

VINOBA BHAVE UNIVERSITY HAZARIBAGH

SYLLABUS FOR B-TECH 7TH SEMESTER

SEMESTER-VII

S.N	Course no.	Subject	Period			Evaluation scheme					Credit	Hours
			L	T	P	TA	CT	TOT	ESE	Sub Total		
Theory												
1	ME 7124-7126	Elective – I	3	1	0	20	10	30	70	100	4	4
2	ME 7127-7129	Elective - II	3	1	0	20	10	30	70	100	4	4
3	ME 7130	Control System and Measurement	3	1	0	20	10	30	70	100	4	4
4	ME 7131	Mechanical System and Design	3	1	0	20	10	30	70	100	4	4
5	ME 7132	Industrial Engineering and management	3	1	0	20	10	30	70	100	4	4
Total										500	20	20
Sessionals												
1	ME 7222	Tour, Training & Colloquium	0	0	3	30	-	30	20	50	2	3
2	ME 7223	Mechanical System and Design	0	0	3	30	-	30	20	50	2	3
3	ME 7224	Control System and Measurement	0	0	3	30	-	30	20	50	2	3
4	ME 7225	Project part – I	0	0	3	30	-	30	20	50	2	3
5	ME 7307	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-I

1. Mechatronics (ME 7124)
2. Operation Research (ME 7125)
3. Reliability and Maintainability (ME 7126)

Elective-II

1. Gas Dynamics (ME 7127)
2. Composite Materials (ME 7128)
3. Mechanical Vibration (ME 7129)

SEMESTER-VII

ELECTIVE – I

MECHATRONICS (ME 7124)

1. Manufacturing Process and Automation.
2. Integrated Product Design.
3. Application of Software Engineering in Industries.
4. Fundamental of Microprocessor and its Application.
5. Artificial Intelligence and Expert Systems in Design and Manufacturing.
6. Simulation, Modelling and Integration.
7. Mechatronics Engineering and its Application
8. Concurrent Engineering / Reverse Engineering.

ELECTIVE – I

OPERATIONS RESEARCH (ME 7125)

Origin and development of O.R. Areas of Application, Allocation problems, Transportation problem and Assignment problem.

Linear programming, Graphical and simplex technique Degeneracy Duality.

- Stepping stone method.
- MODI method
- Vogel's Approximation method
- Introduction to simulation and Monte-carls technique
- Queuing theory
- Introduction nonlinear programming
- Project management by PERT and CPM, Crashing of network, Decompression of activity-updating
- Dynamic programming.

ELECTIVE – I RELIABILITY & MAINTAINABILITY(7126)

Reliability : Hazard Rate, Mean Time to Failure.

Hazard Models. Constant Hazard, Weibull Model.

System reliability : Series, Parallel and Mixed Configurations, K ou of n structure. Economic of Introducing a stand by or Redundancy into a Production System, Optimum Design Configuration of Series / Parallel System.

Maintainability : Maintenance Increament. Equipment and mission availability. Defination and basic concept. Relationship between reliability, availability and maintainability.

Corrective maintenance time distributions, maintainability demonstration, prediction of corrective maintenance time.

Introduction to life testing.

ELECTIVE – II

GAS DYNAMICS (ME 7127)

1. Basic concepts and definitions:-Compressibility, Lagrangian and Eulerian and relationship, steady irrotational flow.
2. Basic laws and energy equation:-conservation of mass, thermodynamic laws, momentum equations for perfect and non-viscous fluids.
3. Steady flow energy equations, isentropic flow, acoustic velocity, velocity of propagation due to pressure pulse, mach no., mach line and mach angle, steady flow through constant and variable areas, duct nozzles.
4. Flow with friction:-Friction losses, Fanning equation, Darcy equation, friction factors, friction parameter, fennoline.
5. Diabatic equation:-stagnation temperature, Rayleigh equation, Rayleigh line, pressure ratio, temperature ratio, entropy consideration.
6. Wave phenomena: - Formation of shock wave properties changes, plane stationary, normal shock, introduction to oblique shock.
7. Propulsion:-Introduction to ramjets, rockets and jet planes, rocket propulsion, classification of rocket motors, propellant.
8. Boundary layer control: boundary layer control by suction and injection.
9. Incompressible turbulent boundary layer on a flat plate, boundary layer in favorable and adverse pressure gradient. calculation of flow resistance.

ELECTIVE – II
COMPOSITE MATERIALS (ME 7128)

1. Classification and characteristics of composite materials –Mechanical behavior, current and potential advantage of fiber –reinforced composite materials.
2. Macro- mechanical behavior of laminar-stress-strain relations for isotropic materials orthotropic materials, plane stress and plane strain relations. Invariant, properties of an orthotropic lamina, strength of orthotropic lamina, biaxial strength theory.

3. Micro-mechanical behavior of lamina:-mechanics of materials and elasticity approaches to stiffness, their comparison, mechanics of material approach to strength.
4. Macro-mechanical behavior of laminate- classical lamination theory, special cores of laminate stiffness, comparison of theoretical and experimental laminate stiffness, strength of laminates, inter-laminar stresses.
5. Design of laminates:-invariant laminate, stiffness concepts, special results for invariant laminate stiffness, use of invariant laminates, stiffness in design, laminate joints.
6. Bending of laminated under distributed lateral load- specially orthotropic laminates, symmetric angle-ply lamintes, antisymmetric cross ply laminates, anty angle ply laminates.
7. Buckling of laminated plates- specially orthotropic laminates, symmetric angle ply laminates, antisymmetric cross laminates and antisymmetric angle- pylamintes.
8. Vibration of laminated:-specially orthotropic laminates, symmetric ply laminates, antisymmetric cross ply laminates, antisymmetric angle-ply laminates.

ELECTIVE – II
MECHANICAL VIBRATION (ME7129)

1. Single degree of freedom- Equation of motion, undamped free vibration , torsional vibration , free damped vibration , forced damped vibration , rotating and reciprocating unbalanced , vibration isolation, transmissibility , logarithmic decrement , self excited vibration , equivalent viscous damping, coulomb damping, critical speed of shaft.
2. Vibration isolation –Vibration isolation and transmissibility, materials used as isolators and their properties.
3. Two degree of freedom-Principal modes, dynamic absorber, Lagrange's equation, influence coefficient.

4. Method of determining natural frequency-Rayleigh's method, Dunker ley's method, Stodola's method, matrix method, matrix iteration method, Holzer's method.
5. Vibration of continuous beam-Longitudinal vibration of bars, transverse vibration of bars, torsional vibration, vibration of strings.
6. Laplace transformation and control system-Control system block diagram, control systems applied to vibrations.

CONTROL SYSTEMS AND MEASUREMENT(ME 7130)

1. INTRODUCTION: concept of automatic controls open loop and closed loop systems , servo mechanism-block diagram , transformer functions
2. REPRESENTATION OF CONTROL COMPONENTS AND SYSTEMS: translations and__rotational mechanical components, electrical components, series and parallel combinations , comparators for rotational and linear motions integrating devices- hydraulic servo motor temperature control systems, speed control systems
3. SYSTEM RESPONSE: first and second order system response to step, pulse, ramp and sinusoidal input systems with distance velocity lag.
4. CONTROLLER MECHANISM: pneumatic hydraulic and electric controller's general principles and circuits for generating various control actions.
5. CONTROL SYSTEM ANALYSIS: transient response of simple control systems, stability of control systems, Routh's criterion.
6. BLOCK DIAGRAMS AND SIGNAL FLOW GRAPHS:
7. PRESSURES: Use of manometers, Bourdon gauge, bellows type gauge. Measurement of vacuum and pressure. Transducers, static and dynamic, response of pressure measuring instruments.
8. FLOW: Use of obstruction type meters. Variable area meters, probes. Positive displacement type meters, Hot wire Anemometry.
9. TEMPERATURE: Use of thermocouples, resistance thermometers, pyrometer, thermistors, static and dynamic response of temperature measuring instruments. Thermocouple errors and compensation. Heat flux measurement and meters.
10. STRAIN:__Use of strain gauge, static and dynamic response. Displacement, Velocity, Acceleration. Jerk linear and angular. Piezoelectric pick/ups, Inductive type pick/up. Force, torque, time Frequency and phase angle: use of CRO, Electric counters, density and viscosity of gases and liquids, calorific value of solid, liquid and gaseous fuels. Noise. Humidity flow visualization. Demonstration of shadow and schlieren techniques, introduction to metrology.

MECHANICAL SYSTEMS AND DESIGN (ME 7131)

1. DESIGN OF SUB ASSEMBLES AND MACHINE ELEMENTS:
 - i. Design of brackets and pipe joints,
 - ii. Design of gear boxes,
 - iii. Design of welded joints,
 - iv. Design of chain drive.
2. DESIGN OF FLYWHEEL AND HYDRAULIC PRESS.
3. DESIGN OF I.C. ENGINE PARTS:
Cylinders, truck pistons, connecting rods,
crank and crankshaft and valve gear.
4. Design of centrifugal pump.

INDUSTRIAL ENGINEERING AND MANAGEMENT (ME 7132)

1. MATERIAL MANAGEMENT: Inventory function model (Deterministic), Inventory analysis and control.
2. WORK STUDY : (a) Motion study-Flow process charts , Motion economy, Therbligs, (b)Time study: Work management techniques, equipments, Performance rating , Standard time. (c)Work sampling principles, Procedure and application Ergonomics, Fatigue.
3. PRODUCTION PLANNING AND CONTROL: (a) Production batch size. Buffer stock, production range, minimum cost batch size, (b) Machine loading, progressing feed back, control charts.
4. QUALITY MANAGEMENT: (a) statistical methods : probability and probability distribution functions, confidence limit, estimation, analysis of variance; (b) Statistical quality control: sampling inspection, acceptance sampling plans, control charts for variables (c) Operating characteristic (O.C) curve : average outgoing quality (A.O.Q.) curve and limits, producer's risk, consumer's risk(L.T.P.D.), acceptable quality level (A.Q.L.). (d) Quality circles : quality organization, quality education, problem solving techniques, brain storming. (e) Quality standards : bureau of Indian standards, I.S.I., I.S.O.-9000
5. ELEMENTARY OPERATION RESEARCH: (a) Transportation problems,(b)Assignment problems, Linear programming problems, Simplex methods, Duality (d) Queing theory(Single channel).

6. PROJECT MANAGEMENT: (a) Network technique: PERT and CPM, crashing the network, application, cantt chart, Small scale industry; Feasibility study, Financing the project.. Government incentives, industrial policy, Preparation of project report.

7. INDUSTRIAL SAFETY: (a) Industrial accidents, causes and costs, (b) Process risks, mechanical, chemical and electrical, (c) Accident prevention safety education, preventive measures, protective equipments machine safe guarding (d) First aid.

8. POLLUTION CONTROL: (a) Industrial hygiene: fatigue causes, fatigue reduction, (b) Clean environment, (c) Land pollution and waste control, (d) Water pollution, water treatment and sewage disposal, (e) Air pollution, control of fumes, smoke, toxic material, noise, temperature.

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.