STATE BOARD OF TECHNICAL EDUCATION BIHAR

Scheme of Teaching and Examinations for
IIIrd SEMESTER DIPLOMA IN MECHANICAL ENGINEERING
(Effective from Session 2020· 21Batch)

THEORY

Sr. No.	SUBJECT	SUBJECT CODE	Periods per Week	Hours of Exam.	Teacher's Assessment (TA) Marks A	Class Test (CT) Marks B	End Semester Exam (ESE) Marks C	Total Marks (A+B+C)	Pass Marks ESE	Pass Marks in the Subject	Credits
1.	Basic Mechanical Engineering	2025301	03	03	10	20	70	100	28	40	03
2.	Material Science & Engineering	2025302	04	03	10	20	70	100	28	40	03
3.	Fluid Mechanics & Hydraulic Machinery	2025303	04	03	10	20	70	100	28	40	03
4.	Manufacturing Engineering- I	2025304	04	03	10	20	70	100	28	40	03
5.	Thermal Engineering - I	2025305	04	03	10	20	70	100	28	40	03
		Total: ·	19				350	500			15

PRACTICAL

Sr. No.	SUBJECT	SUBJECT CODE	Periods per	Hours of Exam.	Internal(PA)	External (ESE))	Total	Pass	Credits
6.	Manufacturing Engineering Lab	2025306	02 50% Physical 50% Virtual	03	15	35	50	20	01
7.	Fluid Mechanics & Hydraulic Machinery Lab	2025307	02 50% Physical 50% Virtual	03	07	18	25	10	01
8.	Web Technology Lab	2018308	02 50% Physical 50% Virtual	03	07	18	25	10	01
9.	Thermal Engineering Lab-I	2025309	02 50% Physical 50% Virtual	03	07	18	25	10	01
			Total: – 08				125		04

TERM WORK

Sr. No.	SUBJECT	SUBJECT CODE	Periods per Week	Marks of Internal Examiner (PA)	Marks of External (ESE)	Total Marks	Pass Marks in the Subject	Credits
10.	Essence of Indian Knowledge and Tradition	2025310	4	15	35	50	20	02
11.	Python	2018311	2	07	18	25	10	01
12.	Summer Intern ship-I (4 weeks)	2025312	-	15	35	50	20	02
			Total: - 06			125		05
Total Periods per week Each of duration One Hour		33		Total Marks = 750				24

BASIC MECHANICAL ENGINEERING

Subject Code	Theory							Credits
2025301	No. of Periods Per Week			Full Marks	:	100		03
	L	**T**	**P/S**	ESE	:	70		
	03	—	—	TA	:	10		
	—	—	—	CT	:	20		

Course objectives:

- To understand General Principles of Mechanical Engineering.
- To understand laws of thermodynamics, thermal and thermodynamic Processes.
- To understand working principles of power developing and power absorbing devices.
- To understand basic materials and manufacturing processes.

CONTENTS: THEORY

Unit	Name of Topics	Hrs.
Unit-I	**1.1** Introduction to Thermodynamics - Role of Thermodynamics in Engineering and Science, Types of Systems, Thermodynamic Equilibrium, Properties, State, Process and Cycle, **1.2** Elementary introduction to Zeroth, First and Second laws of thermodynamics, Heat and Work Interactions for various non-flow and flow processes; **1.3** Concept of Heat Engine, Heat Pump & Refrigerator, Efficiency/ COP; Kelvin- Planck and Clausius Statements, Carnot Cycle, Carnot Efficiency, T-S and P-V Diagrams, Concept of Entropy (Definition and simple problems only).	**12**
Unit-II	**2.1** Heat transfer & Thermal Power Plant - Modes of Heat Transfer; Conduction: Composite Walls and Cylinders, Combined Conduction and Convection: **2.2** Overall Heat Transfer Co- efficient, Simple Numerical Problems: Thermal Power Plant Layout; Rankine Cycle; **2.3** Fire Tube and Water Tube boilers, Babcock & Wilcox, Cochran Boilers; (Related simple problems only).	**12**
Unit-III	**3.1** Steam Turbines - Impulse and Reaction Turbines; Condensers: Jet & Surface Condensers, Cooling Towers; **3.2** Internal Combustion Engines and Refrigeration: Otto, Diesel and Dual cycles; P-V and T-S Diagrams; IC Engines: 2 – Stroke and 4– Stroke I.C. Engines, S.I. and C.I. Engines	**14**
Unit-IV	**4.1** Materials and Manufacturing Processes - Engineering Materials, Classification and their Properties; Metal Casting, Moulding, Patterns, **4.2** Metal Working: Hot Working and Cold Working, Metal Forming: Extrusion, Forging, Rolling, Drawing, **4.3** Gas Welding, Arc Welding, Soldering, and Brazing.	**14**
Unit-V	**5.1** Machine Tools and Machining Processes - Machine Tools: Lathe Machine and types, Lathe Operations, **5.2** Milling Machine and types, Milling Operations, Shaper and Planer Machines: Differences, **5.3** Quick-Return Motion Mechanism, Drilling Machine: Operations, Grinding Machine: Operations	**8**

References:
1. Basic Mechanical Engineering – M.P. Poonia & S.C. Sharma, Khanna Publishing House, Delhi
2. Elements of Mechanical Engineering – M. L. Mathur, F. S. Mehta and R. P. Tiwari, Jain Brothers, New Delhi
3. Engineering Heat Transfer – Gupta & Prakash, Nem Chand & Brothers, New Delhi
4. Workshop Technology (Vol. 1 and 2) – B. S. Raghuvanshi, Dhanpath Rai and Sons, New Delhi.
5. Basic Mechanical Engineering – J Benjamin
6. Elements of Mechanical Engineering – Roy and Choudhary
7. Engineering Thermodynamics – Spalding and Cole
8. Basic Mechanical Engineering   Dinesh Agarwal, Naweed   FPH

Course outcomes:
At the end of the course, the student will be able to:

CO1	Understand basics of thermodynamics and components of a thermal power plant
CO2	Understand basics of heat transfer, refrigeration and internal combustion engines
CO3	Understand mechanism of thermal power plant and boiler operation
CO4	Identify engineering materials, their properties, manufacturing methods encountered in engineering practice
CO5	Understand functions and operations of machine tools including milling, shaping, grinding and lathe machines

MATERIAL SCIENCE & ENGINEERING

Subject Code **2025302**	Theory						Credits **03**
	No. of Periods Per Week			Full Marks	:	100	
	L	T	P/S	ESE	:	70	
	04	—	—	TA	:	10	
	—	—	—	CT	:	20	

Course objectives:

- To understand crystal structures and atomic bonds.
- To understand the properties of different types of ferrous metals and alloys.
- To understand the properties of different types of non-ferrous metals and alloys.
- To understand various metallic failures and acquire the knowledge of testing of materials.
- To understand the concept of corrosion and its prevention.

CONTENTS: THEORY

Unit	Name of Topics	Hrs.
Unit-I	1.1 Crystal structures and Bonds - Unit cell and space lattice: Crystal system: The seven basic crystal systems; Crystal structure for metallic elements: BCC, FCC and HCP; Coordination number for Simple Cubic, BCC and FCC; Atomic radius: definition, atomic radius for Simple Cubic, BCC and FCC; Atomic Packing Factor for Simple Cubic, BCC, FCC and HCP; Simple problems on finding number of atoms for a unit cell. 1.2 Bonds in solids – Classification of primary or chemical bond, secondary or molecular bond; Types of primary bonds: Ionic, Covalent and Metallic Bonds; Types of secondary bonds: Dispersion bond, Dipole bond and Hydrogen bond.	12
Unit-II	2.1 Phase diagrams, Ferrous metals and its Alloys - Isomorphs, eutectic and eutectoid systems; Iron-Carbon binary diagram; Iron and Carbon Steels; flow sheet for production of iron and steel; 2.2 Iron ores – Pig iron: classification, composition and effects of impurities on iron; Cast Iron: classification, composition, properties and uses; Wrought Iron: properties, uses/applications of wrought Iron; comparison of cast iron, wrought iron and mild steel and high carbon steel; 2.3 standard commercial grades of steel as per BIS and AISI; Alloy Steels – purpose of alloying; effects of alloying elements – Important alloy steels: Silicon steel, High Speed Steel (HSS), heat resisting steel, spring steel, Stainless Steel (SS): types of SS, applications of SS – magnet steel –composition, properties and uses	12
Unit-III	3.1 Non-ferrous metals and its Alloys - Properties and uses of aluminium, copper, tin, lead, zinc, magnesium and nickel; Copper alloys: Brasses, bronzes – composition, properties and uses; Aluminium alloys: Duralumin, hindalium, magnalium -composition, properties and uses; Nickel alloys: Inconel, monel, nichrome – composition, properties and uses. 3.2 Anti-friction/Bearing alloys: Various types of bearing bronzes - Standard commercial grades as per BIS/ASME.	12

Unit-IV	**4.1** Failure analysis & Testing of Materials - Introduction to failure analysis; Fracture: ductile fracture, brittle fracture; cleavage; notch sensitivity; fatigue; endurance limit; characteristics of fatigue fracture; variables affecting fatigue life; creep; creep curve; creep fracture;	**12**
	4.2 Destructive testing: Tensile testing; compression testing; Hardness testing: Brinell, Rockwell; bend test; torsion test; fatigue test; creep test.	
	4.3 Non-destructive testing: Visual Inspection; magnetic particle inspection; liquid penetrant test; ultrasonic inspection; radiography.	
Unit-V	**5.1** Corrosion & Surface Engineering - Nature of corrosion and its causes; Electrochemical reactions; Electrolytes; Factors affecting corrosion: Environment, Material properties and physical conditions; Types of corrosion; Corrosion control: Material selection, environment control and design;	**12**
	5.2 Surface engineering processes: Coatings and surface treatments; Cleaning and mechanical finishing of surfaces; Organic coatings; Electroplating and Special metallic plating; Electro polishing and photo-etching; Conversion coatings: Oxide, phosphate and chromate coatings; Thin film coatings: PVD and CVD;	
	5.3 Surface analysis; Hard-facing, thermal spraying and high- energy processes; Process/material selection. Pollution norms for treating effluents as per standards.	

Reference Books:

1. A Text Book of Material Science & Metallurgy – O.P. Khanna, Dhanpath Rai and Sons, New Delhi. 2003.
2. Material Science & Engineering – R.K. Rajput, S.K. Kataria & Sons, New Delhi, 2004.
3. Material Science – R.S. Khurmi, S. Chand & Co. Ltd., New Delhi, 2005.
4. Material Science and Engineering   Arun Jain, K.P.Singh   FPH

Course outcomes

At the end of the course, the student will be able to:

CO1 Explain about crystal structures and atomic bonds.
CO2 Describe about classification of ferrous metals and their properties.
CO3 Explain about non-ferrous metals, cutting tool materials and composites along with their properties.
CO4 Describe about the various metallic failures and knowledge in testing of materials.
CO5 Explain the principle of corrosion, their types and its prevention methods along with the various surface engineering processes.

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FLUID MECHANICS & HYDRAULIC MACHINERY

Subject Code	Theory						Credits
2025303	**No. of Periods Per Week**			**Full Marks**	:	100	**03**
	L	**T**	**P/S**	**ESE**	:	70	
	04	—	—	**TA**	:	10	
	—	—	—	**CT**	:	20	

Course objectives:
- To understand fluid flow & related machinery for power generation, water supply and irrigation.
- To Select and use appropriate flow measuring device.
- To Select and use appropriate pressure measuring device.
- To understand and analyze the performance of pumps and turbines.

CONTENTS: THEORY

Unit	Name of Topics	Hrs.
Unit-I	**1.1** Properties of fluid - Density, Specific gravity, Specific Weight, Specific Volume, Dynamic Viscosity, Kinematic Viscosity, Surface tension, Capillarity, Vapour Pressure, Compressibility. **1.2** Fluid Pressure & Pressure Measurement - Fluid pressure, Pressure head, Pressure intensity, Concept of vacuum and gauge pressures, atmospheric pressure, absolute pressure, Simple and differential manometers, Bourdon pressure gauge, **1.3** Concept of Total pressure on immersed bodies, center of pressure, Simple problems on Manometers.	**12**
Unit-II	**2.1** Fluid Flow - Types of fluid flows, Path line and Stream line, Continuity equation, Bernoulli's theorem, **2.2** Principle of operation of Venturimeter, Orifice meter and Pitot tube, Derivations for discharge, coefficient of discharge and numerical problems. **2.3** Flow Through Pipes- Laminar and turbulent flows; Darcy's equation and Chazy's equation for frictional losses, Minor losses in pipes, Hydraulic gradient and total gradient line, Numerical problems to estimate major and minor losses	**14**
Unit-III	**3.1** Impact of jets - Impact of jet on fixed vertical, moving vertical flat plates, Impact of jet on curved vanes with special reference to turbines & pumps, Simple Numerical on work done and efficiency.	**12**
Unit-IV	**4.1** Hydraulic Turbines – Layout of hydroelectric power plant, Features of Hydroelectric power plant, Classification of hydraulic turbines, Selection of turbine on the basis of head and discharge available, **4.2** Construction and working principle of Pelton wheel, Francis and Kaplan turbines, Draft tubes– types and construction, Concept of cavitation in turbines, **4.3** Calculation of Work done, Power, efficiency of turbines, Unit quantities and simple numerical.	**10**

Unit-V	**5.1** Centrifugal Pumps **-** Principle of working and applications, Types of casings and impellers,	**12**
	5.2 Concept of multistage, Priming and its methods, Cavitation, Manometric head, Work done, Manometric efficiency, Overall efficiency. Numerical on calculations of overall efficiency and power required to drive pumps.	
	5.3 Reciprocating Pumps- Construction, working principle and applications of single and double acting reciprocating pumps, Concept of Slip, Negative slip, Cavitation and separation.	

Reference Books:

1. Fluid Mechanics & Hydraulic Machines, S.S. Rattan, Khanna Publishing House, New Delhi

2. Hydraulic, fluid mechanics & fluid machines – Ramamrutham S, Dhanpath Rai and Sons, New Delhi.

3. Hydraulics and fluid mechanics including Hydraulic machines – Modi P.N. and Seth S.M., Stan- dard Book House. New Delhi

4. One Thousand Solved Problems in Fluid Mechanics – K. Subramanya, Tata McGraw Hill. 5.Hydraulic, fluid mechanics & fluid machines – S. Ramamrutham, Dhanpat Rai and Sons, New Delhi

6. Fluid Mechanics and Hydraulic Machines – R. K. Bansal, Laxmi Publications, New Delhi

7.   Fluid Mechanics and Hydraulic Machinery   **Manish Sinha**   **FPH**

Course outcomes:

At the end of the course, the student will be able to:

i. Measure various properties such as pressure, velocity, flow rate using various instruments.
ii. Calculate different parameters such as co-efficient of friction, power, efficiency etc. of various Systems.
iii. Describe the construction and working of turbines and pumps.
iv. Test the performance of turbines and pumps.
v. Plot characteristics curves of turbines and pumps.

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MANUFACTURING ENGINEERING – I

Subject Code	Theory						Credits
2025304	No. of Periods Per Week			Full Marks	:	100	03
	L	T	P/S	ESE	:	70	
	04	—	—	TA	:	10	
	—	—	—	CT	:	20	

Course objectives:

- To understand the importance of cutting fluids & lubricants in machining.
- To study various types of basic production processes. To select, operate and control the appropriate processes for specific applications.
- To understand the concept of gear making and list various gear materials.
- To understand the importance of press tools and understand various die operations.
- To understand Grinding and finishing processes.

CONTENTS: THEORY

Unit	Name of Topics	Hrs.
Unit-I	**1.1** Cutting Fluids & Lubricants -Introduction; Types of cutting fluids, Fluids and coolants required in turning, drilling, shaping, sawing & broaching; Selection of cutting fluids, methods of application of cutting fluid; Classification of lubricants (solid, liquid, gaseous), Properties and applications of lubricants. **1.2** Lathe Operations – Types of lathes – light duty, medium duty and heavy duty geared lathe, CNC lathe; Specifications; Basic parts and their functions; Operations and tools – Turning, parting off, Knurling, facing, Boring, drilling, threading, step turning, taper turning.	12
Unit-II	**2.1** Broaching Machines - Introduction to broaching; Types of broaching machines – Horizontal type (Single ram & duplex ram), Vertical type, pull up, pull down, and push down; Elements of broach tool; broach teeth details; Nomenclature; Tool materials. **2.2** Drilling – Classification; Basic parts and their functions; Radial drilling machine; Types of operations; Specifications of drilling machine; Types of drills and reamers.	10
Unit-III	**3.1** Welding - Classification; Gas welding techniques; Types of welding flames; Arc Welding – Principle, Equipment, Applications; Shielded metal arc welding; Submerged arc welding; TIG / MIG welding; Resistance welding - Spot welding, Seam welding, Projection welding; Welding defects. Welding defects; Brazing and soldering: Types, Principles, Applications. **3.2** Milling – Introduction; Types of milling machines: plain, Universal, vertical; constructional details, specifications; Milling operations: simple, compound and differential indexing; Milling cutters – types; Nomenclature of teeth; Teeth materials; Tool signature of milling cutter; Tool & work holding devices.	10

Unit-IV	**4.1** Gear Making - Manufacture of gears – by Casting, Moulding, Stamping, Coining Extruding, Rolling, Machining; Gear generating methods: Gear Shaping with pinion cutter & rack cutter; **4.2** Gear hobbing; Description of gear hob; Operation of gear hobbing machine; Gear finishing processes; Gear materials and specification; Heat treatment processes applied to gears. **4.3** Press working – Types of presses and Specifications, Press working operations – Cutting, bending, drawing, punching, blanking, notching, lancing; Die set components- punch and die shoe, guide pin, bolster plate, stripper, stock guide, feed stock, pilot; Punch and die clearances for blanking and piercing, effect of clearance.	**12**
Unit-V	**5.1** Grinding and finishing processes - Principles of metal removal by Grinding; Abrasives – Natural & Artificial; Bonds and binding processes: Vitrified, silicate, shellac, rubber, Bakelite. **5.2** Factors affecting the selection of grinding wheels: size and shape of wheel, kind of abrasive, grain size, grade and strength of bond, structure of grain, spacing, kinds of binding material; **5.3** Standard marking systems: Meaning of letters & numbers sequence of marking, Grades of letters; **5.4** Grinding machines classification: Cylindrical, Surface, Tool & Cutter grinding machines; Construction details; Principle of centerless grinding; Advantages & limitations of center less grinding; Finishing by grinding: Honing, Lapping, Super finishing; Electroplating: Basic principles, Plating metals, applications; **5.5** Hot dipping: Galvanizing, Tin coating, Parkerizing, Anodizing; Metal spraying: wire process, powder process and applications; **5.6** Organic coatings: Oil base Paint, Lacquer base, Enamels, Bituminous paints, rubber base coating; finishing specifications.	**16**

Reference Books:
1.   **Manufacturing technology – P N Rao, Tata McGraw-Hill Publications**
2.   **Elements of workshop Technology (Volume I & II) – S. K. Hajra Chaudary, Bose & Roy, Media Promoters and Publishers Limited.**
3.   **Production Technology (Volume I & II) – O. P. Khanna & Lal, Dhanpat RaiPublications.**
4.   **Fundamental of metal cutting and machine tools– B. L. Juneja, New age international limited.**
5.   **Manufacturing Technology, Metal Cutting & Machine tools– P. N. Rao, Tata McGraw-Hill Publications**
6.   **Production Technology – R.B. Gupta, Satya Prakashan, New Delhi**

7.   **Production Processes**   **Ram manohar Pandey**   **FPH**
8.   **Manufacturing Engineering -I**   **Rajendra Duggar**   **FPH**

Course outcomes:
At the end of the course, the student will be able to:
CO1   Know and identify basic manufacturing processes for manufacturing different compo- nents.
CO2   Operate & control different machines and equipment's.
CO3   Produce jobs as per specified dimensions and inspect the job for specified dimensions. CO4   Select the specific manufacturing process for getting the desired type ofoutput.
CO5   Adopt safety practices while working on various machines.
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THERMAL ENGINEERING – I

Subject Code	Theory						Credits
2025305	No. of Periods Per Week			Full Marks	:	100	03
	L	**T**	**P/S**	ESE	:	70	
	04	**—**	**—**	TA	:	10	
	—	**—**	**—**	CT	:	20	

Course Learning Objectives:
- To give a good understanding of and thorough insight into all important aspects of thermal systems, energy control and the general issue of energy.
- To understand the principles & working of various power producing & power absorbing de- vices.
- To study, analyze and evaluate the operation and the performance of I.C. engines, compressors and refrigerators, to apply pinch technology and to critically analyze and describe the global behavior of integrated thermal systems.

CONTENTS: THEORY

Unit	Name of Topics	Hrs.
Unit-I	**1.1** Sources of Energy - Brief description of energy Sources: Classification of energy sources- Renewable, Non-Renewable; Fossil fuels, including CNG, LPG; **1.2** Solar Energy: Flat plate and concentrating collectors & its applications (Solar Water Heater, Photovoltaic Cell, Solar Distillation); **1.3** Wind Energy; Tidal Energy; Ocean Thermal Energy; Geothermal Energy; Biogas, Biomass, Bio-diesel; Hydraulic Energy, Nuclear Energy; Fuel cell.	**08**
Unit-II	**2.1** Internal Combustion Engines - Assumptions made in air standard cycle analysis; Brief description of Carnot, Otto and Diesel cycles with P-V and T-S diagrams; Internal and external combustion engines; advantages of I.C. engines over external combustion engines; **2.2** Classification of I.C. engines; neat sketch of I.C. engine indicating component parts; Function of each part and materials used for the component parts - Cylinder, crank case, crank pin, crank, crank shaft, connecting rod, wrist pin, piston, cooling pins cylinder heads, exhaust valve, inlet valve; **2.3** Working of four-stroke and two-stroke petrol and diesel engines; Comparison of two stroke and four stroke engines; Comparison of C.I. and S.I. engines; Valve timing and port timing diagrams for four stroke and two stroke engines. (Related simple problems only).	**12**
Unit-III	**3.1** I.C. Engine Systems - Fuel system of Petrol engines; Principle of operation of simple and Zenith carburetors; Fuel system of Diesel engines; Types of injectors and fuel pumps; **3.2** Cooling system-air-cooling, water-cooling system with thermosiphon method of circulation and water-cooling system with radiator and forced circulation (description with line diagram). Comparison of air cooling and water-cooling system; **3.3** Ignition systems – Battery coil ignition and magneto ignition (description and working). Comparison of two systems; **3.4** Types of lubricating systems used in I.C. engines with line diagram; Types of governing of I.C.	**12**

	engines – hit and miss method, quantitative method, qualitative method and combination methods of governing; their applications; Objective of super charging. (Related simple problems only).	
Unit-IV	**4.1** Performance of I.C. Engines **-** Brake power; Indicated power; Frictional power; Brake and Indicated mean effective pressures; Brake and Indicated thermal efficiencies; Mechanical efficiency; Relative efficiency; **4.2** Performance test; Morse test; Heat balance sheet; Methods of determination of B, P., I.P. and F.P.; Simple numerical problems on performance of I.C. engines.	**14**
Unit-V	**5.1** Air Compressors **-** Functions of air compressor; Uses of compressed air; Types of air compressors; Single stage reciprocating air compressor - its construction and working (with line diagram) using P-V diagram; Multi stage compressors – Advantages over single stage compressors; Rotary compressors: Centrifugal compressor, axial flow type compressor and vane type compressors. **5.2** Refrigeration & Air- conditioning Refrigeration; Refrigerant; COP; Air Refrigeration system: components, working & applications; Vapour Compression system: components, working & applications; Air conditioning; Classification of Air- conditioning systems; Comfort and Industrial Air-Conditioning; Window Air-Conditioner; Summer Air-Conditioning system, Winter Air-Conditioning system, Year-round Air- Conditioning system. (Related simple problems only).	**14**

Reference Books:
1. **Introduction to Renewable Energy – Vaughn Nelson, CRC Press**
2. **Thermal Engineering – P.L. Ballaney, Khanna Publishers, 2002**
3. **A Course in Thermal Engineering – S. Domkundwar & C.P. Kothandaraman, Dhanpat Rai.**
4. **Thermal Engineering – R.S. Khurmi and J.K. Gupta, 18th Edition, S. Chand & Co,NewDelhi.**
5. **Thermal Engineering – R. K. Rajput,8th Edition, Laxmi publications Pvt Ltd, New Delhi.**
6. **Thermal Engieering**   **Rajeev Singh**   **FPH**
7. **Thermal Engieering -I**   **Sanjay Malhotra**   **FPH**

Course outcomes:
At the end of the course, the student will be able to:

- **CO1**   **Know various sources of Energy and their applications.**
- **CO2**   **Classify I.C. engines and understand their working and constructional features.**
- **CO3**   **Draw the energy flow diagram of an I.C. engine and evaluate its performance.**
- **CO4**   **Describe the constructional features of air compressor and working of different air compressors.**
- **CO5**   **Know the applications of refrigeration and Classify air-conditioning systems.**

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MANUFACTURING ENGINEERING LAB

Subject Code	Practical						Credits
	No. of Periods Per Week			Full Marks	:	50	
2025306	L	T	P/S	Internal (PA)	:	15	**01**
	—	—	02	External (ESE)	:	35	

Course Objectives:
- To Practice the casting principles and operations in foundry.
- To Practice the operation of Lathe.
- To Practice the joining of metals using different Welding techniques.

Course Content:

S.No.   Topics for practice
I   Moulding & casting of (i) Connecting rod (ii) Solid bearing (iii) V-Pulley/Gear Pulley
II   Arc welding (i) Lap Joint (ii) Butt Joint (iii) T- Joint
III   Gas welding (i) Lap Joint (ii) Butt Joint
IV   Spot welding (i) Lap Joint
V   Turning Exercise (i) Facing, Step Turning & Chamfering (ii) Step Turning & Taper Turning
         (iii) Step Turning & Groove Cutting (iv) Step Turning & Knurling (v) Step Turning &
         Thread Cutting (vi) Turning and Drilling
VI   Grinding the Lathe Cutting tools to the required angles
VII   Study of Lathe, drilling machine, shaping machine and slotting machine
VIII   The dismantling some of the components of lathe and then assemble the same
IX   List the faults associated with lathe and its remedies
X   The routine and preventive maintenance procedure for lathe

Reference Books:
1.   Elements of Workshop Technology (Volume I & II) – Hajra Chowdry & Bhattacharaya, Media Promoters, 11th Edition, 2007
2.   Introduction of Basic Manufacturing Processes and Workshop Technology – Rajender singh, new age International (P) Ltd. New Delhi, 2006
3.   Workshop Technology – Raghuwanshi, Khanna Publishers. Jain &Gupta, New Delhi, 2002
4.   Production Technology – Jain & Gupta, Khanna Publishers, New Delhi, 2006.
5.   Production Technology – HMT, 18th edition, Tata McGraw Hill, New Delhi
6.   Manufacturing process – Myro N Begman, 5 th edition, Tata McGraw Hill, New Delhi

Course outcomes:
At the end of the course, the student will be able to:

CO1 Prepare a mould sand mix and molten metal and calculate the amount of metal to be poured in the mould
CO2 Centre the job and select the proper tool to perform the job on lathe machine. CO3 Calculate the taper angle and practice different taper turning methods on lathe.
CO4 Prepare the edges for welding and select the suitable electrode, voltage and current.
CO5 Operate the welding transformer and generator to perform various weld joint operations.

FLUID MECHANICS & HYDRAULIC MACHINERY LAB

Subject Code	Practical						Credits
	No. of Periods Per Week			Full Marks	:	25	
2025307	L	T	P/S	Internal (PA)	:	07	01
	—	—	02	External (ESE)	:	18	

Course Objectives:
- To calibrate the given flow measuring device.
- To apply the knowledge acquired in theory subject.
- To analyze the performance of turbines and pumps.

Course Content:

S. No.	Topics for practice
I	Verification of Bernoulli's theorem.
II	Determination of Coefficient of Discharge of Venturi meter.
III	Determination of Coefficient of Discharge, coefficient of contraction and coefficient of velocity of Orifice meter.
IV	Determination of coefficient of friction of flow through pipes.
V	Determination of force exerted by the jet of water on the given vane.
VI	Determination of minor losses of flow through pipes.
VII	Calibration of pressure gauge using dead weight pressure gaugetester.
VIII	Trial on centrifugal pump to determine overall efficiency.
IX	Trial on reciprocating pump to determine overall efficiency.
X	Trial on Pelton wheel to determine overall efficiency.
XI	Trial on Francis/Kaplan turbine to determine overall efficiency.

Reference Books:

N. Kumara Swamy, Fluid Mechanics and Machinery Laboratory Manual, Charotar Publishing House Pvt. Ltd., ANAND 388 001, Ed. 2008

Course outcomes:

At the end of the course, the student will be able to:
CO1 Measure various properties such as pressure, velocity, flow rate using various instruments.
CO2 Calculate different parameters such as co-efficient of friction, power, efficiency etc. of various systems.
CO3 Understand the need and importance of calibration of pressure gauges.
CO4 Describe the construction and working of turbines and pumps.
CO5 Test the performance of turbines and pumps and Plot characteristics curves.

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WEB TECHNOLOGY LAB

SUBJECT CODE: 2018308	Practical						Credits
	No. of Periods per Week			Full Marks:	:	25	**01**
	L	T	P/S				
	-		02	Internal	:	07	
				External	:	18	

Course Learning Objectives:

This Lab course is intended to practice whatever is taught in theory class of 'Web Technologies'. Some of the things that should necessary be covered in lab.

Course outcomes:

Student will be able to program web applications using and will be able to do the following:

- Use LAMP Stack for web applications
- Write simple applications with Technologies like HTML, Java script, AJAX, PHP
- Connect to Database and get results
- Parse XML files Student will be able to develop/build a functional website with full features.

	Content: Practical	**Hrs.**	**Marks**
Unit – 1	Home page Development static pages (using Only HTML) of an online Book store.	04	
Unit – 2	Write a JavaScript to design a simple calculator to perform the following operations: sum, product, difference and quotient.	06	
Unit – 3	Write a PHP program to display a digital clock which displays the current time of the server.	06	
Unit – 4	Write an HTML code to display your CV on a web page.	04	
Unit – 5	Write an XML program to display products.	05	
Unit – 6	Create a web page with all types of Cascading style sheets.	06	
Unit – 7	Write a PHP program to display a digital clock which displays the current time of the server.	05	
Unit – 8	Write a JavaScript that calculates the squares and cubes of the numbers from 0 to 10 and outputs HTML text that displays the resulting values in an HTML table format.	04	

This is a skill course. More student practice and try to find solution on their own, better it will be.

Reference Books:

1. "Web Technologies--A Computer Science Perspective", Jeffrey C.Jackson
2. "Internet & World Wide Web How to Program", Deitel, Deitel, Goldberg, Pearson Education
3. "Web programming- Building Internet Application", Chris Bales
4. Web Applications: Concepts and Real World Design, Knuckles

Thermal Engineering Lab – I

Subject Code	Practical						Credits
	No. of Periods Per Week			Full Marks	:	25	
2025309	L	T	P/S	Internal (PA)	:	07	01
	—	—	02	External (ESE)	:	18	

Course Objectives:
- To understand the importance of fuel properties and learn the methods of determination of various properties of fuels.
- To understand the working principles of various methods used in determination of properties of fuels.
- To observe different parts of I.C. engine and understand their working.
- To identify the physical differences between S.I. and C.I. engines and 2-S and 4-S engines.

Course Content:

S.No.   Topics for practice
I   Flash & Fire point tests using Abel's/Cleveland/Pensky Martin Apparatus
II   Viscosity measurement using Say bolt viscometer
III   Calorific value tests using Bomb Calorimeter (Solid and Liquid fuels) and Junkers Gas Calorimeter (Gaseous fuels)
IV   Carbon residue test using Conradson's apparatus.
V   Assembling and disassembling of I.C. Engines
VI   Port timing diagram of Petrol engine
VII   Port timing diagram of Diesel engine VIII   Valve timing diagram of Petrol engine IX Valve timing diagram of Diesel engine
VIII   Study of petrol and diesel engine components and Models Reference Books:
1.   Thermal Engineering – P.L. Ballaney, Khanna Publishers, 2002
2.   A Course in Thermal Engineering – S. Domkundwar & C.P. Kothandaraman, Dhanpat Rai & Publication New Delhi
3.   Thermal Engineering – R.S. Khurmi and J.K. Gupta, 18th Edition, S. Chand & Co, New Delhi

Course outcomes:
At the end of the course, the student will be able to:
CO1   Understand the determination of flash and fire point of a given sample of fuel using given apparatus (Abels, Cleveland & Penesky martin)
CO2   Understand the determination of Viscosity of a given sample of oil using given apparatus.
CO3   Understand the determination of Calorific value of a given sample of fuel using given apparatus.
CO4   Understand the determination of amount of carbon residue of a given sample of petroleum product.
CO5   Draw VTD /PTD of given I.C. Engine and understand how the processes are controlled during its operation.
CO6   Understand the functions of various parts of IC engines and the working of IC engines.

ESSENCE OF INDIAN KNOWLEDGE AND TRADITION

Subject Code 2025310	Practical			No. of Period in one session: 50			Credits
	No. of Periods Per Week			Full Marks	:	50	
	L	T	P/S	Internal (PA)	:	15	
	—	—	04	External (ESE)	:	35	02

Course Content:

Basic Structure of Indian Knowledge System:

• Basic Structure of Indian Knowledge System:

(i) वेद, (ii) उन्नवेद (आयुर्वेद, धनुवेद, गन्धवेद, स्थानत्य आदद) (iii) वेदांग (शिक्षा, कल्न, ननरुत, व्याकरण, ज्योनतष छांद), (iv) उनाइग (धर्म सि, रीरांसा, नुराण, तकमिास)

• Modern Science and Indian Knowledge System

• Yoga and HolisticHealthcare

• Case Studies.

SUGGESTED TEXT/REFERENCE BOOKS:

S. No.	Title of Book	Author	Publication
1.	Cultural Heritage of In- dia-Course Material	V. Sivaramakrishna	Bharatiya Vidya Bhavan, Mumbai, 5th Edition, 2014
2.	Modern Physics and Vedant	Swami Jitatmanand	Bhartiya Vidya Bhavan
3.	The wave of Life	Fritzof Capra	
4.	Tao of Physics	Fritzof Capra	
5.	Tarkasangraha of Annam Bhatta, Inernational	V N Jha	Chinmay Foundation, Velliarnad, Amaku,am
6.	Science of Consciousness Psychotherapy and Yoga Practices	RN Jha	Vidyanidhi Prakasham Delhi, 2016

PYTHON (Term Work)

Subject Code 2018311	Term Work						Credits
	No. of Periods Per Week			Full Marks	:	25	01
	L	T	P/TW				
	—	—	02	Internal (PA)	:	07	
	—	—	—	External (ESE)	:	18	

	CONTENTS: Practical	Hrs.	Marks
UNIT – 01	Write a program to demonstrate basic data type in python.		
UNIT – 02	Write a program to compute distance between two points taking input from the user (Pythagorean Theorem)		
UNIT – 03	Write a python program Using for loop, write a program that prints out the decimal equivalent of $1+\frac{1}{2}+1/3\ldots.1/n$		
UNIT – 04	Write a Python program to find first n prime numbers. Write a program to demonstrate list and tuple in python.		
UNIT – 05	Write a program using a for loop that loops over a sequence. Write a program using a while loop that asks the user for a number and prints a countdown from that number to zero.		
UNIT – 06	Write a Python Program to add matrices. Write a Python program to multiply matrices.		
UNIT – 07	Write a Python program to check if a string is palindrome or not.		
UNIT – 08	Write a Python program to Extract Unique values dictionary values		
UNIT – 09	Write a Python program to read file word by word Write a Python program to Get number of characters, words.		
UNIT – 10	Write a Python program for Linear Search		

References Books:

1. Taming Python by Programming, Jeeva Jose, Khanna Publishing House

2. Starting Out with Python, Tony Gaddis, Pearson

3. Core Python Programming, Wesley J. Chun, Prentice Hall

4. Python Programming: Using Problem Solving Approach, Reema Thareja, Oxford University

5. Introduction to Computation and Programming Using Python. John V. Guttag, MIT Press.

Subject Code **2025312**	Theory							Credits **02**
	No. of Periods per Week			Full Marks	:	50		
	L	T	P/S	Internal(PA)	:	15		
	-	—	-	External(ESE)	:	35		
	—	—	—		:			

> How important is it really to do an internship before applying for a job?

> Do you need to get the hands-on experience that is talked about when discussing the importance of internships or is it a matter of just landing the right job?

During the Course duration year, students may feel overwhelmed with coursework, sports, or co-curricular activities that may keep them extremely busy while leaving no time to think of doing an internship or a job. Many students may also feel that they are caught in a bind since they need to make money to pay for their expenses but they can only find unpaid internships in their field.

Getting Your Feet Wet
Internships are a proven way to gain relevant knowledge, skills, and experience while establishing important connections in the field. Internships are also a way to get your feet wet and find out if a specific field is something you could see yourself doing full-time.

Internships may be completed during fall or spring semester or full time over the course of the summer. Unpaid internships may be easier to get but may also pose problems if making money is necessary, especially during the summer. There are many who cannot afford to work for no pay, so they are forced into doing menial jobs such as wait staff or bartending to work their way through college. It may preclude some from doing an internship which may be a detriment when hoping to get a full-time job.

Financial Considerations
Financial considerations when looking for an internship can make a big difference in the decision-making process. Sometimes, students will take a part-time or full-time job to supplement the time that they are spending at their internship. Whether an internship is paid or unpaid, there are many things that need to be taken into consideration to decide if an internship is worthwhile. It's important to decide if an internship will ultimately be in the best interest of the student to help meet the requirements needed when applying for a full-time job.

How to Get Funding for an Internship
Some colleges also offer funded internships for students. Check with your college to see if they offer a funded internship program that may help to meet the requirements of your college curriculum while offering experiences that employers seek when hiring new college graduates for entry-level jobs. Many foundations and organizations offer financing to college students so they may try writing to a number of them to see if they provide funding for college students seeking to do internships in their field.

Having an Internship and a Job
Students may elect to do a summer internship a couple of days per week while working a part-time job for the remainder of the time. For those who need to maximize the amount of money they make over the course of the summer, they may look into doing an internship during the academic year when they are less likely to expect to make money to help defray their college expenses.

In addition to internships, volunteer opportunities can also be an excellent way to gain experience and exposure to the workforce. Employers love to see volunteer experiences on a student's resume.

Volunteering shows commitment to causes and certain values that are intrinsic to the individuals who have participated in these types of experiences. Employers look for employees who are publicly engaged and who take an interest in community service and in doing good work.

What Employers Want
Internships and volunteer experiences make candidates more competitive in the job market. In addition to gaining exposure and experience in the field, they also provide an opportunity to see if the particular career field is the right one based on getting personal experience in the field. No matter what opportunities you engage in, it's important to maintain professionalism and take on the individual responsibility that is required.

The Benefits of Completing an internship
By doing a great job and completing more than what is required of you in your internship, you will be creating a great impression that can provide a great reference letter at the least, and may even potentially lead to a potential job offer. When you leave the organization at the end of the internship, you should ask for a recommendation letter that you can keep on file for future reference.

Internships Are a Learning Experience
Internships are a great way to learn the ropes so even if you find yourself filing or making coffee, as long as you're learning about the field take advantage of the opportunity and don't take the experience lightly. Asking questions is one key to learning in an internship and keeping yourself flexible throughout the internship can open many doors.