

MAHARSHI DAYANAND UNIVERSITY, ROHTAK
SCHEME OF STUDIES & EXAMINATIONS
B.E 2nd YEAR (SEMESTER – III) MECHANICAL ENGINEERING
Modified ‘E’ Scheme Effective from 2006-07

Course No.	Course Title	Teaching Schedule				Marks For Class Work	Marks for Examination		Total Marks	Duration of Exam
		L	T	P	Total		Theory	Practical		
MATH-201 E	Mathematics – III (Common with all Branches)	3	1	-	4	50	100	-	150	3
HUM- 201 E	Economics (Common with all Branches)	3	1	-	4	50	100	-	150	3
ME-201 E	Thermodynamics (ME, AE)	3	1	-	4	50	100	-	150	3
ME-203 E	Strength of Materials-I (ME,AE)	3	1	-	4	50	100	-	150	3
ME-205 E	Engineering Mechanics (ME, AE)	3	1	-	4	50	100	-	150	3
ME-207 E	Machine Drawing	1	-	4	5	50	-	-	50	-
EE-213 E	Electronics Engg. (ME, CHE)	3	1	-	4	50	100	-	150	3
ME-209 E	Strength of Materials -I Lab (ME, AE)	-	-	2	2	25	-	25	50	3
EE-219 E	Electronics Engg. Lab. (ME, CHE)	-	-	2	2	25	-	25	50	3
ME-211E	Computer Aided Drafting Lab.	-	-	2	2	50	-	50	100	4
	TOTAL	19	6	10	35	450	600	100	1150	

Note:

1. Students will be allowed to use Non-Programmable Scientific Calculator. However, sharing of calculator will not be permitted in the examination.
2. The university examination in the ME-207E (Machine Drawing) shall not be conducted w.e.f. the session 2006-07. Thus the total marks of the subject shall be 50 only.
3. The marks for class work as well as practical examination in the subject ME-211E (Computer Aided Drafting Lab.) has been increased from 25 each to 50 each. Thus the total marks for the subject shall be 100 in place of 50 from the session 2006-07.
4. The grand total of semester marks shall be 1150 in-place of 1200 marks.

MATH-201-E : MATHEMATICS-III

L T P
3 1 -

Class Work : 50 Marks
Exam. : 100 Marks
Total : 150 Marks
Duration of exam. : 3 Hours

Part-A

Fourier Series and Fourier Transforms : Euler's formulae, conditions for a Fourier expansion, change of interval, Fourier expansion of odd and even functions, Fourier expansion of square wave, rectangular wave, saw-toothed wave, half and full rectified wave, half range sine and cosine series.

Fourier integrals, Fourier transforms, Shifting theorem (both on time and frequency axes), Fourier transforms of derivatives, Fourier transforms of integrals, Convolution theorem, Fourier transform of Dirac-delta function.

Part-B

Functions of Complex Variable : Definition, Exponential function, Trigonometric and Hyperbolic functions, Logarithmic functions. Limit and Continuity of a function, Differentiability and Analyticity.

Cauchy-Riemann equations, necessary and sufficient conditions for a function to be analytic, polar form of the Cauchy-Riemann equations. Harmonic functions, application to flow problems. Integration of complex functions. Cauchy-Integral theorem and formula.

Power series, radius and circle of convergence, Taylor's Maclaurin's and Laurent's series. Zeros and singularities of complex functions, Residues. Evaluation of real integrals using residues (around unit and semi circle only).

Part-C

Probability Distributions and Hypothesis Testing : Conditional probability, Bayes theorem and its applications, expected value of a random variable. Properties and application of Binomial, Poisson and Normal distributions.

Testing of a hypothesis, tests of significance for large samples, Student's t-distribution (applications only), Chi-square test of goodness of fit.

Linear Programming : Linear programming problems formulation, Solving linear programming problems using (i) Graphical method (ii) Simplex method (iii) Dual simplex method.

TEXT BOOKS :

1. Advanced Engg. Mathematics : F Kreyszig.
2. Higher Engg. Mathematics : B.S. Grewal.

REFERENCE BOOKS :

1. Advance Engg. Mathematics : R.K. Jain, S.R.K. Iyenger.
2. Advanced Engg. Mathematics : Michael D. Greenberg.
3. Operation Research : H.A. Taha.
4. Probability and statistics for Engineers : Johnson. PHI.

Note: Examiner will set eight questions, taking two from Part-A, three from Part-B and three from Part-C. Students will be required to attempt five questions taking at least one from each part.

HUM-201-E ECONOMICS

L T P
3 1 -

Class Work : 50 Marks
Theory : 100 Marks
Total : 150 Marks
Duration of Exam. : 3 Hrs.

COURSE OBJECTIVE : The purpose of this course is to :

1. Acquaint the student in the basic economic concepts and their operational significance and
2. Stimulate him to think systematically and objectively about contemporary economic problems.

UNIT-I

Definition of Economics - various definitions, Nature of Economic problem, Production possibility curve Economic laws and their nature. Relation between Science, Engineering, Technology and Economics.

UNIT-II

Concepts and measurement of utility, Law of Diminishing Marginal Utility, Law of equi-marginal utility - its practical application and importance.

UNIT-III

Meaning of Demand, Individual and Market demand schedule, Law of demand, shape of demand curve, Elasticity of demand, measurement of elasticity of demand, factors effecting elasticity of demand, practical importance & applications of the concept of elasticity of demand.

UNIT-IV

Meaning of production and factors of production; Law of variable proportions, Returns to scale, Internal and External economics and diseconomies of scale.

Various concepts of cost - Fixed cost, variable cost, average cost, marginal cost, money cost, real cost opportunity cost. Shape of average cost, marginal cost, total cost etc. in short run and long run.

UNIT-V

Meaning of Market, Types of Market - Perfect Competition, Monopoly, Oligopoly, Monopolistic Competition (Main features of these markets)

Supply and Law of Supply, Role of Demand & Supply in Price Determination and effect of changes in demand and supply on prices.

UNIT-VI

Nature and characteristics of Indian economy (brief and elementary introduction), Privatization - meaning, merits and demerits. Globalisation of Indian economy - merits and demerits. Elementary Concepts of VAT, WTO, GATT & TRIPS agreement.

TEXT BOOKS :

1. Principles of Economics : P.N. Chopra (Kalyani Publishers).
2. Modern Economic Theory – K.K. Dewett (S.Chand)

REFERENCE BOOKS :

1. A Text Book of Economic Theory Stonier and Hague (Longman's Landon)
2. Micro Economic Theory – M.L. Jhingan (S.Chand)
3. Micro Economic Theory - H.L. Ahuja (S.Chand)
4. Modern Micro Economics : S.K. Mishra (Pragati Publications)
5. Economic Theory - A.B.N. Kulkarni & A.B. Kalkundrikar (R.Chand & Co.)
6. Indian Economy : Rudar Dutt & K.P.M. Sundhram

NOTE: Eight questions are to be set atleast one question from each unit and the students will have to attempt five questions in all.

ME- 201 E THERMODYNAMICS

L	T	P	Sessional	: 50 Marks
3	1	-	Theory	: 100 Marks
			Total	: 150 Marks
			Duration of Exam.	: 3 hrs.

Unit I Basic Concepts: Macroscopic and Microscopic Approaches, Thermodynamic Systems, Surrounding and Boundary, Thermodynamic Property – Intensive and Extensive, Thermodynamic Equilibrium, State, Path, Process and Cycle, Quasi-static, Reversible and Irreversible Processes, Working Substance. Concept of Thermodynamic Work and Heat, Equality of Temperature, Zeroth Law of Thermodynamic and its utility. Problems.

Unit II First Law of Thermodynamics: Energy and its Forms, Energy and 1st law of Thermodynamics, Internal Energy and Enthalpy, PMMFK, Steady flow energy equation, 1st Law Applied to Non-flow process, Steady Flow Process and Transient Flow Process, Throttling Process and Free Expansion Process. Problems.

Unit III Second Law of Thermodynamics: Limitations of First Law, Thermal Reservoir, Heat Source and Heat Sink, Heat Engine, Refrigerator and Heat Pump, Kelvin- Planck and Clausius Statements and their Equivalence, PMMSK. Carnot Cycle, Carnot Heat Engine and Carnot Heat Pump, Carnot Theorem and its Corollaries, Thermodynamic Temperature Scale. Entropy, Clausius Inequality, Principle of Entropy Increase, Temperature Entropy Plot, Entropy Change in Different Processes, Introduction to Third Law of Thermodynamics. Problems.

Unit IV Availability and Irreversibility: High and Low Grade Energy, Availability and Unavailable Energy, Loss of Available Energy Due to Heat Transfer Through a Finite Temperature Difference, Dead state of a system, Availability of a Non-Flow or Closed System, Availability of a Steady Flow System, Helmholtz and Gibb's Functions, Effectiveness and Irreversibility, Second law efficiencies of processes & cycles. Problems.

Unit V Pure Substance: Pure Substance and its Properties, Phase and Phase Transformation, Vaporization, Evaporation and Boiling, Saturated and Superheat Steam, Solid – Liquid – Vapour Equilibrium, T-V, P-V and P-T Plots During Steam Formation, Properties of Dry, Wet and Superheated Steam, Property Changes During Steam Processes, Temperature – Entropy (T-S) and Enthalpy – Entropy (H-S) Diagrams, Throttling and Measurement of Dryness Fraction of Steam. Problems.

Unit VI Ideal and Real Gases: Concept of an Ideal Gas, Basic Gas Laws, Characteristic Gas Equation, Avogadro's law and Universal Gas Constant, P-V-T surface of an Ideal Gas. Vander Waal's Equation of state, Reduced Co-ordinates, Compressibility factor and law of corresponding states. Mixture of Gases, Mass, Mole and Volume Fraction, Gibson Dalton's law, Gas Constant and Specific Heats, Entropy for a mixture of non-reactive gases. Problems.

Unit VII Thermodynamic Relations: Maxwell Relations, Clapeyron Equation, Relations for changes in Enthalpy and Internal Energy & Entropy, Specific Heat Capacity Relations, Joule Thomson coefficient & inversion curve.

Text Books:

1. Engineering Thermodynamics – Jones and Dugan, PHI, New Delhi.
2. Fundamentals of Engineering Thermodynamics – E. Radhakrishnan, PHI, New Delhi.

Reference Books :

1. Theory and Problems of Thermodynamics – Y. V.C. Rao, Wiley Eastern Ltd., New Delhi.
2. Engineering Thermodynamics – C P Arora, Tata McGraw Hill
3. Engineering Thermodynamics – P K Nag, Tata McGraw Hill

NOTE: In the semester examination, the examiner will set 8 questions in all, at least one question from each unit, and students will be required to attempt only 5 questions.

ME- 203 E STRENGTH OF MATERIALS –I

L	T	P	Sessional	: 50 Marks
3	1	-	Theory	: 100 Marks
Marks			Total	: 150

Duration of Exam. : 3 Hrs.

- Unit I** Simple Stresses & Strains: Concept & types of Stresses and strains, Poisson's ratio, stresses and strain in simple and compound bars under axial loading, stress strain diagrams, Hooks law, elastic constants & their relationships, temperature stress & strain in simple & compound bars under axial loading, Numerical.
- Unit II** Compound Stresses & Strains: Concept of surface and volumetric strains, two dimensional stress system, conjugate shear stress at a point on a plane, principle stresses & strains and principal-planes, Mohr's circle of stresses, Numerical.
- Unit III** Shear Force & Bending Moments: Definitions, SF & BM diagrams for cantilevers, simply supported beams with or without over-hang and calculation of maximum BM & SF and the point of contra-flexure under (i) concentrated loads, (ii) uniformly distributed loads over whole span or a part of it, (iii) combination of concentrated loads and uniformly distributed loads, (iv) uniformly varying loads and (v) application of moments, relation between the rate of loading, the shear force and the bending moments, Problems.
- Unit IV** Torsion Of Circular Members: Torsion of thin circular tube, Solid and hollow circular shafts, tapered shaft, stepped shaft & composite circular shafts, combined bending and torsion, equivalent torque, effect of end thrust. Numericals.
- Unit V** Bending & Shear Stresses in Beams: Bending stresses in beams with derivation & application to beams of circular, rectangular, I,T and channel sections, composite beams, shear stresses in beams with combined bending, torsion & axial loading of beams. Numericals.
- Unit VI** Columns & Struts: Column under axial load, concept of instability and buckling, slenderness ratio, derivation of Euler's formulae for the elastic buckling load, Eulers, Rankine, Gordom's formulae Johnson's empirical formula for axial loading columns and their applications, eccentric compression of a short strut of rectangular & circular sections, Numerical.
- Unit VII** Slope & Deflection: Relationship between bending moment, slope & deflection, Mohr's theorem, moment area method, method of integration, Macaulay's method, calculations for slope and deflection of (i) cantilevers and (ii) simply supported beams with or without overhang under concentrated load, Uniformly distributed loads or combination of concentrated and uniformly distributed loads, Numerical.
- Unit VIII** Fixed Beams: Deflections, reactions and fixing moments with SF & BM calculations & diagrams for fixed beams under (i) concentrated loads, (ii) uniformly distributed load and (iii) a combination of concentrated loads & uniformly distributed load.

Text Books:

1. Strength of Materials – G.H.Ryder - Macmillan, India
2. Strength of Materials– Andrew Pytel and Fredinand L.Singer, Addison – Wesley

Reference Books :

1. Strength of Materials – Popov, PHI, New Delhi.
2. Strength of Materials A Rudimentary Approach – M.A. Jayaram, Sapna Book House, Bangalore

NOTE: In the semester examination, the examiner will set 8 questions in all, at least one question from each unit, and students will be required to attempt only 5 questions.

ME 205 E ENGINEERING MECHANICS

L T P
3 1 -

Sessional :50 Marks
Theory :100 Marks
Total marks :150 Marks
Duration of exam: 3 Hrs

- Unit-I** Review of Basic Force Systems: Dimensions and units of mechanics, idealization of mechanics, laws of mechanics, vector algebra review, moment of a force about a point and axis, the couple and couple moment, addition and subtraction of couples, moment of a couple about a line, translation of a force to a parallel position, resultant of a force system, Problems (vector method).
- Unit-II** Equilibrium: Introduction, free body diagram, control volumes, general equations of equilibrium, two point equivalent loading, static in-determinacy, simple truss, method of joints, method of sections, co-planer cable-loading a function of x, coplanar cables- loading the weight of the cable itself. Problems.
- Unit-III** Properties of Surfaces & Moments and Products of inertia : First moment of an area and the centroid, principal axes, formal definition of inertia quantities, relation between mass-inertia terms and area-inertia terms, translation of coordinate axes, transportation properties of the inertia terms, a brief introduction to tensors, the inertia of ellipsoid and principal moments of inertia, Problems (vector method).
- Unit-IV** Kinematics of Particles and Rigid Bodies: Velocity and acceleration in path and cylindrical coordinates, motion of a particle relative to a pair of translating axes, translation and rotation of rigid bodies, Chasles theorem, moving references, velocity and acceleration for different references, inertia and coriolis forces. Problems(vector method).
- Unit-V** Particle Dynamics, Energy Methods & Momentum Methods: Newton's law for rectangular coordinates & cylindrical coordinates, rectifier translation, central force motion, Newton's law for path variables, work energy equations, work energy equations for a systems of particles, linear and angular momentum equations for a systems of particles. Problems(vector method).
- Unit-VI** Variational Mechanics: Hamiton principle, Lagrange equations, principle of virtual work, methods of minimum potential energy, stability.

Text Book:

1. Engineering Mechanics - Statics & Dynamics by I.H. Shames, PHI, New Delhi.
2. Engineering Mechanics – Timoschenko.

Reference Books :

1. Statics & Dynamics by J.L. Meriam, JohnWiley & Sons (P) Ltd. New York.
2. Statics & Dynamics by Beer & Johnson, MGH, New Delhi.

NOTE : In the semester examination, the examiner will set 8 questions in all, at least one question from each unit, and students will be required to attempt only 5 questions.

ME- 207 E MACHINE DRAWING

L	T	P	Theory	:	-
1	-	4	Sessional	:	50 Marks
			Total	:	50 Marks

PART-A

Introduction to BIS Specification SP : 46 – 1988 Code of Engineering drawing – Limits , fits and Tolerance (Dimensional and Geometrical tolerance) , Surface finish representation.

Gear: Gear terminology, I.S. convention representation of assembly of spur gears, helical gears, bevel gears , worm and worm wheel.

PART-B

Orthographic views from isometric views of machine parts / components. Dimensioning, Sectioning. Exercises on Coupling, Crankshaft, Pulley, Piston and Connecting rod , Cotter and Knuckle joint. Riveted Joint and Welded Joint.

PART-C

Assembly drawing with sectioning and bill of materials from given detailed drawings of assemblies : Lathe Tail stock , Machine vice , Pedestal bearing , Steam stop valve , Drill jigs and Milling fixture.

- NOTE :**
- (1) In the semester examination , the examiner will set total six questions in all, taking two questions from each part. The students will be required to attempt three questions in all, taking one question from each part
 - (2) The questions from Part-A and Part-B will carry 20 marks each. Question from Part-C will carry 60 marks.

Text Books:

1. Machine Drawing - N D Bhatt and V M Panchal, Charotar Publishing House.
2. A Text Book of Machine Drawing - P S Gill Pub.: S K Kataria & Sons.
3. Engineering Graphics with Auto CAD 2002 - JamesD.Bethune, Pearson Education.

Reference Books :

1. A Text Book of Machine Drawing Laxmi Narayana and Mathur, M/s. Jain Brothers, New Delhi.
2. Machine drawing by N Sidheshwar, Kannaieh, V S Sastry, TMH., New Delhi.

L T P
3 1 -

Class Work : 50
Exam : 100
Total : 150
Duration of Exam : 3hrs

UNIT – I : DIODES :

P-N junction, P-N junction as a rectifier, V-I characteristics, Breakdown diodes, Light emitting diodes, Load – Line concept, Clipping, Clamping, Rectifiers.

UNIT – II : TRANSISTORS :

Operation and Characteristics of a Transistor, Common Emitter, Common Collector and Common Base Configurations of a transistor, Biasing and Transistor as an amplifier and oscillator..

UNIT – III : OP-AMPS :

Basic Characteristics of an OP-AMP, Applications of OP-AMP (Inverter, Non-Inverter, Integrator, Differentiator, Logarithmic amplifier, Square wave generator).

UNIT – IV : POWER AMPLIFIERS :

Class A, Class B and Class C Amplifiers.

UNIT – V : STABILISED POWER SUPPLIES :

Regulated power supply, series voltage regulator.

UNIT – VI : DIGITAL GATES :

Binary numbers, OR, AND, NAND, NOR, NOT, EX-OR Gates.

TEXT BOOK : Integrated Electronics Milman & Halkias (MGH).

REFERENCE BOOKS :

1. Digital Electronics by R.P.Jain (MGH).
2. Microelectronics – Ramana (MGH).
3. Electronics Principles Malvino, TMH.

NOTE : 1. Five out of eight questions are to be attempted.
2. At least one question should be set from each unit.

ME- 209 E STRENGTH OF MATERIAL-I LAB

L	T	P	Sessional	:	25 Marks
-	-	2	Exam	:	25 Marks
			Total	:	50 Marks
			Duration of exam	:	3 Hrs.

List of Experiments :

1. To study the Brinell hardness testing machine & perform the Brinell hardness test.
2. To study the Rockwell hardness testing machine & perform the Rockwell hardness test.
3. To study the Vickers hardness testing machine & perform the Vickers hardness test.
4. To study the Erichsen sheet metal testing machine & perform the Erichsen sheet metal test.
5. To study the Impact testing machine and perform the Impact tests (Izod & Charpy).
6. To study the Universal testing machine and perform the tensile test.
7. To perform compression & bending tests on UTM.
8. To perform the shear test on UTM.
9. To study the torsion testing machine and perform the torsion test.
10. To draw shear Force, Bending Moment Diagrams for a simply Supported Beam under Point and Distributed Loads.
11. To determine Mechanical Advantage and Efficiency of Single and Double Purchase Winch Crab.
12. To determine Mechanical Advantage and Efficiency of Worm and Worm Gear of Single, Double and Triple start.
13. To determine Mechanical Advantage, Efficiency of Simple and Compound Screw Jack.
14. To find Moment of Inertia of a Fly Wheel.

Note:

1. At least ten experiments are to be performed in the semester.
2. At least eight experiments should be performed from the above list. Remaining two experiments may either be performed from the above list or designed & set by the concerned institute as per the scope of the syllabus.

L T P
0 0 2

Class Work : 25
Exam : 25
Total : 50
Duration of Exam : 3hrs

LIST OF EXPERIMENTS :

1. Study of V-I Characteristics of Diode.
2. Study of a Clipping and Clamping circuits.
3. Study of a Half wave rectifier.
4. Study of a Full wave rectifier.
5. Study and Analysis of a Transistor in Common Emitter Configuration.
6. Study of OP-AMP as Inverter and Comparator.
7. Study of OP-AMP as Differentiator.
8. Study of OP-AMP as Integrator.
9. Study of OP-AMP as Square wave generator.
10. Realization of Truth Tables of AND, OR, NOT Gates.
11. Realization of Truth Tables of NAND, NOR and EX-OR Gates.

Note : At least seven experiments should be performed from above list. Remaining three experiments may either be performed from the above list or designed & set by the concerned institution as per the scope of the syllabus.

ME – 211 E COMPUTER AIDED DRAFTING LAB.

L T P
- - 2

Sessional : 50 Marks
Practical : 50 Marks
Total : 100 Marks
Duration of Exam : 4 hrs.

The students will be required to carry out the following exercises using educational soft-wares (AutoCad-2002, I-DEAS, Pro-Engineer etc).

1. Setting up of drawing environment by setting drawing limits, drawing units, naming the drawing, naming layers, setting line types for different layers using various type of lines in engineering drawing, saving the file with .dwg extension.
2. Layout drawing of a building using different layer and line colors indicating all Building details. Name the details using text commands, Make a title Block.
3. To Draw Orthographic projection Drawings (Front, Top and side) of boiler safety valve giving name the various components of the valve.
4. Make an Isometric dimensioned drawing of a connecting Rod using isometric grid and snap.
5. Draw quarter sectional isometric view of a cotter joint.
6. Draw different types of bolts and nuts with internal and external threading in Acme and square threading standards. Save the bolts and nuts as blocks suitable for insertion.
7. Draw 3D models by extruding simple 2D objects, dimension and name the objects.
8. Draw a spiral by extruding a circle.