NOIDA INTERNATIONAL UNIVERSITY

Course Curriculum

UNIVERSITY POLYTECHNIC

THIRD SEMESTER

MECHANICAL ENGINEERING/AUTO MOBILE ENGG.

DME 301 : SOLID MECHANICS

Credits: 4 **Semester III**

Module No.	Contents	Teaching Hours
	UNIT-1 **DEFORMATION OF METALS** **Mechanical properties of materials:** Engineering materials – Ferrous and non ferrous materials -Definition of mechanical properties such as strength – elasticity, plasticity, ductility, malleability, stiffness, toughness, brittleness, hardness, wear resistance, machenability, castability and weldability - Alloying elements-effect of alloying element - Fatigue, fatigue strength, creep – temperature creep – cyclic loading and repeated loading – endurance limit. **Simple stresses and strains:** Definition – Load, stress and strain – Classification of force systems – tensile, compressive and shear force systems – Behavior of mild steel in tension up to rupture – Stress – Strain diagram – limit of proportionality – elastic limit – yield stress – breaking stress – Ultimate stress – percentage of elongation and percentage reduction in area – Hooke's law – Definition – Young's modulus - working stress, factor of safety, load factor, shear stress and shear strain - modulus of rigidity. Linear strain – Deformation due to tension and compressive force – Simple problems in tension, compression and shear force. Definition – Lateral strain – Poisson's ratio – volumetric strain – bulk modulus – volumetric strain of rectangular and circular bars – problems connecting linear, lateral and volumetric deformation – Elastic constants and their relationship - Problems on elastic constants - Definition – Composite bar – Problem in composite bars UNIT-2 **TORSION AND SPRINGS** Theory of torsion – Assumptions – torsion equation – strength of solid and hollow shafts – power transmitted – Definition – Polar modulus – Torsional rigidity – strength and stiffness of shafts – comparison of hollow and solid shafts in weight and strength considerations – Advantages of hollow shafts over solid shafts – Problems. Types of springs – Laminated and coiled springs and applications – Types of coiled springs – Difference between open and closely coiled helical springs – closely coiled helical spring subjected to an axial load – problems to determine shear stress, deflection, stiffness and resilience of closed coiled helical springs **UNIT-3** **PROPERTIES OF FLUIDS, ELEMENTS OF HYDRAULIC SYSTEMS, PUMPS AND VALVES** **Introduction** - Definition of fluid - Classification of Fluids - ideal and real fluids -Properties of a fluid – definition and units - Pressure-units of Pressure - Pressure head-atmospheric, gauge and absolute pressure. **Introduction** – elements of a hydraulic system – advantages of hydraulics systems – disadvantages – qualities of a good hydraulic fluid – hydraulic symbols. **Hydraulic pumps and control valves:** Principles of operation of non positive displacement pumps –centrifugal pumps – volute – diffuser – propeller pumps – mixed flow pumps – principles of operation of positive displacement pumps – rotary pumps – gear – lobe - vane – piston – reciprocating pumps. **Control valves:** Introduction to valves – types – pressure control valves - relief valve – pressure reducing valve – sequence valves – pressure switches – directional control valves– types only – solenoid controlled — check valves – foot	12

Reference Books/ Text Books / Case Studies:

Text Books:

1. Strength of Materials ,R.K. Bansal,, Laxmi Publications Pvt. Ltd., New Delhi, 3rd Edition, 2010.
2. Strength of materials, S.S.Rattan, Tata Mcgraw hill, New Delhi,2008, ISBN 9780070668959,
3. Strength of Materials, B K Sarkar, I Edition, 2003 Tata Mcgraw hill, New Delhi.
4. Engineering mechanics, R.K. Bansal, Laxmi Publications Pvt. Ltd., New Delhi,

Reference Books:

1. Hydraulics & Pneumatics Power for production Harry L Stewart – Industrial Press Inc, New York - 1977
2. Pneumatic circuit by Harry L. Stewart – Audel Series – 1976
3. Fundamentals of pneumatic control Engg – Text book By Festo Company -1985
4. Introduction to Pneumatics – Text Book by Festo Company - 1983

DME 302: THERMAL ENGINEERING

Credits: 04 **Semester III**

Module No.	Contents	Teaching Hours
I	**FUNDAMENTAL OF THERMODYNAMICS:** Definition, concept of thermodynamic system and surroundings. Closed system, open system, isolated system, thermodynamics definition of work. Zeroth law of thermodynamics. First law of thermodynamics for cyclic and non-cyclic processes. Idea of internal energy and enthalpy. Thermodynamic processes -constant volume, constant pressure, constant temperature (Isothermal) processes, adiabatic Process polytrophic process, their representation on P-V diagram and calculation of work done. Application of the first law of these process. Second law of thermodynamic 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 forrefrigerator and heat pump. Physical concept and significance of Entrogy. Reversibility and efficiency. Expression for change of entropy in various thermodynamic processes.	12
II	**PROPERTIES OF STEAM & STEAM GENERATORS** Idea of steam generation begining from heating of water at0°C to its complete fromation 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. 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.	16
III	**AIR COMPRESSOR** Definition and their use, Difference between reciprocating and rotary compressor, their types and working work done during compression in single stage and two stage, Heat rejected and inter cooling in tow stage compression, Volumetric efficiency, compress or lubrication.	10

DME 303: FLUID MECHANICS

Credits: 4 **Semester III**

Module No.	Contents	Teaching Hours
I	**Introduction**: Ideal and real fluids, fluid mechanics, Hydrostatics, Hydrodynamics, Hydraulics. **Properties of Fluid**: Mass density, specific weight, specific gravity, viscosity, surface tension - cohesion, adhesion and, capillarity, vapour pressure. Units of measurement and their conversion compressibility. **Hydrostatic Pressure:** Pressure, intensity of pressure, pressure head, Pascal's law and its applications. Total pressure, resultant pressure, and center of pressure. Total pressure and center of pressure on horizontal, vertical and inclined plane surfaces of rectangular, triangular, trapezoidal shapes and circular. **Buoyancy:** Buoyancy, metacentre, stability of floating body.	12
II	**Measurement of Pressure**: Atmospheric pressure, gauge pressure, vacuum pressure and absolute pressure. Piezometer, simple manometer and differential manometer. **Fundamentals of Fluid Flow**: Types of Flow: Steady and unsteady flow, laminar and turbulent flow, uniform and non-uniform flow. Discharge and continuity equation (flow equation). Types of hydraulic energy: Potential energy, kinetic energy, pressure energy. Bernoulli's theorem; statement and description (without proof of theorem) and simple numerical problems. **Flow Measurement**: Venturimeter and mouthpiece, Pitot tube, Orifice and Orificemeter, Current meters, Notches and weirs.	14
III	**Flow in Pipes**: Definition of pipe flow; Reynolds number, laminar and turbulent flow - explained through Reynold's experiment, Critical velocity and velocity distributions in a pipe for laminar flow, Head loss in pipe lines due to friction, sudden expansion and sudden contraction, entrance, exit, obstruction and change of direction, Hydraulic gradient line and total energy line, Flow from one reservoir to another through a long pipe of uniform cross section, Pipes in series and parallel, Water hammer phenomenon and its effects **Flow through open channels**: Definition of an open channel, uniform flow and non-uniform flow, Estimation of Discharge using Chezy's and Manning's formula, Most economical channel sections (rectangular and trapezoidal, Head loss in open channel due to friction. **Hydraulic Pumps:** Hydraulic pump, reciprocating pump, centrifugal pumps	16

Reference Books/ Text Books / Case Studies:

1. Asawa, G.L. (2009), Fluid Flow in Pipes and Channels, CBS Publishers and Distributors, New Delhi.
2. Gupta, V. and Gupta, S.K. (1984), Fluid Mechanics and its Applications, New Age International (P) Limited, Publishers, New Delhi.
3. Massey, B.S. (revised by John Ward-Smith) (1998), Mechanics of Fluids, Chennai Micro Print Pvt. Ltd., Chennai.

Streeter, V.L., Wylie, E.B., and Bedford.

DME 304: INTERNAL COMBUSTION ENGINE

Credits: 4 **Semester III**

Module No.	Contents	Teaching Hours
Unit – I	**Air Standard Cycles:** Internal and external combustion engines; classification of I.C. Engines, Cycles of operation in four stroke and two stroke I.C. Engines; Otto cycle, Diesel cycle, dual combustion cycle; air standard efficiency, specific work output, specific weight; work ratio; mean effective pressure. **Introduction to Engine Performance parameters:-** mechanical efficiency, brake mean effective pressure and indicative mean effective pressure, torque, volumetric efficiency; specific fuel consumption (BSFC, ISFC), thermal efficiency; Basic engine measurements; fuel and air consumption, brake power, indicated power and friction power, ***Hear balance sheet(Diagram).***	12
Unit – II	**Carburetion, Fuel Injection and Ignition systems:-** Mixture requirements for various operating conditions in S.I. Engines; carburetor, MPFI, factors affecting air fuel mixture, injection system in diesel engine; types of ***injection systems,*** Ignition system; types of ignition systems, spark plugs, super charging, turbocharging. **Pollution from Engine and Its control:-** Air pollution from I.C. Engine, Hydrocarbons and Hydrocarbons emissions, Other emissions, Methods of emission control; alternative fuels for I.C. Engines.	12
Unit - III	**Combustion in I.C. Engines:** **S.I. engines:-** Combustion in S.I. Engines; detonation; effects of engine variables on detonation; Octane rating of fuels; pre-ignition; combustion chambers in S.I. engines. **C.I. Engines :-** Combustion in C.I. Engines; delay period; variables affecting delay period; knock in C.I. engines, Cetane rating; combustion chambers in C.I. engine. **Lubrication and Cooling Systems:-** Lubricating system, Types of lubrication system; properties of lubricating oil; SAE rating of lubricants, , Need of engine cooling; disadvantages of overcooling; Types of cooling systems, radiators.	12

Reference Books:

1. Internal Combustion Engines –V. Ganesan, Pub.-Tata McGraw-Hill.
2. Engineering fundamental of the I. C. Engine – Willard W. Pulkrabek Pub.-PHI, India

DEC 304 – Basic Electronics Engineering

Credits: 4 **Semester III**

Module No.	Contents	Teaching Hours
Unit –I	**Semiconductor Physics**: Basic of Semiconductor materials and effect of temperature on semiconductor. **PN Junction Diode**:P-N junction diode with its Forward & Reverse Characteristics. Important specifications of P-N junction diode(ratings) , Break down in P-N junction, Voltage regulation **Rectifiers & Filters**: Rectifier circuit (HWR, FWR). Their comparison on the basis of circuit operation, waveforms, average (dc) value of rectifier output, ripple factor, ripple frequency, transformer utilization factor, rectification efficiency,	12
Unit – II	**Clipping & Clamping circuits**: Types and applications.Voltage Multiplier circuits: Types and applications. **Special purpose diode**: Light Emitting Diode, Liquid Crystal Display & Opt-couplers, Tunnel diode(with tunneling function),varactor diode,Schottky-Barrier diode, Zener diode, Zener diode as a voltage regulator. **Bipolar Junction Transistor (BJT):**Construction, working principle of PNP and NPN transistors, characteristics of CB, CE and CC configurations. D.C load line, Thermal stability factor. Different types of biasing methods (Fixed biasing, Collector–Base bias, Potential divider biasing,).	12
Unit - III	**Applications of BJT:** **a) Small Signal Amplifier:** Approximate hybrid model for Common Emitter Amplifier. Analysis of CE single stage Small Signal Amplifier (with un-bypassed & bypassed emitter resistor), using approximate hybrid equivalent circuit (amplifier input, output impedance, current & voltage gain). **b) Application of BJT CE inverter switch**. FETs	12

Books

1. Basic Electronics and Linear Circuit by NN Bhargava, Kulshreshta and SC Gupta, Tata McGraw Hill Education Pvt Ltd, New Delhi.
2. Electronic Principles by SK Sahdev, Dhanpat Rai & Co., New
3. DelhiPrinciples of Electrical and Electronics Engineering by VK Mehta; S Chand and Co., New Delhi
4. Electronic Components and Materials by SM Dhir, Tata McGraw Hill Publishing Company Pvt Ltd, New Delhi.
5. Principles of Electronics by SK Bhattacharya and Renu Vig, SK Kataria and Sons, Delhi
6. Electronics Devices and Circuits by Millman and Halkias; McGraw Hill.

Principles of Electronics by Albert Paul Malvino; Tata McGraw Hill Educa

DME 352: THERMAL ENGINEERING LAB.

Credits: 02 **Semester III**

LIST OF PRACTICALS

Module No.	Contents	Teaching Hours
1	Determination of temperature by a. Thermo couple b. Pyrometer	24
2	Study of constructional details and specification of different types of boilers and sketch	
3	Demonstration of mounting and accessories on a boiler for study and sketch (field visit).	
4	Performance testing of steam boiler.	
5	Determination of dryness fraction of wet steam sample.	
6	Study and understanding of various types of furnace and their use	
7	through available Furnaces / visits.	
8	Study and sketching of various hand tools, Lifting tacks, Gadgets used in plant.	

	To study various types of compressors with the help of their models.	

DME 351: SOLID MECHANICS LAB.

Credits: 2 **Semester III**

List Of Practical

Module No.	Contents	Teaching Hours
	1.Direct Tension Test 2 Torsion Test 3 Hardness Test A) Brinell's Hardness Test B) Rockwell Hardness Test 16 18 21 4 Test on Springs 5 Compression Test on Cube 6 Impact Test 7 Punch Shear Test	

DME 353: FLUID MECHANICS LAB.

Credits: 2 **Semester III**

List Of Practical

Module No.	Contents	Teaching Hours
1	To verify Bernoulli's Theorem	
2	To find out Venturimeter coefficient	
3	To determine coefficient of velocity (C_v), Coefficient of discharge (C_d)	
4	Coefficient of contraction (C_c) of an orifice and verify the relation between them	
5	To perform Reynold's experiment	
6	To verify loss of head in pipe flow due to **a.** Sudden enlargement **b.** Sudden contraction **c.** Sudden bend	24
7	Demonstration of use of current meter and Pitot tube	
8	To determine coefficient of discharge of a rectangular notch/triangular notch.	

DEC – 351: BASIC ELECTRONICS ENGG. LAB

Credits: 2 **Semester-III**

LIST OF PRACTICALS

Module No.	Contents	Teaching Hours
1.	PN Junction diode characteristics A. Forward bias B. Reverse bias.	
2.	Zener diode characteristics and voltage regulator	
3.	Half wave Rectifier with and without filter.	
4.	Full wave Rectifier with and without filter.	
5.	Full wave Bridge Rectifier with and without filter.	
6.	Transistor CB Characteristics (Input and Output)	
7.	Transistor CE characteristics (Input and Output)	
8.	Transistor CC characteristics (Input and Output)	