



**C. U. SHAH UNIVERSITY**  
**Wadhwan City**

**FACULTY OF:-**Technology and Engineering  
**DEPARTMENT OF:-**Automobile Engineering

**SEMESTER:-** -IV

**CODE:-** - 4TE04FME1

**NAME:-** – Fluid Mechanics (FME)

**Teaching and Evaluation Scheme:-**

Subject Code	Name of the Subject	Teaching Scheme (Hours)				Credits	Evaluation Scheme							
		Th	Tu	Pr	Total		Theory				Practical (Marks)			Total
							Sessional Exam		University Exam		Internal		University	
							Marks	Hrs	Marks	Hrs	Pr/Viva	TW	Pr	
4TE04FME1	Fluid Mechanics	3	0	2	5	4	30	1.5	70	3	30	20	---	150

**Objectives:**

- To identify and obtain values of fluid properties and relationship between them.
- To understand the principles of continuity, momentum, and energy as applied to fluid motions.

**Prerequisites:**

- Basic knowledge of Physics and Elements of Mechanical Engineering.

**Course outline:**

Sr. No.	Course content	Hours
1.	<b>Properties of fluid:</b> Introduction: Fluid, liquids and gases, difference between solid and fluid, physical properties such as density, specific weight, viscosity, Newtonian and Non-Newtonian Fluid, causes of viscosity in gases, causes of viscosity in a liquid compressibility, surface tension, capillarity, vapour pressure, cavitations & its all effects and remedies, Thoma's cavitations factor.	06
2.	<b>Fluid Statics :</b> Hydrostatic law, Pascal's law, pressure at a point, pressure measurement with manometers, Total Pressure, centre of pressure, Pressure on a plane (Horizontal, Vertical, Inclined) & Curved surfaces, Archimedes Principle, Buoyancy and stability of floating and submerged bodies, meta centre & meta centric height – analytical and experimental determination.	06
3.	<b>Fluid Kinematics:</b> Types of flow (steady vs. unsteady, uniform vs. non-uniform, laminar vs. turbulent, One, Two and Three dimensional, compressible vs. incompressible, rotational vs. Irrotational), Stream lines, path lines, streak lines, velocity components, convective, local and total acceleration, velocity potential, stream function, continuity equation in Cartesian co-ordinates.	05
4.	<b>Fluid Dynamics:</b>	06

	Introduction to Navier-Stokes' equation, Euler's equation of motion along a stream line, Bernoulli's equation, Application of Bernoulli's equation to Pitot tube, Venturi meter, Orifices, Orifice meter, Triangular Notch & Rectangular Notch	
5.	<b>Dimensional Analysis:</b> Dimensions of physical quantities, dimensional homogeneity, Rayleigh's method, Buckingham's theorem, important dimensionless numbers, Model analysis (Reynolds, Froude and Mach)	05
6.	<b>Viscous flow :</b> Reynolds number and Reynolds experiment, flow of viscous fluid through circular pipe - Hagen – Poiseuille's equation, Flow of viscous fluid between two parallel fixed plates, power absorbed in viscous flow through - journal, Foot step and Collar bearing, Movement of piston in dash pot, Methods of Measurement of viscosity.	06
7.	<b>Compressible Fluid Flow :</b> Thermodynamic concept, speed of a sound wave, Mach number, Mach cone, Mach cone and Mach angle, flow with friction through pipes, adiabatic and isothermal flow, jet propulsion flow through variable area, flow through nozzle, Back pressure variation.	06

#### **Learning Outcomes:**

- The student will demonstrate an ability to recognize the type of fluid flow that is occurring in a particular physical system.
- The student will demonstrate an ability to choose the appropriate fluid mechanical principles needed to analyze fluid-flow situations.

#### **Books Recommended:**

1. Fluid Mechanics and Hydraulic Machines, by R.K. Bansal, Laxmi Prakashan.
2. Fluid Mechanics and Hydraulic Machines, by R.K. Rajput, S.Chand & Co
3. Fluid Mechanics, by F. White, Tata-McGraw Hill publishers
4. Fluid Mechanics and Fluid Power Engineering, by D.S. Kumar, S.K.Kataria & Sons
5. Fluid Mechanics, by Cengel and Cimbala, Tata-McGraw Hill Publishers.
6. Fluid Mechanics and Hydraulic Machines, by S. Gupta, Pearson Publishers.
7. Mechanics of Fluids, by Shames, McGraw Hill publishers.



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**FACULTY OF:-**Technology and Engineering  
**DEPARTMENT OF:-**Automobile Engineering

**SEMESTER:-** IV

**CODE:-** 4TE04AEN1

**NAME:-** Automobile Engines (AEN)

**Teaching and Evaluation Scheme:-**

Subject Code	Name of the Subject	Teaching Scheme (Hours)				Credits	Evaluation Scheme							
		Th	Tu	Pr	Total		Theory				Practical (Marks)			Total
							Sessional Exam		University Exam		Internal		University	
							Marks	Hrs	Marks	Hrs	Pr/Viva	TW	Pr	
4TE04AEN1	Automobile Engines	3	0	2	5	4	30	1.5	70	3	30	20	---	150

**Objectives:**

- To understand the basic principles of engines used for automobiles and different systems.

**Prerequisites:**

- Basic knowledge Elements of Mechanical Engineering and fundamentals of Physics.

**Course outline:**

Sr. No.	Course content	Hours
1.	<b>Introduction:</b> Engine application, classification, constructional details of spark ignition (SI) and compression ignition (CI) engines, working principles: Two stroke SI and CI engines – construction and working, valve and port timing diagrams, comparison of SI and CI engines and four stroke and two stroke engines, firing order.	05
2.	<b>Fuels and Fuel Systems:</b> Types of fuel, properties. • Fuel supply system in SI engine: Fuel supply system layout, Fuel feed pump, filters, carburetion, types of carburetors, mixture requirements, idling, cold starting, economy, power and acceleration, choke. Petrol injection, Multi-point fuel injection. • Fuel supply system in CI engine: Fuel injection pump, fuel feed pump, injectors, nozzles, cold starting devices (glow plugs), types of governors, Common Rail Diesel Injection (CRDI) System.	08
3.	<b>Combustion and Combustion Chambers:</b> Introduction to combustion in Petrol engine and Diesel engines and stages of combustion, Dependence of ignition timing on load and speed, Knock in SI and CI engines, Combustion chambers for SI and CI engines, Dual timing	07

	spark plug, Direct and indirect injection combustion chambers for CI engines, importance of Swirl, squish and turbulence, factors controlling combustion chamber design.	
4.	<b>Cooling and Lubrication Systems:</b> Need for cooling, types of cooling systems- air and liquid cooling systems, Thermo syphon and forced circulation and pressurized cooling systems, properties of coolants. Functions & types of lubrication systems and it's components, types of lubricating pumps, oil coolers, types of oils, lubricant properties and additives for lubricants, big end & small end bearings, Bush bearings, Thrust bearings and bimetallic bearings.	07
5.	<b>Intake and Exhaust System:</b> Exhaust/Intake systems, types of air cleaners, supercharger, turbo charger, silencers, catalytic convertor.	05
6.	<b>Engine Emission:</b> Emission of pollutants from SI & CI engines, control of emissions from SI and CI engines, measurement of pollutants in exhaust gases, effect of different pollutants on human and plant life , emission (Euro & Bharat stage) norms.	06
7.	<b>Engine testing:</b> Measurement of indicated power, brake power, friction power, speed, air consumption, fuel consumption. IC engine efficiencies, specific output, specific fuel consumption, heat balance sheet, performance characteristics of SI and CI engines, testing of IC engines as per Indian standard 10001	07

#### **Learning Outcomes:**

- The student will get thorough understanding of the engines and engine testing
- The subject helps the students to understand the latest developments in the field of automotive engines.

#### **Books Recommended:**

1. A course in internal combustion engines by V.M. Domkundwar, Dhanpatrai & Co.
2. Internal combustion engines by Mathur & Sharma , Dhanpat Rai & sons.
3. Internal combustion engines by V. Ganeshan ,Tata Mc Grawhill

#### **References:**

1. Internal combustion engines Fundamentals by John B Heywood , McGraw Hill Publisher
2. Automotive Engines by Wiliam. H. Crouse, McGraw Hill Publisher



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**FACULTY OF:-**Technology and Engineering  
**DEPARTMENT OF:-**Automobile Engineering

**SEMESTER:-** IV

**CODE:-** 4TE04ASY1

**NAME:-** Automobile Systems (ASY)

**Teaching and Evaluation Scheme:-**

Subject Code	Name of the Subject	Teaching Scheme (Hours)				Credits	Evaluation Scheme							
		Th	Tu	Pr	Total		Theory				Practical (Marks)			Total
							Sessional Exam		University Exam		Internal		University	
							Marks	Hrs	Marks	Hrs	Pr/Viva	TW	Pr	
4TE04ASY1	Automobile Systems	4	0	2	6	5	30	1.5	70	3	30	20	---	150

**Objectives:**

- To impart knowledge to students in various systems of automobile engineering and to have the practice for assembling and dismantling of engine parts.

**Prerequisites:**

- Basic knowledge of Elements of Mechanical Engineering.

**Course outline:**

Sr. No.	Course content	Hours
1.	<b>Introduction:</b> Development of automobiles, general classification of automobiles, main part of automobile, vehicle assemblies, types of chassis layout with reference to power plant locations and drive, vehicle frames, chassis and body.	06
2.	<b>Transmission System:</b> Clutch –Functions of clutch, requirements of a good clutch, constructional features and working of different types of clutch, clutch plate, plate facing, clutch linkage, friction materials and factor affecting the power transmission by a clutch. Torque converter.	07
3.	<b>Gear Box:</b> Functions of gearbox, need of gear box, gears & gear ratios, principle of gearing, types of gear boxes, Gear shifting mechanism transfer case.  Automatic Transmission: Basic devices used in automatic transmission, principle of epicycle gearing, torque converter, free wheel clutch, over speed drive and its working, semi/fully automatic transmission, continuously variable transmission	08

	(CVT).	
4.	<b>Driveline and Differential :</b> Propeller shaft, Driveshaft, Universal joints. Constant velocity universal joints. Rear wheel drive arrangement: rear axle, Rear axle drives (Hotch kiss drive, torque tube drive), rear axle daft support, different types of final drives. Differential principles. Constructional details of a differential gear unit. Non-slip and limited slip differential. differential locks differential housings.	08
5.	<b>Front Axle &amp; Steering System:</b> Types of front axles, Constructional details, materials. Front wheel geometry viz. Castor, Camber, King pin inclination, Toe. Wheel Alignment. Steering geometry. Ackerman and Davis steering system. Different types of steering gear boxes. Steering linkages and their layouts, Power and power assisted steering.	08
6.	<b>Suspension System:</b> Principle, type of suspension system, conventional and independent front and rear axle, spring, rubber and air suspensions, automatic/hydro suspension system, shock absorbers.	07
7.	<b>Brake:</b> Theory of Automobile Braking, stopping distance, time and Braking efficiency, effect of weight transfer during Braking, theory of drum brakes, leading and trailing shoes, Braking torque, constructional details of drum brake and its activators, Disc brake theory, types and construction, Hydraulic braking System, Mechanical Braking System, Pneumatic Braking System, Power-Assisted Braking System, Servo Brakes, Readers, types and construction, Anti-Lock Braking System, constructional details	08
8.	<b>Wheels &amp; Tyres:</b> Types of wheels, wheel dimensions, types of tyres (conventional tube tyre/ tubeless tyre), comparison of radial and bias ply tyres, tyre materials, considerations in tread design, tyre section, tyre designations, tyre wear indicators, nitrogen in tyres, factors affecting tyre life, wheel and tyre troubleshooting.	08

#### Learning Outcomes:

- Students will gain thorough understanding of the construction and operating principles of Part of automobiles.
- The subject helps the students to understand the latest developments in the field.
- The practical performance develops the team work spirit and accuracy in work of an individual student.

#### Books Recommended:

1. Automobile Engineering Vol. - I & II by Dr. Kirpal Singh, Standard Pub.& Dist.
2. Automobile Engineering Vol. - I & II by Dr. K.M.Gupta, Umesh Pub.
3. Automobile Engineering, by R. B. Gupta, SatyaPrakashan
4. Automobile Technology, by Dr. N. K. Giri, Khanna Pub.

#### References:

1. Automotive Mechanics, by W. Crouse, Tata McGraw Hill
2. Automobile Engineering, by G. B. S. Narang, Khanna Pub
3. Automobile engineering, by Dr. V. M. Domkundwar, Dhanpatrai & Co.



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**FACULTY OF:-**Technology and Engineering  
**DEPARTMENT OF:-**Automobile Engineering  
**SEMESTER:-**IV  
**CODE:-** 4TE04TDY1  
**NAME:-** Thermodynamics (TDY)

**Teaching and Evaluation Scheme:-**

Subject Code	Name of the Subject	Teaching Scheme (Hours)				Credits	Evaluation Scheme							
		Th	Tu	Pr	Total		Theory				Practical (Marks)			Total
							Sessional Exam		University Exam		Internal		University	
							Marks	Hrs	Marks	Hrs	Pr/Viva	TW	Pr	
4TE04TDY1	Thermodynamics	4	0	0	4	4	30	1.5	70	3	---	---	---	100

**Objectives:**

- To understand principles of thermodynamics and to be able to use it in accounting for the bulk behaviour of the simple physical systems.
- To provide in-depth study of thermodynamic principles, thermodynamics of state, basic thermodynamic relations, and Properties of pure substances.
- To enlighten the basic concepts of vapour power cycles.

**Prerequisites:**

- Basic knowledge of elements of mechanical engineering.

**Course outline:**

Sr. No.	Course content	Hours
1.	<b>Introduction:</b> Macroscopic & Microscopic viewpoint, Thermodynamic system & control volume, Thermodynamic properties, processes & cycle, homogenous & heterogeneous Systems, Thermodynamic Equilibrium, Quasistatic Processes, Zeroth Law of Thermodynamics.	05
2.	<b>First law of Thermodynamics:</b> First law for a closed system undergoing a cycle and change of state, Energy-A property of the system, Perpetual motion machine of the first kind, steady flow energy equation applied to nozzle, diffuser, boiler, turbine, compressor, pump, heat exchanger, throttling process and filling and emptying process.	08
3.	<b>Second law of thermodynamics &amp; Entropy:</b> Limitations of First law of thermodynamics, Kelvin-Planck and Clausius statements and their equivalence, Perpetual motion machine of the second kind,	10

	carnot cycle, carnot's theorem, corollary of carnot theorem, thermodynamic temperature scale. Clausius theorem, the property of entropy, inequality of Clausius, entropy change in open system, reversible and irreversible process, principle of increase of entropy, Third law of thermodynamics, Entropy and disorder, concept of exergy.	
4.	<b>Availability:</b> High and Low grades of energy. Available and unavailable energy, Availability of closed system, Availability of steady flow systems, Availability of open system processes, Irreversibility, some idea of exergy.	06
5.	<b>Gas power cycles:</b> Introduction to Carnot cycle, Otto cycle, Diesel cycle, Dual cycle, Brayton cycle, Ericsson Cycle.	06
6.	<b>Properties of pure substance and steam power cycle:</b> Properties of pure substances in solid, liquid and vapour phases, P-V, T-V, T-S, H-S diagrams, PVT surfaces, Vapour Carnot cycle, Rankine cycle, modified Rankine cycle, comparison of Rankine and Carnot, binary vapour cycle.	08
7.	<b>Combustion of fuels:</b> Combustion of air, combustion equations, minimum air requirement, excess air and air fuel ratio, wet and dry analysis of products of combustion, conversion of volumetric analysis by mass, determination of calorific value of fuel by Bomb calorimeter and Junkers gas calorimeter, Enthalpy of formation, Enthalpy of reaction, Adiabatic flame temperature.	08
8.	<b>Properties of gases and Mixtures:</b> Avogadro's law, equation of state, ideal gas equation, Vander Waal's equation, reduced properties, law of corresponding states, compressibility chart. Gibbs-Dalton law, volumetric analysis of gas mixture, apparent molecular weight and gas constant, specific heat of a gas mixture, adiabatic mixing of perfect gases, gas and vapour mixtures.	09

### Learning Outcomes:

- Students will gain thorough understanding of Thermodynamics principles.
- The subject helps the students to understand the latest developments in the field.
- The practical performance develops the team work spirit and accuracy in work of an individual student.

### Books Recommended:

1. Engineering Thermodynamics, by P.K. Nag, Tata McGraw-Hill , New Delhi
2. Engineering Thermodynamics, by R.K. Rajput, Laxmi Publications, New Delhi
3. Fundamentals of Engineering Thermodynamics, by R.Yadav, Central Publishing House, Allahabad

### References:

1. Thermodynamics – An Engineering Approach, by Yunus Cengel & Boles, Tata Mc. Graw-Hill, New Delhi
2. Thermodynamics, by J.P. Holman, Tata McGraw-Hill.
3. Thermal Engineering, by P. L. Balleny, Khanna Publication.





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**FACULTY OF:-**Technology and Engineering  
**DEPARTMENT OF:-**Automobile Engineering  
**SEMESTER:-** IV  
**CODE:-** 4TE04MPR1  
**NAME -**Manufacturing Processes-I (MPR)

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**Teaching and Evaluation Scheme:-**

Subject Code	Name of the Subject	Teaching Scheme (Hours)				Credits	Evaluation Scheme							
		Th	Tu	Pr	Total		Theory				Practical (Marks)			Total
							Sessional Exam		University Exam		Internal		University	
							Marks	Hrs	Marks	Hrs	Pr/Viva	TW	Pr	
4TE04MPR1	Manufacturing Processes-I	4	0	2	6	5	30	1.5	70	3	30	20	---	150

**Objectives:**

- To impart the basic knowledge about machine and their operation in general as a prime element in manufacturing environment.
- To create understanding and importance of engineering machine selection in various fields of manufacturing applications.
- To clarify that a wide range of machine makes it essential to select the most suitable machine for a specific application.

**Prerequisites:**

- Basic knowledge of Machine, Materials and Physics.

**Course outline:**

Sr. No.	Course content	Hours
1.	<b>Basic Machine Tools:</b> Machine tools classification, working and auxiliary motions in machine tools, Primary cutting motions in machines tools.	06
2.	<b>Lathes Machine:</b> Engine Lathes, construction all arrangement and principal unit so engine lathes, type and size range of engine lathes, Operations carried one engine lathe, attachment extending the processing capacities of engine lathes, description of other type s of lathes, Plain truing lathes, facing lathes, multiple tool lathes, simple purpose lathes, turret lathes, horizontal and vertical. Alignment tests of lathes.	10
3.	<b>Drilling Machines:</b>	08

	Purpose and field of application of drilling machines upright drill processes, radial drills, alignment tests of drilling machine.	
4.	<b>Boring Machine:</b> Purpose and field of application, Horizontal boring machines, Precision boring machines.	06
5.	<b>Milling Machines:</b> Purpose and types of milling machines, general purpose milling machines, different types of milling operations, milling cutters, attachments extending the processing capabilities of general purpose milling machines. Alignment tests of milling machine.	10
6.	<b>Planers, Shapers and Slotters:</b> Classification: Attachments extending the processing capacities of each.	08
7.	<b>Sawing and broaching, Machines:</b> Metal sawing classification: reciprocating sawing machines, circular sawing machines, band sawing machines. Types of broaching machines, advantage and limitations of broaching.	06
8.	<b>Grinding Machines and Abrasives:</b> Classification of grinding machines, cylindrical grinders, internal grinders, Surface grinders, tool and cutter grinders, grinding wheel surface finishing. Abrasives, manufacture of grinding wheels.	06

#### **Learning Outcomes:**

- Students will be confident to select the machine in their fields of manufacturing.
- The practical performance develops the team work spirit and accuracy in work of an individual student.

#### **Books Recommended:**

1. Workshop Technology Vol. I and II by Hajra & Choudhari, Khanna Publishers
2. Manufacturing Processes, by O. P. Khanna, Dhanpat Rai Publishers.
3. Production Technology, by R. K. Jain and S. C. Gupta, Khanna Publishers
4. Manufacturing Engineering and Technology, by Kalpakjian, Addison Wesley Publishing Co.
5. Workshop Technology Vol.I & II & III by Chapman CBS Publication
6. Processes and Materials of Manufacture, by Lindberg, Roy A., Prentice-Hall of India.
7. Workshop Technology Vol. II by B. S. Raghuvanshi, Dhanpat Rai & Co (p) Ltd
8. Principles of Manufacturing, by Campbell, Tata McGraw-Hill Publishing Company