DEPARTMENT OF MECHANICAL ENGINEERING

RULES AND REGULATIONS
SCHEME OF INSTRUCTION AND SYLLABI
of
B.Tech. Programs
# National Institute of Technology
## Warangal 506 004

## Scheme of Instruction and Evaluation

### B. Tech. Mechanical Engineering

#### I - Year I - Semester

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<td>6.</td>
<td>ME491</td>
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<td>7.</td>
<td>ME499</td>
<td>Project Work Part-B</td>
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### LIST OF ELECTIVES

#### III Year, I Semester

<table>
<thead>
<tr>
<th>No.</th>
<th>Code</th>
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<tbody>
<tr>
<td>1</td>
<td>ME311</td>
<td>Advanced Thermodynamics</td>
</tr>
<tr>
<td>2</td>
<td>ME318</td>
<td>Finite Element Method</td>
</tr>
<tr>
<td>3</td>
<td>ME325</td>
<td>Advanced Welding Technology</td>
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<td>4</td>
<td>ME326</td>
<td>Advanced Metal Casting and NDT</td>
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<td>5</td>
<td>ME332</td>
<td>Operations Research</td>
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#### III Year, II Semester

<table>
<thead>
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<tr>
<td>1</td>
<td>ME361</td>
<td>Computational Fluid Dynamics</td>
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<tr>
<td>2</td>
<td>ME362</td>
<td>Automobile Engineering</td>
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<tr>
<td>3</td>
<td>ME368</td>
<td>Mechanical Vibrations</td>
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<td>4</td>
<td>ME369</td>
<td>Design of Mechanisms</td>
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<td>5</td>
<td>ME375</td>
<td>Advanced Metal Forming</td>
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<td>6</td>
<td>ME376</td>
<td>Machine Tool Design</td>
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<td>7</td>
<td>ME382</td>
<td>Production Planning and Control</td>
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<tr>
<td>8</td>
<td>ME383</td>
<td>Design and Analysis of Experiments</td>
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#### IV Year, I Semester

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<tr>
<td>1</td>
<td>ME411</td>
<td>Non-Conventional Energy Sources</td>
</tr>
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<td>2</td>
<td>ME412</td>
<td>Convective Heat Transfer</td>
</tr>
<tr>
<td>3</td>
<td>ME413</td>
<td>Advanced I.C. Engines</td>
</tr>
<tr>
<td>4</td>
<td>ME418</td>
<td>Engineering Acoustics</td>
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<td>5</td>
<td>ME419</td>
<td>Rotor Dynamics</td>
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<td>6</td>
<td>ME420</td>
<td>Mechanics of Composite Materials</td>
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<td>7</td>
<td>ME425</td>
<td>Advanced Manufacturing Processes</td>
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<td>8</td>
<td>ME426</td>
<td>Tool Design</td>
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<td>9</td>
<td>ME427</td>
<td>Micro and Nano Manufacturing</td>
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<td>10</td>
<td>ME428</td>
<td>Design for Manufacturing</td>
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<td>11</td>
<td>ME431</td>
<td>New Venture Creation</td>
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<td>12</td>
<td>ME432</td>
<td>Total Quality Management</td>
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<td>13</td>
<td>ME433</td>
<td>Advanced Operations Research</td>
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<td>14</td>
<td>ME434</td>
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#### IV Year, II Semester

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<tbody>
<tr>
<td>1</td>
<td>ME461</td>
<td>Cryogenics</td>
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<td>2</td>
<td>ME462</td>
<td>Power Plant Engineering</td>
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<td>3</td>
<td>ME463</td>
<td>Gas Dynamics</td>
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<td>4</td>
<td>ME464</td>
<td>Energy Systems and Management</td>
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<td>5</td>
<td>ME468</td>
<td>Micro and Smart Systems</td>
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<td>6</td>
<td>ME469</td>
<td>Rapid Prototyping</td>
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<td>7</td>
<td>ME470</td>
<td>Condition Monitoring</td>
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<td>ME471</td>
<td>Innovative Design</td>
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<td>9</td>
<td>ME475</td>
<td>Nano Materials Processing and Properties</td>
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<td>ME476</td>
<td>Advanced Materials and Processing</td>
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<td>11</td>
<td>ME477</td>
<td>Design and Application of Engineering Materials</td>
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<td>ME478</td>
<td>Industrial Automation</td>
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<td>ME479</td>
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<td>16</td>
<td>ME483</td>
<td>Reliability Engineering</td>
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<tr>
<td>17</td>
<td>ME484</td>
<td>Theory of Constraints</td>
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</table>
B.Tech. MECHANICAL ENGINEERING

SYLLABUS

MA101 MATHEMATICS - I (4-0-0)

Rank, Normal form, Inverse of a matrix - solutions of systems of linear equations - Characteristic roots and vectors - Rolle’s and Mean value theorems - Expansions - Indeterminate forms - Curve tracing - Partial Differentiation - maxima and minima of functions - solution of first order first degree differential equations - Homogeneous and non-homogeneous linear equations of arbitrary order.

Reading:

HS101 ENGLISH FOR COMMUNICATION (3-0-2)


Reading:

ME102 ENGINEERING GRAPHICS (2-0-3)

Principles of orthographic projections, projections of points, lines, planes and solids, Section of solids, Isometric views, Auto-CAD.

Reading:

CY101 CHEMISTRY (4-0-0)


Reading:
PH101  PHYSICS  (4-0-0)4
Interference - Interferometers- Applications; Diffraction- Multiple slits- resolving power- Applications; Polarization - Optical activity- photoelasticity; Lasers - Holography - Applications; Optical Fibers - Sensing; Functional materials - Nano materials; Matter waves, Schrodinger wave equation, Tunneling, particle accelerators; Acoustics- Ultrasonics - Applications.

Reading:

EE101  BASIC ELECTRICAL ENGINEERING  (3-0-0)3

Reading:

EC101  BASIC ELECTRONICS ENGINEERING  (3-0-0)3

Reading:

CE102  ENVIRONMENTAL STUDIES  (3-0-0) 3
Environmental studies and its importance, Environment and Society, Sustainable development, Global Concerns, Resources, Ecosystems, Ecological pyramids, Biodiversity, Environmental Pollution, Nuclear radiation hazards, Solid waste management, Disaster Management, Rain water harvesting, Environmental Acts and Legislation, Environment and human health

Reading:

ME101  BASIC MECHANICAL ENGINEERING  (3-0-0)3
Basic principles of thermodynamics, thermal power plant layout and different components, vapour compression refrigeration, fundamentals of heat transfer, I.C. engines and gas turbines, salient features of an automobile, transmission of power: belt and gear drives, manufacturing processes: casting, welding, Forming and machining.

Reading:
CS101  PROBLEM SOLVING AND COMPUTER PROGRAMMING (4-0-0)4
Reading:

CE101  ENGINEERING MECHANICS (4-0-0)4
Reading:

PH102  PHYSICS LABORATORY (0-0-3)2
Newton's rings; \(\lambda\) of He-Ne laser; Width of single slit; specific rotation of sugar solution; RC circuit; LCR resonance circuit; Half Life of a Radioactive substance; Diffraction grating; Numerical aperture and bending losses; Planck's constant; Ultrasonic diffraction.

CY102  CHEMISTRY LABORATORY (0-0-3)2
Reading:

CS102  PSCP LABORATORY (0-0-3)2
Familiarization - Editing - Conditional expressions - Series evaluation - Functions - Recursion - Arrays - Pointers - C-strings - Strings - File I/O - Formatted Output - Structures, Classes.

ME103  WORKSHOP PRACTICE (0-0-3)2
Exposure is given to the student in the following Trades: Fitting, Welding, Carpentry, Foundry, Power Tools, House Wiring and Machine Shop.
Reading:

MA151  MATHEMATICS - II (4-0-0)4
Laplace transform - Inverse Laplace transform - Solution of ODE - Evaluation of plane areas, volume and surface area of a solid of revolution and lengths - Convergence of Improper integrals - Double and triple integrals - Vector Differentiation - Gradient - Divergence and Curl - Line and surface integrals - Green's theorem, Gauss Divergence theorem, Stokes’ theorem.
Reading:

MA236

TRANSFORMATION TECHNIQUES

(3-0-0) 3


Reading:

MM235

MATERIALS ENGINEERING

(3-1-0) 4


Reading:

ME201

THERMODYNAMICS

(3-1-0) 4


Reading:

ME202

KINEMATICS OF MACHINERY

(3-0-0) 3

Machines, mechanisms, inversions, velocity and acceleration analyses of planar mechanisms, Graphical and analytical methods, kinematic synthesis, kinematics of toothed gears and gear trains, cams.

Reading:
**CE235  FLUID MECHANICS AND HYDRAULIC MACHINES (3-1-0) 4**


*Reading:*

**CE236  MECHANICS OF SOLIDS (3-1-0) 4**

Statically determinate and indeterminate structures, Thermal Stresses, Elastic Constants, Thin and thick cylinders and Spherical shells, Impact Loading, Strain Energy, Shear force and Bending Moment, Theory of Simple Bending, Flexural shear, Torsion of Circular Shafts, Theories of failure, Springs, Deflection of Beams, Principal Planes, Principal stresses and strains.

*Reading:*

**CE237  FLUID MECHANICS AND HYDRAULIC MACHINES LABORATORY (0-0-3) 2**


*Reading:*

**CE238  MATERIAL TESTING LABORATORY (0-0-3) 2**

Study of Stress-Strain characteristics of Steel - Tension test - Compression Test - Strain measurement - Ductility Tests - Shear Test - Hardness Tests - Torsion Test - Bending Test - Test on Spring.

**MA285  NUMERICAL AND STATISTICAL METHODS (3-0-0) 3**


*Reading:*

**EC285  ELECTRONIC MEASUREMENT SYSTEMS (3-0-0) 3**

Measurement, Instrumentation and calibration, Transducers, Signal Conditioning circuits, Feedback transducer systems, Data acquisition, Display and Recording Systems.

*Reading:*
ME251 TURBOMACHINES (3-1-0) 4

Fundamentals of turbomachines, ideal and actual gas turbine cycles for shaft power and propulsion, centrifugal compressors, axial flow compressors, combustion chambers, axial flow turbines, ideal and actual cycles for steam power plants, steam nozzles, steam turbines.

Reading:

ME252 DESIGN OF MACHINE ELEMENTS - 1 (3-1-0) 4

Design process, problem formulation, factors of safety, failure theories, design of fasteners: bolted, riveted, welded joints; design of joints for rods, shaft couplings.

Reading:

ME253 MANUFACTURING TECHNOLOGY (4-0-0) 4

Foundry Technology, Melting furnaces, Special casting processes, Gating and riser design, Casting defects, Arc welding, TIG, MIG, submerged arc, resistance welding, Gas welding, Flash butt welding, Solid state welding, Welding metallurgy, Forming Technology, Powder metallurgy.

Reading:

ME254 MACHINE DRAWING (2-0-3) 4

Development and Intersection of surfaces, Conventional representation of machine elements, materials, surface finish and tolerances - Sectional views and additional views - Drawing of Screw threads, locking devices, Fasteners, Keys and Cotter, Knuckle joints, Rivetted Joints, Shaft Couplings and Bearings - Pipe Joints, Assembly and production drawings.

Reading:

ME255 MANUFACTURING TECHNOLOGY LABORATORY (0-0-3) 2

Gas welding, Arc Welding, Testing of weldments (Destructive and Non-destructive), Metallurgical studies of weldments, CO₂ moulding, Testing of moulding sand, Plastic injection moulding, Flux core arc welding.

EC286 BASIC ELECTRONICS LABORATORY (0-0-3) 2

Study of components and Instruments - Characteristics of N-junction diode, Zener diode, BJT, JFET, Applications of diode, Frequency response of RC Coupled BJT amplifier, RC Phase shift oscillator, OPAMP as inverting and non-inverting amplifier, Verification of truth tables, Implementation of adder and subtractor using IC 7400 NAND gate ICs.
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<tr>
<td>ME301</td>
<td>INTERNAL COMBUSTION ENGINES</td>
<td>(3-0-0) 3</td>
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<td>Classification, VTD and PTD, combustion chambers for SI and CI engines, combustion in SI and CI engines, fuel supply system, super charging, performance of I. C. engines, engine emissions, modern developments. Reading:</td>
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<tr>
<td>ME302</td>
<td>DYNAMICS OF MACHINERY</td>
<td>(3-1-0) 4</td>
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<td>Dynamic force analysis in planar mechanisms, flywheels, balancing of rotors and reciprocating machinery, balancing machines, governors, free and forced vibration of damped and undamped single degree of freedom systems, isolation, whirling of shafts, gyroscope. Reading:</td>
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<tr>
<td>ME303</td>
<td>MACHINE TOOLS AND METROLOGY</td>
<td>(4-0-0) 4</td>
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<td></td>
<td>Machine Tools: Types, Specifications, Operations, Tools, Accessories and attachments, Machining time calculations, Gear Machining, Abrasive and Finishing processes, Metrology: Linear and Angular Measurements, Limits, Fits and Tolerances, Design of limit gauges, Comparators, Screw Thread Measurement, Gear inspection, Surface roughness measurement, Interferometry, Form Measurements, CMM. Reading:</td>
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<tr>
<td>ME304</td>
<td>MANAGEMENT SCIENCE AND PRODUCTIVITY</td>
<td>(4-0-0) 4</td>
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<td>Functions of management, Leadership styles and motivational theories, Marketing management process, PLC strategies, Production strategies, Facility design, PPC, Productivity and work study, Process control charts, Acceptance sampling, Taguchi's philosophy, QFD, TQM, Inventory control, Project planning and feasibility analysis, project scheduling methods. Reading:</td>
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<td>ME305</td>
<td>MECHANICAL MEASUREMENTS</td>
<td>(3-0-0) 3</td>
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<td>Generalized configuration and functional description of measuring instruments, generalized performance characteristics of instruments - static and dynamic characteristics, uncertainty analysis, basic electrical transducers, force, torque, speed, pressure, flow, temperature and heat flux measurement, pollution measurement. Reading:</td>
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<tr>
<td>Course Code</td>
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<td>ME306</td>
<td>THERMAL ENGINEERING LABORATORY</td>
<td>(0-0-3) 2</td>
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<td>Experiments on performance of SI and CI engines at constant and variable speeds, Experiments on performance of Turbo machines, Steam experiments.</td>
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<tr>
<td>ME307</td>
<td>DYNAMICS AND MEASUREMENTS LABORATORY</td>
<td>(0-0-3) 2</td>
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<td>ME 311</td>
<td>ADVANCED THERMODYNAMICS</td>
<td>(3-0-0) 3</td>
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<td>ME318</td>
<td>FINITE ELEMENT METHOD</td>
<td>(3-0-0) 3</td>
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<td>ME325</td>
<td>ADVANCED WELDING TECHNOLOGY</td>
<td>(3-0-0) 3</td>
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<td>ME326</td>
<td>ADVANCED METAL CASTING AND NDT</td>
<td>(3-0-0) 3</td>
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<td>ME332</td>
<td>OPERATIONS RESEARCH</td>
<td>(3-0-0) 3</td>
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<td>OR Modelling Approach; Linear Programming; Transportation and Assignment Problems; dynamic programming, Integer programming, introduction to nonlinear programming.</td>
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<td><strong>Reading:</strong></td>
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<td>SM335</td>
<td>ENGINEERING ECONOMICS AND ACCOUNTANCY</td>
<td>(3-0-0) 3</td>
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<tr>
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<td>Basic concepts of national income, inflation, economic policies, financial accounting, preparation of cost sheet, concepts of financial management and smart investment.</td>
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<tr>
<td>ME351</td>
<td>HEAT AND MASS TRANSFER</td>
<td>(3-1-0) 4</td>
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<td>ME352</td>
<td>DESIGN OF MACHINE ELEMENTS-2</td>
<td>(3-1-0) 4</td>
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<td>Fatigue criterion, stress concentration, design of shafts, gears, belt and chain drives, springs, bearings and lubrication, design of I C Engine components - crank shaft, brakes and clutches.</td>
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<tr>
<td>ME353</td>
<td>MACHINING SCIENCE</td>
<td>(3-1-0) 4</td>
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<tr>
<td></td>
<td>Metal Cutting: Single point cutting tool geometry, Mechanics of metal cutting, Built-Up-Edge, Merchant's analysis, Thermal aspects in machining, Cutting Fluids, Cutting tool materials, Machinability, tool wear and tool life, Machining economics, Mechanics of Milling and Grinding, Modern Machining Processes: USM, EDM, ECM, AJM, WJM, AWJM and LBM.</td>
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<tr>
<td>ME354</td>
<td>HEAT TRANSFER AND FUELS LABORATORY</td>
<td>(0-0-3) 2</td>
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<td>Heat transfer experiments on Natural and Forced convection, radiation and heat exchangers; Determination of the fuel characteristics such as Viscosity, Flash and Fire points and Distillation; Reciprocating compressor performance evaluation.</td>
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</table>
ME355  MACHINING AND METROLOGY LABORATORY  (0-0-3) 2
Dismantling and assembly of lathe, Experiments on Lathe, Shaper, Drilling machine, Milling Machine,
Measurement of surface roughness, tool wear, Inspection of work pieces using Comparators, Thread
Measurement using Floating Carriage Diameter Measuring Machine, Straightness Measurement using Auto-
Collimator.

ME361  COMPUTATIONAL FLUID DYNAMICS  (3-0-0) 3
Governing equations of fluid dynamics, mathematical behaviour of partial differential equations, problems
with various types of boundary conditions, Discretization, structured grid generation, grids with appropriate
transformation, parabolic, elliptic and hyperbolic partial differential equations, stability analysis, Numerical
solution of quasi one-dimensional nozzle flow.
Reading:
3. Anderson, D.A., Tannhill, J.C., and Pletcher, R.H., Computational Fluid Mechanics and Heat Transfer,

ME362  AUTOMOBILE ENGINEERING  (3-0-0) 3
Introduction, power plant, fuel system, electrical system and other electrical fittings, lubricating system and
cooling systems, chassis and transmission, axles, clutches, propeller shafts and differential, Condition for
correct steering, steering gear mechanisms, automotive air conditioning, Tyres.
Reading:

ME368  MECHANICAL VIBRATIONS  (3-0-0) 3
Review of single degree freedom systems, Complex frequency response, Rotating/Reciprocating unbalances,
Transmissibility, Vibration measuring devices. Two degree freedom systems, Dynamic Vibration Absorbers,
Multi degree freedom systems, Eigen value problems, model analysis, continuous systems: vibration strings,
bars and beams.
Reading:

ME369  DESIGN OF MECHANISMS  (3-0-0) 3
Kinematic fundamentals, graphical systems, Grashoff's condition, springs as links, graphical linkage synthesis,
quick return motion, coupler curves, straight line mechanisms, dwell mechanisms, position analysis, and
analytical linkage synthesis.
Reading:
2. Hamilton H. Mabie and Fred L. Ocvirk, Mechanisms and Dynamics of Machinery, John Wiley & Sons,

ME375  ADVANCED METAL FORMING  (3-0-0) 3
Mechanics of metal working, Flow stress determination, Effect of temperature, strain rate and metallurgical
structures, Advanced techniques of Sheet Metal Forming, Forming limit criteria, Defects, Conventional Vs
High velocity forming methods - Material behaviour - stress waves and deformation in solids - Stress wave
induced fractures - Case studies.
Reading:

ME376  MACHINE TOOL DESIGN  (3-0-0) 3

Reading:

ME382  PRODUCTION PLANNING AND CONTROL  (3-0-0) 3
Forecasting; Aggregate Planning; Materials Requirement Planning; sequencing and scheduling; Just-in-Time Production Systems, introduction to theory of constraints.

Reading:

ME383  DESIGN AND ANALYSIS OF EXPERIMENTS  (3-0-0) 3
Fundamental of Experimentation, Simple comparative experiments, Experiments with single factor, ANOVA, Factorial and Fractional Factorial experiments, Orthogonal Arrays, Response Surface Methodology, and Taguchi's Parameter Design.

Reading:

ME401  REFRIGERATION AND AIR-CONDITIONING  (3-0-0) 3
Introduction, vapour compression refrigeration, multi pressure systems, refrigerants, absorption refrigeration systems, Psychrometry of air-conditioning processes, cooling load calculations, air-conditioning systems, refrigeration and air-conditioning equipment, trouble shooting.

Reading:

ME402  CAD / CAM  (3-1-0) 4

Reading:
<table>
<thead>
<tr>
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<th>Course Title</th>
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<tbody>
<tr>
<td>ME403</td>
<td>CAD / CAM LABORATORY</td>
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<tr>
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<td>Open GL programs, Solid modeling and Script files, CNC programming using ProE and SINUTRAIN, Training on Denford, Heidenhain, Fanuc Desktop Tutors, Training on FDM machine for Rapid Prototyping.</td>
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<tr>
<td>ME411</td>
<td>NON-CONVENTIONAL ENERGY SOURCES</td>
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<tr>
<td>ME412</td>
<td>CONVECTIVE HEAT TRANSFER</td>
<td>(3-0-0) 3</td>
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<td>ME413</td>
<td>ADVANCED I. C. ENGINES</td>
<td>(3-0-0) 3</td>
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<td>ME418</td>
<td>ENGINEERING ACOUSTICS</td>
<td>(3-0-0) 3</td>
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<tr>
<td>ME419</td>
<td>ROTOR DYNAMICS</td>
<td>(3-0-0) 3</td>
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<tr>
<td>ME420</td>
<td>MECHANICS OF COMPOSITE MATERIALS</td>
<td>(3-0-0) 3</td>
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<td>ME425</td>
<td>ADVANCED MANUFACTURING PROCESSES</td>
<td>(3-0-0) 3</td>
</tr>
<tr>
<td>ME426</td>
<td>TOOL DESIGN</td>
<td>(3-0-0) 3</td>
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<tr>
<td>ME427</td>
<td>MICRO AND NANO MANUFACTURING</td>
<td>(3-0-0) 3</td>
</tr>
<tr>
<td>ME431</td>
<td>NEW VENTURE CREATION</td>
<td>(3-0-0) 3</td>
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</tbody>
</table>
venture (SSE), Product planning and development, Aspects of Financial, Marketing and Project management; Project Formulation, Techno-economic feasibility assessment, Preparation of business plan. Growth strategies for SSEs; Laws concerning entrepreneurial ventures.

Reading:

**ME432 TOTAL QUALITY MANAGEMENT**

(3-0-0) 3

Evolution of the word 'Quality' - Quality costs, Axioms of TQM, philosophies of quality gurus, Tools of TQM: QFD, SPC, Parameter design, tools for supporting the quality improvement process, standards and awards.

Reading:

**ME433 ADVANCED OPERATIONS RESEARCH**

(3-0-0) 3

Game Theory, Decision Analysis, Queuing Theory and simulation, Evolutionary optimization methods.

Reading:

**ME434 SUPPLY CHAIN MANAGEMENT**

(3-0-0) 3


Reading:

**ME451 MECHATRONICS**

(3-0-0) 3

Mechatronics system design, modelling and simulation of physical systems, sensors and transducers, actuators, digital logic, micro-processors and microcontrollers, applications of mechatronics and case studies.

Reading:

**ME452 MECHATRONICS LABORATORY**

(0-0-3) 2


**ME461 CRYOGENICS**

(3-0-0) 3

Properties of solids for cryogenic systems, refrigeration and liquefaction - simple Linde cycle, Pre-cooled Joule-Thomson cycle, dual-pressure cycle, Simon helium liquefier, classical cascade cycle, mixed-refrigerant cascade cycle, ultra-low-temperature refrigerators, equipment associated with low-temperature systems, storage and transfer systems.
### Reading:


**ME462**  
**POWER PLANT ENGINEERING**  
(3-0-0) 3

Introduction, steam power plant, steam boilers, steam condensers, cooling towers, cogeneration and combined cycles, nuclear power plants, hydroelectric power plants, power plant economics.  
**Reading:**


**ME463**  
**GAS DYNAMICS**  
(3-0-0) 3

Review of fundamentals, isentropic flow with variable area, flow in constant area ducts with friction and heat transfer, normal and oblique shock waves.  
**Reading:**


**ME464**  
**ENERGY SYSTEMS AND MANAGEMENT**  
(3-0-0) 3

Basic principles of Energy conservation, Energy analysis and application of laws of thermodynamics, energy consumption and rejection patterns for different processes, energy conservation potential for different processes, energy storage systems, energy demand estimation, pricing, energy management, energy audit, case studies.  
**Reading:**


**ME468**  
**MICRO AND SMART SYSTEMS**  
(3-0-0) 3

**Reading:**


**ME469**  
**RAPID PROTOTYPING**  
(3-0-0) 3

Reading:

ME470

**CONDITION MONITORING**

(3-0-0) 3

Condition Monitoring application and benefits, online and off-line techniques, vibration monitoring and analysis, Shock pulse method, oil analysis - wear debris, temperature analysis, non-destructive techniques, case studies, Introduction to structural health monitoring.

Reading:

ME471

**INNOVATIVE DESIGN**

(3-0-0) 3

Engineering design process, Descriptive, prescriptive and integrative models of design, Conceptual design, Embodiment design, Brainstorming, Synectics, Rational methods of design, Ethical issues, Biomimicry, TRIZ technique, ARIZ, Axiomatic design, Design for manufacturing and Assembly, Design for environment, Failure modes and effects analysis, Robust design.

Reading:

ME475

**NANOMATERIALS PROCESSING AND PROPERTIES**

(3-0-0) 3

Nanomaterials, Various synthesis and characterization techniques, Production methods of nanometallic alloys, Nanoceramics and nanoceramic composites, Processing of nanomaterials, Applications of bulk nanomaterials.

Reading:

ME476

**ADVANCED MATERIALS AND PROCESSING**

(3-0-0) 3

Processing of metallic materials: casting and solidification. Single crystal growth, Zone refining. Powder Metallurgy techniques and their applications to MMCs, Processing of ceramics, Rheological behaviour, Slip and tape casting, hot and cold processing, Forming of glass and ceramic composites, Processing of polymers.

Reading:

ME477

**DESIGN AND APPLICATIONS OF ENGINEERING MATERIALS**

(3-0-0) 3

Principles of materials selection and design, Normalization of properties, weighting factors, materials performance index. Introduction to design codes, criteria for material qualification and acceptance for important applications, Examples for aircraft wings, cutting tools, gas turbine blades etc.
Reading:

**ME478  INDUSTRIAL AUTOMATION  (3-0-0) 3**

Principles and strategies of automation, Advanced automation functions, Levels of automations, Material handling systems and design, Storage systems, Automatic identification methods, Industrial control systems, Continuous Vs discrete control, Computer process control and its forms, Control system components.

Reading:

**ME479  INDUSTRIAL ROBOTICS  (3-0-0) 3**

Robotics-classification, sensors, grippers and manipulators, selection of robot, kinematics-differential kinematics and static-dynamics, trajectory planning-motion control-interaction control, rigid body mechanics, Control architecture, Programming of robots and vision systems, application of robots in production systems.

Reading:

**ME480  FLEXIBLE MANUFACTURING SYSTEMS  (3-0-0) 3**

Components of FMS, Computer control and functions, planning, scheduling and control of FMS, Supervisory computer control, Software and database of FMS, FMS performance evaluation, analytical model, simulation model, FMS configuration planning and routing, FMS production planning and control.

Reading:

**ME482  PROJECT MANAGEMENT  (3-0-0) 3**

Project Planning: Project System Management - Project systems environment, Project feasibility analysis, market feasibility, technical feasibility, financial feasibility, economic feasibility, Project Scheduling: Network techniques, CPM, PERT, GERT, LOB, GAN, Time cost trade off and crashing procedure, Contract Management.

Reading:
ME483  RELIABILITY ENGINEERING  (3-0-0) 3
Basic concepts and Terminology, Component reliability models, System reliability models, Reliability Block
Diagrams, Repairable and non-repairable systems, Life testing and reliability assessment, Reliability allocation,
Tools for reliability analysis, Mechanical reliability, Maintainability analysis.
Reading:

ME484  THEORY OF CONSTRAINTS  (3-0-0) 3
Concepts behind TOC, five steps of TOC, throughput accounting, Logistics solutions of TOC: DBR methodology, OPT, Critical chain methodology, Tools for thinking process: CRT, EC, FRT, PRT and TT.
Reading:

OPEN ELECTIVES

CE390  ENVIRONMENTAL IMPACT ASSESSMENT  (3-0-0)3
Reading:

EE390  LINEAR CONTROL SYSTEMS  (3-0-0)3
Reading:

EC390/EC440  COMMUNICATION SYSTEMS  (3-0-0)3
Reading:
EC391/EC441  MICROPROCESSOR SYSTEMS  (3-0-0) 3

Over view of Micro Computer Structure and Operation, Microprocessor Evolution, 8086 Architecture, Memory Segmentation, addressing modes, Instruction set, Assembly language programming, Pin Descriptions, 8086 Minimum Mode and Maximum Mode, Timing and Bus cycles, Memory interfacing. Interrupt Structure, Types, Responses, Peripheral Interfacing- PPI, Hex keypad Interfacing, Display Interfacing, Interfacing A/D and D/A converters, Programmable Interval Timer (8254), Programmable Interrupt Controller (8259), DMA Technique, and Programmable Communication Interface (8251).

Reading:

EC392/EC442  ELECTRONIC MEASUREMENTS AND INSTRUMENTATION SYSTEMS  (3-0-0) 3


Reading:

MM 390  METALLURGY FOR NON-METALLURGISTS  (3-0-0) 3

Structure of Metals and Alloys, Mechanical Properties and strengthening mechanisms, discovering metals-overview of metals, modern alloy production, fabrication and finishing of metal products, testing and inspection of metals, quality, steel products and properties, cast irons, heat treatment, tool steels and high speed steels, stainless steels, nonferrous metals, corrosion, durability of metals and alloys, the materials selection process.

Reading:

CH390  NANOTECHNOLOGY AND APPLICATIONS  (3-0-0)3

Introduction to nano sizes and properties, Quantum Mechanics, Chemical Kinetics at nanoscale, Nanomaterials: Fabrication, Nanomaterials: Characterization, Applications in electronics, Applications in chemical engineering, Nanobiology.

Reading:
### CH391  INDUSTRIAL SAFETY AND HAZARDS  (3-0-0) 3


**Reading:**

### CS390  OBJECT ORIENTED PROGRAMMING  (3-0-0)3

Object Oriented Thinking - Messages and Methods - OO Design - Software Components - Design Paradigms - Inheritance - Mechanisms for software reuse - Polymorphism - AWT Class - Input output Streams - Design Patterns - Exception handling.

**Reading:**

### BT390  GREEN TECHNOLOGY  (3-0-0)3


**Reading:**

### SM 390  MARKETING MANAGEMENT  (3-0-0)3


**Reading:**

### MA390  NUMERICAL SOLUTION OF DIFFERENTIAL EQUATIONS  (3-0-0)3

Reading:

MA391  
Fuzzy Mathematics and Applications  
(3-0-0) 3

Crisp set theory - Fuzzy set theory - Propositional Logic - Predicate Logic - Fuzzy Relations - Fuzzy Logic - Switching functions and Switching circuits - Applications of fuzzy mathematics.

Reading:

PH390  
Medical Instrumentation  
(3-0-0) 3


Reading:

PH391  
Advanced Materials  
(3-0-0) 3

Nano Materials - Nano biology; Biomaterials - ceramics, dental materials; Composites; Optical materials - solar cells, CCDs, lasers; Super conducting materials - SQUIDS; Smart materials; SAW Materials and Electrets.

Reading:

CY390  
Instrumental Methods in Chemical Analysis  
(3-0-0) 3


Reading:

CY391  
Chemical Aspects of Energy Systems  
(3-0-0) 3

Energy as the Key of Civilisation; Thermochemistry of Energy Sources and Kinteics of Energy Tapping; Conventional and Finite Energy Sources; Coal Based Energy Sources and Coal Carbonisation; Petroleum and Natural Gas; Biomass and Gobar Gas; Primary and Secondary Batteries, Reserve Batteries, Solid State and Molten Solvent Batteries, Lithium Ion Batteries;, Solar Energy Harnessing, Photogalvanic and Photovoltaic Energy Storage; Fuel Cells; Hydrogen as Future Fuel; Photochemical Water Cleavage; Green Energies.
Reading:

HS390  
SOFT SKILLS  (3-0-0)3  
Soft Skills - definition - scope and importance - workplace communication, process and barriers - Interpersonal and Intra-personal communication skills - team building - emotional intelligence - developing self-esteem - time and stress management - group discussions, interviews, and presentations - skills resignation - writing - campus to company - dressing and grooming - Entrepreneurial Skills Development - Project

Reading:

CE440  
BUILDING TECHNOLOGY  (3-0-0) 3  

Reading:

MM 440  
MATERIALS FOR ENGINEERING APPLICATIONS  (3-0-0) 3  
Classification of materials and properties, metallurgical aspects of materials, Significance of microstructural features, effect of cooling and heating rates and ageing materials for mechanical load bearing applications, corrosion resistant materials, materials for electrical, electronic, civil, biomedical applications.

Reading:

CH440  
INDUSTRIAL POLLUTION CONTROL  (3-0-0)3  
Introduction - Air pollution - Meteorological aspects of air pollution - Air pollution sampling and measurement - Air pollution control methods and equipment - Control of specific gaseous pollutants - Sources and classification of water pollutants - sampling Waste water and analysis - Waste water treatment - Solid waste management - Hazardous waste management.

Reading:

CH441  
FUEL CELL TECHNOLOGY  (3-0-0)3  
Reading:

CS440  MANAGEMENT INFORMATION SYSTEMS  (3-0-0) 3

Reading:

BT440  BIOSENSORS  (3-0-0)3
Introduction to Biosensors, Advantages and limitations, various components of biosensors, Types of Biosensors, Types of membranes used in biosensor constructions. Transducers in Biosensors: Various types of transducers; principles and applications of Biosensors.

Reading:

SM440  HUMAN RESOURCE MANAGEMENT  (3-0-0) 3

Reading:

MA440  OPTIMIZATION TECHNIQUES  (3-0-0) 3

Reading:

MA441  OPERATIONS RESEARCH  (3-0-0) 3
Formulation of a LPP - Graphical solution - Simplex method - revised simplex method - duality theory - Transportation problems - Single server queuing models - deterministic inventory control models - stochastic inventory control models.

Reading:
PH440  
**NANO MATERIALS AND TECHNOLOGY** (3-0-0) 3

General properties of Nano materials- mechanical properties; Fullerenes and CNT’s - Synthesis, physical properties; Investigation and manipulating materials in the Nanoscale - SAMs and clusters; Semi conducting Quantum Dots - Nanobiology- Nanosensors - Nanomedicines.

Reading:

PH441  
**BIOMATERIALS AND TECHNOLOGY** (3-0-0) 3

Overview of biomaterials; Structure and properties of biomaterials - surface properties of solids; Types of biomaterials - implant materials; Characterization of materials; Bio implantation materials - Materials in ophthalmology; Tissue response to implants.

Reading:

CY440  
**CORROSION SCIENCE** (3-0-0) 3

Understanding Corrosion, types of corrosion, methods of corrosion monitoring, measurement of corrosion steel in reinforced cement concrete, corrosion rates of metals due to microbially induced corrosion, methods of corrosion prevention and control.

Reading:

CY441  
**CHEMISTRY OF NANOMATERIALS** (3-0-0) 3

Synthesis, characterization, properties and applications of the following Nanomaterials, Fullerenes, Carbon nanotubes, Core-Shell Nanoparticles, Nanoshells, Self-assembled monolayers and Monolayer Protected Metal Nanoparticles, Nanocrystalline materials, Magnetic Nanoparticles and Important properties in relation to nanomagnetic materials, Thermoelectric materials, Non-linear optical materials, liquid crystals.

Reading:

HS440  
**CORPORATE COMMUNICATION** (3-0-0) 3

Importance of Communication in the Corporate World; Oral Communication: a) Oral Fluency and Communication Techniques, b) Seminar skills and Presentation skills; Listening Skills; Writing for Career Purposes; Leadership Communication.

Reading: