

**GANPAT UNIVERSITY**  
**B. TECH. SEM. V – MECHANICAL ENGINEERING**  
**ME-501- MATERIAL TECHNOLOGY**

Teaching scheme (Hrs)			Examination scheme (Marks)							Grand Total
			Theory				Practical			
L	P	Total	Int Asses	Sem End		Total	Int Asses	Sem End	Total	
				Marks	Marks					
4	2	6	30	70	3	100	25	25	50	150

**1. Theory of Alloys :**

Systems, phases and phase rule, structural constituents, equilibrium diagram, cooling curves, lever – arm principle, eutectic reaction, protecting reaction, eutectoid reaction, Iron carbon diagram, constitution, microstructures & properties of plain carbon steels.

**2. Heat treatment of steel :**

Study of heat treatment processes such as spheroidizing, Hardening, carburizing, nitriding, cyaniding, induction hardening, flame hardening, aging, hardenability, controlled atmosphere in heat treatments, Application of above processes to machine components & mechanical equipments such as gears, shaft bearings, turbine blades, crank shafts, pistons etc.

**3. Steels :**

Effect of alloying elements such as manganese, nickel, chromium, molybdenum, vanadium, tungsten, cobalt and boron, low alloy engineering steels, stainless steel, tool and die steels, high temperature alloys, selection of steels for various machines components and mechanical equipments, coding of steels as per ASME and ISI.

**4. Cast Iron :**

Constitution, properties of gray, white, malleable and spheroidal graphite cast irons, heat treatment of cast irons, seasoning of cast iron, effect of silicon, manganese, sulphur, phosphorous and other elements on the properties of cast iron, use of specific grades of cast iron in mechanical field.

**5. Non – ferrous Alloys :**

Constitution and properties of the alloys of copper, aluminum, lead, tin, zinc, magnesium etc., Application of mechanical field.

**6. Powder Metallurgy :**

Application of powder metallurgy, advantages of powder metallurgy, manufacturing processes, production of powder compacting, sintering, products of powder, metallurgy, filters, babbitted bearings for automobiles, oil pump gears, cemented carbides, diamond impregnated tools.

**7 Corrosion of metal and alloys :**

Mechanism of corrosion, types of corrosion, prevention of corrosion, metal coatings, organic coatings, lining and cladding, use of inhibitors cathodic protection.

**8. Development Of Special Materials :**

Ceramic materials, Materials for nuclear reactors, High temperature alloys, cryogenic materials, Teflon, Araldite etc.,

**9.Refractory materials :**

Properties and classifications, acid refractories, basic refractories, Insulation refractories, selection of refractories for furnaces, boilers, cupola etc.

**10. Composite Materials:** Classification, Characterization & application of composite materials.

**11. Nano Technology:** Introduction to nano technology & nano science, field of application of nano materials.

• **TERM WORK :**

The term work to be prepared by the candidates shall consists of technical report of about ten experiments performed by the candidates out of which at least two experiments will be based on each of the following topics listed under the headings of

- a. Physical metallurgy
- b. Ferrous metallurgy
- c. Non-ferrous metallurgy

• **BOOKS:**

1. A Text Book of Materials Science & Metallurgy - By - (O.P. Khanna)
2. Introduction to Physical Metallurgy By - (Sidney H. Avner)

**REFERENCE BOOKS:**

1. Physical Metallurgy – Principles & Practice (V. Raghavan)
2. Engineering Physical Metallurgy & Heat-Treatment (Y.Lakhtin)
3. Materials Science (R.S. Khurmi)
4. Corrosion Engineering (Fontanna M.G. & Green N.D.)
5. Introduction to Nano Technology – (Poole Charles P; Owens Frank J.)
6. Composite Materials – (Chawla Krishan K.)

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**GANPAT UNIVERSITY**  
**B. TECH. SEM. V – MECHANICAL ENGINEERING**  
**ME – 502 ENERGY CONVERSION & UTILIZATION SYSTEM**

Teaching scheme (Hrs)			Examination scheme (Marks)							
			Theory				Practical			Grand Total
L	P	Total	Internal Asses.	Sem End		Total	Internal Asses.	Sem End	Total	
				Marks	Hrs					
4	2	6	30	70	3	100	25	25	50	150

**Section – I (Internal Combustion Engines)**

- Air standard cycles**, Ideal air standard cycles, Fuel air cycles, characteristics of fuel air mixtures, variation of specific heats. Actual cycles, actual processes taking place in engines.
- Combustion in S.I. Engine and C.I. Engines**: Stages of combustion in S.I. Engine, Detonation, and Control of detonation. Stages of combustion in C.I. Engines, delay period, factors influencing delay period, diesel knock, control of diesel knock, Alternative fuels (CNG, LPG & Biodiesel)
- Carburetion and fuel injection**: Requirements of a good carburetor, simple carburetor, and complete carburetor, Calculation of air-fuel ratio for a simple carburetor. Electronic fuel injection in S.I. engine. Requirements of diesel injection system, types of injection systems, fuel pumps.
- Systems and Testing**: Various systems of I.C. Engine, Lubrication system, function of lubricating system. Cooling system etc., Testing and performance, Variable speed test of S.I. Engine, Constant speed load tests of C.I. Engines, Morse tests.

**BOOKS:** Mathur M.L. and Sharma R.P. : A Course in internal combustion engines, Dhanpat Rai and Sons, (1980).

**REFERENCE BOOKS:**

Ganeshan V. : Internal Combustion Engines, McGraw Hill Company, Newton and Steed : Automobile Engineering, ELBS Publishing,  
 Narang G.B.S. : Automobile Engineering, Dhanpat Rai and Sons,

## Section – II (Refrigeration and Air-conditioning)

5. **Air Cycle Refrigeration:** Air refrigeration system, Bell-Coleman air cycle, Bootstrap system, aircraft refrigeration systems, actual cycle, ramming, compression and turbine efficiencies, C.O.P.
6. **Vapor Compression and Absorption Refrigeration:** Analysis of vapor compression cycle, heat balance, compound compression with intercooler, Multi-evaporation, cascading, Vapour absorption system, Basic cycle, Thermodynamic analysis of absorption system, Non-conventional systems, Losses and efficiencies of components, Desirable properties of refrigerants and solvents.
7. **Psychometry and Psychometric Processes:** Preparation of psychometric charts, choice of coordinates, temperatures, enthalpy deviation, psychometric measurements, mixing process, bypass factor, apparatus dew point, sensible heat factor, adiabatic humidification, efficiency of humidification, hot water and cold water humidification, enthalpy-potential.
8. **Air Conditioning & Ventilation Systems:** Humidifiers, air coolers, dehumidifiers, air cleaning, impurities in air and air cleaners, air washers, ducts, pressure drop in ducts, Load Calculation..

- **Term work:** -

The term work shall be based on experimental and analytical work on topics mentioned above

- **Practical & Oral:** -

The candidate shall be examined orally / practically on the base of above term work.

### **BOOKS:**

1. Thermal Engineering by Mathur & Mehta.
2. Advances in refrigeration and air conditioning by P. S. Desai.

### **REFERENCE BOOKS:**

1. Refrigeration and Air conditioning by Kurmia gupta
2. Refrigeration and air-conditioning by C. P. Arora
3. Refrigeration and Air conditioning by V.K. Jain
4. Principles of Air conditioning by Long
5. Refrigeration & Air Conditioning by Jordan & Priester

**GANPAT UNIVERSITY**  
**B. TECH. SEM. V – MECHANICAL ENGINEERING**  
**ME-503 VIBRATION & BALANCING OF MACHINES**

Teaching scheme (Hrs)			Examination scheme (Marks)							Grand total
			Theory				Practical			
L	P	Total	Int Asses	Sem end		Total	Int Asses	Sem End	Total	
				Marks	Marks					
3	2	5	30	70	3	100	25	25	50	150

**1. Balancing:-**

Introduction, Balancing of single revolving mass, Balancing of several masses revolving in the same plane, Several masses revolving in different planes, Static & Dynamic balancing, Balancing of Reciprocating mass, Partial primary balancing of locomotives, Variation of tractive force, Swaying couple, Hammer blow, Coupled locomotives, Balancing of multi cylinder inline engine, Balancing of V engine, Balancing of Radial engine, Direct and Reverse crank method of balancing, Balancing machine.

**2. Cam Dynamics: -**

Tangent cam, Circular disc cam, Cylindrical cam, Conical cams, Analytical and Graphical methods for determination of velocity and accelerations, Dynamics of high speed cam systems, Polydyne cams, Force analysis of cams, Vibrations in cam, Jump in cam, Shock in cam, Spring surge criteria in high speed cams, Synthesis of cam.

**3. Vibration: -**

Introduction, Types of vibrations, Natural, Damped & Undamped vibration, Forced vibration, Energy method, Rayleigh's method, Differential equation of damped free vibration, Logarithmic decrement, Forced vibrations, Characteristic curves, Single degree & multi degree system vibration, Transverse vibration, Vibration isolation, Torsional vibrations, Equivalent torsional systems with gears, Critical speed of shafts, Critical speed of disc, Critical speed with damping, Introduction to Non linear vibrations, Vibration Measuring Instruments.

• **Term work: -**

The term work shall be based on experimental and analytical work on topics mentioned above

• **Practical & Oral: -**

The candidate shall be examined orally / practically on the base of above term work.

• **Reference Books**

- |   |                     |
|---|---------------------|
| 1. Theory of machines<br>Dhanpat Rai & Son's  | By V.P. Singh       |
| 2. Theory of machines<br>Magraw-Hill public   | By S.S. Ratan       |
| 3. Theory of machines                         | By Haidari          |
| 4. Mechanisms of Machine                      | By rao & Dukkipatti |
| 5. Theory of machines                         | By Sadhu singh      |
| 6. Theory of machines                         | By P.L. Bellani     |
| 7. Mechanical vibrations                      | By G.K groover      |
| 8. Theory of machine & mechanisms             | By Joseph Sigly     |
| 9. Vibration & noise for Engineer             | By Kaiwal Pujara    |
| 10. Mechanical vibration                      | By setc             |
| 11. Theory & practice of mechanical vibration | By Rao & Gupta      |

**GANPAT UNIVERSITY**  
**B. TECH. SEM. V – MECHANICAL ENGINEERING**  
**ME – 504 FLUID POWER ENGINEERING**

Teaching scheme (Hrs)			Examination scheme (Marks)							
			Theory				Practical			Grand Total
L	P	Total	Internal Asses.	Sem End		Total	Internal Asses.	Sem End	Total	
				Marks	Hrs					
4	2	6	30	70	3	100	25	25	50	150

1. **Hydropower Station:** Utilization of energy of water – development of hydraulic power stations – selection of basic parameters for hydro station – types of hydraulic power stations – layout of power station.
2. **Flow through pipes:** Fluid friction, hydraulic gradient of pipe, losses of head due to friction in pipe – siphon pipe- Equivalent size of a pipe - parallel flow through pipes, time of emptying tank through a pipe, time of flow from one reservoir to another through long pipe, branched mains, Hydraulic Power Transmission through pipes, flow through nozzles, Venturi & Orifices , Water hammer.
3. **Principle of working of Turbo – Machinery:**  
Impact of jet on different types of flat and curved plates, fixed and moving, single and series of plates, derivation of condition for maximum efficiency, hinged plate and pipe bends.
4. **Hydraulic Turbines:**  
Classification of turbines, Impulse and reaction, Radial, Axial, and mixed flow turbines, Major components of different turbines, Expressions for work done and efficiency of Pelton wheel, Bucket of Pelton wheel, Size and number of buckets, Single jet and multi jet Pelton wheel, Francis turbine, Kaplan turbine and Propeller turbines.
5. **Performance of Turbines:**  
Specific speed, Range of Specific speed for different turbines, performance curves of turbine, Selection of turbines according to available head, discharge and load, Governing of turbines.
6. **Pump & Compressors:**  
Roto dynamic pumps, Centrifugal turbine pumps and axial flow pumps, constructional features and working theory, pressure rise through impeller, characteristic curves of C.F. pump, Priming, maximum suction limit – Minimum starting speed to deliver the discharge, specific speed of pumps, suction specific speed.  
Centrifugal and axial compressors, Drag and lift on aerofoil blade, pressure rise, Power input, Drag and lift co-efficient. Calculation of pressure ratio, static and total Pressure static and total temperatures, work done, power input factor, and work Done Factor, pressure coefficient, slip factor, compressibility effect, pre-whirl, Compressor

Performance curve, efficiency and losses, surging and stalling.

**7. Miscellaneous Hydraulic Machines :**

Construction & application of Hydraulic Press, Hydraulic Accumulator, Hydraulic Intensifier, Hydraulic Crane, Hydraulic Jack, Hydraulic lift, Hydraulic Ram.

Fluid couplings and fluid torque converter, Hydraulic Dynamometer, Hydraulic clutch.

• **Term work:** -

The term work shall be based on experimental and analytical work on topics mentioned above

• **Practical & Oral:** -

The candidate shall be examined orally / practically on the base of above term work.

**BOOKS &**

1. Fluid mechanics and hydraulic machines by R. K. Bansal
2. Fluid Power Engineering by D.S. Kumar

**REFERENCE BOOKS:**

1. Hydraulic and hydraulic machines by Jagdishlal.
2. Hydraulic Machines by Vasandani
3. Gas turbines & Jet propulsion by Khajuria & Dubey

**GANPAT UNIVERSITY**  
**B. TECH. SEM. V – MECHANICAL ENGINEERING**  
**ME – 505 METAL FORMING & FABRICATION TECHNOLOGY**

Teaching scheme (Hrs)			Examination scheme (Marks)							Grand Total
			Theory				Practical			
L	P	Total	Internal Asses.	Sem End		Total	Internal Asses.	Sem End	Total	
				Marks	Hrs					
3	2	5	30	70	3	100	25	25	50	150

**1. Fundamentals of metal forming:**

Classification of forming processes, mechanics of metal working, temperature in metal working, hot working, cold working, strain rate effects, metallurgical structure, hydrostatic pressure, workability, residual stresses.

**2. Primary metal working and processes:**

A. Forging: Classification of forging processes, forging equipment, forging defects.

B. Rolling of metals: Classification of rolling processes, principle of metal rolling mills, simplified analysis of rolling load, rolling variables, defects in rolled products.

C. Extrusion: Classification of extrusion process, extrusion equipments, hot extrusion, deformation, lubrication and defects in extrusion, cold extrusion, hydrostatic extrusion, extrusion of tubing, production of seamless pipe and tubing.

D. Drawing of rods, wires and tubes: Sizing, coining and embossing.

**3. Cold forming (Sheet metal working):**

A. Drawing: deep drawing, squeezing, bending, blanking, piercing, notching etc., high energy rate forming, spinning, operations and applications.

B. Press work: Types of press, drive mechanisms for presses, feed mechanisms press tools sets, die classification, elements of die and punch design.

**4. Fabrication process:**

A. Welding: Welding process, description of braze welding, forge welding, gas welding, Resistance welding, induction welding, arc welding, electron beam, laser welding, friction welding, thermit welding, flow welding, cold welding, explosion welding, plasma arc welding.

B. The formation of a fusion welded joint, the factors involved, the nature of heat source, the welding arc, the cathode, the arc, powder source characteristics, metal transfer, heat flow, metallurgical reactions with weld pool, contraction of weld deposit.

C. Electrode coatings, electrode classification and selection.

D. Source of current supply for arc welding.

E. Welding defects and their detection.

F. Expansion, contraction, distortion and residual stress in welding, Method of controlling distortion and stress in welding.

G. Soldering and brazing, process description and application.

**5. Press:**

## Types of press, Elements of press tools and Press operations

- **Term work:** -

The term work shall be based on experimental and analytical work on topics mentioned above

- **Practical & Oral:** -

The candidate shall be examined orally / practically on the base of above term work.

### **TEXT BOOKS:**

1. Text Book Of Welding Technology – By O.P. Khanna
2. Production Technology – By Jain & Gupta
3. A Textbook of production engg. - By P.C. Shrama
4. Mechanical Metallurgy – By Dieter

### **REFERENCE BOOKS**

1. Material Science Vol. I & II – By Higgins
2. Manufacturing Process – By Lindberg
3. Manufacturing Process – By Begeman
4. Manufacturing process – By Rusinoff
5. Welding engg. – By B.E. Rosset
6. Fundamentals of Tool Design – By Astme
7. Welding Engineering – By Little

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**GANPAT UNIVERSITY**  
**B. TECH. SEM. V – MECHANICAL ENGINEERING**  
**ME – 506 CAD SOFTWARE PACKAGES**

Teaching scheme (Hrs)			Examination scheme (Marks)							
			Theory				Practical			Grand Total
L	P	Total	Internal Asses.	Sem End		Total	Internal Asses.	Sem. End	Total	
				Marks	Hrs					
--	2	2	--	--	--	--	25	25	50	50

**1. Sketcher**

Configuring for sketcher, Setting sketching environment, Creating sketcher geometry, Modifying sketcher geometry, Dimensioning sketcher geometry, Constraining geometry

**2. Part Modeling**

Basic (Parent child relationship), Base feature, Create datum's features, Edit features, Engineering features, Advanced features, Creating drawing, Working model views, Dimensioning and detailing your models, Controlling drawing details with layers, Importing and exporting data

**3. Assembly**

Creating top-down assemblies, Creating bottom-up assemblies, Placement constraints, Assembly datum planes, Assembling the components, Redefining the components of the assembly, Reordering the components, Modifying the components of the assembly, The bill of material

**4. Introduction To CAD Software Packages**

Pro-Engineer Wild Fire – 3, Nature of Pro-E, System requirements, Important terms and definitions, file menu options, Managing file, Function of mouse, Various toolbars, ANSYS, Inventor.

- **Term work:** -

The term work shall be based on experimental and analytical work on topics mentioned above

- **Practical & Oral:** -

The candidate shall be examined orally / practically on the base of above term work.

**Reference Books:**

Pro-Engineer wildfire for engineers & designers (Release – 2.0) By Sham Tikoo