Faculty of Engineering & Technology

P.K.University

Shivpuri (MP)

Department of Mechanical Engineering

Evaluation Scheme & Syllabus for
B.Tech. Fourth Year
(VII & VIII Semester)

(Effective from session 2025-26)

STUDY AND EVALUATION SCHEME FOR B.TECH MECHANICAL ENGINEERING

SEMESTER-VII

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	
UENTRME701	Entrepreneurship Development	3	1	0	4	30	-	30	70	-	70	100
UCOMPME702	Computer Aided Design	3	1	0	4	30	-	30	70	-	70	100
UAUTOME703	Automobile Engineering	3	1	0	4	30	-	30	70	-	70	100
UCOMPME704	Computer Aided Manufacturing (CAM)	3	0	0	3	30	-	30	70	-	70	100
UTOTAME705	Total Quality Management	3	0	0	3	30	-	30	70	-	70	100
UCADOME706	Computer Aided Design Lab	0	0	2	1		25	25	-	25	25	50
UAUTOME707	Automobile Engineering Lab	0	0	2	1	-	25	25	-	25	25	50
UINDUME708	Industrial Training	0	0	2	1	-	25	25	-	25	50	50
Total		15	3	6	21	150	75	225	350	75	450	650

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IV Year VII Semester

L	T	P
3	1	0

UENTRME701
ENTREPRENEURSHIP DEVELOPMENT

UNIT –I: **Entrepreneurship-** definition. growth of small scale industries in developing countries and their positions visa-vis large industries; role of small scale industries in the national economy; characteristics and types of small scale industries; demand based and resources based ancillaries and sub-control types. Government policy for small scale industry; stages in starting a small scale industry.

UNIT -II Project identification- assessment of viability, formulation, evaluation, financing, field-study and collection of information, preparation of project report, demand analysis, material balance and output methods, benefit cost analysis, discounted cash flow, internal rate of return and net present value methods.

UNIT -III Accountancy- Preparation of balance sheets and assessment of economic viability, decision making, expected costs, planning and production control, quality control, marketing, industrial relations, sales and purchases, advertisement, wages and incentive, inventory control, preparation of financial reports, accounts and stores studies.

UNIT –IV Project Planning and control: The financial functions cost of capital approach in project planning and control. Economic evaluation, risk analysis, capital expenditures, policies and practices in public enterprises. Profit planning and programming, planning cash flow, capital expenditure and operations. Control of financial flows, control and communication.

UNIT –V Laws concerning entrepreneur viz, partnership laws, business ownership, sales and income taxes and workman compensation act. Role of various national and state agencies which render assistance to small scale industries.

TEXT / REFERENCE BOOKS:

1. Forbat, John, "Entrepreneurship" New Age International.
2. Havinal, Veerbhadrappa, "Management and Entrepreneurship" New Age International
3. Joseph, L. Massod, "Essential of Management", Prentice Hall of India.

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L	T	P
3	1	0

UCOMPME702
COMPUTER AIDED DESIGN (CAD)

UNIT-I Introduction: Introduction to CAD/CAED/CAE, Elements of CAD, Essential requirements ofCAD, Concepts of integrated CAD/CAM, Necessity & its importance, Engineering Applications Computer Graphics-I CAD/CAM systems,

Computer Graphics-I Graphics Input devices-cursor control Devices, Digitizers, Keyboardterminals, Image scanner, Speech control devices and Touch, panels, Graphics display devices-Cathode Ray Tube, Random & Raster scan display, Color CRT monitors, Direct View StorageTubes, Flat Panel display, Hard copy printers and plotters

UNIT-II Computer Graphics-II Graphics standards, Graphics Software, Software Configuration,Graphics Functions, Output primitives- **Bresenham's line drawing algorithm and Bresenham's** circle generating algorithm Geometric Transformations: World/device

CoordinateRepresentation, Windowing and clipping, 2 D Geometric transformations-Translation, Scaling, Shearing, Rotation & Reflection Matrix representation, Composite transformation, 3Dtransformations, multiple transformation .

UNIT-III Curves: Curves representation, Properties of curve design and representation, Interpolationvs approximation, Parametric representation of analytic curves, Parametric continuity conditions,Parametric representation of synthetic curves-Hermite cubic splines-Blending function formulation and its properties, Bezier curves-Blending function formulation and its properties, Composite Bezier curves, B-spline curves &its properties, Periodic &non-periodic B-splinecurves

UNIT-IV 3D Graphics: Polygon surfaces-Polygon mesh representations, Quadric and Super quadric surfaces and blobby objects; Solid modeling-Solid entities, Fundamentals of Solid modeling-Set theory, regularized set operations; Half spaces, Boundary representation, Constructive solidgeometry, Sweep representation, Color models. Basic application commands for 2d drafting software like AutoCAD/ Draftsight (any one)&3d solid modeling software Solid works/Autodesk Inventor/PTCCreo /Catia.

UNIT-V Finite Element Analysis: Basic concept of the finite element method, comparison of FEM with direct analytical solutions; Steps in finite element analysis of physical systems, Finite Element analysis of 1-D problems like spring, bar, truss and beam elements formulation by direct approach; development of elemental stiffness equations and their assembly, solution and its post processing.

Books and References:

1. Computer Graphics, by Hearn & Baker, Prentice Hall of India
2. CAD/CAM, by Groover and Zimmers, Prentice Hall India Ltd.
3. CAD/CAM :Theory and Practice, by Zeid, McGraw Hill

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L	T	P
3	1	0

UAUTOME703
AUTOMOBILE ENGINEERING

UNIT-I Introduction: Basic concepts of Automobile Engineering and general configuration of an automobile, Powerand Torque characteristics.Rolling, air and gradient resistance.Tractive effort. Gear Box. Gearratio determination.

UNIT-II Transmission System: Requirements. Clutches.Toque converters.Over Drive and free wheel, Universal joint.Differential Gear Mechanism of Rear Axle.Automatic transmission, Steering and Front Axle.Castor Angle, wheel camber & Toe-in, Toe-out etc..Steering geometry. Ackerman mechanism,Under steer and Over steer.

UNIT-III Braking System: General requirements, Road, tyre adhesion, weight transfer, Braking ratio. Mechanical brakes,Hydraulic brakes.Vacuum and air brakes.Thermal aspects.

Chasis and Suspension System: Loads on the frame, Strength and stiffness, Independent front & rear suspension, Perpendiculararm type, Parallel arm type, Dead axle suspension system, Live axis suspension system, Airsuspension & shock absorbers.

UNIT-IV Electrical System: Types of starting motors, generator & regulators, lighting system, Ignition system, Horn, Batteryetc.

Fuel Supply System: Diesel & Petrol vehicle system such as Fuel Injection Pump, Injector & Fuel Pump, and Carburetor. MPFI System.**,**

UNIT-V Emission standards and pollution control : Indian standards for automotive vehicles-Bharat I and II, Euro-I and Euro-II norms, fuel quality

standards, environmental management systems for automotive vehicles, catalytic converters, fueladditives and modern trends in automotive engine efficiency and emission control.

Maintenance system: Preventive maintenance, break down maintenance and over hauling.

Books and References:

1. Automotive Engineering- Hietner
2. Automobile Engineering - Kripal Singh.
3. Automobile Engineering - Narang.

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L	T	P
3	0	0

UCOMPME704
COMPUTER AIDED MANUFACTURING (CAM)

UNIT-I: Introduction to Automation: Automated Manufacturing system; Need of automation, Basic elements of automation, Levels of automation, Automation Strategies, Advantages & disadvantages of automation, Historical development and future trends.

UNIT-II: Fundamental of Numerical Control, elements of NC machine tools, classification of NC machinetools, Advantages, suitability and limitations of NC machine tools, Application of NC system.Definition and designation of control axes, Constructional details of Numerical Control MachineTools, MCU structure and functions, Methods of improving accuracy and productivity using NC.

UNIT –III Computer Numerical Control (CNC) : Features of CNC, Elements of CNC machines, the machine control unit for CNC , Direct Numerical Control(DNC) and Adaptive Controls. System Devices: Drives, Feedback devices, Counting devices, DAC and ADCs, Interpolator systems, Control loop circuit elements in PTP system, Contouring system, Incremental and absolute systems.

UNIT –IV NC Part Programming-

(a) Manual (word address format) programming Examples Drilling, Turning and Milling; canned cycles, Subroutine, and Macro.

(b) Computer Assisted Part programming (APT) Geometry, Motion and Additional statements, Macro- statement.

UNIT-V Computer Integrated manufacturing system , Group Technology, Flexible Manufacturing System, Computer aided process planning-Retrieval and Generative System. Types and generations of Robots, Structure and operation of Robot, Robot applications.

Books and References :

1. Automation, Production System and Computer Integrated Manufacturing, by Mikell P. Grover, PrenticeHall of India Pvt Ltd.
2. CAD/CAM – Theory and Practice, by Ibrahim Zeid, McGraw Hill
3. Computer Aided Manufacturing, by Cheng, Pearson India
4. CAD/CAM: Principles and Oerations, by P. N. Rao, McGraw Hill
5. CAD/CAM: Computer Aided Design and Manufacturing, by M. Groover, Pearson India.

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L	T	P
3	0	0

UTOTAME705

TOTAL QUALITY MANAGEMENT (TQM)

UNIT -I Quality Concepts: Evolution of Quality control, concept change, TQM Modern concept, Quality concept in design, Review off design, Evolution of proto type. **Control on Purchased Product** Procurement of various products, evaluation of supplies, capacity verification, Development of sources, and procurement procedure. **Manufacturing Quality** Methods and Techniques for manufacture, Inspection and control of product, Quality in sales and services, Guarantee, analysis of claims.

UNIT –II Quality Management: Organization structure and design, Quality function, decentralization, Designing and fitting organization for different types products and company, Economics of quality value and contribution, Quality cost, optimizing quality cost, seduction programmer. **Human Factor in Quality** Attitude of top management, co-operation, of groups, operators attitude, responsibility, causes ofoperators error and corrective methods.

UNIT –III Tools and Techniques : Seven QC tools (Histogram, Check sheet, Ishikawa diagram, Pareto, Scatter diagram, Control chart, flow chart). **Control Charts**: Theory of control charts, measurement range, construction and analysis of R charts, process capability study, use of control charts. **Attributes of Control Charts :**Defects, construction and analysis off-chart, improvement by control chart, variable sample size, construction and analysis of C-chart.

UNIT –IV Defects Diagnosis and Prevention: Defect study, identification and analysis of defects, corrective measure, factors affecting reliability, MTTF, calculation of reliability, Building reliability in the product, evaluation of reliability, interpretation of test results, reliability control, maintainability, zero defects, quality circle.

UNIT –V IS0-9000 and its concept of Quality Management: ISO 9000 & ISO 14000 series, Quality information system and documentation, Auditing, Taguchi method, JIT .

Books and References:

1. Total Quality Management, by Dale H. Besterfield, Pearson India
2. Beyond Total Quality Management, Greg Bounds, McGraw Hill.

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L	T	P
0	0	2

UCADOME706
COMPUTER AIDED DESIGN (CAD) LAB

List of practical:
CAD/ CAM Experiments:

1. Design of machine component or other system experiment: Writing and validation of computer program.

2. Understanding and use of any 3-D Modeling Software commands.

3. Pro/E/Idea etc. Experiment: Solid modeling of a machine component

4 . Writing a small program for FEM for 2 spring system and validation of program or using a FEM Package

5 . Root findings or curve fitting experiment: Writing and validation of computer program.

6. To study the characteristic features of CNC machine

7. Part Programming (in word address format) experiment for turning operation (including Operations such as grooving and threading) and running on CNC machine

8. Part Programming (in word address format or ATP) experiment for drilling operation (point to point) and running on CNC machine

9. Part Programming (in word address format or ATP) experiment for milling operation (contouring) and running on CNC machine

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L	T	P
0	0	2

UAUTOME707
AUTOMOBILE ENGINEERING LAB

List of practical:

1. Study & experiment on Valve mechanism.
2. Study & experiment on Gear Box.
3. Study & experiment on Differential Gear Mechanism of Rear Axle.
4. Study & experiment on Steering Mechanism.
5. Study & experiment on Automobile Braking System.
6. Study & experiment on Chassis and Suspension System.
7. Study & experiment on Ignition system of I.C. Engine.

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UINDUME708: INDUSTRIAL TRAINING

Students shall carryout industrial training as a part of their curriculum after the completion of their 3rd year for 6 WEEKS/ 45 DAYS. After this their performance shall be evaluated during 7th semester by SUBMITTING TRAINING REPORT & CERTIFICATE, taking viva of each and every student.

Faculty of Engineering & Technology

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Department of Mechanical Engineering

Evaluation Scheme & Syllabus for
B.Tech. Final Year
(VIII Semester)

(Effective from session 2025-26)

STUDY AND EVALUATION SCHEME FOR B.TECH MECHANICAL ENGINEERING

SEMESTER-VIII

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	
UNONCME801	Non Conventional Energy Resources	3	1	0	4	30	-	30	70	-	70	100
UQUALME802	Quality Control	3	0	-	3	30	-	30	70	-	70	100
UOPERME803	Operations Research.	3	1	0	4	30	-	30	70	-	70	100
UPLATME804	Plant Layout and Material Handling.	3	0	-	3	30	-	30	70	-	70	100
UPROJME805	Major Project	-	0	12	7		100	100		200	200	300
Total		12	2	12	21	120	100	220	280	200	480	700

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IV Year VIII Semester

L	T	P
3	1	0

UNONCME801
NON-CONVENTIONAL ENERGY RESOURCES

UNIT-I

Solar Radiation: Extra-terrestrial and terrestrial, radiation measuring instrument, radiation measurement and predictions.

Solar thermal conversion: Basics, Flat plate collectors-liquid and air type. Theory of flat plate collectors, selective coating, advanced collectors, Concentrators: optical design of concentrators, solar water heater, solar dryers, solar stills, solar cooling and refrigeration.

Solar photovoltaic: Principle of photovoltaic conversion of solar energy; Technology for fabrication of photovoltaic devices; Applications of solar cells in PV generation systems; Organic PV cells.

UNIT-II Wind energy characteristics and measurement: Metrology of wind speed distribution, wind speed statistics, Weibull, Rayleigh and Normal distribution, Measurement of wind data, Energy estimation of wind regimes; Wind Energy Conversion: Wind energy conversion principles; General introduction; Types and classification of WECS; Power, torque and speed characteristics; power curve of wind turbine, capacity factor, matching wind turbine with wind regimes; Application of wind energy.

UNIT-III Production of biomass, photosynthesis-C3&C4 plants on biomass production;

Biomass resources assessment; Co2 fixation potential of biomass; Classification of biomass; Physicochemical characteristics of biomass as fuel Biomass conversion routes: biochemical, chemical and thermo chemical Biochemical conversion of biomass to energy: anaerobic digestion, biogas production mechanism, technology, types of digesters, design of biogas plants, installation, operation and maintenance of biogas plants, biogas plant manure-utilization and manure values.

Biomass Gasification: Different types, power generation from gasification, cost benefit analysis of power generation by gasification.

UNIT-IV Small Hydropower Systems: Overview of micro, mini and small hydro system; hydrology; Elements of turbine; Assessment of hydro power; selection and design criteria of turbines; site selection and civil works; speed and voltage regulation; Investment issue load management and tariff collection; Distribution and marketing issues.

Ocean Energy: Ocean energy resources, ocean energy routs; Principle of ocean thermal energy conversion system, ocean thermal power plants. Principles of ocean wave energy and Tidal energy conversion.

UNIT-V

Geothermal energy: Origin of geothermal resources, type of geothermal energy deposits, site selection geothermal power plants;

Hydrogen Energy: Hydrogen as a source of energy, Hydrogen production and storage.

Fuel Cells: Types of fuel cell, fuel cell system and sub-system, Principle of working, basic thermodynamics

TEXT AND REFERENCES BOOKS:

1. Kothari, Singal&Rajan; Renewable Energy Sources and Emerging Technologies, PHI Learn 2. Khan, B H, Non Conventional Energy, TMH.

3. Sukhatme and Nayak, Solar Energy, Principles of Thermal Collection and Storage, TMH.

4. Tiwari and Ghosal, Renewable Energy Resources: basic principle & application, NarosaPubl

5. KoteswaraRao, Energy Resources, Conventional & Non-Conventional, BSP Publication.

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L	T	P
3	0	0

UQUALME802
QUALITY CONTROL

UNIT-I

Introduction : Concept and evaluation of quality control. Measurement & Metrology, precisionvs accuracy.Process capability, standrdisation& Interchangeability.

Inspection and Gauges : Inspection methods. Types of Gauges. Limits Fits and Tolerances. Non-Destructive Testings& Evaluation.

UNIT-II

Control Charts for SQC : Statistical Quality Control (SQC). Control charts for variables suchas X, R charts and control charts for attributes such as p-chart, c-chart. Construction & use of thecontrol charts.Process capability.

UNIT-III

Acceptance Sampling for SQC : Principle of acceptance sampling. Producer's and consumer'srisk. Sampling plans –single, double & sequential. Sampling by attributes and variables.

UNIT-IV

Reliability : Introduction to reliability, bath-tub curve. Life expectancy. Reliability based design.Series & Parallel System.

Defect Diagnosis and prevention : Basic causes of failure, curve/control of failure.

MTBF. Maintainability, Condition monitoring and dignostic techniques.

Value Engineering : Elements of value analysis, Techniques.

Unit-V :

TQM : Basic Concept, Quality control , Quality Assurance and Quality Management and TotalQuality Management. Implementation of TQM .ISO 9000 and its series, Zero defect. . Taguchi
method, Six Sigma concepts.

Other Factors in Quality : Human Factors such as attitude and errors. Material-Quality, Quality circles, Quality in sales & service.

BOOKS AND REFERENCE:

1. Statistical Quality Control by Grant and Leavarworth, McGraw Hill
2. Maintenance for Reliability by Rao.

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L	T	P
3	1	0

UOPERME803
OPERATIONS RESEARCH

UNIT-I Introduction: Basic of Operation Research, Origin & development of Operation Research, Applications.

Linear Programming: Introduction & Scope, Problem formulation, Graphical Method, SimplexMethods, primal and dual problem sensitivity analysis.

UNIT-II Transportation Problem: Methods of obtaining initial and optimum solution,degeneracy inTransportation problems, unbalanced Transportation Problem.

Assignment Problem: Methods of obtaining optimum solution, Maximization problem,travelling salesman problem.

UNIT-III Game Theory: two person Zero sum game, Solution with/without saddle point, dominance rule,Different methods like Algebraic, Graphical and game problem as a special case of Linear Programming. **Sequencing:** Basic assumptions, n Jobs through 2-3 machines, 2 Jobs on m machines.

UNIT-IV Stochastic inventory models: Single & multi period models with continuous & discrete demands, Service level & reorder policy. **Simulation:** Use, advantages & limitations, Monte-carlo simulation, Application to queuing, inventory& other problems.

UNIT-V Queuing models: Characteristics of Queuing Model, M/M/1 and M/M/S system, cost consideration. **Project management:** Basic Concept of network Scheduling, Rules for drawing network diagram, Applications of CPM and PERT techniques in Project planning and control; crashing of operations; resource allocation.

BOOKS AND REFERENCES:

1. Operations Research: Principles and Practice, by- Ravindran, Phillips, Solberg, John Wiley &Sons.
2. Principal of Operation Research, by- Harvey M. Wagner, Prentice Hall.
3. Introduction to Operation Research, by- Gillett, McGraw Hill.
4. Operations Research - An Introduction, by- Hamdy A. Taha, Pearson India.
5. Operation Research, by- Wayne L. Winston, Thomsan Learning.
6. Problems in Operations Research by- Prem Kumar Gupta & D.S. Hira, S. Chand

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UPLANME804
PLANT LAYOUT AND MATERIAL HANDELING

L	T	P
3	0	0

UNIT -I

Introduction: Criteria, Strategies/Tactics, Sustainability and Eco-Efficiency in Facility Design, Basic Planning,Alternative Machine Arrangements, Flow Lines, Location Models, Act/Building Details, Aislesand Security, Storage, Shipping and Receiving, Offices, Specialized Areas.

UNIT -II

Workstations, Unit Loads & Containers, Conveyors, Vehicles, Lifting Devices, Workstation Material Handling, Ethics in Facility Design Facilities design procedure and planning strategies, Production, activity and materials flow analysis, Space requirements and personnel services design considerations.

`UNIT -III

Layout construction techniques: systematic layout planning; activity relationship analysis, pairwise exchange, graph-based construction algorithmic. **Material Handling:** Material handling principles; material handling equipment and material handling systems.

UNIT -IV

Computerized Layout and Analytical Methods: ALDEP, CORELAP, CRAFT, BLOCPLAN,etc. **Warehouse operations**: function, storage operations. **Manufacturing operation:** JIT, TQM, AM, CIM, SCM, Facility systems, **Quantitative models**: Layout model, waiting line, AS/RS, simulation model, etc.

UNIT -V

Assessment and evaluation of layout alternatives Projects, Use Spiral software to practice plantLayout design, Apply mathematical and engineering techniques such as systematic layout planning approach, quantitative model, cost estimate to solve practical facility layout problem.

BOOKS AND REFERENCES:

1. Plant Layout and Material Handling, by- James M. Apple, John Wiley & Sons.
2. Plant Layout and Material Handling, by- Fred E. Meyers, Prentice Hall.
3. Facility Layout and Location: An Analytical Approach, by Richard L, Francis, Pearson India.
4. Plant Layout and Material Handling, by- B. K. Aggarwal, Jain Brothers.
5. Plant Layout and Material Handling, by- S. C. Sharma, Jain Brothers.
6 Materials Handling Handbook, by- Raymond A. Kulwiec, John Wiley & Sons

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IV Year VIII Semester

L	T	P
0	0	12

UPROJME805
MAJOR PROJECT

This project course may be in continuation of Project allotted in the beginning of the VII semester. Here, the students are supposed to do the detailed work as scheduled in the last semester. Finally, he/she will be required to submit the detailed project report on which viva-voice examination will be conducted by a committee having at least one external examiner.