B. Tech. Degree
MECHANICAL ENGINEERING

SYLLABUS FOR CREDIT BASED CURRICULUM
(For Students Admitted in 2011 – 2012)

DEPARTMENT OF MECHANICAL ENGINEERING
NATIONAL INSTITUTE OF TECHNOLOGY
TIRUCHIRAPPALLI - 620 015
INDIA

MAY 2011
The total credits required for completing the B.Tech. Programme in Mechanical Engineering is 180.

**SEMESTER III**

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**Practical**

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**Total** 12 0 15 18

Credits for I Year - 45
Credits for Mechanical Engineering (III to VIII Semester) - 135
Total Credits - 180
### LIST OF ELECTIVES

#### Elective – I:

**SEMESTER VI**

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#### Elective – II & III:

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(Or) Any one Elective from other Departments

#### Elective – IV & V:

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(Or) Any one Elective from other Departments
MA211 SPECIAL FUNCTIONS AND STATISTICS  (3 – 0 – 0) 3

Laplace Transforms of standard functions – Unit Step function, Dirac delta, function, derivatives and integrals - Inverse Laplace Transform - convolution theorem – Periodic functions - Application to ordinary differential equations and simultaneous equations with constant coefficients and integral equations.

Gamma and Beta functions - Forbenius method of finding series solution of ordinary differential equation.

Bessel’s equation – Bessel functions - Recurrence formulae - Orthogonality property-Generating function. Legendre's equation- Legendre polynomials - Rodrigue's formula-Orthogonality property - Generating function - Recurrence relations.


Moment generating function - Characteristic function – Chebyshev’s inequality - Law of large numbers - Central Limit Theorem.

References:

EE223 APPLIED ELECTRICAL ENGINEERING  (2 – 0 – 2) 3


Torque – Slip Characteristics - Equivalent Circuit – Starting and Speed Control.


References:

**EC217 APPLIED ELECTRONICS ENGINEERING**  \((2–0–2)\) 3


Concept of negative feed-back; Feed-back amplifiers. Applications of operational amplifiers.

Inverting and non-inverting amplifiers; Differentiator – Multiplier - Divider, Comparator - VI and IV converter.

Digital Circuits – D/A and A/D – Types; Sample and Hold circuit - Multiplexers, Demultiplexers, Decoder and Encoders.

Practice on R.C. Coupled amplifier, OP amp, Multiplexers and Demultiplexers, SCR and Applications, Power supply and Regulator.

**References:**


**PR221 PRODUCTION TECHNOLOGY – I**  \((3–0–0)\) 3

Moulding sands - Types and Properties, patterns - types of patterns, selection of patterns - pattern allowances - Classifications of castings - according to mould materials and moulding methods. Special casting techniques - Fettling and finishing of castings - defects in castings.


**References:**


**CE281 STRENGTH OF MATERIALS (3 - 0 - 0) 3**


Thin cylindrical and spherical shells subjected to internal pressure. Principal stresses and their planes. Plane of maximum shear – Mohr’s circle of stresses. Thick cylinders – Lame’s equation, shrink fit. Compound cylinders.

Shear force and bending moment diagrams for beams subjected to different types of loads – Theory of simple bending and assumptions.

Leaf spring, shear stress. Deflection – The moment area method, Macaulay’s method – superposition (statically determinate beams only).

Torsion of solid and hollow circular shafts – Power transmission, strength and stiffness of shafts. Stress and deflection in open helical spring.

**References:**


**ME203 ENGINEERING THERMODYNAMICS (3-1-0) 4**

Review of basic concepts of thermodynamics, properties of pure substances - First law applied to control mass, control volumes. First law of thermodynamics steady flow energy equation - applications of SFEE - uniform state, uniform flow.

Second law statements - irreversible processes, Carnot theorem, Clausius Inequality — entropy, entropy change for pure substances – T-S diagram, entropy change applied to control mass, control volume-availability and irreversibility.

Vapour power cycles - Rankine cycle - Effect of pressure and temperature on rankine cycle - Reheat cycle - Regenerative cycle - Air standard power cycles - Assumptions regarding air standard cycles - Otto, Diesel, dual, Stirling and Brayton cycles.

Mixture of non-reacting gases - Dalton's and Amalgam's model - calculation of $C_p$, $C_v$, $R$ and $U$, $h$ and $s$ changes for gas mixtures fuels and combustion - combustion chemistry - calculation of air fuel ratio - exhaust gas analysis.

References:


CE283 STRENGTH OF MATERIALS LAB (0 – 0 – 2) 1

Deflection test on springs, steel bar, cantilever beams, wooden beams.
Torsion test on different grades of steel.
Hardness test.
Impact test.

ME205 MACHINE DRAWING (0 - 0 - 6) 2


References:


SEMESTER IV

MA208 FOURIER SERIES AND PARTIAL DIFFERENTIAL EQUATIONS (3 – 0 – 0) 3


Formation of PDE - Solution of standard types of first order equations - Lagrange's linear equation - Second and higher order homogeneous and non-homogeneous linear equations with constant coefficients.

One-dimensional wave equation and one-dimensional heat flow equation - method of separation of variables - Fourier series solution.

Two-dimensional heat flow equation in steady state - Laplace equation in Cartesian and polar co ordinates - method of separation of variables - Fourier series solution.

References:

**MT252 ENGINEERING METALLURGY (3 – 0 – 0) 3**


Phase Diagrams and Ferrous Alloys Fe- FeC diagram, Critical temperature - Plain carbon steel and other steels.


Testing of Materials I - Properties evaluated by tensile testing procedure, Engineering stress strain curve vs. true stress-strain curve, stress strain curve for typical materials. Hardness testing.

Testing of Materials II - Impact testing, Fracture toughness. Fatigue testing: Creep testing.

References:
PR222 PRODUCTION TECHNOLOGY – II (3 – 0 – 0) 3

Lathes, capstan & turret lathe, drilling and boring machine - Classification - principles of working components, work holding & tool holding devices.

Shaper, planner & slotter, machines - Classification - principles of working components, work holding & tool holding devices.

Milling, hobbing, broaching & grinding machines - Classification - principles of working components, work holding & tool holding devices.

NC & CNC machine tools and manual part programming Machining centre, turning centre. NC part programming.

Computer aided part programming - APP: Post processors. APT programming - motion statements, additional apt statements.

References:

ME202 THERMAL ENGINEERING (3 – 0 – 0) 3

Reciprocating air compressors - types - construction - work of compression without clearance - effect of clearance – Multistaging - optimum intermediate pressure for perfect inter cooling - Compressor efficiencies and mean effective pressure.

Working of two and four stroke engines - valve and port timing diagrams - Deviation of engine indicator diagram from air standard cycles - Fuel air cycles and their analysis, Comparison of air standard and fuel air cycles - Losses in actual cycles.

I.C. engines fuels and rating -SI engine air fuel mixture requirements - Performance curve of an automobile carburetor - Diesel injection systems - types - Jerk type pump - Injection pump governors. Types of nozzles - Introduction to petrol injection.

Battery Ignition - magneto ignition and transistorized coil ignition - Combustion in SI engines - Knock in SI engines - effect of engine variable on knock - Combustion in CI engines - knock in CI engines - combustion chambers for SI and CI engines.

References:


ME204 MECHANICS OF MACHINES I (3 - 1 - 0) 4

Mechanisms - classification of mechanisms, Kinematic inversions - Grashoff's law - Inversions of slider crank mechanism, Coupler curves, spatial mechanisms - Straight-line generators.

Slider crank mechanisms and four bar mechanism; Velocities of points on a rigid body - relative velocity - velocity polygon Acceleration of points on a rigid body - relative acceleration - acceleration polygon - Coriolis acceleration - analytical method.

Chebyshev spacing for precision positions - Structural error - Overlay method - Complex curve synthesis - Roberts Chebyshev theorem - Frudenstine’s equation; Analytical synthesis using complex algebra; synthesis of dwell mechanism.


References:


ME206 FLUID MECHANICS (3-1-0) 4

Basic concepts - Fluid properties - Basic hydrostatic equation - Manometry - Submerged and floating bodies.

Pressure at a point - Hydrostatic equations for incompressible and compressible fluids - Manometers - Hydrostatic force on a submerged plane and curved surfaces - Buoyancy and equilibrium of floating bodies - Metacentre - Fluid in rigid motion bodies.

Fluid dynamics; integral and differential formulations - Continuity equation - Navier-Stokes equations.

Laminar and turbulent flows - Some exact solutions of Navier-Stokes equations - Flow through pipes.
Fluid rotation and deformation - Stream function - Condition of irrotationality - Governing equations of potential flow - Laplace equation. Boundary layer concept - Prandtl's equation - Drag on flat plates - Buckingham π-theorem - Dimensionless numbers.

References:


**CE 290 FLUID MECHANICS LAB (0 – 0 – 2) 1**

Determination of pipe friction.
Calibration of venturimeter, orifice meter and water meter.
Determination of discharge coefficients for notches and weirs.
Determination of minor losses.
Determination of discharge coefficients for mouthpiece and orifice.
Flow through helical coils.
Determination of metacentric height.

**MT 262 METALLURGY LAB (0 – 0 – 2) 1**


Preparation of specimen for metallographic observation of Mild Steel, Low Carbon Steel, Medium Carbon Steel, Hypereutectoid Steel, Hardened Steel, Tempered Steel, Tool Steel and Stainless steel.


Tensile, Hardness and Creep testing of given metallic materials.

**PR232 PRODUCTION PROCESS LAB (0 – 0 –3) 2**

Lathe – Simple / Step / Taper Turning, Thread Cutting, Drilling and Boring.
Shaping – V – Cutting
Milling – Job requiring Indexing.
Hobbing – Spur Gear Cutting
Grinding – Surface / Cylindrical grinding
CNC Lathe – Simple Turing, Step Turning, Thread Turing
Machining Center – A typical job production.
ME208 THERMAL ENGINEERING LAB I  (0 - 0 - 3) 2

Property determination for fuels and lubrication oil.
Study and performance testing of IC engines.
Study and performance testing of air compressor.
Emission measurements.

SEMESTER V

MA 301 NUMERICAL METHODS (3 – 0 – 0) 3

Solution of linear system - Gaussian elimination and Gauss-Jordan methods - LU decomposition methods - Crout's method - Jacobi and Gauss-Seidel iterative methods - sufficient conditions for convergence - Power method to find the dominant eigenvalue and eigenvector.

Solution of nonlinear equation - Bisection method - Secant method - Regula falsi method - Newton- Raphson method for f(x) = 0 and for f(x,y) = 0, g(x,y) = 0 - Order of convergence - Horner's method - Graeffe's method - Bairstow's method.


Numerical solution of Laplace equation and Poisson equation by Liebmann's method - solution of one dimensional heat flow equation - Bender - Schmidt recurrence relation - Crank - Nicolson method - Solution of one dimensional wave equation.

References:


ME315 MECHATRONICS (3 – 0 – 0) 3

INTRODUCTION

SENSORS AND TRANSDUCERS


8085 MICROPROCESSOR


PROGRAMMABLE LOGIC CONTROLLERS

Introduction-Basic structure-Input/Output Processing-Programming-Mnemonics-Timers, Internal relays and counters-Data handling-Analog Input/Output-Selection of a PLC.

DESIGN AND MECHATRONICS

Stages in Designing mechatronic systems - Traditional and Mechatronic design -Possible design solutions-Case studies of mechatronic systems - Pick and place robot - automatic car park system -engine management system.

References:


ME301 COMPRESSIBLE FLOW AND JET PROPULSION  (3 - 0 - 0) 3

Governing equations for inviscid-compressible flows - static and stagnation properties - speed of sound and Mach number.

Isentropic flow through variable area passage ducts - Choking of flow.
Normal and oblique shocks - Prandtl-Meyer flows.
Fanno flow - Rayleigh flow.
Fundamentals of jet propulsion - Propulsion cycle - Power and efficiency calculations - Turbojet, turbofan, and turboprop engines - Fundamentals of rocket propulsion.

References:

ME303 HEAT AND MASS TRANSFER  (3-0-0) 3
Conduction - General 3-D equation - Heat generation problems - Fins - Unsteady state conduction.

Radiation Laws - Black and Gray bodies - Radiation exchange between surfaces - Radiation shields Green house effect.

Forced Convection - Boundary layer theory - External and internal flows - Free convection - Correlations.


References:

ME305 MECHANICS OF MACHINES - II (3-1-0) 4
Static and dynamic force analysis of mechanisms - Flywheel function and design.

Balancing of rotating masses in one and in several planes - Balancing of reciprocating masses – Single and multi-cylinder engines.

Governors; gravity and spring controlled governors - Gyroscopic effect.

Vibration; free and forced vibrations - Single degree and multi-degree freedom systems.

Vibration control - Passive and active control.

References:

ME307 ANALYSIS AND DESIGN OF MACHINE COMPONENTS  (3 - 0 - 0) 3
Mechanical engineering design - Design considerations - Material selection - Modes of
failure - Theories of failure - Endurance limit - Stress concentration - Factor of safety.

Design of shafts and couplings - Design of cotter and knuckle joints.

Helical and leaf springs.

Fasteners and keys - Design of welded joints - Fillet and butt welds - Design of riveted joints.

Design of sliding contact bearings - Selection of rolling contact bearings.

References:


IC 317 MECHATRONICS LAB (0 – 0 – 2) 1

Verification of basic specifications of operation amplifier from data sheet; OP-amp Ck1 amplifier (inverting and Non-inverting)

P-amp Ck2 wave form generation (square wave, triangular wave); OP-amp Ck3 Integrator, Differentiator; OP-amp Ck4 V-I converter & I-V converter.

Study of transducers: RTD + Signal Conditioning Circuit; Study of LVDT with accessory chip; Study of Digital Gates - SOP realization.

Study of Microprocessor instruction set; Simple programs using 8085 microprocessor - Addition, Use of functions, Peripheral chips, Waveform generation.

Usage of interrupts, Stepper motor control, Key board interface, Heater control; Study of PLC; Study of tools such as PSPICE; Usage of simulators (any other microprocessor)

ME309 DYNAMICS LAB (0 - 0 - 3) 2

Measurement of moment of inertia of rigid bodies.
Gyroscope.
Jump speed of a cam.
Mechanical vibrations.
Balancing.

ME 311 PRODUCTION DRAWING AND COST ESTIMATION (1 – 0 – 2) 2

Conventional Representation of Machine elements - International Standards (ISD) and Indian Standards (IS).
Limits and Fits - IT system of tolerances, deviations and fits.

Geometric Dimensioning and Representation - Tolerancing, Tolerancing of form, orientation, location and run-outs, Datums and Datum Systems.


Cost Estimation of setting time and machining time - estimation of material cost, labour cost and overhead cost based on supplied data. Given a sub-assembly /assembly to prepare production drawings of components as per current drawing office practice. At least ten sub-assemblies/assemblies are to be completed on A4 sheets.

References:
1. Indian Standards : 10714,10715,10716,10717,10719, 813,919,2709,8000 , pt.1 to 4 : 10721, 11158 corresponding to ISO's

SEMESTER VI

ME302 TURBOMACHINES (3 - 0 - 0) 3

Introduction - Classification - Dimensional analysis - Specific speed - Basic laws and equations.
Hydraulic turbines; Pelton, Francis, and Kaplan turbines - Turbine efficiencies - Cavitation in turbines.

Centrifugal pumps; theory, components, and characteristics - Cavitation - Axial flow pumps - Pump system matching.

Centrifugal and axial flow compressors; slip, surging and chocking.

Steam turbines; basic cycle, impulse and reaction turbines - Gas turbine; basic cycle and multi-staging - Power and efficiency calculations.

References:

ME304 AUTOMOBILE ENGINEERING (3 - 0 - 0) 3
General classification of vehicles - Power unit - All components of power unit.

Steering systems - Power steering - Wheel and suspension systems - Transmission system; clutches, couplings, gear boxes, and torque converters.

Axles - Differentials - Mechanical, hydraulic, and pneumatic brakes - Power brakes - Four wheel drive.

Electrical systems; construction, operation, and maintenance of batteries - Starter motors.

Lighting and electrical accessories - Panel board instruments - Automobile air conditioning - Troubleshooting.

References:


**ME306 DESIGN OF MECHANICAL DRIVES (3 - 0 - 0) 3**

Introduction to transmission elements - Positive and friction based drives.

Importance of friction based drives - Design of flat and V-belts - Design of rope and chain drives.

Design of spur and helical gears based on contact and beam strength.

Design of bevel and worm gears.

Design of multi-speed gearbox - Preparation of ray diagram and kinematic arrangement diagram for multi-speed gearbox.

References:


**ME308 COMPUTER AIDED DESIGN AND DRAFTING (3 - 0 - 0) 3**

CAD hardware - Product cycle - CAD tools, CAD systems; system evaluation, CAD specific I/O devices.
CAD software - Graphic standards – Modes of graphics operation, Software Modules.

Geometric modeling – Types and mathematical representation and manipulation of curves and surfaces.

Solid modeling- fundamentals, feature based modeling manipulations of solid models.

Transformation of Geometric models and visual realism - Animation.

References:


ME310 REFRIGERATION AND AIR CONDITIONING    (3 - 0 - 0) 3


Discussion of components of V.C system, Servicing. Vacuumizing and charging of refrigerant. Introduction to cryogenics.


Air-conditioning systems – discussion about the central plant with direct evaporator and chiller applications, Ice plant, refrigerators. Food preservation, IQF technique and freeze drying etc. Cold storage and thermal insulation.

References:


ME312 THERMAL ENGINEERING LAB - II (0 - 0 - 3) 2

Study and performance tests on refrigeration.
Study and performance tests on air conditioning test rig.
Heat transfer experiments based on conduction and convection.
Heat transfer experiments based on radiation.

ME314 AUTOMOBILE ENGINEERING LAB (0 - 0 - 3) 2
Study on engine components.
Fuel systems.
Ignition systems - Transmission systems - Steering systems.
Suspension and braking systems.
Layout of electrical wiring - Light and heavy vehicles.

**ME316 COMPUTER AIDED DESIGN AND DRAFTING PRACTICE (0 - 0 - 2) 1**

Components drawing with dimensioning
Assembly drawing using modeling software package
Shaft coupling
Bearings
Automobile parts
Machine tool parts

**SEMESTER VII**

**HM 401 INDUSTRIAL ECONOMICS  (3 – 0 – 0) 3**

Demand and Supply – Forecasting techniques – Cost and Revenues.
Competitive nature of the firms – Keynesian economics – National income.
Trade cycle – Inflation – Index numbers – Capital budgeting – Cash flow analysis – Balance sheet.

**References:**


**ME403 POWER PLANT ENGINEERING (3 - 0 - 0) 3**

Layout - various components and functions of thermal power plants.
Nuclear power plants and gas turbine.
Hydro power plants.
Diesel power plants.
Power plant economics and environmental hazards.

**References:**

**ME405 METROLOGY AND QUALITY CONTROL**  (3 - 0 - 0) 3


Surface finish; terminology and measurements - Optical measuring instruments.

Measurement of screw thread and gear elements - Acceptance test for machines.

Statistical Quality Control - Control charts - Sampling plans.

**References:**


**ME407 OIL HYDRAULICS AND PNEUMATICS**  (3 - 0 - 0) 3

Basic concepts of fluid power system design - Hydraulic oils and fluid properties – Seals and Seal materials - Filters and Filtration.

Hydraulic pumps, cylinders, and motors - Construction, sizing, and selection.

Control valves; pressure, flow, and direction - Servo-valves.

Basic hydraulic circuits, hydrostatic transmission - Cartridge valve circuits.

Control of hydraulic circuits - Electrical, electronics, and PLC - Pneumatic components and basic circuits.

**References:**


**ME409 METROLOGY LAB**  (0 - 0 - 2) 1

Measurements on precision instruments; sine bar, CMM - Universal measuring microscope, Profile projector - Electronic comparator, optical flat, surface roughness - Gear tooth thickness - MAAG gear tester - Calibration of LVDT - Statistical Quality Control charts.
ME411 COMPREHENSIVE VIVO-VOCE   (0 - 3 - 0) 3
ME413 PROJECT WORK - PHASE I    (0 - 1 - 0) 0
SEMESTER VIII

HM402 MANAGEMENT PRINCIPLES AND CONCEPTS (3 – 0 – 0) 3

Introduction to management – Evolution of scientific management, modern management, Principles- Elements of management planning, organizing, staffing, directing, coordinating, reporting, budgeting.

Financial management, objectives, scope, Techniques of investment analysis, Payback period, sources of financing, technology management, product design, and plant layout.

Inventory management, project management, PERT, CPM- Applications.

Significance of Human resources management, HR Planning, Job evaluation, recruitment and selection.

Placement and induction, training, Performance appraisal, compensation, Industrial relations.

References:

PR472 RESOURCE MANAGEMENT TECHNIQUES (3 – 0 – 0) 3

Linear programming, graphical method - simplex method - big M method - Two-phase method - introduction to duality theory


Queueing theory & sequencing - applications of queuing model - single and multi server model.

Decision theory and replacement analysis.

Project scheduling - project network - determination of critical path, project duration and slack time calculation - Cost considerations in project scheduling.

References:
LIST OF ELECTIVES

SEMESTER VI

Elective I

ME352 FINITE ELEMENT METHOD (3 - 0 - 0) 3

Introduction - Illustration using spring systems and simple problems - Weighted residual
methods Galerkin's method - Variational approach - Rayleigh-Ritz method.

One-dimensional finite element analysis; bar element, beam element, frame element - Heat
transfer problems.

Two-dimensional finite element analysis; types of elements, shape functions, natural
coordinate systems.

Applications to structural mechanics - Numerical integration - Solution of finite element
equations.

Fluid flow problems - Dynamic problems.

References:


ME354 ADVANCED IC ENGINES (3 - 0 - 0) 3

Engine design parameters, properties of working fluids.

Analysis of engine cycles, fuel intake systems.

Combustion in SI and CI engines.

Pollutant formation and control in IC engines.

Engine performance and modeling.

References:

SEMESTER VII

Elective – II & III:

ME451 INDUSTRIAL SAFETY (3 - 0 - 0) 3

Evolution of modern safety concept- safety policy - Safety Organization - Safety Committee - budgeting for safety. Safety training – creating awareness, awards, celebrations, safety posters, safety displays, safety pledge, safety incentive scheme, safety campaign

Concept of an accident, reportable and non reportable accidents, reporting to statutory authorities – principles of accident prevention – accident investigation and analysis – records for accidents, departmental accident reports, documentation of accidents – unsafe act and condition – domino sequence – supervisory role – cost of accident.

Machine Guarding, Guarding of hazards, Machine Guarding types and its application – Safety in welding and Gas cutting – Safety in Manual and Mechanical material handling- Safety in use of electricity

Toxicity- TLV- Types of Chemical Hazards-Occupational diseases caused by dust, fumes, gases, smoke and solvent hazards- control measures

Fire triangle- Types of fire - first aid firefighting equipment – flammability limit- LPG safety

Overview of factories act 1948 – OHSAS-18000

References:


ME453 OPTIMIZATION IN ENGINEERING DESIGN (3 – 0 – 0) 3

Specialized algorithms - Integer, geometric.

Nontraditional algorithms.

References:

ME455 COMPUTATIONAL FLUID DYNAMICS (3 - 0 - 0) 3

Classification of partial differential equations - Discretization methods; finite difference and finite volume formulations.

Numerical solution of elliptical equations - Linear system of algebraic equations.

Numerical solution of parabolic equations - Stability analysis.

Numerical solution of hyperbolic equations - Burgers equation.

Incompressible Navier-Stokes equations and algorithms - Basics of grid generation.

References:


ME457 DESIGN OF GEARS AND CAMS (3 - 0 - 0) 3

Design of gears - spur, helical, bevel and worm & worm wheel.

BIS standards for gear design.

Force analysis.

Design of cams - Tangential and Polynomial cams.

References:

1. BIS Standards.

ME459 MEMS DEVICES - DESIGN AND FABRICATION (3 – 0 – 0) 3

An overview of microelectromechanical devices and technologies, and an introduction to design and modeling

Standard microelectronic fabrication technologies; bulk micromachining, surface micromachining, bonding technologies, related fabrication methods, and creating process flows.
Mechanical, thermal, electrical, magnetic, optical, and chemical properties of materials

Introduction to lumped modeling of systems and transducers; an overview of system dynamics

MEMS examples, energy methods, the thermal energy domain; modeling dissipative processes, Fluids and Transport

Text Book


References


ME461-WELDING ENGINEERING (3 – 0 – 0) 3


Welding Processes - 2 Radiant energy and solid phase welding processes and equipment - Beam power control. Laser beam cutting, under water welding. Diffusion welding.


Welding metallurgy - weld thermal cycles and their effects - structural changes in different materials, effect of pre and post heat treatment. Weldability.


References:


**HM401 CORPORATE COMMUNICATIONS (3 – 0 – 0) 3**

Communication in the corporate world – Communication process – Networks and Channels of communication

Technology for communication – Role of psychology – Motivation - Speech mechanics – Mental process of speaking

Extempore speech practice – Group dynamics – Seminar & Presentation skills and interview strategies


**References:**


**SEMESTER VIII**

**Elective IV & V:**

**ME452 INDUSTRIAL ROBOTICS (3 - 0 - 0) 3**

Classification and characteristics

Principles and problems in robot design and control

Transmission system.

Vision system.

Programming and languages.
References:


**ME454 COMBUSTION ENGINEERING (3 - 0 - 0) 3**

Combustion of fuels - Combustion equations and air-fuel ratio calculations.

Thermodynamics of combustion - Thermochemistry - Kinetics of combustion.

Laminar and turbulent flames - Quenching, flammability, ignition and flame stabilization. Combustion in SI and CI engines.

Emission and control methods.

References:


**ME456 DYNAMICS OF MACHINERY (3 - 0 - 0) 3**

Single degree of freedom systems - Periodic excitations - Impulse response - Virtual work.

Forced vibrations.

Two degree of freedom systems - coupled vibrations.

Vibration of continuous systems.

Wave and Euler equations - Vibration of plates.

References:


**ME458 RENEWABLE ENERGY (3 - 0 - 0) 3**


Solar thermal energy conversion - Efficiencies - Solar photo voltaic energy.

Bio energy - Conversion - bio degradation - Biogas generation - Fuel properties - Biomass
gasifier.

Wind energy - Data and energy estimation, Conversion - Wind mill - Performance, applications Geothermal.

Tidal energy - Magneto hydrodynamic - Thermionic - Fuel cell.

References:


**ME460 ADVANCED MACHINING PROCESSES (3 – 0 – 0) 3**

Non-traditional machining processes – classification.

Chemical and electrochemical processes - material removal - maskants and etchants - types of chemical material removal - application and limitations - Electrochemical material removal.

Thermoelectrical processes - types - electrical discharging machining, electron beam machining, ion beam machining and plasma arc machining.

Mechanical processes - ultrasonic machining abrasive jet machining - abrasive flow machining - water jet cutting.

Special Machining Processes - polygonal turning and drilling deep hole drilling and trepanning - shaped tube electrolytic machining - thread rolling - roller burnishing - electrical discharge wire cutting - thermal deburring - orbital grinding micromachining - Numerical control and automated processes.

References:

ME403 POWER PLANT ENGINEERING (3 - 0 - 0) 3

Layout - various components and functions of thermal power plants.
Nuclear power plants and gas turbine.
Hydro power plants.
Diesel power plants.
Power plant economics and environmental hazards.

References:

Conduction - General 3-D equation - Heat generation problems - Fins - Unsteady state conduction.

Radiation Laws - Black and Gray bodies - Radiation exchange between surfaces - Radiation shields Green house effect.

Forced Convection - Boundary layer theory - External and internal flows - Free convection - Correlations.

Heat exchangers - Fouling factor, LMTD and NTU methods - Boiling and condensation - Boiling regimes and correlations, Nusselt's theory - Condensation over surfaces.
Mass transfer - Fick's law - Similarities between heat and mass transfer.

References: