STUDY & EVALUATION SCHEME

Diploma in Engineering – Second Year

Branch – Mechanical Engineering

Year – IInd, Semester – IIIrd

S. No.	Subject Code	Subject	Periods			Evaluation Scheme				Subject Total
						Sessional			Exam.	
			L	T	P	CT	TA	Total	ESE	
Theory Subjects										
1.	DMA -301	Applied Mathematics-II (A)	03	01	00	30	20	50	100	150
2.	DME - 301	Mechanics of Solid	03	01	00	30	20	50	100	150
3.	DME - 302	Material Science - I	03	01	00	30	20	50	100	150
4.	DME - 303	Thermal Engineering - I	03	01	00	30	20	50	100	150
5.	DME - 304	Mechanical Engineering Drawing	01	00	03	30	20	50	100	150
6.	DME - 305	Basic Electrical Engineering	03	01	00	30	20	50	100	150
Practical Subjects										
1.	DME - 351	Mechanics of Solids Lab.	00	00	03	10	10	20	30	50
2.	DME - 353	Thermal Engineering Lab.	00	00	03	10	10	20	30	50
3.	DME - 355	Basic Electrical Engineering Lab.	00	00	03	10	10	20	30	50
4.	GP - 351	General Proficiency	-	-	-	-	-	50	-	50
		Total	**16**	**05**	**12**	**-**	**-**	**-**	**-**	**1100**

APPLIED MATHEMATICS-II (A)

(DMA-301)

(Common to All Diploma Engineering Courses)

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UNIT-1

Matrix-I

Type of matrix: Null matrix, unit matrix, square matrix, symmetric and skew-symmetric matrix, orthogonal matrix, diagonal and triangular matrix, Hermitian and Skew-Hermitian matrix, unitary matrix.

Algebra of Matrix: Addition, subtraction and multiplication.

Determinant of matrix, cofactor of matrix, computing inverse through determinant and cofactor.

Elementary row/column transformation: meaning and use in computing inverse of matrix.

UNIT-2

Matrix-II

Linear dependence/independence of vectors. Definition and computation of rank of matrix through determinants, elementary row and column transformation (Echelon and Normal form of matrix), consistency of equations.

Eigen Values and Eigen Vectors, Cayley-Hamiltom Theorem

Definition and evaluation of Eigen values and Eigen vectors of a matrix of order 2 and 3. Cayley-Hamilton theorem (without proof) and its verification, use of Cayley-Hamilton theorem in finding inverse.

UNIT-4

Ordinary Differential Equation

Introduction, formation, order, degree of ordinary differential equation. Formation of ordinary differential equations through physical, geometrical, mechanical, electrical consideration.

Solution of differential equations of first order and first degree by variable separable, reducible to variable separable forms, linear and Bernoulli form and exact differential equation.

UNIT-5

Second Order Differential Equation

Properties of solution, linear differential equation of second order with constant coefficients, complimentary function and particular integral, equation reducible to linear form with constant coefficients.

Simple Applications

LCR circuit, Motion under gravity, Newton's law of cooling, Radioactive decay, Population growth, Oscillations of a string, Equivalence of electrical mechanical system.

References:

1. Applied Mathematics: Kailash Sinha, Meerut publication.
2. Applied Mathematics: P.K Gupta, Asian Publication.
3. Applied Mathematics: H.R Luthra, Bharat Bharti Prakashan.
4. Applied Mathematics: H.K Das, C.B.S Publication.
5. Mathematics for Polytechnic: S.P Deshpande, Pune Vidyarthi Griha.
6. Calculus: Single Variable: Robert T. Smith, Tata McGraw Hill.
7. Mathematics I: Ane Books India. Z. Khan, Q.S Ahmad & S.A. Khan.

MECHANICS OF SOLIDS

(DME-301)

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UNIT-I

STRESS STRAIN AND PROPERTIES OF MATERIALS:

Mechanical properties of materials Ductility, Tenacity, Brittleness, Toughness, Hardness, Factor of safety.

Different types of loads and stresses, strain in a stepped bar. Determination of stress and elongation of a bolt in a bolted joint when subjected to direct external load only, stresses in compound bars and columns. Equivalent modulus of a compound bar, temperature stresses. Shrinkage of a tyre on a wheel. Temperature stress in compound bar, stress-stain curves for mild steel, Aluminum, cast iron & rubber.

COMPLEX STRESSES:

Stresses on an oblique plane in a body subjected to direct load, concept of compound stresses. Principal stress and Principle planes under direct and shear stresses. Graphical determination by Mohr's circle.

8

UNIT-II

SHEAR FORCE AND BENDING MOMENT:

Shear force and bending moment for concentrated and uniformly distributed loads on simply supported beams, cantilever and overhanging beam. Shear force and bending moment diagrams. Relationship between shear force and bending moment. Point of contra flexure, calculations for finding the position of contra flexure. Condition for maximum bending moment.

THEORY OF SIMPLE BENDING:

Simple bending, examples of components subjected to bending such as beam, axle, carriage spring etc. Assumptions made in the theory of simple bending in the derivation of bending formula. Section Modulus Definition of neutral surface and neutral axis and calculation of bending stressess at different layers from the neutral surface for beam of different sections, Pure bending, Concept of Moment of Inertia and case study 8

UNIT-III

STRAIN ENERGY:

Meaning of strain energy and resilience. Derivation of formula for resilience of a uniform bar in tension. Proof resilience, modulus of resilience, suddenly applied load, Impact or shock load. Strain energy in a material subjected to uniaxial tension and uniform shear stress. General expression for total strain energy of simple beam subjected to simple bending.

TORSION:

Strength of solid and hollow circular shafts. Derivation of torsion equation. Polar modulus of section. Advantages of a hollow shafts over solid shaft. Comparison of weightsof solid and hollow shafts for same strength. Horse power transmitted. Calculation of shaft diameter for a given horse power. 8

UNIT-IV

Slopes and Deflections of Beams:

Definition of slope and deflection, sign convention. Circular bending. Calculation of maximum slope and

deflection for the following standard cases by double integration or moment area method. Cantilever having

point load at the free end. Cantilever having point load at any point of the span. Cantilever with uniformly distributed load over the entire span Cantilever having U.D.L. over part of the span from free end Cantilever having U.D.L. over a part of span from fixed end Simply supported beam with point load at centre of the span. Simply supported beam with U.D. load over entire span.

NOTE: All examples will be for constant moment of inertia without derivation of formula.

UNIT-V

COLUMNS AND STRUTS:

Definition of long column, short column and slenderness ratio. Equivalent length, Critical load, Collasping load, End conditions of columns. Application of Euler's and Rankines formule (No Derivation). Simple numerical problems. 6

Ref. Book:

SOM : R. K. Rajput, S. Chand Publications

MATERIAL SCIENCE-I

(DME-302)

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UNIT-I

GENERAL:

Brief introduction to the subject metallurgy and its scope in engineering field, classification of materials of industrial importance. Their chemical thermal, electrical, magnetic, mechanical and technogical properties and their selection criteria for use in industry.

STRUCTURE OF METALS AND THEIR DEFORMATION:

Structure of metals and its relation to their physical, mechanical and technological properties. Elementary idea of arrangement of atoms in metals, molecular structures crystal structures and crystal imperfactions. Deformation of metals, effects of cold and hot working operations over them. Recovery recrystallisation and grain growth, solid solutions, alloys and inter metallic compounds, alotropy of metals, effect of grain size on properties of metals. Corrosion its causes and prevention.

7

UNIT-II

PROPERTIES AND USAGE OF METALS:

METALS:

Ferrous Metals:

-Classification of iron and steel. Sources of iron ores and places of availability. Outline of manufacture of pig iron, wrought iron, cast iron and steel. (Flow diagram only)

-Cast iron: Types as per I.S. - White, malleable, grey mottled, modular and alloy, properties and common uses.

-Classification of steels according to carbon content and according to use as per I.S.

Mechanical properties of various steels and their uses. Name and places of steel plant in India.

Availability of various section of steel in market, its forms and specifications.

9

UNIT-III

Alloy Steel : Effect of alloying various elements, viz Cr, Ni, Co, V, W, Mo, Si and Mn on mechanical properties of steel, Common alloy steels, viz,

(a) Ni-Steel

(b) Ni-Cr-steel

(c) Tungsten Steel

(d) Cobalt steel

(e) Stainless steel

(f) Tool steel- High Carbon Steel, High Speed tool Steel, Satellite Metal, Tungsten Carbide Diamonds.

(g) Silicon magnese steel

(h) Spring steel

(i) Heat resisting alloy steels (Nimonic steels).

(j) Impact hardening steel 8

UNIT-IV

Non-ferrous Materials:

(i) Important ores and their metal content, outline of manufacturing methods, trade names, properties (Phy/Mech./Elect.) and use of the following metals: Aluminum, Zinc, Copper, Tin, Silver, Lead.

(ii) Base metal with principle alloying elements (I.S.I. specification). Important properties and

use of the following alloys:

(a) Aluminum Alloys:

Aluminum-Copper alloy, Al, Zn alloy, Aluminum-

Silica Alloy-Al-Ni-Alloy, Duralumnium-derived alloys (R.R. and Y-alloy).

(b) Copper Alloys:

Brass, Bronze, Gun metal, Phosphor Bronze, Aluminum Bronze, Ni Bronze. 8

UNIT-V

Nickel Silver:

Nickel-Copper Alloy (monel metal) inconel, Nickel, Silver.

Bearing Metals:

Lead base alloys, tin base alloys. (White metals or babbit metals) Copper base alloys.

Solders:

Solders-(Lead, Tin solder, Plumber solder, Tinman's solder or Tin solder) Silver solder,

Brazing alloys (spelter), Inconel alloys. 8

Ref. Books:

Manufacturing Process for Engineering Materials: Kalpak Jain - Pearson Education

K.M. Gupta

P.N. Rao - TMH

THERMAL ENGINEERING-I

(DME-303)

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UNIT-I

FUNDAMENTAL OF THERMODYNAMICS :

Definition, concept of thermodynamic system and surroundings. Closed system, open system, isolated system, thermodynamics definition of work. Zeroth low of thermodynamics. First law of thermodynamics for cyclic and noncyclic processes. Idea of internal energy and enthalpy. Thermodynamic processes - constant volume, constant pressure, constant temperature (Isothermal) processes, adiavatic process polytropic process, their representation on P-V diagram and calculation of work done. Application of the first law of these process. Simple numerical problems.

8

UNIT-II

Second law of thermo dynamic, concept of perpetual motion machine of first order and that of second order. Concept of heat engine, heat pump and refrigerator. Carnot cycle efficiency for heat engine and cop for refrigerator and heat pump.

ENTROPY - its physical concept and significance, reversibility and efficiency, Irreversibility and entropy.

Expression for change of entropy in various thermodynamic processes. Simple numerical problems concerning the above. 8

UNIT-III

PROPERTIES OF STEAM :

Idea of steam generation beginning from heating of water at 0oC to its complete formation into saturated steam. Pressure temperature curve for steam. Idea of dry saturated steam, wet steam and its dryness fraction, super heated steam and its degree of super heat. Enthalpy, entropy, specific volume and saturation pressure and temperature of steam. Use of steam table and mollier chart. Simple numerical problems.

8

UNIT-IV

STEAM GENERATORS:

Types of steam generators - Low pressure and High pressure boilers, Modern high pressure high discharge boiler - Stirling boiler, Lamont, Loefflor, Benson, Velox, ramsin and Schmidi-Hartmann boiler, Computer controlled accessories, Equivalent evaporation, Boiler performance efficiency.

8

UNIT-V

STEAM TURBINE:

Classification, details of turbine, working principle of impulse and reaction turbine, compounding methods of steam turbine, efficiency bleeding, concept of steam bozzles, governing of turbine.

STEAM CONDENSER:

Principle of operation, classification, A brief concept of condenser details. 8

Ref. Books :

1. Engineering Thermodynamics: R. K. Rajput, Laxmi Publications
2. Thermal Engineering : R.S. Khurmi and J.K. Gupta- S. Chand Publications.

MECHANICAL ENGINEERING DRAWING

(DME-304)

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UNIT-I

GENERAL CONCEPT OF MACHINE DRAWING

(a) Views and sections (Full and half), dimensioning

Technique -Unidirection and aligned practice conventions as per latest code of practice for

general engineering drawing.

(b) General concept of IS working drawing symbols for

(i) Welding & Rivetting

(ii) Serews & Screw threads

(iii) Surface Finish Marks

(iv) Limits, Fits & Tolerances 7

UNIT-II

FAMILIARIZATION WITH AUTO CAD COMMONDS:

- What is CAD, Different type of CAD software available,

Advantages of using CAD, AUTOCAD graphical user interface.

- Setting up drawing environment: Setting units, drawing limits, Snap, Opening and Saving a drawing, Setting drafting properties, Different co-ordinate system used.

- Commands and their aliases, Different methods to start a command.

- Selecting object, removing object from selection set,

Editing with grips, Editing object properties.

- Use of draw commands - Line, Arc, Circle, Polygon, Polygon,

Polyline, rectangle, Ellipse, construction line, Spline.

- Use of modify commands - erase offset, Move, Copy, Mirror,

Fillet, Chamfer, Array, Scale, Stretch, rotate, Explode,

Lengthen.

- Creating 2D objects using Draw and Modify commands, Use of

Hatch commands.

- Controlling the drawings display; Zoom, PAN, view ports,

Aerial view.

- Drawing with precision : Adjusting snap and Grid alignment.

- Use of Tools Menu bar for calculating distance, angle, area,

ID points, Mass using inquiry command, Quick select.

- Adding text to drawing, Creating dimension.

- Use of UCS, Alignment of UCS, Move UCS, Orthographic UCS.

- Creating 3 D objects using region, boundary, 3D Polyline,

Extrude, revolve feature.

- Use of solid 3D edit features, Shell, Imprint, Separate,

Section, Boolean functions like Union, Subtract and

Intersect, Extrude faces, Move faces, Delete face, Offset faces, Copy faces and color faces commands.

- To show the section - Use of slice, Section commands. 10

UNIT-III

Sectioned View of

(i)) Foundation bolts

(ii) Pipe Joints - Flanged, Socket, Hydraulic joint and Union joint.

Assembly Drawing of

(i) Knuckle joint- Part drawing, Solid Modeling, Assembly and Sectioning.

(ii) Protective type flange coupling- Part drawing, Solid

Modeling, Assembly and Sectioning.

(iii) Bench vice - Part drawing, Solid Modeling, Assembly and Sectioning. 7

UNIT-IV

Assembly drawing from detail and vice versa.

(i) Tail stock of Lathe machine

(ii) Screw jack

(iii) Drilling Jig Spur gear profile drawing from given data

Free hand sketching of

(i) Pipe fittings-Such as-Elbows-Reducers, T-Cross and Bibcock.

(ii) I. C. engine piston, Simple bearing, Cotter and Knuckle joint, pulleys and flywheel-Sectioned views.

(iii) Cutting tools of Lathe machine, shaper and common milling cutters. 8

UNIT-V

Gear puller and C-clamp Sketching of ortho graphics views from isometric views be practiced. 7

NOTE :

All the sheets should be working drawing complete with tolerances, type of fits and surface finish symbols and material list according to I.S.I. code. 25% drawing sheet should be drawn in first angle projection and rest 75% drawing sheet should be in third angle projection.

BASIC ELECTRICAL ENGINEERING

(DME-305)

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UNIT-I

Steady State Analysis of A.C. Circuits

Sinusoidal and phasor representation of voltage and current, single a.c. circuit Behaviour of resistance, inductance, capacitance and their combination in Series & parallel, and power factor, series & parallel resonance, bandwidth and Quality factor. 9

UNIT-II

Network Theory

Mesh and nodal analysis for a.c. and d.c .networks, Network theorem Superposition theorem. Thevenin's theorem, Norton's theorem and Maximum Power transfer theorem, Star-Delta transformation.

Measuring Instruments.

Construction and principle of operation of voltage and current measuring Instrument, introduction to power and energy meters 9

UNIT-III

Three phase AC Circuits

Star-Delta connection, line and phase voltage/current relations, three phase Power and its measurement.

Magnetic Circuit and Transformer

Magnetic circuit concept, principle of operation, phasor diagram, equivalent Circuit, efficiency, voltage regulation of single phase transformer, opern Circuit and short circuit test. 9

UNIT-IV

D.C. Generator

Construction, types of d.c. generators, e.m.f. equation, Magnetization and Load characteristics, Losses and efficiency, Speed control of d.c. Motors, Applications.

D.C. Motor

Working principle, types of d.c. motor, speed, characteristic, efficiency And applications.

Single Phase Induction Motor

Principle of operation, Methods of starting, split phase induction motor, Capacitor motor, capacitor start motor two value capacitor motor. 8

UNIT-V

Three Phase Induction Motor

Production of rotating field, Principle of operation, slip-torque characteristics, applications.

Three Phase Synchronous Motor

Construction, principle of operation and applications 8

Reference Books

1. V. Del Toro “Principles of Electrical Engg.” Prentice Hall International
2. W. H. Hayt & J.E. Kennedy, “Engineering Circuit Analysis.” Mc.Graw Hill
3. I. J. Nagrath, “Basic Electrical Engg.” Tata Mc Graw Hill
4. A.E. Fitgerald, D.E. Higginbortham and A Grabel, “Basic Electrical Engg.” Mc Graw Hill.

MECHANICS OF SOLIDS LAB

(DME-351)

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Any Ten

1. To find the sheer force at a given section of simply supported beam for different loading.

2. To find the value of 'E' for a steel beam by method of deflection for different loads.

3. To determine the ultimate tensile strength, its modulus of Elasticity, Stress at yield point, % Elongation and contraction in x-sectional area of a specimen by U.T.M. through necking phenomenon.

4. To determine the ultimate crushing strength of materials like steel and copper and compare their strength.

5. To determine Rock Well Hardness No. Brinell Hardness No. of a sample.

6. To estimate the Shock Resistance of different qualities of materials by Izod's test and charpy test.

7. To determine the bending moment at a given section of a simply supported beam for different loading.

8. To determine the angle of twist for a given torque by Torsion apparatus and to plot a graph between torque and angle of twist.

9. To determine the Max-Fibre stress in X-section of simply supported beam with concentrated loads and to find the neutral axis of the section.

10. To perform heat treatment process on materials of known carbon percentage -

1. Annealins 2. Normalising 3. Case Hardening.

Mini Project

i. Collect samples of heat insulating materials

ii. Collect samples of various steels and cast iron.

iii. Collect sample of Non-Ferrous alloys.

iv. Collect samples of Non-Metallic engineering materials

11. To determine the various parameters of helical coil spring

12. Preparation of specimens and study of microstructure of eight given metals and alloys on metallurgical microscope.

i. Brass.

ii. Bronze.

iii. Grey Cast Iron.

iv. Malleable Cast Iron.

v. Low Carbon Steel.

vi. High Carbon Steel.

vii. High Speed Steel.

viii. Bearing Steel.

13. Study of diamond polishing apparatus.

14. Study metallurgical microscope.

15. (a) To prepare specimens for microscope examination (For Polishing andetching).

(b) To examine the microstructure of the above specimens under metallurgical microscope.

(c) To know composition of alloy steel by spebber steeloscope

(d) To know carbon in steel by carbon steel estimation apparatus

THERMAL ENGINEERING LAB

(DME-353)

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Any Ten

1. Determination of temperature by :

i. Thermo couple

ii. Pyrometer

2. Study of constructional details and specification of high pressure bioler and sketch (through field visit)

3. Performance testing of steam boiler.

4. Study of steam turbines through models and visits.

5. Determination of dryness fraction of wet steam sample.

6. Study and understanding of various types of furnace and their use through available furnaces/visits.

7. Study and sketching of various hand tools, Lifting tackes, Gadgets used in plant.

8. Study of fuel sypply and lubrication system in I.C. engine.

9. Study of battery ignition system of a multi-cylinder petrol engine stressing on ignition timing, setting fixing order and contact breaker gap adjustment.

10. Morse test on multi-cylinder petrol engine

11. To prepare heat balance sheet for diesel/petrol engine.

12. Demonstration of mounting and accessories on a boiler for study and sketch (field visit).

13. Determination of B.H.P. for diesel and petrol engine by dynamometer.

BASIC ELECTRICAL ENGINEERING LAB

(DME-355)

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List of Practicals

A minimum of 10 experiments from the following:

1. Verification of Network theorems.

2. Study of diode characteristics.

3. To study a half wave and full rectifier circuit with and without capacitor filter and determine the ripple factor.

4. Determination of common base ad common emitter characteristics of a transistor

5. Study of phenomenon of resonance in RLS series circuit.

6. Measurement of power in a three phase circuit by two wattmeter method

7. Measurement of efficiency of a single phase transformer by load test

8. Determination of parameters and losses in a single phase transformer by OC and SC test

9. DC generator characteristics.

10. Speed control of de shunt motor

11. Study running and reversing of a three phase induction motor.

12. Study of a single phase energy meter.

13. To study the various logic gate (TTL)

Additional experiments may be added based on contents of syllabus.