

DEPARTMENT OF MECHANICAL ENGINEERING

COURSE OUTCOMES

B.Tech in Mechanical Engineering			
REGULATION:	NRIA18	YEAR-SEM:	I-I

1. ENGG.MATHEMAICS-III

At the end of the course, the students will develop ability to

1. write an analytic function if either real part or imaginary part is known and by using Cauchy-Riemann equations or apply Milne-Thompson method(L3)
2. evaluate the integral of complex function over the region bounded by the closed curves by apply either Cauchy-Goursat theorem or Cauchy's integral formula or Cauchy's Residue theorem(L5)
3. write the infinite series expansion of complex function by apply Taylor's/Maclaurin's/Laurent's series(L3)
4. write a Fourier series expansion of a periodic function by using Euler's formulae (L3)
5. Solve the Partial difference equations (L3)
6. solve one dimensional wave and heat equations by using partial differential equations (L3)

2. MATERIAL SCIENCE AND ENGINEERING

1. Estimate the properties of the metals and alloys based on structures.
2. Classify, construct and analyze equilibrium diagrams.
3. Analyze and distinguish various ferrous, non-ferrous metals and alloys.
4. Identify the influence of mechanical working and heat treatment principles on materials.
5. Classify, analyze and suggest the suitable manufacturing method for composite materials and Powder metallurgy.
6. Able to suggest the suitable material for any applications demand by

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the society

3. BASIC THERMODYNAMICS

1. Understand the basic concepts of thermodynamics.
2. Understand the first law of thermodynamics and its applications.
3. Understand the second law of thermodynamics, use of Maxwells relations and thermodynamic functions and concept of entropy.
4. Understand the formation of steam and calculate the quality of steam.
5. Understand the working of vapour power cycels and calculate their performance.
6. Understand the Concept of standard cycles and should be able to calculate the efficiency and performance parameters

4. MECHANICS OF MATERIALS

1. Gain a fundamental understanding of the concepts of stress and strain by analysing different solids and structures
2. Analyze and beams, to determine axial forces, torque, shear forces, and bending moments
3. Analyze the beams of different shapes for finding out the shear stress and bending stress distribution.
4. Develop the governing differential equation for the elastic curve, and apply different techniques for finding out the deflection at required points.
5. Analyze determinate and indeterminate axial members, torsional members
6. Calculate the buckling load for columns with different end conditions.

5. MANUFACTURING PROCESS

1. Understand the Technology of the casting processes.
2. Differentiate various casting methods and their applications.
3. Differentiate various joining processes with applications
4. Understand various bulk metal forming and sheet metal processes
5. Understand Various Plastic operations

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| 6. Evaluate the manufacturing processes being utilized in the present industrial scenario. |
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6. ESSENTIALS OF ELECTRICAL AND ELECTRONIC ENGINEERING

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| 1. To learn the basic principles of electrical law's and analysis of networks. |
| 2. To understand the principle of operation and construction details of DC and AC Machines. |
| 3. To understand the principle of operation and construction details of transformer. |
| 4. To study the operation of PN junction diode, half wave, full wave rectifiers and Transistors. |

THIRD YEAR : R16 B.Tech , MECHANICAL

1. DYNAMICS OF MACHINERY

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| 2. Analyze stabilization of sea vehicles, aircrafts and automobile vehicles. |
| 3. Compute frictional losses, torque transmission of mechanical systems. |
| 4. Analyze dynamic force analysis of slider crank mechanism and design of flywheel. |
| 5. Describe the operation and analyze governors. |
| 6. Compute balancing of reciprocating and rotary masses. |

2. DESIGN OF MACHINE MEMBERS - II

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| 1. Select the suitable bearing based on the application of the loads and predict the life of the bearing. |
| 2. Design of IC Engines parts. |
| 3. Design of curved beams of different cross sections |

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| 4. Design power transmission elements such as Belt, Ropes & Chains, Gears, Levers and Power Screws. |
| 5. Utilize design data hand book and design the elements for strength, stiffness and fatigue. |

3. OPERATIONS RESEARCH

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| 1. Form linear programming problem for the data given and solving using appropriate method. |
| 2. Solving the transportation problem, optimizing it, assignment of jobs to different persons and finding the sequence of completion of all the jobs and idle time of machines. |
| 3. When to replace of an item by group replacement or individual replacement. |
| 4. Solving the game by dominance property, graphical methods with and without saddle point. |
| 5. Maintaining different type of inventories and interval of placing the orders by minimizing the total cost |
| 6. Solving the problems using dynamics programming and simulation methods |

4. METAL CUTTING AND MACHINE TOOLS

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| 1. The course provides students with fundamental knowledge and principles in material removal processes. |
| 2. In this course, the students apply the fundamentals and principles of metal cutting to practical applications through multiple labs using lathes, milling machines, grinding machines, and drill presses, Computer Numerical Control etc |
| 3. To demonstrate the fundamentals of machining processes and machine tools. |
| 4. To develop knowledge and importance of metal cutting parameters. |
| 5. To develop fundamental knowledge on tool materials, cutting fluids |

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and tool wear mechanisms.

6. To apply knowledge of basic mathematics to calculate the machining parameters for different machining processes.

5. THERMAL ENGINEERING – II

1. Present the methods to improve Rankine cycle efficiency and parameters of flue gas analysis
2. Exhibit the classification of draught and working of various Boilers.
3. Explain the applications of Steam Nozzles and various design considerations
4. Demonstrate the working of Steam Turbines and condensers
5. Understand the role of Gas Turbines
6. Demonstrate the classification of Rockets and Jet propulsion systems

FINAL YEAR R16

1. MECHATRONICS

1. Describe mechatronics system and differentiate various sensors and transducers
2. Understand solid state electronic devices, analog signal conditioning devices and amplifiers
3. Demonstrate hydraulic and pneumatic actuating systems
4. Explain micro processors and micro controllers and applications of PLC.
5. Define data acquisition systems and digital signal processing
6. Design mechatronics systems relate logic gates and their role in PLC.

2. CAD/CAM

1. Observe the various input and output devices used in CAD/CAM systems. Describe the mathematical basis in the technique of representation of geometric entities including points, lines, and parametric curves, surfaces and solid, and the technique of transformation of geometric entities using transformation matrix

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2. To construct the database models and geometric modeling features-drafting and modeling systems used in CAD/CAM- Solid modeling features and applications. List the various commands in the CAD.
3. Write the programs for different models by using NC part programming, distinguish between NC, CNC & DNC in CAD/CAM
4. Analyze the Group Technology (GT), CAPP & FMS and can be able to describe the use of GT and CAPP for the product development
5. Differentiate various computer-based applications in manufacturing system and quality control (CQAC) aspects.
6. Identify the various elements and their activities in the Computer Integrated Manufacturing Systems, differentiate various material-handling systems and can summarize the CIM implementation strategies.

3. FINITE ELEMENT METHOD

1. Understand the concepts behind variational methods and weighted residual methods in FEM
2. Identify the application and characteristics of FEA elements such as bars, applications to structural and heat transfer problems.
3. Formulate finite element modeling of truss and frame elements along with the concepts of transformation from local to global matrices
4. Develop stiffness matrix for a plane stress & plane strain conditions on a CST, Axisymmetric elements by interpolating shape functions in natural coordinate system
5. Interpolate the shape functions of Isoperimetric elements and use numerical integration to evaluate the element matrices in typical 2D problems. Formulate finite element model to steady state heat transfer analysis using one & two dimensional elements.
6. Formulate mass and stiffness matrices of 1D & beam elements to establish Eigen values & Eigen vectors using Lagrangian and Hamilton principles.

4. ADDITIVE MANUFACTURING

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1. Summarize Rapid prototyping and give their classification.
2. Discuss the models, specifications, process and principle, of LOM and FDM Process.
3. Describe models, specifications, process and principle, of SLS and 3DP Process.
4. Discuss the Rapid tooling
5. Describe the R.P data formats and softwares
6. Summarize R.P applications.

5. ADVANCED MATERIALS

1. Summarize composite materials and give their classification.
2. Discuss the classification, properties, processing methods and application of composite materials.
3. Describe the manufacturing methods of composite materials.
4. Discuss the mechanics of composite materials.
5. Describe the properties, manufacturing methods and applications of functionally graded materials and shape memory alloys.
6. Summarize nano materials, their properties and applications.

6. POWER PLANT ENGINEERING

1. Describe and analyze different types of sources of energy related with power plant operation energy . related with power plant operation. Analyze the working and layout of steam power plants and the different systems comprising the plant and discuss about its economic and safety impacts.
2. Combine concepts of previously learnt courses to define the working principle of diesel power plant, its layout, safety principles and compa

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re it with plants of other types
3. Discuss the working principle and basic components of the hydro electric plants and the economic principles and safety precautions involved with it
4. Describe the working principle and basic components of the nuclear power plant and the economic and safety principles involved with it.
5. Understand about measurement and instrumentations in power plants and coordination of different types of power plants
6. Discuss and analyse on measurement and instrumentations in power plants and coordination of different types of power plants

COS IInd semester B.Tech , MECHANICAL

SECOND YEAR : Name of the Course

1. PROBABILITY AND STATISTICS

Find the measures of central tendency and relation between them.
Evaluate the correlation coefficient, rank coefficient and regression.
Understand probabilities of events and expectations of random variables for elementary problems.
Solve problems related to binomial and poisson distribution.
Compare situations in which it is appropriate to consider the relevance of the Normal distribution.
Construct hypothesis and carryout appropriate tests to check its acceptability.

2. DESIGN OF MACHINE MEMBERS-I

Estimate safety factors of machine members subjected to static and dynamic loads.
Apply multidimensional static failure criteria in the analysis and design of mechanical components.
Identify the loads, the machine members subjected and calculate static and dynamic stresses to ensure safe design.
Design fasteners subjected to variety of loads.
Select standard machine elements such as keys, shafts, couplings.
Analyze and design of mechanical springs.

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3. FM & HM

1. Define fluid properties and explain procedure of dimensional analysis
2. Explain procedure of measurement of fluid pressure and manometry
3. Apply laws of conservation of mass, momentum and energy to fluid flow
4. Analyze flow through different pipes
5. Analyze the impact of jet on the vanes
6. Evaluate performance of hydraulic machines

4. ICE>

1. Understand the working of various internal combustion engine components and their working Principles.
2. Analyze the combustion phenomenon of SI engines and CI engines.
3. Comprehend the air standard, fuel air and actual cycles.
4. Compute the two stroke and four stroke engine performance characteristics.
5. Describe the components, functioning and performance of gas turbines.
6. Apply the principles of gas turbines and jet propulsion systems.

5. INDUSTRIAL MATERIALS

1. Familiarize with the concepts of industrial materials, their classification, properties and applications.
2. Appreciate the types, structure and characteristics of composite materials.
3. Elaborate the applications of composite materials.
4. Understand the shape memory concept and its use in industry.
5. Elaborate nano materials and importance of nano materials over bulk materials
6. Examine the case studies and explore the significance of selection of materials in applications like aerospace, boiler tubes, turbine blades, automobiles, eco sustainable materials.

6. Kinematics of Machinery

Understand Kinematic joint and mechanism and study the relative motion of parts in a machine without taking into consideration the forces involved.
Understand various mechanisms for straight line motion and their applications.
Draw the velocity and acceleration of four bar chain and slider crank chain graphically.
Apply working principles of cams and also design the profile of cams.

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Decide the no of teeth on a gear and also select the gear teeth depending on the application in the unit of Gears.

Understand various power transmission mechanisms and methodologies and working principles. Students are exposed to merits and demerits of each drive.

7. BASICS OF MECHANICAL ENGINEERING

1. Familiarize with the Engineering materials, their types, properties and applications.
2. Analyze coplanar concurrent systems and friction
3. Design Power transmission systems using belts, ropes and gear trains.
4. Solve Simple problems in stresses and strains
5. Familiarize with Basic manufacturing processes used in manufacturing of products.
6. Appreciate the Industrial safety, its requirement, goals, training, procedures followed in industries.

THIRD YEAR : R16 B.Tech , MECHANICAL

Name of the Course

1. Entrepreneurship

1. Entrepreneurship, its concept, importance, classifications and entrepreneurial models.
2. Business models, types of ownership, social entrepreneurship and women entrepreneurship
3. Industrial policy, importance, legal Issues to consider when starting your business
4. Business plan, steps and feasibility study, Project Report Preparation and Evaluation Criteria
5. Small Business, Steps, Marketing Considerations & HRM
6. Monitoring and Evaluation of Business,

2. Heat Transfer

Apply the modes of heat transfer
Analyze the significance of Biot and Fourier numbers.
Understand the significance of non dimensional numbers
Evaluate the empirical correlations for convective heat transfer for various cross sections
Develop Heat Exchangers and understand concept of boiling and condensation
Apply the laws of radiation heat transfer

3. PROFESSIONAL ETHICS AND HUMAN VALUES

Behave professionally with good human values.
Understand & Follow the Principles for Harmony:
Follow Engineering Ethics with Social Experimentation
Remember Engineers' Responsibilities towards Safety and Risk and act

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accordingly

Get Acquainted with Engineers' Duties and Rights

Gain Knowledge on various Global Issues

4. INSTRUMENTATION AND CONTROL SYSTEMS

Select appropriate devices for measuring devices of deferent physical parameters.

Understanding of various temperature and pressure measuring devices.

Analyze and measuring the level and speed parameters.

Compare of various stress strain measuring devices.

Analyze humidity, force, torque and power measuring devices.

Develop various elements of control systems.

5. METROLOGY

engineering parts, tolerances & fits

measuring systems, instruments used and gauges

principles of measuring instruments & interferometry

types of comparators and surface roughness measurement

nomenclature of gears, and screw thread measurement

flatness measuring procedure and machine tools alignment tests

6. Refrigeration and Air conditioning

Understand the basic concepts of refrigeration and their applications.

Evaluate the performance parameters of different types of refrigeration systems.

Identify the desirable refrigerant and its use in various refrigeration systems.

Understand the components of VCR and VAR systems and differentiate with one another.

Analyze the psychrometric properties and processes used in Air Conditioning systems.

Design of Air Conditioning systems for human comfort conditions.

7. ROBOTICS

1. Overview of Robotics and identify various robot configurations.

2. Identify various robot components and select different end effectors for specific application.

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3. Carryout Homogeneous transformations, kinematic analysis for various kinematic chains.
4. Perform differential transformations and calculate dynamic analysis for simple kinematic chains.
5. Perform trajectory planning for a manipulator by avoiding obstacles.
6. Select appropriate actuators and sensors for a robot and to understand various robot applications in manufacturing.

FINAL YEAR R16

Name of the Course

1. AUTOMOBILE ENGINEERING

Identify the vehicle structure, layout, IC engine components.
Understand the different vehicle drives, IC engines and engine lubrication system, turbochargers and transmission system.
Understand construction and working principle of automotive clutches and gear boxes.
Explain the requirements of axles, final drive, differential, steering and suspension systems
Understand the automotive brakes, wheels and tires, lighting and accessories.
Identify harmful IC engine emissions and use viable alternate fuels in engines.

2. Non-destructive Evaluation

1. Understand and explain the concepts, techniques and methods of nondestructive test Radiography.
2. Learn and describe the principle, applications, advantages and limitations of Ultrasonic test.
3. Understand and interpret the principle, procedure, applications, advantages and limitations of Liquid penetration test.
4. Understand and infer the principle, procedure, applications, advantages and limitations of Magnetic particle test.
5. Understand and describe the principle, applications, advantages and limitations of Eddy current test.
6. Apply methods knowledge of non destructive testing to evaluate products of railways, automobiles, aircrafts, chemical industries etc.

3. UN CONVNTIONAL MACHINING PROCESSES

Describe un conventional machining methods and also working

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principles of ultrasonic machining processes.
Demonstrate electro-chemical machining principles in grinding, honing and debarring process.
Explain principle, working, applications and various characteristics of electric discharge machining process.
Identify the difference between EBM and LBM on the basis of its characteristics, parameters and accuracy.
Explain the applications, characteristics and process of plasma arc machining based on MRR and accuracy.
Compare different types of mechanical finishing process.

4. Production Planning And Control

Understand production systems and their characteristics.
Apply forecasting techniques to production systems.
Evaluate MRP and JIT systems against traditional inventory control systems.
Apply scheduling techniques to production systems
Analyze aggregate planning strategies.
Understand theory of constraints for effective management of production systems