Elements of Mechanical Engineering

Autonomous

[2018 Syllabus]

Subject code: 18ME1ICEME/18ME2ICEME

I SEMESTER B.E./B.Tech (PHYSICS GROUP)												
Course and Course Code		Course Title	Teaching Department	Paper Setting Board	Teaching Hours /Week			Examination				Credits
					Theory Lecture	Tutorial	Practical/ Drawing	Duration in hours	CIE Marks	SEE Marks	Total Marks	
					L	T	P					
ESC	18ME1ICEME	Elements of Mechanical Engineering	ME, Auto & IEM Engineering	Mechanical Engineering	2	2	- -	03	50	50	100	3

Course outcomes: At the end of the semester, students will be able to

CO.1	Identify the various sources of energy, comprehend the properties of steam &working of boilers and turbines
CO.2	Understand the working of Internal combustion engines and refrigeration concepts.
CO.3	Understand various machine tools, their specifications and modern manufacturing systems
CO.4	Understand various metal joining processes
CO.5	Understand the fundamentals of various power transmission systems
CO.6	Understand and appreciate significance of mechanical engineering in different fields of engineering

CO-PO matrices

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO.1	3	3											3	2	
CO.2	3	3											3	2	
CO.3	3				3								3	2	
CO.4	3												3	2	
CO.5	3	3											3	2	
CO.6	3												3	2	

Unit	Contents	Hours	COs
1	**Steam:** Formation of steam, Types of steam, Steam properties-Enthalpy, dryness fraction, wetness fraction, latent heat, sensible heat, Internal energy, Specific volume, External work of evaporation, degree of superheat, amount of superheat, saturated and superheated temperature, Numericals on steam. **Boilers:**Classification of Boilers, Babcock and Wilcox Boiler, Lancashire Boiler, Boiler mountings and accessories (no sketches) **Steam Turbines:** Classification, Principle operation of Impulse and reaction turbines, Delaval's turbine, Parson's turbine **Water turbines:** Classification, Principles and operations of Pelton wheel, Francis turbine, Kaplan turbine.	7	1,6
	Demonstration of Boiler models and working of Water Turbines in Heat Transfer Laboratory and Fluid Machinery Laboratory	1	
2	**Internal combustion (I.C) engines:**I.C. Engines parts, 2 Stroke and 4 stroke petrol engines, 4 stroke diesel engines. P-V diagrams of Otto and Diesel cycles, Numericals on indicated power, brake power, indicated thermal efficiency, brake thermal efficiency, mechanical efficiency and specific fuel consumption. **Refrigeration:** Definitions –Refrigeration, Ton of Refrigeration, Unit of Refrigeration, Refrigerating effect, Ice making capacity, COP, Relative COP, Properties of refrigerants, list of commonly used refrigerants, Principle and working of Vapour Compression Refrigeration and Vapour Absorption Refrigeration	7	2,6
	Demonstration of working of I.C Engines and Vapour Compression Refrigeration test rig in Energy Conversion and Heat Transfer Laboratory	1	
3	**Lathe:**Components of Lathe, Classification, Principle of operation, lathe specification, Lathe operations: Turning, facing, knurling, thread cutting, Taper Turning by swiveling compound rest.		

	Drilling machine: Principle and Classification of drilling machines, Bench drilling machine, Radial drilling machine, Operations on drilling machine-Drilling, Boring, Reaming, Tapping, Counter Sinking, Counter boring and Spot facing. **Introduction to Advanced Manufacturing Systems** **Computer Numerical Control (CNC):** Introduction, Components of CNC, open loop and closed loop systems, advantages and disadvantages of CNC. **Robotics:** Introduction, Classification based on robot configuration: Polar, Cylindrical, Cartesian and jointed arm configuration. Application, Advantages and disadvantages of robots	7	
	Demonstration of Lathe operations(Turning, Taper Turning) and Drilling operations(Drilling, Boring), C.N.C machine in Machine shop Laboratory and R &D Centre respectively	1	3,6
4	**Joining process** **Soldering:** Principle of soldering, Surface preparation, Methods of soldering, Applications **Brazing:** Principle of brazing, methods of brazing, Applications **Adhesive Bonding:** Principle of Adhesive bonding, Adhesive types, Surface preparation and application methods, Applications of Adhesive bonding, Advantages and limitations **Welding:** Definition, Classification, Applications of welding, Flux and its functions, Description of arc welding, Electrodes used in arc welding, Description of oxyacetylene welding, Types of flames produced in gas welding, Comparison between welding, soldering and Brazing, Welding Defects.	8	4,6
	Hands on practice on welding and soldering facilities in the Workshop Practice Laboratory		
5	**Power Transmission** **Belt drives-**Terminology of a belt drive, open and cross belt drives, Derivations on length of open and cross belt, Angle of contact, Ratio of belt tensions (no derivation), Centrifugal tension, Power transmitted by a belt drive,MaximumTension in the Belt, Condition for Maximum		

	PowerTransmission (no derivation), Initial Tension in the Belt, Stepped pulley, Jockey pulley, Fast and Loose pulley. Definitions-Slip, Creep, velocity ratio. Applications, Advantages and Disadvantages of flat belt drive, Numericals on belt drives. **Gear Drives:** Types of Gears and applications, Advantages and disadvantages of gear drive, Gear Tooth Nomenclature, Velocity ratio of simple and compound gear train, Numericals on Gear drives	7	
	Demonstration of Belt & Gear drives in the Machine shop Laboratory	1	5,6

Note:

1. **Questions for CIE and SEE not to be set from self-study component**
2. **Assignment questions should be from self-study component only**

Self-study component

Unit 1: Solar energy, wind energy, bio energy, Environmental issues like global warming, ozone depletion

Unit 2: Room Air-conditioner, Hybrid Engines

Unit 3: Principle of Casting, forging, extrusion, rolling and milling

Unit 4: TIG welding, MIG welding, Friction welding

Unit 5: Differential Gear Drives, Gearbox, Timing belts

Text Books

1. Elements of Mechanical Engineering, K. R. Gopalakrishna, Subhas Publications, Bangalore, 2008.
2. Elements of Mechanical Engineering, Vol.-1 & 2, HajraChoudhury, Media Promoters, New Delhi, 2001.

Reference Books

1. Mikell P. Groover, “Fundamentals of Modern Manufacturing” Fourth Edition, JOHN WILEY & SONS, INC.
2. Bharat VinjamuriManjunathShettar, “Computer Integrated Manufacturing” Sunstar Publisher, 2016

COMPUTER AIDED ENGINEERING DRAWING

Course Code: **18ME1ICCED/18ME2ICCED** Credits: 3
L: P: T: S: 1: 3: 0: 0 CIE Marks: 50
Exam Hours: 03 SEE Marks: 50

	Course and Course Code		Course Title	Teaching Department	Paper Setting Board	Teaching Hours /Week			Examination				Credits
						Theory Lecture	Tutorial	Practical/ Drawing	Duration in hours	CIE Marks	SEE Marks	Total Marks	
						L	T	P					
	ESC	18ME2ICEGR	Engineering Graphics	ME, Auto & IEM Engineering	Mechanical Engineering	2	--	2	03	50	50	100	3

Course Outcomes: At the end of the semester Students will be able to

CO.1	Make use of drafting tools in creating engineering drawing.	1
CO.2	Know and understand the conventions and the methods of engineering drawing.	2
CO.3	The student will be able to identify the position of the object and draw the views using orthographic projection technique in their respective quadrants.	3
CO.4	Construct the appropriate drawing satisfying the constraints given.	3
CO.5	Apply the knowledge of isometric projection to show pictorial view of an object	4
CO.6	Improve their visualization skills so that they can apply these skills in design and developing new products.	4

Mapping of Course Outcomes to Program Outcomes

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO.1	3	-	-	-	2	-	-	-	-	-	-	-	-	2	-
CO.2	3	-	-	-	-	-	-	-	-	-	-	-	2	-	-
CO.3	3	3	2	-	2	-	-	-	-	-	-	-	3	2	-
CO	3	3	2	-	2	-	-	-	-	-	-	-	3	2	-

.4															
CO.5	3	3	2	-	2	-	-	-	-	-	-	-	3	2	-
CO.6	3	3	2	-	2	-	-	-	-	-	-	-	2	2	-

Unit	Contents of Course	Hours	COs
1	**Introduction to Computer Aided Sketching** Introduction, Drawing Instruments and their uses, BIS conventions, Lettering, Dimensioning and free hand practicing. Computer screen, layout of the software, standard tool bar/menus and description of most commonly used tool bars, navigational tools. Co-ordinate system and reference planes. Definitions of HP, VP, RPP & LPP. Creation of 2D/3D environment. Selection of drawing size and scale. Commands and creation of Lines, Co-ordinate points, axes, poly-lines, square, rectangle, polygons, splines, circles, ellipse, text, move, copy, off-set, mirror, rotate, trim, extend, break, chamfer, fillet, curves, constraints viz. tangency, parallelism, inclination and perpendicularity. Dimensioning, line conventions, material conventions and lettering.	3	CO1 CO2
2	**Orthographic projections** Introduction, Definitions - Planes of projection, reference line and conventions employed, Projections of points in all the four quadrants, Projections of straight lines (located in First quadrant/first angle only), True and apparent lengths, True and apparent inclinations to reference planes (No application problems). **Orthographic Projections of Plane Surfaces (First Angle Projection Only)** Introduction, Definitions–projections of plane surfaces–triangle, square, rectangle, pentagon, hexagon and circle, planes in different positions by change of position method only (No problems on punched plates and composite plates).	08	CO3 CO4

3	**Projections of Solids (First angle Projection only)** Introduction, Definitions – Projections of right regular prisms, pyramids, cylinders and cones in different positions (No problems on tetrahedron, cube, octahedron, combination of solids and suspended solids).	12	CO3 CO4 CO6
4	**Sections and Development of Lateral Surfaces of Solids** Introduction, Section planes, Sections, Sections of right regular prisms, pyramids, cylinders and cones resting with base on HP. (No problems on sections of solids) Development of lateral surfaces of above solids, their frustums and truncations. (No problems on lateral surfaces of trays, tetrahedrons, spheres and transition pieces).	08	CO4 CO6
5	**Isometric Projection** Introduction, Isometric scale, Isometric projection of simple plane figures, Isometric projection of tetrahedron, hexahedron(cube), right regular prisms, pyramids, cylinders, cones, spheres, cut spheres and combination of solids (Maximum of two solids).	08	CO4 CO5

Text Books:

1) N.D. Bhatt & V.M. Panchal, **Engineering Drawing**, Charotar Publishing House, Gujarat, 48th edition, 2005.
2) A Primer on **Computer Aided Engineering Drawing**, Published by VTU, Belgaum, 2006

Reference Books:

1) K.R. Gopalakrishna, **Engineering Graphics,** Subash Publishers Bangalore, 32nd edition, 2005.
2) Primer Solution Book, Published by VTU, Belgaum, 2006

CIE for 50 marks

1. Assignment/sketch book/Print out	25 Marks
2. Surprise test/Mid semester test	10 Marks
3. Test conducted towards the end of semester	15Marks

Question paper pattern for SEE:

1. Module -1 is only for practice and not for examination.
2. Question paper for each batch of students will be set separately by the examination authority. The answer sheets will have to be jointly evaluated by the Internal & External examiners.
3. A maximum of THREE questions will be set as per the following pattern (No mixing of questions from different Modules).

Q. No.	From Chapters	Marks Allotted
1	Module 2	30
2	Module 3	40
3	Module 4 & 5	30
Total		**100**

Q. No.	Solutions and Sketching in the Graph Book	Computer Display and Printout	Total Marks

1	15	15	30
2	20	20	40
3	15	15	30
Total Marks	**50**	**50**	**100**

Students have to submit the computer printouts and the sketches drawn on the graph sheets at the end of the examination. Both Internal & External examiners have to jointly evaluate the solutions (sketches) and computer display & printouts of each student for 100 marks (50 marks for solutions & sketches + 50 marks for computer display and printouts) and submit the marks list along with the solution (sketches) on graph sheets & computer printouts in separate covers.

4. Each batch must consist of a minimum of 10 students and a maximum of 12 students.
5. Examination can be conducted in parallel batches, if necessary.