Mandsaur University, Mandsaur(M.P.)

Department of Mechanical Engineering

Syllabus of

Advance Material Science and Metallurgy (MEC-260)

B.Tech.(IV-Semester) (CBCS Scheme)(04YDC)

W.e.f. (session2017-18)

Name of Subject With Code No.	Maximum Marks Allocation				Lectures			Credit	Total Marks
	Theory Paper		Continuous Evaluation	Practical Examination	L	T	P		
	End Sem. Test (EST)	Mid Sem. Test (MST)							
Advance Material Science and Metallurgy (MEC-260)	60	30	10	------	3	0	0	3	100

Course Objective:- The syllabus of the subject shall impart the knowledge about properties of materials and to make the students to understand the selection and processing of materials for a wide range of applications in engineering and elsewhere to learn metallurgical concepts of materials and various testings.

Unit 1: Mechanical Properties and their Testing Tensile test, engineering stress-strain curve, true stress-strain curve, types of stress-strain curves, compression test, bend test, torsion test, formability, hardness testing, different hardness tests Vickers, Rockwell, Brinnel, Impact test, fatigue test, creep test.

Unit 2: Equilibrium Diagrams Definitions of terms, rules of solid –solubility, Gibb's phase rule, solidification of a pure metal, plotting of equilibrium diagrams, lever rule, Iron-iron carbide equilibrium diagram, critical temperatures, solidification and microstructure of slowly cooled steels, non-equilibrium cooling of steels, property variation with microstructures, classification and application of steels,, specification of steels, transformation products of austenite, TTT diagram, critical cooling rate, CCT diagram.

Unit 3: Heat Treatment Heat treatment of steels, cooling media, annealing processes, normalizing, hardening, tempering, quenching and hardenability, surface hardening processes- nitriding, carbonitriding, flame hardening, induction hardening.

Unit 4: Metallography Microscopy, specimen preparation, polishing abrasives and cloths, specimen mounting, electrolytic polishing, etching procedure and reagents, electrolytic etching, optical metallurgical microscope, macroscopy, sulphur printing, flow line observations, examination of fractures, spark test, electron microscope

Unit 5: Strengthening Mechanisms and Non-destructive Testing Refinement of grain size, cold working/strain hardening, solid solution strengthening, dispersion strengthening, Precipitation hardening, Magnetic particle inspection, dye penetrant inspection, ultrasonic inspection, radiography, eddy current testing, acoustic emission inspection.

REFERENCES

1. Engineering physical Matallurgy-By Prof. Y Lakhtin MIR Publishers Moscow.

2. A Text Book of Material Science And Metallurgy by O.P. Khanna.
3. Material Science And Process. by S. K. Hazia Choudhry.
4. Mechanical Metallurgy by Dieter (Tata Mcgrawhill).
5. Materials Science by B.S. Narang (Pub. CBS pub. & Distributions New Delhi).
6. Principles of Engineering Metallurgy, L. Krishna Reddy, New Age International Publishers.

Course Outcomes:- Enhanced knowledge about materials and special metals and alloys at microscopic level. The application of the knowledge of Material science in Practical field applications.
study of this subject will make the student to learn about technical applications of materials their properties in the engineering industries.

Mandsaur University, Mandsaur(M.P.)
Department of Mechanical Engineering
Syllabus of
Energy Conversion System-I (MEC270)
B.Tech.(IV-Semester) (CBCS Scheme)(04YDC)
W.e.f. (session2017-18)

Name of Subject With Code No.	Maximum Marks Allocation				Lectures per week			Credits	Total Marks
	Theory Paper		Continuous Evaluation	Practical Examination	L	T	P		
	End Sem. Test (EST)	Mid Sem. Test (MST)							
Energy Conversion System-I (MEC270)	**60**	**30**	**10**	**---**	3	-	-	3	**100**

Course objective: To learn the Concepts of thermodynamics and principles of energy conversion processes into various applications like IC Engines, Steam Turbines, water turbines, Compressors, heat exchangers.

Unit1:

Gas Power Cycles: Otto, Diesel, Dual, Brayton Cycles, Calculation of Mean Effective Pressure, and Air Standard Efficiency – Comparison of Cycles, Phase change cycles: Rankine, Regenerative and Reheat cycles.

Unit 2:

Steam Generators: Classification, Conventional Boilers, High-Pressure Boilers-Lamont, Benson, Loeffler and Velox Steam Generators, Performance and Rating of Boilers, Equivalent Evaporation, Boiler Efficiency, Heat Balance Sheet, Combustion in Boilers, Super Critical Boilers, Fuel and Ash Handling, Boiler Draught, Overview of Boiler Codes

Unit 3:

Steam Nozzles And Turbines**:** Flow of Steam through Nozzles, Shapes of Nozzles, Effect of Friction, Critical Pressure Ratio, Supersaturated Flow. Impulse and Reaction Principles, Compounding, Velocity Diagram for Simple and Multi-Stage Turbines, Speed Regulations – Governors

Unit 4:

Steam Condensers, Cooling Towers and Heat Exchangers: Introduction, Types of Condensers, Back Pressure and its Effect on Plant Performance Air Leakage and its Effect on Performance of Condensers, Various Types of Cooling Towers, Design of Cooling Towers, Classification of Heat Exchangers, Recuperates and Regenerators .Parallel Flow, Counter Flow and Cross Flow Exchangers, Fouling Factor, Introduction to LMTD Approach to Design a Heat Exchanger

Unit 5:

Water Turbines: Classification, Pelton, Francis and Kaplan Turbines, Vector Diagrams and Work Done, Draft Tubes, Governing of Water Turbines. Centrifugal Pumps: Classification, Advantage Over Reciprocating Type, Definition of Mano-Metric Head, Gross Head, Static Head, Vector Diagram and Work Done. Performance and Characteristics: Application of Dimensional Analysis and Similarity to Water Turbines and Centrifugal Pumps, Unit and Specific Quantities, Selection of Machines, Hydraulic, Volumetric, Mechanical and Overall Efficiencies, Main and Operating Characteristics of the Machines, Cavitations.

References:

1. P.K.Nag; Basic and Applied Thermodynamics; TMH
2 R. Yadav Steam and Gas Turbines
3. Bansal R. K; Fluid Mechanics & Fluid Machines
4. Sarkar, B.K,"Thermal Engineering" Tata McGraw-Hill Publishers, 2007

Course Outcome: The Understanding about Basics and Fundamentals of T**hermal** E**ngineering and** G**as** D**ynamics** Processes (IC Engines, Steam Turbines, water turbines, Compressors, heat exchangers) will be enhanced.

Mandsaur University, Mandsaur(M.P.)

Department of Mechanical Engineering

Syllabus of

Theory of Machines (MEC280)

B. Tech. (-Semester) (CBCS Scheme)(04YDC)

w.e.f. (session2017-18)

Name of Subject With Code No.	Maximum Marks Allocation				Lectures per week			Credits	Total Marks
	Theory Paper		Continuous Evaluation	Practical Examination	L	T	P		
	End Sem. Test (EST)	Mid Sem. Test (MST)							
Theory of Machines (MEC280)	40	20	10	30	2	1	2	4	100

Course Objectives: Theory of Machines is a Fundamental Course for Mechanical Engineers to Understand the Working Principals of any Machine. This Course is Essential to Understand the Motion, Transmission of the Motion and the Forces Responsible for the Motion

Unit 1:

Mechanisms and Machines: Mechanism, Machine, Plane and Space Mechanisms, Kinematic Pairs, Kinematic Chains and their Classification, Degrees of Freedom, Grubler's Criterion, kinematic Inversions of Four Bar Mechanism and Slider Crank Mechanism, Equivalent Linkages, Pantograph, Straight Line Motion Mechanisms, Davis and Ackermann's Steering Mechanisms, Hooke's Joint.

Unit 2:

Displacement, Velocity and Acceleration Analysis of Plane Mechanisms: Kinematic Analysis of Plane Mechanisms Using Graphical and Cartesian Vector Notations: Planar kinematics of a Rigid Body, Rigid Body Motion, Translation, Rotation About a Fixed Axis, Absolute General Plane Motion. General Case of Plane Motion, Relative Velocity Method, Velocity and Acceleration Analysis, Instantaneous Center and its Application, Kennedy's Theorem, Relative Motion, Coriolis Component of Acceleration; Velocity and Acceleration Analysis Using Complex Algebra (Raven's) Method.

Unit 3:

Flywheels:

Significance of Flywheel, Turning Moment and Crank Effort Diagrams for Reciprocating Machines, Coefficient of Fluctuation of Speed and Energy, Limiting Velocity of Flywheel, Design of Flywheels for Engines and Punching Machines.

Unit 4 :

Gears: Classification of Gears, Nomenclature, Involutes and Cycloidal Tooth Profile Properties, Synthesis of Tooth Profile for Spur Gears, Tooth System, Conjugate Action, Velocity of Sliding, Arc of Contact, Path of Contact, Contact Ratio, Interference and Undercutting, Helical, Spiral, Bevel and Worm Gears.

Gear Trains: Simple, Compound, Epicyclic Gear Trains; Determination of Gear Speeds Using Vector, Analytical and Tabular Method; Torque Calculations in Simple, Compound and Epicyclic Gear Trains.

Unit 5 :

Cams: Classification of Followers and Cams, Radial Cam Nomenclature, Analysis of Follower Motion (Uniform, Modified Uniform, Simple Harmonic, Parabolic, Cycloidal), Pressure Angle, Radius of Curvature, Synthesis of Cam Profile by Graphical Approach, Cams With Specified Contours.

Unit 6 :

Friction Devices: Clutches, Brakes and Dynamometers

Classification of Clutches, Torque Transmission Capacity, Considerations for Uniform Wear and Uniform Pressure Theory, Single Plate and Multi-Plate Clutch, Centrifugal Clutch, Energy Equation and Thermal Considerations.

Classification of Brakes, Braking Effect, Analysis of Brakes: Block Brake, Band Brake, Band and Block Brake, Internal Expansion Shoe Brake; Braking Analysis of Four Wheelers. Classification of Dynamometers, Analysis of Dynamometers: Prony Brake, Rope Brake, Hydraulic, Belt Transmission, Epicyclic-Train and Bevis-Gibson Torsion.

List of Experiments (Expandable)

- To Study all Inversions of Four-bar Mechanisms Using Models.
- To Plot Fall and Rise of the Follower Versus Angular Displacement of Cam and Vice Versa.
- Analysis of Clutch.
- Analysis of Brakes.
- Power Measurement Using Dynamometers.

ACTIVE LEARNING ASSIGNMENTS:

Preparation of Power-Point Slides, Which Include Videos, Animations, Pictures, Graphics for Better Understanding Theory and Practical Work – The Faculty Will Allocate Chapters/ Parts of Chapters to Groups of Students so that the Entire Syllabus to be Covered.

Reference Books:

1. S S Rattan , Theory of Machines, McGraw-Hill.
2. J.Uicker , Gordon R Penstock & J.E. Shigley, Theory of Machines and Mechanisms, Oxford.
3. A G Ambekar, Mechanism and Machine Theory, PHI.
4. R L Norton, Kinematics and Dynamics of Machinery, McGraw-Hill.
5. Kenneth J Waldron , Gary L Kinzel, Kinematics, Dynamics and Design of Machinery, Wiley.
6.Meriam, J L and Kraige, L G, Engineering Mechanics: Dynamics, Wiley.
7.Dr.Jagdish Lal; Theory of Machines; Metropolitan Book Co; Delhi
8.Rao JS and Dukkipati; Mechanism and Machine Theory; NewAge Delhi.
9.Sharma CS; Purohit K; Theory of Mechanism and Machines; PHI.
10.Thomas Bevan; Theory of Machines; Pearson/ CBS PUB Delhi.

Course Objective: Learned Fundamental Course for Theory of machine to Understand the Working Principals of any Machine. Understand the Motion, Transmission of the Motion and the Forces Responsible for the Motion, Displacement, Velocity and Acceleration Analysis of Plane Mechanisms, Flywheels, Gears, Friction Devices: Clutches, Brakes and Dynamometers.

Mandsaur University, Mandsaur(M.P.)

Department of Mechanical Engineering

Syllabus of

Subject : Fluid Mechanics(MEC290)

B. Tech. (IV -Semester) (CBCS Scheme) (04YDC)

W. e. f. (session 2016-17)

Name of Subject With Code No.	Maximum Marks Allocation				Lectures per week			Credits	Total Marks
	Theory Paper		Practical Examination	Continuous Evaluation	L	T	P		
	Mid Sem. Test (MST) F_1	End Sem. Test (EST) F_2							
Fluid Mechanics (MEC290)	**20**	**40**	**30**	**10**	2	1	2	4	**100**

Course Objectives:

1. To Understand Fluid Statics and Fluid Dynamics.
2. To Understand Application of Mass, Momentum and Energy Equation in Fluid Flow.
3. To Learn Various Flow Measurement Techniques.

Unit : 1 Properties of Fluids : Fluid Definition and Properties, Newton's Law of Viscosity Concept of Continuum, Classification of Fluids, Mass, Density, Specific Weight, Volume and Gravity, Surface Tension, Capillarity, Viscosity, Bulk Modulus of Elasticity, Pressure and Vapor Pressure, Thermodynamic Properties of Fluids , Engineering Units of Various Properties, Variation Pattern of Different Properties of Fluids Under Different Ambient Conditions ,

Unit : 2 Fluid Statics: Definition of Body and Surface Forces, Pascal's Law, Basic Hydrostatic Equation, Forces on Surfaces Due to Hydrostatic Pressure, Pressure at a Point, Pressure Variation in Static Fluid, Absolute and Gauge Pressure, Atmospheric and Vacuum Pressure, Simple Manometers and Differential Manometers, Total Pressure and Center of Pressure on Plane and Curved Surfaces, Submerged in a Liquid.

Unit : 3 : **Buoyancy and Fluid Kinematics** : Buoyancy and Archimedes' Principle Buoyant Force, Metacentre and Metacentric Height , Determination of Metacentric Height Experimentally and Theoretically , Stability of Floating and Submerged Bodies, Relative Equilibrium, Kinematics of Flow : Types of Flow-Ideal & Real , 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 & Irrigational Flow, Circulation, Stagnation Point, Separation of Flow, Sources & Sinks, Velocity Potential, Stream Function, Flow Nets Their Utility & Method of Drawing Flow Nets.

Unit : 4 Fluid Dynamics and Flow Measurement : 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. The Moment of Momentum Equation, Forces on Fixed and Moving Vanes and Other Applications. Fluid Flow Measurements: Meaning of Discharge and its Unit Venturimeter , Orificemeter, Nozzle Meter, Weirs and Notches, Mouth Pieces Velocity Measurement: Pitot Tube, Prandtl Tube, Current Meters .

Unit : 5 Dimensional Analysis and Real Fluid Flows : Dimensional Analysis, Dimensional Homogeneity, Use of Buckingham-pi Theorem, Calculation of Dimensionless Numbers, Similarity Laws, Specific Model Investigations : Submerged Bodies, Psubmerged Bodies, Weirs, Spillways, Roto -Dynamic Machines . Definition of Reynold's Number, Laminar Flow Through Apipe (Hagen-Poiseuille Flow), Velocity Profile and Head Loss; Turbulent Flows and Theoriesof Turbulence-Statistical Theory, Eddy Viscosity Theory and Prandtl Mixing Length Theory; Velocity Profiles for Turbulent Flows- Universal Velocity Profile,1/7th Power Law; Velocity Profiles for Smooth and Rough Pipes Darcy's Equation for Head Loss in Pipe(No Derivation),Moody's Diagram, Pipes in Series and Parallel, ,Major and Minor Losses in Pipes.

Outcomes: Learner Should be able to ….
1. Understand Properties of Fluids and Classification of Flows
2. Formulate and Solve Equations of the Control volume for Fluid Flow Systems
3. Calculate Resistance to Flow of Incompressible Fluids Through Closed Conduits and Over Surfaces
4. Apply Fundamentals of Compressible Fluid Flows to Relevant Systems

List of Experiments:
1. Determination of Metacentric Height.
2. Determination of Pressure Surge in Pipes
3. Measurement of Hydrostatic Force on Bodies/Surfaces
4. Verification of Archimedes' Principle
5. Verification of Pascal's Law
6. Calibration of Venturi Meter / Orifice Meter / Nozzle Meter / Pitot Tube
7. Determination of Friction Factor for Pipes
8. Determination of Major and Minor Losses in Piping Systems

References: (i) Fluid Mechanics : K.L. Kumar
(ii) Fluid Mechanics : Seth and Modi
(iii) Fluid Mechanics : Dr. R.K. Bansal
(iv) Fluid Mechanics: B.M.Massey
(v). Fluid Mechanics: Cengel and Cimbala

Course Outcome: Learned Fluid Statics and Fluid Dynamics, Application of Mass, Momentum and Energy Equation in Fluid Flow,Various Flow Measurement Techniques.

Mandsaur University, Mandsaur(M.P.)

Department of Mechanical Engineering

Syllabus of

Production Technology-II

B.E.(IV-Semester) (CBCS Scheme) (04YDC)

W.e.f.(session 2017-18)

Name of Subject With Code No.	Maximum Marks Allocation				Lectures per week			Credits	Total Marks
	Theory Paper		Continuous Evaluation	Practical Examination	L	T	P		
	End Sem. Test (EST)	Mid Sem. Test (MST)							
Production Technology-II (MEC220)	**40**	**20**	**10**	**30**	2	1	2	4	**100**

Course objective: To Provide the Various Concepts of Technology and Machines Used in Production particularly in the area of metal cutting, Lathe machine, milling and Grinding, Shaper and slotter machine.

Unit1:

THEORY OF METAL CUTTING

Cutting Tools/Fluids: Tool Materials, Nomenclature and Geometry of Cutting Tools , Orthogonal and Oblique Cutting - Classification of Cutting Tools: Single, Multipoint – Tool Signature for Single Point Cutting Tool - Mechanics of Orthogonal Cutting – Force Relations : Merchant Circle – Determination of Shear Angle - Chip Formation-Cutting Tool Materials - Tool Wear and Tool Life - Machinability – Simple Problems, Tool life.

Unit 2:

METAL CUTTING LATHES:

Engine Lathes, Construction all Arrangement and Principal Units of Engine Lathes, Type and Size Range of Engine Lathes, Operations Carried on Engine Lathe , Attachment Extending the Processing Capacities of Engine Lathes, Description of Other Types of Lathes, Plain Truing Lathes, Facing Lathes, Multiple Tool Lathes, Simple Purpose Lathes, Turret Lathes, Horizontal and Vertical. Alignment Tests of Lathes

Unit 3:

MILLING AND GRINDING MACHINES

Milling machines - Cutters Vertical, Horizontal and Universal Milling Machines, Indexing, Gear Cutting; Milling Cutters-Geometry and Specifications
Grinding – Surface and Cylindrical Grinding, Centre Less Grinding, Grinding Wheels, Construction and Specifications; Mechanics of Grinding; Tool Grinding.
Drilling: Drilling Tool Geometry, Drilling Machines

Unit 4:

SHAPER AND SLOTTER:

Introduction, Principle, Parts of Shaper, Classification of Shapers, Quick Return Mechanism of Ram, Working on Shaper, Hydraulic Shaper, Operations Performed on Shaper.

Unit 5:

UNCONVENTIONAL MACHINING: Limitation of Conventional Machining processes - Chemical, Electric Discharge, Electron Beam, Laser Beam, Ion Beam, Plasma, Explosive.

List of Experiments:
1. To Make a Job on Lathe Machine with all Operations like Turning, Step turning, Drilling , Tapper Turning ,Thread Cutting and knurling
2. Study of Bench Grinding Machine Prepare a Gringing Job on it.
3. To Perform a keyway Operation on Shaper Machine.
4. To Perform Side and Face Milling Operation on Milling Machine.
5. To Prepare a Spur Gear on Milling Machine Through Indexing Method.
6. To Study of Pillar Drilling Machine and Prepare a Job on it.

References:

1. Rao.P.N., Manufacturing Technology, Vol. 1,2 and 3, Tata McGraw Hill
2 Kalpakjian, S. & Schmid S.R, Manufacturing Engineering and Technology, Addison Wesley Longman
3. Jain R.K. Production Technology, Khanna Publishers
4. Ghosh, A., & Mallik, A. K. 1986. Manufacturing Science: Ellis Horwood
5. Hajra Choudhary.S.K and Hajra Choudhary.A.K, "Elements of Manufacturing Technology Vol II", Media Publishers, 2007

Course Outcome: The Understanding About Basics and Fundamentals of Manufacturing Processes will be Enhanced. Learned Various Concepts of Technology and Machines Used in Production particularly in the area of metal cutting, Lathe machine, milling and Grinding, shaper and Slotter machine.

Mandsaur University, Mandsaur(M.P.)
Department of Mechanical Engineering
Syllabus of
Auto CAD Practices(MEC-310)
B.Tech.(IV-Semester) (CBCS Scheme)(04YDC)
W.e.f. (session2017-18)

Name of Subject With Code No.	Maximum Marks Allocation				Lectures per week			Credits	Total Marks
	Theory Paper		Continuous Evaluation	Practical Examination	L	T	P		
	End Sem. Test (EST)	Mid Sem. Test (MST)							
Auto CAD Practices(MEC-310)	---	----	**50**	**50**	2	-	4	4	**100**

Course Objective: - (i) To learn drawing environment, orthographic projection.
(ii) To learn isometric dimensioned drawing
(iii) Concepts of 2D & 3D Drawing.

Setting up of Drawing Environment by Setting Drawing Limits, Drawing Units, Naming the Drawing, Naming Layers, Setting Line Types for Different Layers Using Various Type of Lines in Engineering Drawing, Saving and Printing of File.

To Draw Orthographic Projection Drawings (Front, Top and Side) of Boiler Safety Valve Giving Name the Various Components of the Valve.

Make an Isometric Dimensioned Drawing of a Connecting Rod Using Isometric Grid and Snap.

Draw Quarter Sectional Isometric View of a Cotter Joint.

Draw Different Types of Bolts and Nuts with Internal and External Threading in Acme and Square Threading Standards. Save the Bolts and Nuts as Blocks Suitable for Insertion.

Draw 3D Models by Extruding Simple 2D Objects, Dimension and Name the Objects.

Draw a Spiral by Extruding a Circle.

Refrence Books:
1.Introduction to AutoCAD 2012, 2D and 3D Design (Special Indian Edition), By Alf

Yarwood.
2.Engineering AutoCAD by A. P. Gautam , Khanna Publishing.
3. Autocad Training Guide**,** by Linkan Sagar, BPB Publication.
4. Learn AutoCAD in a Easy Way by Sunil K. Pandey ,Unitech books.

5. Advanced AutoCAD by R. Cheryl, IP Industrial Press.

Subject Outcome : - (i) Learned drawing environment, orthographic projection.
(ii) Learned isometric dimensioned drawing
(iii) Learned Concepts of 2D & 3D Drawing.
