## 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.

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 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.

UNIT I MATRICES

- Characteristic equation
- Eigenvalues and Eigenvectors of a real matrix
- Properties of eigenvalues and eigenvectors
- Cayley-Hamilton Theorem
- Diagonalization of matrices
- Reduction of a quadratic form to canonical form by orthogonal transformation.

UNIT II FUNCTIONS OF SEVERAL VARIABLES

- Partial derivatives
- Homogeneous functions and Euler’s theorem
- Total derivative
- Differentiation of implicit functions
- Jacobians
- Partial differentiation of implicit functions
- Taylor’s series for functions of two variables
- Maxima and minima of functions of two 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

- Existence conditions
- Transforms of elementary functions
- Basic properties
- Transforms of derivatives and integrals
- Inverse transforms
- Convolution theorem
- Transform of periodic functions
- Application to solution of linear ordinary differential equations with constant coefficients.

TOTAL: 45 PERIODS

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  9

UNIT II  ACOUSTICS AND ULTRASONICS  9

UNIT III  THERMAL PHYSICS  9

UNIT IV  APPLIED OPTICS  9

UNIT V  SOLID STATE PHYSICS  9
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
TEXT BOOKS:

REFERENCES:

PT CY8152 ENGINEERING CHEMISTRY L T P C
3 0 0 3

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 NANO CHEMISTRY

TEXT BOOKS

RE REFERENCE BOOKS

PTGE8153 ENGINEERING MECHANICS
L T P C
3 0 0 3

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
Free body diagram – Types of supports –Action and reaction forces –stable equilibrium – Moments and Couples – Moment of a force about a point and about an axis – Vectorial representation of moments and couples – Scalar components of a moment – Varignon’s theorem – Single equivalent force -Equilibrium of Rigid bodies in two dimensions – Equilibrium of Rigid bodies in three dimensions

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

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.

TOTAL: 45 PERIODS

TEXT BOOKS:

REFERENCES:

PTGE8151 COMPUTING TECHNIQUES

UNIT I INTRODUCTION

UNIT II C PROGRAMMING BASICS
UNIT III  ARRAYS AND STRINGS  9
Arrays – Initialization – Declaration – One dimensional and Two dimensional arrays. String-

UNIT IV  FUNCTIONS AND POINTERS  9
Function – definition of function – Declaration of function – Pass by value – Pass by reference
– Recursion – Pointers - Definition – Initialization – Pointers arithmetic – Pointers and arrays-
Example Problems.

UNIT V  STRUCTURES AND UNIONS  9
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.

TEXTBOOKS

REFERENCES
   Education, 2006

PTAU8201  ELECTRICAL AND ELECTRONICS ENGINEERING  L T P C
3 0 0 3

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

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

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

REFERENCES:

PTAU8202  MANUFACTURING PROCESSES  L T P C
3 0 0 3

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

UNIT II  WELDING PROCESSES
UNIT III METEL FORMING PROCESSES

UNIT IV MACHINING PROCESSES

UNIT V PLASTIC MATERIAL PROCESSES

TEXT BOOKS:

REFERENCE BOOKS:

PTAU8203 MEASUREMENT SYSTEM FOR AUTOMOBILES L T P C 3 0 0 3
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

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- Piezoelectric 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


Introduction to MEMs

TOTAL: 45 PERIODS

TEXT BOOKS:

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

UNIT I BASIC THERMODYNAMICS

UNIT II AIR STANDARD CYCLES AND COMPRESSORS
Otto, Diesel, Dual combustion and Brayton cycles. Air standard efficiency. Mean effective pressure. Compressors, Classifications of compressors, Single stage and multi stage, Effect of intercooler in multi stage compressor, Perfect and imperfect intercooler, work done by the compressor, Reciprocating, Rotary, Axial, Vane compressors.

UNIT III STEAM AND JET PROPULSION
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
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

TOTAL : 60 PERIODS

(Use of standard Steam tables with mollier chart and Refrigerant tables are permitted)

TEXT BOOKS:

REFERENCES:
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

UNIT II INTERPOLATION AND APPROXIMATION
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

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

TEXT BOOKS:
REFERENCES:

PTAU8301 AUTOMOTIVE CHASSIS

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
TEXT BOOKS

REFERENCES

PTAU8302 AUTOMOTIVE ELECTRICAL AND ELECTRONICS

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

REFERENCES:
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 10

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

UNIT IV COMBUSTION AND COMBUSTION CHAMBERS 9

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.

TOTAL : 45 PERIODS

TEXT BOOKS:

REFERENCES:
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 – Thermal stresses – Impact loading.

UNIT II STRESSES IN BEAMS 10
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 10

UNIT IV TORSION – SPRINGS – COLUMNS 10

UNIT V BIAXIAL STRESSES 7
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.

TOTAL: 45 PERIODS

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

REFERENCES:
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
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
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
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
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

TOTAL : 45 PERIODS

TEXT BOOKS:

REFERENCES
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

TEXT BOOKS:

REFERENCES:
5. Heinz advanced engine tech
UNIT I  CLUTCH AND GEAR BOX  
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 Synchromesh 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  

UNIT III  EPICYCLIC GEARBOXES USED IN AUTOMATIC TRANSMISSION  

UNIT IV  AUTOMATIC TRANSMISSION APPLICATIONS  
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  

TOTAL : 45 PERIODS

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
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
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
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

UNIT V  TWO & THREE WHEELERS – CASE STUDY
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

TEXT BOOK:

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

PTPR8351  KINEMATICS AND DYNAMICS OF MACHINES  L T P C  3 1 0 4

OBJECTIVES:
To understand the basic concepts of mechanisms and machinery

UNIT I  MECHANISMS
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

TEXT BOOK

REFERENCES

PTAU8411  AUTOMOTIVE ENGINE AND CHASIS COMPONENT LABORATORY  L T P C
0 0 3 2
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 guage
10. Puller
11. Torque wrench

**TOTAL : 45 PERIODS**

**PTAU8501 AUTOMOTIVE COMPONENTS DESIGN**

**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  9

UNIT III  GEAR DESIGN  8

UNIT IV  FLYWHEELS  7
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  9
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

TEXTBOOKS:

REFERENCES:
UNIT IV   INDUSTRIAL APPLICATIONS  

UNIT V   MILITARY AND COMBAT VEHICLES  
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

TEXT BOOKS:
2. SAE Handbook Volume III

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

PTAU8503   VEHICLE BODY ENGINEERING  
L T P C  
3 0 0 3

UNIT I   CAR BODY DETAILS  

UNIT II   BUS BODY DETAILS  
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  
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
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

TOTAL : 45 PERIODS

TEXTBOOKS:

REFERENCES:

PTAU8504  VEHICLE CONTROL SYSTEM

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

TEXT BOOKS:

REFERENCES:

PTAU8511 ENGINE TESTING AND EMISSION MEASUREMENT LABORATORY

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.

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

TEXT BOOKS:

REFERENCES:
1. Dean Karnopp, Vehicle Stability, 1st edition, Marcel Dekker, 2004
PTAU8602  VEHICLE MAINTENANCE

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

TEXT BOOKS:
3. Vehicle Service Manuals of reputed manufacturers

REFERENCE:
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.

TOTAL : 45 PERIODS

REFERENCES:
1. Service manuals of reputed vehicles.
UNIT III EMISSIONS IN CI ENGINE
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

UNIT V TEST PROCEDURE, INSTRUMENTATION & EMISSION MEASUREMENT

TOTAL : 45 PERIODS

TEXT BOOKS:

REFERENCES:
3. SAE Transactions, Vehicle emission, 1982 (3 volumes).

PTAU8702 MANUFACTURING OF AUTOMOTIVE COMPONENTS

OBJECTIVE:
To impart knowledge on basic principle and production methods of automotive components.

UNIT I CASTED ENGINE COMPONENTS
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
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

UNIT IV  VEHICLE CHASSIS

UNIT V  RECENT DEVELOPMENTS

TOTAL : 45 PERIODS

TEXT BOOK:

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

PTAU8001  ADVANCE THEORY OF IC ENGINES  L  T  P  C
3  0  0  3

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 

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  
Modern Engine Technology like DTS- i, DTS – Fi, DTS – Si, VVT, Camless Engine, GDi, CRDI 

UNIT II  VEHICLE SAFETY  
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- Adaptive cruise control 

UNIT III  VEHICLE SECURITY AND COMFORT SYSTEM  
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  
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

TEXT BOOKS:

REFERENCE:

PTAU8003 ALTERNATIVE FUELS AND ENERGY SYSTEMS L T P C 3 0 0 3

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

PTAU8004 AUTOMOTIVE AERODYNAMICS

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

TEXT BOOK:
REFERENCES:

PTAU8005 AUTOMOTIVE MATERIALS L T P C
3 0 0 3

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

TEXTBOOKS:

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

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

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

UNIT IV ENGINE EXPERIMENTAL TECHNIQUES

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

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

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
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
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

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  9
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


TOTAL : 45 PERIODS

TEXT BOOKS:

REFERENCES
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

TEXT BOOKS:

REFERENCES:

PTAU8010  FLEET MANAGEMENT

UNIT I  MANAGEMENT TRAINING AND OPERATION

UNIT II  VEHICLE MAINTENANCE

UNIT III  VEHICLE PARTS, SUPPLY MANAGEMENT AND BUDGET
UNIT IV SCHEDULING AND FARE STRUCTURE

UNIT V MOTOR VEHICLE ACT
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.

TEXT BOOK:

REFERENCES:

TOTAL : 45 PERIODS

PTAU8011 HYBRID AND ELECTRIC VEHICLES L T P C
3 0 0 3
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 FUELL 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

TOTAL : 45 PERIODS
TEXT BOOKS:

REFERENCES:

PTAU8012 SIMULATION OF IC ENGINES

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
TEXTBOOK:

REFERENCES:

PTAU8013 VEHICLE AIR-CONDITIONING

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-COOLING 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
TEXT BOOKS:

REFERENCES:

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

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

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 9

UNIT II TQM PRINCIPLES 9
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 9

UNIT IV TQM TOOLS & TECHNIQUES II 9
UNIT V QUALITY SYSTEMS

TOTAL : 45 PERIODS

TEXT BOOK:

REFERENCE BOOKS: