

# **STATE BOARD OF TECHNICAL EDUCATION BIHAR**

Scheme of Teaching and Examinations for

## **III<sup>rd</sup> SEMESTER DIPLOMA IN MECHANICAL (Automobile) ENGINEERING**

(Effective from Session 2020-21 Batch)

### **THEORY**

Sr. No.	SUBJECT	SUBJECT CODE	TEACHING SCHEME	EXAMINATION-SCHEME							
			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.	Automobile Transmission System	2033301	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.	Vehicle Maintenance	2033304	04	03	10	20	70	100	28	40	03
5.	Thermal Engineering - I	2025305	04	03	10	20	70	100	28	40	03
<b>Total:-</b>			<b>19</b>					<b>350</b>	<b>500</b>		<b>15</b>

### **PRACTICAL**

Sr. No.	SUBJECT	SUBJECT CODE	TEACHING SCHEME	EXAMINATION-SCHEME						
			Periods per Week	Hours of Exam.	Practical		Total Marks	Pass Credits		
					Internal (PA)	External (ESE)		Mark	s	
6.	Automobile Transmission Systems Lab	2033306	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	
<b>Total:-</b>							<b>08</b>		<b>125</b>	<b>04</b>

### **TERMWORK**

Sr. No.	SUBJECT	SUBJECT CODE	TEACHING SCHEME	EXAMINATION-SCHEME					
			Periods per Week	Marks of Internal (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	
<b>Total:-06</b>							<b>125</b>		<b>05</b>
<b>Total Periods per week Each of duration One Hour</b>				<b>33</b>	<b>Total Marks = 750</b>				<b>24</b>

# Automobile Transmission System

Subject Code <b>2033301</b>	<b>Theory</b>						Credits <b>03</b>
	No. of Periods Per Week			Full Marks	:	100	
	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	Marks
<b>Unit-I</b>	<b>Vehicle layout and Chassis frame:-</b> <b>1.1</b> Classification and specifications of Chassis- 2-Wheeler, Passenger car, Commercial Vehicle. <b>1.2</b> Vehicle layout & its types—2 Wheel Drive- Front Engine Front Wheel Drive, Rear Engine Rear Wheel Drive, Front Engine Rear Wheel Drive & 4 Wheel Drive. <b>1.3</b> Major assemblies – their locations and functions. <b>1.4</b> Various loads acting on chassis frame. <b>1.5</b> Type of frames, frames construction, and material- 2 wheeler and 4 - wheeler.	<b>8</b>	<b>12</b>
<b>Unit-II</b>	<b>Clutches:-</b> <b>2.1</b> Principle, function and requirements of Clutch. <b>2.2</b> Various types of clutches used in Automobiles – single plate, multiplate clutches dry & wet clutches, centrifugal clutch, Semi-centrifugal clutch, diaphragm clutch. <b>2.3</b> Materials used for clutch lining. <b>2.4</b> Hydraulic & mechanical clutch linkage, Cable operated clutch linkage. <b>2.5</b> Fluid coupling- principle, construction and working.	<b>12</b>	<b>14</b>
<b>Unit-III</b>	<b>Gear Boxes:-</b> <b>3.1</b> Principle and necessity of Gear Box. <b>3.2</b> Types, construction and working of gear boxes & their layouts such as sliding mesh, constant mesh, synchromesh type, transfer case. <b>3.3</b> Gear ratios with the help of power flow diagrams. <b>3.4</b> Gear shift mechanism. <b>3.5</b> Overdrive <b>3.6</b> Concepts of automatic gear box. <b>3.7</b> Torque Converter- principle, construction and working	<b>12</b>	<b>14</b>
<b>Unit-IV</b>	<b>Propeller shafts, universal joints &amp; slip joints: -</b> <b>4.1</b> Necessity and function of Propeller Shaft. <b>4.2</b> Constant velocity Joints- Inboard & outboard Joints- Rzeppa Joint, Tripod Joint. <b>4.3</b> Universal joint and slip joint. <b>4.4</b> Hotchkiss drive and torque tube drive.	<b>6</b>	<b>10</b>
<b>Unit-V</b>	<b>Final drive: -</b> <b>5.1</b> Principle, Necessity and function of final drive and differential. <b>5.2</b> Working of differential and differential lock. Backlash in differential. <b>5.3</b> Types of rear axles such as semi - floating, three quarter floating and full floating type.	<b>8</b>	<b>12</b>

	5.4 Transmission in two-wheeler- chain drive and belt drive. 5.5 Spur differential construction.		
<b>Unit-V</b>	<b>Wheels and Tyres:-</b> 6.1 Types of wheels, rims and tyres. 6.2 Tyre materials, construction. 6.3 Necessity and types of treads. 6.4 Tyre inflation and its effect. Tyre rotation and nomenclature	<b>6</b>	<b>8</b>
	Total	<b>52</b>	<b>70</b>

<b>Text / Reference Books:-</b>		
<b>Titles of the Book</b>	<b>Name of Authors</b>	<b>Name of the Publisher</b>
Motor automotive technology..	Anthony Schwaller	Delmar Publisher Inc.
Automotive service	Tim Gills	Delmar Publisher Inc.
Automobile Engineering Vol. II	Anil Chikkara	Satya Prakashan New Delhi
Automobile Mechanics	Crouse / Anglin	TATA McGraw – HILL
Automobile Engineering Vol.-I	Kirpal Singh	Standard Publication
The Automobile	Harbans Singth Royat	S Chand Publication
Automobile Engineering	R.B. Gupta	Satya Prakashan New Delhi
Automotive Mechanics	S. Srinivisan	TATA McGraw – HILL
Automotive Technology	H M SETHI	TATA McGraw– HILL
A text book of Automobile Engineering	R.K Rajput	
Transmission Chassis & related systems	John Whipp	

**Course outcomes:**

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

- CO1 Understand Structure and component of chassis, loads acting and classification of frame**
- CO2 Understand mechanism of power transfer, classification, construction and working of clutches.**
- CO3 Understand gear shift mechanism, types of gear box, construction and working**
- CO4 Identify various joints, use and construction of propeller shaft**
- CO5 Understand construction and working of differential gear**
- CO6 Understand types of wheels and tyres, construction and materials used**

# MATERIAL SCIENCE & ENGINEERING

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

## 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**

<b>Unit</b>	<b>Name of Topics</b>	<b>Hrs</b>	<b>Marks</b>
<b>Unit-I</b>	<p><b>1.1</b> 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.</p> <p><b>1.2</b> Bonds in solids - Classification - 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.</p>	<b>12</b>	
<b>Unit-II</b>	<p><b>2.1</b> 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;</p> <p><b>2.2</b> 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;</p> <p><b>2.3</b> 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,</p> <p><b>2.4</b> Stainless Steel (SS): types of SS, applications of SS – magnet steel – composition, properties and uses</p>	<b>12</b>	
<b>Unit-III</b>	<p><b>3.1</b> 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, hinalium, magnelium – composition, properties and uses; Nickel alloys: Inconel, monel, nicPerome – composition, properties and uses.</p> <p><b>3.2</b> Anti-friction/Bearing alloys: Various types of bearing bronzes - Standard</p>	<b>12</b>	

	commercial grades as per BIS/ASME.		
<b>Unit-IV</b>	<p><b>4.1</b> Failure analysis &amp; 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;</p> <p><b>4.2</b> Destructive testing: Tensile testing; compression testing; Hardness testing: Brinell, Rockwell; bend test; torsion test; fatigue test; creep test.</p> <p><b>4.3</b> Non-destructive testing: Visual Inspection; magnetic particle inspection; liquid penetrant test; ultrasonic inspection; radiography</p>	<b>12</b>	
<b>Unit-V</b>	<p><b>5.1</b> Corrosion &amp; 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;</p> <p><b>5.2</b> 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;</p> <p><b>5.3</b> Surface analysis; Hard-facing, thermal spraying and high-energy processes; Process/material selection. Pollution norms for treating effluents as per standards.</p>	<b>12</b>	
	Total	<b>60</b>	

#### 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.**

#### 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.**

# FLUID MECHANICS & HYDRAULIC MACHINERY

<b>Subject Code 2025303</b>	<b>Theory</b>			<b>Credits</b>			
	No. of Periods Per Week			Full Marks	:	100	<b>03</b>
	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	Marks
<b>Unit-I</b>	<p><b>1.1</b> Properties of fluid - Density, Specific gravity, Specific Weight, Specific Volume, Dynamic Viscosity, Kinematic Viscosity, Surface tension, Capillarity, Vapour Pressure, Compressibility.</p> <p><b>1.2</b> Fluid Pressure &amp; Pressure Measurement - Fluid pressure, Pressure head, Pressure intensity, Concept of vacuum and gauge pressures, atmospheric pressure, absolute pressure, Simple and differential manometers, Bourdan pressure gauge.</p> <p><b>1.3</b> Concept of Total pressure on immersed bodies, center of pressure, Simple problems on Manometers.</p>	<b>12</b>	
<b>Unit-II</b>	<p><b>2.1</b> Fluid Flow: Types of fluid flows, Path line and Stream line, Continuity equation, Bernoulli's theorem</p> <p><b>2.2</b> Principle of operation of Venturimeter, Orifice meter and Pitot tube, Derivations for discharge, coefficient of discharge and numerical problems.</p> <p><b>2.3</b> Flow Through Pipes: Laminar and turbulent flows; Darcy's equation and Chezy's equation for frictional losses, Minor losses in pipes, Hydraulic gradient and total gradient line, Numerical problems to estimate major and minor losses</p>	<b>14</b>	
<b>Unit-III</b>	<p><b>3.1</b> Impact of jets: Impact of jet on fixed vertical, moving vertical flat plates, Impact of jet on curved vanes with special reference to turbines &amp; pumps, Simple Numerical on work done and efficiency.</p>	<b>12</b>	
<b>Unit-IV</b>	<p><b>4.1</b> 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</p> <p><b>4.2</b> Construction and working principle of Pelton wheel, Francis and Kaplan turbines, Draft tubes – types and construction, Concept of cavitation in turbines.</p> <p><b>4.3</b> Calculation of Work done, Power, efficiency of turbines, Unit quantities and simple numerical.</p>	<b>10</b>	
<b>Unit-V</b>	<p><b>5.1</b> Centrifugal Pumps: Principle of working and applications, Types of casings and impellers.</p> <p><b>5.2</b> 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.</p> <p><b>5.3</b> Reciprocating Pumps: Construction, working principle and applications of single and double acting reciprocating pumps, Concept of Slip, Negative slip, Cavitation and separation.</p>	<b>12</b>	
<b>Total</b>		<b>60</b>	<b>70</b>

**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., Standard 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**

**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.**

## VEHICLE MAINTENANCE

<b>Subject Code</b> <b>2033304</b>	<b>Theory</b>						<b>Credits</b> <b>03</b>	
	No. of Periods Per Week			Full Marks	:	100		
	L	T	P/S	ESE	:	70		
	04	—	—	TA	:	10		
	—	—	—	CT	:	20		

Unit	Name of Topics	Hrs	Marks
<b>Unit-I</b>	Auto Workshop Layout & Equipment: <b>1.1</b> General safety precautions and procedures. <b>1.2</b> Functions of General shop equipment and tools (of the below mentioned tools and equipment only) -wheel balancer, wheel aligner, crankshaft aligner and straightener, engine analyzer, arbor press, drill press, battery charger, Tyre changer, car washer, lift, FIP calibration machine, head light aligner, valve grinder, honing machine, cylinder boring machine. <b>1.3</b> Layout with equipment required for dealers of two- wheeler, Four wheelers - cars and commercial vehicles. For road - side garages. Layout of modern workshop for specialized job work, crankshaft grinding, engine (re-boring), F.I.P repairs, crankshaft journal boring, brake drum boring	<b>6</b>	<b>10</b>
<b>Unit-II</b>	Maintenance management and record Keeping: <b>2.1</b> Necessity of maintenance <b>2.2</b> Types of maintenance and their applications <b>2.2.1</b> Preventive maintenance system. <b>2.2.2</b> Scheduled maintenance system <b>2.2.3</b> Break down maintenance system <b>2.3</b> General maintenance schedule -Daily, weekly, monthly & periodic maintenance. for various vehicles -Two –wheelers, LMV, HMV <b>2.4</b> General servicing procedure. Decision to repair or replace. <b>2.5</b> Workshop records- history sheet, work order, activity file	<b>6</b>	<b>8</b>
<b>Unit-III</b>	Engine Maintenance Part A: <b>3.1</b> Troubles, Causes & remedies in engine, fuel system, cooling system, lubrication system & MPFI Engine. <b>3.2</b> Checking and Servicing of following engine components: cylinder head, cylinder block, cylinder liners, piston, piston ring, crank-shaft, connecting rod, valves. <b>3.3</b> Tuning of engine Part B: <b>3.4</b> Fuel feed system service carburetor dismantling, cleaning and tuning, injector cleaning and testing, FIP phasing and calibration, MPFI -injector testing and cleaning. Sensor testing). <b>3.5</b> Lubrication system service. – change oil filter, check oil pump, and diagnose causes for excessive oil consumption, external oil leakage, and low oil pressure in an automobile engine.	<b>17</b>	<b>26</b>
<b>Unit-IV</b>	Chassis & Body Maintenance: <b>4.1</b> Checking and repairing of Clutch for clutch plate thickness, runout, rivet depth, warpage of pressure plate. <b>4.2</b> Adjustment of clutch. <b>4.3</b> Troubles, Causes and remedies of clutch. <b>4.4</b> Checking gearbox for run out of main shaft and lay shaft, for wear of synchronizer and worn bearings, checking oil seals. <b>4.5</b> Troubles, Causes and remedies of gearbox	<b>10</b>	<b>14</b>



	<p><b>4.6</b> Checking and adjusting differential for ring gear run-out, backlash in ring gear, tooth contact between ring gear and pinion, bearing preload.</p> <p><b>4.7</b> Troubles, Causes and remedies of propeller shaft, differential and rear axle.</p> <p><b>4.8</b> Inspection and repair of master cylinder, wheel cylinder, brake drum, brake disc, brake linings and brake pads.</p> <p><b>4.9</b> Adjustment of hydraulic brakes – shoe clearance, brake pedal free travel, pedal to wall clearance, parking brake adjustment.</p> <p><b>4.10</b> Bleeding of hydraulic brakes</p> <p><b>4.11</b> Troubles, Causes and remedies in brake system.</p>		
<b>Unit-V</b>	<p><b>5.1</b> Troubles, Causes and remedies of suspension system. Lubrication of leaf springs</p> <p><b>5.2</b> Procedure of wheel alignment (after chassis height adjustment) by wheel alignment gauges and procedure of wheel balancing. Troubles, Causes and remedies of steering system.</p> <p><b>5.3</b> Care of wheels and tires, retreading of tires and vulcanizing. Tire rotation.</p> <p><b>5.4</b> Frame repairs (cracks, loose rivets, and skewness in frames) and alignments.</p> <p><b>5.5</b> Body repairs- denting, denting tools and equipment</p> <p><b>5.6</b> Repainting procedure, patch work.</p> <p><b>5.7</b> Painting defects.</p> <p><b>5.8</b> Adjustment of doors and locks</p>	<b>9</b>	<b>12</b>
	Total	<b>60</b>	<b>70</b>

**Text / Reference Books:**

1. Automotive Service - Tim Gills - Delmar Publisher Inc.
2. Automobile Mechanics - Crouse / Anglin - TATA McGraw – HILL
3. Automobile Engineering Vol. III Auto Marketing and Workshop Techniques - Anil Chikara - Satya Prakashan, New Delhi
4. Automobile Engineering Vol. IV Body repair techniques - Anil Chikara - Satya Prakashan, New Delhi
5. Automobile Engineering Vol. V Paint techniques - Anil Chikara - Satya Prakashan, New Delhi
6. Automobile Engineering Vol. I - Dr. Kirpal Singh - Standard Publishers.
7. Motor Automotive Technology - Anthony Schwaller - Delmar Publisher Inc.
8. Automotive Engine Performance - Ken Layne - Prentice Hall Career Technology
9. Automotive Mechanics - S.Srinivasan - Tata McGraw Hill.

## THERMAL ENGINEERING - I

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

Unit	Name of Topics	Hrs	Marks
<b>Unit-I</b>	<p><b>1.1</b> Sources of Energy - Brief description of energy Sources: Classification of energy sources-Renewable, Non-Renewable; Fossil fuels, including CNG, LPG;</p> <p><b>1.2</b> Solar Energy: Flat plate and concentrating collectors &amp; its applications (Solar Water Heater, Photovoltaic Cell, Solar Distillation);</p> <p><b>1.3</b> Wind Energy; Tidal Energy; Ocean Thermal Energy; Geothermal Energy; Biogas, Biomass, Bio-diesel; Hydraulic Energy, Nuclear Energy; Fuel cell.</p>	<b>8</b>	
<b>Unit-II</b>	<p><b>2.1</b> 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;</p> <p><b>2.2</b> 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;</p> <p><b>2.3</b> 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).</p>	<b>12</b>	
<b>Unit-III</b>	<p><b>3.1</b> 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;</p> <p><b>3.2</b> Cooling system-air-cooling, water-cooling system with thermos-siphon method of circulation and water-cooling system with radiator and forced circulation (description with line diagram). Comparison of air cooling and water-cooling system;</p> <p><b>3.3</b> Ignition systems – Battery coil ignition and magneto ignition (description and working). Comparison of two systems;</p> <p><b>3.4</b> Types of lubricating systems used in I.C. engines with line diagram; Types of governing of I.C. engines – hit and miss method, quantitative method, qualitative method and combination methods of governing; their applications; Objective of super charging. (Related simple problems only).</p>	<b>12</b>	
<b>Unit-IV</b>	<p><b>4.1</b> 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;</p> <p><b>4.2</b> Performance test; Morse test; Heat balance sheet; Methods of determination of B.P., I.P. and F.P.;</p> <p><b>4.3</b> Simple numerical problems on performance of I.C. engines.</p>	<b>14</b>	
<b>Unit-V</b>	<p><b>5.1</b> 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.</p> <p><b>5.2</b> Refrigeration &amp; Air-conditioning - Refrigeration; Refrigerant; COP; Air Refrigeration system: components, working &amp; applications; Vapour Compression system: components, working &amp; applications; Air conditioning; Classification of</p>	<b>14</b>	

	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).		
	Total	<b>60</b>	<b>70</b>

**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.

**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.

# AUTOMOBILE TRANSMISSION SYSTEMS LAB

<b>Subject Code</b> <b>2033306</b>	<b>Theory</b>						<b>Credits</b>
	<b>No. of Periods Per Week</b>			<b>Full Marks</b>	<b>:</b>	<b>50</b>	<b>01</b>
	<b>L</b>	<b>T</b>	<b>P/S</b>				
	—	—	<b>02</b>	<b>Internal (PA)</b>	<b>:</b>	<b>15</b>	
	—	—	—	<b>External (ESE)</b>	<b>:</b>	<b>35</b>	

## **Contents: Practical**

### **Intellectual skill:**

1. Identify concepts applied.
2. Identify parts like clutch, gear box, universal joints, propeller shaft, final drive, wheels & tyres.
3. Classify the system according to their application.
4. Detect fault by observation & trial.
5. Take reading from various instruments like chassis odynometer.

### **Motor skill:**

1. Sketch the different devices.
2. Handle tools, equipment, and instrument.
3. Observe the behaviors of various systems under various parameters.

### **List of Practical/ Assignments:**

1. Draw various vehicle layouts for- two wheelers, three wheeler and four wheelers and compare them.
2. Open a single plate dry clutch assembly and sketch exploded view.
3. Open a multi-plate clutch used in two wheelers, observe the operating linkages and sketch the system.
4. Open any two types of gear boxes observe gear shifting, gear ratio and sketch the system & compare them.
- 5 Open & observe automatic transmission devices such as torque converter, various drives.
- 6 Open & observe universal joints such as Hooks universal joint.
- 7 Open the differential, sketch the unit with bearing locations.
- 8 Assembly & disassembly of any one type of rear axle.
- 9 Open any two types of tyres, wheels and rims, observe and sketch.

## FLUID MECHANICS & HYDRAULIC MACHINERY LAB

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

Course Objectives:

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

### Course Content:

S.No.	Topics
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 gauge tester.
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.

# WEB TECHNOLOGY LAB

<b>SUBJECT CODE: 2018308</b>	<b>Practical</b>			No. of period in one session:			Credits
	No. of Periods per Week			Full Marks:		25	<b>01</b>
			P/S	<b>Internal (PA)</b>		07	
			02	<b>External (ESE)</b>		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.

	<b>Content</b>	<b>Hrs.</b>	<b>Marks</b>
<b><u>Unit – 1</u></b>	Home page Development static pages (using Only HTML) of an online Book store.		
<b><u>Unit – 2</u></b>	Write a JavaScript to design a simple calculator to perform the following operations: sum, product, difference and quotient.		
<b><u>Unit – 3</u></b>	Write a PHP program to display a digital clock which displays the current time of the server.		
<b><u>Unit – 4</u></b>	Write an HTML code to display your CV on a web page.		
<b><u>Unit – 5</u></b>	Write an XML program to display products.		
<b><u>Unit – 6</u></b>	Create a web page with all types of Cascading style sheets.		
<b><u>Unit – 7</u></b>	Write a PHP program to display a digital clock which displays the current time of the server.		
<b><u>Unit – 8</u></b>	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.		

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

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

### **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 Able's/Cleveland/Pensky Martin Apparatus
- II Viscosity measurement use/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
- X 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, NewDelhi

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 ap- paratus.
- 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.

## TERM WORK

### ESSENCE OF INDIAN KNOWLEDGE AND TRADITION

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

#### Course Content:

Basic Structure of Indian Knowledge System:

- Basic Structure of Indian Knowledge System:

(i) वेद, (ii) उन्नवेद (आयुर्वेद, धनुर्वेद, गन्धर्ववेद, स्थानत्य आदद) (iii) वेदांग (शिक्षा, कल्प, ननरुत, व्याकरण, ज्योनतष छांद), (iv) उन्नाइग (धर्म सि, रीरांसा, नुराण, तकमिस)

- Modern Science and Indian Knowledge System
- Yoga and Holistic Healthcare
- 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	Bharatiya 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	VidyanidhiPrakasham, Delhi, 2016



**TERM WORK****Python**

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

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

**TERM WORK**  
**Summer Internship-I (4 weeks)**

<b>Subject Code</b> <b>2025312</b>	Term Work						<b>Credits</b>  <b>02</b>
	No. of Periods Per Week			Full Marks	:	50	
	L	T	TW				
—	—	<b>04</b> Weeks	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.