	04
10	05	CO5	Determination of Centroid of basic geometrical figures such as square, rectangle, triangle, circle & Centre of gravity of simple solids such as cylinder, sphere, cone, cube.	04
11	06	CO6	Numericals on Angular motion	04
		Total		30

Note: All experiments are compulsory

References/ Books:

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

E-References:

1. support@swayam.gov.in
2. arunasis@iitg.ernet.in
3. www.google.com
4. www.youtube.com
5. <http://www.nationallibrary.gov.in>

CO Vs PO and CO Vs PSOMapping (CIVIL ENGINEERING)

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3
CO1	3	3	3	2	1	2	2	3	2	--
CO2	3	3	3	2	1	1	2	3	--	--
CO3	3	3	3	2	1	1	2	3	--	--
CO4	3	3	3	2	1	1	2	3	--	--
CO5	3	3	3	2	1	1	2	3	--	--
CO6	3	3	3	2	1	1	2	3	--	--

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

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

Industry Consultation Committee:

Sr. No	Name	Designation	Institute/Organisation
1	ShriShivkumarAade	Deputy Chief Engineer	Mhada
2	ShriSharadSonawane	Director	Om Ajay Constructions
3	SmtYaxikaSoni	Sr.Lecturerin Civil Engineering	S.B.M.Polytechnic
4	SmtSanjana Male	Lecturer in Civil Engineering	G.P.Mumbai
5	SmtAshwiniHagawane	Lecturer in Mechanical Engineering	G.P.Mumbai

Coordinator,
Curriculum Development,
Department of Civil Engineering

Head of Department
Department of Civil Engineering

I/C, Curriculum Development Cell

Principal

Programme : Diploma in Mechanical Engineering (Sandwich Pattern)										
Course Code: ME19R202				Course Title: Engineering Drawing-II						
Compulsory / Optional: Compulsory										
Teaching Scheme and Credits				Examination Scheme						
L	P	TU	Total	TH (3Hrs 30 min)	TS1 (1Hr 30 min)	TS2 (1Hr, 30 min)	PR	OR	TW	Total
3	3	--	6	60	20	20	--	--	50	150

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:

Engineering drawing is the graphical language of Engineers. This is a graphical tool used by the Designers, Planners, Supervisors and Technician to express their thoughts, ideas and concepts. It offers students an insight into the methods of dealing with engineering drawing problems. This preliminary course aims at building a foundation for further course in machine drawing and other allied subjects. This subject is useful in developing imagination, drafting and sketching skills of students.

Course Outcomes: Student should be able to

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

Course Content Details:

Unit No	Topics / Sub-topics
1	Projection of Solids 1.1 Projections of Prism, Pyramid, Cone, Cylinder, Tetrahedron, Cube with their axes inclined to one reference plane and parallel to other. 1.2 Projections of above solids using auxiliary plane method
	Course Outcome: CO1 Teaching Hours :06 Marks: 06 (R-0, U-0, A-6)
2	Sections of Solids Draw the sectional views for a cutting plane parallel to one perpendicular to other plane 2.1 Cone, Pyramid, Prism & Cylinder resting on their base on Horizontal Plane.

	2.2 Prism, Cylinder: a) Axis parallel to both the reference plane. b) Axis perpendicular to and parallel to other plane Course Outcome:CO2 Teaching Hours:08 Marks: 12(R-0, U-0, A-12)
3	Developments of Surfaces 3.1 Draw the development of lateral surfaces of cube, prism, cylinder, pyramid and cone 3.2 Development of surfaces such as tray, funnel, Chimney and pipe bends. Course Outcome:CO3 Teaching Hours :09 Marks: 12(R-0, U-0, A-12)
4	Intersection of solids 4.1 Prism with prism, Cylinder with cylinder, Prism with Cylinder When (i) the axes are at 90° and intersecting (ii) The axes are at 90° and Offset. and cone resting on base on HP and with axis intersecting and offset from axis of cylinder. Course Outcome:CO4 Teaching Hours : 06 Marks:08 (R-0, U-0, A-08)
5	Missing views 5.1 Draw the missing view for a given orthographic views 5.2 Draw the sectional missing view for a given orthographic views Course Outcome:CO5 Teaching Hours : 08 Marks:10 (R-0, U-0, A-10)
6	Auxiliary views 6.1 Concept of auxiliary plane 6.2 Projection of object on auxiliary plane 6.3 Completing the auxiliary views with the help of given views Course Outcome:CO6 Teaching Hours :08 Marks:12 (R-0, U-0, A-12)

Suggested Specifications Table (Theory):

Unit No	Topic Title	Distribution of Theory Marks			
		R Level	U Level	A Level	Total Marks
1	Projection of Solids	0	0	06	06
2	Sections of Solids	0	0	12	12
3	Developments of Surfaces	0	0	12	12
4	Intersection of solids	0	0	08	08
5	Missing views	0	0	10	10
6	Auxiliary views	0	0	12	12
Total		0	0	60	60

List of Drawing Sheets

Sr. No.	Unit No	COs	Title of the Experiments	Hours
1	1	CO1	Sheet No:1 Projection of Hexahedron/pyramid/prism /cone (one problem)	02
2	2	CO1	Sheet No:1 Projection of Hexahedron/pyramid/prism /cone with auxiliary method (one problem)	02
3	3	CO2	Sheet No:2 Sections of Solids such as cone/pyramid/cylinder/prism when true shape of the section is given (one problem)	04
4	4	CO2	Sheet No:2 Sections of Solids such as cone/pyramid/cylinder/prism when cutting section is given (one problem)	04
5	5	CO3	Sheet No:3 Developments of Surfaces such as cone/pyramid/cylinder/prism when cutting section is given (one problem)	04
6	6	CO3	Sheet No:3 Developments of Surfaces such as Tray/ Elbow/Pipe Joints (one problem)	04
7	1	CO4	Sheet No:4 Intersection of solids interpenetrating solid intersecting their axis such as prism with prism or cylinder with cylinder or cone with cylinder (Two problems)	04
8	2	CO4	Sheet No:4 Intersection of solids interpenetrating solid with offset in their axis such as prism with prism or cylinder with cylinder or cone with cylinder (Two problems)	05
9	3	CO5	Sheet No:5 Missing views (Two problems)	04
10	4	CO5	Sheet No:6 Missing sectional views (Two problems)	04
11	5	CO6	Sheet No:7 Auxiliary views (Two problems)	04
12	6	CO6	Sheet No:8 Complete the Top view/ Front view when auxiliary view is given (Two problems)	04
Total				45

Note: All Sheets are compulsory.

References/ Books:

Sr. No.	Title	Author, Publisher, Edition and Year Of publication	ISBN
1	Engineering drawing	N.D.Bhatt, Charotar Publishing House, 53 rd Edition, 2016	978-9380-3581-78
2	Engineering Graphics	P.J. Shah, S. Chand, revised edition, 2014	978-8121-9296-79
3	Engineering Drawing	Amar Pathak, Wiley Publication, 1 st Ed. 2010	978-9350-0401-64
4	Engineering drawing	D.Jolhe, Tata McGraw Hill Education, 2017	978-0070-6483-71

5	Textbook on engineering drawing	K.L.Narayan,P.Kannaiah, Scitech publications, 24 th reprint, 2010,	978-8183-7142-28
6	Engineering drawing practice For school and colleges	IS Code SP-46	-

E-References:

1. <https://ocw.mit.edu/courses/drawing>
2. <https://nptel.in/courses/drawing>
3. <http://home.iiik.edp.ac.in>

CO Vs PO and CO Vs PSO Mapping

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2
CO1	02	01	01	01	01	01	02	01	01
CO2	02	01	01	01	01	01	02	01	01
CO3	03	01	02	01	01	01	03	01	01
CO4	03	01	02	01	01	01	03	01	01
CO5	02	01	02	01	01	01	03	01	01
CO6	02	01	02	01	01	01	03	01	01

Industry Consultation Committee:

Sr. No	Name	Designation	Institute/Organization
1	Mr. Kiran Pawar	Managing Director	Seven star solar system Ltd
2	Mr. K.B. Salunkhe	Sel. Grade Lecturer in Mechanical Engineering	Government Polytechnic, Thane
3	Dr. S. B. Mahagaonkar	Sel. Grade Lecturer in Mechanical Engineering	Government Polytechnic, Mumbai
4	Mr. K. Z. Dhangare	Lecturer in Mechanical Engineering	Government Polytechnic, Mumbai

Coordinator,
Curriculum Development,
Department of Mechanical Engineering

Head of Department
Department of Mechanical Engineering

I/C, Curriculum Development Cell

Principal