B.N. MANDAL, UNIVERSITY, MADHEPURA

Details Of Theory & Sessional Papers Code Of 3rd Year B.Tech. Course

Branch:- Mechanical Engineering

Sl. No.	Subject	Subject Code	Branch Code	L	T	P	Th. Ext.	Th. Int.	Sessional
01	Industrial Economics And Accountancy	I.E&A	ME-301	3	1	0	70	30	------------------
02	Fluid Machinery	FM-II	ME-302	2	1	3	70	30	Fluid Machinery-50
03	Steam Power System	SPS	ME-303	2	1	3	70	30	Steam Power System-50
04	Dynamics Of Machinery	DOM	ME-304	2	1	3	70	30	Dynamics Of Machinery-50
05	Design Of Machine Element	DOME	ME-305	2	1	3	70	30	Design Of Machine Element-100
06	Heat And Mass Transfer	HMT	ME-306	2	1	3	70	30	Heat And Mass Transfer-50
07	Mechanics of solid-II	MOS-II	ME-307	3	1	0	70	30	------------------
08	Manufacturing Process	MP	ME-308	3	1	0	70	30	Manufacturing Process -50
09	Industrial Training	IT	ME-309	0	0	3			industrial Training-50

Expert – I
(External)

Expert – II
(Internal)
HOD, ME

Dean
Faculty Engg.
BNMU
MADHEPURA

Principal
MIT
PURNEA

Member Secretary
Syllabus committee
BNMU
MADHEPURA

3rd YEAR MECHANICAL ENGINEERING

ME-301   INDUSTRIAL ECONOMICS AND ACCOUNTANCY

1st Term :-

1. Engineering Economy: (a) Simple and compound interest, Annuities, (b) Depreciation, causes and methods, (c) Comparison of alternative and replacement studies: (i) Equivalent annual cost method, (ii) present worth method, (iii) Rate of return method.

5 Lectures

2. Accounting: (a) Double entry book keeping, (b) journal, (c) Ledgers, (d) Manufacturing account: profit and loss accounts, (e) Balance Sheet.

7 Lectures

3. Costing: (a) Cost and cost accounting, elements of costs, (b) Break even analysis, determining selling price and profitability, (c) Overhead cost allocation

7 Lectures

4. Entrepreneurship development: (a) Introduction to entrepreneurship, (b) motivation, (c) Psychological factors, risk taking behavior, (d) Rural entrepreneurship, (e) Self employment

5 Lectures

2nd Term:

1. Management and Organisation: (a) Principle of management (b) elements of management, planning, organizing, direction and control, (c) Organisation structure and charts, line staffs functional and committee organisation.

4 Lectures

2. Industrial Management: (a) Industrial ownership: Proprietorship, Partnership, Joint Stock Company and Cooperative Societies, (b) Site selection, (c) Plant layout: process oriented, product oriented layouts, line balancing.

4 Lectures.

3. Production Materials Management: (a) Production types: job order, batch and mass production, (b) Inspection and quality control, (c) Inventory control, economic order quantity.

4 Lectures

4. Optimization Techniques: (a) Linear programming: graphical method, analytical method of solution (two variables) (b) CPM and PERT.

4 Lectures

5. Personal Management: (a) Functions: Manpower planning: Recruitment, selection, training promotion, discipline, welfare (b) Job evaluation, (c) Merit rating, (d) Wages and incentives.

4 Lectures

6. Marketing Management: (a) market research and sales forecasting (b) sales management, (c) Advertisement and sales promotion

4 Lectures

BOOKS RECOMMENDED:

1. Engineering economy by De Carmo, Sallion and Canada (Mac Millan) Publ. Co. New York and Collier Mac Millan publishers, London.

2. Industrial Organisation and Management by Bethal, Atwater, Smith and Stackman (Mc Graw Hill Book and Co)

3. Industrial Organisation and Engg. Economics by Banga and Sharma (Khanna Publishers, Delhi)
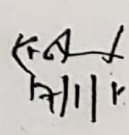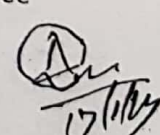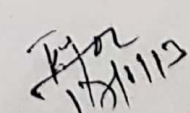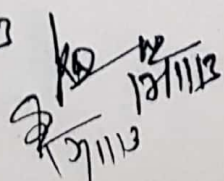
1st Term :-

1. Introduction – classification of fluid machinery.   1 Lectures

2. Dynamic action of fluid jet – Impact of fluid jet on fixed and moving flat places, impact of jet on fixed and moving curved vanes, flow over radial vanes, jet propulsions.

                                            4 Lectures

3. Euler's fundamental equation, degree of reaction.   4 Lectures

4. Hydraulic turbines, introduction, classification, impulse turbine, construction details, velocity triangles, power and efficiency calculations, reaction turbines; constructional details, working principle, velocity triangles, power and efficiency calculations, draft tube, cavitations, governing.

                                            10 Lectures

5. Principle of similarity in fluid machinery; unit and specific quantities, testing models and selection of hydraulic turbines.

                                            5 Lectures

2nd Term :-

6. **Positive displacement pumps :** Reciprocating pump; working principle, classification, slip, indicator diagram, effect of friction and acceleration, theory of air vessel, performance characteristics of gear oil pump and screw pump.

                                            5 Lectures

7. **Rotodynamic pumps :** Introduction, classification, centrifugal pump; main components, working principle velocity triangle, effect of shape of blade specific speed, heats, power and efficiency, calculations minimum steering speed, multi stage pumps, performance characteristic, comparison with reciprocating pump.

                                            7 Lectures

8. **Air compressor :** Reciprocating compressor, introduction, P-V diagram, calculation of isothermal and adiabatic work and efficiency, free air delivery, slippage, volumetric efficiency, effect of clearance, multistage compression, inter cooling.

                                            6 Lectures

9. **Rotary compressor :** Introduction fans, blower and compressor, state and total head, centrifugal compressor, velocity triangles, slip factor, losses and efficiencies, performance
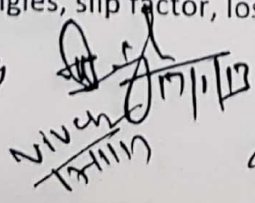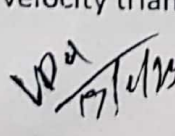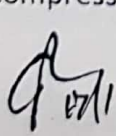
1st Term :-

1. Analysis of steam power cycle, Reheat pressure and degree of regeneration process heat & power generation.

6 Lectures

2. Boilers : Classification, boiler mountings & accessories, draft system, chimney height calculation, induced & forced draft fans, Boiler energy balance. Constructional details of boiler furnace, waterwall, Pulverized fuel burning. Different types of furnaces for burning coal, fuel oil & gas. Circulation theory. Feed water treatments.

10 Lectures

3. Steam nozzles : Flow through nozzles shapes & flow area, Effect of friction supersaturated flow, Estimation of flow area, Effect of divergence.

8 Lectures

2nd Term :-

4. Steam turbines : Construction & working of steam turbines, Impulse & reaction turbines inlet & outlet velocity diagrams. Work output & efficiencies. Pressure & velocity compounding regenerative feed heating cycle reheat cycle, reheat factor, governing of turbines, back pressure & pass out turbines.

10 Lectures

5. Steam condensers: Types, cooling water requirement, air leakage & air pump capacity, vacuum & condenser, Efficiency, Steam ejector, Spray pond cooling tower.

7 Lectures

6. Instrumentation in steam turbine plant.   7 Lectures

ME-304   DYNAMICS OF MACHINERY

1st Term :-

1. Force analysis of mechanism : Dynamics of plane motion of a rigid body, dynamically equivalent two mass system, correction torque, forced in mechanism and machines.

<div align="right">6 Lectures</div>

2. Turning moment diagram : Fluctuations of crankshaft speed and energy in a direct acting engine mechanism, flywheels.

<div align="right">7 Lectures</div>

3. Cams : Classification of cams and followers, types of follower and retardation, cam profile and generation of concentric and offset radial cam profiles by graphical method. cams with specified contours tangent cam with roller follower, circular arc cam with flat follower.

<div align="right">11 Lectures</div>

2nd Term :-

4. Analysis of gyroscopic motion : Principle of gyroscope, gyroscopic couple and gyroscopic reaction couple, Gyroscopic effects on the movement of ships, aeroplanes, two wheeled and four wheeled vehicles, gyrostabilizers.

<div align="right">6 Lectures</div>

5. Effects of inertia of reciprocating masses on engine frame : Unbalanced primary and secondary forces and couples, balancing of primary and secondary forces, partial balancing of locomotives, balancing of multicylinder in line and radial engines, direct and reverse cranks methods for balancing of radial engines.

<div align="right">8 Lectures</div>

6. Mechanical vibrations : Basic concepts degree of freedom, types of damping and viscous damping; natural free, damped free and damped forced vibrations of a single degree of freedom spring mass system, reciprocating and rotating unbalance, vibration isolation and transmissibility, whirling of shaft, elementary treatment of two degree of freedom systems

torsional vibrations of single rotor and two rotor systems, transverse vibration of simply supported beam energy method, Rayleigh's and Dankerley method.

10 Lectures

Text Books :

1. theory of machines by Thomas Bevan
2. Theory of machines by Shah and Jadhwani
3. Mechanical Vibration by William Thompson

Practical: 5 to 8 journals (including experiments & assignment) based on theory

ME- 305   DESIGN OF MACHINE ELEMENTS

1st Term :-

1. **Introduction :** Engineering material and their properties, Manufacturing consideration in machine design, factor of safety.

                                                                                          8 Lectures

2. **Simple stresses in machine parts,** torsional and bending stresses, dynamic loads, stress concentration.   8 Lectures

3. **Design of riveted joints,** welded joints, bolted joint, cotter joint, knuckle joint, pressure vessels and pipe joints.   8 Lectures

2nd Term :-

4. **Design of keys,** couplings, shafts levers, columns, studs, power screw, belt drive, pulley.

                                                                                          14 Lectures

5. Springs, clutches and brakes.   10 Lectures

Text Books :
1. Design of machine elements by VB Bhandari (TMH)
2. Design of machine elements by Sharma & Purohit (PHI)
3. Design data book by Mahadevan
4. Design data book by PSG institute of technology, Coimbatore
5. Design data book by Suresh Verma, Jadon

Reference Books :
1. Mechanical Engineering Design by Shigley
2. Machine Design by Black & Adams

ME-306   HEAT AND MASS TRANSFER

1st Term :-

1. **Introduction** : Basic concepts and modes of heat transfer.   1 Lectures

2. **Conduction** : General three dimensional heat conduction equation; one dimensional steady state heat conduction through composite plane walls; cylinders and spheres; critical radius of insulation.   8 Lectures

3. **Extended surface**: Heat transfer from extended surfaces of uniform cross section.
                    6 Lectures

4. **Unsteady heat conduction** : one dimensional unsteady heat conduction, lumped system analysis; use of Heisler chart, periodic changes of surface temperature.
                    6 Lectures

2nd Term :-

5. **Convection** : Free and forced convection, hydrodynamic and thermal boundary layer equation over flat plate, laminar boundary layer analysis, fully developed heat transfer through smooth pipes, relation between fluid friction and heat transfer forced convection correlations, laminar free convection on a vertical flat plate, empirical co-relations, application of dimensional analysis. Similarly conditions of heat transfer, Reynolds Analogy.

                    9 Lectures

6. **Heat exchange** : Types, LMTD, effectiveness, NTU method, single and multipass.
                    6 Lectures

7. **Radiation** : Physical mechanism, radiation properties, black body radiation, grey body, kirchoff's law, Wien's displacement law, view factor, radiation exchange between infinite planes, radiation shields.   7 Lectures

8. Mass transfer : Fick's law, analogy between heat and mass transfer, equimolal counter diffusion, isothermal evaporation of water through stagnant air.

4 Lectures

Practical: 5 to 8 journals (including experiments & assignment) based on theory

Text Books :

1. Design of machine elements by VB Bhandari (TMH)
2. Design of machine elements by Sharma & Purohit (PHI)
3. Design data book by Mahadevan
4. Design data book by PSG institute of technology, Coimbatore
5. Design data book by Suresh Verma, Jadon
6. Heat and Mass transfer by D.S. Kumar

Reference Books :

1. Principal of Heat Transfer by J.F. Kreith.
2. Heat & Mass Transfer by Sachdeva

Practical: 5 to 8 journals (Including experiments & assignment) based on theory.

ME-307   Mechanics of Solids -II

1st Term:-

1 > **Strain Energy :** Strain energy due to direct bending moment, Castiglion's theorem, Application of deflection and slope of beam, deflection of simply supported and cantilever beam.

                                                                    Lecture : 6

2 > **Thick Cylinders & spheres :** Comparision of thin and thick cylinders, Radial and Hoop stresses, Application of compound cylinder theory, thick spherical shells, radial and circumferential stress.   Lecture : 8

3 > **Rotation of rings and disc :** Thin disc of uniform thickness, thick discs, radial and hoop stresses, Discs with central holes, Disc of uniform strength.

                                                                    Lecture : 5

4 > Theory of Yielding: Different theories of failure, comparison of theory of failure.

Lecture : 5

2nd Term:-

5 > Unsymmetrical Bending : Flexural Stresses due to unsymmetrical bending of beams.

Lecture : 4

6 > Curved Beams : Beams with large original curvature, Stresses in crane hooks, rings and links.

Lecture : 6

7 > Shear Centre : Shear centre of thin walled open cross-section, shear flow.

Lecture : 4

8 > Analysis of Strain : Two-dimensional strain, Principal strain, Mohr's circle of strain, Strain rosette.

Lecture : 6

9 > Fatigue & Creep : Fatigue of metals, mechanism of fatigue, S.N. Curve, Gerber's formula, Goodman's formula, Creep of metals, mechanism of creep, Creep curve, Creep rate.

Lecture : 4

TEXT BOOKS:

1. Strength of Materials   by G.H. Ryder

2. Mechanics of Solids   by Kazmi

3. Mechanics of Materials   by Arthur Morlay
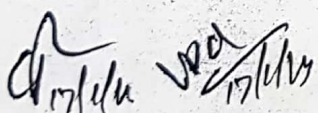
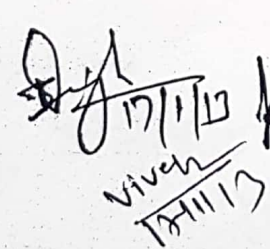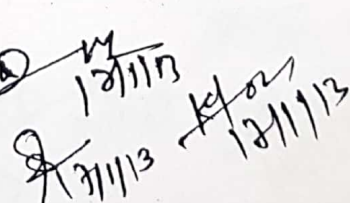4. Mechanics of Solids   by L.S. Srinath
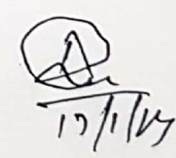
ME-308

Manufacturing Process
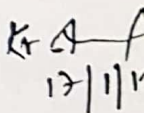
Ist Term; -

1 > Casting processes:

(a) Types of pattern, pattern allowances, types of modulus, sand preparation and sand test, preparation of moulds.

(b) Furnaces- Electric furnaces, Cupola.

(c) Cores- Uses of cores chills, chaplets.

(d) Gating design- Aspiration effect and effect of friction and velocity distribution, Design of risers and gates. Dry sand mould casting, shell mould casting, investment casting, gravity die casting, metal mould casting, die casting, slush casting, centrifugal casting, CO2 process.

(e) Casting defects, causes and remedy.

(f) Finishing of casting and inspection.   12 Lectures

2 > Mechanical Working Of Metal : Hot working and cold working, its advantages, dis-advantages and applications, Rolling, Forging, Wire drawing, Extrusion, Punching and blanking, Piercing, spinning coining. Embossing, Thread rolling, Tube drawing.

8 Lectures

3 > Powder metallurgy : Principles, methods of producing powder, pressing, sintering and finishing operations, applications.   4 Lectures

2nd Term : -

4 > Welding, Brazing, Soldering : Principles, Process, Parameters and applications of gas welding, Arc welding, TIG, MIG welding, Thermit welding, Electron beam welding, Laser beam welding, Submerged arc welding, Electroslag welding.

10 Lectures

5 > Fluxes – for gas welding and for arc welding. Electrode classification and selection, atomic hydrogen welding, selection of welding technique, filler metal, welding for the following metals- cast iron, and non-destructive test, Equipment, fluxes and applications of soldering and brazing.   6 Lectures

6 > Heat Treatment of Metals : Allotropic and non- allotropic alloys, Heat Treatment processes, Heat Treatment of carbon steel with reference to iron carbon diagram and TTT curve, Time transformation and temperature curve. Defects in heat treatment and their remedies. Austempering and Martempering. Surface hardening of steels, Heat treatment of high speed steels.

8 Lectures

TEXT BOOKS:

1. Manufacturing Processes and Materials of Engineers, by Doyle, Keysar, Leach, Schrader and

Singer (Prentice Hall)

Practical: 5 to 8 journals (including experiments & assignment) based on theory

REFERENCE BOOKS:

1. Foundry Technology   by K.P. Sinha & D.B. Goel