PROGRAMME EDUCATIONAL OBJECTIVES (PEOs):

I. Students will excel in their professional career in automobile industry and research with highest professional and ethical standards to their activities by acquiring knowledge in basic engineering, mathematics, science and automobile engineering.

II. Students will exhibit professionalism, team work in their chosen profession and adapt to current trends, technologies and industrial scenarios by pursuing lifelong learning.

PROGRAMME OUTCOMES (POs):

1. Graduate will demonstrate strong basics in mathematics, science and Engineering
2. Graduate will demonstrate the ability to design and conduct Experiments, as well as to analyze and interpret data.
3. Graduate will demonstrate the ability to design a system, component or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and Safety, manufacturability and sustainability.
4. Graduate will become familiar with modern Engineering tools and analyse the problems within the domains of Automobile Engineering as the members of multidisciplinary teams.
5. Graduate will acquire the capability to identify, formulate and solve complex engineering problems related to Automobile Engineering
6. Graduate will demonstrate and understanding of professional and ethical responsibility with reference to their career in the field of Automobile Engineering
7. Graduate will be able to communicate effectively both in verbal non-verbal forms
8. Graduate will be trained towards developing the impact of development of Automobile engineering on global, economic environment and societal context
9. Graduate will be capable of understanding the value for life-long learning
10. Graduate will demonstrate knowledge of contemporary issues focusing on the necessary to develop new material, design, and engineering practice in the field of Automobile Engineering
11. Graduate will demonstrate the ability to use the techniques, skills and Modern engineering tools necessary for engineering practice in the field of Automobile Engineering
12. Graduate will have a firm scientific, technological and communication base that helps them either to find a desire placement or to become an Entrepreneur and explore their knowledge in their field.
13. Graduate will be capable of doing higher studies and research in inter and multi-disciplinary areas.
## CORRELATION BETWEEN POs AND PEOs

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# M.E. AUTOMOBILE ENGINEERING (FT/PT)

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**TOTAL CREDITS TO BE EARNED FOR THE AWARD OF DEGREE = 71**
ANNA UNIVERSITY, CHENNAI
UNIVERSITY DEPARTMENTS
REGULATIONS – 2015
CHOICE BASED CREDIT SYSTEM
CURRICULA AND SYLLABI
M.E. AUTOMOBILE ENGINEERING (PART TIME)

SEMESTER I

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OBJECTIVE:
- Study of the Constructional details and Theory of important drive line, Structural, Steering, Braking and Suspension Systems of Automobiles. Problem–Solving in Steering Mechanism, Propeller Shaft, Braking and Suspension Systems are to be done.

UNIT I  LAYOUT, FRAME, FRONT AXLE AND STEERING SYSTEM  13

UNIT II  DRIVE LINE, FINAL DRIVE AND DIFFERENTIAL  12

UNIT III  REAR AXLES, WHEELS, RIMS AND TYRES  11

UNIT IV  SUSPENSION SYSTEM  12
Requirements of Suspension System, Types of Suspension – Constructional details and characteristics of Single Leaf, Multi–Leaf spring, Coil spring and Torsion bar, Rubber, Pneumatic and Hydro – elastic Suspension, Independent Suspension System, Shock Absorbers.

UNIT V  BRAKE SYSTEM  12

TOTAL 60 PERIODS

OUTCOME:
At the end of this course the student should be able to
- Understand of the Constructional details of chassis Know the important drive line, Structural, Steering, Braking and Suspension Systems of Automobiles.
- Improve the Problem–Solving skill in Steering Mechanism, Propeller Shaft, Braking and Suspension systems.
- Acquire the importance of axle and tyre selection
- Understand the Dynamics of the chassis affecting vehicle characteristics

TEXT BOOKS
REFERENCES

AM7102 AUTOMOTIVE ENGINES AND SUBSYSTEMS

L T P C
3 0 0 3

OBJECTIVE:
- The main objective of this course is to impart knowledge in automotive engine. The detailed concept, construction and principle of operation of engine and various engine components, combustion, cooling and lubrication systems will be taught to the students. At the end of the course the students will have command over automotive engines and the recent development in the area of engines.

UNIT I ENGINE BASIC THEORY 9

UNIT II FUEL SUPPLY AND IGNITION SYSTEMS 9

UNIT III COOLING AND LUBRICATING SYSTEMS 9
Air cooling and water cooling – thermo syphon cooling, forced cooling systems. Fins and radiator - design aspects. Theory of lubrication — types of lubrication, splash lubrication system, petrol lubrication system, forced feed lubrication system. Properties of engine lubricants.

UNIT IV AIR MOTION, COMBUSTION AND COMBUSTION CHAMBERS 9

UNIT V NEW ENGINE TECHNOLOGY 9

TOTAL : 45 PERIODS

OUTCOME:
- To students will have the basic knowledge on Automotive Engines and its various sub components along with its functions. At the end of the course the students will have command knowledge over automotive engines and the recent development in the area of internal combustion engines.

TEXTBOOK
REFERENCES:

AM7103 AUTOMOTIVE TRANSMISSION L T P C 3 0 0 3

OBJECTIVE:
- The main objective of this course is to impart knowledge in automotive transmission.
- The detailed concept, construction and principle of operation of various types of mechanical transmission components, hydrodynamic devices, hydrostatic devisees and automatic transmission system will be taught to the students.
- The design of clutch and gearbox will also be introduce to the students

UNIT I CLUTCH 9
Requirements of Transmission system. Clutches – Functions, Principle of operation and types – single plate, multi plate, diaphragm and overrunning clutches.

UNIT II GEAR BOX 9
Purpose of gear box. Construction and working principle of sliding, constant and synchromesh gear boxes. Problems on performance of automobile such as Resistance to motion, Tractive effort, Engine speed & power and acceleration. Determination of gear box ratios for different vehicle applications.

UNIT III HYDRODYNAMIC TRANSMISSION 9

UNIT IV AUTOMATIC TRANSMISSION 9

UNIT V HYDROSTATIC DRIVE AND ELECTRIC DRIVE 9

OUTCOME:
- At the end of the course the students will have command over automotive transmission concepts and applications like The constructional, working principle of various types of manual and automotive transmission of an automobile.
- The performance characteristics, design of clutch and gear box for different vehicle applications.
The construction and working principles of hydrostatic drive and electric drives used in the automotive transmission system.

TEXTBOOK:

REFERENCES:

MA7154 ADVANCED NUMERICAL METHODS

OBJECTIVE:
• To impart knowledge on numerical methods that will come in handy to solve numerically the problems that arise in engineering and technology. This will also serve as a precursor for future research.

UNIT I ALGEBRAIC EQUATIONS

UNIT II ORDINARY DIFFERENTIAL EQUATIONS
Runge Kutta Methods for system of IVPs, numerical stability, Adams-Bashforth multistep method, solution of stiff ODEs, shooting method, BVP: Finite difference method, orthogonal collocation method, orthogonal collocation with finite element method, Galerkin finite element method.

UNIT III FINITE DIFFERENCE METHOD FOR TIME DEPENDENT PARTIAL DIFFERENTIAL EQUATION

UNIT IV FINITE DIFFERENCE METHODS FOR ELLIPTIC EQUATIONS
Laplace and Poisson’s equations in a rectangular region: Five point finite difference schemes, Leibmann’s iterative methods, Dirichlet and Neumann conditions – Laplace equation in polar coordinates: finite difference schemes – approximation of derivatives near a curved boundary while using a square mesh.

UNIT V FINITE ELEMENT METHOD

TOTAL: 60 PERIODS

OUTCOME:
• It helps the students to get familiarized with the numerical methods which are necessary to solve numerically the problems that arise in engineering.
BOOK FOR STUDY

AM7111 ENGINE AND CHASSIS LABORATORY

OBJECTIVE:
- The main objective of this course is to impart knowledge in the assembling and dismantling and study of different types of an engine and its various systems like steering system, transmission system, electrical system, ignition system, and Braking system.
- At the end of the course the student will be well versed in the assembling and dismantling of any vehicles.

LIST OF EXPERIMENTS
1. Performance and emission Test of SI Engine.
2. Performance and emission Test of CI Engine.
3. Heat balance test on IC engines
5. Determination of in-cylinder pressure vs crank angle.
7. Study of Wheel Alignment System
8. Assembling and dismantling of the following
   i. SI engine.
   ii. CI engine
   iii. V engine
   iv. Single plate, Diaphragm Clutch.
   v. Constant mesh, Sliding mesh gear box
   vi. Transfer case
   vii. Differential
   viii. Front axle, Rear axle
   ix. Brake system
   x. Steering system

TOTAL: 60 PERIODS

OUTCOME
- Be familiar with of the Performance and emission Test of SI & CI Engine, Heat balance test on IC engines
- To develop the trouble shoot skill in chassis system, Chassis dynamometer, and Wheel Alignment System.

14
OBJECTIVE:
- To impart knowledge to the students in the principles of operation and constructional details of various Automotive Electrical and Electronic Systems like Batteries, Starting System, Charging System, Ignition System, Lighting System and Dash – Board Instruments, Electronic ignition system, various sensors and the role of ECU.

UNIT I  BATTERY AND STARTING SYSTEMS  9

UNIT II  CHARGING AND LIGHTING SYSTEMS  9

UNIT III  ELECTRONIC IGNITION AND INJECTION SYSTEMS  9

UNIT IV  ELECTRICAL SYSTEMS  9
Warning and alarm instruments : Brake actuation warning system, traficators, flash system, oil pressure warning system, engine over heat warning system, air pressure warning system, speed warning system, door lock indicators, neutral gear indicator, horn design, permanent magnet horn, air & music horns. Wind shield wiper. window washer, instrument wiring system and electromagnetic interference suppression, wiring circuits for instruments, electronic instruments, dash board illumination.

UNIT V  MICROPROCESSOR IN AUTOMOBILES  9
Microprocessor And Microcomputer controlled devices in automobiles such as instrument cluster, Voice warning system, Travel information system, Keyless entry system. Environmental requirements (vibration, Temperature and EMI).

TOTAL : 45 PERIODS

OUTCOME:
At the end of this course the student should be able to
- Understand about Batteries, Starting System
- Understand the functioning of charging System and Ignition System in Tandem
- Understand the Lighting System and Dash – Board Instruments of vehicle.
- Know the Functions of electrical accessories onboard the vehicle.

TEXTBOOK:

REFERENCES:
OBJECTIVE:

- The main objective of this course is to impart knowledge in automotive pollution control. The detailed concept of formation and control techniques of pollutants like UBHC, CO, NOₓ, particulate matter and smoke for both SI and CI engine will be taught to the students. The instruments for measurement of pollutants and emission standards will also be introduced to the students. At the end of the course the students will have command over automotive pollution and control.

UNIT I EMISSION FROM AUTOMOBILES


UNIT II EMISSION FROM SPARK IGNITION ENGINE AND ITS CONTROL

Emission formation in SI Engines- Carbon monoxide- Unburned hydrocarbon, NOₓ. Smoke — Effects of design and operating variables on emission formation — controlling of pollutants - Catalytic converters — Charcoal Canister — Positive Crank case ventilation system, Secondary air injection, thermal reactor, Laser Assisted Combustion.

UNIT III EMISSION FROM COMPRESSION IGNITION ENGINE AND ITS CONTROL

Formation of White, Blue, and Black Smokes, NOx, soot, sulphur particulate and Intermediate Compounds — Physical and Chemical delay — Significance Effect of Operating variables on Emission formation — Fumigation, EGR, HCCI, Particulate Traps, SCR — Cetane number Effect.

UNIT IV NOISE POLLUTION FROM AUTOMOBILES


UNIT V TEST PROCEDURES AND EMISSION MEASUREMENTS

Constant Volume Sampling I and 3 (CVSI &CVS3) Systems- Sampling Procedures — Chassis dyno - Seven mode and thirteen mode cycles for Emission Sampling — Sampling problems — Emission analysers —NDIR, FID, Chemiluminescent, Smoke meters, Dilution Tunnel, SHED Test, Sound level meters.

TOTAL : 45 PERIODS

OUTCOME:

By the end of this course, students will be able to

- Understand the various emissions formed in IC engines
- Understand the effects of pollution on human health and environment
- Understand the control techniques
- Understand the emission norms
TEXTBOOK:

REFERENCES

AM7203 VEHICLE BODY ENGINEERING

OBJECTIVE:
- The main objective of this course is to impart knowledge in the construction of vehicle, aerodynamic, concept, panelling of passenger car body trim. At the end of the course the student will be well versed in the design and construction of external body of the vehicles.

UNIT I CAR BODY

UNIT II BUS BODY
Types of bus body: based on capacity, distance traveled and based on construction.– Layout for various types of Bus body, Types of metal sections used – Regulations – Constructional details: Conventional and integral. Driver seat design.

UNIT III COMMERCIAL VEHICLE BODY
Types of commercial vehicle bodies – LCV, HCV. Construction details of - Flat platform body and Tanker body – Dimensions of driver’s seat in relation to controls – Drivers cab design – segmental design, compaction of driver’s cab.

UNIT IV VEHICLE AERODYNAMICS
Vehicle drag and types. Types of forces and moments. Effects of forces and moments. Side wind effects on forces and moments. Various body optimization techniques for minimum drag. Wind tunnels – Principle of operation, Types. Wind tunnel testing such as: Flow visualization techniques, Airflow management test – measurement of various forces and moments by using wind tunnel.

UNIT V BODY MATERIALS, TRIM, MECHANISMS AND BODY REPAIR

TOTAL : 45 PERIODS
OUTCOME:
Upon completion of the course, students will
- Know about different aspects of car body and bus body, types, commercial vehicle.
- Role of various aerodynamic forces and moments, measuring instruments.
- Know about the material used in body building, tools used, body repairs.

TEXTBOOK:

REFERENCES:

AM7251  VEHICLE DYNAMICS  L T P C
3 0 0 3

OBJECTIVE:
- Road vehicles are classified into various types based on application. The design of vehicle control system, traction and brake, ride and handling dynamics for each vehicle are presented. Students will learn about the fundamental theory of vehicle dynamics, vehicle performance as well as related tests. It is also an important goal to instruct them in the application of the dynamic modeling and analysis approach in vehicle design. The objective of this course is to train the students as specialists in the vehicle engineering domain, to develop their capacities of analysis, evaluation and design based on their acquisition of skills in modeling dynamic equation and performance analysis.

UNIT I  BASIS OF VIBRATION  9

UNIT II  TYRES  9

UNIT III  VERTICAL DYNAMICS  9

UNIT IV  LONGITUDINAL DYNAMICS AND CONTROL  9
UNIT V  LATERAL DYNAMICS

OUTCOME:
- At the end of the course, the students will be introduced to the fundamentals of vehicle dynamics and the performance indices and evaluation criteria of vehicles, to analyze the influence of vehicle configuration and design parameters on vehicle performance, to discuss the approach for predicting vehicle performance and to simulate and analyze vehicle performance as well.

TEXT BOOKS:

REFERENCES:
1. Dean Karnopp, Vehicle Stability, 1st edition, Marcel Dekker, 2004

AM7211  AUTOMOTIVE ELECTRICAL AND ELECTRONICS AND VIRTUAL INSTRUMENTATION LABORATORY

OBJECTIVE:
- To import the knowledge in the area of automotive electrical system and electronic system associated in modern vehicles.

LIST OF EXPERIMENTS:
1. Testing of
   a. battery
   b. starting systems
   c. charging systems
   d. ignition systems
   e. body controller systems
2. Study of
   a. automotive lighting system and adjustment of head lights beam
   b. major electrical components used in modern vehicles
   c. diagnostic tool used in vehicle
3. Dismantling, testing and assembling of Starter system components
4. Dismantling, testing and assembling of Charging system components
5. Basic Analog Experiments like
   a. Logic gates, Adders, Flip flops
   b. Amplifier, filter,
   c. Multiplexer and De-multiplexer
6. Interfacing seven segment displays
7. Microprocessor and microcontroller programming
   a. Arithmetic and Logic operation,
   b. Code conversion,
   c. Waveform generation,
   d. Look up table
8. Interfacing ADC and DAC for Data Acquisition and Control Application
9. Interfacing Sensors for Measurements of position, displacement, velocity, force, temperature, proximity/range etc
11. Study of
    a. Virtual Instrumentation
    b. Controller Area Network
    c. Multiplexing System
    d. Electronic Control Unit
    e. Engine Sensors and Actuators
    f. Chassis Sensors and Actuators
    g. Development of Embedded Systems
12. Mini Project

TOTAL: 45 PERIODS

OUTCOME:
At the end of the course the students will be able to have the knowledge in
- Automotive electrical systems and electrical accessories
- Basic microprocessor / microcontroller programming
- Automotive sensor, transducer, actuator, virtual instrumentation, data acquisition
- Development of embedded systems for automobiles

AM7301 ENGINE MANAGEMENT SYSTEMS

OBJECTIVE:
- The course will focus on engine management systems viz fuel injection, ignition system, emission control and engine management. This course will provide opportunities to discuss the fundamentals of engine control, sensors, actuators, electronics systems, diagnostics system.

UNIT I FUNDAMENTALS OF AUTOMOTIVE ELECTRONICS
Components for electronic engine management system, open and closed loop control strategies, PID control, Look up tables, introduction to modern control strategies like Fuzzy logic and adaptive control. Switches, active resistors, Transistors, Current mirrors/amplifiers, Voltage and current references, Comparator, Multiplier. Amplifier, filters, A/D and D/A converters.

UNIT II SENSORS AND ACTUATORS
Inductive, Hall Effect, thermistor, piezo electric, piezoresistive, based sensors. Throttle position, mass air flow, crank shaft position, cam position, engine speed sensor, exhaust oxygen level (two step, linear lambda and wideband), knock, manifold temperature and pressure sensors. Solenoid, relay(four and five pin), stepper motor
UNIT III SI ENGINE MANAGEMENT
Layout and working of SI engine management systems. Group and sequential injection techniques. Advantages of electronic ignition systems. Types of solid state ignition systems and their principle of operation, Contactless (BREAKERLESS) electronic ignition system, Electronic spark timing control.

UNIT IV CI ENGINE MANAGEMENT

UNIT V DIGITAL ENGINE CONTROL SYSTEM
Cold start and warm up phases, idle speed control, acceleration and full load enrichment, deceleration fuel cutoff. Fuel control maps, open loop and closed loop control – Integrated engine control system, Electromagnetic compatibility – EMI Suppression techniques – Electronic dashboard instruments – Onboard diagnosis system.

TOTAL : 45 PERIODS

OUTCOME:
At the end of the course, the student should able to
- Explain the fundamentals, operation, function of various sensors and actuators in engine management systems.
- Explain the fundamentals, operation, function of various fuel injection systems pertain to SI and CI Engine.
- Explain the control algorithm during various engine operating conditions.

TEXT BOOKS:
2. Automobile Electronics by Eric Chowanietz SAE

REFERENCES:

AM7311 COMPUTER AIDED ENGINE COMPONENT DESIGN LABORATORY
L T P C
0 0 4 2

OBJECTIVE:
- Import the knowledge in the area of design and analysis of automotive engine components

LIST OF EXPERIMENTS:
Design, model and (Structural / Thermal) analysis of the following components
1. Engine Cylinder
2. Piston
3. Connecting rod Assembly.
4. Valve train components
5. Crank shaft.
6. Cam shaft.

TOTAL: 60 PERIODS

OUTCOME:
- At the end of the course the students will be able to have a complete knowledge in design and analysis of automotive engine components

REFERENCES:

21
OBJECTIVE:

- The objectives of this course are to make the students understand the advanced concepts of thermodynamics applied to I.C. engines. To impart knowledge on entropy and its significance in engine combustion. To provide complete knowledge on chemical kinetics involved in pollution formation.

UNIT I BASIC CONCEPTS

Systems, property, state, path and process- quasi static process, work, modes of work. Review of laws of thermodynamics – first and second law of thermodynamics – Application of the energy equation to the engine combustion process. Application to closed and open systems of automobile. internal energy, specific heat capacities, enthalpy, and steady flow process.

UNIT II ENTROPY


UNIT III COMBUSTION OF HYDROCARBON FUELS


UNIT IV CHEMICAL KINETICS OF COMBUSTION


UNIT V CHEMICAL EQUILIBRIUM AND DISSOCIATION


OUTCOME:

- Students will possess extended knowledge in thermodynamics such as entropy and its significance.
- Students will possess a comprehensive understanding of importance of chemical kinetics and dissociation involved in combustion and pollution formation in IC engines.
REFERENCES:

AM7002 ALTERNATIVE FUELS AND PROPULSION SYSTEMS

OBJECTIVE:
- At the end of the course, the student will be able to acquire knowledge of alternate fuels and the changes in the engine design for handling them and understand various propulsion systems for use in the automobiles.

UNIT I ALCOHOLS AS FUELS

UNIT II VEGETABLE OILS AS FUELS

UNIT III HYDROGEN AS ENGINE FUEL

UNIT IV BIOGAS, NATURAL GAS AND LPG AS FUELS
Biogas, Natural gas and LPG – Properties and production methods. CO₂ and H₂S scrubbing in Biogas, Modifications required for use in Engines- Performance, combustion and emission Characteristics in engines. Issues & limitation in Gaseous fuels.

UNIT V HYBRID AND ELECTRIC VEHICLES

OUTCOME:
By the end of this course, students will be able to
- Student will possess a comprehensive understanding of available alternative fuels for IC engines. They will posses complete knowledge on producing different biofuels, modifying them and using them in IC engines
- Students will acquire the skills in developing new technologies for alternative fuels efficiently in IC engines.
- Students will demonstrate the importance of using alternative fuels for sustainable energy supply and for emission control in IC engines.

TOTAL :45 PERIODS
REFERENCES
4. Transactions of SAE on Biofuels (Alcohols, vegetable oils, CNG, LPG, Hydrogen, Biogas etc.).

AM7003 AUTOMOTIVE AERODYNAMICS L T P C
3 0 0 3

OBJECTIVE:
- At the end of the course, the students will be able to apply basic principles of aerodynamics to improve fuel efficiency of road vehicles.

UNIT I INTRODUCTION TO FLUID PROPERTIES

UNIT II SCOPE AND ANALYSIS OF PASSENGER CAR

UNIT III OPTIMIZATION TECHNIQUES OF PASSENGER CAR
Front end modification – front and rear wind shield angle – Boat tailing – Hatch back, fast back and square back – Dust flow patterns at the rear – Effect of gap configuration – effect of fasteners.

UNIT IV SCOPE AND ANALYSIS OF COMMERCIAL VEHICLES

UNIT V WIND TUNNEL TESTING OF ROAD VEHICLES
Principles of wind tunnel technology – problems with scale models – full scale wind tunnels – instrumentation techniques – Real time testing methods.

TOTAL: 45 PERIODS

OUTCOME:
On completion of the course the student will have
- an ability to apply concepts of fluid dynamics on vehicle motion
- an ability to interpret the influence of vehicle design on fuel economy
- an exposure on drag reduction enhancing vehicle performance
- an ability to develop programs and interpret test data through computational fluid dynamics

TEXTBOOK:
REFERENCES:
2. Automotive Aerodynamics: Update SP-706, S

AM7004 AUTOMOTIVE AIR CONDITIONING SYSTEMS
L T P C
3 0 0 3

OBJECTIVE:
- At the end of the course, the students will be able to understand the Psychometric concepts, refrigerant characteristics, components of the automotive air-conditioning and their functions, and the latest developments in the field of vehicle air conditioning.

UNIT I FUNDAMENTALS 9
Terminology, design factors and concepts related to air conditioning system - Construction and Working principles of Thermostatic Expansion valve and Orifice tube based system- Heating system types -detailed study of HVAC components like compressor, evaporator, condenser, TXV, orifice tube, Receiver-drier, heater core etc. Location of air conditioning components in a vehicle.

UNIT II REFRIGERANTS & AIR MANAGEMENT SYSTEMS 9
Refrigerants:
Temperature and pressure relation, Properties of R-12 and R134a- refrigerant oil. Simple problems -Containers - Handling refrigerants - Tapping into the refrigerant container - Ozone Layer Depletion.
Air management system:
Air routing for manual, semi and automatic system- cases and ducts- Air distribution, control head and doors- Defrost system

UNIT III AUTOMATIC CLIMATE CONTROL SYSTEM 9
Block diagram - types of Sensors and Actuators, - Control Logic Electrical wiring diagram of manual and automatic system - multiplexing between BCM and PCM- control of compressor clutch, blower motor etc.- diagnostics tools and features.

UNIT IV DESIGN OF AIR-CONDITIONING COMPONENTS 9
Modeling of Fixed and variable Displacement type compressor, evaporator modeling - heat transfer correlations for the fluids inside the evaporator, analysis of evaporator frosting- condenser modeling - improvement of refrigerant flow control method.

UNIT V AIR CONDITIONING DIAGNOSIS AND SERVICES 9
AC system diagnosis based on temperature and pressure measurements, sight glass, sound etc. - refrigerant leak detection- Trouble shooting and Servicing of compressor, evaporator, condenser, heater core etc. – HVAC equipment , recovery and charging. Air routing system service.

TOTAL: 45 PERIODS

OUTCOME:
- To students will have the basic knowledge on psychometric terminologies and simple problem pertaining to psychometric and refrigerant system. At the end of the course the students will have through knowledge over different component and their function related to different type of vehicle air conditioning system.

TEXTBOOK:

REFERENCES
4. SAE paper No: 931121,900084, 850040,931137,870029 etc.
5. Vehicle service manuals.

AM7005 AUTOMOTIVE SAFETY

OBJECTIVE:
The course should enable the students to:

- Know about the basics about the vehicle.
- Understand the safety aspects in the vehicle.
- Know and understand the various safety aspects.
- To get the knowledge in sensors provided in the vehicle to avoid the crash and to detect the defects in the vehicle.
- To know about the comfort and convenience system.

UNIT I INTRODUCTION

UNIT II PASSIVE SAFETY CONCEPTS

UNIT III PASSIVE SAFETY EQUIPMENTS AND CONVENIENCE SYSTEM
Seat belt, Seat belt tightener system and importance, collapsible steering column. Air bags and its activation. Designing aspects of automotive bumpers and materials for bumpers. Steering and mirror adjustment, central locking system, Tire pressure control system, rain sensor system, automated wiper system.

UNIT IV ACTIVE SAFETY
Antilock braking system, Stability Control. Adaptive cruise control, Lane Keep Assist System, Collision warning, avoidance system, Blind Spot Detection system, Driver alertness detection system.

UNIT V VEHICLE INTEGRATION AND NAVIGATION SYSTEM

TOTAL: 45 PERIODS
OUTCOME:
The students should be able to:

- Know about the design of the bumper for safety.
- Know about the concept of crumble zone, and also the effect of acceleration and deceleration of the vehicle in the compartment of the vehicle.
- Know the various types of safety aspects such as active and passive safety, the active safety components and the working passive safety components such as air bags, seat belts.
- Know the working of the compartment while moving of the vehicle, about the collapsible steering and tiltatable steering column, about the collision avoidance system, front and rear object detection.
- Know about the rear vehicle detection system, and the braking system, the comfort and convenience system for the vehicle such as central locking system, garage door opening system and about the environment information system.

TEXT BOOK:

REFERENCES:
4. ARAI Safety standards

AM7006 ELECTRIC AND HYBRID VEHICLES L T P C
3 0 0 3

OBJECTIVE:
- This course will introduce general aspects of advanced Hybrid Electric Vehicles (HEV), including architectures, modeling, sizing, sub-system design and hybrid vehicle control. It will cover vehicle dynamics, energy storage sources, electric propulsion systems, power electronics design, and HEV control and communication.

UNIT I NEED FOR ALTERNATIVE SYSTEM
Need of electric vehicles hybrid vehicles – comparative study of diesel, petrol, pure electric and hybrid Vehicles. Limitations of electric vehicles. Specification of some electric and hybrid vehicles

UNIT II VEHICLE DESIGN CONSIDERATIONS FOR ELECTRIC VEHICLES
Various Resistance- Transmission efficiency- Vehicle mass- Electric vehicle chassis and Body design considerations- Heating and cooling systems- Power steering- Tire choice- Wing Mirror, Aerials and Luggage racks

UNIT III ENERGY SOURCES: BATTERIES AND FUEL CELLS
UNIT IV PROPULSION MOTORS AND CONTROLLERS
Characteristics of DC motors. AC single phase and 3-phase motor, PR motors, Switched reluctance machines, speed controllers, Inverters, DC/DC converters.

UNIT V HYBRID VEHICLES

OUTCOME:
The student should be able to
- Explain how a hybrid vehicle works and describe its main components and their function.
- Describe the different hybrid topologies with respect to their functional blocks and their characteristics.
- Design and implement both simple and advanced models of the vehicles.
- Analyze the performance of a hybrid vehicle.
- Build efficiency models of important components.
- Evaluate the environmental impact of road vehicles.
- Calculate basic electrical and thermal properties for power electronic converters.
- Describe the operating principle and properties for the most common types of electrical motors in hybrid technology.
- Describe the operating principle for fuel cells and energy storage elements and calculate basic performance of them.
- Describe the fuel alternatives for hybrid vehicles.

TEXT BOOKS:

REFERENCES:

AM7007 ENGINE COMBUSTION THERMODYNAMICS AND ENGINE HEAT TRANSFER

OBJECTIVE:
The objective of this course is to make the students to understand the principle of internal combustion engine combustion process and to introduce the various heat transfer models. The students will also understand various engine measurement techniques such as surface temperature, cylinder pressure, flow velocity and their significance in engine combustion.

UNIT I BASIC CONCEPTS OF COMBUSTION AND FLAMES
UNIT II THERMODYNAMICS OF ENGINE COMBUSTION 8

UNIT III SPRAY COMBUSTION ANDignition Delay 9

UNIT IV HEAT TRANSFER IN IC ENGINES 9

UNIT V INSTRUMENTATION 9

TOTAL : 45 PERIODS

OUTCOME:
- Student will possess a comprehensive understanding of thermodynamics involved in combustion process of I.C. Engines.
- Students will demonstrate the importance of engine heat transfer in designing modern engine combustion systems.
- Students will possess complete knowledge in engine pressure data acquisition and analysis for combustion parameters.

REFERENCES

AM7008 FINITE ELEMENT METHODS IN AUTOMOBILE ENGINEERING L T P C
3 0 0 3

OBJECTIVE:
- To equip the students with the Finite Element Analysis fundamentals.
- To enable the students to formulate the design problems into FEA.
• To introduce basic aspects of finite element technology, including domain discretization, polynomial interpolation, application of boundary conditions, assembly of global arrays, and solution of the resulting algebraic systems.
• Understand how to use finite element analysis in engineering problems and application areas including stress, heat transfer, and vibration analysis

UNIT I  INTRODUCTION  

UNIT II  1D ELEMENTS  

UNIT III  2D ELEMENTS  

UNIT IV  STRUCTURAL AND DYNAMIC ANALYSIS  

UNIT V  HEAT TRANSFER ANALYSIS AND FLOW ANALYSIS  
1D & 2D problems in fluid mechanics and heat transfer by conduction and convection. Transient thermal analysis. Case Studies like Heat transfer analysis of piston, fins.

TOTAL : 45 PERIODS

OUTCOME:
Upon completing this course, the students will be able to:
• Identify mathematical model for solution of common engineering problems.
• Formulate simple problems into finite elements.
• Solve structural, thermal, fluid flow problems.
• Use professional-level finite element software to solve engineering problems in Solid mechanics, fluid mechanics and heat transfer.
• Derive element matrix equation by different methods by applying basic laws in mechanics and integration by parts

TEXT BOOK:

REFERENCES
AM7009 HYDRAULIC AND PNEUMATIC SYSTEMS

OBJECTIVE:
- The main objective of this course is to impart knowledge in hydraulic and pneumatic system. The detailed concept on construction and principle of operation of various component of hydraulic and pneumatic system will be taught to the students.

UNIT I INTRODUCTION

UNIT II PNEUMATIC SYSTEMS

UNIT III HYDRAULIC SYSTEMS

UNIT IV SERVO AND PLC SYSTEMS
Electro pneumatics, ladder diagram. Servo and Proportional valves - types, operation, application. Hydro-Mechanical servo systems. PLC-construction, types, operation, programming.

UNIT V AUTOMOTIVE APPLICATIONS
Hydraulic tipping mechanism, power steering, for lift hydraulic gear, hydro-pneumatic suspension, air brake. Maintenance and trouble shooting. Design and analysis of a hydraulic / Pneumatic system-Case Study

OUTCOME:
- To students will have the basic knowledge on various laws and simple problem pertaining to hydraulic and pneumatic system. At the end of the course the students will have through knowledge over different component and their function related to hydraulic and pneumatic system and how it is used for automotive applications.
TEXT BOOKS:
2. Werner Deppert and Kurt Stoll, “Pneumatic Controls: An introduction to principles”, Vogel-Druck Wurzburg, Germany, 1975

REFERENCES:

AM7010   IC ENGINE PROCESS MODELING       L T P C
                      3 0 0 3

OBJECTIVE:
- The main objective of this course is to impart knowledge in computer simulation of IC engine process. The detailed concept of air standard, fuel air cycle, progressive and actual cycle simulation of SI engine will be taught to the students. The simulation of two stroke SI engine will also be introduced to the students. At the end of the course the students will have command over simulation of IC engine process.

UNIT I   INTRODUCTION TO MODELLING  9

UNIT II   COMBUSTION AND STOICHIOMETRY  9
Reactive processes, Heat of reaction, measurement of URP, measurement of HRP. Introduction - combustion equation for hydrocarbon fuels. Calculation of minimum air, excess air and stoichiometric air required for combustion. Conversion of volumetric analysis to mass analysis. Introduction, complete combustion in C-H-N-O systems, constant volume adiabatic combustion, constant pressure adiabatic combustion, calculation of adiabatic flame temperature, isentropic changes of state.

UNIT III  COMPUTER SIMULATION OF SI ENGINE WITH FUEL AIR CYCLE  9
SI Engine simulation with air as working medium, deviation between actual and ideal cycle. Fuel air cycle analysis - Temperature drop due to fuel vaporization, full throttle operation, work output and efficiency calculation, part-throttle operation, engine performance at part throttle, super charged operation. SI Engines simulation with progressive combustion. Wiebe’s law combustion analysis.

UNIT IV  COMPUTER SIMULATION OF SI ENGINE WITH GAS EXCHANGE PROCESS  9
Introduction, gas exchange process, Heat transfer process, friction calculations, compression of simulated values, validation of the computer code, engine performance simulation, pressure crank angle diagram, brake power, brake thermal efficiency, effect of speed on performance.
UNIT V  COMPUTER SIMULATION OF CI ENGINE

TOTAL: 45 PERIODS

OUTCOME:
- Student will possess a comprehensive understanding of all the processes involved in engine cycles. They will acquire the skills in developing the complete theoretical model of combustion of an internal combustion engine.
- Students will demonstrate the importance of intake and exhaust processes in developing a theoretical model of a complete engine.
- Students will possess complete knowledge on adiabatic flame temperature, heat transfer and their importance in engine modeling.

TEXTBOOK:

REFERENCES

AM7011  INSTRUMENTATION AND EXPERIMENTAL TECHNIQUES  L T P C
3 0 0 3

OBJECTIVE:
- Study of the theory, construction and operation of different measurement technology, instruments transducers and their application in automotive industry.

UNIT I  LINEAR AND ANGULAR MEASUREMENTS  8

UNIT II  PRESSURE & FLOW MEASUREMENT  11
Diaphragm - various elastic elements - Transduction methods - Potentiometric strain gauge, variable reluctance and capacitive device, piezo electric transducers and its application to high speed engine.Farnboro Engine indicator. Low pressure measurement - McLeod gauge, pirani gauge, thermocouple typeconductivity gauge. Classification of flow meters - Orifice plate, venturimeter, flow nozzles, pitot tubes, rotameter, electromagnetic flow meters, anemometers, ultrasonic and magnetic flow meters, alcolck viscous flow meter.

UNIT III  TEMPERATURE MEASUREMENT  8
UNIT IV LOAD AND TORQUE MEASUREMENT 8

UNIT V VEHICLE EXPERIMENTAL TECHNIQUES 10

TOTAL: 45 PERIODS

OUTCOME:
At the end of this course the student should be able to
- Understand the components of the automotive instruments and their functions and the latest developments in this field
- Understand transducers, modifiers and terminating devices
- Understand mechanical measurement
- Grasp the basics of engine experimental techniques
- Grasp the basics of vehicle experimental techniques

TEXTBOOK:

REFERENCES
1. A.W. Judge, ‘Engineering Precision Measurement’, Chapman and Hall Ltd, Essex Street W.C., 1951,

AM7012 MATERIALS IN AUTOMOTIVE TECHNOLOGY 3 0 0 3

OBJECTIVE:
- To make the students to understand the requirements related to materials used in various automotive parts
- To make the students to identify materials for specific parts based on the usage
- To make the students to identify materials for aesthetic and functional coatings

UNIT I INTRODUCTION 9
Elasticity-forms - Stress and strain relationship in engineering materials - Deformation mechanism - Strengthening material - Strain hardening, alloying, polyphase mixture, martensitic precipitation, dispersion, fibre and texture strengthening - iron carbon diagram.

UNIT II METALLIC MATERIALS 9
Cast irons - types, properties, structures, compositions and applications, plain carbon steels, low alloy steels and effects of alloying elements, high alloy steels, stainless steel types, castability, formability, machinability, hardenability and weldability of the material, high temperature steels and

UNIT III  COMPOSITES

UNIT IV ELECTRICAL AND MAGNETIC MATERIALS

UNIT V RUBBER AND PLASTICS MATERIALS

TOTAL : 45 PERIODS

OUTCOME:
- The students will be able identify the materials used in specific parts
- The students will be able find the materials for a part
- The students will be able explain the requirements of functional coatings

TEXT BOOK:

REFERENCES

AM7013 MODELING OF VEHICLE SYSTEMS

OBJECTIVE:
- The objective of this course is to introduce the essential principles of simulation of various vehicle systems like longitudinal, lateral dynamics, modeling of suspension and tyre system etc.

UNIT I LONGITUDINAL DYNAMICS AND CONTROL
UNIT II  LATERAL DYNAMICS AND ELECTRONIC STABILITY CONTROL  9
Lateral Systems - Kinematic Model - Bicycle Model. Motion of Particle Relative to a rotating Frame. Dynamic Model in Terms of Error with Respect to Road, Yaw Rate and Slip Angle. Road Model. Differential Braking Systems - Independent All Wheel Drive Torque Distribution

UNIT III  MODELING OF PASSIVE AUTOMOTIVE SUSPENSIONS  9

UNIT IV  MODELING OF SEMIACTIVE AND ACTIVE AUTOMOTIVE SUSPENSIONS  9
Semi-Active Suspension Model - Optimal Semi-Active Control Law - Calculation of Transfer Function Plots - Performance of Semi-Active Suspension Systems. Active Automotive Suspensions – Tradeoffs and Limitations - Invariant Points and Their Influence - Hydraulic Actuators for Active Suspensions

UNIT V  LATERAL AND LONGITUDINAL TYRE FORCES  9

TOTAL : 45 PERIODS

OUTCOME:
• To students will have the basic knowledge on mathematical model of various sub components like passive and active suspension along with its functions. At the end of the course the students will have command knowledge over longitudinal dynamics and control, lateral dynamics and control, recent development in the area of modern vehicle technologies.

TEXT BOOK

AM7014  NOISE, VIBRATION AND HARSHNESS  L T P C
3 0 0 3

OBJECTIVE:
The course should enable the students to:
• Understand the various types of vibration with damping and without damping.
• Understand the Various types of noise and its measurement and analysis techniques.
• Understand the various sources of noise from automobiles.
• Understand the various noise controlling techniques.
• Understand the various noise from mechanical components and it’s suppressing techniques.

UNIT I  FUNDAMENTALS OF ACOUSTICS AND NOISE, VIBRATION  8

UNIT II  EFFECTS OF NOISE, BLAST, VIBRATION, AND SHOCK ON PEOPLE  7
General Introduction to Noise and Vibration Effects on People and Hearing Conservation, Sleep Disturbance due to Transportation Noise Exposure, Noise-Induced Annoyance, Effects of

UNIT III ENGINE NOISE AND VIBRATION—SOURCES, PREDICTION, AND CONTROL

UNIT IV TRANSPORTATION NOISE AND VIBRATION SOURCES-PREDICTION AND CONTROL

UNIT V NOISE AND VIBRATION TRANSDUCERS, ANALYSIS EQUIPMENT, SIGNAL PROCESSING, AND MEASURING TECHNIQUES

TOTAL : 45 PERIODS

OUTCOME:
The students should be able to know:

- Classification of vibration of free, forced, undamped, damped, linear, nonlinear Vibration Response of damped and undamped systems under harmonic force, analysis of single degree and two degree of freedom systems, torsional vibration, Determination of natural frequencies.
- Vibration isolation by tuned absorbers, untuned viscous dampers. Damping treatments, application dynamic forces generated by IC engines, engine isolation, Crank shaft damping, Modal analysis of the mass elastic model shock absorbers.
- Methods for control of engine noise, combustion noise, mechanical noise, predictive analysis. Noise Suppressing Techniques like palliative treatments and enclosures, automotive noise control principles. Sound in enclosures, sound energy absorption, sound transmission through barrier.

REFERENCES:
AM7015 PRODUCTION OF AUTOMOTIVE COMPONENTS

LTCP 3 0 0 3

OBJECTIVE:
- The objective of this course is to make the students to know and understand the production methods of various engine components like piston, connecting rod, crankshaft etc and various chassis components like friction lining materials, propeller shaft, steering column, gears etc.

UNIT I CASTING

UNIT II MACHINING
Special consideration of machining of various components such as flywheel, piston rings, bearing bushes, and liners, permanent mould casting of piston

UNIT III FORGING AND EXTRUSION PROCESS

UNIT IV POWDER METALLURGY AND PROCESSING OF PLASTICS

UNIT V RECENT TRENDS IN MANUFACTURING OF AUTO COMPONENTS

TOTAL : 45 PERIODS

OUTCOME:
- By the end of this course, students will be able to
  - Understand the methods to manufacture the vehicle components
  - Understand the requirements of each component and material
  - Understand the step by step procedure for manufacturing vehicle components
  - Understand the advanced techniques used for manufacturing Automobile components

TEXT BOOK

REFERENCES

HMT handbook
OBJECTIVE:
- To impart the knowledge on research design
- To know about the data processing, report writing and Intellectual property rights

UNIT I
INTRODUCTION TO RESEARCH
Research – Objective – Significance – Types – approaches; Research and scientific research –
The hall marks of scientific research; Research process – steps involved; Current literature survey
methods – abstraction of research papers

UNIT II
RESEARCH DESIGN AND SAMPLE DESIGN
Research Design – Need for Research Design – steps involved - features of Good Design –
Important concepts relating to Research Design – Different Research designs – Basic Principles of
Experimental Designs – Sample Design – steps involved – sampling techniques – Hypothesis
testing to determine optimal sample size.

UNIT III
ANALYSIS OF DATA
Statistics in Research – Measures of Central Tendency – Measures of Dispersion – Measures of
Asymmetry (Skewness) – Measures of Relationship – Simple Regression Analysis – Multiple
Correlation and Regression Partial Correlation – Association in case of attributes – Other
Measures – Summary chart concerning Analysis of Data.

UNIT IV
INTERPRETATION AND REPORT WRITING
Interpretation – need for interpretation - Technique of interpretation – precaution in interpretation –
Report writing - Significance of Report writing – Different steps in report writing – Layout of the

UNIT V
INTELLECTUAL PROPERTY RIGHTS
An overview of Intellectual property (IP) – Importance – Protection of IPR – Patents – Patentable
and Non-Patentable inventions – Procedure for filing of patents – acquisition of patent rights –
patents offices in India and jurisdiction – Modification of granted patents – protection against unfair
competition – Enforcement of IPR.

OUTCOME:
By the end of this course, students will be able to
- Understand the concepts of various approaches of research, literature survey methods,
data analysis, report preparation and significance of Intellectual property Rights

REFERENCES
   2000.
OBJECTIVE:
- The main objective of this course is to introduce the concept and principle of operation of special vehicles such as Bulldozers, Ditchers, Bucket excavators, farm equipments, military vehicles etc. At the end of the course, the students can have a better understanding of the application of the special types of vehicles in the excavation of earth.

UNIT I EARTH MOVING AND CONSTRUCTIONAL EQUIPMENTS 10
Construction details, capacity and applications of earthmovers for dumpers, front-end loaders, bulldozers, excavators, backhoe loaders, scrappers, motor graders etc. criteria for selection of prime mover for dumpers and front end loaders based on vehicle performance characteristics.

UNIT II POWER TRAIN CONCEPTS 7

UNIT III VEHICLE SYSTEMS AND FEATURES 14

UNIT IV SPECIAL PURPOSE VEHICLES FOR INDUSTRIAL APPLICATIONS 5

UNIT V FARM EQUIPMENTS, MILITARY AND COMBAT VEHICLES 9
Ride and stability characteristics, power take off, special implementations. Special features and constructional details of tankers, gun carriers and transport vehicles. Harvesting vehicles.

TOTAL : 45 PERIODS

OUTCOME:
At the end of this course the student should
- Know the concept and principle of operation of special vehicles such as bulldozers, ditchers, bucket excavators, farm equipments, military vehicles etc
- Have better understanding of the application of the special types of vehicles in the excavation.
- Understand earth moving and constructional equipments
- Learn the basics of power train concepts for special vehicles
- Grasp the maintenance of farm equipments, military and combat vehicles

REFERENCES
OBJECTIVE:
- To import the knowledge on the properties of fuels, lubricants and testing methods for the design and operation of the I.C engines.

UNIT I MANUFACTURE OF FUELS AND LUBRICANTS 9
Structure of petroleum, refining process, fuels, thermal cracking, catalytic cracking, polymerization, alkylation, isomerisation, blending, products of refining process. Manufacture of lubricating oil base stocks, manufacture of finished automotive lubricants.

UNIT II THEORY OF LUBRICATION 9
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, introduction to design of a lubricating system.

UNIT III PROPERTIES AND TESTING OF LUBRICANTS 9
Specific requirements for automotive lubricants, oxidation deterioration and degradation of lubricants, synthetic lubricants, classification of lubricating oils, properties of lubricating oils, tests on lubricants. Grease, classification, properties, test used in grease.

UNIT IV PROPERTIES AND TESTING OF FUELS 9
Thermo-chemistry of fuels, 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, copper strip corrosion etc.

UNIT V ADDITIVES FOR LUBRICANTS AND FUELS 9
Additive - mechanism, requirements of additive, petrol fuel additives, diesel fuel additives – Additives and additive mechanism, for lubricants. Introduction to Nano fluids

TOTAL : 45 PERIODS

OUTCOME:
- At the end of the course, the students will be able to have a complete knowledge on the various properties of fuels, lubricants and testing methods.

TEXT BOOKS:

REFERENCES
OBJECTIVE:
- The objective of this course is to make the students to know and understand the constructional details, operating characteristics and design aspects of various Two and Three wheelers.

UNIT I INTRODUCTION
Classifications - design considerations – weight and dimension limitations – requirements, stability problems, gyroscopic effect - pendulum effect of two and three wheelers.

UNIT II POWER UNITS, IGNITION SYSTEMS AND OTHER ELECTRICAL SYSTEMS
2-stroke and 4-stroke engines. Design criteria for engines – design of cylinders, cylinder head, cooling fins, crank case, connecting rod and crank shaft. Carburettor types and design. Battery coil ignition, magneto ignition and electronic ignition. Lighting and other electrical systems.

UNIT III CLUTCHES AND TRANSMISSION

UNIT IV FRAMES, SUSPENSION, WHEELS AND TYRES
Types of frames. Wheel frames - construction design of frames for fatigue strength, torsional stiffness and lateral stability. Front and rear forks. Springs for suspension, Dampers, constructional details of wheel and tyres.

UNIT V THREE WHEELERS
Auto rickshaws, different types. Pick-Ups and delivery type vehicle, frames and transmission, wheel types, wheel mountings, attachment, tyre types. Brake systems.

OUTCOME:
- To students will have the basic knowledge on various two wheelers and its technology along with its functions. At the end of the course the students will have through knowledge over different frames, suspension system and transmission unit used on various two and three wheeler vehicles.

TEXTBOOK:

REFERENCES:
4. Servicing Manuals- various motor cycles, Scooters, Mopeds and three wheelers.
UNIT I INTRODUCTION
Components of chassis management system – role of various sensors and actuators pertaining to chassis system – construction – working principle of wheel speed sensor, steering position, tyre pressure, brake pressure, steering torque, fuel level, Engine and vehicle design data.

UNIT II DRIVELINE CONTROL SYSTEM

UNIT III SAFETY AND SECURITY SYSTEM
Airbags, seat belt tightening system, collision warning systems, child Lock, anti lock braking systems, Vision enhancement, road recognition system, Anti theft technologies, smart card system, number plate coding, central locking system.

UNIT IV COMFORT SYSTEM
Active suspension systems, requirement and characteristics, different types, Vehicle Handling and Ride characteristics of road vehicle, pitch, yaw, bounce control, power windows, thermal management system, adaptive noise control.

UNIT V INTELLIGENT TRANSPORTATION SYSTEM

TOTAL: 45 PERIODS

OUTCOME:
- To students will have the basic knowledge on mathematical modeling of various automotive system, time domain specification. At the end of the course the students will have through knowledge over safety and security system, comfort system and intelligent vehicle system.

TEXT BOOKS:

REFERENCES:

AM7021 VEHICLE MAINTENANCE

OBJECTIVE:
To import the knowledge in the area of vehicle maintenance like
- Introduction about layout of maintenance shop, tools and instruments
- Maintenance procedure of power plant and sub systems
- Maintenance procedure of chassis, vehicle body and electrical and electronic systems

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UNIT I  MAINTENANCE RECORDS, BASIC TOOLS AND INSTRUMENTS  9

UNIT II  POWER PLANT REPAIR AND OVERHAULING  9

UNIT III  MAINTENANCE, REPAIR AND OVERHAULING OF THE CHASSIS  9
Maintenance, servicing and repair of clutch, gearbox, propeller shaft. Maintenance of front axle, rear axle, brakes, steering systems. Tyre maintenance.

UNIT IV  MAINTENANCE AND REPAIR OF VEHICLE BODY  9
Body panel tools for repairing. Tinkering and painting. Minor and major repairs. Door lock and window glass actuating system maintenance.

UNIT V  MAINTENANCE AND REPAIR OF ELECTRICAL AND ELECTRONIC SYSTEMS  9
Maintenance, testing and trouble shooting of battery, starter motor, dynamo, alternator, regulator, lighting system, horn and dash board instruments. Introduction to OBD.

OUTCOME:
- At the end of the course, the students will be able to have a complete knowledge of the vehicle maintenance procedures and acquire skills in handling situations where the vehicle is likely to fail.

TEXTBOOK:

REFERENCES:
3. John Dolce, Fleet maintenance, Mcgraw Hill, Newyork, 1984