

Minor: Automotive Engineering													
Sl. No.	Course and Course code		Course Title	Teaching Dept.	Teaching Hours/Week			Examination					
					Theory Lecture	Tutorial	Practical /Drawing g	Duration in hr	CIE Marks	SEE Marks	Total Marks		Credits
1.	PCC	ME1251-1	Automotive Electricals and Electronics	ME	3	0	0	3	50	50	100	3	
2.	PCC	ME1252-1	Automotive Engines	ME	3	0	0	3	50	50	100	3	
3.	PCC	ME1253-1	Automotive safety Systems	ME	3	0	0	3	50	50	100	3	
4.	PCC	ME1254-1	Automotive Transmission Systems	ME	3	0	0	3	50	50	100	3	
5.	PCC	ME1255-1	Automotive Fuels and Lubricants	ME	3	0	0	3	50	50	100	3	
6.	PCC	ME1256-1	Manufacturing and Materials for Automotive Components	ME	3	0	0	3	50	50	100	3	
TOTAL					18	0	0	18	300	300	600	18	

Automotive Electricals and Electronics			
Course Code:	ME1251-1	Course Type	PCC
Teaching Hours/Week (L: T: P: S)	3:0:0:0	Credits	03
Total Teaching Hours	40	CIE + SEE Marks	50+50
Teaching Department: Mechanical Engineering			
Course Objectives:			
1.	To help students to gain essential and basic knowledge of automotive electrical systems		
2.	To understand the working principle with necessary design requirement		
3.	To equip them with knowledge required for the automotive electrical development.		
4.	To get knowledge on different types, automotive sensors and actuators.		
5.	To know the engine management systems and vehicle management systems.		
UNIT-I			
Starting System and Electric Drives			8 Hours
Requirements of Starter Motor, Starter Motor types, construction and characteristics, Starter drive mechanisms, Starter Switches and Solenoids. Brushless DC Motor, speed control, Brushless PM Motor for electric vehicles, Spark Plugs, Constructional details and Types, Battery Coil and Magneto-Ignition System, Circuit details and Components, Centrifugal and Vacuum Advance Mechanisms, Non-Contact- type Ignition Triggering devices, Capacitive Discharge Ignition, Distributor-less Ignition System			
Charging & Lighting Systems			7 Hours
Charging system components, Generators and Alternators, types, construction and Characteristics, Voltage and Current Regulation, Cut –out relays and regulators, Charging circuits for D.C. Generator, A.C. Single Phase and Three – Phase Alternators Head Lamp and Indicator Lamp construction and working details, Focusing of head lamps, Anti-Dazzling and Dipper Details, Automotive Wiring Circuits.			
UNIT-II			
Sensors and Actuators			8 Hours
Speed sensors, Pressure sensors: Manifold Absolute Pressure sensor, knock sensor, Temperature sensors: Coolant and Exhaust gas temperature, Exhaust Oxygen level sensor. Position sensors: Throttle position sensor, accelerator pedal position sensor and crankshaft position sensor, Air mass flow sensor. Solenoids, stepper motors and relays			
Engine & Vehicle Management System			7 Hours
Electronic engine control: Input, output and control strategies, electronic fuel control system, fuel control modes: open loop and closed loop control at various modes, EGR control, Electronic ignition systems – Spark advance correction schemes, fuel injection timing control. Cruise control system, Antilock braking system, electronic suspension system, electronic steering control, traction control system, Transmission control system			
UNIT-III			
Automotive Batteries & Characteristics			10 Hours

Principle and construction of Lead Acid Battery, Nickel – Cadmium Battery, Nickel Metal, Hybrid Battery, Sodium Sulphur Battery and Aluminum Air Battery-Choice of Batteries for automotive applications, Characteristics of Battery, Battery Rating, Capacity and Efficiency, Various Tests on Battery, Battery– Charging Techniques. Maintenance of batteries.

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

1.	Knowledge about the need and working of ignition systems
2.	Understand the working of lighting system
3.	Gain the skills on the recent development in the area of automotive electricals
4.	To acquire the different automotive actuators working principle and its applications.
5.	To understand the modern vehicle management system and their requirements.

**Course Outcomes Mapping with Program Outcomes & PSO**

Program Outcomes→	1	2	3	4	5	6	7	8	9	10	11	12	PSO↓		
↓ Course Outcomes													1	2	3
<b>ME1251-1-1.1</b>	1					1			1	2	3	2	2		
<b>ME1251-1-1.2</b>	1					1			1	2	3	2	2		
<b>ME1251-1-1.3</b>	1					1			1	2	3	2	2		
<b>ME1251-1-1.4</b>	1					1			1	2	3	2	2		
<b>ME1251-1-1.5</b>	1					1			1	2	3	2	2		

1: Low 2: Medium 3: High

**TEXTBOOKS:**

1.	Tom Denton, "Automotive Electrical and Electronic Systems", Routledge, 2018 ISBN: 9780415725774
2.	William B Ribbens, "Understanding Automotive Electronics: An Engineering Perspective", Newne Butterworth- Heinemann, 7th edition 2017

**REFERENCE BOOKS:**

1.	Crouse.W.H., "Automobile Electrical Equipment", McGraw Hill Book Co Inc. New York, 2005
2.	Judge.A.W., "Modern Electrical Equipments of Automobiles", Chapman & Hall, London, 2004.
3.	Robert Bosch, "Automotive Handbook", SAE (8 <sup>th</sup> Edition), 2022.
4.	Barry Hollembeak, "Automotive Electricity and Electronics", Delmar Cengage Learning; 7 <sup>th</sup> edition, 2018

Automotive Engines			
Course Code:	ME1252-1	Course Type	PCC
Teaching Hours/Week (L: T: P: S)	3:0:0:0	Credits	03
Total Teaching Hours	40	CIE + SEE Marks	50+50
Teaching Department: Mechanical Engineering			
Course Objectives:			
1.	To identify the thermal sciences related to IC engine; know combustion processes involved in S.I Engine and different variables affecting it.		
2.	To demonstrate combustion process in C.I Engine and different variables affecting it also how methods of swirl generation lead to better combustion.		
3.	To distinguish the various emissions from SI & CI engine and highlight the various control techniques used.		
4.	To illustrate engine modification for the use of fuels like LPG, Hydrogen & alcohols.		
5.	To summarize the recent developments in engine and Measurement of different engine parameters.		
UNIT-I			
Spark Ignition Engines			8 Hours
Spark ignition Engine mixture requirements - Feedback Control Carburetors -Fuel - Injection systems - Monopoint and Multipoint injection - Stages of combustion - Normal and Abnormal combustion-Factors affecting knock - Combustion Chambers -.			
Compression Ignition Engines			7 Hours
States of combustion in C.I. Engine - Direct and indirect injection systems - Combustion chambers - Fuel spray behavior - spray structure, spray penetration and evaporation - Air motion – Turbocharging.			
UNIT-II			
Pollutant Formation Control			8 Hours
Pollutant - Sources and types - formation of NOx - Hydro-carbon Emission Mechanism - Carbon Monoxide Formation - Particulate emissions – Methods of controlling Emissions- Catalytic converters and Particulate Traps-Methods of measurements and Driving cycles. Evolution and implementation of Bharath Stage norms.			
Alternative Fuels			7 Hours
Alcohol, Hydrogen, Natural Gas and Liquefied Petroleum Gas, Bio-diesel. - Properties, Suitability, Engine Modifications, Merits and Demerits as fuels.			
UNIT-III			
Recent Trends			10 Hours
Learn Burn Engines - Stratified charge Engines - Gasoline Direct Injection Engine - Homogeneous charge Compression Ignition, Fuel Cells - working, properties, Merits and demerits. Introduction to Electric drives and Hybrids, Flex Fuel and Micro engines. Measurement techniques: Bosch Smoke meter, Hartridge smoke meter, Measurement of Brake Power by dynamometers. Future of IC Engines			

<b>Course Outcomes:</b> At the end of the course student will be able to																
1.	Describe stages of the combustion processes involved in SI Engine and variables affecting it.															
2.	Describe stages of the combustion processes involved in CI Engine and variables affecting it.															
3.	Identify different types of emissions from SI & CI engines and explain techniques to solve air pollution problems.															
4.	Explain the methods of production of alternative fuels for IC engines. Describe engine modification techniques used in IC engines for alternate fuels															
5.	Explain the recent trends in IC engines SCI, HCCI, electric drives and fuel cells.															
<b>Course Outcomes Mapping with Program Outcomes &amp; PSO</b>																
<b>Program Outcomes→</b>		1	2	3	4	5	6	7	8	9	10	11	12	<b>PSO↓</b>		
<b>↓ Course Outcomes</b>														1	2	3
<b>ME1252-1.1</b>		3	2				1	1		1			1		2	
<b>ME1252-1.2</b>		3	2				1	1		1			1		2	
<b>ME1252-1.3</b>		3	2				1	1		1			1		2	2
<b>ME1252-1.4</b>		3	2				1	1		1			1		2	2
<b>ME1252-1.5</b>		3	2				1	1		1			1	2		2
<b>1: Low 2: Medium 3: High</b>																
<b>TEXTBOOKS:</b>																
1.	John B. Heywood, "Internal Combustion Engine Fundamentals ", McGraw Hill, 2018. ISBN: 9781260116106															
2.	Charles Fayette Taylor 'The Internal-combustion Engine in Theory and Practice, MIT PRESS Massachusetts Institute of Technology, 1985.															
<b>REFERENCE BOOKS:</b>																
1.	M.L Mathur and R.P.Sharma, " Internal Combustion Engine". Dhanpat Rai															
2.	Rowland S.Benson and N.D.Whitehouse, " Internal combustion Engines ", Vol.I and II, Pergamon Press, 1983.															
3.	Duffy Smith, "Auto fuel Systems ", the Good Heart Willox Company, Inc., 1987.															
4.	Ryan O Hayre, Suk – Woncha, Whitney colella, Fritz B. Prinz, "Fuel Cell Fundamentals", Second Edition, John Wiley Publication,2009.															

Automotive Safety Systems			
Course Code:	ME1253-1	Course Type	PCC
Teaching Hours/Week (L: T: P: S)	3:0:0:0	Credits	03
Total Teaching Hours	40	CIE + SEE Marks	50+50
Teaching Department: Mechanical Engineering			
Course Objectives:			
1.	To help the students to acquire in-depth knowledge of automotive safety systems.		
2.	To make students understand the underlying concepts and methods of automotive safety.		
3.	To make students to differentiate the different active and passive safety systems.		
4.	To make the students to be familiar with latest safety systems.		
5.	To enable the students to apply the knowledge of safety systems to develop less accident- prone vehicles		
UNIT-I			
Introduction			07 Hours
Design of the body for safety, energy equation, engine location, deceleration of vehicle inside passenger compartment, deceleration on impact with stationary and movable obstacle, concept of crumple zone, safety sandwich construction.			
Active & Passive Safety:			09 Hours
Driving safety, conditional safety, perceptibility safety, operating safety, Exterior safety, interior safety, deformation behavior of vehicle body, speed and acceleration characteristics of passenger compartment on impact.			
UNIT-II			
Safety Equipments			05 Hours
Seat belt, regulations, automatic seat belt tightener system, collapsible steering column, tiltable steering wheel, air bags, electronic system for activating air bags, bumper design for safety, Anthropomorphic Test Devices( ATD)			
Collision Warning and Avoidance			09 Hours
Collision warning system, causes of rear end collision, frontal object detection, rear vehicle object detection system, object detection system with braking system interactions, safety regulations and consumer ratings			
UNIT-III			
Comfort and Convenience			10 Hours
Steering and mirror adjustment, central locking system , Garage door opening system, tyre pressure control system, rain sensor system, environment information system, Recent Trends - Passenger and Occupant Safety - Testing			
Course Outcomes: At the end of the course student will be able to			

1.	Comprehend the steps involved in the automotive body design to improve safety.
2.	Differentiate the active and passive safety systems and their impact on passengers.
3.	Explain the construction and working principle of various safety equipments employed in automobiles.
4.	Evaluate the behaviour of various safety systems on improving safety, comfort and convenience.
5.	Assess the performance of different testing procedures involved in passenger and occupant safety.

### Course Outcomes Mapping with Program Outcomes & PSO

Program Outcomes→	1	2	3	4	5	6	7	8	9	10	11	12	PSO↓		
↓ Course Outcomes													1	2	3
<b>ME1253-1.1</b>	3	3				2					1	2			3
<b>ME1253-1.2</b>	3	2				2	1				1	2			3
<b>ME1253-1.3</b>	3	2				2					1	2			3
<b>ME1253-1.4</b>	3	2				2					1	2			3
<b>ME1253-1.5</b>	3	2				2					1	2			3

1: Low 2: Medium 3: High

### TEXTBOOKS:

1. Bosch - "Automotive Handbook" - 9th edition - SAE publication - 2014

### REFERENCE BOOKS:

1. Ronald.K.Jurgen - "Automotive Electronics Handbook" - Second edition- McGraw-Hill Inc., - 1999.
2. J.Powloski - "Vehicle Body Engineering" - Business books limited, London - 1969.
3. Mathew Huang – "Vehicle Crash Mechanics", CRC Press, 2002
4. Paul Du Bois Clifford C. Chou Bahig B. Fileta Tawfik B. Khalil Albert I. King Hikmat F. Mahmood Harold J. Mertz Jac Wismans, "Vehicle Crashworthiness and Occupant Protection" American Iron and Steel Institute, 2000.

Automotive Transmission Systems			
Course Code:	ME1254-1	Course Type	PCC
Teaching Hours/Week (L: T: P: S)	3:0:0:0	Credits	03
Total Teaching Hours	40	CIE + SEE Marks	50+50
Teaching Department: Mechanical Engineering			
Course Objectives:			
1.	To help students gain essential and basic knowledge of different transmission systems and components.		
2.	To develop skills in design and maintenance of transmission equipment.		
3.	To enable the students to apply the knowledge of energy conversions to come up with power saving potentials in transmission system components.		
4.	To gain knowledge of latest transmission system components.		
5.	To understand the concept of hydrostatic and electric drives		
UNIT-I			
Clutch			08 Hours
Need and requirement of clutch, types of clutches, friction clutches – Single plate clutch, multi plate clutch, cone clutch, centrifugal clutch, electromagnetic clutch, hydraulic clutches, fluid coupling.			
Traction and Tractive Efforts			08 Hours
Various Resistances to Motion of the Automobile, Traction, tractive effort Performance curves, acceleration grade ability, drawbar pull.			
UNIT-II			
Gear Box			05 Hours
Necessity of gear box, 3-speed & 4-speed gear boxes, Constructional details of sliding-mesh gear box, constant-mesh gear box, synchromesh gear box, overdrive.			
Torque Converters			04 Hours
Principal of torque conversion, single, multi stage and polyphase torque converters, performance characteristics, constructional and operational details of typical hydraulic transmission drives.			
Automatic Transmission			07 Hours
Relative merits and demerits when compared to conventional transmission – epicyclic and hydromatic transmission – Ford T-model, Cotal and Wilson Gear box - continuously variable transmission – Semi automatic transmission.			
UNIT-III			
Hydrostatic and Electric Drives			08 Hours
Hydrostatic Drives: Advantages and disadvantages, principles of hydrostatic drive systems, construction and working of typical hydrostatic drives, Janney Hydrostatic drive. Electric Drives: Advantages and limitations, principles of Ward Leonard system of control			



Modern electric drive for buses and performance characteristics.  
 Power transmission for hybrid vehicle – dual clutch transmission – automated manual transmission - Ford and Chevrolet drive.

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

1.	Describe the working of manual, automatic and semi-automatic transmission systems.
2.	Assess the transmission systems required for the any given vehicle.
3.	Estimate the transmission system efficiency and arrive at power saving opportunities.
4.	Explain the role of transmission components in improving the performance of the vehicle.
5.	Demonstrate a comprehensive grasp of hydrostatic and electric drives.

**Course Outcomes Mapping with Program Outcomes & PSO**

Program Outcomes→	1	2	3	4	5	6	7	8	9	10	11	12	PSO↓		
↓ Course Outcomes													1	2	3
<b>ME1254-1-1.1</b>	3					1						2			2
<b>ME1254-1-1.2</b>	3					1						2			2
<b>ME1254-1-1.3</b>	3					1						2			2
<b>ME1254-1-1.4</b>	3					1						2			2
<b>ME1254-1-1.5</b>	3					1						2			2

1: Low 2: Medium 3: High

**TEXTBOOKS:**

1. Fischer and Pollack, "The Automotive Transmission Book", Springer, 2015

**REFERENCE BOOKS:**

1. Newton K and Steeds. W. "The Motor Vehicle", Butter Worth's & Co., Publishers Ltd, 2001.
2. Automatic vehicle transmission, John Wiley Publications 2018
3. Crouse. W.H., Anglin., D.L., "Automotive Transmission and Power Trains construction",

Automotive Fuels and Lubricants			
Course Code:	ME1255-1	Course Type	PCC
Teaching Hours/Week (L: T: P: S)	3:0:0:0	Credits	03
Total Teaching Hours	40	CIE + SEE Marks	50+50
Teaching Department: Mechanical Engineering			
Course Objectives:			
1.	To know about Petroleum Refining and Lubrication Manufacturing		
2.	To gain knowledge on lubrication theory and system design		
3.	To understand about various types of lubricants		
4.	To develop skills on testing of fuels		
5.	To study about the combustion process		
UNIT-I			
Manufacture of Fuels and Lubricants			8 Hours
Refining process, fuels, thermal cracking, catalytic cracking, polymerization, alkylation, isomerization, blending, products of refining process. Manufacture of lubricating oil base stocks, manufacture of finished automotive lubricants			
Theory of Lubrication			8 hours
Engine friction: introduction, total engine friction, effect of engine variables on friction, hydrodynamic lubrication, elasto hydrodynamic lubrication, boundary lubrication, bearing lubrication, functions of the lubrication system.			
UNIT-II			
Lubricants			8 hours
Specific requirements for automotive lubricants, oxidation deterioration and degradation of lubricants, additives and additive mechanism, synthetic lubricants, classification of lubricating oils, properties of lubricating oils, tests on lubricants. Grease, classification, properties, test used in grease.			
Properties and Testing of Fuels			8 hours
Properties and testing of fuels, relative density, calorific value, flash point, fire point, distillation, vapour pressure, spontaneous ignition temperature, viscosity, pour point, flammability, ignitability, diesel index, API gravity, aniline point, carbon residue			
UNIT-III			
Combustion & Fuel Rating			8 hours
SI Engines – flame propagation and mechanism of combustion, normal combustion, knocking, octane rating, fuel requirements. CI Engine, mechanism of combustion, diesel knock, cetane rating, fuel requirements. Additive - mechanism, requirements of an additive, petrol fuel additives and diesel fuel additives – specifications of fuels			
Course Outcomes: At the end of the course student will be able to			
1.	Understanding Petroleum Refining and Lubrication Manufacturing		

2.	Comprehend the Lubrication Theory and System Design															
3.	Understand various types of lubricants															
4.	Comprehensive Knowledge of Fuel Properties and Testing															
5.	Know about Combustion Mechanisms and Fuel Ratings															
<b>Course Outcomes Mapping with Program Outcomes &amp; PSO</b>																
<b>Program Outcomes→</b>		1	2	3	4	5	6	7	8	9	10	11	12	<b>PSO↓</b>		
<b>↓ Course Outcomes</b>														1	2	3
<b>ME1255-1.1</b>		3					1	2					3			3
<b>ME1255-1.2</b>		3					1	2					3			3
<b>ME1255-1.3</b>		3					1	2					3			3
<b>ME1255-1.4</b>		3					1	2					3			3
<b>ME1255-1.5</b>		3					1	2					3			3
<b>1: Low 2: Medium 3: High</b>																
<b>TEXTBOOKS:</b>																
1.	Ganesan.V., "Internal Combustion Engineering", Tata McGraw-Hill Publishing Co., New Delhi, 2003.															
2.	Mathur. M.L., Sharma. R.P. "A course in internal combustion engines", Dhanpatrai publication, 2003.															
3.	Obert. E.F "Internal Combustion Engineering and Air Pollution", International book Co., 1988															
<b>REFERENCE BOOKS:</b>																
1.	Brame, J.S.S. and King, J.G. – "Fuels Solids, Liquids, Gaseous". Edward Arnold, 1961															
2.	Francis, W, "Fuels and Fuel Technology", Vol. I & II, Pergamon, 1965															
3.	Hobson, G.D. & Pohl.W "Modern Petroleum Technology", 1974															

Manufacturing and Materials for Automotive Components			
Course Code:	ME1256-1	Course Type	PCC
Teaching Hours/Week (L: T: P: S)	3:0:0:0	Credits	03
Total Teaching Hours	40	CIE + SEE Marks	50+50
Teaching Department: Mechanical Engineering			
Course Objectives:			
1.	To understand various casted engines components		
2.	To understand various forged components of the engine		
3.	To know about material selection for transmission system		
4.	To understand the various manufacturing process of automotive body components		
5.	To study about surface coating and composites		
UNIT-I			
Casted Engine Components			08 Hours
Material selection and Manufacturing methods for Piston, Piston rings, Cylinder block, wet and dry liners, Engine head, Oil pan, Carburetors. Thermal barrier coating of Engine head and valves.			
Forged Engine Components			08 Hours
Material selection and Manufacturing methods for Crank shaft, Connecting rod, Cam shaft, valve, Piston pin, Push rod, Rocker arm, tappets, spark plug			
UNIT-II			
Materials for Transmission System			07 Hours
Material selection and Manufacturing methods for Clutch – Clutch lining – Gear Box – Gear – Propeller Shaft – Differential – Axle Shaft – Bearing – fasteners – Wheel drum. Methods of Gear manufacture – Gear hobbing and gear shaping machines - gear generation - gear finishing and shaving – Grinding and lapping of hobs and shaping cutters – gear honing – gear broaching			
Manufacturing of Body Components			07 Hours
Introduction, thermoforming and hydro forming, press forming, welding of body panels, resistance, welding and other welding processes. Introduction - moulding of instrument panel, moulding of bumpers, reinforced reaction injection moulding, tooling and tooling requirements, manufacture of metal/polymer/metal panels. Adhesives and sealants, leaf spring manufacturing, composite leaf springs, wrap forming of coil springs			
Vehicle Chassis			03 Hours
Material selection and manufacturing methods for chassis, dead axle, leaf spring, coil spring and shock absorbers – wheel housing – steering system, Brake shoes, wheel rim, Tyres.			
UNIT-III			
Surface Coatings			03 Hours
Chemical vapour deposition, physical vapour deposition, sol-gel processing, spraying, plating, paining in paint booth.			

Polymers and Composites													04 Hours			
Plastics – Plastics in Automobile vehicles – Processing of plastics - Emission control system – catalytic converter – Hydro forming of exhaust manifold and lamp housing – stretch forming of Auto body panels – MMC liners –Selection of materials for Auto components. Use of Robots in Body weldment																
Course Outcomes: At the end of the course student will be able to																
1.	Understand the various casted engine components															
2.	Understand the various forged engine components															
3.	Select materials for transmission systems															
4.	Know about various manufacturing process of automotive body components															
5.	Explain about surface coating and composites															
Course Outcomes Mapping with Program Outcomes & PSO																
Program Outcomes→		1	2	3	4	5	6	7	8	9	10	11	12	PSO↓		
↓ Course Outcomes														1	2	3
ME1256-1.1		3		2			1	1				2	2			3
ME1256-1.2		3		2			1	1				2	2			3
ME1256-1.3		3		2			1	1				2	2			3
ME1256-1.4		3		2			1	1				2	2			3
ME1256-1.5		3		2			1	1				2	2			3
1: Low 2: Medium 3: High																
TEXTBOOKS:																
1.	Serope Kalpakjian and Steven R. Schmid, Manufacturing Processes for Engineering Materials, Fourth Edition, Pearson Education publications – 2018.															
REFERENCE BOOKS:																
1.	Philip F. Ostwald & Jairo Munuz, Manufacturing Processes and Systems, John Wiley & Sons, New York, 2008.															
2.	Degarmo E.P., Materials and process in Manufacturing, Macmillan Publishing Co., 2017.															
3.	Heldt P.M., High Speed Combustion Engines, Oxford IBH publishing Co., Calcutta, 1996.															
4.	Kalpakjian, Manufacturing and Engineering and Technology, Addison Wesley Publishing Company, 2018.															