Jabalpur Engineering College, Jabalpur

(Declared Autonomous by MP Govt., Affiliated to RGPV, Bhopal)

(AICTE Model Curriculum Based Scheme)

Bachelor of Technology (B.Tech.) III Semester (Mechanical Engineering)

w.e.f. July 2023

S.No.	Subject Code	Category Code	Subject Name	Maximum Marks Allotted					Total Marks	Contact Hours Per Week			Total Credits
				Theory			Practical						
				End. Sem.	Mid Sem. Exam.	Quiz/ Assignment	End Sem.	Lab Work		L	T	P	
1	MA31	BSC	Mathematics-III	70	20	10	-	-	100	3	1	-	4
2	ME32	HSMC	Material Science	70	20	10	-	-	100	3	1	-	4
3	ME33	PCC	Mechanics of Materials-I	70	20	10	30	20	150	3	-	2	4
4	ME34	PCC	Manufacturing Process	70	20	10	30	20	150	3	-	2	4
5	ME35	PCC	Thermodynamics	70	20	10	30	20	150	3	-	2	4
6	ME36	ESC	Geometric Modelling Lab	-	-	-	30	20	50	-	-	4	2
			Total	**350**	**100**	**50**	**120**	**80**	**700**	**15**	2	**10**	**22**
7	ME37	DLC	Self-Learning Presentation (SWAYAM/NPTEL/MOOC)	-	-	-	-	-	-	-	-	-	8
8	ME38	MC	NSS/NCC/Swatchhata Abhiyan/Rural Outreach	Qualifier									
Additional Course for Honours or Minor Specialization				Permitted to opt for maximum two additional MOOC courses in subject code ME37 for the award of Honours (Minor Specialization).									

Note: MOOC/NPTEL subjects shall be taken with permission of HOD/Coordinator

1 hour lecture (L) = 1 credit	1 hour Tutorial (T) = 1 credit	2 hour Practical (P) = 1 credit

BSC: Basic Science Course, HSMC: Humanities & Social Sciences including Management Course, PCC: Professional Core Course, ESC: Engineering Science Course, MC: Mandatory Course, DLC: Distance Learning Course

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Bachelor of Technology (B.Tech.) III Semester, Branch (CE/ME/IP)

COURSE CONTENT **w.e.f. July 2023**

Subject Code	Subject Name	Maximum marks Allotted			Total marks	Hours/Week			Total Credit
MA31	MATHEMATICS-III	Theory			100	L	T	P	4
		End Sem	Mid-Sem Exam	Quiz/ Assignment		3	1	0	
		70	20	10					

Module 1: Numerical Method-I (08 hours)

Roots of algebraic and transcendental equations: Bisection method, Regula-Falsi method, Newton-Raphson method, Iteration method, Graffes root squaring method, Solution of system of linear equations: Gauss elimination method, Gauss Jordan method, LU decomposition method, Relaxation method, Jacobi and Gauss-Seidel methods.

Module 2: Numerical Method-II (08 hours)

Interpolation: Finite difference operator and their relationships, Difference tables, Newton, Gauss, Bessel and Stirling's interpolation formulae, Divided differences,Lagrange interpolation and Newton's divided difference interpolation. Numerical differentiation and Integration: First and second order derivatives by various interpolation formulae, Trapezoidal, Simpsons $1/3^{rd}$ and $3/8^{th}$ rules.

Module 3: Numerical Method-III (10 hours)

Numerical solution of ordinary differential equations: Solution of ODE by Taylor series, Picard's method , Modified Euller method, Runge-Kutta method, Predictor corrector method. Partial differential equations: Finite difference, solution of two-dimensional Laplace and Poission's equations, Implicit and explicit methods for one dimensional heat equation (Bendre Schmidt and Crank-Nicholson methods), Finite difference explicit method for wave equation.

Module 4: Applied Statistics (08 hours)

Curve fitting by the method of least squares- Fitting of straight lines, Second degree parabolas and more general curves. Test of significance: Large sample test for single proportion, Difference of proportions, single mean, difference of means and difference of standard deviations.

Module 5: Concept of Probability (06 hours)

Probability Mass function, Probability Density Function, Discrete Distribution (Binomial, Poisson's distribution), Continuous Distribution (Normal, Exponential Distribution).

Books References:

1. P. Kandasamy, K.Thilagavathy, K. Gunavathi, Numerical Methods, S. Chand & Company, 2^{nd} Edition, Reprint 2012.
2. S.S. Sastry, Introductory methods of numerical analysis, PHI, 4^{th} Edition, 2005.
3. B.S. Grewal, Higher Engineering Mathematics, Khanna Publisher, 35^{th} Edition, 2010.
4. N.P. Bali and Manish Goyal, A text book of Engineering Mathematics, Laxmi Publications, Reprint, 2010.
5. S. Ross, A First Course in Probability, 6^{th} Edition, Pearson Education India 2002.
6. W. Feller, An Introduction to Probability Theory and its Applications, Vol. 1, 3^{rd} Edition, Wiley 1968. Statistics.

Course Outcomes:

At the end of the course the students will able to:

1. Mathematical tools for Numerical Solution of algebraic and transcendental equations.
2. Estimate the value of function by various interpolation methods.
3. Determine derivative and integrals by numerical methods.
4. Solve the ODE and PDE by finite difference/numerical methods.
5. Apply probability distribution and statistics in various techniques dealing with engineering problems.

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COURSE CONTENTS **w.e.f. July 2023**

Subject Code	Subject name	Maximum Marks Allotted					Total Marks	Hours/Week			Total Credits
		Theory			Practical						
		End Sem	Mid-sem Exam	Quiz/ Assignment	End sem	Lab Work		L	T	P	
ME32	Material Science	70	20	10	-	-	100	3	1	-	4

Course objective:

1. To give basic knowledge of science behind materials and physical metallurgy.
2. Introduce the concept of structure property relations:
3. Lay the ground work for studies and fields such as solid state physics, mechanical behavior of materials, phase and phase diagram, heat treatment, failure of materials and their protection.

Course Contents:

Module-I

Crystal Atoms of Solid: Structure of atom binding in solids metallic, Vander walls, ionic and covalent, Space lattice and crystal system arrangement of atoms in BCC, FCC and HCP crystal. Manufacture of refractory and ferrous metals, properties uses and selection of acid, basic and natural refractory, metallurgical coke, properties, types, uses and brief description of the manufacturing processes for iron and steel making.

Module-II

Mechanical Property measurement: Tensile, compression and torsion tests; Young's modulus, relations between true and engineering stress-strain curves, generalized Hooke's law, yielding and yield strength, ductility, resilience, toughness and elastic recovery, Hardness: Rockwell, Brinell and Vickers and their relation to strength, Creep fatigue.

Module-III

Deformation of Metals: Point and line defects in crystals, their relation to mechanical properties, deformation of metal by slip and twinning stress strain curves of poly crystalline materials viz. mild steel, cast iron and brass yield point phenomenon. Cold and hot working of metals and their effect on mechanical properties, annealing of cold worked metals, principles of re-crystallization and grain growth phenomenon, fracture in metal and alloys, ductile and brittle fracture, fatigue failure.

Module-IV

Alloy Formation and Binary Diagram: Phase in metal system solution and inter-metallic. compounds. Hume-Rottery's rules, solidification of pure metals and alloy equilibrium diagrams of isomorphous, eutectic peritectic and eutectoid system, non-equilibrium cooling and coring iron, iron carbon equilibrium diagram. Introduction to cast iron and steel.

Module-V

Principles of Heat Treatment & Heat treatment of Metals & Alloys: TTT curves heat treating processes, normalizing, annealing spheroidizing, hardening, tempering, and Case hardening. austempering, mar-tempering, precipitation hardening process with reference to Al, Cu alloys Non Ferrous metals base alloys, Bronze, Brasses, Duralumin, and Bearing Metals.

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Powder Metallurgy: Property and Applications of Powder Metallurgy, Various process and methods of making products by powder Metallurgy techniques.

Evaluation:

Evaluation will be continuous an integral part of the class followed by the final examination as well as through external assessment.

References:

1. Narula GK, KS and Gupta VK; Material Science; TMH
2. Raghavan V; Material Science and Engineering, PHI Publication.
3. Raghavan V; Physical Metallurgy Principles and Practice; PHI
4. Rajendran V Physical Metallurgy Principles and practice; PHI
5. Sriniwasan R; Engineering materials and metallurgy; TMH
6. Navneet Gupta, Material Science & Engineerign, Dhanpat Rai.
7. G.E Dieter, Mechanical Metallurgy, Mc-Graw Hill 1987
8. D.S clark and W.Varney Physical Metallurgy for Engineers 2ed., East-West 1994
9. B.K Agrawal introduction to Engineering Materials, TMH

Course outcomes:

At the completion of this course, students should be able to

CO1	Explain the crystal structure and classification of materials.
CO2	Illustrate methods of determining properties and their suitability for applications.
CO3	Interpret the phase diagrams of materials.
CO4	Selection suitable heat-treatment process to achieve desired properties of metals and alloys.

Mapping of the course outcomes (COs) with program outcomes (Pos):

Course Outcomes	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	1	2	1									
CO2	2	3	1									
CO3		2		1			1					
CO4	1	3	2									

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COURSE CONTENTS **w.e.f. July 2023**

Subject Code	Subject name	Maximum Marks Allotted					Total Marks	Hours/Week			Total Credits
		Theory			Practical						
		End Sem	Mid-sem Exam	Quiz/ Assignment	End sem	Lab Work		L	T	P	
ME33	Mechanics of Materials- I	70	20	10	30	20	150	3	-	2	4

Course Objective:

At the completion of course the students will be able:

1. To calculate the stresses and strain of different members of machines.
2. To draw shear force and bending moment diagram for various types of beams with different loadings.
3. To find the deflection of various types of beams with different loadings.
4. To study torsion of shafts and stresses in thin cylinders and spheres.

Course Contents:

Module-I

Stress and Strain: Stresses in members of a structure, Axial loading, normal stress, shear stress, analysis of simple structures, stepped rods, bars of varying section, stress-strain diagram, Hooke's law, stress due to temperature, Poisson's ratio, Bulk modulus, shear strain, relation among elastic constants, residual stress, strain energy under axial loads and stresses due to impact of falling weights. Transformation of stress and strain principal stresses, normal and shear stress, Mohr's circle and its application to two dimensional analyses.

Module-II

Shear Force and Bending Moment: Shear force and Bending Moment diagram for cantilever, beam supported at ends, beams with overhangs. Point of contraflexure.

Stresses in beams: Pure bending, Theory of simple bending, Neutral layer- neutral axis, Stress distribution in beams, Flexure formula, Section modulus, Bending of symmetric member, Bending of composite sections, Normal and shear stresses in beams.

Module –III

Deflection Of Beams: Slope, Deflection and Radius of curvature, Cantilevers subjected to various types of load, Macaulay's method and Area moment method for deflection of Cantilever beam, Simply supported beam and Overhanging beam subjected to various types of loads, Relation between maximum. Bending and maximum deflection.

Module-IV

Torsion of Shafts: Theory of pure torsion, Polar modulus, Torsional Rigidity, angle of twist, Torsional stresses in a shafts, Power transmitted by a shaft, Stepped shafts, Composite shafts, Torsional resilience, shafts in series and shafts in parallel, Torsion of a tapering rod.

Springs: Leaf springs, Helical springs, open and closed coil, stress in spring wire, deflection of helical spring.

Module-V

Columns and Struts: stability of structures, Crushing load, Crippling load, Euler's formula for columns with different end conditions, Rankine's formula, Limitation of Euler's formula.

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Thin Cylinders and Spheres: Circumferential and Longitudinal stresses, Wire bound pipes, thin spherical shells.

Evaluation:

Evaluation will be continuous an integral part of the class followed by the final examination as well as through external assessment.

Reference:

1. Beer FP, Jonhson Mechanics of Materials, Sixth Edition,Mc Graw Hills.
2. Debarata Nag & Abhijet chanda: strength of material: Wiely.
3. Rattan; strength of materials, second edition Mc Graw Hills.
4. Nash William; Schaum's outline series; fourth Edition Strength of Materials; Mc graw Hills.
5. Singh Arbind K; Mechanics of solid; PHI
6. Sadhu Singh; strength of materials ; khanna pub.
7. R Subramannian, strength of materials OXFORD University press Third Edition.
8. S Ramamurthum, Strenght of materials, Dhanpat Rai.
9. Stephen Timoshenko; strength of materials part 1& 2 CBS pub.

Course outcomes:

At the completion of this course, students should be able to

CO1	Calculate stresses and strain in different structural members under uni-axial and combine loading.
CO2	Evaluate stresses in beam and shafts under various loading like torsion, pure bending etc.
CO3	Calculate deflection at any section for different types of beams.
CO4	Analyze stresses in the pressure vessel and critical load in the column

Mapping of the course outcomes (COs) with program outcomes (Pos):

Course Outcomes	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	3	2									
CO2	1	2	2									
CO3	2	2	3									
CO4	1	3	2	1								

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Mechanics of Materials- I Lab

List of experiments: (study and experiments on) (Can be modified/expanded further)

1. Tensile Strength testing of a given mild steel on UTM
2. Compressive Strength testing of a given specimen on UTM
3. Hardness testing of given specimen using Rockwell and Vickers/ Brinell testing
4. Shear test of a mild steel rod.
5. Bending test of a mild steel specimen.
6. Impact testing on Impact testing machine: - Charpy and Izod.
7. Study of Spring Test machine
8. Study of non destructive testing machine.
9. Study of Fatigue phenomenon and the fatigue failure of different part of fatigue testing machine.
10. Proof load determination for the leaf spring.

Course outcomes of Lab:

At the completion of this course, students should be able to

CO1	Find the yield strength, ultimate strength of mild steel specimen
CO2	Find resilience and toughness of steel material
CO3	Understand the different techniques of non destructive testing

Mapping of the course outcomes (COs) with program outcomes (Pos):

Course Outcomes	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	1	2										1
CO2	1	2	2									
CO3	1		2		1							1

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COURSE CONTENTS w.e.f. July 2023

Subject Code	Subject name	Maximum Marks Allotted					Total Marks	Hours/Week			Total Credits
		Theory			Practical						
ME34	Manufacturing Process	End Sem	Mid-sem Exam	Quiz/ Assignment	End sem	Lab Work	150	L	T	P	4
		70	20	10	30	20		3	-	2	

Course objective:

Students are able to explain and distinguish among various basic manufacturing processes like casting, metal forming, welding, rolling and press working along with practical applications.

Course Contents:

Module-I

Pattern Making: Types of pattern, Pattern and pattern making, pattern allowances; pattern design considerations, core and core boxes.

Casting: Types of casting process. Moulding and Foundry core sands and their properties, gating, runners, risers, solidification, defects and elimination, moulding machines, centrifugal casting, dye casting, shell moulding, Lost wax moulding; continuous casting, cupola description and operation.

Module-II

Welding: Types of welding, Gas welding method, gas flames, gas cutting, Electric arc welding, AC and DC welding machines and their characteristics, flux, electrodes, submerged arc welding, TIG & MIG welding, pressure welding, electrical resistance welding spot, seam and butt welding; Consumable estimation for weld length and size, Thermit chemical welding, brazing and soldering, welding defects & remedies. Safety precautions.

Module-III

Forging: Types of forging operations. Theory and application of forging processes, description of drop and horizontal forging machines.

Module-IV

Press working: Description and operation of processes, process of shearing, punching, piercing blanking, trimming, perfecting, notching, lancing, embossing, coining, bending, forging and drawing; press, types of presses, tool dies, die punch clearance, auxiliary equipment, safety devices, stock feeders, scrap cutters, forces, pressure and power requirements.

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Module-V

Rolling: Types of Rolling operations, stages of rolling for formation, General description of machines and process; rolling of structural section plates and sheets; hot and cold rolling techniques.

Evaluation:

Evaluation will be continuous an integral part of the class followed by the final examination as well as through external assessment.

References:

1. Anderson and Tetro; Shop Theory, Mc Graw Hills.
2. Kaushish JP; Manufacturing Processes; PHI Learning.
3. KalpakjianProducting Engineering, PEARSON Education.
4. Chapman; Workshop Technology.
5. Philip F Ostwald; Manufacturing Process &systems: John Wiley.
6. Raghuvanshi; Workshop Technology, Dhanpat Rai.
7. HajraChoudhary; Workshop Technology: Vol L..
8. Bhupendra Gupta, Manufacturing Process; Dhanpat Rai Publishing Co., New Delhi.

Course outcomes:

At the completion of this course, students should be able to

CO1	Understanding the general production processes like Pattern making, casting.
CO2	Compare various welding processes.
CO3	Explain forging and press working operations with applications.
CO4	Illustrate working principle of forming and rolling processes.

Mapping of the course outcomes (COs) with program outcomes (Pos):

Course Outcomes	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	2	1									
CO2	1	2	2									
CO3		3	3	1								
CO4	1	2	2									

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Manufacturing Process Lab

List of Experiments: (Can be modified/expanded further)

1. Study of tools used for various manufacturing processes,(It includes application, use and live demonstration)
2. Hands on exercise on patternmaking (make any one type of wooden pattern using simple tools)
3. Study of Molding and Casting process.
4. Performance on Metal Casting of simple component.
5. Performance on welding of simple work piece (Example Arc and Resistance Welding)
6. Study of forging machine & demonstration of various operations of forging.
7. Study of mechanical, Hydraulic, Pneumatic presses.
8. Demonstration of process like; shearing punching, piercing, blanking, trimming, drawing, etc.
9. Study of rolling process and evaluation of power requirements.

Course outcomes: Laboratory

At the completion of this course, students should be able to

CO1	Distinguish among various casting processes.
CO2	Explain Mechanical working of Metals.
CO3	Able to apply welding process, press working and rolling process
CO4	Experiments with forging operations.

Mapping of the course outcomes (COs) with program outcomes (Pos):

Course Outcomes	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	1	2							2			
CO2		2	1						2			
CO3	1	2	2									
CO4	1	2										

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COURSE CONTENTS **w.e.f. July 2023**

Subject Code	Subject name	Maximum Marks Allotted					Total Marks	Hours/Week			Total Credits
		Theory			Practical						
		End Sem	Mid-sem Exam	Quiz/ Assignment	End sem	Lab Work		L	T	P	
ME35	Thermodynamics	70	20	10	30	20	150	3	-	2	4

Course Objective:

To develop ability and gain insight into the process of problem-solving, with emphasis on thermodynamics specially in following manner

1. Apply conservation principles (mass and energy) to evaluate the performance of simple engineering systems and cycles,
2. Evaluate thermodynamic properties of simple homogeneous substances,
3. Analyze processes and cycles using the second law of thermodynamics to determine efficiency and performance,
4. Discuss the physical relevance of the numerical values for the solutions to specific engineering problems and the physical relevance of the problems in general;
5. Critically evaluate the validity of the numerical solutions for specific engineering problems.

Course Contents:

Module-I

Introduction & Basic Concepts: Fundamentals - System & Control volume, Property, State & Process, Cycle, Temperature, Types of equilibrium, Zeroth law of thermodynamics, Temperature scales, various thermometers, Heat & Work transfer.

Module-II

The First Law of Thermodynamics: Heat/work interaction in systems, First Law for Cyclic & Non-cyclic processes, Total energy, Various modes of energy, Internal energy and Enthalpy, First Law for Flow Processes, Steady state flow processes, Unsteady processes, Limitations of first law of thermodynamics.

Module-III

The Second Law of Thermodynamics: Second law-Kelvin-Planck and Clausius statements, Heat engine, Heat reservoir, Refrigerator, Heat pump, Thermal efficiency and COP, Reversible and irreversible processes, Carnot cycle, Internal and external irreversibility, Absolute temperature scale. Clausius inequality, Entropy, Entropy for solids, liquids, ideal gases undergoing various processes, Principle of increase of entropy, T-S diagrams, Irreversibility and Availability, Energy.

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Module –IV

Properties of Pure Substance: Pure Substance, Phase, Phase-transformations, Formation of steam, Properties of steam, PVT surface, HS, TS, PV, PH, TV diagram, Processes of vapor, Measurement of dryness fraction, Use of Steam tables and Mollier chart.

Module-V

Air Standard Cycles and Non-reactive Gas Mixture: Carnot, Otto, Diesel, Dual cycles and their comparison, Brayton Cycle, PVT relationship, Mixture of ideal gases, Properties of mixture of ideal gases-Internal energy, Enthalpy and Specific heat of gas mixtures.
Steam Tables, Mollier Charts & tables connected to reactive systems are allowed in Examination hall.

Evaluation:
Evaluation will be continuous and integral part of the class followed by the final examination

References:

1. P.K. Nag; Engineering Thermodynamics; Mc-Graw Hills Fifth Edition.
2. Cengal Y; Thermodynamics; Mc-GRAW Hills, Eight Edition.
3. Kross &potter Thermodynamics for Engineering CENGAGE Learning.
4. Moran, Shapiro, Boettner principles of Engineering Thermodynamics Wiley student edition.
5. P Chattopadhya, Engineering Thermodynamics second Edition, OXFORD University press.
6. Zemansky Heat & Thermodynamics, Eight Edition, Mc-Graw Hills India Education.
7. R Yadav applied Thermodynamics, Central Publishing house Allahabad.
8. Van Wylin & sontak, Thermodynamics by, Wiley Eastern.

Course outcomes:

At the completion of this course, students should be able to

CO1	Demonstrate of thermodynamics properties of fluid using standard tables & charts.
CO2	Illustrate the thermodynamics processes on P-v, T-S, and h-S diagrams.
CO3	Estimate of energy interaction of different thermodynamics system.
CO4	Analyze Otto, Diesel, and Dual air standard cycles.

Mapping of the course outcomes (COs) with program outcomes (Pos):

Course Outcomes	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	1										
CO2	1	2										
CO3	1	2	1									
CO4	1	2										

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Thermodynamics Lab

List of Experiments: (Can be modified/expanded further)

1. Verification of first law of thermodynamics.
2. Study of low pressure boilers.
3. Study of Boiler mountings and Accessories.
4. Measurement of dryness fraction by throttling calorimeter
5. Measurement of dryness fraction by separating and throttling calorimeter.
6. Measurement of dryness fraction by separating and throttling calorimeter.
7. Study of 2 Stroke petrol engine.
8. Study of 4 stroke petrol engine.
9. Study of 2 stroke diesel engine.
10. Study of 4 stroke diesel engine.

Course outcomes of lab:

At the completion of this course, students should be able to

CO1	Demonstrate of thermodynamics properties of fluid using standard tables & charts.
CO2	Illustrate the thermodynamics processes on P-v, T-S, and h-S diagrams.
CO3	Estimate of energy interaction of different thermodynamics system.
CO4	Analyze Otto, Diesel, and Dual air standard cycles.

Mapping of the course outcomes (COs) with program outcomes (Pos):

Course Outcomes	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	1	2		1								
CO2	1	2										
CO3	1		1									1
CO4	1	2		2								

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Subject Code	Subject name	Maximum Marks Allotted					Total Marks	Hours/Week			Total Credits
		Theory			Practical						
		End Sem	Mid-sem Exam	Quiz/ Assignment	End sem	Lab Work		L	T	P	
ME36	Geometric Modelling Lab	-	-	-	30	20	50	-	-	4	2

Course Objective:

1. Learn the basic concepts and principles of modeling software.
2. Learn the fundamentals of AutoCAD.
3. Will apply the course knowledge to do a design project on AutoCAD.

Course Content:

Basic concepts of AutoCAD tools, introduction to AutoCAD commands like POINT, LINE, POLYGON, CIRCLE, COPY, MOVE, EXTRUDE etc., Concepts & techniques of 1D and 2D (surface) modelling using AutoCAD, 2D transformations, mesh preparation, modelling of curves, modeling of B-Spline, 3D modeling (solid modelling) using various techniques, 3D transformations and projections, generation of 3D objects from 2D shapes, an overview of geometric modelling, cubic curve, Bezier curve and Bezier surface, part modelling: assembly.

List of Experiments: (Can be modified/expanded further)

1. Study of basic AutoCAD tools and commands and to apply them to draw the projections of points.
2. To make use of the basic commands to draw the projections of lines in AutoCAD.
3. To apply the basic commands to draw the projections of planes in AutoCAD.
4. To utilize the basic commands to draw the projections of solids in AutoCAD.
5. Draw the section of solids using AUTO-CAD tools.
6. To apply the basic knowledge of AutoCAD to draw the solid of revolution and surface of revolution.
7. To utilize the basic knowledge of AutoCAD to draw the plane curves, space curves and lofted solids.
8. Make the intersection of solid of surfaces using Auto-CAD
9. Draw an Isometric projection of any machine component using auto-CAD.
10. Draw an assembly drawing of machine components using CAD tools.

References:

1. George Omura, Steven Keith, Mastering Auto Cad 14 for Mechanical Engineers, Sybex, 1998.
2. Munir Hamad, Autocad 2018, Mercury Learning & Information, 2017.
3. J. Todd, AutoCAD 2007 for DUMMIES, Jason.

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4. Steve Heather, AutoCAD 3D Modeling, Industrial Press, Incorporated, 2017.
5. Cheryl R. Shrock, Beginning AutoCAD 2010: Exercise Workbook, Industrial Press, 2009.
6. Ellen Finkelstein, AutoCAD 2015 and AutoCAD LT 2015 Bible, John Wiley & Sons, 2014.

Evaluation:

Evaluation will be continuous and integral part of the class followed by the final practical examination as well as through external assessment.

Course outcomes:

At the completion of this course, students should be able to

CO1	Demonstrate basic concepts and tools of the Auto CAD Software.
CO2	Apply basic concepts of AutoCAD to develop lines, curves planes and surfaces.
CO3	Illustrate the orthographic projections, solid modeling concepts and techniques.

Mapping of the course outcomes (COs) with program outcomes (Pos):

Course Outcomes	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	1			2	1							1
CO2	1		1	2					2			1
CO3	1		1	2					2			1

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