ANNA UNIVERSITY:: CHENNAI 600 025
UNIVERSITY DEPARTMENTS
CURRICULUM – R 2013
B.E. (PART – TIME) – AUTOMOBILE ENGINEERING
I – VII SEMESTERS CURRICULA & SYLLABI

SEMESTER I

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* - Four weeks Industrial Training during Vacation

**TOTAL CREDITS: 15 +15 + 15 + 14 + 14 + 14 + 15 = 102**

**LIST OF ELECTIVES FOR B. E. (PART – TIME) - AUTOMOBILE ENGINEERING**

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OBJECTIVES

• To facilitate the understanding of the principles and to cultivate the art of formulating physical problems in the language of mathematics.

UNIT I MATRICES


UNIT II FUNCTIONS OF SEVERAL VARIABLES


UNIT III ANALYTIC FUNCTION

Analytic functions – Necessary and sufficient conditions for analyticity – Properties – Harmonic conjugates – Construction of analytic function – Conformal Mapping – Mapping by functions w = a + z , az, 1/z, - Bilinear transformation.

UNIT IV COMPLEX INTEGRATION

Line Integral – Cauchy’s theorem and integral formula – Taylor’s and Laurent’s Series – Singularities – Residues – Residue theorem – Application of Residue theorem for evaluation of real integrals – Use of circular contour and semicircular contour with no pole on real axis.

UNIT V LAPLACE TRANSFORMS


TOTAL: 45 PERIODS

OUTCOMES

• To develop the use of matrix algebra techniques this is needed by engineers for practical applications.
• To familiarize the student with functions of several variables. This is needed in many branches of engineering.
• To develop an understanding of the standard techniques of complex variable theory so as to enable the student to apply them with confidence, in application areas such as heat conduction, elasticity, fluid dynamics and flow the of electric current.
• To make the student appreciate the purpose of using transforms to create a new domain in which it is easier to handle the problem that is being investigated.

BOOKS FOR STUDY

REFERENCES

PTPH8151  ENGINEERING PHYSICS  L T P C
                          3 0 0 3

OBJECTIVE:
To introduce the basic physics concepts relevant to different branches of Engineering and Technology.

UNIT I  PROPERTIES OF MATTER

UNIT II  ACOUSTICS AND ULTRASONICS

UNIT III  THERMAL PHYSICS

UNIT IV  APPLIED OPTICS
Interference - Michelson interferometer: construction, working, determination of wave length and thickness - anti-reflection coating - air wedge and its application - Lasers - Einstein's coefficients - CO2, N\textsubscript{2}YAG and semiconductor lasers - homo junction and hetero junction - construction and working - applications - Optical fibres - classification (index & mode based) - principle and propagation of light in optical fibres - acceptance angle and numerical aperture - fibre optic communication system - active and passive sensors.
UNIT V  SOLID STATE PHYSICS
Nature of bonding - growth of single crystals (qualitative) - crystal systems - crystal planes and directions - expressions for interplanar distance - coordination number and packing factor for simple structures: SC, BCC, FCC and HCP - structure and significance of NaCl, ZnS, diamond and graphite - crystal imperfections: point defects, dislocations and stacking faults - unit cell, Bravais space lattices - miller indices.

TOTAL : 45 PERIODS

OUTCOMES:
- The students will have knowledge on the basics of physics related to properties of matter, optics, acoustics etc., and they will apply these fundamental principles to solve practical problems related to materials used for engineering applications.

TEXT BOOKS:

REFERENCES:
OBJECTIVES:
- To understand about the chemical thermodynamics.
- To impart knowledge in the basics of polymer chemistry.
- To develop sound knowledge on kinetics and catalysis.
- To impart basic knowledge on photochemistry and spectroscopy

UNIT I CHEMICAL THERMODYNAMICS
Second law: Entropy - entropy change for an ideal gas, reversible and irreversible processes; entropy of phase transitions; Clausius inequality. Free energy and work function: Criteria of spontaneity; Helmholtz and Gibbs free energy functions; Gibbs-Helmholtz equation; Clausius-Clapeyron equation; Maxwell relations – Van’t Hoff isotherm and isochore. Chemical potential; Gibbs-Duhem equation – variation of chemical potential with temperature and pressure.

UNIT II POLYMER CHEMISTRY
Introduction: Classification of polymers – Natural and Synthetic; Thermoplastic and Thermosetting. Functionality – Degree of polymerisation. Types and mechanism of polymerisation: Addition (Free Radical, cationic, anionic and living); condensation and copolymerisation. Properties of polymers: Tg, Tacticity, Molecular weight – weight average, number average and polydispersity index. Techniques of polymerisation: Bulk, emulsion, solution and suspension.

UNIT III KINETICS AND CATALYSIS

UNIT IV PHOTOCHEMISTRY AND SPECTROSCOPY

UNIT V NANOCHEMISTRY

TOTAL 45 PERIODS
OUTCOMES:
- The knowledge gained on polymer chemistry, thermodynamics, spectroscopy, phase rule and nano materials will provide a strong platform to understand the concepts on these subjects for further learning

TEXT BOOKS

REFERENCE BOOKS

PTGE8153 ENGINEERING MECHANICS

OBJECTIVE
- To develop capacity to predict the effect of force and motion in the course of carrying out the design functions of engineering

UNIT I BASICS AND STATICS OF PARTICLES

UNIT II EQUILIBRIUM OF RIGID BODIES

UNIT III PROPERTIES OF SURFACES AND SOLIDS
Centroids and centre of mass – Centroids of lines and areas – Rectangular, circular, triangular areas by integration – T section, I section, Angle section, Hollow section by using standard formula – Theorems of Pappus – Area moments of inertia of plane areas – Rectangular, circular, triangular areas by integration – T section, I section, Angle section, Hollow section by using standard formula – Parallel axis theorem and perpendicular axis theorem – Principal moments of inertia of plane areas – Principal axes of inertia – Mass moment of inertia – Mass
moment of inertia for prismatic, cylindrical and spherical solids from first principle – Relation to area moments of inertia.

UNIT IV DYNAMICS OF PARTICLES

UNIT V FRICTION AND ELEMENTS OF RIGID BODY DYNAMICS
Friction force – Laws of sliding friction – equilibrium analysis of simple systems with sliding friction –wedge friction-. Rolling resistance -Translation and Rotation of Rigid Bodies – Velocity and acceleration – General Plane motion of simple rigid bodies such as cylinder, disc/wheel and sphere.

OUTCOMES:
- ability to explain the differential principles applies to solve engineering problems dealing with force, displacement, velocity and acceleration.
- ability to analyse the forces in any structures.
- ability to solve rigid body subjected to dynamic forces.

TEXT BOOKS:

REFERENCES:

PTGE8151 COMPUTING TECHNIQUES
L T P C
3 0 0 3

OBJECTIVES:
The students should be made to:
- Learn the organization of a digital computer.
- Be exposed to the number systems.
• Learn to think logically and write pseudo code or draw flow charts for problems.
• Be exposed to the syntax of C.
• Be familiar with programming in C.
• Learn to use arrays, strings, functions, pointers, structures and unions in C.

UNIT I    INTRODUCTION

UNIT II    C PROGRAMMING BASICS

UNIT III   ARRAYS AND STRINGS

UNIT IV    FUNCTIONS AND POINTERS

UNIT V     STRUCTURES AND UNIONS
Introduction – need for structure data type – structure definition – Structure declaration – Structure within a structure - Union - Programs using structures and Unions – Storage classes, Pre-processor directives.

TOTAL : 45 PERIODS

OUTCOMES:
At the end of the course, the student should be able to:
• Design C Programs for problems.
• Write and execute C programs for simple applications.

TEXTBOOKS

REFERENCES
OBJECTIVE:
- To impart the knowledge on basic concepts of electrical circuits and electrical machines.
- To impart the knowledge on basic concepts of electronic components, devices and circuits

UNIT I BASIC CONCEPTS AND DC CIRCUITS  9
Ohm's law - Electrical resistance - Series /Parallel resistive circuits - Star/Delta transformations - Kirchoff's law - Node and Mesh analysis - Thevenin's and Norton's theorem.

UNIT II A.C.CIRCUITS  9
RMS and average value of periodic waves - Form factor - Phase and Phase difference - Simple RC,RL and RLC circuits - series and parallel resonance - power and power factor - introduction to three phase systems – power measurement in 3 phase system.

UNIT III D.C. MACHINES  10

UNIT IV ELECTRONIC COMPONENTS AND DEVICES  9
Operating principle and characteristics of Simple PN Junction Diodes, Zener diode, Bipolar Junction transistor - Field Effect Transistors – UJT – SCR.

UNIT V ANALOG CIRCUITS  8
Rectifier and Power Supply Circuits, clipper, clamper using diodes, Operational Amplifiers (Ideal) - properties and typical circuits like differentiator, integrator, summer, comparator.

TOTAL : 45 PERIODS

OUTCOMES:
- The students will be able to construct analog and digital circuits with electrical and electronics component. They will be familiar with the use of electrical and electronic measuring systems

REFERENCES:
OBJECTIVE:
To learn the basic processes available to make a part/product. Will help the students to select the best manufacturing process based on quality/time/cost/mechanical properties.

UNIT I CASTING PROCESSES 9

UNIT II WELDING PROCESSES 9

UNIT III METAL FORMING PROCESSES 9

UNIT IV MACHINING PROCESSES 9

UNIT V PLASTIC MATERIAL PROCESSES 9

TOTAL : 45 PERIODS

OUTCOMES:
- The students will be in a position to select and employ a particular non traditional machining process as well as a rapid prototyping technique based upon the application in industries.

TEXT BOOKS:

REFERENCE BOOKS:
OBJECTIVES:
- To impart the knowledge on basics of measurements and sensors
- To impart the knowledge on automotive measurements and instruments

UNIT I INTRODUCTION TO MEASUREMENTS AND SENSORS
Sensors: Functions- Classifications- Main technical requirement and trends
Units and standards- Calibration methods- Classification of errors- Error analysis- Limiting error- Probable error- Propagation of error- Odds and uncertainty- principle of transduction- Classification.
Static characteristics- mathematical model of transducers- Zero, First and Second order transducers- Dynamic characteristics of first and second order transducers for standard test inputs.

UNIT II VARIABLE RESISTANCE AND INDUCTANCE SENSORS
Principle of operation- Construction details- Characteristics and applications of resistive potentiometer- Strain gauges- Resistive thermometers- Thermistors- Piezoresistive sensors
Inductive potentiometer- Variable reluctance transducers:- EI pick up and LVDT

UNIT III VARIABLE AND OTHER SPECIAL SENSORS
Variable air gap type, variable area type and variable permittivity type- capacitor microphone Piezoelectric, Magnetostrictive, Hall Effect, semiconductor sensor- digital transducers-Humidity Sensor. Rain sensor, climatic condition sensor, solar, light sensor, antiglare sensor.

UNIT IV AUTOMOTIVE PRESSURE AND FORCE/TORQUE SENSOR
Pressure Sensor:
Typical automotive applications- Thick film pressure sensor- Semiconductor pressure sensor- Integrated silicon intake-manifold pressure sensor-Integrated silicon combustion-pressure sensor- Piezo electric sensor-High pressure sensor with metal diaphragm.

Force/Torque Sensor:
Typical automotive applications- Magneto elastic bearing-pin sensor- Magneto elastic tension/compressive force sensor according to the cross-ductor principle – Basic principle of torque measurement –Stress and Angle measuring torque sensor

UNIT V AUTOMOTIVE POSITION AND RPM/VELOCITY SENSORS
Temperature Sensors:- Typical automotive applications -Sintered-Ceramic resistors-Thin film resistors-Thick film resistors- Monocrystalline silicon semiconductor resistor- Thermopile sensors
Flow Sensors:- Ultrasonic flow sensors-Pitot tube air-flow sensor- Hot wire air-mass flow meter- Micro mechanical hot-film air-mass flow meter- Lambda sensor -Imaging sensor-Rain Sensor Introduction to MEMs

OUTCOME:
- Students gained the basic knowledge on measurements and sensor.
- Familiarized in application of automotive sensors.

TOTAL: 45 PERIODS
TEXT BOOKS:

REFERENCES:

PTAU8204 THERMODYNAMICS AND THERMAL ENGINEERING L T P C
3 1 0 4

OBJECTIVE:
- To introduce fundamental concepts in thermodynamics, heat transfer, propulsion and refrigeration and air conditioning.

UNIT I BASIC THERMODYNAMICS
14

UNIT II AIR STANDARD CYCLES AND COMPRESSORS
12

UNIT III STEAM AND JET PROPULSION
12
Properties of steam, Dryness fraction, Quality of steam by steam tables and Mollier chart – Rankine cycle, Work done, Steam rate – Steam Nozzles, Types of nozzles, Friction in nozzles - Simple jet propulsion system – Thrust rocket motor – Specific impulse.

UNIT IV REFRIGERATION AND AIR-CONDITIONING
10
Principles of refrigeration, Vapour compression – Vapour absorption types, comparison - Co-efficient of performance (COP), Properties of refrigerants – Basic Principle, Summer, winter and Year round Air conditioning.

UNIT V HEAT AND MASS TRANSFER
12

TOTAL : 60 PERIODS
(Use of standard Steam tables with mollier chart and Refrigerant tables are permitted)
OUTCOMES:
- It helps the students to have a clear idea of application of thermodynamics and heat transfer. The student would be able to identify the applications of these techniques in their engineering fields.

TEXT BOOKS:

REFERENCES:

PTMA8251 NUMERICAL METHODS
(EEE, IT, Printing, Automobile, Industrial, Manufacturing) 3 0 0 3

OBJECTIVES:
- To provide the mathematical foundations of numerical techniques for solving linear system, eigen value problems, interpolation, numerical differentiation and integration and the errors associated with them;
- To demonstrate the utility of numerical techniques of ordinary and partial differential equations in solving engineering problems where analytical solutions are not readily available.

UNIT I SOLUTION OF EQUATIONS AND EIGENVALUE PROBLEMS
9

UNIT II INTERPOLATION AND APPROXIMATION
9
Interpolation with unequal intervals - Lagrange interpolation – Newton’s divided difference interpolation – Cubic Splines - Interpolation with equal intervals - Newton’s forward and backward difference formulae – Least square method - Linear curve fitting.

UNIT III NUMERICAL DIFFERENTIATION AND INTEGRATION
9
UNIT IV INITIAL VALUE PROBLEMS FOR ORDINARY DIFFERENTIAL EQUATIONS

UNIT V BOUNDARY VALUE PROBLEMS IN ORDINARY AND PARTIAL DIFFERENTIAL EQUATIONS
Finite difference methods for solving two-point linear boundary value problems. Finite difference techniques for the solution of two dimensional Laplace’s and Poisson’s equations on rectangular domain – One dimensional heat-flow equation by explicit and implicit (Crank-Nicholson) methods - One dimensional wave equation by explicit method.

TOTAL: 45 PERIODS

OUTCOMES:
- The students will have a clear perception of the power of numerical techniques, ideas and would be able to demonstrate the applications of these techniques to problems drawn from industry, management and other engineering fields.

TEXT BOOKS:

REFERENCES:

PTAU8301 AUTOMOTIVE CHASSIS L T P C
3 0 0 3

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
UNIT II DRIVE LINE, FINAL DRIVE AND DIFFERENTIAL

UNIT III REAR AXLES, WHEELS, RIMS AND TYRES

UNIT IV SUSPENSION SYSTEM

UNIT V BRAKING SYSTEM

TOTAL : 45 PERIODS
OUTCOMES:
• The students will understand the constructional, working principle of various sub system of an automobile.

TEXT BOOKS

REFERENCES

PTAU8302 AUTOMOTIVE ELECTRICAL AND ELECTRONICS

OBJECTIVES
• Knowledge in vehicle electrical and electronics components for engine operation.
• Enhancing the knowledge of reversor and microprocessor applications in vehicle control systems.
• Gaining information’s on modern safety system in vehicle braking.
UNIT I BATTERIES AND STARTING SYSTEM
Different types of Batteries – principle, rating, testing and charging. Starter motors characteristics, capacity requirements. Drive mechanisms. Starter switches.

UNIT I CHARGING SYSTEM LIGHTING AND ACCESSORIES

UNIT III ELECTRONIC IGNITION AND INJECTION SYSTEM
Spark plugs. Advance mechanisms. Different types of ignition systems. Electronic fuel injection systems.

UNIT IV SENSORS AND MICROPROCESSORS IN AUTOMOBILES
Basic sensor arrangements. Types of sensors – oxygen sensor, hot wire anaemometer sensor, vehicle speed sensor, detonation sensor, accelerometer sensor, crank position sensor. Microprocessor and microcomputer controlled devices in automobiles such voice warning system, travel information system, keyless entry system, automatic transmission system, electronic steering system.

UNIT V SAFETY SYSTEMS
Antilock braking system, air bag restraint system, voice warning system, seat belt system, road navigation system, anti theft system.

TOTAL : 45 PERIODS

OUTCOMES:
- The student will have to know about all theoretical information and about electrical components used in a vehicle

REFERENCES:

PTAU8303 AUTOMOTIVE PETROL ENGINES
OBJECTIVE:
- To impart the knowledge on basic concepts on Automotive SI Engines and its various sub components along with its functions.

UNIT I ENGINE CONSTRUCTION AND OPERATION
UNIT II  FUEL AND IGNITION SYSTEM  10  
Carburetor – requirements, working principle, types, different circuits – Compensation –  
Maximum power devices – Petrol injection in SI engines, Magneto coil and battery coil spark  
ignition system. Advance mechanism. Electronic ignition System – CDI.

UNIT III  COOLING AND LUBRICATION SYSTEM  8  
Need for cooling. Types of cooling system – air cooling and Liquid cooled systems. Forced  
circulation system, pressure cooling system, Evaporative cooling system – Need for Lubrication  
system. Mist lubrication system, wet & dry sump lubrication, Properties of lubricants,  
properties of coolant – Recent Technologies.

UNIT IV  COMBUSTION AND COMBUSTION CHAMBERS  9  
Combustion in SI engine – Stages of combustion – Flame propagation – Rate of pressure rise  
– Abnormal combustion – pre ignition and knock in SI engines – effect of engine variables on  
knock – Combustion chambers for SI engine – Different types – Factors controlling combustion  
chamber design.

UNIT V  TWO STROKE ENGINES  8  
Two stroke engine – types, terminologies, definitions, construction and operation. Comparison  
of four stroke and two stroke engine operation. Theoretical scavenging processes. Merits and  
demerits, scavenging efficiency, Scavenging pumps, Rotary valve engine.

OUTCOMES:  
- Understand the working principles and constructional details of automotive SI Engines  
- Understand the different sub systems of S.I Engine like, Fuel and ignition system,  
lubricating system, cooling system etc.

TEXT BOOKS:  
   1994.

REFERENCES:  
2. Obert E.F., Internal Combustion Engines Analysis and Practice, International Text Books:  

PTAU8304  MECHANICS OF SOLIDS  
OBJECTIVE:  
- To introduce various behavior of structural components under various loading  
  conditions.

UNIT I  INTRODUCTION  8  
Definition of stress, strain and their relations – Relations between material constants – Axial  
loading - Statically determinate and indeterminate problems in tension & compression – Plane  
Impact loading.
UNIT II STRESSES IN BEAMS
Shear force & bending moment diagrams: Bending and shear stress variation in beams of symmetric sections, a typical spar section: Beams of uniform strength - beams of two materials.

UNIT III DEFLECTION OF BEAMS

UNIT IV TORSION – SPRINGS – COLUMNS

UNIT V BIAXIAL STRESSES
Stresses in thin-walled pressure vessels – combined loading of circular shaft with bending, torsion and axial loadings – Mohr’s circle and its construction – determination of principal stresses.

OUTCOMES:
• Solve the problems related to the structural components under various loading conditions

TEXT BOOKS:
2. Timoshenko and Young "Strength of Materials" Vol. I & II

REFERENCES:

PTAU8305 THEORY OF FUELS AND LUBRICANTS L T P C
3 0 0 3

OBJECTIVES
• To understand the properties of fuels and lubricants 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 LUBRICANTS
9
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.

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 COMBUSTION & FUEL RATING
9

TOTAL : 45 PERIODS

OUTCOMES:
• At the end of the course, the student can understand the importance, manufacturing methods, testing methods, combustion methodology of automotive fuels and lubricants.

TEXT BOOKS:

REFERENCES

PTAU8401 AUTOMOTIVE DIESEL ENGINES L T P C
3 0 0 3
OBJECTIVES:
• To impart knowledge on basic concepts of automotive diesel engines, combustion process involved in diesel engines and the various subsystems used along with their functions in detail.
UNIT I  DIESEL ENGINE BASIC THEORY  9

UNIT II  FUEL INJECTION SYSTEM  9

UNIT III  AIR MOTION, COMBUSTION AND COMBUSTION CHAMBERS  10

UNIT IV  SUPERCHARGING AND TURBOCHARGING  8

UNIT V  DIESEL ENGINE TESTING AND PERFORMANCE  9

TOTAL: 45 PERIODS

OUTCOMES:
- The students can understand the construction and basic principle of operation of various types of engines and its various fuel induction systems. Also the students can have the basic knowledge on theory of combustion and its types, different types of combustion chamber, air motion etc. Also the students will get the knowledge on the design advances in IC engines; Electronic fuel injection system will also be introduced to the students. At the end of the course the students will have command over automotive engine operation and its fuel injection system.

TEXT BOOKS:

REFERENCES:
5. Heinz advanced engine tech

PTAU8402 AUTOMOTIVE TRANSMISSION

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OBJECTIVES:
- To know about the various transmission and drive line units of automobiles.

UNIT I CLUTCH AND GEAR BOX 9
Requirement of transmission system, Different types of clutches, principle & Construction of Single plate coil spring and Diaphragm spring clutches, Need and Objectives of Gear box. Construction and operation of Sliding mesh, Constant mesh and Synchronmesh gearboxes. – Determination of gear ratios for vehicles. Performance characteristics in different speeds. Problems on performance of automobile such as Resistance to motion, Tractive effort, Engine speed & Power and acceleration.

UNIT II HYDRODYNAMIC TRANSMISSION 9

UNIT III EPICYCLIC GEARBOXES USED IN AUTOMATIC TRANSMISSION 9

UNIT IV AUTOMATIC TRANSMISSION APPLICATIONS 9
Need for automatic transmission, Four speed longitudinally mounted automatic transmission - Chevrolet “Turboglide” Transmission, Continuously Variable Transmission (CVT) – Types – Operations of a typical CVT.

UNIT V HYDROSTATIC AND ELECTRIC DRIVE 9

TOTAL : 45 PERIODS

OUTCOMES
- The students will understand the constructional, working principle of various types of manual and automotive transmission of an automobile.

TEXT BOOKS:

REFERENCES:
1. SAE Transactions 900550 & 930910.
OBJECTIVE:
- The aim of this course is to make the students to know and understand the constructional details operating characteristics and vehicle design aspects

UNIT I  THE POWER UNIT  9
Two stroke and four stroke SI & CI engine Construction and Working, merits and demerits, Symmetrical and unsymmetrical valve & port timing diagrams. Scavenging process.

UNIT II  FUEL AND IGNITION SYSTEMS  9
Fuel system – Different circuits in two wheeler fuel systems, fuel injection system. Lubrication system, Ignition systems - Magneto coil and battery coil spark ignition system, Electronic ignition System, Starting system - Kick starter system – Self starter system. Recent technologies.

UNIT III  CHASSIS AND SUB-SYSTEMS  9
Main frame for two and three wheelers, its types, Chassis and different drive systems for two wheelers, Single, multiple plates and centrifugal clutches, Gear box and its and various gear controls in two wheelers. Front and rear suspension systems. Shock absorbers. Panel meters and controls on handle bar, Freewheeling devices

UNIT IV  BRAKES AND WHEELS  8

UNIT V  TWO & THREE WHEELERS – CASE STUDY  10
Case study of Sports bike, Motor cycles, Scooters and Mopeds - Auto rickshaws, Pick up van, Delivery van and Trailer. Servicing and maintenance. Recent developments.

TOTAL : 45 PERIODS

OUTCOMES:
- The students can able to understand the various subsystem of two and three wheeler and also know how it is different from light motors and heavy motor vehicles.

TEXT BOOK:

REFERENCES:
2. K. K. Ramalingam, Two Wheelers, Scitech publications, Chennai,
OBJECTIVES:

- To understand the basic concepts of mechanisms and machinery

UNIT I  MECHANISMS  14

UNIT II  FRICTION  12

UNIT III  GEARING AND CAMS  12

UNIT IV  BALANCING  11
Static and dynamic balancing – single and several masses in different planes – primary and secondary balancing of reciprocating masses – Balancing of single and multi cylinder engines – Governors and Gyroscopic effects.

UNIT V  VIBRATION  11

TOTAL : 60 PERIODS

OUTCOMES:

- Upon completion of this course, the students can apply mathematical knowledge to predict the properties and characteristics of a fluid.
- Can critically analyse the performance of pumps and turbines.

TEXT BOOK

REFERENCES
OBJECTIVE:

- To familiarize and train the students on the constructional arrangements of different automotive chassis components.

1. Study of the following engines and its components by dismantling, comparing with recent engine components and assembling various parts.
   i. Multi cylinder (4/6) inline diesel engine.
   ii. Multi cylinder (4/6) inline petrol engine.
2. Study and measurements of a chassis.
3. Study, dismantling and assembling of the following components and systems
   i. Front axle (Rzeppa joint)
   ii. Real axle
   iii. Differential and Transfer Case.
   iv. Clutch (Single plate and Multi plate clutch)
   v. Gear box (Sliding, constant and mesh and synchromesh)
   vi. Steering System.
   vii. Braking system (Mechanical and Hydraulic)

Equipments Required:

1. Multi cylinder (4/6) inline diesel engine.
3. Chassis.
4. Front axle with Rzeppa joint.
5. Rear axle with differential.
7. Sliding, constant mesh and synchromesh gear box.
8. Steering gear box with linkages.
9. Braking system components like, brake shoe, wheel cylinder, and master cylinder.

Tools and Instruments required:

1. Spanners (Ring and Double and 6mm to 32mm)
2. Players (Cutting and nose)
3. Hammer and mallet
4. Screw driver
5. Piston Ring Compressor
6. Piston Ring Extractor
7. Allen Key
8. Vernier caliper
9. Cylinder bore gauge
10. Puller
11. Torque wrench

OUTCOMES:

- At the end of course the students will get familiarized on the constructional arrangements of different chassis systems.
OBJECTIVE:
- To familiarize the various steps involved in the Design Process
- To understand the principles involved in evaluating the shape and dimensions of a component to satisfy functional and strength requirements.
- To learn to use standard practices and standard data
- To learn to use catalogues and standard machine components

UNIT I  INTRODUCTION

UNIT II  DESIGN OF SHAFTS AND SPRINGS

UNIT III  GEAR DESIGN

UNIT IV  FLYWHEELS
Determination of the mass of a flywheel for a given co-efficient of speed fluctuation. Engine flywheels stresses of rim of flywheels. Design of hubs and arms of flywheel – Turning moment diagram.

UNIT V  DESIGN OF BEARINGS
Design of journal bearings - Ball and Roller bearings – Types of Roller bearings – Bearing life – Static load capacity – Dynamic load capacity – Bearing material – Boundary lubrication – Oil flow and temperature rise.

TOTAL : 45 PERIODS

OUTCOMES:
- At the end of course the students familarize on the design procedure of different automotive components

TEXTBOOKS:

REFERENCES:
OBJECTIVES:

- To know about the various types of special types of vehicles, equipment and their working principles and applications.

UNIT I EARTH MOVING EQUIPMENTS 10
Construction layout, capacity and applications of earthmovers like dumpers, front-end loaders, bulldozers, backhoe loaders, scrappers, Bucket conveyors etc. Selection criteria of prime mover for dumpers and front end loaders based on vehicle performance characteristics.

UNIT II CONSTRUCTIONAL EQUIPMENTS 9
Layout of Constructional equipments, excavators, Jip Cranes, hoist, motor graders, Mixing machine, concrete ready mixers, drillers, ramming machines for construction of bridges and working principles, Power generators

UNIT III FARM EQUIPMENTS 9
Classification of tractors – Main components of tractor. Working attachment of tractors – Auxiliary equipment – Trailers and body tipping mechanism - plowing - paddy plantation machine harvesting machines. Sugarcane harvesting, power trailers

UNIT IV INDUSTRIAL APPLICATIONS 9

UNIT V MILITARY AND COMBAT VEHICLES 8
Ride and stability characteristics, power take off, special implementations. Special features and constructional details of tankers, gun carriers and transport vehicles, bridge builders, communication vehicles.

TOTAL : 45 PERIODS

OUTCOMES:

- Get familiarized with various types of special vehicles and equipment.

TEXT BOOKS:

2. SAE Handbook Volume III

REFERENCES:

1. B. Geleman and M. Moskovin, Farm tractors, MIR publishers, Moscow.
OBJECTIVES:

- The main objective of this course is to impart knowledge in the construction of vehicle, aerodynamic, concept, paneling 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 DETAILS 10
Types of Car body - Saloon, convertibles, Limousine, Estate Van, Racing and Sports car – Visibility regulations, driver’s visibility, improvement in visibility and tests for visibility. Driver seat design - Car body construction - Various panels in car bodies. Safety aspect of car body.

UNIT II BUS BODY DETAILS 9
Types of bus body: based on capacity, distance traveled and based on construction.— Bus body lay out for various types, Types of metal sections used – Regulations – Constructional details: Conventional and integral. driver seat design- Safety aspect of bus body.

UNIT III COMMERCIAL VEHICLE DETAILS 8
Types of commercial vehicle bodies - Light commercial vehicle body. Construction details of commercial vehicle body - Flat platform body, Trailer, Tipper body and Tanker body – Dimensions of driver’s seat in relation to controls – Drivers cab design - Regulations.

UNIT IV VEHICLE AERODYNAMICS 9
Objectives, Vehicle drag and types. Various 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 9

TOTAL : 45 PERIODS

OUTCOMES:

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.

TEXTBOOKS:

REFERENCES:
OBJECTIVES:
- The course is designed to know about automotive system dynamics, different controllers and tuning of different controllers.

UNIT I INTRODUCTION TO VEHICLE CONTROL SYSTEM
Steps in vehicle control system design- Influence of vehicle system design on vehicle control- examples w.r.to vehicle sub system - Degree of freedom for vehicle control- Calculation of the Control degree of freedom- Effect of feedback on Control degree of freedom- selection of controlled, manipulated, measured disturbance variables- classification of the variables in various automotive systems like engines, suspension, braking, air conditioning – General types of vehicle controller configurations- Feedback, Inferential, Feed-Forward, Ratio control

UNIT II DYNAMIC BEHAVIOUR AND HARDWARE OF VEHICLE CONTROL SYSTEMS
Transfer function and state-space models- Dynamic behavior of first order and second order vehicle system- Standard vehicle system inputs- Dynamic responses characteristics of more complicated vehicle system- Development of empirical models from vehicle system data Hardware elements like vehicle plant, measuring instruments, transducers, transmission lines, controller, final control elements, recording elements- Use of digital computers in vehicle control

UNIT III FEEDBACK AND ADVANCED CONTROLLERS FOR VEHICLE CONTROL SYSTEM
Introduction- Basic Control modes- Proportional Control- Integral Control- Reset windup- Derivative Control- various forms of PID control- Enhancements of PID controllers- On-off controllers- Typical responses of feedback control systems- Digital Version of PID controllers Feed-Forward control-Cascade control- Design considerations for cascade control, Time delay compensation, Inferential control- Nonlinear control- Adaptive control

UNIT IV ENGINE CONTROL SYSTEM
Fuel control- Ignition control- Lambda control- Idle speed control- Knock control-Adaptive knock control- Combustion torque estimation

UNIT V VEHICLE DRIVELINE, BRAKING AND SUSPENSION CONTROL SYSTEM
Driveline modeling- Modeling for neutral Gear- driveline Control- Driveline Speed Control- Driveline control for gear shifting- Active suspension control Antilock braking control - Traction Control - Electronic stability Program control

TOTAL : 45 PERIODS

OUTCOMES
- Knowing the procedure for modeling different automotive sub system, various control actions and get the exposure of different automotive actuators, tuning controllers.
- Get familiarized with various complex control schemes for automotive systems

TEXT BOOKS:
PTAU8511  ENGINE TESTING AND EMISSION MEASUREMENT LABORATORY

OBJECTIVES:
- To train the students in testing of the Engines.

LIST OF EXPERIMENTS:
1. Study and use of IC engine testing Dynamometers.
2. Study of 2 and 4 wheeler chassis Dynamometers.
3. Study and use of Pressure pickups, charge amplifier, storage oscilloscope and signal analyzers used for IC engine testing.
5. Performance study of diesel engine.
6. Calculation of frictional power on petrol engines.
8. Testing of 2 and 4 wheelers using chassis dynamometers.
9. Study of NDIR Gas Analyzer and FID.
10. Study of Chemiluminescent NOx analyser.
12. Diesel smoke measurement.

TOTAL : 45 PERIODS

OUTCOMES:
- The student will get familiarized with the basics of engine testing of engine performance, combustion process and emission characteristics.

TEXT BOOK:

REFERENCES:
UNIT I CONCEPT OF VIBRATION

UNIT II TIRES

UNIT III VERTICAL DYNAMICS

UNIT IV LONGITUDINAL DYNAMICS AND CONTROL

UNIT V LATERAL DYNAMICS

TOTAL : 45 PERIODS

OUTCOMES:
- The student will understand how passenger comfort is achieved along with vehicle stability.

TEXT BOOKS:

REFERENCES:
1. Dean Karnopp, Vehicle Stability, 1st edition, Marcel Dekker, 2004
OBJECTIVES:
- To know about the various methods of maintaining vehicles and their subsystems.

UNIT I  MAINTENANCE, WORKSHOP PRACTICES, SAFETY AND TOOLS  10

UNIT II  ENGINE AND ENGINE SUBSYSTEM MAINTENANCE  8
General Engine service- Dismantling of Engine components- Engine repair- working on the underside, front, top, ancillaries- Service of basic engine parts, cooling and lubricating system, fuel system, Intake and Exhaust system, electrical system - Electronic fuel injection and engine management service - fault diagnosis- servicing emission controls

UNIT III  TRANSMISSION AND DRIVELINE MAINTENANCE  8
Clutch- general checks, adjustment and service- Dismantling, identifying, checking and reassembling transmission, transaxle- road testing- Removing and replacing propeller shaft, servicing of cross and yoke joint and constant velocity joints- Rear axle service points- removing axle shaft and bearings- servicing differential assemblies- fault diagnosis.

UNIT IV  STEERING, BRAKE, SUSPENSION, WHEEL MAINTENANCE  11
Inspection, Maintenance and Service of Hydraulic brake, Drum brake, Disc brake, Parking brake, Bleeding of brakes.
Inspection, Maintenance and Service of Mc person strut, coil spring, leaf spring, shock absorbers. Dismantling and assembly procedures.
Wheel alignment and balance, removing and fitting of tyres, tyre wear and tyre rotation.
Inspection, Maintenance and Service of steering linkage, steering column, Rack and pinion steering, Recirculating ball steering service- Worm type steering, power steering system

UNIT V  AUTO ELECTRICAL AND AIR CONDITIONING MAINTENANCE  10
Maintenance of batteries, starting system, charging system and body electrical -Fault diagnosis using Scan tools. Maintenance of air conditioning parts like compressor, condenser, expansion valve, evaporator - Replacement of hoses- Leak detection- AC Charging- Fault diagnosis
Vehicle body repair like panel beating, tinkering, soldering, polishing, painting.

TOTAL : 45 PERIODS

OUTCOMES:
- Upon the completion of the course, the student can able to understand the importance of maintenance and also the step by step procedure for maintain the various automotive sub systems

TEXT BOOKS:
3. Vehicle Service Manuals of reputed manufacturers

REFERENCE:
OBJECTIVES
- To impart practical knowledge in automotive maintenance
- To understand the different procedures involved in any maintenance shop
- To impart practical knowledge in reconditioning of degraded parts
- To impart practical knowledge in Tuning the vehicle for best performance

STUDY EXPERIMENTS:
1. Tools and instruments required for maintenance
2. Safety aspects with respect to man, machine and tools
3. General procedures for servicing and maintenance schedule
4. Wheel Alignment procedure

LIST OF EXPERIMENTS:
1. Minor and major tune up of gasoline and diesel engines
2. Calibration of Fuel pump
3. Engine fault diagnosis using scan tool
4. Fault diagnosis and service of transmission system
5. Fault diagnosis and service of driveline system
6. Fault diagnosis and service of braking system
7. Fault diagnosis and service of suspension system
8. Fault diagnosis and service of steering system
9. Fault diagnosis and service of Electrical system like battery, starting system, charging system, lighting system etc
10. Fault diagnosis and service of vehicle air conditioning system
11. Practice the following:
   i. Adjustment of pedal play in clutch, brake, hand brake lever and steering wheel play.
   ii. Air bleeding from hydraulic brakes, air bleeding of diesel fuel system.
   iii. Wheel bearings tightening and adjustment.
   iv. Adjustment of head lights beam.
   v. Removal and fitting of tire and tube.

OUTCOMES
- Students can able to do understand the functioning of maintenance shop
- Students can able to perform different maintenance procedures
- Students can able to rectify and replace and damaged parts
- Students can able to do some minor tuning on engine and vehicle

REFERENCES:
1. Service manuals of reputed vehicles.
OBJECTIVES:
- 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 INTRODUCTION 6

UNIT II EMISSIONS IN SI ENGINE 11
Chemistry of SI engine combustion – HC and CO formation in SI engines – NO formation in SI engines – Smoke emissions from SI engines – Effect of operating variables on emission formation.

UNIT III EMISSIONS IN CI ENGINE 10
Basics of diesel combustion – Smoke emission and its types in diesel engines – NOx emission and its types from diesel engines – Particulate emission in diesel engines. Odor, sulfur and Aldehyde emissions from diesel engines – effect of operating variables on emission formation.

UNIT IV CONTROL TECHNIQUES FOR REDUCTION OF EMISSION 9

UNIT V TEST PROCEDURE, INSTRUMENTATION & EMISSION MEASUREMENT 9

TOTAL : 45 PERIODS

OUTCOMES:
- Upon the completion of the course, the student will understand the fundamentals of formation of automobile pollutions in SI and CI Engines, various control techniques, test procedures etc.

TEXT BOOKS:

REFERENCES:
3. SAE Transactions, Vehicle emission, 1982 (3 volumes).
OBJECTIVE:
To impart knowledge on basic principle and production methods of automotive components.

UNIT I  CASTED ENGINE COMPONENTS  9
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.

UNIT II FORGED ENGINE COMPONENTS  8
Material selection and Manufacturing methods for Crank shaft, Connecting rod, Cam shaft, valve, Piston pin, Push rod, Rocker arm, tappets, spark plug.

UNIT III TRANSMISSION SYSTEM  10


UNIT IV VEHICLE CHASSIS  8

UNIT V RECENT DEVELOPMENTS  10

TOTAL : 45 PERIODS

OUTCOMES:
• Upon completion of this course, the students can able to know the methodology for manufacturing casted engine and forged engine components.

TEXT BOOK:

REFERENCES:
2. Newton and steels, the motor vehicle, ELBS, 1990
OBJECTIVES:

- Knowledge in usage of software for simulating the performance of IC engines
- Acquiring ability to simulate the various types combustion processes of IC engines.
- Knowledge in performance simulation of IC engines.

UNIT I COMBUSTION OF FUELS


UNIT II ENGINE CYCLE ANALYSIS

Ideal air, fuel air cycle and actual cycle analysis. Progressive combustion analysis in SI engines. Parametric studies on work output, efficiency and other engine performance.

UNIT III COMBUSTION MODELLING


UNIT IV NON-CONVENTIONAL IC ENGINES


UNIT V COMBUSTION ANALYSIS IN IC ENGINES

Photographic studies of combustion processes – Analysis of Pressure crank angle diagrams in SI and CI engines. Knock study for Pressure crank angle histories. Apparent heat release rate and Wiebe’s law analysis for combustion. Calculation of ignition delay and combustion duration. – Hot wire and laser Doppler anemometry and velocimetry for flow and combustion analysis in IC engines.

TOTAL : 45 PERIODS

OUTCOMES:

- At the end of the course, the student can able to model and simulate the engine cycle, perform combustion analysis, instruments used in measurement, recent developments in the IC engines.

TEXTBOOKS:


REFERENCES:


PTAU8002 ADVANCE VEHICLE TECHNOLOGY  L T P C
                                      3 0 0 3

OBJECTIVES:
• To learn and understand the programming, data acquisition hardware and implementing small automotive related projects in virtual instrumentation

UNIT I POWERTRAIN  9
Modern Engine Technology like DTS-i, DTS-Fi, DTS-Si, VVT, Camless Engine, GDi, CRDI

UNIT II VEHICLE SAFETY  9
Anti lock braking systems - Traction Control system - Electro-hydraulic brakes - Occupant safety systems - Airbags, seat belt tightening system, collision warning systems, child Lock - Power windows - Power Sunroof - Seat and steering column - Biometric systems - Driver-assistance systems - Adaptive cruise control

UNIT III VEHICLE SECURITY AND COMFORT SYSTEM  9
Vision enhancement, road recognition system, Anti theft technologies, smart card system, number plate coding, Locking system - Central locking system - acoustic signaling devices Active suspension systems, requirement and characteristics, different types, Vehicle Handling and Ride characteristics of road vehicle, pitch, yaw, bounce control, Climate control management system

UNIT IV VEHICLE INFORMATION AND COMMUNICATION  9

UNIT V INTELLIGENT TRANSPORTATION SYSTEM  9
Traffic routing system - Automated highway systems - Lane warning system - Driver Information System, driver assistance systems - Driver conditioning warning - Route Guidance and Navigation Systems - Hybrid / Electric and Future Cars

TOTAL: 45 PERIODS

OUTCOMES:
• On completion of the course, the student will understand the new developments in the area of automobile area.

TEXT BOOKS:
OBJECTIVES

- To know about the types of alternative fuels and energy sources for IC engines.

UNIT I ALCOHOLS AS FUELS 9

UNIT II VEGETABLE OILS AS FUELS 9

UNIT III HYDROGEN AS ENGINE FUEL 9

UNIT IV BIOGAS, NATURAL GAS AND LPG AS FUELS 9
Production methods of Biogas, Natural gas and LPG. Properties studies. CO₂ and H₂S scrubbing in Biogas., Modification required to use in SI and CI Engines- Performance and emission characteristics of Biogas, NG and LPG in SI and CI engines.

UNIT V ELECTRIC, HYBRID AND FUEL CELL VEHICLES 9

TOTAL : 45 PERIODS

OUTCOMES:
- On completion of the course, the student will understand the various alternative fuels available, its properties, performance characteristics, combustion characteristics, emission characteristics, engine modifications required etc.
REFERENCES:
4. Transactions of SAE on Biofuels (Alcohols, vegetable oils, CNG, LPG, Hydrogen, Biogas etc.).

PTAU8004 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 for the design of vehicle body.

UNIT I  INTRODUCTION
Scope, historical developments, fundamental of fluid mechanics, flow phenomenon related to vehicles, external and internal flow problem, resistance to vehicle motion, performance, fuel consumption and performance potential of vehicle aerodynamics.

UNIT II  AERODYNAMIC DRAG OF CARS
Cars as a bluff body, flow field around car, drag force, types of drag force, analysis of aerodynamic drag, drag coefficient of cars, strategies for aerodynamic development, low drag profiles.

UNIT III  SHAPE OPTIMIZATION OF CARS
Front end modification, front and rear wind shield angle, boat tailing, hatch back, fast back and square back, dust flow patterns at the rear, effects of gap configuration, effect of fasteners. Case studies on modern vehicles.

UNIT IV  VEHICLE HANDLING
The origin of forces and moments on a vehicle, lateral stability problems, methods to calculate forces and moments – vehicle dynamics under side winds, the effects of forces and moments, characteristics of forces and moments, dirt accumulation on the vehicle, wind noise, drag reduction in commercial vehicles and racing cars.

UNIT V  WIND TUNNELS FOR AUTOMOTIVE AERODYNAMICS
Introduction, principle of wind tunnel technology, limitation of simulation, stress with scale models, full scale wind tunnels, measurement techniques, equipment and transducers, road testing methods, numerical methods. CFD analysis.

TOTAL : 45 PERIODS

OUTCOMES:
- Upon completion of this course, the students will understand the fundamentals of aerodynamics, vehicle body optimisation, measuring aerodynamics forces etc.
TEXT BOOK:

REFERENCES:

PTAU8005 AUTOMOTIVE MATERIALS L T P C
3 0 0 3

OBJECTIVES:
- To introduce fundamental concepts on automotive materials and its selection criteria, materials for engine, transmission system, structure and application.

UNIT I ENGINEERING MATERIALS AND THEIR PROPERTIES
9
Classes of engineering materials - the evolution of engineering materials, Definition of materials properties, Displaying material properties using materials selection charts, Forces for change in materials selection and design, Materials and the environment

UNIT II BASIS OF MATERIAL SELECTION
9

UNIT III MATERIALS FOR ENGINES AND TRANSMISSION SYSTEMS
9
Materials selection for IC engines: Piston, piston rings, cylinder, Engine block, Connecting rod, Crank shaft, Fly wheels, Gear box, Gears, Splines, Clutches.

UNIT IV MATERIALS FOR AUTOMOTIVE STRUCTURE
9
Materials selection for bearings, leaf springs, chassis & frames, Bumper, shock absorbers, wind screens, panels, brake shoes, Disc, wheels, differentials, damping and antifriction fluids, Tyres and tubes.

UNIT V ELECTRONIC MATERIALS FOR AUTOMOTIVE APPLICATIONS
9
Materials for electronic devices meant for engine control, ABS, Steering, Suspension, Sensors, anti-collision, Anti-fog, Head lamps.

TOTAL: 45 PERIODS

OUTCOMES:
- Student can able to know fundamental concepts about materials and its selection. Study on the materials Material costs, Availability, Recyclability, Environmental consideration Enhance knowledge on materials used for various automotive components, chassis, and its applications.

TEXTBOOKS:

REFERENCES:

PTAU8006 AUTOMOTIVE TEST INSTRUMENTATION 3 0 0 3

OBJECTIVES:
• The main objective of this course is to provide theoretical and applicative knowledge in automobile test instrumentation engineering based on virtual reality technologies through advanced instrumentation techniques, programming and data acquisition hardware and implementing small automobile related projects in virtual instrumentation environment.

UNIT I MEASUREMENT SYSTEMS 6
Introduction to Measurement systems-static and dynamic measurement –closed and open loop system - Requirements and characteristics – Analysis of experimental detail. Error analysis

UNIT II TRANSUDCERS, MODIFIERS AND TERMINATING DEVICES 8
Transducers for Automotive Applications – Amplifiers- filters –data Acquisition- Indicators, Printers and displays –Signal Analyzing.

UNIT III MECHANICAL MEASUREMENT 10
Instrumentation for measuring Weight, Force, torque, pressure power, temperature, fluid flow, vibration, rotational speed, velocity, acceleration and angular motion.

UNIT IV ENGINE EXPERIMENTAL TECHNIQUES 12

UNIT V VEHICLE EXPERIMENTAL TECHNIQUES 9
Laboratory tests- test tracks - Endurance Tests- crash tests- Vehicle performance test - Brake tests.

TOTAL : 45 PERIODS

OUTCOMES:
• Possess knowledge in virtual instrumentation and how it can be applied in data acquisition and instrument control in automobile engineering.
- Can Experiment and analyze the automobile laboratory prototype measurement systems using a computer, plug-in DAQ interfaces.

REFERENCES:
1. A.W. JUDGE, Engineering Precision Measurement, Chapman and Hall Ltd, Essex Street W.C.,1951,
2. T.G. Beckwith and Buck, Mechanical Measurements, Oxford and IBH Publishing House, New Delhi, 1995

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<th>Code</th>
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OBJECTIVES:
The objectives of this course are to make the students to understand the principle of general and engine combustion. To understand engine heat release rate and various heat transfer models and to study the experimental methods for combustion and heat transfer in engines.

UNIT I THERMODYNAMICS OF COMBUSTION 10
Premixed and diffusion combustion process in IC engines. First and Second Law of Thermodynamics applied to combustion- combustion Stoichiometry- chemical equilibrium, spray formation and droplet combustion.

UNIT II CHEMICAL KINETICS OF COMBUSTION 10

UNIT III FLAMES 10
Laminar premixed – flame speed correlations- quenching, flammability, and ignition, flame stabilization, laminar diffusion flames, turbulent premixed flames-Damkohler number.

UNIT IV HEAT TRANSFER IN IC ENGINES 8

UNIT V EXPERIMENTS IN IC ENGINES 7
Cylinder pressure measurement. Rate of heat release calculation – hot wire and laser Doppler anemometry and velocimetry for flow and combustion analysis in IC engines.

TOTAL : 45 PERIODS

OUTCOMES:
Get familiarized with the following
- The principle of general and engine combustion, heat release rate and various heat transfer models.
REFERENCES:

PTAU8008 COMPUTATIONAL FLUID MECHANICS L T P C 3 0 0 3

AIM
This course aims to introduce numerical modeling and its role in the field of heat and fluid flow, it will enable the students to understand the various discretisation methods and solving methodologies and to create confidence to solve complex problems in the field of heat transfer and fluid dynamics.

OBJECTIVES :
• To develop finite difference and finite volume discretized forms of the CFD equations.
• To formulate explicit & implicit algorithms for solving the Euler Eqns & Navier Stokes Eqns.

UNIT I GOVERNING DIFFERENTIAL EQUATION AND FINITE DIFFERENCE METHOD
Classification, Initial and Boundary conditions – Initial and Boundary Value problems – Finite difference method, Central, Forward, Backward difference, Uniform and non-uniform Grids, Numerical Errors, Grid Independence Test.

UNIT II CONDUCTION HEAT TRANSFER
Steady one-dimensional conduction, Two and three dimensional steady state problems, Transient one-dimensional problem, Two-dimensional Transient Problems.

UNIT III CONVECTION HEAT TRANSFER AND FEM
UNIT IV INCOMPRESSIBLE FLUID FLOW

UNIT V TURBULENCE MODELS
Algebraic Models – One Dimension model, K – e Models, Standard and High and Low Reynolds number models, Prediction of fluid flow and heat transfer using standard codes.

OUTCOMES:
Upon completion of this course, the students can able
- To create numerical modeling and its role in the field of fluid flow and heat transfer
- To use the various discretization methods, solution procedures and turbulence modeling to solve flow and heat transfer problems.

TEXT BOOKS:

REFERENCES

PTAU8009 FINITE ELEMENT TECHNIQUES

OBJECTIVES:
- To introduce the concepts of Mathematical Modeling of Engineering Problems.
- To appreciate the use of FEM to a range of Engineering Problems.

UNIT I INTRODUCTION
UNIT II STATIC ANALYSIS

UNIT III DYNAMICS ANALYSIS

UNIT IV HEAT TRANSFER AND FLUID FLOW ANALYSIS

UNIT V AUTOMOTIVE APPLICATION
Force distribution on different parts of automotive structure, design of the parts, static, dynamic and thermal analysis of the parts using finite element method. Material redistribution to minimize stresses and deflection. Optimization of location of ribs to maximize rigidity.

TOTAL: 45 PERIODS

OUTCOMES:
• Upon completion of this course, the students can able to understand different mathematical Techniques used in FEM analysis and use of them in Structural and thermal problem

TEXT BOOKS:

REFERENCES:

PTAU8010 FLEET MANAGEMENT L T P C
3 0 0 3

OBJECTIVES:
• To provide detailed knowledge to students on Automobile management training, operation, vehicle maintenance, vehicle scheduling, fixation of fare and its structure. In addition the knowledge about vehicle parts supply management, budget allocation and the details of motor vehicle act will be imparted.
UNIT I MANAGEMENT TRAINING AND OPERATION 10

UNIT II VEHICLE MAINTENANCE 8

UNIT III VEHICLE PARTS, SUPPLY MANAGEMENT AND BUDGET 10

UNIT IV SCHEDULING AND FARE STRUCTURE 10

UNIT V MOTOR VEHICLE ACT 7
Schedules and sections – Registration of motor vehicles – EURO Norms - Licensing of drivers – Control of permits – Limits of speed – traffic signs – Constructional regulations – Description of goods carrier, delivery van, tanker, tipper, Municipal, fire fighting and break down service vehicle.

TOTAL : 45 PERIODS

OUTCOMES:
- Demonstrate effective vehicle management skills such as scheduling, fare fixation for optimal usage on roads.
- Possess an extensive knowledge and understanding of the business and management practices on vehicles in fleets and their maintenance.

TEXT BOOK:

REFERENCES:
OBJECTIVES:
- To understand the methods of representation of system and their transfer function models
- To provide adequate knowledge in the time response of systems and steady state error analysis
- To give basic knowledge in obtaining the open loop and closed loop frequency responses of system
- To understand the concept of stability of control system and methods of stability analysis
- To study the three way of designing compensators for a control system

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 ENERGY SOURCES: BATTERIES AND FUEL CELLS
Battery Parameters-Power requirement of electric vehicles- Different types of batteries - Lead acid-Nickel based-Sodium based-Lithium based- Metal Air based. Battery charging- Charger design- Quick charging devices- Battery Modeling.
Fuel Cell- Fuel cell characteristics- Fuel cell types-Hydrogen fuel cell- Connecting cell in series-water management in the PEM fuel cell- Thermal Management of the PEM fuel cell

UNIT III PROPULSION MOTORS AND CONTROLLERS
A characteristic of permanent magnet and separately exited DC motors. AC single phase and 3-phase motor – inverters – DC and AC motor speed controllers.

UNIT IV VEHICLE DESIGN CONSIDERATIONS FOR ELECTRIC VEHICLES
Aerodynamic-Rolling resistance- Transmission efficiency- Vehicle mass- Electric vehicle chassis and Body design considerations- Heating and cooling systems- Controllers- Power steering- Tyre choice- Wing Mirror, Aerials and Luggage racks

UNIT V HYBRID VEHICLES

OUTCOMES:
- Get familiarized with hybrid and electric vehicle.

TEXT BOOKS:

REFERENCES:
OBJECTIVE:
To impart knowledge in simulating IC engine processes. The detailed concept of air standard, fuel air cycle, progressive and actual cycle simulation of SI engine will be taught to the students. At the end of the course the students will have command over simulation of IC engine process.

UNIT I INTRODUCTION

UNIT II COMBUSTION AND STOICHIOMETRY
Reactive processes, Heat of reaction, measurement of URP, measurement of HRP. Introduction - combustion equation for hydrocarbon fuels. Calculation of minimum air required for combustion, excess air supplied and stoichiometric air required for complete combustion. Conversion of volumetric analysis to mass analysis.

UNIT III ADIABATIC FLAME TEMPERATURE
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. SI Engine simulation with air as working medium, deviation between actual and ideal cycle.

UNIT IV SI ENGINE SIMULATION WITH ADIABATIC COMBUSTION
Introduction, Engine details, 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 V SI ENGINE SIMULATION WITH GAS EXCHANGE PROCESS
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.

TOTAL : 45 PERIODS

OUTCOMES:
- The student will be familiar with the basics of simulation, combustion process, SI Engine modeling and simulation process

TEXTBOOK:

REFERENCES:
OBJECTIVES:
- The course is designed to know about basic air-conditioning concepts, Principles, types, components and maintenance aspects of vehicle air-conditioning system

UNIT I  AUTOMOTIVE AIRCONDITIONING FUNDAMENTALS  9
Purposes of Heating, Ventilation and Air Conditioning- Environmental Concerns- Ozone layer depletion- Location of air conditioning components in a car – Schematic layout of a vehicle refrigeration system.
Psychrometry – Basic terminology and Psychrometric mixtures- Psychrometric Chart- Related problems

UNIT II  AUTOMOTIVE COOLING AND HEATING SYSTEM  9
Vehicle Refrigeration System and related problems- Fixed thermostatic and Orifice tube system- Variable displacement thermostatic and Orifice tube system- Vehicle air conditioning operation
Types of compressor- Compressor Clutches- Compressor Clutch electrical circuit- Compressor lubrication- Condensers- Evaporators- Expansion devices- Evaporator temperature and pressure controls- receiver-drier- Accumulators- refrigerant hoses, Connections and other assemblies- Heating system

UNIT III  AIR-CONDITIONING CONTROLS, DELIVERY SYSTEM AND REFRIGERANTS  9
Types of Control devices- Preventing Compressor damage- Preventing damage to other systems- Maintaining driveability- Preventing Overheating
Ram air ventilation- Air delivery Components- Control devices- Vacuum Controls
Containers – Handling refrigerants – Discharging, Charging & Leak detection – Refrigeration system diagnosis – Diagnostic procedure – Ambient conditions affecting system pressures.

UNIT IV  AUTOMATIC TEMPERATURE CONTROL  9
Different types of sensors and actuators used in automatic temperature control- Fixed and variable displacement temperature control- Semi Automatic- Controller design for Fixed and variable displacement type air conditioning system

UNIT V  SYSTEM SERVICING AND TESTING  9
Special tools for servicing vehicle air conditioning – Diagnosing components and air conditioning systems- Diagnosing cooling system- Air delivery system- Automatic temperature Control system diagnosis and service

TOTAL : 45 PERIODS

OUTCOMES:
- Students will be able to understand the components of the automotive air-conditioning and their functions and the latest developments in this field
- Students will be able to understand the of the automotive air-conditioning and their functions and the latest developments in this field

TEXT BOOKS:

REFERENCES:

PTGE8551 ENGINEERING ETHICS AND HUMAN VALUES L T P C
(Industrial, Mechanical Printing, Automobile, EEE 3 0 0 3
CSE, ECE, Civil, Textile)

OBJECTIVES:

- To enable the students to create an awareness on Engineering Ethics and Human Values, to instill Moral and Social Values and Loyalty and to appreciate the rights of others.

UNIT I HUMAN VALUES 10

UNIT II ENGINEERING ETHICS 9

UNIT III ENGINEERING AS SOCIAL EXPERIMENTATION 9
Engineering as Experimentation – Engineers as responsible Experimenters – Codes of Ethics – A Balanced Outlook on Law – The Challenger Case Study

UNIT IV SAFETY, RESPONSIBILITIES AND RIGHTS 9


UNIT V GLOBAL ISSUES 8

TOTAL: 45 PERIODS
OUTCOMES:
- Upon completion of the course, the student should be able to apply ethics in society, discuss the ethical issues related to engineering and realize the responsibilities and rights in the society

TEXT BOOK

REFERENCES:

WEB SOURCES:
1. www.onlineethics.org
2. www.nspe.org
3. www.globalethics.org
4. www.ethics.org

PTMG8651 TOTAL QUALITY MANAGEMENT L T P C
(EEE, Mechanical, Automobile, Printing, Industrial, Manufacturing, CSE, ECE, IT, Leather, Production) 3 0 0 3

AIM
To provide comprehensive knowledge about the principles, practices, tools and techniques of Total quality management.

OBJECTIVES
- To understand the various principles, practices of TQM to achieve quality.
- To learn the various statistical approaches for Quality control.
- To understand the TQM tools for continuous process improvement.
- To learn the importance of ISO and Quality systems

UNIT I INTRODUCTION

UNIT II TQM PRINCIPLES
Quality statements - Customer focus –Customer orientation, Customer satisfaction, Customer complaints, Customer retention - Continuous process improvement – PDCA cycle, 5s, Kaizen - Supplier partnership – Partnering, Supplier selection, Supplier Rating.
UNIT III TQM TOOLS & TECHNIQUES I

UNIT IV TQM TOOLS & TECHNIQUES II

UNIT V QUALITY SYSTEMS

OUTCOMES
• The student would be able to apply the tools and techniques of quality management to manufacturing and services processes.

TEXT BOOK:

REFERENCE BOOKS:

PTGE8071 DISASTER MANAGEMENT

OBJECTIVES:
• To provide students an exposure to disasters, their significance and types.
• To ensure that students begin to understand the relationship between vulnerability, disasters, disaster prevention and risk reduction
• To gain a preliminary understanding of approaches of Disaster Risk Reduction (DRR)
• To enhance awareness of institutional processes in the country and
• To develop rudimentary ability to respond to their surroundings with potential disaster response in areas where they live, with due sensitivity

UNIT I INTRODUCTION TO DISASTERS
Definition: Disaster, Hazard, Vulnerability, Resilience, Risks – Disasters: Types of disasters – Earthquake, Landslide, Flood, Drought, Fire etc - Classification, Causes, Impacts including social, economic, political, environmental, health, psychosocial, etc.- Differential impacts- in terms of caste, class, gender, age, location, disability - Global trends in disasters: urban disasters, pandemics, complex emergencies, Climate change- Dos and Don’ts during various types of Disasters.
UNIT II APPROACHES TO DISASTER RISK REDUCTION (DRR) 9
Disaster cycle - Phases, Culture of safety, prevention, mitigation and preparedness community based DRR, Structural- nonstructural measures, Roles and responsibilities of- community, Panchayati Raj Institutions/Urban Local Bodies (PRls/ULBs), States, Centre, and other stakeholders- Institutional Processess and Framework at State and Central Level- State Disaster Management Authority(SDMA) – Early Warning System – Advisories from Appropriate Agencies.

UNIT III INTER-RELATIONSHIP BETWEEN DISASTERS AND DEVELOPMENT 9
Factors affecting Vulnerabilities, differential impacts, impact of Development projects such as dams, embankments, changes in Land-use etc.- Climate Change Adaptation- IPCC Scenario and Scenarios in the context of India - Relevance of indigenous knowledge, appropriate technology and local resources.

UNIT IV DISASTER RISK MANAGEMENT IN INDIA 9
Hazard and Vulnerability profile of India, Components of Disaster Relief: Water, Food, Sanitation, Shelter, Health, Waste Management, Institutional arrangements (Mitigation, Response and Preparedness, Disaster Management Act and Policy - Other related policies, plans, programmes and legislation – Role of GIS and Information Technology Components in Preparedness, Risk Assessment, Response and Recovery Phases of Disaster – Disaster Damage Assessment.

UNIT V DISASTER MANAGEMENT: APPLICATIONS AND CASE STUDIES AND FIELD WORKS 9
Landslide Hazard Zonation: Case Studies, Earthquake Vulnerability Assessment of Buildings and Infrastructure: Case Studies, Drought Assessment: Case Studies, Coastal Flooding: Storm Surge Assessment, Floods: Fluvial and Pluvial Flooding: Case Studies; Forest Fire: Case Studies, Man Made disasters: Case Studies, Space Based Inputs for Disaster Mitigation and Management and field works related to disaster management.

TOTAL: 45 PERIODS

OUTCOMES:
The students will be able to
- Differentiate the types of disasters, causes and their impact on environment and society
- Assess vulnerability and various methods of risk reduction measures as well as mitigation.
- Draw the hazard and vulnerability profile of India, Scenarious in the Indian context, Disaster damage assessment and management.

TEXTBOOK:

REFERENCES
1. Govt. of India: Disaster Management Act , Government of India, New Delhi, 2005
OBJECTIVES:
- To sensitize the Engineering students to various aspects of Human Rights.

UNIT I

UNIT II

UNIT III
Theories and perspectives of UN Laws – UN Agencies to monitor and compliance.

UNIT IV
Human Rights in India – Constitutional Provisions / Guarantees.

UNIT V

TOTAL : 45 PERIODS

OUTCOME:
- Engineering students will acquire the basic knowledge of human rights.

REFERENCES: