

VINOBA BHAVE UNIVERSITY HAZARIBAGH

SYLLABUS FOR B-TECH 8TH SEMESTER

SEMESTER-VIII

| S.N | Course no. | Subject | Period | | | Evaluation scheme | | | | | Credit | Hours |
|-------------------|--------------|-------------------------|--------|---|----|-------------------|----|-----|-----|-----------|--------|-------|
| | | | L | T | P | TA | CT | TOT | ESE | Sub Total | | |
| Theory | | | | | | | | | | | | |
| 1 | ME 8133 | ICGT | 3 | 1 | 0 | 20 | 10 | 30 | 70 | 100 | 4 | 4 |
| 2 | ME 8134 | Power Plant Engineering | 3 | 1 | 0 | 20 | 10 | 30 | 70 | 100 | 4 | 4 |
| 3 | ME 8135-8137 | Elective - III | 3 | 1 | 0 | 20 | 10 | 30 | 70 | 100 | 4 | 4 |
| 4 | ME 8138-8140 | Elective - IV | 3 | 1 | 0 | 20 | 10 | 30 | 70 | 100 | 4 | 4 |
| 5 | ME 8141-8143 | Elective - V | 3 | 1 | 0 | 20 | 10 | 30 | 70 | 100 | 4 | 4 |
| Total | | | | | | | | | | 500 | 20 | 20 |
| Sessionals | | | | | | | | | | | | |
| 1 | ME 8226 | Project part – II | 0 | 0 | 12 | 30 | - | 120 | 80 | 200 | 8 | 12 |
| 2 | ME 8308 | General Proficiency | - | - | - | - | - | - | - | 50 | 2 | - |
| Total | | | | | | | | | | 250 | 10 | 12 |

TA-Teachers assessment, CT- Class test, ESE- End semester examination.

Total Credits 20+10=30 Total Marks 500+250=750 Total Hours 20+12=32

(Rest 10 hours is to be utilized for co-curricular development)

Elective-III

1. Work Study & Measurement(ME 8135)

2. Advance Engg. Mathematics (ME 8136)

3. Materials Management (ME 8137)

Elective-IV

1. Applied Stress Analysis(ME 8138)

2. Robotics (ME 8139)

3. Industrial Statistics(ME 8140)

Elective-V

1. Instrumentation & Control(ME 8141)

2. Financial Management & Accounting (ME 8142)

3. Metrology (ME 8143)

SEMESTER-VIII

I.C. ENGINE AND GAS TURBINE(ME 8133)

1. INTRODUCTION: Engine classifications; two strokes, four strokes (S.I. and C.I.).Engines, engine parts engine's working principles in general and valve timing diagrams.
2. REVIEW OF THE THERMODYNAMIC CYCLES: Their comparison, fuel air cycles, Real cycles.

- 3 ENGINE PERFORMANCE TEST: Purpose and types, measurements of power (IHP, BHP, and FHP), Air-Fuel ratio, and plot of different performance curves (engine speed vs. BHP, IHP, thermal efficiency torque, air fuel ratio).
4. THEORY OF COMBUSTION: principles of combustion, chemical equilibrium and dissociation, adiabatic flame temperature. Thermodynamic charts- Unburned and Burned mixture charts, Transition from unburned to burned mixture charts. Combustion processes in S.I. and C.I. engines. Effect of engine variables on combustion process, Knock in S.I. and C.I. engines, combustion chambers for S.I. and C.I. engines.
5. FUELS: Petroleum base fuels, gasoline and its properties, alcohols (fuels for S.I. engines), Blending, diesel fuel and properties, knock rating of S.I... and C.I. fuels.
6. (a) CARBURATION: Working principles, chemically correct air fuel ratio and load variation, Governing and compensating devices (accelerating pumps, idling jets, economizer, chokes etc.), Venturi and jet diameter calculation.
(b) INJECTION SYSTEM: Types, elements of atomizer and pumps, types of nozzles and governing system.
7. (a) SUPERCHARGING: Principle of supercharging, superchargers, Turbo superchargers.
(b) ENGINE LUBRICATION AND COOLING: Purpose, principles of lubrication and cooling. Types of lubricants.
8. GAS TURBINE: principle, principles of gas turbine, simple open gas turbine cycle, effect of operating variables on thermal efficiency. Regenerative and reheat cycles, multistage efficiency, multistage gas turbine cycle, closed cycle gas turbine, gas turbine application.
9. JET PROPULSION: Working principle, thrust power, propulsive force and propulsive efficiency.
10. ROCKET ENGINES: Basic theory of operation, solid propellant rockets, application of rocket engines.

POWER PLANT ENGINEERING (ME 8134)

1. INTRODUCTION: A brief survey of power and energy of availability of power and energy in India, fuels, gas oil, coal and their characteristics, ash and refuse analysis.
2. BOILERS: Circulation Principles (Natural and Forced), types of boilers Furnace design and heat transfer characteristics, Boilers rating and characteristics, modern boilers.

3. BOILER GAS LOOP: Coal storage, conveyers, pulverizers, Oil and Gas supply system. Fuel bed mixing, stokers and Burners, Ash and handling methods of dust collection, air preheater, Draught system Control equipments.
4. BOILER WATER LOOP: Water treatment plant , feed water heating contact and surface heaters, Evaporators, Feed water pumps, Economizers and Super heaters, Condensers, Cooling water requirement.
5. PIPING SYSTEM AND ELEMENTS: Pipe size determination, calculation of losses in pipe, pipe insulation, High temperature effects on piping, piping supports.
6. CONTROLS AND INSTRUMENTATION: Temperature, pressure, flow measuring devices, circular and strip chart recorders.
7. NUCLEAR POWER STATION: Elementary concept, Nuclear Reactors, Moderators. Shield Reflectors, control rod, nuclear fuels. Breeder and gas cooled reactors.
8. MODERN POWER PLANT AND POWER PLANT ECONOMICS: The variable load, ideal and realized load curves, Terms and factors, effects of variable load on power plant operation, method of meeting the load, Source of income, effect of plant types and costs. Economic survey and site suitability of different plants.

ELECTIVE - III

WORK STUDY & MEASUREMENT (ME 8135)

Introduction : Purpose and Scope of Work Study and its Historical Development. Work Study as a Tool for Productivity Enhancement.

Method Study : Objectives and Scopes, General Procedure to Tackle Method Study Problems (Steps, Select, Record, Critical, Examination, Develop, Install, and Maintain Improved Method)., recording Techniques and their Applications (Operation Process Chart; Flow Process Chart, Two Handed Process Chart, Multiple Activity Chart, Flow Diagram, string Diagram, Photographic Aids and Models.

Micromotion Study : Preparation of Motion Films and Analysis with the help of thrbligs and SIMO Charts, Memomotion Study, Cycle Graph and Chrno Cycle graph and Principles of Motion Economy.

Work Measurement : Concept, Scope and Objectives, Various Work Management Techniques, Stop Watch Study Procedure in Detail, Performance rating and Determination of Normal Allowances in time study and determination of Standard Time.

Work Sampling, Concept and Uses, sampling Study Procedure and Presentation of Results, establishing Time Standard by Work Sampling, Practical Applications.

PMTS : Establishment and Uses of Elemental Time Data, Predetermined Motion Time Systems, Major Systems, Uses and Applications.

Wage & Incentive : Principle and Methods of Job Evaluation and Merit Rating, Principles of Wage & Incentive Payment, Comparative Study of Incentive Schemes.

Ergonomics : Concept, Scope and Objectives of Human Factors in Engineering and Man-Environment Interaction, Causes and Prevention of Fatigue, Design of Man Environment Systems and Methodology.

ELECTIVE - III

ADVANCE ENGINEERING MATHEMATICS (ME 8136)

1. Vector calculus-Integral transformation, theorem of Gauss, Stokes and Green, curvilinear coordinates transformation from one system to another.
2. Integral calculus-Double and triple integral, change in order of integration, differentiation under integral sign, change of variables, improper integral, convergence of improper integral, general and principle value of infinite integral.
3. Matrices-Solvability of sets of linear equations, characteristics, value problems, properties of symmetric matrices, numerical method for finding out the characteristic value of vector.
4. Classical methods of optimization of a function of several variables with constants. Introduction to calculus of variation.
5. Series expansion of arbitrary function-Orthogonalisation of functions, generalized Fourier series, Bessel equalities, discussion on closures, completeness and convergence in the mean, Sturm Liouville problem and eigen function expansion.
6. Cartesian tensor-Multiple suffix sets, summation convention, dummy suffixes, special symbols like ϵ_{ij} and ϵ_{ijk} , coordinate transformation, algebraic operation on tensors, sum, product, contraction and quotient law.
7. Partial differential equation-Characteristics of linear first and second order partial differential equation, classification of second order equation, use of Green function and integral transformation for their solution.

ELECTIVE - III

MATERIALS MANAGEMENT (ME 8137)

Introduction, Relevance of Materials Management, Need for Integrated approach, Deterministic models; EOO, EPO, Discount, backlogging, multi-item models etc., sensitivity analysis, basic systems of inventory management, inventory costing, Aggressive inventory models, Stochastic inventory models, service level, single period model, etc. Role of uncertainty, selective inventory controls, material planning, forecasting, warehousing, storage etc. Documentation for purchasing etc. MRP concepts, logic, computerized models, implementation issues, case studies. JIT philosophy, logic applications, implementation, vendor selection & evaluation. Vendor relation, consolidation of vendor base, single sourcing. Information systems for materials, documentation. Procurement & internal based purchasing, e-commerce & materials management. Organizational issues & evaluation of materials function.

ELECTIVE – IV

APPLIED STRESS ANALYSIS (ME 8138)

1. Analysis of Strain-Stress at a point, invariant of stress, stress equations of equilibrium, laws of stress transformation, principle stresses and planes, principal stresses in two- dimensional system, special state of stresses (dilatation and distortion).
2. Analysis of strain-Definition of displacement and strain, strain invariants, strain equations of transformation, principal strains, generalized stress-strain relations, compatibility equation.
3. Plane problems-Plane stress, plane strain, Airy's stress function to Cartesian coordinates and polar coordinates applications to simply supported beams with V.D. loads, stresses and displacements subjected to internal and external pressure , stress distribution in a thin infinite plate with circular hole, subjected to uniaxial load.
4. Strain measurement methods-Basic characteristics of strain gauge, type of strain gauges-mechanical, optical and electrical.
5. Electrical resistance strain gauge:-Factors producing strain- sensitivity in metallic alloys. Gauge construction, types of strain gauges-unbounded, bounded wire strain gauge, metal foil strain gauges.
6. Factors affecting gauge selection, gauge sensitivity and gauge factor, correction for transverse strain effects.
7. Rosette analysis-Three element, rectangular, delta rosette. An element rectangular rosette.
8. Circuitry for strain measuring bridge, Wheatstone bridge, temperature compensation, application to tension, compression, bending, torsion and combined stresses.

ELECTIVE – IV
ROBOTICS (ME 8139)

BASIC CONCEPT IN ROBOTICS: Introduction, Definition, Basic structure of robot, Resolution. Accuracy, repeatability, Work envelope, pays load and degrees of freedom.

CLASSIFICATION OF ROBOT SYSTEM: Point-to-point and continuous path systems, loops of robotic system, robot anatomy, Basic configurations- Cartesian, cylindrical, polar and jointed- arm configuration. SCARA robot and spatial configuration.

DRIVE AND CONTROL SYSTEM: Types of drive systems, Dynamic performance, Actuators-Pneumatic and hydraulic actuators, controls approaches of robot, open loop and closed –loop control system.

ROBOT KINEMATICS: Direct kinematics problems in robotics, geometry based direct kinematics analysis, co-ordinate transformation and Wrist motion.

ROBOT AND EFFECTORS: Robot gripper and gripping mechanism, types of gripper, Grasping requirements for the gripper.

SENSOR SYSTEM IN ROBOTICS: Sensor and Transducer, Desirable features, tactile and non-tactile sensors-Touch sensor, Force and Torque Sensor, Proximity Sensor, Range Sensors; Machine vision and Artificial Intelligence.

ROBOT PROGRAMMING: Programming methods- Manual teaching and lead through teaching, Programming through Textual robot languages.

ROBOT APPLICATION AND SAFETY: General application of robot in material handling Machine loading and unloading, welding, spray painting and Assembly, Safety measures in robotic area.

ELECTIVE – IV
INDUSTRIAL STATISTICS (ME 8140)

Sampling Theory :

Sampling and distribution of Statistics, Central limit theorem, point and interval estimation of parameters. Hypothesis testing, OC Curve, Chi Square, Goodness of fit curves. Application to Industrial problems.

Statistical Quality Control : Shewhart Control Charts for measurement and attributes, acceptance sampling, single and multiple OC curves, AOQ and

AOQL for single sampling plans. Introduction to sequential sampling.

Regression and Correlation Analysis :

Two dimensional variables and related distributions, Regression of the mean, Covariance and correlation of Bivariate, Normal distribution. Simple linear regression and correlation problems and estimation of parameters. Introduction to curvi-linear and multiple regression.

Variance Analysis and Design of Experiments :

Analysis of Variance and Covariance. One Way, Two Way, and Random Classifications, Latin square design GRAEO latin square design, Two factor experiments.

ELECTIVE – V

INSTRUMENTATION AND CONTROL (ME 8141)

Measurements: Definition, importance and requirements for static and dynamic measurements, mechanical and electrical measuring system, Measurement of displacement and strain.

Dial gauges, Electrical strain gauge : inductive type strain gauges, resistance strain gauges, wire and foil types, photo cells.

Measurement of force, torque and power. Measurement of load using elastic transducers and electrical resistance strain gauges.

Use of load cells and providing thinners for calibrations of force measuring devices. Measurement of torque by brakes dynamometer and electrical strain gauges, Measurements of speed by tachometers and stereoscopes, measurement of mechanical power using hydraulic and electrical dynamometers.

Pressure Measurement : Gravitational and elastic types of pressure measuring devices, manometers, micro manometers, Bourdon pressure gauge and their defects, Diaphragm type pressure pick ups used in conjunction with secondary transducers, pressure cells, static and dynamic calibration of pressure measuring devices.

Flow Measurement : Primary methods, meters, flow nozzle and orifice meters, basic principles of magnetic and ultrasonic flow meters, Vibration measurements, Method of vibration measurements based on sensory perception, Mechanical methods, Measurement of relative motion and of absolute motion, Vibration pick ups, Methods of excitation for vibration measurement.

Dynamometry : Fundamental principles and design aspects of dynamometers used on machine tools.

Automatic control, Concept of automatic controls, simple open loop and closed loop systems, concept of feed back, block diagram and transfer functions.

Modes of Control : Characteristics of proportional control, integral control, proportional plus integral control, derivative control, proportional plus derivative control and two position control system, stability criterion, Rouths criteria. Traffer and program controlled automatic lathes and other machine tools.

ELECTIVE – V

FINANCIAL MANAGEMENT AND ACCOUNTING (ME 8142)

Goals and Functions of Finance:

Evolution of Finance, objective of the firm, functions of finance, concept of time & value of money.

Principles of Capital Budgeting:

Kinds of Capital Budgeting decisions, evaluation of proposals, capital discounting & non-discounting based method.

Working Capital Management:

Definition and importance of working capital- working capital operating cycle, factors affecting working capital, inventory management, introduction to cash & receivable management.

Sources of Finance:

Working capital financing, long-term finance, financial instruments, financing institutions, schemes, IDBI re-finance lease financing.

Financing & Dividend Policies:

Capital structure of a firm, operating & financial leverage, EBIT, EPS analysis.

Cost Accounting:

Cost classification, cost grid, fixed & variable costs, marginal costing, significance of overhead cost, machine hour rate method, variance analysis.

Financial Accounting:

Book keeping-single, double entry, journal & ledger, financial statement-profit & loss accounts, balance sheet

Financial Ratio Analysis:

Uses & nature, liquidity coverage ratios.

ELECTIVE – V

METROLOGY (ME 8143)

1. Standard of Measurements :

- (i) Principles of Measurements : Line Standard, Imperial Standard Yard, Standard Meter, Wave Length Standards and Bars, Effect of Environment on Measuring Accuracy. ISI Code of Practice
- (ii) Constructional Details of Measuring Instruments, Abbe Principles, Pivots and Bearings, Sources of Error, Temperature Variations, Parallax, Sine and Cosine Errors, Elastic Deformations etc.
- (iii) Measuring Accuracy : Dimensional and Geometrical accuracy.

2. Tolerance and Limit Systems : Systems of Tolerance and Fits, ISA and ISI System of Tolerance and Fits, The Economics of Wide and Close Tolerance, Principles of Limit, Gauging of Plain Work, Design and Manufacture of Gauges.

3. Measuring Instruments : Linear Measurement : Direct Measuring Tools, Comparators – Types, Relative Merit and Limitations, Optical Instruments, Projectors and Microscopes, Angular Measurements, Clinometer, Taper Gauges, Sine Bar, Angle Blocks and Auto Collimators, Circular Division Testers, Optical Dividing Head.

4. Geometrical Form of Surfaces : Concepts and Measurements of Flatness, Straightness, Parallelism, Perpendicularity, Roundness, Cylindricity, Runout and Concentricity, Errors in Positioning, Uses of Interference Methods, Measurements of Surface Texture.

5. Screw Thread Measurements : Systems of Screw Threads, Principles of Limit Gauging of Threaded Work, Measurements of Screw Threads, External and Internal Threads and Measuring Instruments.

6. Spur Gear Measurements : Geometrical Definitions of Spur Gears, Basic Parameters of Spur Gears, Measurement of Spur Gear Parameters, Individual and Accumulative Error Measurements.

7. Alignment and Large Scale Measurements : Machine Tool Alignments, Instruments and Method for Testing Straightness, Flatness & Squareness, Alignment Charts, Dynamic Testing of Machine Tools.