

GUJARAT TECHNOLOGICAL UNIVERSITY

M.E Semester: 1

Mechanical Engineering (I.C.Engine & Automobile)

Subject Name Advanced Thermodynamics & Heat Transfer

Sr.No	Course content
1.	Basic concepts of thermodynamics; irreversibility; Review of basic laws of thermodynamics and their consequences; Concept of Exergy and Entropy; Exergy for closed system; Entropy generation; entropy balance for closed system; behavior of gases; Equations of state.
2.	Phase equilibrium; phase rule without chemical reaction; chemical potential of ideal gases; T-ds equations for simple compressible systems; Helmholtz and Gibbs functions; Maxwell relations; generalized relations for changes in enthalpy; entropy and internal energy; equations for specific heats; Clausius clapeyron equation; Joule-Thomson and Joule coefficients; applications of thermodynamic relations.
3.	Review of the basic laws of conduction; One dimensional steady state conduction with variable thermal conductivity and with internal distributed heat source; Extended surfaces-review and design considerations; Two dimensional steady state conduction; Unsteady state conduction; solutions using Groeber's and Heisler's charts for plates,cylinders and spheres suddenly immersed in fluids.
4.	Review of convection and radiation heat transfer laws, Natural and forced convection; Heat transfer in turbulent flow; eddy heat diffusivity; Reynold's analogy between skin friction and heat transfer; von Karman; turbulent flow through circular tubes; Review of radiation principles; diffuse surfaces and the Lambert's Cosine law; Radiation through non-absorbing media; Hottel's method of successive reflections.

Reference Books:

1. Fundamentals of Engineering Thermodynamics, Moran MJ & Shapiro HM, John Wiley,
2. Engineering Thermodynamics work and heat Transfer, Roger Gordon & Yon Mayhew, Addison-Wesley, 2001
3. Thermodynamics an Engineering Approach, Cengel Y.A. & Boles M.A., Tata McGraw-Hill,
4. Fundamentals of Classical Thermodynamics, Van Wylen GJ & Sonntag RE, Wiley
5. Thermodynamics, Wark K. Jr. & Donald E.R.,Mc Graw Hill (6th Edn.); 1999.
6. Fundamentals of Heat Transfer, Encropera
7. Heat, Mass and Momentum transfer, Rohsenow and Choi Prentice Hall
8. Fundamentals of Heat Transfer, Grober, Erk and Mc Graw Hill Grigull
9. Analysis of Heat and Mass Transfer, Eckert and Drake McGraw Hill
10. Thermal Radiation, Siegel and Howell McGraw Hill.
11. Engineering Thermodynamics by Jones & Dugan
12. Engineering Thermodynamics by P. K. Nag
13. Basic Engineering Thermodynamics by T Ray chaudhary
14. Fundamentals of Engineering thermodynamics, R. Yadav.
15. Advanced thermodynamics Engineering, Kalyan Annamalai & Ishwar K Puri, CRC Press.
16. Heat and Mass Transfer, R.K.Rajput
17. Heat and Mass Transfer, D.S.Kumar
18. Handbook of Thermal Engineering, Kreith F

GUJARAT TECHNOLOGICAL UNIVERSITY

M.E Semester: 1

Mechanical Engineering (I.C.Engine & Automobile)

Subject Name Fundamentals of I.C.Engine & Automobile

Sr.No	Course content
1.	Introduction to I.C Engine; Engine types and their operation; classification; Actual cycle; air fuel cycle; combustion charts (Equilibrium); Two stroke engines; four stroke engine; characteristics of engines; air capacity of engine; valve timing diagram; Fundamentals of Automotive Electronics, Microprocessor and micro computer applications in automobiles, Components for engine management system.
2.	Engine Components, Material, construction and design aspects; piston assembly; connecting rod; crankshaft; cylinder head; cylinder block; flywheel, ports; valves; valve actuating mechanism; cams; camshaft drives; vibration damper.
3.	Fuel Supply in SI Engines; Carburetion and mixture requirements; Transfer pump; Carburetors - types, constructional and design aspects; Mixture distribution and inlet manifold; The concept of multipoint fuel injection system, Fuel Supply in CI Engines; Injection system components; Jerk and Distributor pumps; Mechanical and Pneumatic governors; Injectors.
4.	Stratified Charged; Low heat rejection engine; four / three valve engine; OHC engine; MPFI; VVT; cam less engine; New engine technology; Recent developments in I. C. engines.
5.	Automotive electrical system; Basic transmission systems; suspension systems; steering systems; tyre and wheel; handling and maintenance; troubleshooting and repairs.

List of Experiments:

1. Testing of Internal combustion engine according to Indian and International standards.
2. Study and Performance analysis of two stroke Petrol Engine.
3. Study and Performance analysis of four stroke Petrol Engine.
4. Study and Performance analysis of four stroke Diesel Engine.
5. To Study various engine components, material and design aspects.
6. Study of MPFI and CRDI systems
7. Study of ignition , cooling, lubrication systems
8. Study of clutch and Transmission systems
9. Study of automotive brakes , suspension and steering systems
10. Study of Recent developments in the field of I.C. Engine and Automobile.
11. **Group Discussion / Technical Debate on advanced topic.**

Reference Books:

1. Introduction to Internal Combustion Engines”, Richard Stone, McMillan, London
2. Internal Combustion Engines Fundamentals – John B. Heywood, McGraw Hill
3. Vehicle and Engine Technology – Hein Heister
4. I.C. Engine by Maleev V. L., McGraw Hill Book, Co.
5. I. C. Engines – Ferguson
6. I. C. Engines – C. Fayette Taylor & Edward S. Taylor, International text book com
7. I. C. Engine & Air Pollution – E. F. Obert, Harper & Row Publishers, New York
8. Automotive Engines - Herbert E. Ellinger
9. Automobile Electrical & Electronic Equipments - Young, Griffiths - Butterworths, London
10. Fundamentals of Automotive Electronics - V.A.W. Hilliers - Hatchin, London
11. I.C Engine, R.K. Singhal
12. I.C Engine, Mathur and Sharma
13. I.C Engine, Domkundwar

GUJARAT TECHNOLOGICAL UNIVERSITY

M.E Semester: 1

Mechanical Engineering (I.C.Engine & Automobile)

Subject Name Fluid Mechanics & Gas Dynamics

Sr.No	Course content
1.	Review of fundamentals; types of flow; Generalized continuity equation; momentum and energy equations, Euler and Navier-Stokes equations, integration of the momentum equation; the generalized Bernoulli's equation; velocity of sound and its importance; physical difference between incompressible, subsonic and supersonic flows; three reference speeds; dimensionless velocity; concepts of static and stagnation parameters.
2.	Two dimensional flow in rectangular and polar coordinates; stream function; irrotationality and the velocity potential function; vorticity and circulation; plane potential flow and the complex potential function; Sources, sinks, doublets and vortices; flow around corners; Rankine ovals; flow around circular cylinders with the without circulation; pressure distribution on the surface of these bodies; aerofoils theory; Joukowski transformation; circular arc, symmetrical aerofoil theory; Joukowski aerofoils; Joukowski hypothesis; drag, and lift forces.
3.	Flow in constant area duct; friction-governing equations; choking due to friction, performance of long ducts; isothermal flow in long ducts; Flow in constant area duct with heating and cooling; Normal shocks-Introductory remarks; governing equations; Rankine- Hugonout; Prandtl and other relations; weak shocks; thickness of shocks; normal shocks in ducts; performance of convergent-divergent nozzle with shocks; moving shock waves; shocks problems in one dimensional supersonics diffuser; supersonic pilot tube.
4.	Dimensional analysis and similitude: Buckingham π theorem; Van driest theorem; dimensional analysis; model study; compressible flow of viscous fluids.

List of Experiments:

1. To study calibration characteristics of Rotameter.
2. Study of flow passing through Shocks.
3. Performance and testing of orifice plate, nozzle and Venturimeter.
4. To study different types of Wind tunnel.
5. To study the effect of angle of attack on Lift and Drag force.
6. To study the loss of energy in wake region behind the aerofoil in the wind tunnel.
7. To study the loss of energy in wake region behind various models (car, jeep, bus etc.) in the wind tunnel.
8. To draw profile of NASA Aerofoils.

Reference Books:

1. Advanced Fluid Mechanics, Raudkiri & Callander Edward Ronald
2. Fundamentals of Mechanics, Currie McGraw Hill of Fluids
3. Fluid Mechanics, Landau & Lifshitz Addition Wesley
4. Fluid Mechanics, Som & Biswas Tata McGraw Hyde antic Machinery
5. Gas dynamics, Ali Campbell & Iennings.
6. Gas dynamics, Radha Krishnan , PHI
7. Fundamentals of compressible flow, S.M. Yahya, New Age Pub
8. The Phenomena of Fluid, Brodkey Addition Wesley Motion
9. Foundation of Fluid, Yuan Prentice Hall Mechanics

GUJARAT TECHNOLOGICAL UNIVERSITY

M.E Semester: 1

Mechanical Engineering (I.C.Engine & Automobile)

Subject Name Vehicle Dynamics

Sr.No	Course content
1.	Suspension system - requirements, types, air suspension, rubber suspension, Shock absorbers; compensated suspension systems; design of leaf spring; coil spring and torsion bar; types of drives-Hotchkiss and torque tube; wheel alignments; wheel wobble; wheel shimmy; pitching; bouncing and rolling; roll centre and roll axis; anti-roll bar; road holding.
2.	Handling Characteristics: Steering geometry; Fundamental condition for true Rolling; Akerman's Steering Gear; Davis Steering gear; Steady state Handling; Neutral steer; Under steer and over steer; Steady state response; Yaw velocity; Lateral Acceleration; Curvature response & directional stability; jack-knifing in articulated vehicle; loading of automobile chassis due to road irregularities; comfort criteria; load transferred while braking and cornering; equivalent weight of vehicle.
3.	Ride Characteristics: Human response to vibrations; Single degree & Two degree freedom; Free & Forced vibrations; Vehicle Ride Model; Quarter car suspension model; Half car suspension model; Full car suspension model; Two degree freedom model for sprung & unsprung mass; Two degree freedom model for pitch & bounce; Vibrations due to road roughness and engine unbalance; Transmissibility of engine mounting; Motion of vehicle on undulating road.
4.	Stability of Vehicles: Load distribution, calculation of tractive effort and reactions for different drives, stability of a vehicle on a slope, on a curve and a banked road.

Reference Books:

1. Theory of Ground Vehicles - J. Y. Wong - John Wiley & Sons, NY
2. Steering, Suspension & Tyres – J. G. Giles, Iete Books Ltd., London
3. Mechanics of Road Vehicles – W. Steed, Iete Books Ltd. London
4. Automotive Chassis – P. M. Heldt, Chilton Co. NK
5. Gillespie.T.D., "Fundamental of vehicle dynamic society of Automotive Engineers ", USA, 1992.
6. Vehicle dynamics and control by Rajesh Rajamani , Springer publication
7. Vehicle Dynamics : Theory and Application by Reza N Jazar, Springer publication.

GUJARAT TECHNOLOGICAL UNIVERSITY

M.E Semester: 1

Mechanical Engineering (I.C.Engine & Automobile)

Subject Name Automobile Refrigeration & A/C

Sr.No	Course content
1.	Introduction; methods of refrigeration; vapour compression refrigeration system; vapour absorption refrigeration system; applications of refrigeration & air conditioning; Automobile air conditioning; air conditioning for passengers; isolated vehicles, transport vehicles; applications related with very low temperatures.
2.	Refrigerant, Classification, properties, selection criteria, commonly used refrigerants, alternative refrigerants, eco-friendly refrigerants, applications of refrigerants, refrigerants used in automobile air conditioning.
3.	Psychrometry (definitions and processes); Application of psychrometric processes of summer and winter air conditioning (applied psychrometry); review of refrigeration and air conditioning load calculations, factors forming the load on refrigeration & air conditioning systems; cooling & heating load calculations; load calculations for automobiles, effect of air conditioning load on engine performance; Human comfort; Comfort chart.
4.	Air conditioning systems, Classification, layouts, central / unitary air conditioning systems, components like compressors, evaporators, condensers, expansion devices, fan blowers, heating systems, Automotive heaters, Control used in Refrigeration system, Air conditioning protection, Engine protection, Distribution duct system, sizing, supply / return ducts, type of grills, diffusers, ventilation, air noise level, layout of duct systems for automobiles and their impact on load calculations.
5.	Air Conditioning Service: Air conditioner maintenance & service; servicing heater system, removing & replacing components; trouble shooting of air conditioning system; compressor service; methods of dehydration; charging & testing; Air Conditioning Control : Common control such as thermostats, humidistat, control dampers, pressure cutouts, relay.

Reference Books:

1. Heating & Air Conditioning Systems – Mitchell Information Services
2. Refrigeration and Air conditioning, Stoecker, McGraw Hill
3. Paul Lung, “Automotive Air Conditioning”, C.B.S. Publisher & Distributor, Delhi.
4. Harris, “Modern Air Conditioning”.
5. ASHRAE Handbook – 1985 Fundamentals
6. William H. Crouse & Donald L. Anglin, “Automotive Air Conditioning”, McGraw Hill, Inc.1990.
7. Michel Information Services, Inc., Mitchell Automatic Heating & Air Conditioning Systems, Prentice Hall, Inc. 1989.
8. Paul Weisler, “Automotive Air Conditioning”, Reston Publishing Co. Inc. 1990
9. A text book of Refrigeration and Air conditioning, Arora and Domkundwar.

GUJARAT TECHNOLOGICAL UNIVERSITY

M.E Semester: 1

Mechanical Engineering (I.C.Engine & Automobile)

Subject Name Combustion Engineering

Sr.No	Course content
1.	Combustion thermodynamics; Stoichiometry; first and second laws of thermodynamics applied to combustion; Ignition and combustion in SI engine; Flame travel; turbulent flame propagation; flame stabilization; vaporization; Review of detonation and Diesel knock; effect of various factors; Combustion chambers for SI engines; Combustion in CI engine; Ignition delay and diesel knock; Excess air supply and air motion; Combustion chamber for CI engines- Construction and Performance aspects; M-combustion chamber; latest combustion chamber and technology.
2.	Fundamentals of combustion kinetics' Combustion products in equilibrium; rate of reactions; chain reactions; opposing reactions; consecutive reactions, competitive reactions; Conservation equation for multi component reacting systems.
3.	Combustion of liquid fuel droplet; fuel atomization; types of injectors; spray formation and characteristics; Oil – fired furnace combustion; gas turbine spray combustion; direct injection engine combustion; detonation of liquid gaseous mixture.
4.	Combustion of solid fuels; Coal combustion; combustion of pulverized coal; combustion of coal on bed in a fluidised bed and in a cyclone burners; stabilization of pulverized coal combustion; design consideration of coal burners; combustion generated pollution.

Reference Books:

1. Combustion Engineering – Gary L. Borman, Kenneth W. Ragland, McGraw Hill
2. Principles of Combustion – Kenneth K. Kuo, John Wiley & Sons
3. Fuels & Combustion – S. P. Sharma & Chander Mohan, Tata McGraw Hill
4. Fuels & Combustion - Sarkar
5. Introduction to combustion phenomenon, Kanury murty, Mc-Ggraw hill
6. Combustion, fundamentals, strehlow, Mc-Ggraw hill

GUJARAT TECHNOLOGICAL UNIVERSITY

M.E Semester: 1

Mechanical Engineering (I.C.Engine & Automobile)

Subject Name Modeling, Simulation & Computer Application

Sr.No	Course content
1.	Concept of system and environment; Continuous and discrete system; linear and nonlinear systems; stochastic activities; static and dynamic models; principles used in modeling; Models classifications, Mathematical models, Physical models, analog models and others, Estimation of model parameters;
2.	Technique of simulation; experimental nature of simulation; numerical computation techniques; continuous system models; analog and hybrid simulation; feedback systems; Stochastic variables; discrete and continuous probability functions; random numbers; rejection method.
3.	Computer technique for simulation; computer generation of Pseudo random; Application, Modeling of Civil, Electrical and Mechanical components of small hydro and Renewable Energy Projects.
4.	Introduction to MATLAB, Various Simulation tools.

Reference Books:

1. System Simulation, Geoffrey Gordon Prentice-Hall
2. System Simulation, The Art and Science, Robert E. Shannon Prentice – Hall
3. System Modeling and Control, J. Schwarzenbach and K. F. Gill, Edward Arnold
4. Modeling and Analysis Of Dynamic Systems, Charles M. Close & Dean K. Frederick
Houghton Mifflin
5. Simulation of Manufacturing, Allan Carrie John, Wiley & Sons
6. Computational Heat Transfer, Y. Jaluria and K. E. Torrance Hemisphere Publishing
7. System Simulation Dr. D. S. Hira

GUJARAT TECHNOLOGICAL UNIVERSITY

M.E Semester: 2

Mechanical Engineering (I.C.Engine & Automobile)

Subject Name Instrumentations & Vehicle Testing

Sr.No	Course content
5.	Planning and Measurement; Instrumentation; Selection of measuring instrument; requirements of measurement such as precision, accuracy, errors, sensitivity, readability and reliability; Measurement of thermo-physical properties; Devices to measure temperature and pressure of the working fluid, coolant, air and fuel flow into the engine.
6.	Indicating and recording instruments; Vibrometer; Accelerometer; vibration and pressure pickups; vibration test methods; Counters; stroboscopes; charge amplifiers; cathode ray oscillographs; FFT analyzer.
7.	Warning and alarm instruments; Brake actuation warning system; traficators; flash system; oil pressure warning system; engine over heat warning system; air pressure warning system; speed warning system; door lock indicators; gear neutral indicator; horn design; permanent magnet horn; air & music horns; safety air bag and latest developments.
8.	Data acquisition and processing: General data acquisition system examples, storage; processing, recording and display devices.
9.	ISI codes for testing automotive engines; Laboratory dynamometer testing systems of power train and vehicle under simulated conditions; Instrumentation for testing vehicles; road test of automobile vehicles; wheel alignment; balancing; PUC test of vehicles; preparation of test reports, EURO standards, Bharat stages.

List of Experiments:

1. Study of Garage layouts, Workshop management and Automotive service equipments.
2. Cleaning and Testing of a Petrol Injector on MPFI test bench.
3. Calibration and Phasing of Diesel Fuel Injection Pump on Fuel Pump test bench.
4. Study working principle and perform operation of (a) Four post hoist (b) Electronic air inflator (c) Tyre changer (d) Car Washer.
5. Overhauling of Carburetor.
6. Overhauling of Gearbox
7. Balancing of a wheel using Wheel balancer and Alignment measurement
8. Inspection and service of an Air conditioning system of a car using AC recovery unit and UV leak detector.

Tutorial :

- i Maintenance schedule chart for service of a car.
 - ii Service procedure for any car with necessary steps.
- 9. Visit of well equipped Automobile workshop.**

Reference Books:

1. Engineering Experimentation – Ernest O. Doebelin
2. Experimental Methods for Engineers – Holman J.P., McGraw Hill Book Co.
3. Measurement Systems, Applications & Design – Ernest O Doebelin, McGraw Hill Book Co.
4. Modern Electric Equipments for Automobiles – Judge A. W., Chapman Hall, London
5. Applied Instrumentation in Process Industries – Andrews W. G.

GUJARAT TECHNOLOGICAL UNIVERSITY

M.E Semester: 2

Mechanical Engineering (I.C.Engine & Automobile)

Subject Name Alternate Fules and Energy

Sr.No	Course content
1.	Conventional fuels; Estimation of conventional fuels; advantages and disadvantages of conventional fuels; Need for Alternate fuel; Availability and Comparative properties of Alternate fuels; Use of Alcohols; LPG, Hydrogen; CNG and LNG; Vegetable oils and Biogas in Automotive Engines;, Relative merits and demerits of various alternate fuels.
2.	Manufacture of Alcohols; Properties as engine fuels Alcohols and Gasoline blends; Performance in S. I. Engines: Methanol and gasoline blends; Effect of compression ratio; Alcohols in Stratified charge engines; Combustion characteristics in engines; Reformed alcohols use in CI Engines; Ignition accelerators; Alcohol Diesel emulsions; Dual fuel systems.
3.	Various vegetable oils for engines; Esterification Performance in engines; Biogas in engines; Performance and Emission characteristics; Shale oil, coal liquid and Tars and fuel; Performance and Emission characteristics.
4.	Availability of CNG; Properties; Modification required to use in Engines; Performance and Emission characteristics of CNG, LPG in SI and CI Engines; Performance and Emission data for LPG; Hydrogen Production methods; Storage and handling; Performance; Safety aspects.
5.	Layout of an electric vehicle; Advantages and limitation; specifications; System components; Electronic control system; High energy and power density batteries; Hybrid vehicles; Solar energy based vehicles; Hydrogen energy based vehicles; Latest development.

List of Experiments:

1. Testing of Internal combustion engine according to Indian and International standards.
2. Study the properties of conventional fuels and Need for an alternative fuels.
3. Study of measurement technique as per ASTM and measurement of different fuel properties.
4. Performance test on a 4 stroke 4 cylinder diesel engine with different blends of a biodiesel.
5. Study of Hydrogen as a alternate fuel for auto vehicle.
6. Study of an Electric & Hybrid Car.
7. Case study on performance of a dual fuel engine using LPG-Diesel fuel and study of a LPG vehicle.
8. Study of a CNG as a substitute fuel for an I.C. engine.
- 9. Group Discussion or Technical quiz.**

Reference Books:

1. Alternate fuels guide book, Bechtold R.L, SAE
2. Solar Engineering of Thermal Processes Duffie & Beckman John Wiley
3. Energy, the Biomass Option Bungay John Wiley
4. Introduction to Wind Energy Technology Lysen Georgia Inst.
5. Energy, Doolittle Matrix Pub.
6. Energy & Environment, Fowler McGraw Hill
7. Solar Energy S.P. Sukhatme Tata McGraw Hill

GUJARAT TECHNOLOGICAL UNIVERSITY

M.E Semester: 2

Mechanical Engineering (I.C.Engine & Automobile)

Subject Name Modern Vehicle Design

Sr.No	Course content
1.	Engine Components; Material, construction and design aspects of engine components; Determination of engine power; Engine selection-swept volume, stroke, bore & no. of cylinders; Arrangement of cylinders stroke to bore ratio.
2.	Design procedure and considerations, material selection & actual design of components; cylinder block design; Design of Piston; piston assembly; Cylinder, Cylinder liner, Cylinder head, Combustion Chamber, Connecting rod, Crank Shaft, Fly Wheel, valves, valve actuating mechanism, cams, camshaft drives, vibration damper, Gearbox design, Constant-mesh gearboxes, synchro-mesh gearboxes, heavy vehicle gearboxes.
3.	Design of couplings; design fluid couplings; torque converter; differential axle; Suspension system design; Tandem axle suspension; adaptive suspension system; shock dampers; Steering system design – power assisted steering, four wheel steering system.
4.	Design of Brakes – Hydraulic brakes, air and endurance brake, antilock brakes; vehicle structure; chassis frames; Principle of vehicle Aerodynamics; Aerodynamic design of vehicle, latest developments.
5.	Introduction to CAD; The product cycle and CAD; Automation and CAD; Finite element analysis; Stress analysis on Automobile Components.

Reference Books:

1. The Automotive Chassis – Engineering Principle – Reimpell J.
2. Automotive Chassis – Design & Calculation – P. Lukin, G. Gaspariyarts, V. Rodionov, MIRPublishing, Moskow
3. Automotive Chassis – P. M. Heldt, Chilton Co. NK
4. Mechanics for Road Vehicles – W. Steed, Illiffe Books Ltd., London
5. Design of Automotive engines, Kolchin and Demodov
6. Automotive design, Jiles. J.G
7. Machine Design, Pandya and Shah
8. Machine Design, Khurmi and Gupta

GUJARAT TECHNOLOGICAL UNIVERSITY

M.E Semester: 2

Mechanical Engineering (I.C.Engine & Automobile)

Subject Name Automobile Chassis & Body Engineering

Sr.No	Course content
1.	Vehicle Aerodynamics; Objects- vehicle drag and types; various types of forces and moments; effects of forces and moments; various body optimization techniques for minimum drag; principle of wind tunnel technology; flow visualization techniques; tests with scale models.
2.	Car Body Details; Types of car bodies; visibility; regulation;, driver's visibility; methods of improving visibility; safety design; constructional details of roof; under floor; bonnet; boot; wings etc; Classification of coach work.
3.	Design of Vehicle Bodies; Vehicle body materials; Layout of the design; preliminary design; safety; Idealized structure; structural surface; shear panel method; symmetric and asymmetrical vertical loads in car; longitudinal loads; different loading situations; load distribution on vehicle structure; Calculation of loading cases; stress analysis of bus body structure under bending and torsion; stress analysis in integral bus body; Design of chassis frame; Rules and regulations for body; Recent safety measures; Testing of body.

Reference Books:

1. Vehicle Body Engineering – Pawloski J., Business Books Ltd.
2. The Automotive Chassis : Engineering Principles – Reimpell J.
3. Vehicle Body Layout and Analysis – John Fenton, Mechanical Engg. Publications Ltd. London
4. Body Construction and Design – Giles J. G., Illife Books, Butterworth and Co.

GUJARAT TECHNOLOGICAL UNIVERSITY

M.E Semester: 2

Mechanical Engineering (I.C.Engine & Automobile)

Subject Name High Speed Diesel Engine

Sr.No	Course content
1.	Introduction of diesel engine; basic operations; thermodynamic cycles (Ideal and actual); various losses; limitations; compression ratio; Combustion in diesel engine; various stages; Delay period and different factors affecting it; its influence on performance; Various performance parameters.
2.	Introduction of combustion chamber in diesel engine; combustion chamber requirements; necessity and types of air motion; Swirl flow; swirl ratio; selection of method of swirl; types of swirl; Types, design and constructional features and relative merits of open, pre-combustion, swirl, air cell and energy cell combustion chamber; M-combustion chamber; latest combustion chamber.
3.	Functions of components; Plunger and distributor pumps; pressure valves; Fuel injector; types of injection nozzle; spray characteristics; valve opening and closing pressures; quantity and duration of fuel injection; injection timing; nozzle cooling.
4.	Supercharging and Turbocharging of diesel engine; necessity and limitations; supercharging methods; relative merits; turbocharging methods; turbocharger selection.
5.	Performance and maintenance of diesel engine; piston cooling; Engine with different types of combustion chamber; Multi fuel engines; pilot injection; special features of agricultural and industrial engines.

Reference Books:

1. Diesel Engine Operation and Maintenance, V.L.Maleev,
2. Introduction to Internal Combustion Engines”, Richard Stone, McMillan, London
3. Internal Combustion Engines Fundamentals – John B. Heywood, McGraw Hill
4. High Speed Diesel Engines, A.W.Judge,
5. high Speed Diesel Engines, P.M.Heldt,
6. Combustion engine processes, Lichty,
7. Supercharging, Vincent,

GUJARAT TECHNOLOGICAL UNIVERSITY

M.E Semester: 2

Mechanical Engineering (I.C.Engine & Automobile)

Subject Name Automobile Maintenance & Pollution Control

Sr.No	Course content
1.	Engine Maintenance: Engine troubles, effects & remedies, different major & minor services for engine, inspection and checking of components visually and dimensionally, reconditioning methods of engine components, engine tune-up, special tools & advanced equipments.
2.	Chassis Drive-line Maintenance: Maintenance, repair and servicing of clutches, Fluid flywheel, gear boxes, Automatic transmission ,CVT unit, propeller shaft, differential unit, front axle and rear axle, suspension systems, servicing of brake systems- hydraulic, air systems, brake bleeding and brakes adjustments, maintenance and servicing of steering system-Manual & Power Steering system, wheel balancing, wheel alignment, maintenance of tyres, tyre rotation, frame defects, chassis frame alignment.
3.	Maintenance, servicing of auxiliaries: Cooling system service, anti corrosion additives, anti freezing solutions, dry & wet liners, Petrol fuel and diesel fuel system maintenance, MPFI maintenance, lubrication system services, Chassis lubrication, lubrication chart, maintenance and care of storage batteries, battery testing methods, maintenance of ignition systems, tyre service & reconditioning.
4.	Air Pollution due to Automobile Exhaust : Sources of Emission, Exhaust gas constituents & analysis, Ingredients responsible for air pollution, Smoke, odor, Smog formation, Sources of pollution, effects, Analysis of air pollutants, Air pollution control models and equipments.
5.	Exhaust Emission Control: Basic method of emission control, catalytic converter, After burners, reactor manifold, air injection, crank case emission control, evaporative loss control, Exhaust gas recirculation, Fuel additives. Pollution Norms : European pollution norms, Indian pollution norms as per Central Motor Vehicle Rules (C.M.V.R.).Characteristics of solid waste, Potential methods of solid waste disposal, Energy recovery from municipal and Industrial solid waste.

Reference Books:

1. Mechanics of Road Vehicles – W. Steed, Iliffe Books Ltd. London
2. Automotive Chassis – P. M. Heldt, Chilton Co. NK
3. I. C. Engine – Litchy
4. I. C. Engine – Obert
5. Introduction to Internal Combustion Engines”, Richard Stone, McMillan, London
6. Vehicle and Engine Technology – Hein Heister
7. Advance Vehicle Technology - Hein Heister
8. S. I. Engine – Fuel Injection Development - Charles A. Fisher, Chapman & Hall
9. Automotive Engines - Herbert E. Ellinger
10. Automobile Engg. Volume – I - American Technical Society, Chicago
11. Internal Combustion Engines Fundamentals – John B. Heyhood, McGraw Hill
12. Environmental Engineering, H.S.Peavy, D.R.Rowe, G.Tchobanoglous, McGraw-Hill Book Company, New York.
13. Introduction to Environmental Engineering and Science, G. Masters, Prentice-Hall International Editions.
14. Environmental Considerations in Energy Development, Asian Development Bank (ADB) Manila.

GUJARAT TECHNOLOGICAL UNIVERSITY

M.E Semester: 2

Mechanical Engineering (I.C.Engine & Automobile)

Subject Name Energy Conservation and Management

Sr.No	Course content
1.	Energy scenario, Principles of energy Conservation, Energy consumption pattern, Resource availability.
2.	Evaluation of thermal performance, calculation of heat loss – heat gain, estimation of annual heating & cooling load factors that influence thermal performance, analysis of existing buildings.
3.	Organizing for energy conservation programme, the energy audit and energy information system, technology for energy conservation, co-generation of process, steam & electricity, computer controlled energy management, commercial options in waste heat recovery equipment, cases of energy studies, energy conservation opportunity, Energy conservation in I. C. Engine.
4.	Strategies for electricity and management, setting up an energy management programme, electricity saving technique by category of end use, Electrical end use in industries, energy & power management in industry, energy management strategies for industry, demand management.
5.	Importance and role of energy management, Energy economics, Payback period, Internal rate of return, life cycle costing.

Reference Books:

1. C.B.Smith, Energy Management Principles, Pergamon Press, New York, 1981.
2. W.C. Turner, Energy Management, Hand Book.
3. Hamies, Energy Auditing and Conservation, Methods, Measurements, Management and Case Study, Hemisphere, Washington, 1980.
4. Kreith, Economics of Solar Energy and Conservation Systems, Vol -3.
5. W.F.Kenny, Energy Conservation in Process Industry.
6. Trivedi, P.R, Jolka K.R., Energy Management, Commonwealth Publication, New Delhi,1997.
7. Witte, Larry C, Industrial Energy Management and Utilization, Hemisphere Publishers, Washinton, 1988.