Faculty of Engineering & Technology

P.K.University

Shivpuri (MP)

Department of Mechanical Engineering

Evaluation Scheme & Syllabus for

B.Tech. Third Year

(V & VI Semester)

(Effective from session 2025-26)

STUDY AND EVALUATION SCHEME FOR B.TECH MECHANICAL ENGINEERING

SEMESTER-V

SUBJECT CODE	SUBJECTS NAME	STUDY SCHEME Periods/Week			Credits	MARKS IN EVALUATION SCHEME						Total Marks of Internal & External
						INTERNAL ASSESSMENT			EXTERNAL ASSESSMENT			
		L	T	P		Th	Pr	Tot	Th	Pr	Tot	
UMANAME501	Managerial Economics	3	1	0	4	30	-	30	70	-	70	100
UMACHME502	Machine Design -I	3	0	0	3	30	-	30	70	-	70	100
UINDUME503	Industrial Sociology	3	0	0	3	30	-	30	70	-	70	100
UMANUME504	Manufacturing Science & Technology -II	3	0	0	3	30	-	30	70	-	70	100
UHEATME505	Heat and Mass Transfer	3	0	0	3	30	-	30	70	-	70	100
UICENME506	IC Engines and Compressors	3	1	0	4	30	-	30	70	-	70	100
UMACHME507	Machine Design -I Lab	0	0	2	1	-	25	25	-	25	25	50
UMANUME508	Manufacturing Science & Technology -II Lab	0	0	2	1	-	25	25	-	25	25	50
UHEATME509	Heat and Mass Transfer Lab	0	0	2	2	-	25	25	-	25	25	50
Total		18	2	6	24	180	75	255	420	75	495	750

Department of Mechanical Engineering
(Faculty of Engineering & Technology)
P.K. University, Shivpuri (MP)
III Year V Semester

L	T	P
3	1	0

UMANAME501
MANAGERIAL ECONOMICS

UNIT I : Introduction of Engineering Economics and Demand Analysis: Meaning and nature of Economics, Relation between science, engineering, technology and economics; Meaning of Demand, Determinants of Demand, Shifts in demand, Law of Demand, Price Elasticity of Demand &Types, Income Elasticity, Cross price Elasticity, Determinants of Elasticity, uses and
Importance of elasticity.

UNIT II: Concept of Supply: Law of Supply, Factors affecting Supply, Elasticity of supply.

Demand Forecasting: Introduction, Meaning and Forecasting, Methods or Techniques of Demand Forecasting, Criteria for Good Demand Forecasting, Demand Forecasting for a New Product;

UNIT III: Cost Analysis- Introduction, Types of Costs, Cost-Output Relationship: Cost Function, Cost-Output Relationships in the Short Run, and Cost-Output Relationships in the Long Run; Short run and long run, Break- Even Analysis; Production functions: laws of variable proportions, law of returns; Economies of scale: Internal and external**.**

UNIT IV: Market Structure: Market Structure Perfect Competition, Imperfect competition – Monopolistic, Oligopoly, duopoly sorbent features of price determination and various market conditions.

UNIT V: Nature and characteristics of Indian economy, concepts of LPG, elementary concepts of National Income, Inflation and Business Cycles ,Concept of N.I. and Measurement., Meaning of Inflation, Types and causes , Phases of business cycle .Investment decisions for boosting economy(National income and per capital income)

TEXT BOOKS-

1. PremvirKapoor, Sociology and Economics for Engineers, Khanna Publishing House (Edition 2018)
2. Salvatore D, —Principles of Microeconomics‖, Oxford University Press.
3. **Koutsoyiannis A, —Modern Microeconomic‖, Macmillan Education Ltd.**
4. DwivediDN, —Principles of Microeconomics‖, Pearson Education.
5. Cowell, FA, —Microeconomic Principles and Analysis‖, Oxford University Press.

Department of Mechanical Engineering
(Faculty of Engineering & Technology)
P.K. University, Shivpuri (MP)
III Year V Semester

L	T	P
3	0	0

UMACHME502
MACHINE DESIGN-I

UNIT I: Introduction Definition, Design requirements of machine elements, Design procedure, Standards in design, Selection of preferred sizes, Indian Standards designation of carbon & alloy steels, Selection of materials for static and fatigue loads. Design for Static Load Modes of failure, Factor of safety, Principal stresses, Stresses due to bending and torsion, Theory of failure.

UNIT II: Design for Fluctuating Loads Cyclic stresses, Fatigue and endurance limit, Stress concentrationfactor,Stress concentration factor for various machine parts, Notch sensitivity, Design for finite and infinite life, Soderberg, Goodman & Gerber criteria. Riveted Joints Riveting methods, materials, Types of rivet heads, Types of riveted joints, Caulking and Fullering, Failure of riveted joint, Efficiency of riveted joint, Design of boiler joints, Eccentric loaded riveted joint.

UNIT III: ShaftsCause of failure in shafts, Materials for shaft, Stresses in shafts, Design of shafts subjected to twistingmoment, bending moment and combined twisting and bending moments, Shafts subjected to fatigue loads,Design for rigidity.

UNIT IV: Mechanical SpringsTypes, Material for helical springs, End connections for compression and tension helical springs, Stressesand deflection of helical springs of circular wire, Design of helical springs subjected to static and fatigueloading.

UNIT V: Keys and Couplings Types of keys, splines, Selection of square & flat keys, Strength of sunk key, Couplings, Design of rigid andflexible couplings.Power ScrewsForms of threads, multiple threads, Efficiency of square threads, Trapezoidal threads, Stresses in screws,Design of screw jackNote: Design data book is allowed in the examination

Books and References:

1. Design of Machine Elements,V.B. Bhandari, Tata McGraw Hill Co.
2. Machine Design-Sharma and Agrawal, S.K. Kataria& Sons.
3. Machine Design, U C Jindal, Pearson Eductaion.
4. Design of Machine Elements, Sharma and Purohit, PHI.
5. Design of Machine Elements-M.F. Spott, Pearson Eductaion
6. Machine Design-Maleev and Hartman, CBS Publishers.
7. Mechanical Engineering Design, 9e – Joseph E. Shigely, McGraw Hill Education.
8. Elements of Machine Component Design, Juvinal&Marshek, John Wiley & Sons.

Department of Mechanical Engineering
(Faculty of Engineering & Technology)
P.K. University, Shivpuri (MP)
III Year V Semester

L	T	P
3	0	0

UINDUME503
INDUSTRIAL SOCIOLOGY

Unit-I

Industrial Sociology: Nature,Scope and Importance of Industrial Sociology. Social Relations in Industry, Social Organisation in Industry- Bureaucracy,Scientific Management and Human Relations.

Unit-II

Rise and Development of Industry : Early Industrialism – Types of Productive Systems – The Manorial or Feudal system. The Guild system, The domestic or putting-out system,and the Factory system. Characteristics of the factory system.Causes and Consequences of industrialization.Obstacles to and Limitations of Industrialization.

Unit-III

Industrialization in India.Industrial Policy Resolutions – 1956.Science.Technology andInnovation Policy of India 2013.

Unit-IV

Contemporary Issues : Grievances and Grievance handling Procedure.

Industrial Disputes: causes, Strikes and Lockouts.Preventive Machinery of Industrial Disputes:Schemes of Workers Participation in Management- Works Committee,Collective Bargaining, Bi-partite & Tri-partite Agreement ,Code of Discipline, Standing Orders. Labour courts & Industrial Tribunals,

Text and References books:

1. GISBERT PASCAL, Fundamentals of Industrial sociology, Tata McGraw Hill Publishing Co., New Delhi, 1972.
2. SCHNEIDER ENGNO V., Industrial Sociology 2nd Edition, McGraw Hill Publishing Co., New Delhi, 1979.
3. MAMORIAC.B. And MAMORIA S., Dynamics of Industrial Relations in India.
4. SINHAG.P. and P.R.N. SINHA, Industrial Relations and Labour Legislations, New Delhi, Oxford and IBH Publishing Co., 1977.
5. NADKARNI, LAKSHMI, Sociology of Industrial Worker,Rawat,Jaipur,1998.
6. BHOWMICKSHARIT,Industry,Labour and Society,Orient,2012.

Department of Mechanical Engineering
(Faculty of Engineering & Technology)
P.K. University, Shivpuri (MP)
III Year V Semester

L	T	P
3	0	0

UMANUME504
MANUFACTURING SCIENCE& TECHNOLOGY-II

Unit I A. Metal Cutting- Mechanics of metal cutting. Geometry of tool and nomenclature .ASA system Orthogonalvs obliquecutting. Mechanics of chip formation, types of chips. Shear angle relationship.
Merchant's force circlediagram. Cutting forces, power required. Heat generation and cutting tool

temperature, Cuttingfluids/lubricants.Tool materials. Tool wear and tool life. Machin-ability.Dynamometer, Brief introduction to machine tool vibration and surface finish.Economics of metal cutting.

Unit-II Machine Tools

(i) Lathe: Principle, construction, types, operations, Turret/capstan, semi/Automatic, Tool layout

(ii) Shaper, slotter, planer: Construction, operations & drives.

(iii) Milling: Construction, Milling cutters, up & down milling. Dividing head & indexing. Max chip thickness & power required.

(iv) Drilling and boring: Drilling, boring, reaming tools. Geometry of twist drills.

Unit-III Grinding &Super finishing

(i) Grinding: Grinding wheels, abrasive & bonds, cutting action. Grinding wheel specification.

Grinding wheel wear - attritions wear, fracture wear. Dressing and Truing. Max chip thickness and Guest criteria. Surface and cylindrical grinding. Center less grinding

(ii) Super finishing: Honing, lapping and polishing. Limits, Fits & Tolerance and Surface roughness: Introduction to Limits, Fits, Tolerances and IS standards, Limit-gauges, and surface-roughness.

Unit-IV B. Metal Joining (Welding)

Survey of welding and allied processes.Gas welding and cutting, process and equipment. Arc welding: Power sources and consumables. TIG&MIG processes and their parameters.Resistance welding - spot, seam projection etc. Other welding processes such as atomic hydrogen, submerged arc, electro slag, friction welding. Soldering & Brazing. Adhesive bonding. Thermodynamic and Metallurgical aspects in welding and weld, Weld ability, Shrinkage/residual stress in welds. Distortions & Defects in welds and remedies. Weld decay in HAZ

Unit-V C. Introduction to Unconventional Machining and Welding

Need & benefits, application and working principle of EDM, ECM, LBM, EBM, USM.AJM, WJM. Similarly, non-conventional welding applications such as LBW, USW, EBW, Plasma- arc welding, Diffusion welding, Explosive welding/cladding. Introduction to Hybrid machining processes

Books and References:

1. Manufacturing Science – A. Ghosh and A.K. Mallik,Affiliated East-West Press

2. 3. Production Technology - R.K. Jain Khanna Publishers.

Department of Mechanical Engineering
(Faculty of Engineering & Technology)
P.K. University, Shivpuri (MP)
III Year V Semester

L	T	P
3	0	0

UHEATME505
HEAT & MASS TRANSFER

UNIT-1

Introduction to Heat Transfer: Thermodynamics and Heat Transfer. Modes of Heat Transfer: Conduction, convection and radiation. Effectof temperature on thermal conductivity of materials; Introduction to combined heat transfer mechanism.

Conduction : General differential heat conduction equation in the rectangular, cylindrical and spherical coordinatesystems.Initial and boundary conditions.Steady State one-dimensional Heat conduction :Simple and Composite Systems in rectangular, cylindrical and spherical coordinates with and withoutenergy generation; Concept of thermal resistance.Analogy between heat and electricity flow; Thermalcontact resistance and over all heat transfer coefficient; Critical radius of insulation.

UNIT-II

Fins: Heat transfer from extended surfaces, Fins of uniform cross-sectional area; Errors of measurement oftemperature in thermometer wells.Transient Conduction:Transient heat conduction; Lumped capacitance method; Time constant; Unsteady state heat conduction inone dimension only.

UNIT-III

Forced Convection: Basic concepts; Hydrodynamic boundary layer; Thermal boundary layer; Approximate integral boundarylayer analysis; Analogy between momentum and heat transfer in turbulent flow over a flat surface; Mixedboundary layer; Flow over a flat plate; Flow across a single cylinder and a sphere; Flow inside ducts;Thermal entrance region, Empirical heat transfer relations; Relation between fluid friction and heat transfer;Liquid metal heat transfer.

Natural Convection : Physical mechanism of natural convection; Buoyant force; Empirical heat transfer relations for naturalconvection over vertical planes and cylinders, horizontal plates and cylinders, and sphere, Combined freeand forced convection.

UNIT-4

Thermal Radiation : Basic radiation concepts; Radiation properties of surfaces; Black body **radiation Planck's law, Wein's displacement law, Stefan Boltzmann law, Kirchoff's law; ; Gray**

body; Shape factor; Black-body radiation;Radiation exchange between diffuse non black bodies in an enclosure; Radiation shields; Radiationcombined with conduction and convection; Absorption and emission in gaseous medium; Solar radiation; Green house effect.

UNIT-5

Heat Exchanger : Types of heat exchangers; Fouling factors; Overall heat transfer coefficient; Logarithmic mean temperature difference (LMTD) method; Effectiveness-NTU method; Compact heat exchangers.

Condensation and Boiling:Introduction to condensation phenomena; Heat transfer relations for laminar film condensation on verticalsurfaces and on outside & inside of a horizontal tube; Effect of non-condensable gases; Dropwisecondensation; Heat pipes; Boiling modes, pool boiling; Hysteresis in boiling curve; Forced convectionboiling.

Introduction to Mass Transfer:

Introduction; Fick's law of diffusion; Steady state equimolar counter diffusion; Steady state diffusion though a stagnant gas film.

Texts Books:

1. Fundamentals of Heat and Mass Transfer, by Incroperra& DeWitt, John Wiley and Sons
2. Heat and Mass Transfer by Cengel, McGraw-Hill
3. Heat Transfer by J.P. Holman, McGraw-Hill
4. Heat and Mass Transfer by Rudramoorthy and Mayilsamy, Pearson Education
5. Heat Transfer by Ghoshdastidar, Oxford University Press
6. A text book on Heat Transfer, by Sukhatme, University Press.
7. Heat Transfer by Venkateshan, Ane Books Pvt Ltd
8. Schaum's outline of Heat Transfer by Pitts & Sisson McGraw-Hill
9. Heat and Mass Transfer by R Yadav, Central Publishing House.

Department of Mechanical Engineering
(Faculty of Engineering & Technology)
P.K. University, Shivpuri (MP)
III Year V Semester

L	T	P
3	1	0

UICENME506
I C ENGINES & COMPRESSORS

Unit-1 Introduction to I.C Engines: Engine classification and basic terminology, Two and four stroke engines,SI and CI engines, Valve timing diagram.Thermodynamic analysis of Air standard cycles, Otto cycle, Diesel cycle, Dual cycle, Stirling cycle, Ericsson cycles, Comparison of Otto, Diesel and Dual cyclesFuel air cycle, factors affecting the fuel air cycle, Actual cycle.

Unit–II SI Engines: Combustion in SI engine, Flame speed, Ignition delay, abnormal combustion and it'scontrol, combustion chamber design for SI engines.Carburetion, Mixture requirements, Carburetors and fuel injection system in SI EngineIgnition system requirements, Magneto and battery ignition systems, ignition timing and spark plug,Electronic ignition, Scavenging in 2 Stroke engines, Supercharging and its effect

Unit–III CI Engine: Combustion in CI engines, Ignition delay, Knock and it's control,Combustion chamberdesign of CI engines.Fuel injection in CI engines, Requirements, Types of injection systems, Fuel pumps, Fuel injectors,Injection timingsExhaust emissions from SI engine and CI engine and it's control

Unit-IV Engine Cooling and Lubrication: Different cooling systems, Radiators and cooling fans, Engine friction, Lubrication principle, Type of lubrication, Lubrication oils, Crankcase ventilation.**Fuels:** Fuels for SI and CI engine , Important qualities of SI and CI engine fuels, Rating of SI engineand CI engine fuels, Dopes, Additives, Gaseous fuels, LPG, CNG, Biogas, Producer gas, Alternativefuels for IC engines.**Testing and Performance:** Performance parameters, Basic measurements, Blow by measurement,Testing of SI and CI engines

Unit V Compressors: Classification, Reciprocating compressors, Single and Multi stage compressors,Inter cooling, Voluetric efficiency.Rotary compressors, Classification, Centrifugal compressor Axial compressors, Surging and stalling,Roots blower, Vane compressor.

Text Books:1. Fundamentals of Internal Combustion Engine by Gill, Smith,Ziurs,
Oxford &IBH Publishing
2. Fundamentals of Internal Combustion Engines by H.N. Gupta, Prentice Hall of India
3. A Course in International Combustion Engines, by Mathur& Sharma, DhanpatRai& Sons.
4. I.C Engine Analysis & Practice by E.FObert.
5. I.C Engine, by V. Ganeshan, Tata McGraw Hill Publishers.
6. I.C Engine, by R. Yadav, Central Publishing House, Allahabad
7. Reciprocating and Rotary Compressors, by Chlumsky, SNTI Publications, Czechoslovakia
8. Turbines, Compressors and Fans, by S.M.Yahya, Tata McGraw Hill Pub.

Department of Mechanical Engineering
(Faculty of Engineering & Technology)
P.K. University, Shivpuri (MP)
III Year V Semester

L	T	P
0	0	2

UMACHME507
MACHINE DESIGN-I LAB

List of practical's

1. Design & drawing of Cotter joint.
2. Design & drawing of Knuckle joint
3. Design of machine components subjected to combined steady and variable loads
4. Design of eccentrically loaded riveted joint
5. Design of boiler riveted joint
6. Design of shaft for combined constant twisting and bending loads
7. Design of shaft subjected to fluctuating loads
8. Design and drawing of flanged type rigid coupling
9. Design and drawing of flexible coupling
10. Design and drawing of helical spring
11. Design and drawing of screw jack

Department of Mechanical Engineering
(Faculty of Engineering & Technology)
P.K. University, Shivpuri (MP)
III Year V Semester

L	T	P
0	0	2

UMANUME- 508
MANUFACTURING SCIENCE& TECHNOLOGY-II LAB

List of practical's

1. Shear-angle determination (using formula) with tube cutting (for orthogonal) on lathe machine.
2. To study about Lathe machine
3. Tool grinding (to provide tool angles) on tool-grinder machine.
4. To study about Gear cutting on milling machine.
5. Machining a block on shaper machine.
6. Finishing of a surface on surface-grinding machine.
7. Drilling holes on drilling machine and study of twist-drill.
8. Study of different types of tools and its angles & materials.
9. Experiment on tool wear and tool life.
10. Experiment on jigs/Fixtures and its uses
11. Gas welding experiment
12. Arc welding experiment

Department of Mechanical Engineering
(Faculty of Engineering & Technology)
P.K. University, Shivpuri (MP)
III Year V Semester

L	T	P
0	0	2

UHEATME509
HEAT & MASS TRANSFER LAB

List of practical's

1. Conduction – Experiment on Composite plane wall
2. Conduction – Experiment on Composite cylinder wall
3 Conduction - Experiment on critical insulation thickness
4. Conduction – Experiment on Thermal Contact Resistance
5. Convection - Pool Boiling experiment
6. Convection - Experiment on heat transfer from tube-(natural convection).
7. Heat exchanger - Parallel flow experiment And Counter flow experiment
8. Convection - Heat transfer through fin-(natural convection) .
9. Convection - Heat transfer through tube/fin-(forced convection).
10 Experiment on solar collector.
11 Experiment on Stefan's Law, on radiation determination of emissivity, etc.

Faculty of Engineering & Technology

P.K.University

Shivpuri (MP)

Evaluation Scheme & Syllabus for
Department of Mechanical Engineering
B.Tech. Third Year
(VI Semester)

(Effective from session 2025-26)

Evaluation Scheme For B.Tech Mechanical Engineering VI sem.

STUDY AND EVALUATION SCHEME FOR B.TECH MECHANICAL ENGINEERING SEMESTER-VI													
SUBJECT CODE	SUBJECTS NAME	STUDY SCHEME Periods/Week			Credits	MARKS IN EVALUATION SCHEME						Total Marks of Internal & External
						INTERNAL ASSESSMENT			EXTERNAL ASSESSMENT			
		L	T	P		Th	Pr	Tot	Th	Pr	Tot	
UINDUME601	Industrial Management	3	0	0	3	30	-	30	70	-	70	100
UMACHME602	Machine Design -II	3	0	0	3	30	-	30	70	-	70	100
UDYNAME603	Dynamics Of Machines	3	1	0	4	30	-	30	70	-	70	100
UREFRME604	Refrigeration and Air Conditioning	3	1	0	4	30	-	30	70	-	70	100
UFLUIME605	Fluid Machinery	3	0	0	0	30	-	30	70	-	70	100
UMACHME606	Machine Design – II Lab	0	0	2	2	-	25	25		25	25	50
UREFRME607	Refrigeration and Air Conditioning Lab	0	0	2	2	-	25	25	-	25	25	50
UFLUIME608	Fluid Machinery Lab	0	0	2	2	-	25	25	-	25	25	50
Total		15	2	6	20	150	75	225	350	75	425	650

Department of Mechanical Engineering
(Faculty of Engineering & Technology)
P.K. University, Shivpuri (MP)
III Year VI Semester

L	T	P
3	0	0

UINDUME601
INDUSTRIAL MANAGEMENT

Unit-I

Introduction: Concept, Development, application and scope of Industrial Management. **Productivity:** Definition, measurement, productivity index, types of production system, Industrial Ownership.

Unit-II

Management Function:Functions of Management, Taylor's Scientific Management Theory,
Fayol's Principles of Management, Social responsibilities of Management,

Introduction to Human resources management: Nature of HRM, functions and importance of HRM.

Unit-III

Work Study: Introduction, definition, objectives, steps in work study, Method study: definition, objectives, and steps of method study, Work Measurement: purpose, types of study — stop watch methods — steps — allowances — standard time calculations — work sampling, Production Planning and Control

Inventory Control: Inventory, Cost, Deterministic Models, and Introduction to supply chain management.

Unit-IV

Quality Control: Process control, SQC, Control charts, Single, Double and Sequential Sampling, Introduction to TQM.

Unit-V

Project Management: Project network analysis, CPM, PERT and Project crashing and resource Leveling

BOOKS AND REFERENCE:

1. Statistical Quality Control by Grant and Leavarworth, McGraw Hill
2. Industrial Management By O P Khan.
3.Problems in Operations Research by- Prem Kumar Gupta & D.S. Hira, S. Chand

Department of Mechanical Engineering
(Faculty of Engineering & Technology)
P.K. University, Shivpuri (MP)
III Year VI Semester

L	T	P
3	0	0

UMACHME602
MACHINE DESIGN-II

UNIT I: Principle of transmission and conjugate actionSpur GearsTooth forms, System of gear teeth, contact ratio, Standard proportions of gear systems, Interference ininvolute gears, Backlash, Selection of gear materials, Gear manufacturing methods, Designconsiderations, Beam strength of gear tooth, Dynamic tooth load, Wear strength of gear tooth, Failure ofgear tooth, Design of spur gears, AGMA and Indian standards.

Helical Gears : Terminology, Proportions for helical gears, Forces components on a tooth of helical gear, Virtual

number of teeth, Beam strength& wear strength of helical gears, Dynamic load on helical gears, Designof helical gears.

UNIT II : Bevel Gears: Terminology of bevel gears, Force analysis, Virtual number of teeth, Beam strength and wear strengthof bevel gears,Effective load of gear tooth, Design of a bevel gear system.

Worm Gears: Types of worms, Terminology, Gear tooth proportions, Efficiency of worm gears, Heat dissipation inworm gearing, Strength and wear tooth load for worm gears, Design of worm gearing system.

UNIT III : Sliding Contact Bearing: Types, Selection of bearing, Plain journal bearing, Hydrodynamic lubrication, Properties and materials,Lubricants and lubrication, Hydrodynamic journal bearing, Heat generation, Design of journal bearing,Thrust bearing-pivot and collar bearing, Hydrodynamic thrust bearing.

UNIT IV: Rolling Contact Bearing: Advantages and disadvantages, Types of ball bearing, Thrust ball bearing, Types of roller bearing,Selection of radial ball bearing, Bearing life, Selection of roller bearings, Dynamic equivalent load forroller contact bearing under constant and variable loading, Reliability of Bearing, Selection of rollingcontact bearing, Lubrication of ball and roller bearing, Mounting of bearing

UNIT V : ICEngine : Selection of type of IC engine, General design considerations, Design of cylinder and cylinder head;Design of piston and its parts like piston ring and gudgeon pin etc.; Design of connecting rod; Design ofcrankshaft

Books and References:

1. Design of Machine Elements-V.B. Bhandari, Tata McGraw Hill Co.
2. Machine Design-Sharma and Agrawal, S.K. Kataria& Sons.
3. Machine Design, U C Jindal, Pearson Eductaion.
4. Design of Machine Elements, Sharma and Purohit, PHI.
5. Design of Machine Eesign-M.F. Spott, Pearson Eductaion
6. Machine Design-Maleev and Hartman, CBS Publishers.

Department of Mechanical Engineering
(Faculty of Engineering & Technology)
P.K. University, Shivpuri (MP)
III Year VI Semester

L	T	P
3	1	0

UDYNAME603
DYNAMICS OF MACHINES

UNIT- I Dynamics of Engine Mechanisms: Displacement, velocity and acceleration of piston; turning moment on crankshaft, turning moment diagram; fluctuation of crankshaft speed, analysis of flywheel.
UNIT –II Governor Mechanisms: Types of governors, characteristics of centrifugal governors, gravity and spring controlled centrifugal governors, hunting of centrifugal governors, inertia governors.

UNIT -III Balancing of Inertia Forces and Moments in Machines: Balancing of rotating masses, two plane balancing, determination of balancing masses (graphical and analytical methods), balancing of rotors, balancing of internal combustion engines (single cylinder engines, in-line engines, V-twin engines, radial engines, Lanchester technique of engine balancing.

UNIT -IV Friction: Frictional torque in pivots and collars by uniform pressure and uniform wear rate criteria. Boundary and fluid film lubrication, friction in journal and thrust bearings, concept of friction circle and axis, rolling friction. **Clutches**: Single plate and multi plate clutches, Cone clutches. **Belt drives**; Velocity ratio, limiting ratio of tension; power transmitted; centrifugal effect on belts, maximum power transmitted by belt, initial tension, creep; chain and rope drives;
Brakes: Band brake, block brakes, Internal and external shoe brakes, braking of vehicles.
Dynamometer: Different types and their applications.

UNIT -V Introduction, Classification of Vibration Systems, Harmonic motion, Vector representation of harmonic motion, Natural frequency & response, Effects of vibration,

superposition of simple harmonic motions, beats, Fourier analysis-analytical and numerical **methods. Single Degree Freedom System, Equation of motion, Newton's method, D'Alembert's**

principle, Energy method etc., Free vibration, Natural frequency, Equivalent systems, Displacement, Velocity and acceleration, Response to an initial disturbance, Torsional vibrations, Damped vibrations, Vibrations of systems with viscous damping, Logarithmic decrement, Energy dissipation in viscous damping, Forced vibrations with rotating and reciprocating unbalance**Critical speed of shafts**, Whirling of uniform shaft, Shaft with one disc with and without damping,Multi-disc shafts, Secondary critical speed

TEXT BOOKS:

1. Ambekar, AG; Mechanism and Machine Theory;PHI2. Rattan SS; Theory of machines; TMH
3. Sharma and Purohit; Design of Machine elements; PHI
4. Mechanical Vibrations – G. K. Groover, Jain Brothers, Roorkee

Department of Mechanical Engineering
(Faculty of Engineering & Technology)
P.K. University, Shivpuri (MP)
III Year VI Semester

L	T	P
3	1	0

UREFRME604
REFRIGERATION & AIR CONDITIONING

UNIT-I Refrigeration: Introduction to refrigeration system, Methods of refrigeration, Carnot refrigeration cycle, Unit of refrigeration, Refrigeration effect &C.O.P.

Air Refrigeration cycle: Open and closed air refrigeration cycles, Reversed Carnot cycle, Bell Coleman or Reversed Joule airrefrigeration cycle, Aircraft refrigeration system, Classification of aircraft refrigeration system. Bootstrap refrigeration, Regenerative, Reduced ambient, Dry air rated temperature .

UNIT-II Vapour Compression System: Single stage system, Analysis of vapour compression cycle, Use of T-S and P-H charts, Effect ofchange in suction and discharge pressures on C.O.P, Effect of sub cooling of condensate &superheating of refrigerant vapour on C.O.P of the cycle, Actual vapour compression refrigerationcycle, Multistage vapour compression system requirement, Removal of flash gas, Intercooling,Different configuration of multistage system, Cascade system.

UNIT-III Vapour Absorption system: Working Principal of vapour absorption refrigeration system, Comparison between absorption &compression systems, Elementary idea of refrigerant absorbent mixtures, Temperature – concentrationdiagram & Enthalpy – concentration diagram , Adiabatic mixing of two streams, Ammonia – Watervapour absorption system, Lithium- Bromide water vapour absorption system, Comparison. Three fluidsystems.

Refrigerants: Classification of refrigerants, Nomenclature, Desirable properties of refrigerants, Common refrigerants,Secondary refrigerants and CFC free refrigerants. Ozone layer depletion and global warmingconsiderations of refrigerants

UNIT-IV Air Conditioning: Introduction to air conditioning, Psychometric properties and their definitions, Psychometric chart,Different Psychometric processes, Thermal analysis of human body, Effective temperature and comfortchart, Cooling and heating load calculations, Selection of inside & outside design conditions, Heattransfer through walls & roofs, Infiltration & ventilation, Internal heat gain, Sensible heat factor (SHF), By pass factor, Grand Sensible heat factor (GSHF), Apparatus dew point (ADP). Air Washers,Cooling towers & humidifying efficiency.

UNIT-V Refrigeration Equipment & Application: Elementary knowledge of refrigeration & air conditioning equipmentse.g compressors, condensers, evaporators & expansion devices, Food preservation, Cold storage, Refrigerates Freezers, Ice plant,Water coolers, Elementary knowledge of transmission and distribution of air through ducts and fans,Basic difference between comfort and industrial air conditioning.

TEXT BOOKS:

1. Refrigeration and Air conditioning by C.PArora, McGraw-Hill
2. Refrigeration and Air conditioning, by Manohar Prasad, New Age International (P) Ltd.Pub.
3. Refrigeration and Air conditioning by R. C. Arora, PHI
4. Principles of Refrigeration by Roy J. Dossat. Pearson Education
5. Refrigeration and Air conditioning by stoecker& Jones. McGraw-Hill
7. Refrigeration and Air conditioning by Arora&Domkundwar. DhanpatRai

Department of Mechanical Engineering
(Faculty of Engineering & Technology)
P.K. University, Shivpuri (MP)
III Year VI Semester

L	T	P
3	0	0

UFLUIME605
FLUID MACHINERY

UNIT-I Introduction

Impulse of Jet and Impulse Turbines:Classification of Fluid Machines & Devices, Application of **momentum and moment ofmomentum equation to flow through hydraulic machinery, Euler's**

fundamental equation.Introduction to hydrodynamic thrust of jet on a fixed and moving surface (flat &*C*urve),Classification of turbines, Impulse turbines, Constructional details, Velocity-triangles, Powerand efficiency calculations, Governing of Pelton wheel

UNIT-II Reaction Turbines

Francis and Kaplan turbines, Constructional details, Velocity triangles, Power and efficiencycalculations, Degree of reaction, Draft tube, Cavitation in turbines, Principles of similarity,Unit and specific speed, Performance characteristics, Selection of water turbines.

UNIT-III Centrifugal Pumps

Classifications of centrifugal pumps, Vector diagram, Work done by impellor, Efficiencies ofcentrifugal pumps, Specific speed, Cavitation & separation, Performance characteristics.

UNIT-IV Positive Displacement and other Pumps

Reciprocating pump theory, Slip, Indicator diagram, Effect of acceleration, air vessels,Comparison of centrifugal and reciprocating pumps, Performance characteristics.

UNIT-V

Hydraulic accumulator, Hydraulic intensifier, Hydraulic Press, hydraulic crane, hydraulic lift,hydraulic Ram,hydraulic coupling, hydraulic torque converter, air lift pump, jet pump.

TEXT BOOKS:

1. Hydraulic Machines by JagdishLal, Metropolitan book co. pvt ltd.
2. Hydraulic Machines by K Subramanya, Tata McGraw Hill
3. Fluid Mechanics and Machinery by C.S.P.Ojha, R. Berndtsson, P.N. Chandramouli,Oxford University Press
4. Fluid Mechanics and Fluid Power Engineering by D S Kumar, S K Kataria& Sons

Department of Mechanical Engineering
(Faculty of Engineering & Technology)
P.K. University, Shivpuri (MP)
III Year VI Semester

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UMACHME606
MACHINE DESIGN-II LAB

List of practical:

1. Design & drawing of Spur gear.
2. Design & drawing of sliding Bearing
3. To study about different type of gear.
4. Design of helical gear.
5. Design of piston in IC engine.
6. Design of valve mechanism of IC engine
7. Design ofcrank shaft subjected to fluctuating loads

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UREFRME607
REFRIGERATION & AIR CONDITIONING LAB

List of practical:

1. Experiment on refrigeration test rig and calculation of various performance parameters.
2. Study of different types of expansion devices used in refrigeration system.
3. Study of different types of evaporators used in refrigeration systems.
4. To study basic components of air-conditioning system.
5. Experiment on air-conditioning test rig & calculation of various performance parameters.
6. Experiment on air washers
7. Study of window air conditioner.
8. Study & determination of volumetric efficiency of compressor.
9. Visit of a central air conditioning plant and its detailed study.

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III Year VI Semester

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UFLUIME608
FLUID MACHINERY LAB

List oF Practical:

1. Impact of Jet experiment.
2. Experiment on Pelton wheel.
3. Experiment on Francis turbine.
4. Experiment on Kaplan turbine.
5. Experiment on Reciprocating pump.
6. Experiment on centrifugal pump.
7. Experiment on Hydraulic Jack/Press
8. Experiment on Hydraulic Brake
9. Experiment on Hydraulic Ram
10. Study through visit of any water pumping station/plant

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