UNIVERSITY POLYTECHNIC
B.I.T., MESRA, RANCHI

Syllabus of Diploma in Engineering (Mechanical) **(Semester IV)**

COURSE STRUCTURE
Diploma in Technology
(W.E.F. 2011 Batch Students)

SEMESTER – IV
(Total Unit 7.5)
Mechanical

Course Code	Theory	Unit	Course Code	Sessional	Unit
DAE 4001	Thermal Engineering	1.0	DAE 4002	Thermal Engineering Lab.	0.5
DMM 4001	Advance Engineering Measurements	1.0	DMM 4002	Advance Engg. Measurement Lab.	0.5
DAE 4005	Strength of Materials	1.0	DAE 4006	Strength of Material Lab	0.5
DMM 4003	Fluid Mechanics & Machine	1.0	DMM 4004	Fluid Machineries Lab.	0.5
DMM 4005	Theory of Machines	1.0	DGA 4002	PT & Games	0.5
		5.0			**2.5**

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SUBJECT - THERMAL ENGINEERING Course Code : DAE 4001

Module 1
Basic Concepts, Zeroth law of Thermodynamics and its significance, Concept of heat and work. Properties of steam, Properties of Ideal gas. (7)

Module 2
First law of Thermodynamics, first law of thermodynamics for non flow and steady flow processes. (6)

Module 3
Second law of Thermodynamics & Entropy : Concepts of heat engines, refrigerator and heat pump. Entropy, Entropy change for various reversible processes. (6)

Module 4
Thermodynamics cycles – Carnot cycle, Otto cycle, Diesel cycle, Joule/ Brayton cycle, Rankine cycle & Vapour compressive refrigeration cycle. (6)

Module 5
Principles of steam Turbine and nozzles. (4)

Module 6
Air Compressor : Introduction, classification, application, construction and working of a single stage Compressor, calculation of power. (5)

Module 7
Heat transfer, one dimensional steady state condition. Application to composite walls Critical thickness of insulation, basic concepts of free convection & Radiation heat transfer (6)

BOOKS :

1. An Introduction to Thermodynamics By – P.K. Nag.
2. Engineering Thermodynamics By – R.K. Rajput.
3. Thermal Engineering By – P.L. Ballaney.
4. Engg. Thermodynamics By – Arora & Domkundwar
5. Engg. Thermodynamics By – Dr. D. S. Kumar

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Subject: ADVANCE ENGINEERING MEASUREMENTS Course Code: DMM 4001

Module – 1
Introduction : Classification & Types of Measuring Instruments, Limits, Fits & Tolerances.
(4 Lectures)

Module – 2
Micrometer, Vernier Caliper & Gauges : Working principle, Construction & parts of Micrometer, Vernier Caliper, Principle of Vernier, Classification and Description of Gauges.
(6 Lectures)

Module – 3
Measurement of Force and Torque and pressure Standards, Measuring Methods, Comparative study of different types of forces and torque Measuring systems. Description and working Principle of different types of Transducers for Measuring Pressure. (6 Lectures)

Module – 4
Measurement of Humidity : Introduction, Different types of Transducers for measurement of Humidity.
Flow Measurement: Introduction, Principle of operation of various obstruction meters for compressible and incompressible fluid flow measurement. (7 Lectures)

Module - 5
Measurement of Temperature : Glass Thermometer, Thermocouples, Temperature Compensation, Calibration, Bimetal Resistance Thermometer, Thermistor, Measurements of low and medium temperatures pyrometers, Temperature indicators, problems in temperature measurement, Advantages & Disadvantages of Pyrometer. (7 Lectures)

Module - 6
Measurement of Speed and Vibration: Velocity, Acceleration: Speedometers, Accelerometers, calibration and uses. Different pick-ups and their limitations (5 Lectures)

Module – 7
Coordinate Measuring Machines: CMM Construction, operation CMM Application and Benefits, surface measurement. (5 Lectures)

Reference Books:

1. Mechanical Measurement & Control by R. V. Jalgaonkar.
2. Mechanical Measurement by Beckwidth and Buck (Edn. 1965, Addison Wesley Publishing Co. Inc. London)
3. Measurement systems, Application and Design by Docblin (Edn. 1976, Publisher TMH)
4. Introduction to Microprocesors by A.P. Mathur 2nd Edn. 1984, Publisher TMH.
5. Engineering Measurements and Instrumentation by Adams L.F. (Edition 1975, London English University Press).
6. Instrumentation Measurement and Analysis by B.C. Nakra, K.K. Choudhary (Edn. 1985, Publisher TMH, New Delhi).
7. Automation, Production system & Computer Integrated Manufacturing by Mikell. P.

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SUBJECT : STRENGTH OF MATERIALS Course code : DAE 4005

Module 1
Basic Concepts : Definition, elastic & plastic properties of material, stress & strain diagram for ductile & brittle materials, introductory remarks on fatigue, creep & fracture . 4

Module 2
Simple stresses and strains
Stress & strain, Simple stress and strain in composite sections, Thermal stresses, relation between elastic constants. 6

Module 3
Principal Planes and Stresses : Principal stresses and principal planes, Mohr's circle for biaxial stresses. 6

Module 4
Bending Moment and shearing forces : Types of beams, types of support, shear force and bending moment diagram for simply supported, and cantilever subjected to point and uniformly distributed loads, relation between intensity of loading shear force and bending moment. 8

Module 5
Bending, slope and deflection of beams : Definitions, theory of simple bending, relation between slope and deflection calculations for cantilever & simply supported beams. 8

Module 6
Torsion : Torsion of circular shafts, power transmitted. 4

Module 7
Vibrations : Types of vibrations, free vibrations. 4

Books :

1. Mechanics of Solids – Popov
2. Strength of materials – Ryder
3. Strength of materials – Sadhu Singh
4. Strength of materials – Rajput
5. Strength of materials – Bansal

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FLUID MECHANICS & MACHINES Course Code: DMM 4003

Module-1
Fluid – Definitions and their properties **:** Definition of fluid, ideal fluid, classification of fluids, fluid properties i.e. density, viscosity, compressibility, surface tension, capillarity. Definition and intensity of pressure, pressure head, Pascal's law, pressure- measurement . (5)

Module-2
Characteristics of Fluid flow : Laminar & turbulent flow, compressible incompressible, continuity equation – Bernoulli's theorem, momentum equation, flow measurement – venturi meter, orifice plate, & Pitot tube & mouth pieces. (5)

Module-3
Flow through Pipes **:** Friction loss, hydraulic gradient, power transmission through pipes, transmission efficiency. (5)

Module-4
Impact of free Jets: Force exerted by fluid jet on stationary and moving flat plates, Euler's equation of turbine, Impulse and reaction turbine, velocity triangles. (6)

Module-5
Pelton, Kaplan and Francis turbines, velocity triangles, power and efficiency calculations, constructional details. (7)

Module-6
Centrifugal pumps: Classification, heads, power and efficiency calculation, Blade profiles, starting speed, cavitations.
Reciprocating pump: Construction and working of single and double acting reciprocating pumps, power required, overall efficiency, Performance characteristics of gear pumps & jet pumps. (7)

Module-7
Fluid coupling and torque converter: Theory characteristics and uses. Performance characteristics and governing of turbines. (5)

Text Books:

1. Hydraulics and Fluid Mechanics by Modi and Seth
2. Fluid Mechanics and Hydraulic machines by R.K. Bansal.

Reference Books:

1. Fluid Mechanics and Machinery by D. Rama. Durgaiah
2. Hydraulic Machines by J. Lal
3. Fluid Mechanics by V.L. Streeter.

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SUBJECT : THEORY OF MACHINES Course Code: DMM 4005

Module-1: MECHANISMS: Kinematic concept of Link, Kinematic chain, Mechanism, degree of freedom, Inversions of four bar mechanism, single slider crank mechanism and double slider crank mechanisms. (5 Lectures)

Module-2: MOTION ANALYSIS: Types of motion: Kinematic and Dynamic quantitites; Vector diagrams, Instantaneous centers.Velocity and acceleration diagram of plane mechanism including Coriolis components. (8 Lectures)

Module-3: FORCE ANALYSIS: Static force analysis, friction effects, dynamic force analysis, equivalent system. (5 Lectures)

Module-4: FLYWHEEL: Turning Moment on crankshafts, Turning Moment diagram, Fluctuation of energy and speed . (5 Lectures)

Module-5: GEARS, Fundamental laws of gearing: classification and basic terminology, involute tooth profile and its kinematic consideration, spur gears, other types of gears, standards in tooth forms. Gear trains : Simple and, compound gear trains. (8 Lectures)

Module-6: Balancing : Balancing of Rotating masses by a single mass in same plane, Balancing of a single rotating mass by two masses rotating in different planes, Balancing of several masses rotating in same plane. (5 Lectures)

Module-7: CAMS: Various types of cams, Displacement, velocity and acceleration of followers, Graphical determination of CAM profiles with simple followers, specified. (4 Lectures)

Text Book:

1. Theory of Machine by Thomas Beven

Reference Books:

1. Theory of Machines and Mechanism by Ghosh and Malik
2. Mechanism and Machine Theory by J.S. Rao and R.V. Dukkibati
3. Theory of Machine by S.S. Rattan, Tata McGrow Hill.