

1. Material Science (17ME32)

- Describe the mechanical properties of metals, their alloys and various modes of failure.
- Understand the microstructures of ferrous and non-ferrous materials to mechanical properties.
- Explain the processes of heat treatment of various alloys.
- Understand the properties and potentialities of various materials available and material selection procedures.
- Know about composite materials and their processing as well as applications.

2. Basic Thermodynamics (17ME33)

- Explain thermodynamic systems, properties, Zeroth law of thermodynamics, temperature scales and energy interactions.
- Determine heat, work, internal energy, enthalpy for flow & non flow process using First and Second Law of Thermodynamics.
- Interpret behavior of pure substances and its applications to practical problems.
- Determine change in internal energy, change in enthalpy and change in entropy using TD relations for ideal gases.
- Calculate Thermodynamics properties of real gases at all ranges of pressure, temperatures using modified equation of state including Vander Waals equation, Redlich Wong equation and Beattie

3. Mechanics of Materials (17ME34)

- Understand simple, compound, thermal stresses and strains their relations, Poisson's ratio, Hooke's law, mechanical properties including elastic constants and their relations.
- Determine stresses, strains and deformations in bars with varying circular and rectangular cross-sections subjected to normal and temperature loads
- Determine plane stress, principal stress, maximum shear stress and their orientations using analytical method and Mohr's circle • Determine the dimensions of structural members including beams, bars and rods using Energy methods and also stress distribution in thick and thin cylinders
- Draw SFD and BMD for different beams including cantilever beams, simply supported beams and overhanging beams subjected to UDL, UVL, Point loads and couples
- Determine dimensions, bending stress, shear stress and its distribution in beams of circular, rectangular, symmetrical I and T sections subjected to point loads and UDL
- Determine the dimensions of shafts based on torsional strength, rigidity and flexibility and also elastic stability of columns using Rankin's and Euler's theory

4. Metal Casting and Welding (17ME35A/45B)

- Describe the casting process, preparation of Green, Core, dry sand molds and Sweep, Shell, Investment and plaster molds.
- Explain the Pattern, Core, Gating, Riser system and Jolt, Squeeze, Sand Slinger Molding Machines.
- Compare the Gas fired pit, Resistance, Coreless, Electrical and Cupola Metal Furnaces. • Compare the Gravity, Pressure die, Centrifugal, Squeeze, slush and Continuous Metal mold castings. • Explain the Solidification process and Casting of Non-Ferrous Metals.
- Describe the Metal Arc, TIG, MIG, Submerged and Atomic Hydrogen Welding processes used in manufacturing.
- Explain the Resistance spot, Seam, Butt, Projection, Friction, Explosive, Thermit, Laser and Electron Beam Special type of welding process used in manufacturing.
- Describe the Metallurgical aspects in Welding and inspection methods for the quality assurance of components made of casting and joining process.

5. Machine tools and operations (17ME35 B / 45B)

- Explain the construction & specification of various machine tools.
- Describe various machining processes pertaining to relative motions between tool & work piece.
- Discuss different cutting tool materials, tool nomenclature & surface finish.
- Apply mechanics of machining process to evaluate machining time.
- Analyze tool wear mechanisms and equations to enhance tool life and minimize machining cost.

6. Mechanical Measurements and Metrology (15ME36B)

- To develop in students the knowledge of basics of Measurements, Metrology and Measuring devices.
- To understand the concepts of various measurement systems & standards with regards to realistic applications.
- The application of principle of metrology and measurements in industries.
- To develop competence in sensors, transducers and terminating devices with associated parameters
- To develop basic principles and devices involved in measuring surface textures.

7. Computer aided machine drawing (17ME36 A / 46A)

- Sections of pyramids, prisms, cubes, cones and cylinders resting on their bases in 2D
- Orthographic views of machine parts with and without sectioning in 2D.
- Sectional views for threads with terminologies of ISO Metric, BSW, square and acme, Sellers and American standard threads in 2D.
- Hexagonal and square headed bolt and nut with washer, stud bolts with nut and lock nut, flanged nut, slotted nut, taper and split pin for locking counter sunk head screw, grub screw, Allen screw assemblies in 2D
- Parallel key, Taper key, and Woodruff Key as per the ISO standards in 2D
- single and double riveted lap joints, butt joints with single/double cover straps, cotter and knuckle joint for two rods in 2D
- Sketch split muff, protected type flanged, pin type flexible, Oldham's and universal couplings in 2D
- assemblies from the part drawings with limits, fits and tolerance given for Plummer block, Ram bottom safety valve, I.C. Engine connecting rod, Screw Jack, Tailstock of lathe, Machine Vice and Lathe square tool post in 2D and 3D

8. Mechanical measurements and metrology (17ME36 B / 46B)

- Understand the objectives of metrology, methods of measurement, selection of measuring instruments, standards of measurement and calibration of end bars.
- Describe slip gauges, wringing of slip gauges and building of slip gauges, angle measurement using sine bar, sine center, angle gauges, optical instruments and straightness measurement using Autocollimator.
- Explain tolerance, limits of size, fits, geometric and position tolerances, gauges and their design.
- Understand the principle of Johnson Mikrokator, sigma comparator, dial indicator, LVDT, back pressure gauges, Solex comparators and Zeiss Ultra Optimeter
- Describe measurement of major diameter, minor diameter, pitch, angle and effective diameter of screw threads by 2 – wire, 3 – wire methods, screw thread gauges and tool maker's microscope.
- Explain measurement of tooth thickness using constant chord method, addendum comparator methods and base tangent method, composite error using gear roll tester and measurement of pitch, concentricity, run out and involute profile
- Understand laser interferometers and Coordinate measuring machines.
- Explain measurement systems, transducers, intermediate modifying devices and terminating devices.
- Describe functioning of force, torque, pressure, strain and temperature measuring devices.

9. Materials testing lab (17MEL37 A / 47A)

- Acquire experimentation skills in the field of material testing.
- Develop theoretical understanding of the mechanical properties of materials by performing experiments.
- Apply the knowledge to analyze a material failure and determine the failure inducing agent/s.
- Apply the knowledge of testing methods in related areas.
- Know how to improve structure/behavior of materials for various industrial applications.

10. Mechanical measurements and metrology lab (17MEL37 B / 47B)

- To calibrate pressure gauge, thermocouple, LVDT, load cell, micrometer.
- To measure angle using Sine Center/ Sine Bar/ Bevel Protractor, alignment using Autocollimator/ Roller set.
- To demonstrate measurements using Optical Projector/Tool maker microscope, Optical flats.
- To measure cutting tool forces using Lathe/Drill tool dynamometer.
- To measure Screw thread parameters using 2-Wire or 3-Wire method, gear tooth profile using gear tooth vernier/Gear tooth micrometer.
- To measure surface roughness using Tally Surf/ Mechanical Comparator.

11. Foundry and forging lab (17MEL38A / 48A)

- Demonstrate various skills of sand preparation, molding.
- Demonstrate various skills of forging operations.
- Work as a team keeping up ethical principles.

12. Management and engineering economics (15ME51)

- Understand needs, functions, roles, scope and evolution of Management
- Understand importance, purpose of Planning and hierarchy of planning and also analyze its types
- Discuss Decision making, Organizing, Staffing, Directing and Controlling
- Select the best economic model from various available alternatives
- Understand various interest rate methods and implement the suitable one.
- Estimate various depreciation values of commodities
- Prepare the project reports effectively.

13. Dynamics of machinery (15ME52)

- Determine the forces and couples for static and dynamic conditions of four bar and slider crank mechanisms to keep the system in equilibrium.
- Determine magnitude and angular position of balancing masses under static and dynamic condition of rotating masses in same and different planes.
- Determine unbalanced primary, secondary forces and couples in single and multi-cylinder engine.
- Determine sensitiveness, isochronism, effort and power of porter and hartnell governors.
- Determine gyroscopic couple and effects related to 2, 4 wheeler, plane disc, ship and aeroplanes.
- Understand types of vibration, SHM and methods of finding natural frequencies of simple mechanical systems.
- Determine equation of motion, natural frequency, damping factor, logarithmic decrement of damped free vibration (SDOF) systems.
- Determine the natural frequency, force and motion transmissibility of single degree freedom systems.
- Determine equation of motion of rotating and reciprocating unbalance systems, magnification factor, and transmissibility of forced vibration (SDOF) systems.

14. Turbo machines (15ME53)

- Able to give precise definition of turbomachinery
- Identify various types of turbo machinery
- Apply the Euler's equation for turbomachinery to analyse energy transfer in turbomachines
- Understand the principle of operation of pumps, fans, compressors and turbines.
- Perform the preliminary design of turbomachines (pumps, rotary compressors and turbines)
 - Analyze the performance of turbo machinery.

15. Design of machine elements (15ME54)

- Describe the design process, choose materials.
- Apply the codes and standards in design process.
- Analyze the behavior of machine components under static, impact, fatigue loading using failure theories.
- Design shafts, joints, couplings.
- Design of riveted and welded joints. 6. Design of threaded fasteners and power screws

16.Refrigeration and air-conditioning (15ME551)

- Illustrate the principles, nomenclature and applications of refrigeration systems.
- Explain vapour compression refrigeration system and identify methods for performance improvement
- Study the working principles of air, vapour absorption, thermoelectric and steam-jet and thermo-acoustic refrigeration systems
- Estimate the performance of air-conditioning systems using the principles of psychometry.
- Compute and Interpret cooling and heating loads in an air-conditioning system
- Identify suitable refrigerant for various refrigerating systems

17.Theory of elasticity (15ME552)

- Describe the state of stress and strain in 2D and 3D elastic members subjected to direct loads and thermal loads.
- Analyse the structural members: beam, rotating disks, columns
- Analyse the torsional rigidity of circular and non-circular sections.
- Analyse the stability of columns

18.Human resource management (15ME553)

- Understand the importance, functions and principles Human Resource Management and process of Job analysis
- Summarize the objectives of Human Resource planning, Recruitment and selection process
- Understand the process involved in Placement, Training and development activities.
- Understand the characteristics of an effective appraisal system and compensation planning.
- Understand the issues related to employee welfare, grievances and discipline.

19.Non traditional machining (15ME554)

- Understand the compare traditional and non-traditional machining process and recognize the need for Non-traditional machining process.
- Understand the constructional features, performance parameters, process characteristics, applications, advantages and limitations of USM, AJM and WJM.
- Identify the need of Chemical and electro-chemical machining process along with the constructional features, process parameters, process characteristics, applications, advantages and limitations.
- Understand the constructional feature of the equipment, process parameters, process characteristics, applications, advantages and limitations EDM & PAM.
- Understand the LBM equipment, LBM parameters, and characteristics. EBM equipment and mechanism of metal removal, applications, advantages and limitations LBM & EBM.

20. Optimization techniques (15ME561)

- Understand the overview of optimization techniques, concepts of design space, constraint surfaces and objective function.
- Review differential calculus in finding the maxima and minima of functions of several variables.
- Formulate real-life problems with Linear Programming.
- Solve the Linear Programming models using graphical and simplex methods.
- Formulate real-life transportation, assignment and travelling salesman problems to find the optimum solution using transportation algorithms
- Analyze the Queuing model for effective customer satisfaction
- Apply dynamic programming to optimize multi stage decision problems.
- Determine the level of inventory that a business must maintain to ensure smooth operation.
- Construct precedence diagram for series of activities in a huge project to find out probability of expected completion time using PERT-CPM networks. Also reduce the duration of project by method of crashing.

21. Energy and environment (15ME562)

- Summarize the basic concepts of energy, its distribution and general Scenario.
- Explain different energy storage systems, energy management, audit and economic analysis.
- Summarize the environment eco system and its need for awareness.
- Identify the various types of environment pollution and their effects.
- Discuss the social issues of the environment with associated acts.

22. Automation and robotics (15ME563)

- Classify various types of automation & manufacturing systems
- Discuss different robot configurations, motions, drive systems and its performance parameters.
- Describe the basic concepts of control systems, feedback components, actuators and power transmission systems used in robots.
- Explain the working of transducers, sensors and machine vision systems.
- Discuss the future capabilities of sensors, mobility systems and Artificial Intelligence in the field of robotics.

23. Project management (15ME564)

- Understand the selection, prioritization and initiation of individual projects and strategic role of project management.
- Understand the work breakdown structure by integrating it with organization.
- Understand the scheduling and uncertainty in projects.
- Students will be able to understand risk management planning using project quality tools.
- Understand the activities like purchasing, acquisitions, contracting, partnering and collaborations related to performing projects.
- Determine project progress and results through balanced scorecard approach
- Draw the network diagram to calculate the duration of the project and reduce it using crashing.

24. Fluid mechanics & machinery lab (15MEL57)

- Perform experiments to determine the coefficient of discharge of flow measuring devices.
- Conduct experiments on hydraulic turbines and pumps to draw characteristics.
- Basic performance parameters of hydraulic turbines and pumps and execute the knowledge in real life situations.
- Determine the energy flow pattern through the hydraulic turbines and pumps
- Exhibit his competency towards preventive maintenance of hydraulic machines

25. Energy lab (15MEL58)

- Perform experiments to determine the properties of fuels and oils.
- Conduct experiments on engines and draw characteristics.
- Test basic performance parameters of I.C. Engine and implement the knowledge in industry. Identify exhaust emission, factors affecting them and report the remedies.
- Determine the energy flow pattern through the I C Engine
- Exhibit his competency towards preventive maintenance of IC engines.

26. Energy Engineering (15ME71)

- Understand energy scenario, energy sources and their utilization
- Learn about energy conversion methods and their analysis
- Study the principles of renewable energy conversion systems
- Understand the concept of green energy and zero energy

27. Fluid Power System (15ME72)

- To provide an insight into the capabilities of hydraulic and pneumatic fluid power
- To understand concepts and relationships surrounding force, pressure, energy and power in fluid power systems
- To examine concepts centering on sources of hydraulic power, rotary and linear actuators, distribution systems, hydraulic flow in pipes, and control components in fluid power systems
- Exposure to build and interpret hydraulic and pneumatic circuits related to industrial applications
- To familiarize with logic controls and trouble shooting

28. Control Engineering (15ME73)

- Modeling of mechanical, hydraulic, pneumatic and electrical systems
- Representation of system elements by blocks and its reduction
- Transient and steady state response analysis of a system
- Frequency response analysis using polar plot
- Frequency response analysis using bode plot
- Analysis of system using root locus plots
- Different system compensators and variable characteristics of linear systems

29. Design of Thermal Equipments (15ME741)

- To understand types of heat exchanger
- To study the design shell and tube heat exchanger
- To study types and design of steam heat condenser and compact heat exchanger
- To comprehend and design air cooled heat exchanger
- To understand and to design air cooled heat exchanger, furnaces

30. Tribology (15ME742)

- To educate the students on the importance of friction, the related theories/laws of sliding and rolling friction and the effect of viscosity of lubricants
- To expose the students to the consequences of wear, wear mechanisms, wear theories and analysis of wear problems
- To make the students understand the principles of lubrication, lubrication regimes, theories of hydrodynamic and the advanced lubrication techniques
- To expose the students to the factors influencing the selection of bearing materials for different sliding applications
- To introduce the concepts of surface engineering and its importance in tribology

31. Financial Management (15ME743)

- Measure the returns from engineering projects of differing risks and present a risk-return tradeoff relationship
- Determine the financial ratios and profitability margins of projects to evaluate economic viability to accept or reject the project
- Evaluate cost break ups of engineering projects and processes to determine and control the prohibitive cost components
- Apply an Engineering Asset Management techniques to evaluate the economic value of physical assets

32. Design of Manufacturing (15ME744)

- To educate students on factors to be considered in designing parts and components with focus on manufacturability
- To expose the students to dimensional tolerances, geometric tolerances and true position tolerance techniques in manufacture
- To impart the knowledge on design considerations for designing components produced using various machining operations like turning, drilling, milling, grinding etc
- To educate the students on design rules and recommendations for processes like casting, welding, forgings powder metallurgy and injection moulding

33. Smart Materials and MEMS (15ME745)

- This course provides a detailed overview to smart materials, piezoelectric materials structures and its characteristics
- The study of Smart structures and modelling helps in Vibration control using smart materials in various applications
- Helps to understand the principles and concepts of using MEMS, ER & MR Fluids for various applications

34. Automotive Electronics (15ME751)

- Basics of electronic control of internal combustion engines and the drives
- Understand principle of working of sensors and actuators used in automobiles for control
- Diagnostics and safety systems in automobiles

35. Fracture Mechanics (15ME752)

- Fracture mechanics provides a methodology for prediction, prevention and control of fracture in materials, components and structures
- It provides a background for damage tolerant design
- It quantifies toughness as materials resistance to crack propagation

36.Mechatronics (15ME753)

- Understand the evolution and development of Mechatronics as a discipline
- Substantiate the need for interdisciplinary study in technology education
- Understand the applications of microprocessors in various systems and to know the functions of each element
- Demonstrate the integration philosophy in view of Mechatronics technology

37.Mechanical Vibrations (15ME754)

- To enable the students to understand the theoretical principles of vibration and vibration analysis techniques for the practical solution of vibration problems
- To enable the students to understand the importance of vibrations in mechanical design of machine parts subject to vibrations

38.Design Laboratory (15MEL76)

- To understand the natural frequency, logarithmic decrement, damping ratio and damping
- To understand the balancing of rotating masses
- To understand the concept of the critical speed of a rotating shaft
- To understand the concept of stress concentration using Photo elasticity
- To understand the equilibrium speed, sensitiveness, power and effort of Governor

39.Computer Integrated Manufacturing Lab (15MEL77)

- To expose the students to the techniques of CNC programming and cutting tool path generation through CNC simulation software by using G-Codes and M-codes
- To educate the students on the usage of CAM packages
- To make the students understand the importance of automation in industries through exposure to FMS, Robotics, and Hydraulics and Pneumatics