Jabalpur Engineering College, Jabalpur

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(AICTE Model Curriculum Based Scheme)

Bachelor of Technology (B.Tech.) IV Semester (Mechancial 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	ME41	PCC	Energy Conversion Systems	70	20	10	-	-	100	3	1	-	4
2	ME42	PCC	Fluid Mechanics	70	20	10	30	20	150	3	-	2	4
3	ME43	PCC	Machine Drawing & CAD	70	20	10	30	20	150	3	-	2	4
4	ME44	PCC	Kinematics of Machines	70	20	10	30	20	150	3	-	2	4
5	ME45	PCC	Machine Design-I	70	20	10	-	-	100	3	1	-	4
6	ME46	ESC	Software Lab (Python)	-	-	-	30	20	50	-	-	4	2
			Total	**350**	**100**	**50**	**120**	**80**	**700**	**15**	2	**10**	**22**
7	ME47	DLC	Self-Learning Presentation (SWAYAM/NPTEL/MOOC)	-	-	-	-	-	-	-	-	-	8
8	ME48	MC	NSS/NCC/Swatchhata Abhiyan/Rural Outreach	Qualifier									
Additional Course for Honours or Minor Specialization				Permitted to opt for maximum 8 credits against additional MOOC courses in subject code ME47 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

PCC: Professional Core Course, ESC: Engineering Science Course, DLC: Distance Learning Course, MC: Mandatory Course

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

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	
ME41	Energy Conversion Systems	70	20	10	-	-	100	3	1	-	4

Course Objectives:

The purpose of this course is to introduce the undergraduate students with

1. To learn applications of energy conversion device to thermal power plant.
2. To provide an overview of steam boilers, condensers, steam nozzles their applications.
3. To perform calculations on related to designing of energy conversion devices.
4. Importance and components of cooling towers and heat exchangers.

Course Contents:

Module 1 Steam Generators (Boilers): Classification of boilers, Requirements of a good boiler, Conventional boilers, High-pressure boilers- Lamont, Benson, Loeffler and Velox steam generators, Fluidized bed boilers (FBB), Selection of boilers, Performance and rating of boilers, Equivalent evaporation, Boiler efficiency, Heat balance sheet, Heat losses in boiler plant, Combustion in boilers, Stoker firing system, Pulverized fuel firing system, Super critical boilers.

Module II Phase Change Cycles: Introduction, Classifications of vapour power cycles, Basic elements of steam power plant, Vapor Carnot cycle, its efficiency and limitations, Rankin cycle, its efficiency and assumptions, effect of boiler and Condenser pressure and superheat on efficiency, Modified Rankin cycle, Comparison of Rankine and Carnot cycle, Reheat cycle, Perfect regenerative cycle, its expression of efficiency, Ideal and actual regenerative cycle with single and multiple heaters, Regenerative-reheat cycle, Binary-vapor cycle, properties of binary working fluid, work done and efficiency calculations. Simple numerical problem on phase change cycles.

Module III Gas Dynamics: Introduction and Applications of Gas Dynamics, Concept from fluid mechanics, Continuity equation, Momentum equation, One dimensional gas dynamics, Isentropic condition, Speed of sound in fluid, One dimensional wave motion, Elastic waves, Mach number and its significance, Mach cone, Zone of action, Zone of silence, Stagnation state and properties, One-dimensional isentropic flow through variable area duct, Condition for maximum fluid flow, Effect of area ratio as a function of Mach number, Simple numerical problems on Gas Dynamics.

Module IV Air Compressors: Introduction, applications, and Classification of Air Compressors, Reciprocating Air Compressor, working, work done, power required, efficiency, for single and multistage stage compression, Comparison of single stage and multi stage compression, Two stage with intercooler,

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Condition for minimum work done in two stage. Rotary Compressors; working, classifications. Comparison of reciprocating and rotary compressors. Simple numerical problems on Air Compressors.

Module V (A) Steam Nozzles: Introduction and types, Flow of steam through nozzles, Effect of friction in nozzle efficiency, Condition for maximum discharge, Physical significance of critical pressure ratio, Super-saturated flow.

(B) Steam Condensers: Introduction, Objective, Classification of condensers, Comparison of jet and surface condensers, Air leakage and its effect on performance, back pressure and its effect on plant performance, Condenser efficiency and factors affecting, Thermal analysis of condenser, Simple numerical problems on Steam Condensers.

(C) Cooling Towers: Introduction, Function, Components and applications, Cooling tower materials, Classifications of cooling towers, Performance assessment of cooling towers, Energy efficiency opportunities, Best design practices for cooling tower.

(D) Heat Exchangers: Introduction and applications, Classification of heat exchangers.

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

References:

1. Nag PK; Power plant Engineering; TMH
2 . Thermodynamics by Gordon J. Van Wylen
3. P.K.Nag; Basic and applied Thermodynamics; TMH
4. Ganesan; Gas turbines, TMH
5. Heat Engines by V.P. Vasandani& D. S. Kumar
6. R. Yadav Steam and Gas Turbines
7. R.Yadav Thermal Engg.
8. Kadambi& Manohar, An Introduction to Energy Conversion - Vol II. Energy conversion cycles.

Course Outcomes:

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

CO1	Explain steam generation and its utilization to thermal power plant.
C02	Illustrate air compressors and phase change cycles.
C03	Apply the basic knowledge of thermodynamics to gas dynamics and steam nozzles.
CO4	Analyze heat exchanger and effects of its different parameters.

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	3	2										
CO2		2		3								
CO3		2		3								
CO4		2		3								

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Energy Conversion System Lab

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

1. Study of Separating & Throttling calorimeter for measurement of dryness fraction.
2. Study of Benson Boiler.
3. Study of Lamont Boiler.
4. Study of Loeffler Boiler.
5. Study of Velox Boiler.
6. Study of Boiler Draught.
7. Study of Boiler Trial.
8. Study of Cooling Towers.
9. Study of Heat Exchangers
10. Study of Air Compressor.

Evaluation:

Evaluation will be continuous an 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	Explain steam generators and its selection and air compressors, working, types and applications.
C02	Evaluation of performance parameters of boilers.
C03	Explain the working of cooling tower and its performance.
CO4	Compare types of treat exchangers.

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	3	2										
CO2		2	3									
CO3	1	2	3									
CO4		2	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	
ME42	Fluid Mechanics	70	20	10	30	20	150	3	-	2	4

Course Objective:

To be familiar with all the basic concepts of fluids and fluid flow phenomenon, conservation equations and their applications to fluid flow problems.

1. Determination of properties of fluid and their utility.
2. To understand the kinematic and dynamic behavior of fluid.
3. Determination of dimensionless numbers by applying mathematical techniques.
4. Determination of discharge through flow measuring instruments.
5. To understand the fluid flow behavior through pipes

Course Contents

Module 1: Fluid Statics: Basic concepts &properties of the fluid. Newtons law of viscosity, types of fluids, Pressure measurement by manometers and gauges, pressure variation in static fluid, Absolute and gauge pressure, total force and centre of pressure, hydraulic forces on submersed surfaces plan, inclined and curved surfaces; buoyancy, meta-center, Stability of floating and submerged bodies, Relative equilibrium.

Module 2: Kinematics of Flow: Types of flow-ideal & real, Lagrange and Eulerian methods of study of fluid, steady & unsteady, uniform & non-uniform, one, two and three dimensional flow, path lines, streak-lines, streamlines and stream tubes; continuity equation for one and three dimensional flow, rotational & ir-rotational flow, circulation, stagnation point, separation of flow, source, sink and combination of source-sink flow, velocity potential, stream function, flow net & its applications.

Module 3: Dynamics of Flow: Euler's equation of motion along a streamline and derivation of Bernoulli's equation, application of Bernoulli's equation, energy correction factor, linear momentum equation for steady flow; momentum correction factor. Fluid Measurements: Velocity measurement (Pitot tube, current meters etc.); flow measurement (orifices, nozzles, mouthpieces, orifice meter, nozzle meter, venturi-meter, weirs and notches).

Module 4: Dimensional Analysis: Dimensional analysis, dimensional homogeneity, use of Buckingham-pi theorem, calculation of dimensionless numbers, similarity laws and model investigations. Introduction to boundary layer, Boundary layer development on a flat plate and its characteristics - Boundary layer

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thickness, displacement thickness, momentum thickness, energy thickness. Momentum. equation for boundary layer by Von karman, drag on flat plate, boundary layer separation and its control. Aero-foil theory, lift and drag coefficients, streamlined and bluff bodies.

Module 5. Flow through Pipes: Reynolds experiment & Reynolds number, laminar & turbulent flow, Introduction to Navier Stoke's Equation, relation between shear & pressure gradient, laminar flow through circular pipes, friction factor, laminar flow between parallel plates, flow through pipes in series. and parallel, different types of head losses, friction factor and pressure drop.

Evaluation:

Evaluation will be continuous and integral part of the class as well through external assessment.

References:

1. Streeter VL, Wylie EB, Bedford KW; Fluid Mechanics; Mc Graw Hills
2. FOX, McDonald Pritchard, Fluid Mechanics Wiley students edition
3. White Fluid Mechanics; Mc Graw Hills
4. Cengal; Fluid Mechanics; Mc Graw Hills
5. R. Mohanty, Fluid Mechanics; PHI
6. KL Kumar Fluid Mechanics
7. Fluid Mechanics & hydraulic Machines, Modi & Seth
8. CS Jog, Fluid Mechanics Volume II CAMBRIDGE IIScSeries, Third Edition.

Course Outcomes:

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

CO1	Define fluid properties.
C02	Explain the characteristics of fluid in static and dynamic conditions
C03	Apply the equations derived for static and dynamic conditions for flow measurement.
CO4	Demonstrate dimensional homogeneity and similarity between model and prototypes.

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	3											
CO2	2	2										
CO3	1	2	2									
CO4	2		2									

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Fluid Mechanics Lab

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

1. Determination of discharge of liquid flow in pipe by using orifice meter.
2. Determination of discharge of liquid through pipe by using venturimeter.
3. Determination of C_c, C_v, C_d of Orifices.
4. Determination of discharge of liquid flow in pipe through Mouth Piece.
5. Determination of discharge of liquid flow in pipe through V notches.
6. Determination of discharge of liquid flow in pipe through weirs.
7. Determination of discharge of liquid flow in pipe through sluice gate.
8. Reynolds experiment for demonstration of stream lines & turbulent flow.
9. Determination of friction factor of a pipe.
10. To determine the discharge of liquid through rotameter.

Evaluation:

Evaluation will be continuous an 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 devices like Orifice meter, Venturi meter, Nozzle meter, Rotameter etc.
C02	Examine different parameters of fluid through Orifice meter, Venturi meter, Mouth Piece, V notches, Weirs; Sluice gate, Rotameter etc.
C03	Analyze laminar flow and turbulent flow.
CO4	Analyze the experimental losses incurred in a pipe.

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										
CO2	2	2										
CO3		2	2									
CO4	1	3										

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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	
ME43	Machine Drawing & CAD	70	20	10	30	20	150	3	-	2	4

Course Objective:

To enable the students to prepare a detailed assembly drawing for machine components.

Course Contents:

Module 1: Drawing Conventions: IS codes, sectional views and sectioning, surface finish and tolerances representation of machine parts, Conventional representation of materials and machine components Rivet heads and Riveted joints, Welded joints, Drawing of Threaded fasteners, Limit, Tolerances and fits. **14 marks**

Module 2: Assembly Drawing: Assembly Machine Drawing, Basic concept of assembly drawing, bill of materials, drawing of different types of keys, Assembly drawing of Cotter and nuckle joints, Pedestal and footstep bearings. **21 marks**

Module 3: Drawing of Engine Parts: Steam Engine Parts: Crosshead for vertical and horizontal engine, Stuffing box for small and engines.

IC Engines Parts: Piston, piston rings, connecting rods for petrol and diesel engine, Eccentric

Lathe Machine Parts: Tool post and Tail Stock**. 21 marks.**

Module 4: CAD: Software and hardware required to produce CAD drawings, Software: operating systems; CAD software package (AutoCAD/AutoCAD/Inventor/Micro station/Catia/Pro/ENGINEER/Solid works, etc).

Minimum system requirements; Preparing & interpreting CAD drawing, orthographic projections; Commands: absolute/relative/polar coordinates; features e.g. line types, grids, snaps, circle, text, hatching, dimensioning, layers/levels, colour, viewing e. g. zoom, pan; inserting other drawings e g symbols, blocks; modifying e g copy, rotate, move, erase, scale, chamfer, fillet Interpret: determine properties of drawn objects e g list, distance, area, volume use CAD software to produce 2D & 3D assembly drawings and 3D views, 3D coordinate entry (x, y, z), wire frame drawing, 2D to 3D (thickness, extrusion); surface models. 14 marks

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Evaluation:

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

References:

1. Bhatt, ND; Machine Drawing; Charotar Publication.

2. KC Jain, Machine Drawing, PHI.

3. Singh A; Machine Drawing; TMH publication.

4. Narayana and Reddy; Machine Drawing, New age, Delhi.

5. Shigley JE et al; Mechanical Engineering Design, TMH

Course Outcomes:

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

CO1	Illustrate the Indian standards for machine drawing.
C02	Explain Fits and Tolerance in technical drawing.
C03	Draw assembly drawing of joints, couplings, machine elements, I.C. Engine parts and Lathe machine parts.

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	2	2										
CO3	2	2										

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Machine Drawing & CAD Lab

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

1. Draw the part drawing of the IC Engine components.
2. Draw the assembly drawing of the IC Engine components.
3. Draw the assembly drawing and sectional view of Cotter joints,
4. Draw the assembly drawing and sectional view of knuckle joints.
5. Draw the assembly drawing and sectional view of Pedestal bearings.
6. Draw the assembly drawing and sectional view of footstep bearings.
7. Draw the assembly drawing and sectional view of Crosshead for vertical engine using CAD tools.
8. Draw the assembly drawing and sectional view of Crosshead for horizontal engine using CAD tools.

Evaluation:

Evaluation will be continuous an 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	Conventional representation of materials and machine components
C02	Basic concept of assembly drawing.
C03	IC Engines Parts, Lathe Machine Parts
CO4	CAD software to produce 2D & 3D assembly drawings and 3D views.

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		1								
CO2	2	2		1								
CO3	1	1										
CO4	1	2		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						
		End Sem	Mid-sem Exam	Quiz/ Assignment	End sem	Lab Work		L	T	P	
ME44	Kinematics of Machines	70	20	10	30	20	150	3	-	2	4

Course Objective:

At the completion of course the students will be able:

1. To describe the working of different mechanism used in machines.
2. To find velocity and acceleration of links of different;
3. To know the working of different types of gears, gear trains and cams.
4. To know the applications of gyroscopic principle.
5. To know the working principles of belt, rope and chain drive.

Course Contents:

Module 1: Mechanisms and Machines: Links, Pairs, Chains, Structure, Mechanism, Machine, Equivalentlinkage, Degrees of freedom, Gruebler's & Kutzback's criterion, Inversions of four bar chain, Mechanism with lower pairs Pantograph, Straight line motion mechanisms, Davis and Ackermann's steering mechanisms, Hooke's joint, Numerical problems based on above topics.

Module 2: Motion Analysis: Plane motion, Absolute & Relative motion, Displacement, Velocity and Acceleration of a point, Velocity and Acceleration Analysis by Graphical & Analytical methods, Velocity of rubbing, Kennedy's Theorem, Acceleration polygon, Coriolis acceleration component, Klein's construction, Numerical problems based on above topics.

Module 3: Gears: Classification of gears, Helical, Spiral, Bevel and Spur Gear, Spur Gear Terminology, Law of gearing, Tooth profiles, velocity of sliding, Path of contact, Arc of contact, Contact Ratio, Interference and Undercutting, Conjugate action, Numerical problems based on above topics.
Gear Trains: Simple, compound, reverted and epi-cyclic gear trains. Velocity ratio and torque calculation in gear trains.

Module 4: Cams: Classification of Cams and Followers, Radial Cam Terminology, Analysis of Follower motion (uniform, modified uniform, simple harmonic, parabolic, cycloidal), Pressure Angle, Radius of Curvature, Cam Profile for radial and offset followers Synthesis of Cam Profile by Graphical Approach, Cams with Specified Contours.

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Gyroscope: Gyroscopic Action in Machines, Angular Velocity and Acceleration, Gyroscopic torque/ couple, gyroscopic effect on Naval Ships, Stability of Two and Four Wheel Vehicles, Rigid disc at an angle fixed to a rotating shaft.

Module 5: Belt, Rope & Chain Drive: Types of Belts, Velocity ratio of a belt drive, Slip in belts, Length of open belt and crossed belt, Limiting ratio of belt-Tensions, Power transmitted by a belt, Centrifugal tension, Maximum tension in a belt, Condition for maximum power transmitted, Initial tension in a belt, Creep in belt, Applications of V-Belt. Rope and Chain drives.

Evaluation:

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

References:

1. Thomas Bevan; Theory of Machines; Pearson Education.
2. Rattan SS; Theory of machines; MC Graw Hills.
3. Ambekar AG; Mechanism and Machine Theory; PHI. Eastern Economy Edition 2015.
4. Uicker&Shigley, Theory of machines & Mechanism Second Edition Oxford University Press.
5. Rao JS and Dukkipati; Mechanism and Machine Theory; New Age Delhi.
6. Abdulla Shariff, Theory of Machines.
7. Theory of machines by R.K.Bansal.

Course Outcomes:

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

CO1	Explain the kinematics of mechanism and their inversions.
C02	Design different types of gears and gear trains.
C03	Draw cam profile for different follower motions.
CO4	Analyze Gyroscopic effect on Naval ship and Stability of Two and Four Wheel Vehicles.

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		1								
CO2	2	2		1								
CO3	1	1										
CO4	1	2		1								

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Kinematics of Machines Lab

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

1. To finds out gyroscopic couple.
2. To find out velocity & acceleration of slider crank mechanism by Klin's Construction.
3. To find out velocity ratio of various gear trains.
4. To study of various types of belt drives & find out the velocity ratio of the drive.
5. To draw the cam profile.
6. Study of working models of various popular mechanisms like quick return mechanism etc.
7. To draw Involute profile of a gear by generating method.

Evaluation:

Evaluation will be continuous an 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	Verify the law of gyroscope and describe the working of different mechanism and their inversions.
C02	Draw velocity and acceleration of slider crank mechanism by Klein's Construction method.
C03	Calculate velocity ratio of various gear trains and various type of belt drives.
CO4	Draw cam profile and involute, profile of a gear by generating method.

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		1								
CO2	2	2		1								
CO3	1	1										
CO4	1	2		1								

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Subject Code	Subject name	Maximum Marks Allotted					Total Marks	Hours/Week			Total Credits
		Theory			Practical						
ME45	Machine Design-I	End Sem	Mid-sem Exam	Quiz/ Assignment	End sem	Lab Work	100	L	T	P	4
		70	20	10	-	-		3	1	-	

Course Objective:

To study the basic design Principle's and apply the principles to the design of various elements encountered in Mechanical machines and structures.

Course Contents:

Module 1: Mechanical Engineering Design - Design considerations, Design Procedure, Material selection Modes of failure, causes of stress concentration; stress concentration in tension, bending and torsion; reduction of stress concentration, theoretical stress concentration factor, notch sensitivity. Fatigue-Cyclic loading, endurance limit, S-N Curve, loading factor, size factor, surface factor. Stress concentration factor, Design consideration for fatigue, Goodman and modified Goodman's diagram, Soderberg equation, Gerber parabola, design for finite life, cumulative fatigue damage.

Module 2: Design of Fasteners: Design of cotter joints, Design of knuckle joints, Design of welded joints; Fillet and butt welds, Welded joint subjected to Bending moment, Welded joint subjected to Torsional moment, Design of riveted joints; Design of Longitudinal Butt joint for Boiler shell, Design of Circumferential Lap joint for Boiler shell, Eccentrically Loaded Riveted Joint, Design of bolted joints, Forms of threads, Trapezoidal threads.

Module 3: Shafts, Keys & Couplings: Design of shaft under combined bending, twisting and axial loading; shock and fatigue factors, design for rigidity; design of shaft subjected to dynamic load; design of hollow shafts.

Design of keys: Design of Square and Flat keys, Design of Kennedy key.

Module 4: Selection & Design of Bearings: Reynold's equation, stable and unstable operation, heat dissipation and thermal equilibrium, boundary lubrication, dimensionless numbers,

Design of joumal bearings,

Design of Rolling- element bearing: Types of rolling contact bearing, bearing friction and power loss, bearing life; Radial, thrust & axial loads; Static & dynamic load capacities; Selection of ball and roller bearings; lubrication and sealing.

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Module 5: Design of Springs: Types of springs, Terminology of Helical Spring, Design of helical compression and tension spring, Design of leaf spring and Torsion springs, Fatigue loading of springs, Surge in springs, Spiral springs, nipping of leaf spring.

Evaluation:

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

References:

1. Robert C Juvinal, Kurt M Marshek Machine Component design Wiley Student edition.
2. CS Sharma & Kamlesh Purohit, Design of machine elements PHI.
3. Sharma & Agarwal Machine design.
4. Pandya & Shah, Charottar.
5. JE Shingley Machine design Mc Graw Hills,
6. Gope PC, Machine Design, PHI Learning. 2015.
7. P Kannaiah, Machine Design, SCITECH.
8. Nortan RL, Machine Design, Pearson, Fifth Edition.

Course Outcomes:

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

CO1	Illustrate modes of failure, fatigue and different factors used in design.
C02	Design various machine elements such ascotter joints, knuckle joints, welded joints, springs, bearings and shafts used in different machines.
C03	Analyzemachine components against combined bending, twisting and axial loading.

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	1									
CO2	3	2	2	1								
CO3	1	1	2	2								

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Jabalpur Engineering College, Jabalpur (M.P)

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

(AICTE Model Curriculum Based Scheme)

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

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	
ME46	Software Lab (Python)	-	-	-	30	20	50	-	-	4	2

Course Objective:

The objective of the module is to make students familiar with AotoCAD software by making them learn the drafting and modelling on the software.

Course Contents:

Module1: Introduction to python language, Basic syntax, Literal Constants, Numbers, Variable and Basic data types,String, Escape Sequences, Operators and Expressions, Evaluation Order, Indentation, Input, Output, Functions, Comments.

Module2: Data Structure: List, Tuples, Dictionary, DataFrame and Sets, constructing, indexing, slicing and content manipulation.

Module3: Control Flow:Conditional Statements - If, If-else, Nested If-else. Iterative Statement - For, While, Nested Loops. Control statements - Break, Continue, Pass.

Module4: Object oriented programming:Class and Object, Attributes, Methods, Scopes and Namespaces, Inheritance, Overloading, Overriding, Data hiding,Exception: Exception Handling, Except clause, Try finally clause, User Defined Exceptions.

Module5: Modules and Packages: Standard Libraries: File I/0, Sys, logging, Regular expression, Date and Time, Network programming, multi-processing and multithreading.

References

- Timothy A. Budd: Exploring python, McGraw-Hill Education.
- R.NageshwarRao ,"Python Programming" ,Wiley India
- Think Python: Allen B. Downey, O'Reilly Media, Inc.

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

1. To write a Python program to find GCD of two numbers.
2. To write a Python Program to find the square root of a number by Newton's Method.
3. To write a Python program to find the exponentiation of a number.
4. To write a Python Program to find the maximum from a list of numbers.
5. To write a Python Program to perform Linear Search.
6. To write a Python Program to perform binary search.
7. To write a Python Program to perform selection sort.
8. To write a Python Program to perform insertion sort.
9. To write a Python Program to perform Merge sort.
10. To write a Python program to find first n prime numbers.
11. To write a Python program to multiply matrices.
12. To write a Python program for command line arguments.
13. To write a Python program to find the most frequent words in a text read from a file.
14. To write a Python program to simulate elliptical orbits in Pygame.
15. To write a Python program to bouncing ball in Pygame.

Evaluation:

Evaluation will be continuous an 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	Introduction to python language, Basic syntax, Literal Constants
C02	Control Flow:Conditional Statements
C03	Object oriented programming:Class and Object

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	1									
CO2	3	2	2	1								
CO3	1	1	2	2								

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