

# STATE BOARD OF TECHNICAL EDUCATION BIHAR

Scheme of Teaching and Examinations for

## V<sup>th</sup> SEMESTER DIPLOMA IN MECHANICAL 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.	Production & Operations Management	2025501	03	03	10	20	70	100	28	40	03	
2.	Computer Aided Design & Manufacturing	2025502	03	03	10	20	70	100	28	40	03	
3.	Automobile Engineering	2025503	03	03	10	20	70	100	28	40	03	
4.	Elective-I		03	03	10	20	70	100	28	40	03	
Refrigeration & Air-conditioning (2025504A)			Heat Transfer (2025504B)				Power Plant Engineering (2025504C)					
5.	Open Elective / COE		02	03	10	20	70	100	28	40	02	
Industrial Engineering & Management (2025505A)			Farm Equipment & Farm Machinery (2025505B)				Artificial Intelligence (Basics) (2000505B)					
Internet of Things (Basics) (2000505C)			Drone Technology (Basics) (2000505D)				3D Printing & Design (Basics) (2000505E)					
Industrial Automation (Basics) (2000505F)			Electric Vehicles (Basics) (2000505G)				Robotics (Basics) (2000505H)					
			<b>Total:- 14</b>					<b>350</b>	<b>500</b>			<b>14</b>

### PRACTICAL

Sr. No.	SUBJECT	SUBJECT CODE	TEACHING SCHEME		EXAMINATION-SCHEME					
			Periods per Week	Hours of Exam.	Practical (ESE)		Total Marks	Pass Marks In the Subject	Credits	
					Internal (PA)	External (ESE)				
6.	CAD/CAM Lab	2025506	04 50% Physical 50% Virtual	03	15	35	50	20	02	
7.	Elective lab-I	2025507	02 50% Physical 50% Virtual	03	07	18	25	10	01	
Refrigeration & Air-conditioning Lab (2025507A)			Heat Transfer Lab (2025507B)				Power Plant Engineering Lab (2025507C)			
8.	Elective lab / COE Lab		04 50% Physical 50% Virtual	03	20	30	50	20	02	
Automobile Engineering Lab (2025508A)			Farm Equipment & Farm Machinery Lab (2025508B)				Artificial Intelligence Lab (Basics) (2000508B)			
Internet of Things Lab (Basics) (2000508C)			Drone Technology Lab (Basics) (2000508D)				3D Printing & Design Lab (Basics) (2000508E)			
Industrial Automation Lab (Basics) (2000508F)			Electric Vehicles Lab (Basics) (2000508G)				Robotics Lab (Basics) (2000508H)			
<b>Total:- 10</b>							<b>125</b>		<b>05</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	
9.	Summer Intern- ship-II	2025509	(4 weeks continuous)	15	35	50	20	02	
10.	Major Project	2025510	04	07	18	25	10	02	
11.	Term Work		02	20	30	50	20	01	
Course under Moocs/ NPTEL / Others (2025511)			Artificial Intelligence (Basics) (TW) (2000511 B)		Internet of Things (Basics) (TW) (2000511 C)		Drone Technology (Basics) (TW) (2000511D)		
3D Printing (Basics) (TW) (2000511E)			Industrial Automation (Basics) (TW) (2000511F)		Electric Vehicles (Basics) (TW) (2000511G)		Robotics (Basics) (TW) (2000511H)		
<b>Total:- 06</b>							<b>125</b>		<b>05</b>
<b>Total Periods per week Each of duration One Hour</b>				<b>30</b>	<b>Total Marks = 750</b>				<b>24</b>

## PRODUCTION & OPERATIONS MANAGEMENT

<b>Subject Code 2025501</b>	<b>Theory</b>						<b>Credits 03</b>	
	<b>No. of Periods Per Week</b>			<b>Full Marks</b>				<b>100</b>
	<b>L</b>	<b>T</b>	<b>P/S</b>	<b>ESE</b>				<b>70</b>
	<b>03</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:

- One of the most critical areas for success in any business enterprise is how Production and Operations are managed.
- To study the statistics, economics, finance, organizational behavior and strategy into a consolidated production and operation related decisions.
- To discuss the role of location strategy and the criteria for location decisions.
- To define quality and explain quality management, including TQM and its tools.

### CONTENTS: THEORY

<b>Unit</b>	<b>Name of Topics</b>	<b>Hrs</b>
<b>Unit-I</b>	1.1 Process Planning and Process Engineering: Process Planning: Introduction, Function, Pre-requisites and steps in process planning, Factors affecting process planning, Make or buy decision, plant capacity and machine capacity. 1.2 Process Engineering: Preliminary Part Print Analysis: Introduction, Establishing the General Characteristics of work piece, determining the principal Process, Functional surfaces of the work piece, Nature of the work to be Performed, Finishing and identifying operations. 1.3 Dimensional Analysis: Introduction, types of dimensions, measuring the Geometry of form, Baselines, Direction of specific dimensions. Tolerance Analysis: Causes of work piece variation, Terms used in work piece dimensions, Tolerance stacks. Work piece Control: Introduction, Equilibrium Theories, Concept of location, Geometric Control, Dimensional control, Mechanical control.	<b>10</b>
<b>Unit-II</b>	2.1 Production Forecasting: Introduction of production forecasting, The strategic role of forecasting in supply chain, Time frame, Demand behavior, Forecasting methods- Qualitative and Quantitative, Forecast accuracy. 2.2 Scheduling: Introduction, Objectives in scheduling, Loading, Sequencing, Monitoring, Advanced Planning and Scheduling Systems, Theory of Constraints, Employee scheduling.	<b>10</b>
<b>Unit-III</b>	3.1 Break-Even Analysis: Introduction, Break-even analysis charts, Breakeven analysis for process, plant and equipment selection. 3.2 Aggregate Operations Planning: Aggregate production planning, Adjusting capacity to meet the demand, Demand management, Hierarchical and collaborative planning, Aggregate planning for services.	
<b>Unit-IV</b>	4.1 Assembly Line Balancing: Assembly lines, Assembly line balancing, Splitting tasks, Flexible and U- shaped line layouts, Mixed model line balancing, Current Thoughts on assembly lines, Computerized assembly line balancing.	<b>12</b>
<b>Unit-V</b>	5.1 Material Management: Introduction, Importance and objectives, Purchasing and Stores: policies and procedures, Vendor development, selection, analysis and rating.	<b>10</b>

## COMPUTER AIDED DESIGN AND MANUFACTURING

<b>Subject Code 2025502</b>	<b>Theory</b>						<b>Credits 03</b>	
	<b>No. of Periods Per Week</b>			<b>Full Marks</b>	<b>:</b>	<b>100</b>		
	<b>L</b>	<b>T</b>	<b>P/S</b>	<b>ESE</b>	<b>:</b>	<b>70</b>		
	<b>03</b>		<b>—</b>	<b>TA</b>	<b>:</b>	<b>10</b>		
	<b>—</b>	<b>—</b>	<b>—</b>	<b>CT</b>	<b>:</b>	<b>20</b>		

### Course objectives:

To understand concepts of drafting and modelling using CAD.

- To understand the need for integration of CAD and CAM.
- To understand the concepts of flexible manufacturing system.

### CONTENTS: THEORY

Unit	Name of Topics	Hrs
<b>Unit-I</b>	<b>1.1 Fundamentals of CAD/CAM:</b> Automation; Design process; Application of computers for design; Benefits of CAD; Computer configuration for CAD applications; Design workstation; Graphic terminal. <b>1.2 CAD Software:</b> Definition of system software and application software; CAD database and structure. <b>1.3 Geometric modelling:</b> 3D-Wire frame modelling; Wire frame entities and their definitions; Interpolation and Approximation of curves; Concept of Parametric and Non-parametric representation of curves; Curve fitting techniques.	<b>12</b>
<b>Unit-II</b>	<b>2.1 Surface Modeling:</b> Algebraic and Geometric form; Parametric space of surface; Blending functions; Parametrization of surface patch; Subdividing; Cylindrical surface; Ruled surface; Surface of revolution; Spherical surface; Composite surface; Bezier surface; <b>2.2 Solid Modelling:</b> Definition of cell composition and spatial occupancy enumeration; Sweep representation; Constructive solid geometry; Boundary representations.	<b>12</b>
<b>Unit-III</b>	<b>3.1 NC Control Production Systems:</b> Numerical control; Elements of NC system; NC part programming; Methods of NC part programming; Manual part programming, Computer assisted part programming; Post processor; Computerized part program.	<b>12</b>
<b>Unit-IV</b>	<b>4.1 Group Technology:</b> Part families; Parts classification and coding; Production analysis; Machine cell design; <b>4.2 Computer aided process planning:</b> Retrieval type and Generative type; Machinability data systems; MRP and its Benefits.	<b>12</b>
<b>Unit-V</b>	<b>5.1 Flexible manufacturing system:</b> F.M.S equipment; Layouts; Analysis methods and benefits; Computer aided quality control. <b>5.2 Automated inspection:</b> Off-line, On-line, Contact, Non-contact; Coordinate measuring machines; Machine vision; CIM system and Benefits.	<b>12</b>

### Reference Books:

1. CAD/CAM Principles and Applications, P.N.Rao, Tata McGraw-Hill
2. Computer Aided Design and Manufacturing, Groover M.P. & Zimmers Jr, Prentice hall of India
3. CAD/CAM/CIM, Radha Krishna P. & Subramanyam, Wiley Eastern Ltd

### Course outcomes:

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

- CO1 Develop mathematical models to represent curves and surfaces and Model engineering components using solid modeling techniques.
- CO2 Understand geometric transformation techniques in CAD.
- CO3 Develop programs for CNC to manufacture industrial components.
- CO4 Understand the application of computers in various aspects of Manufacturing viz., Design, Proper planning,
- CO5 Manufacture in cost, Layout & Material Handling system.  
Utilize Flexible manufacturing system tools.

# AUTOMOBILE ENGINEERING

<b>Subject Code 2025503</b>	<b>Theory</b>						<b>Credits 03</b>	
	<b>No. of Periods Per Week</b>			<b>Full Marks</b>	<b>:</b>	<b>100</b>		
	<b>L</b>	<b>T</b>	<b>P/S</b>	<b>ESE</b>	<b>:</b>	<b>70</b>		
	<b>03</b>	<b>—</b>	<b>—</b>	<b>TA</b>	<b>:</b>	<b>10</b>		
	<b>—</b>	<b>—</b>	<b>—</b>	<b>CT</b>	<b>:</b>	<b>20</b>		

## Course objectives:

- To understand the basic structure and components of an automobile.
- To understand the concepts of cooling and lubricating systems.
- To understand the concepts of Ignition and transmission and steering systems.
- To understand the classification and necessity of suspension system.
- To identify different special vehicles.

## CONTENTS: THEORY

Unit	Name of Topic	Hrs
<b>Unit-I</b>	<b>Introduction to basic structure of an automobile:</b> 1.1 Basic engine components; Cylinder block; Cylinder head; Gaskets; cylinder liners, types of cylinder liners; Piston and piston pin; piston rings, types of piston rings; Connecting rod; Crank shaft; Cam shaft; Crankcase; Engine valves; Fly- wheel and Governor.	<b>10</b>
<b>Unit-II</b>	<b>Cooling and lubrication system:</b> 2.1 The necessity of cooling system; Types of cooling system-air cooling and water cooling; Air cooling system; Types of water cooling system Thermosyphon system and pump circulation system; Advantages and disadvantages of air cooling and water cooling systems; The components of water cooling System fan, radiator, pump and thermostat; 2.2 The necessity of lubrication system; S.A.E rating of lubrication system; Types of lubrication system; Petrol lubrication and high pressure lubrication system. 2.3 Fuel feed system: Conventional fuels and alternative fuels: Cetane and octane numbers; Types of carburettors; Working of simple carburettor; Multi point and single point fuel injection systems; Different fuel transfer pumps; Working of S.U electrical and A.C mechanical pump; Fuel filters; Fuel injection pump; Fuel injectors.	<b>10</b>
<b>Unit-III</b>	<b>Ignition system:</b> 3.1 Introduction to ignition system; Battery Ignition systems and magneto Ignition system; Electronic Ignition system; Construction and working of lead acid battery; Elements of charging system; Elements of starting system; Types of lights Used in the automobile: Transmission and steering system: 3.2 General arrangement of clutch; Principle of friction clutches; Constructional details of Single plate clutch; Constructional details of multi- plate clutch; Constructional details of centrifugal clutch; Necessity for gear ratios in transmission; Types of gear boxes; Working of sliding mesh gear box; Working of constant mesh gear box; Working of propeller shaft Working of propeller shaft; Working of Universal joint; Working of differential; Types of rear axle; Purpose of front axle; 3.3 Necessity of steering system; Caster, camber and king pin inclination; Rack and pinion steering system; Power steering.	<b>10</b>

<b>Unit-IV</b>	<b>Suspension system:</b> 4.1 Necessity of suspension system; Torsion bar suspension systems; Leaf spring and coil spring suspension system; Independent suspension for front wheel and rear wheel; Working of telescopic shock absorber; 4.2 Functions of brakes; Types of brakes; Working of internal expanding brake; Working of disc brake	<b>10</b>
<b>Unit-V</b>	<b>Special vehicles:</b> 5.1 Introduction to Special vehicles; Tractor; Motor grader; Scrappers; Excavators; Duper trucks.	<b>06</b>

**References:**

1. Automobile Engineering Vol I, II, Kirpal Singh, Standard Publishers Distributors, Delhi.2012.
2. Automobile Mechanics, A.K. Babu, S.C. Sharma, Khanna Publications, New Delhi
3. Automotive Mechanics: Principles and Practices, Joseph Heitner, East West Press
4. Automotive Mechanics, S. Srinivasan, 2nd Edition, Tata McGraw Hill
5. Automobile Engineering Vol I and Vol II, K. M. Gupta, Umesh Publications.
6. Automotive Engineering, Jain and Asthana, Tata McGraw Hill.
7. Automobile Engineering - K P Singh, FPH
8. Automobile Engineering - Sunil Rout, FPH

**Course outcomes:**

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

CO1 Identify the components of an automobile with their working

CO2 Explain the concepts of cooling and lubricating systems.

CO3 Explain the concepts of Ignition and Transmission and steering systems.

CO4 Identify different suspension systems and their applications.

CO5 Differentiate the special vehicles according to the usage.

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# Elective-I

## Heat Transfer

<b>Subject Code 2025504B</b>	<b>Theory</b>						<b>Credits 03</b>
	No. of Periods Per Week			Full Marks	:	100	
	L	T	P/S	ESE	:	70	
	03	—	—	TA	:	10	
—	—	—	CT	:	20		

### CONTENTS: THEORY

Unit	Topic	Hrs.
<b>Unit-I</b>	<b>Conduction:</b> 1.1 Fourier law of heat conduction for isotropic material; Thermal conductivity; Derivation of the energy equation in three dimensions including transient effect; 1.2 Non dimensional - thermal diffusivity and Fourier number; Types of boundary conditions (Dirchlet, Neumann, mixed type); One dimensional solution with and without heat generation; Analogy with electrical circuits.	<b>10</b>
<b>Unit-II</b>	<b>Fins:</b> 2.1 Rectangular and pin fins. Fin effectiveness and efficiency. Critical thickness of insulation. Lumped parameter approach and physical significance of time constant, Biot number, Validity of lumped parameter approach. Introduction to Heisler Chart.	<b>08</b>
<b>Unit-III</b>	<b>Convection:</b> 3.1 Introduction, Newton's law of cooling; Momentum and energy equations in two dimensions; non depersonalization, importance of non-dimensional quantities and their physical significance. 3.2 Velocity and thermal boundary layer thickness by integral method. Analogies between momentum, heat and mass transfer. Natural convection, effect of coupling on the conservation equations.	<b>10</b>
<b>Unit-IV</b>	<b>Radiation :</b> 4.1 Physical mechanism of thermal radiation, laws of radiation, definition of black body, emissive power, intensity of radiation, emissivity, reflectivity, transmissivity, irradiation, radiosity. 4.2 Radiation exchange between black bodies, concept of Gray Diffuse Isotropic (GDI) surface. Radiation exchange between GDI surfaces by radiation network and radiosity matrix method. Radiation shielding.	<b>10</b>

<b>Unit-V</b>	<b>Heat exchangers:</b> 5.1 Types of heat exchangers, parallel and counter flow types, Introduction to LMTD. Correction factors, fouling factor. NTU method for heat exchangers.	<b>10</b>
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**References:**

1. Fundamentals of Heat and Mass Transfer by F.P. Incropera and D.P. Dewitt, 4th ed., John Wiley & Sons.
2. Heat Transfer - A Basic Approach by M.N. Ozisik, McGrawhill.
3. Heat Transfer by J.P. Holman, 8th ed., McGrawhill.
4. Elements of Heat & Mass Transfer by Vijay Gupta, 2nd ed., New Age International Publishers.

**Course outcomes:**

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

CO1 Understand the concepts of conduction

CO2 understand the concepts of fins

CO3 Understand the concepts of radiation.

CO4 Understand the concepts of convection

CO5 Understand the basic concepts of heat exchangers.

## INDUSTRIAL ENGINEERING & MANAGEMENT

<b>Subject Code 2025505A</b>	<b>Theory</b>						<b>Credits 02</b>	
	<b>No. of Periods Per Week</b>			<b>Full Marks</b>	<b>:</b>	<b>100</b>		
	<b>L</b>	<b>T</b>	<b>P/S</b>	<b>ESE</b>	<b>:</b>	<b>70</b>		
	<b>02</b>	<b>—</b>	<b>—</b>	<b>TA</b>	<b>:</b>	<b>10</b>		
	<b>—</b>	<b>—</b>	<b>—</b>	<b>CT</b>	<b>:</b>	<b>20</b>		

### Course objectives:

- To take the right decisions to optimize resources utilization by improving productivity of the Lands, Buildings, People, Materials, Machines, Money, Methods and Management effectively.
- To eliminate unproductive activities under the control of the Management, Supervisor, worker and the Design of Products and Processes.
- To use the Charts to record the Activities of the people, materials and Equipment to find alternative methods which minimize waste and to implement the best method.

### **CONTENTS: THEORY**

<b>Unit</b>	<b>Name of Topics</b>	<b>Hrs</b>
<b>Unit-I</b>	<b>Plant Engineering:</b> 1.1 Plant; Selection of site of industry; Plant layout; Principles of a good layout; Types; Process; Product and Fixed position; Techniques to improve Layout; Principles of Material handling equipment; 1.2 Plant maintenance; Importance; Break down maintenance; Preventive maintenance and Scheduled maintenance. Plant Safety: Importance; Accident: Causes and Cost of an Accident, Accident Proneness, Prevention of Accidents; 1.3 Industrial disputes; Settlement of Industrial disputes; Collective bargaining; Conciliation; Mediation; Arbitration; Indian Factories Act 1948 and its provisions related to health, welfare and safety.	<b>10</b>
<b>Unit-II</b>	<b>Work Study:</b> 2.1 Productivity; Standard of living; Method of improving Productivity; Objectives; Importance of good working conditions. Method Study: Definition; Objectives; Selection of a job for method study; Basic procedure for conduct of Method study; Tools used; Operation process chart; Flow process chart; Two handed process chart; Man Machine chart; String diagram and flow diagram. 2.2 Work Measurement: Definition; Basic procedure in making a time study; Employees rating factor; Application of time allowances: Rest, Personal, Process, Special and Policy allowances; Calculation of standard time; Numerical Problems; Basic concept of production study; Techniques of Work Measurement; Ratio delay study; Synthesis from standard data; Analytical estimating and Pre deter- mined Motion Time System (PMTS).	<b>10</b>
<b>Unit-III</b>	<b>Production Planning and Control:</b> 3.1 Introduction; Major functions of Production Planning and Control; Pre planning; Methods of forecasting; Routing and Scheduling; Dispatching and Controlling; Concept of Critical Path Method (CPM); Types of Production: Mass Production, Batch Production and Job Order Production; Characteristics; Economic Batch Quantity (EBQ); Principles of Product and Process Planning; Make or Buy decision; Numerical problems. 3.2 Quality Control: Definition; Objectives; Types of Inspection: First piece, Floor and Centralized	<b>12</b>

	Inspection; Advantages and Disadvantages; Statistical Quality Control; 3.3 Types of Measurements; Method of Variables; Method of Attributes; Uses of X, R, p and c charts; Operating Characteristics curve (O.C curve); Sampling Inspection; Single and Double Sampling plan; Concept of ISO 9001:2008 Quality Management System Registration/ Certification procedure; Benefits of ISO to the organization.	
<b>Unit-IV</b>	<b>Principles of Management:</b> 4.1 Definition of Management; Administration; Organization; F.W. Taylor's and Henry Fayol's Principles of Management; Functions of Manager; Types of Organization: Line, Staff, Taylor's Pure functional types; Line and staff and committee type; Directing; Leadership, Styles of Leadership; Qualities of a good leader; Motivation; Positive and Negative Motivation; 4.2 Modern Management Techniques; Just In Time; Total Quality Management (TQM); Quality circle; Zero defect concept; 5S Concept; Management Information Systems. Personnel Management: 4.3 Responsibility of Human Resource Management; Selection Procedure; Training of Workers; Apprentice Training; On the Job training and Vestibule School Training; Job Evaluation and Merit Rating; Objectives and Importance; Wages and Salary Administration; Component of Wages; Wage Fixation; Type of Wage Payment: Halsey's 50% Plan, Rowan's Plan and Emerson's efficiency plan; Numerical Problems.	<b>06</b>
<b>Unit- V</b>	<b>Financial Management:</b> 5.1 Fixed and Working Capital; Resources of Capital; Shares Preference and Equity Shares; Debentures; Type of debentures; Public Deposits; Factory Costing: Direct Cost; Indirect Cost; Factory Overhead; Selling Price of a product; Profit; Numerical Problems; Depreciation; Causes; Methods: Straight line, sinking fund and percentage on Diminishing Value Method; Numerical Problems. 5.2 Material Management: Objectives of good stock control system; ABC analysis of Inventory; Procurement and Consumption	<b>10</b>

**References:**

1. Industrial Engineering & Management, S.C. Sharma, Khanna Book Publishing Co. (P) Ltd., Delhi
2. Industrial Engineering and Management, O.P. Khanna, Revised Edition, Dhanpat Rai Publications (P) Ltd., New Delhi – 110002.
3. Management, A global perspective, Heinz Wehrich, Harold Koontz, 10th Edition, McGraw Hill International Edition 1994.
4. Essentials of Management, 4th Edition, Joseph L.Massie, Prentice-Hall of India, New Delhi 2004.
5. Principles and Practices of Management, Premvir Kapoor, Khanna Publishing House, N. Delhi

**Course outcomes:**

- CO1 Explain the different types of layout and plant maintenance with safety
- CO2 List and explain the need of method study and work measurements
- CO3 Explain the production planning and quality control, and its functions
- CO4 Understand the basic principles, approaches and functions of management and identify concepts to specific situations
- CO5 List and explain the different financial sources and methods of inventory management.

**ELECTIVE LAB I**  
**HEAT TRANSFER LAB**

<b>Subject Code 2025507B</b>	<b>Practical</b>			<b>No of Period in one session :</b>			<b>Credits  01</b>
	<b>No. of Periods Per Week</b>			<b>Full Marks</b>			
	<b>L</b>	<b>T</b>	<b>P/S</b>	<b>Internal (PA)</b>	<b>:</b>	<b>07</b>	
	—	—	<b>02</b>	<b>External (ESE)</b>	<b>:</b>	<b>18</b>	

**CONTENTS: PRACTICAL**

- (i) To study of different types Fins on models in laboratory.
- (ii) To study of parallel flow heat exchange and find its efficiency experimentally.
- (iii) To study of counter flow heat exchanger and its efficiency experimentally.
- (iv) Study of Heissier chart.
- (v) Study of Grey- Diffuse Isotropic surface.
- (vi) Study of LMTD of heat exchanger available in lab.

**References:**

1. Fundamentals of Heat and Mass Transfer by F.P.Incropera and D.P.Dewitt, 4th ed., John Wiley & Sons.
2. Heat Transfer - A Basic Approach by M.N.Ozisik, McGrawhill.
3. Heat Transfer by J.P.Holman, 8th ed., McGrawhill.
4. Elements of Heat & Mass Transfer by Vijay Gupta, 2nd ed., New Age International Publishers.

Course outcomes:

**Course outcomes:**

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

CO1 Understand the concepts of conduction

CO2 understand the concepts of fins

CO3 Understand the concepts of radiation.

CO4 Understand the concepts of convection

CO5 Understand the basic concepts of heat exchangers.

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**ELECTIVE LAB /COE LAB**  
**AUTOMOBILE ENGINEERING LAB**

Subject Code 2025508A	Practical			No of Period in one session :			Credits
	No. of Periods Per Week			Full Marks	:	50	
	L	T	P/S	Internal (PA)	:	20	
	—	—	04	External (ESE)	:	30	
							02

**Course objectives:**

- To understand the basic structure and components of an automobile.
- To understand the concepts of cooling and lubricating systems.
- To understand the concepts of Ignition and transmission and steering systems.
- To understand the classification and necessity of suspension system.
- To identify different special vehicles.

**CONTENTS: PRACTICAL**

- (i) To Study of cooling system of four stroke petrol/diesel engine available in lab.
- (ii) To study of ignition system of petrol engine.
- (iii) To study of ignition system of diesel engine
- (iv) To study of steering system available in lab.
- (v) To study transmission system available in lab.
- (vi) To study of suspension system available in lab.

**References:**

1. Automobile Engineering Vol I, II, Kirpal Singh, Standard Publishers Distributors, Delhi.2012.
2. Automobile Mechanics, A.K. Babu, S.C. Sharma, Khanna Publications, New Delhi
3. Automotive Mechanics: Principles and Practices, Joseph Heitner, East West Press
4. Automotive Mechanics, S. Srinivasan, 2nd Edition, Tata McGraw Hill
5. Automobile Engineering Vol I and Vol II, K. M. Gupta, Umesh Publications.
6. Automotive Engineering, Jain and Asthana, Tata McGraw Hill.

**Course outcomes:**

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

CO1 Identify the components of an automobile with their working

CO2 Explain the concepts of cooling and lubricating systems.

CO3 Explain the concepts of Ignition and Transmission and steering systems.

CO4 Identify different suspension systems and their applications.

CO5 Differentiate the special vehicles according to the usage.

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

<b>Subject Code 2025509</b>	<b>Term Work</b>			<b>No of Period in one session :</b>			<b>Credits 02</b>
	<b>No. of Periods Per Week</b>			<b>Full Marks</b>			
	<b>L</b>	<b>T</b>	<b>P/S</b>	<b>Internal (PA)</b>	<b>:</b>	<b>15</b>	
	—	—	<b>4 weeks</b>	<b>External (ESE)</b>	<b>:</b>	<b>35</b>	

- 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.

**TERM WORK**  
**MAJOR PROJECT**

Subject Code 2025510	Term Work			No of Period in one session :			Credits 02
	No. of Periods Per Week			Full Marks			
	L	T	P/S	Internal (PA)	:	07	
	—	—	04	External (ESE)	:	18	

**Course objectives:**

The projects if done right can help enthusiastic Mechanical engineering students to develop the skills/profile needed for an exciting career in core technologies. Since practical skills are very important to work on core industries, experts tend to analyse candidate's performance based on their project experience during the interviews.

These projects provide an excellent opportunity to learn and showcase your practical skills to your future interviewers easily. If spent qualitatively you can build a very innovative electrical project and get a great learning experience. By doing so, you will not only develop an innovative project but also develop valuable skills needed for a successful career in core technologies related to electrical engineering. The best way to master a subject is by doing projects. Through a project you not only get a deeper understanding of the subject but also gain hands-on practical experience. If you are looking to do internships in college, the best way to catch the companies attention is through projects.

Projects are generally done as a combined team effort. Two or more students work under a guide or a staff to get a certain results. By doing a project, you will

- Understand your subject better
- Get practical experience
- Chance to showcase your skills
- Learn about team work, communication skills and responsibilities

When companies look for interns, they prefer students who have good understanding of the subject with atleast some hands on experience. The best to achieve both is by doing projects.

There is no fixed time to do a project. You can do it right from your first year in college. If you are looking to do a technical project, then the best time to start would be mid second year. It's not mandatory that you do many projects but make sure that you at least do one project. A lot of students tend to do few small projects from their second year and do a big project in their final year. By showcasing your projects, you can even look for internships while in college.

You can do any kind of projects based on your interests or subjects. The best way to go about this is to figure out what you are interested in. So the first step is to find your interest and then do projects in your area of interest.

Find your area of interest and then do a project in that field.

You can start by exploring different areas and then pick the field in which you are interested in. You can learn more about it and start working on small problems.

**TERM WORK**  
**COURSE UNDER MOOCS / NPTEL / OTHERS**

<b>Subject Code</b> <b>2025511</b>	<b>Term Work</b>			<b>No of Period in one session :</b>			<b>Credits</b>
	<b>No. of Periods Per Week</b>			<b>Full Marks</b>	<b>:</b>	<b>50</b>	
	<b>L</b>	<b>T</b>	<b>P/S</b>	<b>Internal (PA)</b>	<b>:</b>	<b>20</b>	
	<b>—</b>	<b>—</b>	<b>02</b>	<b>External (ESE)</b>	<b>:</b>	<b>30</b>	<b>01</b>

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