B.N. MANDAL, UNIVERSITY, MADHEPURA

Details Of Theory & Sessional Papers Code Of 2nd Year B.Tech. Course

Branch:- Mechanical Engineering

Sl. No.	Subject	Subject Code	Branch Code	L	T	P	Th. Ext.	Th. Int.	Sessional
01	Mathematics-III	MATH-III	ME-201	3	1	0	70	30	----------
02	Numerical Methods & Computational Techniques	NMCT	ME- 202	2	1	3	70	30	Numerical Methods & Computational Techniques-50
03	Basic Electronics	BE	ME-203	2	1	3	70	30	Basic Electronics-50
04	Fluid Mechanics	FM	ME-204	2	1	3	70	30	Fluid Mechanics-50
05	Strength Of Material-I	SOM	ME-205	2	1	3	70	30	Strength Of Material-50
06	Material Science	MS	ME-206	3	1	0	70	30	----------
07	Thermodynamics	T.D.	ME-207	3	2	0	70	30	Thermodynamics-50
08	Kinematics Of Machinery	KOM	ME-208	3	1	0	70	30	Kinematics Of Machinery-50
09	Machine Drawing	MD	ME-209	0	0	3			Machine Drawing-50
10	Work Shop	W/S	ME-210	0	0	3			Work Shop-50

Expert – I (External)

Expert – II

Dean Faculty Engg. BNMU MADHEPURA

Principal MIT PURNEA

Member Secretary Syllabus committee BNMU MADHEPURA

Subject: Mathematics-III Branch Code: ME-201 (ECE/CSE/EE/ME/CE/IT)

L-T-P: 3-1-0

First Term

1. **Ordinary differential equations & special functions:** Series solution of different equations by Frobenius methods, Bessel's equation, its solution, Bessel's function of first and second kind, recurrence formula, Legendre's equation, its solution, Legendre polynomials, Rodrigue's formula, orthogonality of Legendre polynomial. Lecture: 12
2. **Partial differential equation:** Basic concept, 1st & 2nd order linear & quasi- liear partial differential equation, classification of second order PDE, boundary and initial conditions, wave equations, separation of variables, use of Fourier series, D'Alembert's solution of wave equation, Heat equation, solution by Fourier series. Lecture: 12

Second Term

3. **Complex analysis-I:** Function of complex variables- limit, continuity, differentiability, analyticity of functions Cauchy-Reimann equations, Laplace's equation, harmonic functions, Cauchy's integral theorem, Cauchy's integral formula, Taylor's and Laurent series, residue theorem, its applications to evaluating real integrals. Lecture: 12
4. **Probability & Statistics:** Theorems on probability, including Baye's rule, random variables, cumulative distribution function, probability mass function, probability density function, mathematical expectation, mean variance, moment, generating function and characteristic function, standard probability model binomials, Poisson exponential, Weibull, normal, bivariate normal, sampling and sampling distribution, Chi-square and t-distributions, large and small sample tests of significance. Lecture: 12

Text books:

1. Advanced engineering mathematics by R K Jain & S R K Iyengar.
2. Higher engineering mathematics by B S Grewal.
3. Fundamentals of mathematical statistics by V K Kapoor, & S C Gupta, Sultan & sons.

Reference books:

1. Advanced engineering mathematics by E Kreyszig 8th edition, John Wiley.
2. Complex variable and applications by Churchill & Brown, McGraw Hill.
3. Elements of partial differential equation by I N Sneddon, McGraw Hill.
4. Introduction to probability & statistics for engineering by S M Ross, John Wiley.

NUMERICAL METHOD & COMPUTATIONAL TECNIQUE (CSE/EE/ME/CE/ECE/IT)

BRANCH CODE-ME-202 L-T-P: 2-1-3

FIRST TERM

1. INTRODUCTION TO COMPUTER LANGUAGE:

Machine language, assembly language, high level language compilers, problem solving using computer Algorithm, flowchart, examples lecture-03

2. C/C++ PROGRAMMING:

Constants & variables, arithmetic expression, i/o statement, specification statement, control statement, subscripted variables, logical expression, function and subroutines, examples of programming should include numerical as well as non numeric applications, matrix operations searching, sorting. lecture-21

SECOND TERM

3. ITERATIVE TECHNIQUE FOR SOLUTION OF EQUATION:

I.SOLUTION OF NON LINEAR EQUATION-simple iteration scheme, bisection method, Regula-falsi method, Newton-Raphson method, secant method, their rates of convergence, order of errors etc. lecture-12

ii. SOLUTION OF LINEAR EQUATION-Gaussian elimination, matrix inversion by Gaussian method, computation of determinants, Jacobi and Gauss - Seidal iteration method.

Lecture-06

4. POLYNOMIAL APPROXIMATION: interpolation,several form of interpolating polynomials like Lagrangian interpolation of polynomial and Newtons forwared and backward difference formula,curvefitting(least square) lecture-04

5 NUMERICAL INTEGRATION: Trapezoidal method , Simpsons' rule($1/3^{rd}$ and $3/8^{th}$) order of errors in integration. lecture-04

6. SOLUTION OF INITIAL VALUE PROBLEMS: Euler's method, Runge – kutta second order and fourth order methods (without proof), solution of boundary value problem-finite difference method. Lecture-05

TEXT BOOK:

1. NUMERICAL METHODS FOR SCIENTIFIC FOR ENGINEERING COMPUTATIONS BY M.K JAIN, I.YENGAR AND R.K JAIN, NEW AGE INTERNATIONAL PUBLISHERS, NEW DELHI

2. INTRODUCTORY METHOD OF NUMERICAL ANALYSIS BY S.S.SASTRY, PHI PVT. LTD.

REFERENCE BOOKS

1. NUMERICAL ANANLYSIS IN ENGINEERING BY RAMA B. BHAT, S.CHAKRAVARTY, NAORSA PUBLISHING HOUSE

ADVANCED ENGINEERING MATHEMATICS BY E.KREYSZIG, 8TH EDITION BY JOHN WILLEY & SONS, NEW YORK.

CT LAB

WORKING IN WINDOWS ENVIROMENT,FORTRAN 77 PROGRAMMING BASED ON SYLLABUS

Subject: Basic Electronics Branch Code: ME-203 (ECE/CSE/EE/ME)

L-T-P: 2-1-3

First Term

1. **PN junction diode**: Semiconductor, Depletion layer, barrier potential, forward and reverse breakdown voltage, PIV, characteristics of PN junction diode, knee voltage, ideal PN junction, junction capacitance, breakdown diode (zener diode). Lectures
2. **Rectifiers and filters**: Half wave and full wave rectifiers (centre tapped and bridge), ripple factor, elementary theory of filter, L, C, L-C, and π filters. Clipping and clamping, voltage multiplier. Lectures
3. **BJT introduction**: Basic theory and operation of PNP and NPN transistors, characteristics, CE and CC configurations and determination of α, β, γ and their relations. Lectures

Second Term

4. **Biasing:** Base bias, emitter feedback bias, voltage divider bias, load line, operating point, Incremental analysis using h-model. Lectures
5. **FET**: Introduction, operation, JFET parameters, JFET characteristics, JFET amplifiers. **MOSFET:** Introduction, operation, MOSFET parameters. Lectures
6. **Feedback amplifiers:** Theory of feedback amplifier, positive and negative feedback, topologies, feedback amplifiers. Lectures
7. **Integrated circuits:** Characteristics of ideal op-amp, Application as inverting, non-inverting amplifiers, summer, difference, differentiator, integrator. Lectures
8. **Principle and applications** of SCR and UJT. Lectures

Text Books:

1. Electronic devices and circuits theory by Boylestad and Nashelsky, Pearson.
2. Electronic principles by Albert Malvino and Davis J Bates, TMH.
3. Art of Electronics by Paul H Horowitz.

Reference:

1. Introduction to electronic circuit design by Spencer, Pearson.
2. Device electronics for integrated circuits by Muller and Kamins with Masun Chan, Wiley edition.
3. Principles of electronics by V K Mehta and Rohit Mehta, S Chand.
4. Electronic circuit and system by R J Smith, Wiley.

Basic Electronics Lab:

1. Introduction to DMM (Digital multimeter)
2. Introduction to passive components (resistor, capacitor, and inductor)
3. Introduction to CRO- time period measurement, study of different wave forms, measurement frequency of sinusoidal waveforms by Lissajou's figure.
4. Introduction to connectors- multi strand wires and single strand wires and bread boards.
5. Study of output characteristics of diode, BJT, FET, UJT, SCR.
6. Application of diodes, BJT, FET, UJT and SCR, clipping and clamping, rectification, RC coupled CE and CS FET amplifiers, relaxation oscillators.
7. Application of μA 741 inverting amplifiers, summer amplifiers, difference amplifiers, integrator, differentiator.

Text Book:

Lab manual by Maheshwari, PHI.

ME -204 FLUID MECHANICS-I (ME/CE)

1st Term: -

1 > INTRODUCTION: Concept of continuum, difference between fluid mechanics and solid mechanics, brief history of classical hydraulics, hydrodynamics and fluid mechanics.

5 Lectures

2 > Characteristic properties of fluids- ideal and real fluids, Newtonian and non-Newtonian fluids viscosity, surface tension, capillarity compressibility, fluid statics and buoyancy.

7 Lectures

3 > Fluid kinematics- Stream lines, path lines, streak lines, velocity potential and stream functions, laminar and turbulent flows, steady and unsteady flows, rotational, irrotational motion-circulation, vorticity, velocity and acceleration.

6 Lectures

4 > FLUID DYNAMICS: Conservation of mass, principle of momentum and energy moment of momentum, equation of motion, Euler's equation, Introduction to Navier's-Stokes equation, energy equation, hydraulic and energy gradients. 6 Lecture

2nd Term: -

5 > LAMINAR FLOW: Flow through pipes, frictional and other losses. 5 Lecture

6 > TURBULENT FLOW: Fully developed flows, boundary layer theory, rough and smooth pipe flows.

5 Lecture

7 > DIMENSIONAL ANALYSIS: Similitude of fluid flows, Hydraulics modeling, non-dimensional parameters (Reynolds, Fronde, Euler, Weber and Mach Numbers).

6 Lecture

8 > FLOW MEASUREMENT: Piezometer, manometers, pressure gauges, pilot tube, orifices, notches and weirs, orifice meter, venturimeter, forces on immersed bodies- drag and lift, airfoil section, Fluid mechanics, dynamic force exerted by fluid on fixed and moving vanes, racial flow over curved vanes, applications to hydraulic turbine blades, impulse and reaction turbines, reciprocating and centrifugal pumps, pressure due to deviated flow in pipes, jet propulsions.

8 Lecture

Reference Book/ Text Books:

1. Fluid Mechanics by V.L.Streeter, E.B. and Wylie, McGraw Hill
2. Fluid Mechanics by Fox & McDonald, John Wiley
3. Fluid Mechanics by Munson, John Wiley
4. Fluid Mechanics by F.M. White
5. Fluid Mechanics with Engineering Application by R.L. Daugherty, J.B. Franzini, E.J. Finnemore, McGraw Hill, International Ed.
6. I.H. Shames by Fluid Mechanics, PHI

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

SOM (Strength of Material) ME-205

ME -205 Mechanics of Solid-I (ME/CE)

1st Term:-

1 > Introduction and fundamental concept : Introduction, purpose & scope of the subject, basic assumption, types of forces (external & internal forces), classification of materials, st. venant's principles, principle of super position, generalized hook's law for isotropic & elastic material. Simple stresses & strain – Axial loads – safety concept : general concept, stress analysis of axially loaded base : axial strains and deformation in bars : Strains and deformation ...ally loaded bars –stress – strain relationship – Possion's ratio, analysis of bars of varying sections, Composite bars, thermal stresses, Relationship between elastic constants

Lecture : 14

2 > Torsion : Torsion of solid & hollow circular shaft, Design of circular member in torsion. Closed coil helical spring.

Lecture : 4

3 > Shear force and Bending moment diagram of the transverse section of the beam. Relation between loading, shear force and bending moment.

Lecture : 6

2nd Term:-

4 > Sress due to bending : Pure bending of beams, normal stress and shear stress distribution in a beam subjected to both bending moment & shear force.

Lecture : 6

5 > Deflection Of Beams : Deflection due to bending, Double integration method, Moment area method for simply supported and cantilever beam.

Lecture : 4

6 > **Two Dimensional Stress analysis** : Plane stress, Stress components on a general plane at a point, Principal planes & stresses. Mohr's circle of stresses.

Lecture : 6

7 > **Cases of Combined loading** : Eccentrically loaded member, Core of section, Combined loading of torsion, bending and axial.

Lecture : 4

8 > **Elastic Strain Energy** : Elastic Strain energy of mechanical elements under axial, bending and torsional loadings, Simple applications of strain energy.

Lecture : 4

BOOK RECOMMENDED:

1. Mechanics of Solids – Kazmi
2. Mechanics of Solids – Singh and Jha
3. Mechanics of Solids – Ryder

REFERENCES:

1. Mechanics of Solids – Timoshinko and Gere
2. Introduction to Mechanics of Solids – Grandall and Dahl
3. Mechanics of Solids – Popov

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

ME- 206 **MATERIAL SCIENCE**

1st Term :-

1 > **Classification and application of engineering materials**, recent development in metallic material – cermets.

4 Lectures

2 > **Crystal Structure and Geometry:** Space lattice, unit cell, crystal system, crystalline solids, structure of metallic, ionic and molecular crystals, atomic packing factor, density, co- ordination number, Miller notation of crystal directions and crystal planes, imperfection in crystal, edge and screw dislocations.

8 Lectures

3 > Magnetic Properties: Magnetic properties. Permeability, effect of temperature on magnetization. B-H, curve magnetic domain Factors. 6 Lectures

4 > Mechanical properties of Metals: Plastic deformation of single crystals and polycrystalline metals, solid solution strengthening, Fractures of metals, Fatigue and creep of metals. 6 Lectures

Term :-

5 > Alloy Constitution: Principles of alloy formation, Eutectic, solid solution and intermetallic compounds, and thermal equilibrium diagrams of binary systems involving eutectic and peritectic reactions. 4 Lectures

6 > Iron and its alloys: Iron-carbon equilibrium diagram, allotropy of Iron, plain carbon steels, effects of adding alloying elements in plain carbon steels, Ni-steels, Cr-steels, Ni-Cr steels, heat resisting and high speed steel, structures of gray and white cast iron, Ductile (nodular) Cast iron, malleable cast iron. 8 Lectures

7 > Non Ferrous Alloys:

Copper Base Alloys: Copper-Zinc, Copper-tin, Copper-aluminium and copper nickel alloys

Aluminium Base Alloys: Wrought and Cast Alloy, age hardenable alloys.

Bearing Alloys: Requirement of bearing alloys, Fulfillment of above requirements, copper-base, tin-base and lead-base bearing alloys, super alloys 4 Lectures

8 > Ceramics: Classification of ceramics, structures of ceramics, structures and composition of glasses, mechanical properties of ceramic phases. 3 Lectures

9 > Polymers: Mechanism of polymerization, structure of polymers, classification of polymers, elastomers, natural and synthetic rubber. 3 Lectures

10 > Composite Materials: Introduction to composite materials, dispersion strengthened materials, fiber reinforced materials, cements. 2 Lectures

Text Book :

1. Principle of Materials Science and Engineering by W.F. Smith (McGraw Hill)

2. The nature and properties of engineering materials by Z.D. Jastrzebski

3. Material Science By V. Raghvan

4. Material Science and Engineering : An Introduction by William D Callistor, Jr (Wiley India Edition).

ME-207 Thermodynamics: -(ME/CE)

1st Term : -

1 > **Basic concept** : Thermodynamic system and their properties, thermodynamic equilibrium, quasi-static and non quasi-static process, zeroth law and temperature equilibrium concepts.

7 Lectures

2 > **First law of thermodynamics :** concept of heat and work, first law applied to closed and open system, internal energy and enthalpy, flow work, laws of perfect gas, specific heat, first law applied to flow & non flow process, & Thermodynamics devices.

8 Lectures

3 > **Second law of thermodynamics :** concept of heat engine, refrigerator, heat pump and their range of working temperature, Kelvin-planck's and claussius' statements and their equivalence, Entropy, calculation of entropy change for processes, reversibility, entropy principles, Inequality of claussius, available and unavailable energy.

9 Lectures

2nd Term : -

4 > **Properties of pure substances :** Properties of steam and process with steam, Use of steam tables and mollier charts

5 Lectures

5 > **Helmhotz and Gibb's function,** Maxwell Relation.

3 Lectures

6 > **Ideal cycles :** Air standard cycles, Otto, Diesel, Dual and Brayton cycle, Comparison of Otto, Diesel and Dual cycle.

4 Lectures

7 > **Vapour cycle :** Carnot and Rankine cycle, Regenerative and reheat cycle.

4 Lectures

8 > Non reacting mixture : Mixture of two ideal gases and their properties. 3 Lectures

9 > Psychrometry : Air and water-vapour mixture and their properties, adiabatic saturation, Use of psychrometry charts, Simple introduction to psychrometric process.

5 Lectures

Text Book/reference Book :

(1) Engineering Thermodynamics by PK Nag

(2) An introduction to thermodynamics by YVC Rao

(3) Fundamental of thermodynamics by Van wylem, Wiley India

(4) Thermodynamics by Cengel

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

ME 208 Kinematics of Machinery

1st Term :-

1 > Velocity and acceleration in mechanism :

- Relative velocity method and instantaneous center method
- Acceleration diagram : Coriolis component of acceleration.

8 Lectures

2 > Friction devices :

- Belt drive
- Clutch
- Shoe brakes
- Bank and block brakes.

7 Lectures

3 > Fundamental law of gearing : Basic terminology of gears, arc of contact and path of contact of involute gears, minimum number of teeth on the pinion to avoid interference, Gear trains- simple, compound and planetary, tooth load and torque.

9 Lectures

2nd Term :-

4 > Balancing : Balancing of evolving masses in the same plane by a single revolving mass – Balancing of revolving masses in different planes by two revolving masses in suitable planes.

10 Lectures

5 > Governors : Watt, Porter, Proel & hartnell Governors, Effect of friction, controlling force, governor effort and power, sensitivity and isochronisms.

14 Lectures

Text Books :

(1) Theory of Machine by Thomas Bevan
(2) Theory of Machine by RS Bansal
(3) Theory of Machine by Sadhu Singh

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

ME-209 Machine Drawing

1st Term :-

1 > Introduction to full section Half section, revolved-section off-set section. 2 > Nut Bolts Riveted joints, Thread profiles, Screw jack.
3 > Bushed bearing Pedestal, bearing, foot step bearing.
4 > Flanged coupling flexible coupling, solid coupling.

2nd Term :-

5 > Stuffing Box.
6 > Eccentric.
7 > Cross Head.
8 > Assembly of dissembled parts.
9 > Dissembly of assembly parts.

Text Books :

1. Engineering Drawing by ND Bhatt
2. Engineering Drawing by KL Narayna & Kannaiah

Practical: (Sessional) Minimum 8 drawing sheets, based on the topics mentioned above.

ME-210 WORKSHOP PRACTICE – II

1 > Machine shop : Introduction, study and use of lather machine, shaper machine including operations, holding devices and materials for cutting tools.
Job making – (i) taper Stud (ii) angle block (iii) Different operations.
2 > Welding shop : Introduction, study and use of welding tools and devices, Study of electric arc welding machine. Job making – (i) Lab Joint (ii) Other joints

3 > Sheet Metal shop : Introduction, study and use of various tools, soldering and brazing. Job making – Conical Funnel Hollow Hexagonal cylinder

Practical: Minimum 6 job based on the shops mentioned above.