Diploma Engineering

Curriculum Structure

&

Detailed Syllabus

(III to VI Semester)

Automobile Engineering

(AE)

(III to VI Semester)

Semester III

Sl. No.	Category	Code No.	Course Title	Hours per week			Total Contact Hrs/Week	Credit
				L	T	P		
1	Programme core course-1	AEPC301	Heat Power Engineering-I	3	0	0	3	3
2	Programme core course-2	AEPC302	Strength of Materials	3	0	0	3	3
3	Programme core course-3	AEPC303	Automobile Engine-I	2	0	0	2	2
4	Programme core course-4	AEPC304	Automobile Chassis-I	2	0	0	2	2
5	Programme core course-5	AEPC305	Material Testing Lab	0	0	4	4	2
6	Programme core course-6	AEPC306	Computer Aided Machine Drawing Practice	0	0	4	4	2
7	Programme core course-7	AEPC307	Automobile Engg Drawing-I	0	0	4	4	2
8	Programme core course-8	AEPC308	Automobile Engg Lab-I	0	0	2	2	2
9	Summer Internship-I (4 weeks) after IInd Semester	AESI 309		0	0	0	0	2
			Total					**20**

Semester IV

Sl. No.	Category	Code No.	Course Title	Hours per week			Total Contact Hrs/Week	Credit
				L	T	P		
1	Programme core course-9	AEPC401	Heat power Engineering-II	3	0	0	3	3
2	Programme core course-10	AEPC402	Automobile Engine-II	3	0	0	3	3
3	Programme core course-11	AEPC403	Fluid Mechanics	2	0	0	2	2
4	Programme core course-12	AEPC404	Automobile Reconditioning Shop-I	0	0	2	2	1
5	Programme core course-13	AEPC405	Automobile Engineering Lab-II	0	0	4	4	2
6	Programme core course-14	AEPC406	Automobile Engineering Drawing-II	0	0	2	2	1
7	Programme Elective course-1	AEPE407/A	Automobile Chassis-II	3	0	0	3	3
		AEPE407/B	Alternative Energy-Sources and management					
8	Humanities & Social Science-4	HS 408	Professional Skill Development	2	1	0	3	3
9	Minor Project	AEPR409	Project-I	0	0	4	4	2
10	Mandatory Course-1	AU 410	Essence of Indian Knowledge and Tradition	2	0	0	2	0
			Total					**20**

Semester V

Sl. No.	Category	Code No.	Course Title	Hours per week			Total Contact Hrs/Week	Credit
				L	T	P		
1	Programme core course-15	AEPC501	Theory of machine and Manufacturing Process	3	0	0	3	3
2	Programme core course-16	AEPC502	Automobile Reconditioning Shop-II	0	0	4	4	2
3	Programme core course-17	AEPC503	Automobile Repair and Maintenance Shop-I	0	0	4	4	2
4	Programme core course-18	AEPC504	Automobile Electrical Lab	0	0	4	4	2
5	Programme elective course-2	AEPE505/A	Automotive Electrical and Service Station Management	3	0	0	3	3
		AEPE505/B	Environmental Pollution and Control					
6	Programme elective course-3	AEPE506/A	Motor Vehicle Act	3	0	0	3	3
		AEPE506/B	Transportation Management					
7	Summer Internship-II (6 weeks) after IV Semester	AUSI-507	Summer Internship-II	0	0	0	0	3
8	Open elective course-1	(Any one to be selected from Annexure-I)		3	0	0	3	3
9	Major Project	AEPR509	Project II	0	0	2	2	1
			Total					**22**

Semester VI

Sl. No.	Category	Code No.	Course Title	Hours per week			Total Contact Hrs/Week	Credit
				L	T	P		
1	Programme core course19	AEPC601	Automotive Transmission	3	0	0	3	3
2	Programme Core course20	AEPC602	Automobile Repair and Maintenance Shop-II	0	0	4	4	2
3	Programme elective course-4	AEPE603/A	Farm Machinery	3	0	0	3	3
		AEPE603/B	Earth Moving Equipment					
4	Humanities and Social Science course- 5	HS 604	Entrepreneurship and Start-up's	3	1	0	4	4
5	Open elective-2	(Any one to be selected from Annexure-II)		3	1	0	4	4
6	Mandatory Course-2	AU 606	Indian Constitution	2	0	0	2	0
7	Major Project	AEPR 607	Project III	0	0	6	6	3
8	Seminar	AESE 608		2	0	0	2	1
			Total					**20**

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DETAILED SYLLABUS

THIRD SEMESTER

Sl. No.	Category	Code No.	Course Title	Hours per week			Total Contact Hrs/Week	Credit
				L	T	P		
1	Programme core course-1	AEPC301	Heat Power Engineering-I	3	0	0	3	3
2	Programme core course-2	AEPC302	Strength of Materials	3	0	0	3	3
3	Programme core course-3	AEPC303	Automobile Engine-I	2	0	0	2	2
4	Programme core course-4	AEPC304	Automobile Chassis-I	2	0	0	2	2
5	Programme core course-5	AEPC305	Material Testing Lab	0	0	4	4	2
6	Programme core course-6	AEPC306	Computer Aided Machine Drawing Practice	0	0	4	4	2
7	Programme core course-7	AEPC307	Automobile Engg Drawing-I	0	0	4	4	2
8	Programme core course-8	AEPC308	Automobile Engg Lab-I	0	0	2	2	2
9	Summer Internship-I (4 weeks) after IInd Semester	AESI 309		0	0	0	0	2
			Total					**20**

HEAT POWER ENGINEERIG – I

Course Code	AEPC301
Course Title	Heat Power Engineering-I
Number of Credits	03 (L: 3, T: 0, P: 0)
Prerequisites	NIL
Course Category	Programme core course-1

Course Outcomes: -

After completing this course, student will be able to:
1) Understand the fundamentals of Thermodynamics and Gas Laws.
2) Memorize different thermodynamic processes and thermodynamics laws.
3) Explain the properties of steam and Calculate efficiencies of various air standard cycles.
4) Categorize different modes of heat transfer.
5) Understand the various air compressors and their working principle.

Module- 1: Fundamentals of Thermodynamics and Gas Laws.

Number of class hours: 06

Suggestive Learning Outcomes:
1. Understand the basic concept of thermodynamics.
2. State different gas laws.

Detailed content of the unit:

Definition of force, pressure, temperature, work, heat and power –their units and dimensions in M.K.S. and S.I. System, System and Surroundings, working substance, thermodynamic equilibrium, property, state and process – reversible and irreversible
Definition of Gas, perfect gas, Boyle's Law, Charles' Law & Joule's Law, Characteristics gas equation, Universal gas constant – its physical significance, Numerical Problems.

Module- 2: Thermodynamic laws & processes.

Number of class hours: 07

Suggestive Learning Outcomes:
1. Memorize different thermodynamic laws.

2. Explain different thermodynamic process.

Detailed content of the unit:

Zeroth Law of Thermodynamics (statement only), First Law of Thermodynamics, internal energy, non-flow energy equation Q=W+▲U, enthalpy h= u+pv. Second Law of Thermodynamics, entropy. Thermodynamic property and sp. Heat of gases ($du=C_v dT$ & $dh = C_p dT$), relation between sp. heats and gas constant.

Constant Volume process (Isochoric), Constant pressure (Isobaric), Constant temperature (Isothermal), adiabatic, Polytropic processes, representation on p-v & T-Φ diagram, numerical problems. Flow energy equation, throttling.

Module- 3: Properties of Steam and Air standard cycle.

Number of class hours: 07

Suggestive Learning Outcomes:
1. Understand the steam generation process.
2. Explain various Air standard cycles and calculate their efficiencies.

Detailed content of the unit:

Phase transformation, Steam generation process on T-H diagram, effect of pressure on saturation temperature – critical pressure & temperature, qualities of steam, total heat, dryness fraction, degree of superheat, use of steam table &Mollier chart.

Thermodynamic cycles, air standard cycles, air standard efficiency, Carnot cycle – its efficiency and importance, Otto cycle, diesel cycle, dual cycle – their efficiencies, application and comparison. Joule Cycle – its efficiency. Numerical Problems

Module- 4: Heat Transfer.

Number of class hours: 05

Suggestive Learning Outcomes:
1. Understand the heat transfer in different medium.
2. State different laws of heat transfer.

Detailed content of the unit:

Modes of heat transfer, Fourier's law of conduction, thermal conductivity – its units. Heat transfer through walls, Convective heat transfer – Newton's law of cooling, convection Co-efficient – its units, overall heat transfer co-efficient. Numerical problems

Module- 5: Air Compressor.

Number of class hours: 05

Suggestive Learning Outcomes:
1. Express different Air compressor
2. Explain working principle of reciprocating compressor.

Detailed content of the unit:

Uses of compressed air, classification of compressor, air compressor terminology – free air delivery, clearance volume, volumetric efficiency etc. Construction and working principle of reciprocating compressor, effects of different processes on compression, power required to drive compressor, single and double acting, single and multistage compression, effect of clearance volume on volumetric efficiency, representation on p-v & T- Φ diagram. Rotary compressor – centrifugal compressor, axial flow compressor – description only

References: -

1) Nag, P.K., Engineering Thermodynamics, 3rd ed., Tata McGraw-Hill, 2005
2) Cengal, Y.A and Boles, M.A, Thermodynamics: An Engineering Approach, 5th ed. McGraw Hill, 2006.
3) Rajput, R.K., "Heat & Mass Transfer" Khanna Publishers.
4) Yadav, P., Fundamentals of Engineering Thermodynamics, Central Publishing.
5) Khurmi, R. S., "Thermal Engineering".

Strength of Materials

Course Code	AEPC302
Course Title	Strength of Materials
Number of Credits	3(L:3, T:0, P:0)
Prerequisites	Engineering Mechanics and Physics
Course Category	Programme Core Course

Course Outcomes: - By the end of the course, the students are expected to
CO1: Understand simple stress-strain and elastic constants and express their relationship.

CO2: Calculate critical load for long column at different end conditions.

CO3: Compute shear force and bending moment at any section of beam and draw the S.F. & B.M diagrams of for UDL and Point loads.

CO4: Determine the bending stress, moment of resistance and section modulus of different beam cross section.

CO5: Correlate among deflection, slope, shear force, bending moment and rate of loading and can also calculate the slope and deflection of beam.

Course Content: -

Module- 1: Simple Stress and Strain

Number of class hours: 8 hrs.

Suggestive Learning Outcomes:

1) Can define simple stress-strain, their nature and elastic constants.
2) Can define mechanical properties of common engineering materials.
3) Can explain the significance of various points on stress-strain diagram.

Detailed content of the unit:

Simple Stress and Strain: Definition of rigid, elastic and plastic bodies; Forces, Stress and Strain: Tensile, Compressive, Shear and their nature; Linear and Lateral strain; Poisson's ratio, Volumetric strain; Hooke's Law; Elastic limit; Young's Modulus; Modulus of Rigidity; Bulk Modulus; Relation between elastic constants; Mechanical properties of common engineering materials: Elasticity, Plasticity, Ductility, Brittleness, Toughness, Hardness, Creep, Fatigue, Endurance Limit; Significance of various points on stress–strain diagram such as elastic limit, proportional limit, yield points, ultimate stress, breaking points; True stress; Significance of factor of safety; Strain energy or resilience, proof resilience and modulus of resilience; Strain energy of gradually applied load; Thermal stress and strain; Thermal expansion; Coefficient of thermal expansion; stress in composite sections; Stress and strain values in bodies of uniform section and of composite section under the influence of normal forces; Related numerical problems on the above topics.

Module- 2: Columns and struts

Number of class hours: 5 hrs.

Suggestive Learning Outcomes:

1) Can explain the differences between column and strut.
2) Can express the Euler's equation and Rankine equation.
3) Calculate critical load for long column at different end conditions.

Detailed content of the unit: -

Columns and Struts: Concept of column and strut; Types of column, Explanation of the terms: Slenderness ratio, Effective or equivalent length, crushing load, Buckling or crippling load, buckling factor; Euler's formula for long column and its assumptions (no deduction); Different kinds of end conditions of column; Rankine – Gordon's formula (no deduction); Problems using Euler's formula for long column; Problems using Rankine – Gordon's formula.

Module- 3: Shear Force & Bending Moment

Number of class hours: 7 hrs.

Suggestive Learning Outcomes:

1) Can categorize beam, load.
2) Can calculate SF and BM at different point of a beam and also draw the diagrams.
3) Can express the basic differences between column and beam.

Detailed content of the unit: -

Shear Force & Bending Moment: Types of beams with examples: a) Cantilever beam, b) Simply supported beam, c) Over hanging beam, d) Continuous beam, e) Fixed beam; Types of Loads – Point load, UDL and UVL; Definition and explanation of shear force and bending moment; Sagging & Hogging of Beam; Sign convention to draw SFD and BMD; Calculation of shear force and bending moment and drawing of the S.F and B.M. diagrams only for the following cases: a) Cantilever with point loads, b) Cantilever with uniformly distributed load, c) Simply supported beam with point loads, d) Simply supported beam with UDL; , Point of Contra flexure & its importance; Related numerical problems

Module- 4: Theory of Simple Bending Beam

Number of class hours: 5 hrs.

Suggestive Learning Outcomes:

1) Can explain various terms related to simple bending of beam.
2) Can derive the bending equation of beam.
3) Can calculate bending stress, moment of resistance and section modulus of beam.

Detailed content of the unit: -

Theory of Simple Bending Beam: Concept of bending stress; Explanation of the terms: Pure bending, Neutral layer, Neutral axis, Section modulus, Flexural rigidity, Moment of Resistance, Radius of curvature, Beam of uniform strength; Assumptions in theory of simple bending; Bending Equation: $M/I = \sigma/y = E/R$ with derivation; Problems to find out section modulus of different figures; Problems to find out bending stress and Moment of Resistance in beam.

Module- 5: Deflection of Beams

Number of class hours: 5 hrs.

Suggestive Learning Outcomes:

1) Can define slope and deflection of beam and their sign conventions.
2) Can establish the relation between slope, deflection, SF, BM and rate of loading.
3) Can calculate maximum deflection and slope by point load and UDL.

Detailed content of the unit: -

Deflection of Beams: Concept of deflection and slope of beam; Relation among deflection, slope, shear force, bending moment and rate of loading -Sign convention of slope and deflection; Standard formula (no proof, only simple problems) for maximum slope of deflection of: - i) Cantilever beam subjected to point load at free end, ii) Uniformly distributed load on entire span; iii) Simply supported beam carrying a point load at mid span, iv) Uniformly distributed load on entire span of simply supported beam.

References: -

1) Strength of Materials – R.S. Khurmi, S. Chand Company Ltd. Delhi.
2) A Text Book strength of Material– R.K. Bansal, Laxmi Publication New Delhi.
3) Strength of Materials – D.S. Bedi, Khanna Book Publishing Co. (P) Ltd., Delhi.
4) A Text Book of Strength of Materials- Er. R. K. Rajput, S. Chand Company Ltd. Delhi.
5) Strength of Materials – S. Ramamrutham, Dhanpat Rai & Publication New Delhi.
6) Strength of Materials – B. C. Punmia, Ashok Kumar Jain & Arun Kumar Jain, Laxmi Publications, New Delhi.

AUTOMOBILE ENGINE – I

Course Code	AEPC303
Course Title	Automobile Engine -I
Number of Credits	02 (L: 2, T: 0, P: 0)
Prerequisites	NIL
Course Category	Programme core course-3

Course outcomes: -

After completing this course, student will be able to:

1) Define the basic concepts & constructional features of I.C. Engine. (**k1**)

2) Identify the necessity of cooling system and the basic knowledge of Water and Air cooling system. (**k2**)

3) Identify the purpose of lubrication, properties of lubricating oils and lubrication system. (**k2**)

4) Understand the different fuel feed system for different types of engine.(**k2**)

5) Understand the injection system in petrol and diesel engine and the basic concepts of Governor.(**k2**)

Course Contents:

Module - I: Basics Concepts of I.C. Engine

Number of class hours: 5

Suggestive Learning Outcomes:
1. Describe working principle and various parameters of I.C. Engines.
2. Define construction details and mechanisms of various components.
3. Illustrate valve timing diagrams and engine cycles.

Detailed content of the unit:

Engine. Working Principle of I.C. Engine, Concepts of 2-stroke and 4-stroke Petrol and Diesel Engines, Otto Cycle, Diesel Cycle, Comparison, Classification of I.C. Engines based on various parameters like fuels, number of cylinder, number of strokes, position of stroke, arrangement of cylinder, uses etc.
Construction details, specification, function and working of: —Cylinder block, cylinder head, cylinder liners. Piston, Piston rings, Piston (Wrist) pin. Crank shaft, Connecting Rod, flywheel, Camshaft, Valve operating mechanism, Inlet and exhaust manifolds. Valve timing diagram for 2-stroke and 4- stroke engines

Module - II: Cooling System

Number of class hours: 5

Suggestive Learning Outcomes:
1.Explain different types of cooling systems.
2.Describe components of cooling systems and properties of coolant.
3. Distinguish between air and water cooling.

Detailed content of the unit:

Necessity of cooling, Types of cooling--Air-cooling system, Components of air-cooling system, Water-cooling system. Thermo siphon and pump assisted types. Liquid cooling system, Water cooling system layout, different components of water cooling system like cooling fan, water jackets, water pump, hoses, thermostats, radiator, PVRV cap etc. and their detail, comparison between Air-cooling and water-cooling, Overcooling and under cooling, Anti-freeze solution, additives. Properties of Coolant

Module - III: Lubrication

Number of class hours: 5

Suggestive Learning Outcomes:
1. Describe properties of lubricants.
2. Explain methods of lubrication.
3. Identify oil consumption and contamination.

Detailed content of the unit:

Purpose of lubrication, properties of good lubricant, grading of lubricants, Different types of lubricants and their makes, Different methods of lubrication – Splash lubrication, Gravity lubrication, Mist lubrication, wet sump lubrication and dry sump lubrication. Components of wet sump lubrication system like strainer, fuel pump, filter, pressure gauge, Dipstick, relief valve, oil coolers, causes of oil consumption and oil contamination, Crank case ventilation, Oil additives.

Module – IV: Fuel feed system

Number of class hours: 5

Suggestive Learning Outcomes

1. Explain fuel pumps.
2. Identify components of fuel supply system.
3. Describe theory, properties and working of carburetors.

Detailed content of the unit:

Types of fuel feed system – gravity and pump feed. Mechanical fuel pump and Electrical fuel pump – working principle, other components of fuel supply system line, dry and wet air cleaners, carburettor, Theory of Carburetion, Properties of Air-feed mixture, working of simple carburettor and its limitations, Circuits of complete carburettor, A/F mixture requirement at different condition, Construction and working of solex carburettor. Dual & multi barrel carburetion system.

Module - V: Injection System in S.I. & C.I. Engine

Number of class hours: 5

Suggestive Learning Outcomes:

1. Explain injection systems of S.I.& C.I. Engines.
2. Identify components of C.I. Engines.
3. Describe governing systems and fuel pump.

Detailed content of the unit:

S.I. Engine: Timed and continuous injection system. Multi Port Fuel Injection (MPFI) and throttle body injection, advantages of port injection (MPFI) system.

Electronic petrol injection system, comparison between Carburetion and Petrol injection,

C.I. Engine: Components – Fuel tank, fuel lines, fuel filters, Priming Pump, fuel injection pump (inline and distributor type), fuel injection (single orifice, multiple orifice), types of nozzle.

Governing and Governors (mechanical and hydraulic), Electronic controlled fuel pump, Unit injection system and common rail system, Common Rail Direct Injection (CRDI).

References: -

1) Ganesan. V, Internal Combustion Engines, Tata McGraw Hill Publishing Co., New York, 1994.
2) Wiliam H. Crouse, Automotive Engines, McGraw Hill Publishers, 1985.
3) Ellinger. H.E, Automotive Engines, Prentice Hall Publishers, 1992.
4) Kirpal Singh, Automotive Engineering, Vol. I & II, Standards Publishers, New Delhi, 2002.

AUTOMOBILE CHASSIS – I

Course Code	AEPC304
Course Title	Automobile Chassis -I
Number of Credits	02 (L: 2, T: 0, P: 0)
Prerequisites	NIL
Course Category	Programme core course-4

Course outcomes:

After completing this course, student will be able to:

1) Describe the components of automobile chassis and the different types of chassis layout.(k1)

2) Explain about automobile frame, stresses on frame.(k2)

3) Express about Aerodynamic consideration in body profiling and different types of front axle arrangements.(k2)

4) Identify the steering system and various components of steering system.(k2)

5) Understand about Power steering system and its working principle, types of power steering system.(k2)

Course Contents:

Module - I: Basics of Automobile Chassis

Number of class hours: 05

Suggestive Learning Outcomes:
1. Explain the different components of automobile chassis.
2. Differentiate the various types of automobile chassis.

Detailed content of the unit:

History and Developments of Automobiles; Classification of Vehicles; Components of Automobile Chassis; Layout of Conventional Type Chassis-- Front Engine Front Wheel Drive, Rear Engine Rear Wheel Drive, Four Wheel Drive; Comparison between various types of Chassis Layout; Mono Coquet Chassis.

Module - II: Automobile Frame, Body and axles

Number of class hours: 05

Suggestive Learning Outcomes:

1. Identify the types of automobile frames
2. Analyse the stresses on frames.

Detailed content of the unit:

Automobile Frame; Types of Frame; Alignment of frames; Two wheeler frames; Stresses on frames; Defects in frames.

Module - III: Automobile Body and axles

Number of class hours: 05

Suggestive Learning Outcomes:
1. Understand the vehicle body architecture.
2. Describe the front axle arrangement.

Detailed content of the unit:

Automobile Body Construction, Vehicle Body Architecture, Aerodynamic consideration in body profiling; Comparison between Integral body and Framed Construction, Live Axles; Dead Axles; Types of Front Axle Arrangement; Front Wheel Assembly; Trans-axle

Module - IV: Steering System

Number of class hours: 05

Suggestive Learning Outcomes:
1. Discuss the steering geometry.
2. Express the components of steering parts & their function.

Detailed content of the unit:

Steering Geometry; Camber; Castor; King Pin Inclination or Steering Axis Inclination; Combined Angle; Centre Point Steering; Toe-in &Toe-out; Correct Steering Angle; Steering Gears – worm and sector, Rack and pinion, ball Re-circulating type; Steering Linkage – Components and functions; Factors affecting Steering; Under-steering; Over-steering; Steering System – Troubleshooting.

Module - V: Power Steering

Number of class hours: 05

Suggestive Learning Outcomes:
1. Compare the conventional and power steering system.
2. Discover the working principle of power steering system.

Detailed content of the unit:

Principles of Power Steering; Comparison between Conventional Steering System and Power Steering System; Power Steering System Types; Construction and working of different power steering system; Power Steering Pumps; Four Wheel Steering; Power Steering System – Troubleshooting.

References: -

1) Heldt.P.M. Automotive Chassis, Chilton Co., New York, 1990. 2. Steed. W., Mechanics of Road Vehicles, IIIiffe Books Ltd., London, 1.
2) Powloski. J. Vehicle Body Engineering, Business Books Ltd., 1989.

MATERIAL TESTING LAB

Course Code	AEPC305
Course Title	Material Testing Lab
Number of Credits	2(L:0, T:0, P:4)
Prerequisites	Strength of Materials and Engineering Mechanics.
Course Category	Programme Core Course 5

Course Outcomes: - By the end of the course, the students are expected to

CO1: Identify the given specimen by viewing the micro structure using metallurgical microscope

CO2: Identify the cracks in the specimen using different techniques.

CO3: Determination of hardness of different materials by using different methods.

CO4: Determine the stiffness of spring and torsion and impact strength of different materials.

CO5: Determine the various types of stress and plot the stress strain diagram for mild steel.

List of Experiment: (Any six experiments to be performed)

1) Prepare a specimen and examine the microstructure of the Ferrous and Non- ferrous metals using the Metallurgical Microscope.
2) Determination of Co-efficient of friction between rough surfaces.
3) Detect the cracks in the specimen using Visual inspection and ring test
4) Detect the cracks in the specimen using die penetration test
5) Detect the cracks in the specimen using magnetic particle test.

6) Rockwell's Hardness test of various materials like mild steel, high carbon steel, brass, copper and aluminium etc.
7) Vickers Hardness test of various materials like mild steel, high carbon steel, brass, copper and aluminium etc.
8) Finding the resistance of materials to impact loads by Izod test and Charpy test.
9) Finding the resistance of materials to impact loads by Charpy test.
10) Determination of Strength and Stiffness of Springs.
11) Torsion test on mild steel – relation between torque and angle of twist determination of shear modulus and shear stress
12) Finding Young's Modulus of Elasticity, yield points, percentage elongation and percentage reduction in area, stress strain diagram plotting, tests on mild steel

References: -

1) Strength of Materials – R.S. Khurmi, S. Chand Company Ltd. Delhi.
2) Measurement system (Application and Design) – Ernest O Doebelin.
3) A Text Book strength of Material– R.K. Bansal, Laxmi Publication New Delhi.
4) A Text Book of Strength of Materials- Er. R. K. Rajput, S. Chand Company Ltd. Delhi.

COMPUTER AIDED MACHINE DRAWING PRACTICE

Course Code	AEPC306
Course Title	Computer Aided Machine Drawing Practice
Number of Credits	2(L: 0, T: 0, P:4)
Prerequisites	Engineering Graphics
Course Category	Programme core course-6

Course Outcomes: -

1) Understand the representation of materials used in machine drawing.
2) Draw the development of surfaces for sheet metal working applications.
3) Draw the machine elements.
4) Construct an assembly drawing using part drawings of machine components
5) Represent tolerances and the levels of surface finish of machine elements.

Course Content:-

I. Introduction to CAD software.
II. Drawing aids and editing commands.
III. Basic dimensioning, hatching, blocks and views.
IV. Isometric drawing, printing and plotting
V. Machine drawing practice using Auto CAD: Detailed drawings of following machine parts are to be given to the students to assemble and draw the sectional or plain elevations, plans and side views with dimensioning and bill of materials using cad software (exercises).
1) Fly wheel 2) Spur gear 3) Screw Jack 4) Universal Joint
5) Machine Vice 6) Connecting Rod 7) piston.

References: -

1. Bhatt, N.D., Machine Drawing, Charotar Publishing House, 2003.
2. Sidheswar, N., Kannaiah, P. and Sastry, V.V.S., Machine Drawing, Tata McGraw Hill Book Company, New Delhi, 2000.
3. Kannaih, P., Production Drawing, New Age International, 2009

AUTOMOBILE ENGINEERING DRAWING - I

Course Code	AEPC307
Course Title	Automobile Engineering Drawing-I
Number of Credits	02(L: 0, T: 0, P: 4)
Prerequisites	NIL
Course Category	Programme core course-7

Course Outcomes: - By the end of the course, the students are expected to

CO1: Identify the various engine components.
CO2:Identify the mechanical, water & oil pump, water cooling, fuel injection and steering system, valve mechanism and spark plug.
CO3: Identify the different bearings that are generally used in engine
CO4: Classify different kinds of riveted joints.
CO5: Identify the different engine assembly parts.

Course Content:-

Number of class hours:

Detailed content:

1) To Draw the Engine Components
    a) Cylinder block & Cylinder head.
    b) Piston assembly.
    c) Crank Shaft.
    d) Connecting Rod.
2) Free Hand Drawing of
    a) A.C. mechanical pump
    b) water pump
    c) water cooling system of I.C. Engine

d) Oil Pump
e) Fuel Injection Pump & Injector.
f) Steering system of a Car.
g) Valve mechanism & spark plug

3) To Draw the Engine Bearings
   a) Solid bearing.
   b) Bush bearing.
   c) Thrust bearing.
   d) Ball & Roller bearings (Straight & needle)
4) To Draw Rivet And Riveted Joints
   a) Types of rivet heads.
   b) Types of riveted joints – lap & butt joints (Single Cover Plate and Double Cover Plate).
5) Assembly Drawing of Engine Parts
   a) Assembly drawing of connecting rod, fuel injector etc.

References: -

1) "Engineering Drawing" by N D Bhatt and V M Panchal.
2) "Machine Drawing" by N Sidheswar and P Kannaiah.
3) "Technical Drawing with Engineering Graphics" by Frederick E Giesecke and Ivan L Hill.

AUTOMOBILE ENGINEERING LAB - I

Course Code	DAE 308
Course Title	Automobile Engineering Lab-I
Number of Credits	02(L: 0, T: 0, P: 2)
Prerequisites	NIL
Course Category	Programme core course-8

Course Outcomes:

1) Identify the parts in cut section models of 2-stroke and 4-stroke engine (petrol/diesel).**(K1)**
2) Identify the parts of fuel supply system of petrol engine.**(K2)**
3) Identify the parts of fuel supply system of diesel engine.**(K2)**
4) Identify parts of gear box. **(K2)**
5) Explain steering wheel mechanism. **(K2)**

Practical Content:-

Number of class hours:

Detailed Content of the Unit-

1) Two stroke cycle engine cut section.
2) Four stroke C. I. engine cut section.
3) Four stroke S. I. engine cut section.
4) Fuel supply system of Petrol Engine cut section model.
5) Fuel supply system of Diesel Engine cut section model.
6) Engine lubrication system circuit model.
7) Fuel injector testing machine.
8) Synchromesh Gear Box cut section.
9) Steering wheel mechanism with wheels.
10) Hydraulic break system model.

References: -

1. "Vehicle &Automotive Engineering" by Karloy Jarmai, Betti Bollo.
2. "Automotive Engineering" by Gerard Blokdyk.

Summer Internship-I

Course Code	AESI-309
Course Title	Summer Internship-I
Number of Credits	2 (L: 0, T: 0, P: 0)
Prerequisites	Nil
Course Category	Internship

Internships may be full-time or part-time; they are full-time in the summer vacation and part-time during the academic session.

Sl. no.	Schedule	Duration	Activities	Credits	Hours of Work
1	Summer Vacation after 2nd Semester	3-4 Weeks	Inter/ Intra Institutional Activities **	2	80 Hours

(** Students are required to be involved in Inter/ Intra Institutional Activities viz; Training with higher Institutions; Soft skill training organized by Training and Placement Cell of the respective Institutions; contribution at incubation/ innovation /entrepreneurship cell of the

Institute; participation in conferences/ workshops/ competitions etc.; Learning at Departmental Lab/ Tinkering Lab/ Institutional workshop; Working for consultancy/ research project within the Institutes and Participation in all the activities of Institute's Innovation Council for e.g.: IPR workshop/Leadership Talks/ Idea/ Design/ Innovation/ Business Completion/ Technical Expos etc.)

Benefits to Students:

1. An opportunity to get hired by the Industry/ organization.
2. Practical experience in an organizational setting.
3. Excellent opportunity to see how the theoretical aspects learned in classes are integrated into the practical world. On-floor experience provides much more professional experience which is often worth more than classroom teaching.
4. Helps them decide if the industry and the profession is the best career option to pursue.
5. Opportunity to learn new skills and supplement knowledge.
6. Opportunity to practice communication and teamwork skills.
7. Opportunity to learn strategies like time management, multi-tasking etc. in an industrial setup.
8. Opportunity to meet new people and learn networking skills.
9. Makes a valuable addition to their resume.
10. Enhances their candidacy for higher education.
11. Creating network and social circle and developing relationships with industry people.
12. Provides opportunity to evaluate the organization before committing to a full-time position.

Course Outcome:-

After completion of the course, students will be able to:

C.O.1: Explain the real life organizational and industrial environment situations (K2).

C.O.2: Develop organizational dynamics in terms of organizational behaviour, culture and professional ethics (K1).

C.O.3: Understand the importance of Team work (K2).

C.O.4: Explain invaluable knowledge and networking experience (K2).

C.O.5: Develop skill to build a relationship with a prospective employer (K3).

Course Content:-

Internships are educational and career development opportunities, providing practical experience in a field or discipline. The Summer Internship-I is a student centric activity that would expose Technical students to the industrial environment, which cannot be simulated in the classroom and hence creating competent professionals for the industry. They are structured, short-term, supervised placements often focused around particular tasks or projects with defined timescales. An internship may be compensated, non-compensated or some time may be paid. The internship has to be meaningful and mutually beneficial to the intern and the organization. It is important that the objectives and the activities of the internship program are clearly defined and understood. Following are the intended objectives of internship training:

1. Will expose Technical students to the industrial environment, which cannot be simulated in the classroom and hence creating competent professionals for the industry.
2. Provide possible opportunities to learn, understand and sharpen the real time technical / managerial skills required at the job.
3. Exposure to the current technological developments relevant to the subject area of training.
4. Experience gained from the 'Industrial Internship' in classroom will be used in classroom discussions.
5. Create conditions conducive to quest for knowledge and its applicability on the job.
6. Learn to apply the Technical knowledge in real industrial situations.
7. Gain experience in writing Technical reports/projects.
8. Expose students to the engineer's responsibilities and ethics.
9. Familiarize with various materials, processes, products and their applications along with relevant aspects of quality control.
10. Promote academic, professional and/or personal development.
11. Expose the students to future employers.
12. Understand the social, economic and administrative considerations that influence the working environment of industrial organizations
13. Understand the psychology of the workers and their habits, attitudes and approach to problem solving.

Overall compilation of Internship Activities / Credit Framework:

Major Head of Activity	Credit	Schedule	Total Duration	Sub Activity Head	Proposed Document as Evidence	Evaluated by	Performance appraisal/ Maximum points/ activity
Inter/ Intra Institutional Activities	2	Summer Vacation after 2nd Semester	3-4 Weeks	Inter/ Intra Institutional Workshop/ Training	Certificate	Programme Head	Satisfactory/ Good/ Excellent
				Working for consultancy/ research project	Certificate	Programme Head	Satisfactory/ Good/ Excellent
				Festival (Technical / Business / Others) Events	Certificate	Programme Head	Satisfactory/ Good/ Excellent
				Contribution in Incubation/ Innovation/ Entrepreneurship Cell/ Institutional Innovation Council	Certificate	Cell In-charge	Satisfactory/ Good/ Excellent
				Learning at Departmental Lab/Tinkering Lab/ Institutional workshop	Certificate	Cell In-charge	Satisfactory/ Good/ Excellent

STUDENT'S DIARY/ DAILY LOG

The main purpose of writing daily diary is to cultivate the habit of documenting and to encourage the students to search for details. It develops the students' thought process and reasoning abilities. The students should record in the daily training diary the day-to-day

account of the observations, impressions, information gathered and suggestions given, if any. It should contain the sketches & drawings related to the observations made by the students.

The daily training diary should be signed at the end of each day by the supervisor/ in charge of the section where the student has been working. The diary should also be shown to the Faculty Mentor visiting the industry from time to time and get ratified on the day of his visit.

Student's Diary and Internship Report should be submitted by the students along with attendance record and an evaluation sheet duly signed and stamped by the industry to the Institute immediately after the completion of the training. It will be evaluated on the basis of the following criteria:

a) Regularity in maintenance of the diary.
b) Adequacy & quality of information recorded.
c) Drawings, sketches and data recorded.
d) Thought process and recording techniques used.
e) Organization of the information.

INTERNSHIP REPORT

After completion of Internship, the student should prepare a comprehensive report to indicate what he has observed and learnt in the training period. The student may contact Industrial Supervisor/ Faculty Mentor/TPO for assigning special topics and problems and should prepare the final report on the assigned topics. Daily diary will also help to a great extent in writing the industrial report since much of the information has already been incorporated by the student into the daily diary. The training report should be signed by the Internship Supervisor, TPO and Faculty Mentor. The Internship report will be evaluated on the basis of following criteria:

a) Originality.
b) Adequacy and purposeful write-up.
c) Organization, format, drawings, sketches, style, language etc.
d) Variety and relevance of learning experience.
e) Practical applications, relationships with basic theory and concepts taught in the course.

4TH SEMESTER

Sl. No.	Category	Code No.	Course Title	Hours per week			Total Contact Hrs/Week	Credit
				L	T	P		
1	Programme core course-9	AEPC401	Heat power Engineering-II	3	0	0	3	3
2	Programme core course-10	AEPC402	Automobile Engine-II	3	0	0	3	3
3	Programme core course-11	AEPC403	Fluid Mechanics	2	0	0	2	2
4	Programme core course-12	AEPC404	Automobile Reconditioning Shop-I	0	0	2	2	1
5	Programme core course-13	AEPC405	Automobile Engineering Lab-II	0	0	4	4	2
6	Programme core course-14	AEPC406	Automobile Engineering Drawing-II	0	0	2	2	1
7	Programme Elective course-1	AEPE407/A	Automobile Chassis-II	3	0	0	3	3
		AEPE407/B	Alternative Energy-Sources and management					
8	Humanities & Social Science-4	HS 408	Professional Skill Development	2	1	0	3	3
9	Minor Project	AEPR409	Project-I	0	0	4	4	2
10	Mandatory Course-1	AU 410	Essence of Indian Knowledge and Tradition	2	0	0	2	0
			Total					**20**

Heat Power Engineering-II

Course Code	AEPC401
Course Title	Heat power Engineering-II
Number of Credits	03((L:3, T: 0, P:0)
Prerequisites	Nil
Course Category	Programme core course-9

Course Outcomes: -

1) Understand basic concept of refrigeration.
2) Express different air refrigeration cycles and their functions.
3) Explain the properties of refrigerant and Illustrate refrigeration system components.
4) Understand Psychrometry& Psychometric processes.
5) Memorize concept of air conditioning and principals of automotive air conditioning.

Course Content:-

Module- 1:Principles of Refrigeration

Number of class hours: 04

Suggestive Learning Outcomes: 1) Understand concept of refrigeration.
2) Express reversed Carnot cycle .

Detailed content of the unit: - .
Concept of Refrigeration. Reversed Carnot Cycle. Heat engine, heat pump and refrigerating machine, their comparison. C.O.P. & E.P.R. Units of refrigeration, rating of refrigerating machine.

Module- 2:Refrigeration System

Number of class hours: 05

Suggestive Learning Outcomes: 1) Express Air refrigeration cycles.
2) Understand functions of different refrigeration cycles.

Detailed content of the unit: -
Air refrigeration System, Bell-Coleman cycle – application & its limitation. Vapour Compression Cycle, effect of sub cooling and superheating. Simple mathematical calculation with pressure – enthalpy charts. Vapour absorption Cycle. Actual vapour absorption cycle and application.

Module-3: Refrigerants and Refrigeration system components

Number of class hours: 08

Suggestive Learning Outcomes: 1) Explain properties of different refrigerants.
2) Illustrate different component of refrigerating system and their functions.

Detailed content of the unit: -
Properties of refrigerant. Properties and application of commonly used refrigerants such as R11, R12, R22, NH3 & water. Newer and environment friendly refrigerants.
Function, types, specification and constructional overview of-Compressor. Condenser. Throttling Device. Evaporator. Oil Separator. Accumulator. Control System in refrigeration – solenoid valve, thermostat etc.

Module-4: Psychrometry & Psychometric processes

Number of class hours:07

Suggestive Learning Outcomes: 1) Understand meaning of Psychrometry.
2) Express different psychrometry process.

Detailed content of the unit: -
Definition and meaning of – Saturated air, Dry & Wet bulb temperature, Dew point temperature, Specific humidity, absolute humidity, relative humidity. Dalton's Law of partial pressure, Psychometric chart and its uses
Sensible heating and cooling, humidification and dehumidification- cooling and de-humidification, heating and humidification, cooling with adiabatic humidification, their representation on psychometric chart & simple problem

Module- 5:Automotive air conditioning System

Number of class hours: 06

Suggestive Learning Outcomes: 1) Memorize concept of air conditioning
2) Describe principles of automotive air conditioning.

Detailed content of the unit: -
Concept of air conditioning, Metabolism in human body, Human Comfort, Classification and application of air conditioning
Principles of automotive air conditioning, Ventilation and heating of passenger compartment in a vehicle. Automotive air conditioning system – operating conditions, car air conditioning, bus and truck air conditioning, heater-air-conditioner, manually and automatically controlled air conditioners, typical installations, Causes of failure of automotive air conditioners.

References: -
1. Refrigeration and Air Conditioning – Sadhu Singh, Khanna Book Publishing Co., New Delhi
2. Refrigeration and Air Conditioning – S. Domakundawar, Dhanpat Rai publications.
3. Refrigeration and Air Conditioning – A.S.Sarao& G.S. Gabi, 6th edition, Satya Prakashan publications, New Delhi, 2004.
4. Principles of Refrigeration – Roy J.Dossat, 5th edition, Pearson Publications, 2001.

5. Refrigeration and Air Conditioning – M.Zakria Baig, Premier/ Radiant Publishing House.
6. Refrigeration and Air Conditioning – C.P Arora, Tata McGraw Hill Education, 2000.

Automobile Engine-II

Course Code	AEPC402
Course Title	Automobile Engine-II
Number of Credits	3(L:3, T:0, P:0)
Prerequisites	Automobile Engine-I and Heat Power Engineering
Course Category	Programme Core Course-10

Course Outcomes: - By the end of the course, the students are expected to

CO1: Calculate engine power and its performance.
CO2: Explain Supercharging and Scavenging processes of IC engine.
CO3: Describe the combustion theories of IC engine.
CO4: Explain about fuels and alternative fuels of I.C. Engine fuel.
CO5: Describe about air pollution by IC engine emission and its control.

Course Content: -

Module- 1:Calculation of Engine Power, its Performance & Testing

Number of class hours: 7 hrs.

Suggestive Learning Outcomes:

1) Can define various engine parameters.
2) Can calculate Engine power by morse test and motoring test.

Detailed content of the unit:

Calculation of Engine Power, its Performance & Testing: Engine torque, Brake power, indicated power, Frictional power, mean effective pressure, Fuel Consumption, Specific fuel consumption, Engine efficiency – indicated thermal efficiency, Brake thermal efficiency, Mechanical Efficiency, Efficiency ratio, Air standard efficiency, Volumetric efficiency, Making a heat balance sheet, problems on the above aspect. Engine specifications. Loading Devices: dynamometer (Mechanical, Hydraulic, Electrical dynamometers) and measurement of brake power, Measurement of Indicated power with the help of Engine Indicator. Measurement of frictional power of single cylinder or multi cylinder engines with the help of Morse test and Motoring test. Problems on the above aspect. Effect of temperature and altitude on power. Performance-characteristics curves, Factor affecting the engine performance.

Module- 2:Supercharging and Scavenging

Number of class hours: 7 hrs.

Suggestive Learning Outcomes:

1) Can explain the differences between supercharging and scavenging.
2) Can explain the objectives of supercharging and scavenging.

Detailed content of the unit: -

Supercharging and Scavenging: Supercharging, objectives of supercharging, effects of supercharging on S.I. & C.I. Engines. Advantages of supercharging on C.I. engines over S.I. engines. Effect of supercharging on power, efficiency and fuel consumption and its limitations on S.I. & C.I. engine. Method of Supercharging, Types of Superchargers, Turbo charging. Scavenging, Theoretical scavenging process – perfect scavenging, perfect mixing & short circuiting. Scavenging Parameters – delivery ratio, scavenging efficiency, Trapping efficiency. Types of scavenging – uniflow, cross flow and loop or reverse scavenging. Scavenging pumps

Module- 3:Theory of Combustion

Number of class hours: 6 hrs.

Suggestive Learning Outcomes:

1) Can explain the combustion theory of IC engine.
2) Can explain about the knocking phenomena of IC engine.

Detailed content of the unit: -

Theory of Combustion: Introduction. Combustion theory in S.I. Engine. Stages of combustion in S.I. Engines. Effects of engine variables on Ignition lag, flame propagation. Abnormal combustion – Detonation, Pre-ignition, Surface ignition, factors affecting detonation and its control. S.I. Engines combustion chamber. Combustion theory in C.I. Engine. Stages of combustion in C.I. Engines. Air-fuel ratio, Delay Period and variables affecting delay period. Diesel knock and variables affecting diesel knock, C.I. Engines combustion chamber. Difference between knocking phenomena in S.I. and C.I. Engines.

Module- 4:Fuels and Alternative Fuels for I.C. Engines

Number of class hours: 5 hrs.

Suggestive Learning Outcomes:

4) Can explain about various types of fuels and alternative fuels.
5) Can explain about the properties of fuels.

Detailed content of the unit: -

Fuels and Alternative Fuels for I.C. Engines: Introduction (Properties of fuels, Heating Value of fuels, Concept of A/F ratio, Theoretical air requirement for complete combustion) S.I. engine fuel, octane number requirement, Diesel engine fuel, cetane number, Fuel additives and its effects, L.P.G, CNG, Alcohol & Hydrogen as Automotive fuels, CNG Kit. Comparison between CNG & LPG with gasoline

Module- 5: Air Pollution and Emission Control

Number of class hours: 5 hrs.

Suggestive Learning Outcomes:

4) Can describe about air pollution caused by IC engine emissions.
5) Can explain about various emission control devices used in IC engine.

Detailed content of the unit: -

Air Pollution and Emission Control: Pollutants from Petrol and Diesel Engines. Sources of pollutants from petrol and diesel engines Causes and effects of pollution from petrol and diesel engines on human health, vegetation and other materials (like on paper, plastic, paint etc.) Comparison of Diesel and Gasoline emissions, Emission control system for S.I. engines and C.I. engines – Catalytic Converter, positive crankcase ventilation, evaporation loss control device (ELCD) by charcoal canister, Exhaust gas re-circulation (EGR). Diesel smoke, odour and control. Emission norms for petrol and diesel vehicles (Euro series and Bharat stage I & II). Introduction to Green House Effect

References: -

1. A Textbook of Automobile Engineering- S. K. Gupta, S. Chand Company Ltd. Delhi.
2. Automobile Engineering- R B Gupta, Satya Prakashan, New Delhi.
3. Basic Automobile Engineering- R B Gupta, Satya Prakashan, New Delhi.
4. A Text book of Automobile Engineering (Vol-1 and Vol-2)- Dr. Kirpal Singh, Standard Publishers Distributors. New Delhi.
5. A Text book of Automobile Engineering-R K Rajput, Laxmi Publication (P) Ltd, New Delhi.

FLUID MECHANICS

Course Code	AEPC403
Course Title	Fluid Mechanics
Number of Credits	2(L:2, T:0, P:0)
Prerequisites	Nil
Course Category	Programme core course-11

Course Outcomes: -

1) Memorize various properties of fluid and Hydrostatics.
2) Understand characteristic of fluid kinematics and dynamics.
3) Calculate different parameters such as co-efficient of friction, power, efficiency etc of various Systems.
4) Categorize impact of jets on different plates.
5) Explain the construction and working of turbines and different hydraulic devices.

Course Content:-

Module- 1: Properties of fluid and Hydrostatics

Number of class hours: 05

Suggestive Learning Outcomes: 1) Define various properties of fluid.
2) Memorize about hydrostatics.

Detailed content of the unit: -

Definition of fluid, classification of fluids (Ideal & Practical fluids) Properties of a fluid – density, specific weight, specific volume, specific gravity, compressibility, viscosity, surface tension, capillarity – definitions along with their units.
Definition of Pressure and its unit, PASCAL's law and its application, Relation between Pressure, Height and Density, Pressure head and Piezometric head, Atmospheric pressure, Gauge pressure, Absolute pressure – Problems. Measurement of Pressure Piezometric tube, Manometer – (simple, differential)- problems, Hydrostatic Forces Definitions – total pressure, centre of pressure, Total force and centre of pressure on plane surface immersed – horizontally, vertically, inclined in a liquid – and on curved surface – pressure diagram, Problems.

Module- 2:Fluid kinematics and dynamics

Number of class hours:05

Suggestive Learning Outcomes: 1) Summarize types of fluid flow.
2) Express fluid dynamics and Bernoulli's Theorem.

Detailed content of the unit:
Fluid Kinematics:
Types of fluid flow (steady, unsteady, uniform, non-uniform, laminar and turbulent), Equation of continuity, Discharge of flowing fluid, mean velocity, Reynolds's number and its use.
Fluid Dynamics: Energy possessed by flowing liquid. Pressure energy, kinetic energy and potential energy, Bernoulli's Theorem – statement, assumption and explanation Hydraulic grade line, energy line and stagnation pressure. Problems

Module- 3: Flow measurement & Flow through pipes

Number of class hours:05

Suggestive Learning Outcomes:
1) Explain different parameters such as co-efficient of friction, power, efficiency etc of various Systems.
2) Illustrate different loss due to flow through pipes.

Detailed content of the unit: -
Flow measurement
Hydraulic coefficients (coefficient of contraction, coefficient of velocity, coefficient of discharge), Find the discharge through Venturimeter, Orifice meter (circular), and Pitot tube, Problems.
Flow through pipes
Laws of fluid friction for laminar and turbulent, Darcy's equation for frictional loss (no proof) Minor head loss and Major Head loss, Loss of head due to sudden enlargement, contraction, obstruction, bend & loss at exit (no proof), problem.

Module- 4:Impact of jets

Number of class hours:05

Suggestive Learning Outcomes: 1) Analyze impact of jets .
2) calculate work done and efficiency.

Detailed content of the unit: -

Impact of jets
Impact of jet on stationery and moving flat plate, stationery and moving curved vane, calculation of work done and its efficiency, Problems.

Module- 5:Hydraulic turbine & Hydraulic devices

Number of class hours: 05

Suggestive Learning Outcomes: 1) Analyze the construction and working of turbines.
2) Categorize hydraulic devices and their working and construction.

Detailed content of the unit: -

Hydraulic turbine
Classification of Turbines – Impulse and Reaction turbine, components and working of Pelton wheel, Francis Turbine and Kaplon Turbine.
Hydraulic devices
Fluid CouplingFunction, Construction, Operation, efficiency, Slip, Speed ratio, Power.
Torque ConverterWorking Principle, Construction, Power and efficiency.
Hydraulic LiftWorking Principle, Construction, Efficiency.

References: -

1. Fluid Mechanics & Hydraulic Machines, S.S. Rattan, Khanna Publishing House, New Delhi
2. Hydraulic, fluid mechanics & fluid machines – Ramamrutham S, Dhanpath Rai and Sons, New
Delhi.
3. Hydraulics and fluid mechanics including Hydraulic machines – Modi P.N. and Seth S.M., Standard
Book House. New Delhi
4. One Thousand Solved Problems in Fluid Mechanics – K. Subramanya, Tata McGraw Hill.
5. Hydraulic, fluid mechanics & fluid machines – S. Ramamrutham, Dhanpat Rai and Sons, New
Delhi
6. Fluid Mechanics and Hydraulic Machines – R. K. Bansal, Laxmi Publications, New Delhi

AUTOMOBILE RECONDITIONING SHOP- I

Course Code	AEPC404
Course Title	Automobile Reconditioning Shop- I
Number of Credits	2(L:0, T:0, P:2)
Prerequisites	Nil
Course Category	Programme core course-12

Course Outcomes:

6) Demonstrate dismantling and assembling of single cylinder petrol and diesel engine. **(K2)**
7) Demonstrate dismantling and assembling of multi-cylinder petrol and diesel engine. **(K2)**
8) Identify components by removing carburetor, F.I.P of a diesel engine, fuel injector of a diesel engine. **(K2)**
9) Locate leakage from radiator. **(K1)**
10) Demonstrate refitting of radiator, thermostat valve, F.I.P of a diesel engine, steering gear box and fuel injector. **(K2)**

Practical Content:-

Number of class hours:

Detailed Content of the Unit-

1. Dismantling and Assembly of single cylinder petrol engine.
2. Dismantling and Assembly of single cylinder diesel engine.
3. Dismantling and Assembling of multicylinder petrol engine.
4. Dismantling and Assembling of multicylinder diesel engine.
5. Removing the carburetor from the engine, identifying the components.
6. Removing the radiator from the vehicle, checking it for leakage and refitting.
7. Removing the thermostat valve, checking and refitting.
8. Dismantling of F.I.P of a diesel engine, identifying its components and refitting.
9. Dismantling of steering gearbox and assembling.
10. Removing fuel injector of a diesel engine, identifying its components and assembling.

Automobile Engineering Lab-II

Course Code	AEPC405
Course Title	Automobile Engineering Lab-II
Number of Credits	2(L:0, T:0, P:4)
Prerequisites	Automobile Engine-I & II.
Course Category	Programme Core Course-13

Course Outcomes: - By the end of the course, the students are expected to

CO1: Analyses the exhaust gas of petrol and diesel engine by using computerized software.

CO2: Explain the constructional feature of epicyclic gearbox and calculate the gear ratio.

CO3: Perform the Morse Test of petrol and diesel engine.

CO4: Make heat balance sheet of petrol and diesel engine.

CO5: Determine the performance characteristics of petrol and diesel engine by using an engine test rig.

List of Experiment: (Any six experiments to be performed)

1. Computerised Exhaust Gas Analyse of a petrol engine and compare the output values to the prescribed limits set by the Government.
2. Computerised Exhaust Gas Analyse of a diesel engine and compare the output values to the prescribed limits set by the Government.
3. Construction of epicyclic gearbox, sketch the same and calculate gear ratio.
4. Perform the Morse Test on petrol engine.
5. Perform the Morse Test on diesel engine.
6. Make the Heat Balance sheet of petrol engine.
7. Make the Heat Balance sheet of diesel engine.
8. Study the performance characteristics of petrol engine by using an engine test rig.
9. Study the performance characteristics of petrol engine by using an engine test rig.
10. Study of the constructional feature of torque converter and sketch the same.

References: -

1. A Textbook of Automobile Engineering- S. K. Gupta, S. Chand Company Ltd. Delhi.
2. Automobile Engineering- R B Gupta, Satya Prakashan, New Delhi.
3. Basic Automobile Engineering- R B Gupta, Satya Prakashan, New Delhi.

4. A Text book of Automobile Engineering (Vol-1 and Vol-2)- Dr. Kirpal Singh, Standard Publishers Distributors. New Delhi.

5. A Text book of Automobile Engineering-R K Rajput, Laxmi Publication (P) Ltd, New Delhi.

AUTOMOBILE ENGINEERING DRAWING - II

Course Code	AEPC406
Course Title	Automobile Engineering Drawing-II
Number of Credits	01(L: 0, T: 0, P: 2)
Prerequisites	Nil
Course Category	Programme core course-14

Course Outcomes: - By the end of the course, the students are expected to

CO1: Identify the gear tooth profile.
CO2: Classify the different types of cam and follower.
CO3: Identify the joints & pulley.
CO4: Understand the details assembly of multi plate clutch, differential assembly, leaf spring, different gear arrangements, cotter and knuckle joints, damper.
CO5: Understand the line diagram for different layout of engine.

Course Content:-

Number of class hours:

Detailed content:

1) To Draw the Gear Tooth Profile for Spur Gear, nomenclatures of Tooth Profile.

2) To draw the different types of Cams and followers.

3) To Draw the Joints And Pulley
   a) Universal Joint & Slip Joint.
   b) V-belt pulley.

4) Free Hand Drawing of
   a) Floating axles (Semi, three quarter and full floating) with details Clutch assembly of multi plate.
   b) Differential assembly.
   c) Leaf spring.
   d) Different gearing arrangement.
   e) Cotter and Knuckle joint.
   f) Different types of frame and frame section.
   g) Telescopic damper, torsion bar.

5) To Draw The Line Diagram Showing Layout With Details
   a) Transmission line (from crank shaft to wheel).
   b) Front engine front wheel drive.
   c) Front engine rear wheel drive.
   d) Rear engine rear wheel drive.

References: -

1) "Engineering Drawing" by N D Bhatt and V M Panchal.
2) "Machine Drawing" by N Sidheswar and P Kannaiah.
3) "Technical Drawing with Engineering Graphics" by Frederick E Giesecke and Ivan L Hill.

AUTOMOBILE CHASSIS – II

Course Code	AEPE407/A
Course Title	Automobile Chassis -II
Number of Credits	03 (L:3, T:0, P:0)
Prerequisites	NIL
Course Category	Programme Elective course-I

Course outcomes:-

After completing this course, student will be able to:

1) Explain front axle, steering geometry and features of given type of steering.(**k2**)

2) Explain braking principle, construction and working of different types of brakes and properties of brake fluid.(**k1**)

3) Discuss necessity of power brakes, construction and working principle of power brakes.(**k2**)

4) Understand constructional features and specifications of tyres. **(k2**)

5) Explain functions of suspension systems, air and hydro pneumatic suspension.(**k2**)

Course Contents:

Module - I: Front Axle and Steering

Number of class hours: 6

Suggestive Learning Outcomes:

1. Identify types of front axles, stub axles and parts of steering.
2. Explain the steering geometry parameters.

3. Describe the salient features of the given type of steering.

Detailed content of the unit:

Types of front axle- Dead axle, Live axle, Types of stub axle arrangements - Elliot, Reverse Elliot, Lamoine and Reverse Lamoine, Front wheel assembly. Steering linkages- for the vehicle with rigid axle, independent suspension system, Ackerman steering gear mechanism Steering geometry parameters- Caster, Camber, King-pin inclination, Toe in- Toe out, Correct steering angle, Under-steering and Over-steering, Turning radius.

Construction, working and application of Steering gear box: Rack and pinion type, Re-circulating Ball type and Worm and Roller type steering gear box.

Module - II: Braking System

Number of class hours: 6

Suggestive Learning Outcomes:

1. Explain the braking principle and different types of brake.
2. Describe with sketches construction and working of pneumatic and disc brakes.
3. Explain properties of Brake fluid, heat generation and operating temperature antifade characteristics.

Detailed content of the unit:

Principle of Braking, Braking effect- weight transfer, Types of Brakes. Drum Brakes Construction and working Leading Shoe, Trailing shoe, Mechanical Brakes. Hydraulic Brakes- Bleeding of Brakes, Master cylinder, wheel cylinder, Properties of Brake Fluid. Pneumatic Brake- construction and working, Brake drum- their material, lining thickness, brake clearance, Heat generation and operating temperature anti-fade characteristics, Disc brakes- operation and construction. solid and ventilated disk brakes, Comparison between Drum Brake and Disc Brakes, Hand Brake, Exhaust Brake, Fail Safe Brakes. Adjustments of Brakes, brake Test. Brake System Troubleshooting.

Module - III: Power Brakes

Number of class hours: 6

Suggestive Learning Outcomes:

1. Discuss the necessity of power brakes.
2. Explain types of power brakes, construction and working principle of power brakes.
3. Identify troubles of power brake.

Detailed content of the unit:

Necessity of Power Brakes, Types of Power Brakes, Construction and working principle of power brakes (Pedal assisted and Combined unit type). Vacuum pump, manifold vacuum Antilock Brake System, Power Brake Troubleshooting

Module – IV: Wheels and Tyres

Number of class hours: 6

Suggestive Learning Outcomes:

1. Explain wheel types and specification.
2. Describe constructional features and specifications of tyres.
3. Explain factors affecting tyre performance and life.

Detailed content of the unit:

Wheels- types, Hub attachment, Wheel specification. Light Alloy Wheels. Tyres- Requirements of tyre. Constructional features of tyres, Types of tyres. Tread Patterns, Tyre specifications, Inflation pressure and its effects, Factors affecting tyre performance and life, balancing of wheel tyre assembling (static and dynamic). Tyre Rotation, Tyre Retreading, Tube Vulcanizing

Module - V: Suspension Systems

Number of class hours: 6

Suggestive Learning Outcomes:

1. Explain functions of suspension system.
2. Classify tyre suspension systems.
3. Explain air and hydro pneumatic suspension.

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Detailed content of the unit:

Functions of suspension system, sprung weight, Un-sprung Weight. Types of suspension system (Rigid axle suspension system, Independent suspension system), Springs (Leaf spring, Coil spring). Helper springs (Variable rate springs), Air and Hydro Pneumatic Suspension.

References: -

5) Heldt. P.M. Automotive Chassis, Chilton Co., New York, 1990. 2. Steed. W., Mechanics of Road Vehicles, IIIiffe Books Ltd., London, 1.
6) Powloski. J. Vehicle Body Engineering, Business Books Ltd., 1989.

ALTERNATIVE ENERGY-SOURCES AND MANAGEMENT

Course Code	AEPE407/B
Course Title	Alternative Energy-Sources and management
Number of Credits	03 (L: 3, T: 0, P: 0)
Prerequisites	NIL
Course Category	Programme Elective course-1

Course outcomes:-

After completing this course, student will be able to:

1) Identify renewable energy sources and their utilization.
2) Understand the basic concepts of solar radiation
3) Understand principles of energy conversion from wind.
4) Understand the concepts and applications of fuel cells.
5) Identify methods of energy storage for specific applications

Course Contents:

Module - I: Solar Energy

Number of class hours: 6

Suggestive Learning Outcomes:
1. Describe the energy conversion from solar to other form.
2. Explain the principle of natural and forced convection.

Detailed content of the unit:

Definition, Energy available from Sun, Solar radiation data, solar energy conversion into heat, Flat plate and Concentrating collectors, Principle of natural and forced convection, Solar Engines: Stirling, Brayton engines, Photo voltaic: p-n junctions.

Module - II: Wind Energy

Number of class hours: 6

Suggestive Learning Outcomes:
1. Identify the availability of energy from wind.
2. Describe the Working principle of wind power plant.

Detailed content of the unit:

Energy available from wind, General formula, Lift and drag, Basis of Wind energy conversion, Effect of density, Frequency variances, Angle of attack, Wind speed, Windmill rotors, Horizontal axis and Vertical axis rotors, Working principle of wind power plant.

Module - III: Nature of Geothermal Sources

Number of class hours: 6

Suggestive Learning Outcomes:
1. Classify the different types of geothermal resources.
2. Explain the making of fuel from biomass.

Detailed content of the unit:

Definition and classification of resources, utilization for electricity generation and direct heating, wellhead power generating units. Basic features: Atmospheric exhaust and condensing, Exhaust types of conventional steam turbines. Pyrolysis of Biomass to produce solid, liquid and gaseous fuels

Module - IV: Wave & Tidal energy

Number of class hours: 6

Suggestive Learning Outcomes:
1. Describe the basic of wave & tidal energy.
2. Express the Principles of tidal and wave power generation.

Detailed content of the unit:

Definition of Wave energy & Tidal energy, Difference between tidal and wave power generation. Principles of tidal and wave power generation

Module - V: OTEC energy

Number of class hours: 6

Suggestive Learning Outcomes:
1. Define the basic of OTEC power plant.
2. Express the Environmental impacts of OTEC.

Detailed content of the unit:
OTEC power plants, operation of small open-cycle experimental facility, Economics of OTEC, Environmental impacts of OTEC, Status of multiple product OTEC systems

References: -

1) Non-Conventional Energy Sources /G.D. Rai, Khanna Publishers
2) Renewable energy resources/ Tiwari and Ghosal/ Narosa.

PROFESSIONAL SKILL DEVELOPMENT

Course Code	**:**	**HS- 408**
Course Title	**:**	**Professional Skill Development (Theory)**
Number of Credits	**:**	**3 (L: 2, T: 1, P:0)**
Prerequisites	**:**	**NIL**
Course Category	**:**	**HS**

Course Outcomes:

After successful completion of this course, students would be able to:

CO1: Understand the importance of soft skills and personality in a person's career growth. K2

CO2: Communicate uprightly while looking for a job. K3

CO3: Learn and utilize the key skills while facing job interview. K2 & K3

CO4: Demonstrate effective writing skills for professional excellence. K2

CO5: Explore ways to make oral communications interesting and captivating. K3

Unit – 1Soft Skills & Personality Development

Number of Class Hours: 06 **Marks: 08**

Learning Outcomes:

1) Get acquainted with the details of soft skills and the importance of personality K1
2) Understand the importance of communication skills in developing one's personality. K2
3) Understand the importance of soft skills and personality in a person's career growth K2

Detailed Content:

1. **Soft skills - Demand of Every Employer:** How soft skills complement hard skills, Soft skills as competitive weapon, Classification of soft skills into personal and interpersonal traits, Soft skills needed for career growth- Time management, Leadership traits, Communication and networking skills, Teamwork and Interpersonal skills, Empathy and Listening skills, Responsibility, Attitude, Ethics, Integrity, Values and Trust.

2. **Personality Development – A must for career Growth:** Grooming one's personality as a signal that others read, mapping different personality types – Perfectionists, Helpers, Achievers, Romantics, Observers, Questioners, Enthusiasts or adventurers, Bosses or asserters, Mediators or peacemakers.

Unit – 2 Looking for a Job

Number of Class Hours: 05 **Marks: 08**

Learning Outcomes:

1) Learn to write Job Applications, Cover Letter, Resume, Curriculum Vitae, bio data K2
2) Develop interpersonal skills/ soft skills through Group Discussion. K3

Detailed Content

1. Job Application : Job Application Letters in response to advertisements, Self-application letters for Jobs
2. Curriculum Vitae/Resume: Formats of Resume and CV for a fresher and for someone with experience, Differences between Resume, CV, Bio-data, and choice of referees.
3. Group Discussion : A test of soft skills

Unit – 3 Job Interviews

Number of Class Hours: 05 Marks: 08

Learning Outcomes:

1) Understand the importance of Job interviews in the selection procedure K2
2) Comprehend and Adapt to various types, stages and processes of job interviews K1&K3
3) Demonstrate appropriate body language in interviews K3

Detailed Content

1. Job Interviews: Definition, processes of Interviews, Types of Interviews
2. Stages in Job interviews: Before interview stage, On D' Day, After interview stage.
3. Importance of Body language in Interviews: : Facing an interview, Using proper verbal and non- verbal cues, the perfect handshake ,Exhibiting confidence, the business etiquettes to maintain, body language ,and dress code - what to speak, how to speak in an interview and answer interview questions, negative body language, handling an awkward situation in an interview.
4. Probable interview questions and answers.
5. Mock interviews to be conducted by mock interview boards.

Unit – 4 Enhancing Writing skills

Number of Class Hours: 12 Marks: 08

Learning Outcomes:

1) Write dialogues on given topics / situations K3
2) Express facts &ideas effectively in written form K3
3) Learn to write formal and informal letters & emails. K2

Detailed Content

1) **Art of Condensation**: Principles to increase clarity of written communication.
2) **Dialogue Writing:** Meeting and Parting, Introducing and Influencing, Requests, Agreeing and Disagreeing, Inquiries and Information.
3) **Letter Writing:** Placing an order, Letter to Inquiry, Letter of Complaint, Letter seeking permission.
4) **E- mail writing**: writing the perfect e-mail, steps to the perfect e-mail, formal and informal greetings, requests through an e-mail, writing an apology, complaint and seeking help and information in an e-mail, informing about a file attached in an email, writing the formal ending of an e-mail.

Unit – 5 Conversations, Panel Discussion and Public Speaking

Number of Class Hours:12 Marks: 08

Learning Outcomes:

1. Speak persuasively on a given topic fluently and clearly. K3
2. Participate in formal and informal conversations. K3
3. Express ideas and views on given topics. K3

Detailed Content

1) **Conversation & Dialogue Practice:**
   a) Introducing oneself
   b) Introduction about family
   c) Discussion about the weather
   d) Seeking Permission to do something
   e) Seeking Information at Railway Station/ Airport
   f) Taking Appointments from superiors and industry personnel
   g) Conversation with the Cashier- College/ bank
   h) Discussing holiday plans
   i) Asking about products in a shopping mall
   j) Talking over the Telephone

2) **Panel Discussion:** Act of a moderator - ways to respond to audience questions.
Suggested topics: Current Affairs

3) **Public Speaking**: Art of Persuasion, Making speeches interesting, Delivering different types of speeches: Ceremonial, Demonstrative, Informative, Persuasive.

List of Software/Learning Websites

1. http://www.free-english-study.com/
2. http://www.english-online.org.uk/course.htm
3. http://www.english-online.org.uk/
4. http://www.talkenglish.com/
5. http://www.learnenglish.de/

Reference Books:

(Name of Authors/ Title of the Book /Edition /Name of the Publisher)

1) Sanjay Kumar & PushpLata Communications Skills , 2nd Edition,Oxford University Press
2) Meenakshi Raman & Sangeeta Sharma Technical Communication: Principles & Practice Oxford University Press
3) M. Raman & S. Sharma Technical Communication Oxford University Press
4) Barun Kumar Mitra, Personality Development and Soft Skills Oxford University Press

Minor Project

Course Code	CEPR-409
Course Title	Minor Project
Number of Credits	2 (L: 0, T: 0, P: 4)
Prerequisites	Nil
Course Category	Project Work (PR)

Course Outcome:-

After completion of the course, students will be able to:

C.O.1: Demonstrate a through and systematic understanding of project contents (K2).

C.O. 2: Identify the methodologies and professional way of documentation and communication (K3).

C.O. 3: Illustrate the key stages in development of the project (K2).

C.O. 4: Develop the skill of working in a Team (K3).

C.O. 5: Apply the idea of mini project for developing systematic work plan in major project (K3).

Course Content:-

The minor project topic should be selected / chosen to ensure the satisfaction of the urgent need to establish a direct link between education, national development and productivity and thus reduce the gap between the world of work and the world of study. The course should have the following-

1) Perform detailed study about various components of a project.
2) Study about methodologies and professional way of documentation and communication related to project work.
3) Develop idea about problem formulation.
4) Knowledge of how to organize, scope, plan, do and act within a project thesis.
5) Familiarity with specific tools (i.e. hardware equipment and software) relevant to the project selected.
6) Demonstrate the implementation of a minor project work.

ESSENCE OF INDIAN KNOWLEDGE AND TRADITION

Course Code	AU410
Course Title	Essence of Indian Knowledge and Tradition
Number of Credits	0 (L: 2, T: 0, P: 0)
Prerequisites	Nil
Course Category	Mandatory Course

Course Outcomes: -

After completion of the course the students will be able to-

CO 1: Understand the essence of Indian tradition and the importance of carrying them forward. (**K_2**)
CO 2: Understand the Vedic literature and important ideas discussed in the Vedas. (**K_2**)
CO 3: Describe scientific heritage of ancient India along with comprehending its relevance and application in various modern scientific disciplines. (**K_1**)
CO 4: Relate the theoretical and practical sides of the science of Yoga and Ayurveda with modern knowledge systems. (**K_1**)
CO 5: Explain the worth of Indian intellectual heritage, traditional practices and Indian lifestyle from scientific lenses. (**K_4**)

Module- 1

Name of the Module: Introduction to Vedic Literature

Number of class hours:**05**

Content:

- General structure of Vedic Literature,
- Different theories on the age of the Vedas,
- Educational system in the Vedic times
- subject-matter of Ṛigveda-samhitā, Sāmaveda -Saṁhitā, Yajurveda-Saṁhitā, Atharvaveda-Saṁhitā, Brāhmaṇa and Āraṇyaka literature, Upaveda

Learning outcomes of the Module

1	Describe the Vedic literature (K1)
2	Outline the heritage of ancient India specially the scientific knowledge that is embedded in the Vedas will be shown through this module (K2)

Module- 2

Name of the Unit: Fundamental doctrines of the Upaniṣhads

Number of class hours: **05**

Content:

- General introduction of Upaniṣhadic literature
- Philosophical ideas and ethics in Upaniṣhads

Learning outcomes of the Module

1.	Understand Upaniṣhads and its significance as the perennial source Indian philosophy (K2)
2.	Explain the scientific temperament, knowledge and methods of scientific enquiry that is embedded in the Upaniṣhads (K2)

Module- 3

Name of the Unit: Vedāṅgas, Purāṇas and Dharmaśāstra Literature

Number of class hours: **05**

Content:

- Introduction to Vedāṅga Literature
- History of Sanskrit Grammar
- An Overview of Purāṇic literature
- History of Dharmaśāstra

Learning outcomes of the Module

1.	Describe various scientific and academic disciplines of ancient India along with scientific knowledge that is rooted in the Puranic literature (K1)
2.	Remember ancient system of Law and Governance in a nutshell especially the principles and philosophy behind the ancient constitutions (K1)

Module- 4

Name of the Module: Introduction to Indian Philosophical Systems, Scientific aspects of Indian knowledge systems

Number of class hours: **05**

Content:

- General introduction to Indian Philosophical systems, i.e. Orthodox and Heterodox
- Glimpse of ancient Indian Science and technology.

Learning outcomes of the Module

1.	Describe the Indian Philosophical systems and their relevance and application in modern scientific enquiry (K1)
2.	Remember the various scientific methods, means and validity of knowledge as discussed in these systems, methods of discussion, debate and systemic learning as structured in ancient Indian knowledge literature (K1)

Module- 5

Name of the Unit: Introduction to Yoga &Ayurveda

Number of class hours:**05**

Content:

- General ideas about Yoga,
- Origin and Development of Pātañjali Yoga,
- Origin and Development of Ayurveda and its relevance

Learning outcomes of the Module

1.	Understand about principles and philosophy of Yogic sciences and Āyurveda. (K2)
2.	Identify various ancient texts, practices of Yoga and Āyurveda along with gaining basic practical and theoretical knowledge which they will be able to relate with modern healthcare systems (K4)

References: -

1) Capra, Fritjof. The Tao of Phisics. New York: Harpercollins, 2007.
2) Capra, Fritjof. The Web of Life. London: Harpar Collins Publishers, 1996.
3) Dasgupta, Surendranath& De, Sushil Kumar. A History of Sanskrit Literature.Delhi: Motilal Banarsidass, 2017.

4) Dasgupta, Surendranath. A History of Indian Philosophy. Delhi: Motilal Banarsidass, 1991.
5) Gonda, Jan. A History of Vedic Literature. Delhi: Monohar Publishers and Distributors, 2020.
6) Jha, R.N. Science and Consciousness Psychotherapy and Yoga Practices. Delhi: VidyanidhiPrakashan, 2016.
7) Kane. P.V. History of Dharmasastra, Poona: Bhandarkar Oriental Research Institute, 1930.
8) Max Muller. Ancient Sanskrit Literature, London: Spottiswoode and Co., 1859.
9) Pride of India,New Delhi: Samskrita Bharati, 2006.
10) Shastri, Gourinath. A History of Vedic Literature, Kolkata: Sanskrit PustakBhandar, 2006.
11) Sinha, Jadunath. Indian Philosophy. Delhi: Motilal Banarsidass,1938.
12) Wujastiyk, Dominik. The Roots of Ayurveda. India: Penguin India, 2000.

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Semester V

Sl. No.	Category	Code No.	Course Title	Hours per week			Total Contact Hrs/Week	Credit
				L	T	P		
1	Programme core course-15	AEPC501	Theory of machine and Manufacturing Process	3	0	0	3	3

2	Programme core course-16	AEPC502	Automobile Reconditioning Shop-II	0	0	4	4	2
3	Programme core course-17	AEPC503	Automobile Repair and Maintenance Shop-I	0	0	4	4	2
4	Programme core course-18	AEPC504	Automobile Electrical Lab	0	0	4	4	2
5	Programme elective course-2	AEPE505/A	Automotive Electrical and Service Station Management	3	0	0	3	3
		AEPE505/B	Environmental Pollution and Control					
6	Programme elective course-3	AEPE506/A	Motor Vehicle Act	3	0	0	3	3
		AEPE506/B	Transportation Management					
7	Summer Internship-II (6 weeks) after IV Semester	AUSI-507	Summer Internship-II	0	0	0	0	3
8	Open elective course-1	(Any one to be selected from Annexure-I)		3	0	0	3	3
9	Major Project	AEPR509	Project II	0	0	2	2	1
			Total					**22**

Theory of machine and Manufacturing Process

Course Code	AEPC501
Course Title	Theory of machine and Manufacturing Process
Number of Credits	3(L:3, T:0, P:0)
Prerequisites	Engineering Mechanics, Strength of Materials.

Course Category	Programme Core Course

Course Outcomes: - By the end of the course, the students are expected to

CO1:Understand simple mechanisms and various belt drives and gear trains.

CO2: Differentiate between the functions of fly-wheel and governor

CO3: Explain the basic fundamentals of metals and alloys and various heat treatment processes.

CO4: Describe about smithy, forging and various mechanical working processes.

CO5: Describe the basic differences between electric welding and gas welding process.

Course Content: -

Module- 1: Simple Mechanism and Drives

Number of class hours: 7 hrs.

Suggestive Learning Outcomes:

1) Can differentiate between machine and mechanism.
2) Can describe about belt drives and gear trains.

Detailed content of the unit:

Simple Mechanism andDrives: Definition of machines, mechanism, difference between machines and mechanisms, Link, kinematic pair, kinematic chain, four bar link motion mechanism, Types of constrain motions, instantaneous centre of rotation, Degrees of freedom, Types of belt drive, velocity ratio of simple and compound belt drive, length of belt (no deduction), tension in tight side and slack side of belt their relation (no deduction), power transmitted by belt, slip of belt, creep of belt, angle of contact (definition only), Nomenclature of gear, gear train – simple and compound, epi-cyclic gear train, idle gear, differential gear, power transmitted by gears.

Module- 2: Fly Wheel &Governors

Number of class hours: 5 hrs.

Suggestive Learning Outcomes:

1) Can explain the differences between fly-wheel and governor.
2) Can express the equation of energy stored in a fly-wheel.

Detailed content of the unit: -

Fly Wheel &Governors: Functions of fly wheel, turning moment diagram for a two-stroke and four-stroke I.C. engine (graph only), fluctuation of energy, maximum fluctuation of energy, coefficient of fluctuation of energy, coefficient of fluctuation of speed, size of fly wheel, energy stored in a fly wheel, simple numerical problems. Types of governors, terms used in governors, watt governor, porter governor, sensitiveness of governors, stability of governor, Hunting of governor, effort and power of governors (definition only).

Module- 3: Fundamentals of Metals and Heat Treatment Processes

Number of class hours: 7 hrs.

Suggestive Learning Outcomes:

1) Can explain the Iron-carbon equilibrium diagram.
2) Can describe about various heat treatment processes and their applications.

Detailed content of the unit: -

Fundamentals of Metals and Heat Treatment Processes: Structure of metals; metal alloys; solidification of alloys; Iron-carbon equilibrium diagram; ferrous metals and alloys; steels and its classification; alloy steel & its classification; High speed steel; cutting alloys; non-ferrous metals and alloys – aluminium, copper, lead, nickel, tin, zinc. Purpose and methods of heat treatment – annealing, normalizing, hardening, tempering, hardening, effects of heat treatment on the mechanical properties.

Module- 4: Smithy Forging and Mechanical Working of Metals

Number of class hours: 5 hrs.

Suggestive Learning Outcomes:

6) Can explain various processes involving in smithy and forging.
7) Can describe about various mechanical working of metals.

Detailed content of the unit: -

Smithy Forging and Mechanical Working of Metals: Definition of smithy and forging, hand tools and appliances, forging operations, smith forging, defects in forging, advantages and limitations of forging, hot working, hot rolling, piercing, drawing, hot spinning, extrusion, cold working, cold rolling, cold drawing, cold spinning, cold extrusion, squeezing, peering operation.

Module- 5: Welding Processes

Number of class hours: 6 hrs.

Suggestive Learning Outcomes:

6) Can classify different welding processes.
7) Can describe about arc welding, resisting welding and gas welding processes.

Detailed content of the unit: -

Welding Processes: Definition of welding, classification of welding, weldability, heat effected zone (HAZ), safety equipment, Arc welding Process, TIG, MIG, function of flux in electrode, resistance welding, Principle of resisting welding, types of resistance welding process, butt welding, spot welding, seam welding, gas welding – oxy-acetylene gas welding, Types of oxy-acetylene gas welding flames. Types of welding joints.

References: -

1. Theory of machines – S.S .Rattan, Tata McGraw-Hill publications.
2. Theory of machines – R. K. Bansal, Laxmi publications
3. Theory of machines – R.S. Khurmi & J .K. Gupta, S. Chand publications.
4. Dynamics of Machines – J B K Das, Sapna Publications.
5. Theory of machines – Jagdishlal, Bombay Metro – Politan book Ltd.
6. Elements of Workshop Technology (Volume I & II) – Hajra Chowdry &Bhattacharaya, Media Promoters,2007.

Automobile Reconditioning Shop-II

Course Code	AEPC502
Course Title	Automobile Reconditioning Shop-II
Number of Credits	2(L:0, T:0, P:4)
Prerequisites	Automobile Engine-I & II. Auto Chassis.
Course Category	Programme Core Course.

Course Outcomes: - By the end of the course, the students are expected to

CO1: Dismantle, clean and reassemble the single plate, multi-plate clutch and centrifugal clutch assemblies.

CO2: Dismantle, clean and reassemble the gear box of two and four wheelers.

CO3: Dismantle, clean and reassemble the differential assembly.

CO4: Dismantle, clean and reassemble the universal joint.

CO5: Describe about different types of front and rear axles.

List of Experiment: (Any six experiments to be performed)

11. Dismantling of a dry single plate clutch assembly – sketch of a clutch plate, pressure plate arrangement, cleaning and reassembling.
12. Dismantling of a multi-plate clutch used in two wheelers, study of the drive linkages and sketch of the system, cleaning and reassembling.
13. Dismantling of a centrifugal clutch of mopeds, study of the arrangement and sketch of the system, cleaning and reassembling.
14. Dismantling of a two/four-wheeler gearbox, study of gear shifting mechanism, calculation of gear ratio, sketch of gear box, cleaning & reassembling.

15. Dismantling of a differential assembly, sketch the unit, cleaning and reassembling.
16. Dismantling of a universal joint, cleaning, and reassembling.
17. Study of different types of front and rear axles and their sketches.

References: -

1. A Textbook of Automobile Engineering- S. K. Gupta, S. Chand Company Ltd. Delhi.
2. Automobile Engineering- R B Gupta, Satya Prakashan, New Delhi.
3. Basic Automobile Engineering- R B Gupta, Satya Prakashan, New Delhi.
4. A Text book of Automobile Engineering (Vol-1 and Vol-2)- Dr. Kirpal Singh, Standard Publishers Distributors. New Delhi.
5. A Text book of Automobile Engineering-R K Rajput, Laxmi Publication (P) Ltd, New Delhi.

Automobile Repair and Maintenance Shop-I

Course Code	AEPC503
Course Title	Automobile Repair and Maintenance Shop-I
Number of Credits	02 (L: 0, T: 0, P: 04)
Prerequisites	NIL
Course Category	Programme core course-17

Course outcomes:

After completing this course, student will be able to:

6) Understand the Setting procedure of Crank Shaft of Multi cylinder Engines.

7) Explain about the measurement of cylinder bores, ovality and Taper Boring procedure for Multi cylinder Engines

8) Perform the fuel Injectors test in fuel Injector Tester.

9) Explain the steering system and various components of steering system.

10) Perform the adjustment of Mechanical, Hydraulic and Pneumatic Brakes. Bleeding of Brakes.

Course Contents:

Detailed content of the unit:

1. Inspection of Crank Shaft, Assessment of workability and determination of undersize condition of journals. Setting procedure of Crank Shaft of Multi cylinder Engines in Crank Shaft regrinding machine for grinding both crank pin and mail Journals, Check for Eccentricity cranks.
2. Removal of cylinder liners and setting fining of new lines.

3. Measurement of cylinder bores, Ovality and Taper Boring procedure for Multi cylinder Engines, Honing and lapping.
4. Valve refacing in valve refacer machine, Valve Seat cutting setting and grinding to match with valves. Lapping of Valves.
5. Testing of fuel Injectors in fuel Injector Tester. Phasing and calibration of F.I.P.
6. Steering Geometry. Checking and adjustment of camber, caster, toe-in, toe-out, KPI, SAI.
7. Servicing and adjustment of Mechanical, Hydraulic and Pneumatic Brakes. Bleeding of Brakes Practice in brake drum lathe, measuring ovality shimming the brake drum.

References: -

1) "Automotive Service: Inspection, Maintenance, Repair" by Tim Gills.
2) "Auto Repair and Maintenance" by Dave Stribling.

Automobile Electrical Lab

Course Code	AEPC504
Course Title	Automobile Electrical Lab
Number of Credits	04 (L: 0, T: 0, P: 04)
Prerequisites	NIL
Course Category	Programme core course-18

Course outcomes:-

After completing this course, student will be able to:

1) Demonstrate constructional details & working principle of battery.
2) Understand the various function of coil ignition system.
3) Understand the charging system & various components & constructional details of dynamo.
4) Demonstrate the complete wiring circuit of an Indian vehicle.
5) Describe the various components and the function of Electronic Ignition system.

Course Contents:

Number of class hours:

Detailed content of the unit:

1. Study, testing and sketching of constructional details and working principle of battery.
2. Study, testing and sketching of various components and the functions of coil ignition systems.
3. Study, testing and sketching of starting system and the constructional details of self starter.
4. Study, testing and sketching of various components and the constructional details of dynamo.
5. Study, testing and sketching of charging system and the constructional of dynamo.
6. Practice of head light beam setting.
7. Testing dipper switch, flasher unit and indicator circuits and fault tracing.
8. Study, testing and sketching of different types of horn and relay.
9. Study, testing and sketching of complete wiring circuit of an Indian vehicle (two-wheeler and four-wheeler).
10. Study, testing & sketching of various components and their function of Electronic Ignition system.

References: -

7) Barry Hollenbeck, "Automotive Electricity Electronics And Computer controls" Delmar Publishers.

8) James Haldeman, "Diagnosis and troubleshooting of Automotive Electrical Electronics and Computer Engineering".

Automotive Electrical and Service Station Management

Course Code	AEPE505/A
Course Title	Automotive Electrical and Service Station Management
Number of Credits	03 (L: 3, T: 0, P: 0)
Prerequisites	NIL
Course Category	Programme elective course-2

Course outcomes:-

After completing this course, students will be able to:

1) Understand the different types of battery and the factors affecting the battery life.
2) Describe the construction and working of starting system, alternator.
3) Identify the purpose of ignition system and classification of ignition system on the basis of various conditions.
4) Describe about Engine and Chassis maintenance& management.
5) Understand about Service station management.

Course Contents:

Module - I: Battery

Number of class hours: 05

Suggestive Learning Outcomes:
1. Describe various kinds of battery.
2. Define the factors affecting battery life.

Detailed content of the unit:
Lead Acid Battery, General construction. Working principle. Battery voltage, Battery rating, Battery Capacity. Battery Testing-Specific gravity testing, open voltage testing, High discharge test and cadmium test. Battery charging. Battery defects. Alkaline Batteries- construction, working principle of Nickel-Iron battery, Nickel-cadmium battery and Silver-Zinc battery. Comparison between Alkaline & Lead-Acid battery.

Module - II: Starting system, charging system & Wiring system

Number of class hours: 06

Suggestive Learning Outcomes:
1.Describe the construction of starting system.
2. Define the operation of alternator.

Detailed content of the unit:

Purpose, construction and operation of starting system. Starting motor torque and power requirement. Starting motor Drives- Bendix drive, overrunning clutch etc.
General construction of Automotive Generator and alternator. Advantage and disadvantages of dynamo and Alternator drives. Cut out Relay.
Various lighting circuits Heat lamp types and constructional details. Vertical and Slide control of lights Fog light, Slide light, Brake light, indicator lights, and instrument light, reverse light, parking light. Lighting System Troubleshooting. H.T. cables and L.T. cables-their applications Cable color codes. Wiring harness, cable connections and fuses. Wiring diagram of vehicle.

Module - III: Ignition Systems

Number of class hours: 06

Suggestive Learning Outcomes:
1. Explain the need of ignition system.
2. Understand the components of ignition system & their works.

Detailed content of the unit:

Contact point Ignition system (Battery Ignition and Magneto ignition Constructional details of coil, distributor, condenser, Magneto. Cam angle, Ignition timing. Ignition Advancing Mechanism (centrifugal & vacuum), Comparison between Battery and Magneto Ignition System, Spark plugs- constructional details, classification as per reach, heat range, diameter, care and maintenance of spark plugs. Electronic Ignition System, Electronic Spark Control, Electronic Spark advance. Comparison with conventional system. Distributor less Ignition System. Ignition System Troubleshooting.

Module - IV: Maintenance Management, Engine & Chassis maintenance.

Number of class hours: 06

Suggestive Learning Outcomes:
1. Describe about different maintenance system.
2. Define about Engine and Chassis maintenance.

Detailed content of the unit:

Preventive Maintenance System. Schedule Maintenance System. Break down Maintenance System. Comparison between Preventive Maintenance and break down Maintenance, Engine Turning, Turning of carburetors (adjustment of Idle Speed, Metering Pin adjustment, Float level adjustment etc.) Phasing and calibration of F.I.P. setting and testing of Injectors, Cylinder reboring, ovality, taper, cylinder honing and Ridge cutting, crank shaft Inspection for wear and ovality. Necessity of wheel alignment and its procedure, Care of wheels and tyres, reclaiming and retreading of tyres, vulcanizing. Frame repairs and alignment. Focusing of Head lamp and maintenance of Electrical accessories. Adjustment of Doors and locks. Denting, Painting. Painting equipment, faults in painting. Chassis lubrication and Lubrication Chart.

Module - V: Service Station Tools and Equipment.

Number of class hours: 06

Suggestive Learning Outcomes:
1. Understand about Service station management.
2. Describe the various measuring and testing equipments.

Detailed content of the unit:

Factors influence the site selection of a Service Station. Layout of Service Station. Organizational setup of Service Station. Machine tools and tools used in automobile repairing. Shop-cutters, Pullers, Stud-extractor, Torque wrench, Piston-ring expander, Piston ring groove cleaner.
Measuring and Testing Equipments – Feeler gauge, Cylinder bore gauge, Compression gauge, Ignition timing tester, Spark plug tester, Cam angle tester, tyre inflator gauge, Micrometer, Calipers and their maintenance.
Vehicle Service Equipments- Air Compressor, Fuel Pump, Water Pump, Oil Sprayer and Lubricators. Lifts and Hoists. Voltage current and resistor tester, Coil condenser tester, Tachometer, Exhaust gas analyzer.

References: -

1) Barry Hollenbeck, "Automotive Electricity Electronics and Computer controls" Delmar Publishers.
2) James Haldeman, "Diagnosis and troubleshooting of Automotive Electrical Electronics and Computer Engineering".

Environmental Pollution and Control

Course Code	AEPE505/B
Course Title	Environmental Pollution and Control
Number of Credits	03 (L: 3, T: 0, P: 0)
Prerequisites	NIL
Course Category	Programme elective course-2

Course outcomes:-

After completing this course, student will be able to:

1) Know the global importance of clean environment.
2) Classify the pollutants.
3) Know the sources of pollutants.
4) Understand effect of pollutants on environment & economy.
5) Know about environment & control acts & ISO14000 standards & Operate pollution control devices.

Course Contents:

Module - I: Introduction

Number of class hours: 05

Suggestive Learning Outcomes:
1. Understand the importance of clean environment.
2. Know about the control acts & ISO 14000 standards.

Detailed content of the unit:
Environment, Ecosystem, Classification of pollution & pollutants, Environment &pollution control acts, ISO 14000 standards, Kyoto treaty/ protocol, carbon units.

Module - II: Air Pollution

Number of class hours: 05

Suggestive Learning Outcomes:
1. Describe the classification of pollutants.
2. Know the causes of pollution due to Automobile design.

Detailed content of the unit:
Sources & classification of air pollution, Effects of air pollution on human health, Effects of air pollution on economy, Photochemical air pollution, Air pollution from major Industrial operations e.g. Fertilizer industries aluminium manufacturing plants, Acid plants, Cement industries, Coal & tar industries, paper industries, Refinery & petrochemical industries. Air pollution due to Automobiles- design and operating parameters and methods of control Pollution due to S. I. Engines, Design &operating parameters responsible for emission and methods of pollution control. Pollution due to C.I. Engines. Design & operating parameters responsible for emission and methods of pollution control. Air quality & emission standards of India & Europe. Air pollution in Indian metro cities-Delhi, Mumbai, Chennai, Kolkata

Module - III: Water Pollution

Number of class hours: 05

Suggestive Learning Outcomes:

1. Analyse the causes & effects of water pollution.
2. Describe the steps of water treatment.

Detailed content of the unit:

Sources of water pollution: Effects of water pollution. Water pollution analysis, Physical examination of water. Chemical characteristics of water, Biological investigation of water. Definitions of Important terms used in water pollution – Dissolved 0_2 .Chemical 0_2 demand, Biological 02 demand, Theoretical 02demand,Total solids, Total suspended solids, Total dissolved solids, Turbidity, Alkalinity, Acidity, Water quality standards, Steps in Water treatment, Sampling & analysis of water pollution.

Module - IV: Noise Pollution

Number of class hours: 04

Suggestive Learning Outcomes:

1. Describe the types of noise pollution.
2. Know the effects of noise pollution on health.

Detailed content of the unit:

Definitionofnoise. Sources of noise. Types of noise -Impulsive & sonic noise. Effects of noise on health. Noise measurement. Noise mapping.

Module - V: Other Types of Pollution

Number of class hours: 05

Suggestive Learning Outcomes:

1. Define the causes of soil, chemical pollution.
2. Understand Greenhouse effect & Acid rain & Ozone depletion.

Detailed content of the unit:

Solid waste:

Classification of solids, Solid waste management, Method of solid waste disposal, Reuse, Recycling & recovery of materials from refuse, Soil pollution, Chemistry of soil, Soil irrigation **by** effluents. Agricultural pollution, Radiation pollution, Sources & effects of radiation, Radiation exposure standards, Radiation protection, Treatment & disposal of radiation waste.

Global pollution

Greenhouse effect. Acid rain. Ozone depletion problem.

References: -

6) M.N.Rao&H.V.N.Rao, "Airpollution" TataMcGrawHill.
7) P.Meenakshi, "ElementsofEnvironment Science&Engineering" Prentice-Hall.
8) S. Deswal & A. Deswal, "A basic course in environmental studies" Dhanpat Rai and Sons.

Motor Vehicle Act

Course Code	AEPE506/A
Course Title	Motor vehicle Act
Number of Credits	03 (L: 03, T: 0, P: 0)
Prerequisites	Nil
Course Category	Programme elective course-3

Course Outcomes: -

1) Memorizing definition and provisions of MVA act and awareness of licensing of drivers and conductors.

2) Explaining registration of motor vehicles, permit, and control of traffic.

3) Illustrating road signs and duties of driver, conductors, helper etc.

4) Understanding taxation of motor vehicle.

5) Summarizing insurance of motor vehicle.

Course Content:-

Module- 1: Salient features of M.V. Act

Number of class hours: 06

Suggestive Learning Outcomes: 1) Remembering definition and provisions of M .V. Act.
2) Identifying necessity of driving licenses.

Detailed content of the unit: -
Definition and provisions (salient features of M.V. Act) Licensing of drivers and conductors of motor vehicle: - Necessity, different types, restriction, effectiveness, renewal, revoking of driving licenses and power licensing authority. Necessity, grant, revocation and power of licensing authority.

Module- 2: Registration & control of Transport.

Number of class hours: 06

Suggestive Learning Outcomes: 1) Analyzing registration of motor vehicle.
2) Illustrating control of Transport.

Detailed content of the unit:
Registration of motor vehicle.(old and new) - Necessity, how to made , renewal, transfer of ownership, cancellation, suspension, certificate of fitness, registration of motor vehicle belonging to central govt. ,power of state govt. and central govt. to make rules.) Control of Transport: - Permit and exemption in permit) Offences, penalties and procedures') Control of traffic.

Module- 3: Road Safety

Number of class hours: 06

Suggestive Learning Outcomes: 1) Explaining road signs motor vehicles
2) Analysing duties of drivers, conductors, and helper.

Detailed content of the unit:
Road Safety:
- Road signs, imposition of penalties for violation of Act and articles, duties of drivers, duties of conductors, duties of helper.

Module- 4: Taxation

Number of class hours:06

Suggestive Learning Outcomes: 1) Summarizing meaning of taxation.
2) Expressing method of paying tax.

Taxation: - meaning of taxation, taxation structure for two wheeler, three wheeler, goods and passenger vehicles, Method of paying tax (one time tax), Tax exemption of motor vehicle.

Module- 5: Insurance

Number of class hours:06

Suggestive Learning Outcomes: 1) Understanding meaning of insurance.
2) Expressing procedure of accident claim and duty of driver in case of accident.

Detailed content of the unit:

Insurance: - meaning of insurance, difference between assurance and insurance. Motor vehicle insurance- comprehensive, third party, no fault liability fund,. Procedure of accident claim settlement. Furnishing of particulars of vehicles involve in accident. Duty of driver in case of accident and injury.

References: -

1. Law Publishers (India) Pvt. Ltd.,"L.P.'s, The Motor Vehicles Act, 1988",
2. T. N. Shukla, "The Motor Vehicles Act, 1988".

3. Introduction of Basic Manufacturing Processes and Workshop Technology – Rajender Singh, New age International (P) Ltd. New Delhi, 2006.
4. Production Technology – HMT, 18th edition, Tata McGraw Hill, New Delhi.
5. Manufacturing process – Myro N Begman, Tata McGraw Hill, New Delhi.

Transportation Management

Course Code	AEPE506/B
Course Title	Transportation Management
Number of Credits	03 (L: 3, T: 0, P: 0)
Prerequisites	NIL
Course Category	Programme elective course-3

Course outcomes:-

After completing this course, student will be able to:

1) Define the basic concepts of Motor Vehicle Act.
2) Understand the basic concepts of Transportation Management.
3) Understand; prepare the different documents used in transport organization.
4) Create awareness of ideal driving which includes safety, legal aspects.
5) Understand the purpose of research institutes in India, which are working on advancements of automobiles rather than adopting the idea of reverse engineering.

Course Contents:

Module - I: Introduction to transport management

Number of class hours: 07

Suggestive Learning Outcomes:
1. Summarize the concept of MVA.
2. Describe the need of Insurance and Taxation of vehicle

Detailed content of the unit:
Motor Vehicle Act: Short titles used in MVA, Definitions, Terms regarding vehicle.

Licensing of Drivers of Motor Vehicle: Necessity, Age limit, Responsibility of owners, Restriction on holding a driving license, General, Preliminary test and driving test. Conductor's license: Necessity, Eligibility, Documents required and rules for conductors. Registration of Vehicles: Necessity, where to be made, how to be made, Temporary registration, Production of vehicle at the time of registration, Form and manner of display of registration mark, Size of letters and numerals of registration mark, Transfer of Ownership of Motor Vehicle. Construction of Motor Vehicle: Overall dimensions, General provision regarding construction and maintenance of motor vehicle. Power of central government to make rules, Taxation: Objectives, Basis of taxation, Methods of levying tax, Tax exemption. Insurance: Motor Vehicle Insurance, No-fault liability, Procedure for accident claim.

Module - II: Transport Management

Number of class hours: 07

Suggestive Learning Outcomes:
1. Define the basics of transport management.
2. Describe the policies of transport management.

Detailed content of the unit:
Terms used in transportation: Road transport service, Transport vehicle, Public service vehicle, Goods vehicle, Public place, Depot, Route, Trip, Time table, Vehicle schedule, Fare. Requirements of goods and passenger transport on the basis of-Volume, type, weight of material, class of passenger. Basic elements in Transport Management, Legal compliance: Documents required as per MVA, Registration. Policies of transport organization: Policies towards passenger, employees, like Long distance service, Express service, Night service and others. Freight calculation:
Time base, Distance base, Structure of fare, fixed cost- Maintenance cost, depreciation cost, insurance, interest on capital, variable cost, Hiring of trucks, Toll, staff wages, Miscellaneous cost.
Recordkeeping: Log book, Trip operational sheet, Vehicle ledger, Truck history card, Monthly operational sheet, Goods consignment note, various types of bookings, Use of Computer

Module - III: Estimation and Valuation of Vehicle

Number of class hours: 05

Suggestive Learning Outcomes:
1. Understand the role of surveyor
2. Summarize the factors that need to consider during buying a car.

Detailed content of the unit:
Role of surveyor, Procedure of survey and valuation of vehicle, Accident survey report, Importance of warranty system and protection of law

Buying a new vehicle: Factors to be considered-
Ex-show room price and on road price, use of vehicle, when and where to buy, Closing the deal, Running in. Inspecting the vehicle, Ventilation, Safety, Boot, Interior Storage.
Buying a used vehicle:
When & where to buy: Dealers, used car firms, Private sellers, Garages, Auctions.
Factors to be considered-- Depreciation, Model and year, Oil leak, Oil Pressure, Exhaust, Battery, Odometer, Bonnet
Crash damage, Rust, Suspension damage, Tyres, Switches & accessories, Lights, Chrome, Wiring, Steering, Hydraulic System, Structural corrosion, Floor, Test drive.

Module - IV: Driving skills

Number of class hours: 05

Suggestive Learning Outcomes:
1. Understand the instructions need to be obey during driving of motor vehicle.
2.Learn about the different traffic signs.

Detailed content of the unit:

Instructions in driving of motor vehicle:
Driving theory, traffic education, light vehicle driving practice, Vehicle mechanism & repair, Public relations for drivers, Fire hazards, vehicle maintenance, first aid.
Traffic signs: Mandatory signs, Cautionary signs, Informatory signs. Traffic-signals, causes of accident and remedies, Measures to avoid accidents, Defensive driving, Rain and flood, fog and mist, snow and ice
Fitness to drive: Driving and age, stress due to traffic jam, night driving.

Module - V: Functions & **Role in Automobile Industry**

Number of class hours: 04

Suggestive Learning Outcomes:
1. Understand the role of automotive institutes.

Detailed content of the unit:

Various Research Organizations like- Central Institute of Road Transport.
Automotive Research Association of India, Vehicle Research, Development & Establishment. Central Road Research Institute. Petroleum Conservation & Research

Association

References: -

1) Dr. P. Sudarsanam "Bus station Management", CIRT, Pune.
2) O. P. Khanna, "Industrial Organization &Management", Dhanpat Rai & sons.

Summer Internship-II

Course Code	AESI-507
Course Title	Summer Internship-II
Number of Credits	3 (L: 0, T: 0, P: 0)
Prerequisites	Fundamental and basic practical skills of relevant discipline/programme
Course Category	Internship

Internships may be full-time or part-time; they are full-time in the summer vacation and part-time during the academic session.

Sl. no.	Schedule	Duration	Activities	Credits	Hours of Work
1	Summer Vacation after 4th Semester	6 Weeks	Industrial/Govt./NGO/MSME/ Rural Internship/Innovation / Entrepreneurship ##	3	120 Hours

(##During the summer vacation after 4th Semester, students are ready for industrial experience. Therefore, they may choose to undergo Internship /Innovation /Entrepreneurship related activities. Students may choose either to work on innovation or entrepreneurial activities resulting in start-up or undergo internship with industry/ NGO's/ Government organizations/ Micro/ Small/ Medium enterprises to make themselves ready for the industry. In case a student want to pursue his/her family business and don't want to undergo internship, a declaration by a parent may be submitted directly to the TPO.)

Course Outcome: -

After completion of the course, students will be able to:

C.O.1: Describe a better understanding of the engineering / technological workplace (K2).

C.O.2: Develop and demonstrate workplace competencies necessary for professional and academic success (K2).

C.O.3: Classify career preferences and professional goals (K3).

C.O.4: Develop preliminary portfolio including work samples from the internship (K2).

C.O.5: Increase competitiveness for full-time engineering employment / start-up (K3).

Course Content:-

Internships are educational and career development opportunities, providing practical experience in a field or discipline. The Summer Internship-II is a student centric activity that would expose Technical students to the industrial environment, which cannot be simulated in the classroom and hence creating competent professionals for the industry. They are structured, short-term, supervised placements often focused around particular tasks or projects with defined timescales. An internship may be compensated, non-compensated or some time may be paid. The internship has to be meaningful and mutually beneficial to the intern and the organization. It is important that the objectives and the activities of the internship program are clearly defined and understood. Following are the intended objectives of internship training:

1. Will expose Technical students to the industrial environment, which cannot be simulated in the classroom and hence creating competent professionals for the industry.
2. Provide possible opportunities to learn, understand and sharpen the real time technical / managerial skills required at the job.
3. Exposure to the current technological developments relevant to the subject area of training.
4. Experience gained from the 'Industrial Internship' in classroom will be used in classroom discussions.
5. Create conditions conducive to quest for knowledge and its applicability on the job.
6. Learn to apply the Technical knowledge in real industrial situations.
7. Gain experience in writing Technical reports/projects.
8. Expose students to the engineer's responsibilities and ethics.
9. Familiarize with various materials, processes, products and their applications along with relevant aspects of quality control.
10. Promote academic, professional and/or personal development.
11. Expose the students to future employers.
12. Understand the social, economic and administrative considerations that influence the working environment of industrial organizations
13. Understand the psychology of the workers and their habits, attitudes and approach to problem solving.

Overall compilation of Internship Activities / Credit Framework:

Major Head of Activity	Credit	Schedule	Total Duration	Sub Activity Head	Proposed Document as Evidence	Evaluated by	Performance appraisal/ Maximum points/ activity
Innovation / IPR / Entrepreneurship	3	Summer Vacation after 4th Semester	6 Weeks	Participation in innovation related completions for eg. Hackathons etc.	Certificate	Faculty Mentor	Satisfactory/ Good/ Excellent
				Development of new product/ Business	Certificate	Programme Head	Satisfactory/ Good/ Excellent

				Plan/ registration of start-up			
				Participation in all the activities of Institute's Innovation Council for eg: IPR workshop/ Leadership Talks/ Idea/ Design/ Innovation/ Business Completion/ Technical Expos etc.	Certificate	President/ Convener of ICC	Satisfactory/ Good/ Excellent
				Work experience at family business	Declaration by Parent	TPO	Satisfactory/ Good/ Excellent
Internship	3	Summer Vacation after 4th Semester	6 Weeks	(Internship with Industry/ Govt. / NGO/ PSU/ Any Micro/ Small/ Medium enterprise/ Online Internship	Evaluating Report	Faculty Mentor/ TPO/ Industry supervisor	Satisfactory/ Good/ Excellent
Rural Internship	3	Summer Vacation after 4th Semester	6 Weeks	Long Term goals under rural Internship	Evaluating Report	Faculty Mentor/ TPO/ NSS/ NCC head	Satisfactory/ Good/ Excellent

STUDENT'S DIARY/ DAILY LOG

The main purpose of writing daily diary is to cultivate the habit of documenting and to encourage the students to search for details. It develops the students' thought process and reasoning abilities. The students should record in the daily training diary the day-to-day account of the observations, impressions, information gathered and suggestions given, if any. It should contain the sketches & drawings related to the observations made by the students.

The daily training diary should be signed at the end of each day by the supervisor/ in charge of the section where the student has been working. The diary should also be shown to the Faculty Mentor visiting the industry from time to time and get ratified on the day of his visit.

Student's Diary and Internship Report should be submitted by the students along with attendance record and an evaluation sheet duly signed and stamped by the industry to the Institute immediately after the completion of the training. It will be evaluated on the basis of the following criteria:

a) Regularity in maintenance of the diary.
b) Adequacy & quality of information recorded.
c) Drawings, sketches and data recorded.
d) Thought process and recording techniques used.
e) Organization of the information.

INTERNSHIP REPORT

After completion of Internship, the student should prepare a comprehensive report to indicate what he has observed and learnt in the training period. The student may contact Industrial Supervisor/ Faculty Mentor/TPO for assigning special topics and problems and should prepare the final report on the assigned topics. Daily diary will also help to a great extent in writing the industrial report since much of the information has already been incorporated by the student into the daily diary. The training report should be signed by the Internship Supervisor, TPO and Faculty Mentor. The Internship report will be evaluated on the basis of following criteria:

a) Originality.
b) Adequacy and purposeful write-up.
c) Organization, format, drawings, sketches, style, language etc.
d) Variety and relevance of learning experience.
e) Practical applications, relationships with basic theory and concepts taught in the course.

Major Project - I

Course Code	AEPR-509
Course Title	Project II
Number of Credits	1 (L: 0, T: 0, P: 2)
Prerequisites	Nil
Course Category	Project Work (PR)

Course Outcome:-

After completion of the course, students will be able to:

C.O. 1: Demonstrate a sound technical knowledge of their selected project topic and the knowledge, skills and attitudes of a professional engineer (K2).

C.O. 2: Develop the skill of working in a Team (K3).

C.O. 3: Design engineering solutions to complex problems utilising a systems approach (K6).

C.O. 4: Design the solution of an engineering project involving latest tools and techniques (K6).

C.O. 5: Develop the skill of effective communication with engineers and the community at large in written an oral forms. (K3)

Course Content:-

The major project topic should be selected / chosen to ensure the satisfaction of the urgent need to establish a direct link between education, national development and productivity and thus reduce the gap between the world of work and the world of study. The course should have the following-

1) Develop sound knowledge about the domain of the project work.
2) Perform detailed study about various components of a project.
3) Learn to be an important member of a team for successful execution of a project work.

4) Study about methodologies and professional way of documentation and communication related to project work.
5) Develop idea about problem formulation, finding the solution of a complex engineering problem.
6) Develop project report as per the suggested format to communicate the findings of the project work.
7) Acquire the skill of effective oral communication to the fellow engineers and people in the society at large.
8) Knowledge of how to organize, scope, plan, do and act within a project thesis.
9) Familiarity with specific tools (i.e. hardware equipment and software) relevant to the project selected.
10) Demonstrate the implementation of a major project work.

Semester VI

Sl. No.	Category	Code No.	Course Title	Hours per week			Total Contact Hrs/Week	Credit
				L	T	P		
1	Programme core course19	AEPC601	Automotive Transmission	3	0	0	3	3
2	Programme Core course20	AEPC602	Automobile Repair and Maintenance Shop-II	0	0	4	4	2
3	Programme elective course-4	AEPE603/A	Farm Machinery	3	0	0	3	3
		AEPE603/B	Earth Moving Equipment					

4	Humanities and Social Science course- 5	HS 604	Entrepreneurship and Start-up's	3	1	0	4	4
5	Open elective-2	(Any one to be selected from Annexure-II)		3	1	0	4	4
6	Mandatory Course-2	AU 606	Indian Constitution	2	0	0	2	0
7	Major Project	AEPR 607	Project III	0	0	6	6	3
8	Seminar	AESE 608		2	0	0	2	1
			Total					**20**

AUTOMOTIVE TRANSMISSION

Course Code	AEPC601
Course Title	Automotive Transmission
Number of Credits	3 (L: 3, T: 0, P: 0)
Prerequisites	Nil
Course Category	Programme core course

Course Outcomes: - By the end of the course, the students are expected to

CO1: Understand the constructional, working principle of various types clutches. construction and working mechanism of Gearbox. (K2)

CO2: Demonstrate the construction and working mechanism of Gearbox and calculate the Forward and Reverse Gear Ratio for different vehicles. (K3)

CO3: Analyze the constructional, working principle of Automatic Transmission & its drives. (K4)
CO4: Explain the construction and working of Universal Joints and Propellor Shaft. (K2)
CO5: Describe the working of Differential and Rear Axle Drives. (K2)

Course Content:-

Module- 1: Automotive Clutch

Number of class hours: 6 Hrs.

Suggestive Learning Outcomes:

1) Classify different types of Clutches.
2) Explain the Construction Details and working of clutch.
3) Identify Common faults and remedies.

Detailed content of the unit: -

Automotive Clutch: Necessity, Function and requirements of Automotive Clutch Types of Automotive Clutch. Construction Details of Single Plate and Multiplate (wet & Dry) clutch. Centrifugal and Semi-Centrifugal Clutch. Construction Details and working of Pressure Springs,
Torsional Springs, Friction Disc and Friction Material. Clutch Linkage, Clutch Free Pedal Play. Clutch Adjustments. Self-Adjusting Clutch. Hydraulic Clutch Linkage. Fluid Flywheel, Comparison with conventional clutch. Common faults and remedies.

Module- 2: Manual Transmission

Number of class hours: 6 Hrs.

Suggestive Learning Outcomes:

1) Classify different types of Gear Box.
2) Explain Necessity and Function of the Transmission (Gear Box).
3) Calculate Forward and Reverse Gear Ratio for different vehicles..

Detailed content of the unit: -

Manual Transmission: Necessity and Function of the Transmission (Gear Box). Types of Gear Box – Sliding mesh, Constant mesh & Synchromesh. Construction Details and Working principle of various types of Gearboxes and comparison between them. Forward and Reverse Gear Ratio for different vehicles. Gear Shift Mechanism. Common faults and remedies**.**

Module- 3: Automatic Transmission

Number of class hours: 6 Hrs.

Suggestive Learning Outcomes:

1) Demonstrate the Elements of Automatic Transmission.
2) Explain the construction & working of three-member Epi-cyclic gearbox.
3) Compare Automatic Transmission and Conventional Transition System.

Detailed content of the unit: -

Automatic Transmission: Elements of Automatic Transmission. Principle of Epi-cyclic Gearing. Function, Construction & Working of Three-member epi-cyclic Gearbox. Torque Converter. Freewheel (Overrunning Clutch). Overdrive Mechanism. Semi-Automatic Transmission, Control System. Comparison with Conventional Transition System.

Module- 4: Universal Joints and Propellor Shaft (Drive Lines)

Number of class hours: 6 Hrs.

Suggestive Learning Outcomes:

1) Describe working of Universal Joints and Propellor Shaft.
2) Identify Universal Joints and Propellor Shaft.

Detailed content of the unit: -

Universal Joints and Propellor Shaft (Drive Lines): Necessity of Universal Joints. Types of Universal Joints. Constructional details of Hooke's Joint Limitation of Hooke's Joint. Constant Velocity Joint. Propeller Shaft, Function and constructional details. Driveline for front wheel drive. Driveline for rear engine, rear wheel drive. Whirling of shaft, Two-piece Propeller Shaft. Common faults and remedies.

Module- 5: Final Drive and Differential & Rear Axle & Rear Axle Drives

Number of class hours: 6 Hrs.

Suggestive Learning Outcomes:

1) Describe the Final Drive and Differential.
2) Explain the Rear Axle Drives.

Detailed content of the unit: -

Final Drive and Differential: Necessity of Final Drive. Gear types for Final Drive, Their comparison. Final Drive Ratio, Overall Ratio. Differential – Necessity and Working Principle. Differential lock, Differential Slip. Common troubles and remedies.
Rear Axle and Rear Axle Drives: Types of Rear Axle – Semi Floating, Three quarter Floating and Fully Floating. Rear Axle Drives-Hotch kiss Drive, Torque Tube Drive, Comparison between two. Rear Axle Casing Two wheel and Four-Wheel Drive, Transfer Case.

Reference Books:
1. Automobile Engineering Vol I, II, Kirpal Singh, Standard Publishers Distributors, Delhi. 2012.
2. Automobile Mechanics, A.K. Babu, S.C. Sharma, Khanna Publications, New Delhi

3. Automotive Mechanics: Principles and Practices, Joseph Heitner, East West Press
4. Automotive Mechanics, S. Srinivasan, 2nd Edition, Tata McGraw Hill
5. Automobile Engineering Vol I and Vol II, K. M. Gupta, Umesh Publications.
6. Automotive Engineering, Jain and Asthana, Tata McGraw Hill.

Automobile Repair and Maintenance Shop-II

Course Code	AEPC602
Course Title	Automobile Repair and Maintenance Shop-II
Number of Credits	02(L: 0, T: 0, P: 4)
Prerequisites	Automobile Repair and Maintenance Shop-I
Course Category	Programme core course-20

Course Outcomes: - By the end of the course, the students are expected to

1) Understand the servicing of suspension system.
2) Perform the Wheel Balancing, both in Static and Dynamic.
3) Explain about different type of steering gear box.
4) Perform the servicing of differential assembly.
5) Perform the Servicing/Overhauling of Petrol and Diesel Engine.

Course Content:-

Number of class hours:

Detailed content:

1) Servicing of suspension system. Leaf springs, coil springs, torsion bar, Telescopic Shock absorber.
2) Wheel Balancing. Static and Dynamic.
3) Practice in Brake shoe riveting and de-riveting.
4) Servicing of Steering system-different type of steering gear box wheel lock Angle, calculation of turning circle radius for different vehicles.

5) Servicing of Differential Assembly. Calculation of Final Drive Ratio.
6) Servicing/Overhauling of Petrol Engine.
7) Servicing/Overhauling of Diesel Engine

References: -

1) "Automotive Service: Inspection, Maintenance, Repair" by Tim Gills.
2) "Auto Repair and Maintenance" by Dave Stribling.

Farm Machinery

Course Code	AEPE603/A
Course Title	Farm Machinery
Number of Credits	3(L:3, T:0, P:0)
Prerequisites	Automobile Engine and Machine Tools
Course Category	Programme Elective Course

Course Outcomes: - By the end of the course, the students are expected to

CO1: Describe about different types of primary tools and machines used in farming.

CO2: Describe about different types of transplanting machines used in farming.

CO3: Explain about different types of threshers and basic shovels used in farming.

CO4: Explain about harvesting machinery used in farming.

CO5: Describe about plant protection equipment used in farming.

Course Content: -

Module- 1: Primary Tools and Machines used for Farm Machinery

Number of class hours: 6 hrs.

Suggestive Learning Outcomes:

1) Can describe about traditional tools used in farming.

2) Can Explain about the constructional feature of a tractor.

Detailed content of the unit:
Primary Tools and Machines used for Farm Machinery: Importance of farm machinery, Traditional Hand Tools used in Farming, weed control hand tools and Mowers, Tillage: processes involved in tillage- tools used in tillage, types of tractors – wheel and crawler mounted tractor – essential features, chassis, steering mechanism, braking system, transmission system – clutch mechanism, gear box, differential mechanism & final drive, hydraulic transmission, P.T.O. shaft, draw bar, power tiller, factors of selection of tractor. Trouble shooting, care & maintenance. Attachments In Power Tiller: Purpose, Methods and uses.

Module- 2: Transplanting Machinery

Number of class hours: 6 hrs.

Suggestive Learning Outcomes:

1) Can Explain about rice transplanter and its constructional features with uses.
2) Can explain about seed drill and rippers and their constructional features.

Detailed content of the unit: -
Transplanting Machinery: Rice Transplanter: Types and constructional features, uses. Seed Drill: Types and constructional features, uses. Rippers: Description, constructional features, function and uses

Module- 3: Thresher and Basic Shovel

Number of class hours: 6 hrs.

Suggestive Learning Outcomes:

1) Can describe about the constructional features of a thresher and power thresher.
2) Can describe about various types of basic shovel and their particular uses.

Detailed content of the unit: -

Thresher and Basic Shovel: Types of threshers, functions, Power thresher, Components of power thresher, constructional features, components of cleaning unit of power thresher. Wire loop type thresher, Respbar type thresher, Shovel: types of shovels, power shovel, dipper shovel, drag line, clam shell, back hoe, revolving shovels, and their mechanism

Module- 4: Harvesting Machinery

Number of class hours: 6 hrs.

Suggestive Learning Outcomes:

8) Can explain various types of harvesting machine with uses.
9) Can explain about combine harvester used in farming.

Detailed content of the unit: -
Harvesting Machinery: History of development of harvesting, manual harvesting tools, sickle and its classification, Combine harvester: Types – Functions – Advantages. Short description of -reapers, binders, forge harvester, vegetable harvester, Simple manual fruit harvester.

Module- 5: Plant Protection Equipment

Number of class hours: 6 hrs.

Suggestive Learning Outcomes:

8) Can explain the purpose of plant protection equipment.
9) Can describe about sprayer, duster and nozzle used in farming.

Detailed content of the unit: -
Plant Protection Equipment: Purposeof plant protection equipment,Sprayer and duster: different types sprayer and duster – their components and functions, hydraulic sprayer (High volume sprayer), hand sprayer, compressed and lever operated knapsack sprayer. Nozzle: types of nozzle and functions of nozzle.

References: -

7) Farm tractor maintenance and repair - A K Jain, standard Publishers and Distributors, New Delhi.
8) Principles and application of Technologies in agriculture farm machinery – Er. Sanjay Kumar, Kalyani Publishers, New Delhi.
9) Principle of farm machinery- R A Kepner, Roy Bainer, E L Barger, CBS Publishers and Distributors Pvt. Ltd., New Delhi.
10) A Textbook of Farm Machinery & Power Engineering- by Basavaraj, D Srigiri, Jayan P R. New India Publishing Agency, New Delhi.
11) Farm Machinery- Singh Triveni Prasad, PHI.

Earth Moving Equipment

Course Code	AEPE603/B
Course Title	Earth Moving Equipment
Number of Credits	03 (L: 3, T: 0, P: 0)
Prerequisites	NIL
Course Category	Programme elective course-4

Course outcomes:

After completing this course, student will be able to:

6) Describe the function and uses of dump trucks.

7) Explain the function of dozers and rollers.

8) Explain the features and uses of graders & loaders.

9) Explain the function of Cranes, Scrapers & Fork Lift.

10) Understand Latest developments and automation of earth moving equipment.

Course Contents:

Module - I: Introduction & Dump Trucks

Number of class hours:

Suggestive Learning Outcomes:
1.Outlining the different earth moving equipment.
2. Explain the function of dump trucks.

Detailed content of the unit:

Different earth moving equipment, outlines of their uses.
Dump Trucks: Classification, description, function and uses. Constructional features, body box, tail gate, hoist, trailers.

Module - II: Dozers & Rollers

Number of class hours:

Suggestive Learning Outcomes:

1.Explain the features and function of dozers.
2. Describe the power transmission of roller.

Detailed content of the unit:

Dozers: Description, constructional features, function and uses, types of dozers, Bulldozer – blade, push arm, pitch arm, hydraulic lift, mechanical and power tilt, under-carriage units.

Rollers: Types roller, types of engine, uses, chassis, power transmission, steering mechanism, braking and loading operation, care and maintenance.

Module - III: Graders & Loaders

Number of class hours:

Suggestive Learning Outcomes:

1. Understand the function of graders.
2. Explain the features and function of loaders

Detailed content of the unit:

Graders: Description, constructional features, classification, function and uses

Loaders: Description, constructional features, function and uses of different types of loaders, belt loader.

Module - IV: Cranes, Scrapers & Fork Lift

Number of class hours:

Suggestive Learning Outcomes:
1. Understand the basic of Cranes, Scrapers and Fork Lift.
2. Explain the mechanism of Cranes, Scrapers and Fork Lift.

Detailed content of the unit:

Cranes: Description, function and uses, classification of cranes – wheel and crawler mounted cranes, operating mechanism – hoisting, lifting and slewing, care and maintenance.

Scrapers: Constructional features, working operation – loading, unloading.

Fork Lift: Description, function and uses, engine and battery operated fork lift, care and maintenance.

Module - V: Tanker / Trailer / Carrier & Recent trends in Earth Moving Equipments

Number of class hours:

Suggestive Learning Outcomes:
1.Explain the basic of Tanker.
2. Understand the Latest developments and automation of earth moving equipments.

Detailed content of the unit:

Tanker / Trailer / Carrier: Constructional features, functions and uses, fifth wheel arrangement.

Recent trends in Earth Moving Equipments: Latest developments and automation of earth moving equipments, automated guided vehicle.

References: -

3) Moving the Earth: Excavation Equipment, Methods, Safety, and Cost by Robert L Schmitt
4) Mining Machines and Earth-Moving Equipment by Marek Sokolski.

ENTREPRENEURSHIP AND START-UP'S

Course Code	:	HS 604

Course Title	:	Entrepreneurship and Start-ups
Number of Credits	:	4
Prerequisites (Course code)	:	None
Course Category	:	HS

CO1 Understand the basic concepts of Entrepreneurship and Startups.

CO2 Illustrate skills of discovering business ideas, visualizing and planning a business.

CO3 Analyze market and business risk for strategy development.

CO4 Demonstrate skills of organizational management.

CO5 Exhibit knowledge of financing methods, institutions and skills for communication of ideas.

Course Content:

Unit1-Introduction and Basics of Entrepreneurship and Start–Ups

Suggestive Learning Outcomes:

(1) Describe the Basic Elements of Entrepreneur and Entrepreneurship

(2) Distinguish between Entrepreneur, Manager and Intrapreneur

Content:

- Definitions, Traits of an entrepreneur, Factors influencing entrepreneurship, Types and Functions of Entrepreneurs, Need for promotion of entrepreneurship, Intrapreneur, Motivation
- Role of Entrepreneurs in Economic Development
- Similarities/differences between - Entrepreneur and Manager, Entrepreneur and Intrapreneur.

Unit2–Business Ideas and their implementation

Suggestive Learning Outcomes:

(1) Illustrate different Types of Business Planning and Business Structure
(2) Select specific Institutions Assisting Entrepreneur

Content:

- Discovering ideas
- Visualizing the business
- Business Plan, - Types of planning, Importance of planning, Steps in planning

- Types of Business Structures
- Institutions assisting entrepreneur

Unit3–**Idea to Start-up**

Suggestive Learning Outcomes:

(1) Identify Steps for Starting a SSI
(2) Predict the Target Market and Associated Risk

Content:

- Market analysis – Identifying the target market
- Competition evaluation and Strategy Development
- Steps for starting a small enterprise
- Risk analysis

Unit4–Management of Enterprise

Suggestive Learning Outcomes:

(1) Apply the Basic Accounting Concepts in Business
(2) Demonstrate Knowledge of Pricing, Positioning and Advertising of Products

Content:

- Recruitment and management of talent.
- Determinants of Price, Pricing methods in practice.
- Market Positioning, Advertising and Sales Promotion
- Accounting - Understanding basics of Transaction, Journal, Ledger, Cashbook, Trial Balance, Cost Sheet and Final Accounts through simple problems

Unit5-Financing and Communication of Ideas

Suggestive Learning Outcomes:

(1) Exhibit Knowledge of various Financial Institutions and Financing Methods
(2) Illustrate Business Ideas through Communication Skills

Content:

- Financial Institutions
- Financing methods available for start-ups in India
- Communication of Ideas to potential investors–Investor Pitch

SUGGESTED LEARNING RESOURCES:

S.No.	Title of Book	Author	Publication
1.	The Startup Owner's Manual: The Step-by-Step Guide for Building a Great Company	Steve Blank and Bob Dorf	K & S Ranch ISBN–978-0984999392
2.	The Lean Startup: How Today's Entrepreneurs Use Continuous Innovation to Create Radically Successful Businesses	Eric Ries	Penguin UK ISBN–978-0670921607
3.	Demand: Creating What People Love Before They Know They Want It	Adrian J. Slywotzky with Karl Weber	Headline Book Publishing ISBN–978-0755388974
4.	Entrepreneurship	Alpana Trehan	Dreamtech Press ISBN: 978-93-5004-026-3
5	Marketing and Sales Management	D C Kapoor	S Chand and Company Ltd. ISBN: 81-219-2430-8
S.No.	**Title of Book**	**Author**	**Publication**
6	Business Economics	H L Ahuja	S Chand and Company Ltd. ISBN: 81-219-1791-3
7	Financial Accounting (Principles and Practice)	Jawahar Lal & Seema Srivastava	S Chand Publishing
8	Accounting for Management	N.P. Srinivasan & Sakthivel Murugan	S Chand Publishing
9	Marketing	Harsh V Verma and Ekta Duggal	Oxford University Press ISBN: 0-19-945910-X
10	Marketing (Asian Edition)	Paul Baines, Chris Fill, Kelly Page and Piyush K. Sinha	Oxford University Press
11	Entrepreneurship	Rajeev Roy	Oxford University Press ISBN: 0-19-807263-5
12	Entrepreneurship Development	Kumar S Anil	New Age Publishers
13	Human Resource Management	Uday Kumar Haldar and Juthika Sarkar	Oxford University Press

14	Fundamentals of Entrepreneurship	S K Mohanty	Prentice Hall of India Private Limited ISBN: 81-203-2867-1
15	Entrepreneurship Development	S S khanka	S Chand and Company Ltd. ISBN: 81-219-1801-4

SUGGESTED SOFTWARE/LEARNING WEBSITES:

a. https://www.fundable.com/learn/resources/guides/startup
b. https://corporatefinanceinstitute.com/resources/knowledge/finance/corporate- structure/
c. https://www.finder.com/small-business-finance-tips
d. https://www.profitbooks.net/funding-options-to-raise-startup-capital-for-your-business/

INDIAN CONSTITUTION

Course Code	:	AU- 606
Course Title	:	Indian Constitution
Number of Credits	:	0 (L: 2, T:0; P:0)
Prerequisites (Course code)	:	None
Course Category	:	AU

Course Outcomes:

CO1. Illustrate Preamble, Basic Structure, Fundamental Rights and Duties of Indian Constitution(K3).

CO2. Discuss the Structure of The Indian Union Government (K2).

CO3. Memorize the Role andPower of Governor, Chief Minister and Council ofMinisters and explain the role of State Secretariat (K2).

CO4. Describe the role of Local Administration (K2).

CO5. Explain the Role andFunctioning of Election Commission (K2).

Detailed Course Content:

Unit 1 – The Constitution – Introduction

Number of Class hours:06

Learning Outcomes:

1. Describe the History of the Making of the Indian Constitution (K2)

2. Illustrate Preamble and the Basic Structure of Indian Constitution (K3)
3. Illustrate the Fundamental Rights and Duties set by Indian Constitution (K3)

Detailed content of the unit:

1. The History of the Making of the Indian Constitution
2. Preamble and the Basic Structure, and its interpretation
3. Fundamental Rights and Duties and their interpretation
4. State Policy Principles

Unit 2 – Union Government

Number of Class hours:06

Learning Outcomes:

1. Discuss the Structure of the Indian Union Government (K2).
2. Memorize the Role and Power of President, Prime Minister and Council of Ministers of India (K1)
3. Explain the role of Lok Sabha and Rajya Sabha (K2)

Detailed content of the unit:

1. Structure of the Indian Union
2. President – Role and Power
3. Prime Minister and Council of Ministers
4. Lok Sabha and Rajya Sabha

Unit 3 – State Government

Number of Class hours:06

Learning Outcomes:

1. Memorize the Role and Power of Governor, Chief Minister and Council of Ministers of a state(K1)
2. Explain the role of State Secretariat (K2)

Detailed content of the unit:

1. Governor – Role and Power
2. Chief Minister and Council of Ministers
3. State Secretariat

Unit 4 – Local Administration

Number of Class hours:06

Learning Outcomes:

1. Describe the role of District Administration (K2)

2. Explain the role of Municipal Corporation (K2)
3. Discuss the role of Zila Panchayat (K2)

Detailed content of the unit:

1. District Administration
2. Municipal Corporation
3. Zila Panchayat

Unit 5 – Election Commission

Number of Class hours:06

Learning Outcomes:

1. Explain the Role and Functioning of Election Commission (K2)
2. Classify the role and functioning of Chief Election Commissioner and State Election Commissioner (K2).

Detailed content of the unit:

1. Role and Functioning of Election commission
2. Chief Election Commissioner
3. State Election Commission

Suggested Learning Resources:

S. No.	Title of Book	Author	Publication
1.	Ethics and Politics of the In- dian Constitution	Rajeev Bhargava	Oxford University Press, New Delhi, 2008
2.	The Constitution of India	B.L. Fadia	Sahitya Bhawan; New edition (2017)
3.	Introduction to the Consti- tution of India	DD Basu	Lexis Nexis; Twenty-Third 2018 edition

Suggested Software/Learning Websites:

a. https://www.constitution.org/cons/india/const.html
b. http://www.legislative.gov.in/constitution-of-india
c. https://www.sci.gov.in/constitution
d. https://www.toppr.com/guides/civics/the-indian-constitution/the-constitution-of-india/

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MAJOR PROJECT- II

Course Code	AEPR-607
Course Title	Project III
Number of Credits	3 (L: 0, T: 0, P: 6)
Prerequisites	Nil
Course Category	Project Work (PR)

Course Outcome:-

After completion of the course, students will be able to:

C.O. 1: Demonstrate a sound technical knowledge of their selected project topic and the knowledge, skills and attitudes of a professional engineer (K2).

C.O. 2: Develop the skill of working in a Team (K3).

C.O. 3: Design engineering solutions to complex problems utilising a systems approach (K6).

C.O. 4: Design the solution of an engineering project involving latest tools and techniques (K6).

C.O. 5: Develop the skill of effective communication with engineers and the community at large in written an oral forms (K3).

Course Content:-

The major project topic should be selected / chosen to ensure the satisfaction of the urgent need to establish a direct link between education, national development and productivity and thus reduce the gap between the world of work and the world of study. The course should provide the scope to develop the following by the students-

1) Develop sound knowledge about the domain of the project work.
2) Perform detailed study about various components of a project.
3) Learn to be an important member of a team for successful execution of a project work.

4) Study about methodologies and professional way of documentation and communication related to project work.
5) Develop idea about problem formulation, finding the solution of a complex engineering problem.
6) Develop project report as per the suggested format to communicate the findings of the project work.
7) Acquire the skill of effective oral communication to the fellow engineers and people in the society at large.
8) Knowledge of how to organize, scope, plan, do and act within a project thesis.
9) Familiarity with specific tools (i.e. hardware equipment and software) relevant to the project selected.
10) Demonstrate the implementation of a major project work.

SEMINAR

Course Code	AESE608
Course Title	Seminar
Number of Credits	1 (L: 0, T: 0, P: 1)
Prerequisites	Nil
Course Category	Seminar presentation

Course Outcome:-

After completion of the course, students will be able to:

C.O.1: Demonstrate a thorough and systematic understanding of a seminar topic (K2).

C.O. 2: Identify the methodologies and professional way of documentation and communication (K3).

C.O.3: Demonstrate the ability to construct a report consistent with expectations of the topic, including an appropriate organization, style, voice, and tone (K3).

C.O.4: Develop the ability to follow discussions, oral arguments, and presentations, noting main points or evidence and tracking through different comments given by the audience (K3).

C.O.5: Develop the communication skill as a speaker (K3).

Course Content:-

The seminar topics may be any aspect of the science and technology, entrepreneurship or any contemporary social issues to be solved by specific branch of engineering and technology (For example, Water logging problems in a particular city may be a seminar topic for Civil Engineering Students) must be approved by the instructor in advance.

The course should have the following-

7) Practice speaking in front of a scientific audience.
8) Explore topics in detail.
9) Research topics and organize presentations.
10) To improve as speakers, each student will receive feedback from the fellow students and the instructor.
11) PowerPoint, Key Note or overheads are acceptable media for Visual aids. Visual aids should look professional and be readable in the entire room; use spell check and proofread for typographical errors.
12) Students have to submit a hard copy contains detailed outline (4-5 pages) of their presentation and also a brief abstract (one or two paragraphs; **250 words max.**) describing their presentation.
13) Each student will give 20-minute presentations followed by 3 minutes of question-answer session.

Proposal Seminar Format for Students:

- Introduce yourself.
- Give an introduction and background information on your topic. What relevant research has been performed previously?
- State the problem(s) that remain unanswered.
- Clearly state your objectives and give the specific hypotheses you wish to test.
- Describe the methodology you will use to test your hypotheses. Be sure you fully understand your chosen methods. Give reasons why you chose these methods over other approaches.
- Present any data you have collected thus far.
- Describe what remains to be done, and what you expect to find.

Explain the significance of your findings (or potential future findings).

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