

# Vidyasagar University

## Curriculum for Automobile Maintenance (Major) [Choice Based Credit System]

### Semester-I

Course	Course Code	Name of the Subjects	Course Type/ Nature	Teaching Scheme in hour per week			Credit	Marks
				L	T	P		
CC1		C1T: Principles of Automobiles	Core Course-1	4	0	0	6	75
		C1P: Principles of Automobiles		0	0	4		
CC2		C2T:Constructional details and working of I.C engines	Core Course-2	4	0	0	6	75
		C2P:Constructional details and working of I.C engines		0	0	4		
GE1		TBD	Generic Elective-1				4/5	75
						2/1		
AECC		English	AECC (Elective)	1	1	0	2	50
<b>Semester Total</b>							<b>20</b>	<b>275</b>

**L**=Lecture, **T**=Tutorial, **P**=Practical, **CC**=Core Course, **TBD** = To be decided, **AECC**=Ability Enhancement Compulsory Course

**Generic Elective (GE)** (Interdisciplinary) from other Department [Paper will be of 6 credits]. Papers are to be taken from following discipline: Physics/Electronics/Mathematics/Computer Science/Economics

**Modalities of selection of Generic Electives (GE):** A student shall have to choose **04** Generic Elective (**GE1 to GE4**) strictly from **02** subjects / disciplines of choice taking exactly **02** courses from each subjects of disciplines. Such a student shall have to study the curriculum of Generic Elective (**GE**) of a subject or discipline specified for the relevant semester.

**SEMESTER-I**  
**Core Course (CC)**

**CC-1: Principles of Automobiles**

**Credits 06**

**C1T: Principles of Automobiles**

**Credits 04**

**Principles of Automobiles:**

**Unit-I:**

Basic concept of thermodynamics, 1st and 2nd laws, reversible, irreversible process and adiabatic, Isothermal Process. Thermodynamic Cycle: Carnot, Otto, Diesel, Dual cycles and their air standard efficiency, Numerical Problems.

**Unit-II:**

Classification of I.C Engines, S.I. and C.I Engines, 2 Stroke, 4-Stroke engines and their working Principle.

**Unit-III:**

Engine specifications-Bore, Stroke-length, MEP, I.H.P, B.H.P, S.F.C, mechanical and thermal efficiencies.

**Unit-IV:**

Valve timing diagram-2-stroke and 4 stroke engine.

**Unit-V:**

Fuel used in I.C Engines, Properties of Fuel, Petrol and Diesel, Fuel additives and- fuel rating (Octane and cetane numbers)

**Unit-VI:**

Combustion Process in I.C engines Auto ignition and chemical reaction, pre-ignition MAN and open combustion chambers, effect of knocking, calorific value of fuels, requirement of oxygen for complete combustion.

**Unit-VII:**

Stress, strain, their types, Numerical problems on principle of stresses,

**C1P: Principles of Automobiles**

**Credits 02**

**Practical**

**Unit-I**

**Engineering drawing:**

Scales, projections of solid, surface developments, Isometric and oblique views, elevations, plans and end views off different objects and design.

**Unit-II**

**2-stroke and 4 stroke (C.I &S.I engine):**

Valve, Valve seat, Rocker arm, Push rod, Cam shaft, Crank shaft, Piston, piston ring, Connecting rod, Oil pump, fuel pump, Distributor, Oil filter, Fuel filter, Starter motor, alternator, Dynamo, Solex carburettor, inlet manifold, exhaust manifold, water pump, fly-wheel, vibration damper, spark plug, heater plug, injector, F.I.P pump. Adjustment:- C.B point, piston ring joined, piston ring groove, Cylinder bore, fan belt adjustment, valve tappet.

**Unit-III**

**Cooling system:** Radiator cleaning, thermostat valve, testing fan valve adjust, water pump service, pressure cap testing, over hauling viscous fan.

**Unit-IV**

Electrical safety precaution ,Electrical hand tools, Electrical measuring instrument practice(Volt Metre, Ammeter, Ohm metre, AVO Metre ), Wire cutting and joint practice (Basic wire joints, soldering, Lug joint ), Wire checking, use of terminal block, Magnetic effect of current, Practice using relay.

## **CC-2: Constructional details and working of I.C engines**

**Credits 06**

### **C2T: Constructional details and working of I.C engines**

**Credits 04**

#### **Theory:**

##### **Constructional details and working of I.C engines:**

**Unit-I: Layout of an automobile:** Main Components and assemblies.

**Unit-II:** Constructional features and functions of 2& 4 wheelers, Cylinder block, Crankcase, Cylinder head, Oil Pump, Gasket, Crank Shaft, Main Bearing, Vibration dampers, Exhaust system, Inlet and exhaust manifolds, fly-whell, Piston, Piston rings, Piston Pin, Connecting rod, Cams and Camshaft, Valve and Valve mechanism.

##### **Unit-III:**

**S.I Engines:** Combustion process, types of fuel feed system, various components of fuel system, fuel tank, fuel filters and screens, fuel losses, fuel gauges, fuel pumps, air cleaners, carburettor and its working its working, trouble shooting, servicing adjustments and M.P.F.I system.

##### **Unit- IV:**

**C.I engines:** Combustion and combustion chambers, fuel injection system, fuel tanks, fuel feed pumps, fuel injectors, nozzles and their types, details of nozzles and fuel injector unit, CRDI system.

##### **Unit-V:**

**Cooling System:** Importance, types, various components and accessories with troubles shooting.

##### **Unit-VI:**

**Lubrication system:** Importance, lubricants and their properties, their selections, lubrication system and their working, filters, lubrications in other parts of an automobiles, trouble shooting.

### **C2P: Constructional details and working of I.C engines**

**Credits 02**

#### **Practical**

##### **Unit-I**

##### **Fuel system (Petrol engine):**

Over hauling fuel pump, carburettor, fuel fitter and air cleaner, practice in engine tune up in a vehicle.

##### **Unit-II**

##### **Lubrication system:**

Oil pump over-hauling and refitting, Replacing oil filter, Drawing engine oil, Repairs oil galleries.

##### **Unit-III**

##### **Fuel system (Diesel engine):**

Fuel feed pump over hauling, F.I.P pump single & multi cylinder over hauling, over hauling injector, testing the injector, Fuel bleeding, cleaning the injector.

##### **Unit-IV**

Basic idea and details of fitting shop, First aid, 5S concept, fire, Measuring instruments, Gauge Measurement, Cutting tool's Operation, Heat Treatment, Drill and Grinding Machine Operation.

#### **Job training or garage practice**

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# Vidyasagar University

## Curriculum for Automobile Maintenance (Major) [Choice Based Credit System]

### Semester-II

Course	Course Code	Name of the Subjects	Course Type/ Nature	Teaching Scheme in hour per week			Credit	Marks
				L	T	P		
CC3		C3T: Theory of Machine	Core Course-3	4	0	0	6	75
		C3P: Practical		0	0	4		
CC4		C4T: Suspension system, Steering system, Ignition system and Auto Air conditioning	Core Course-4	4	0	0	6	75
		C4P:Practical		0	0	4		
GE2		TBD	Generic Elective-2				4/5	75
						2/1		
AECC		ENVS	AECC (Elective)				4	100
<b>Semester Total</b>							<b>22</b>	<b>325</b>

L=Lecture, T=Tutorial, P=Practical, CC=Core Course, TBD = To be decided, AECC=Ability Enhancement Compulsory Course

**Generic Elective (GE)** (Interdisciplinary) from other Department [Paper will be of 6 credits]. Papers are to be taken from following discipline: **Physics/Electronics/Mathematics/Computer Science/Economics**

**Modalities of selection of Generic Electives (GE):** A student shall have to choose **04** Generic Elective (GE1 to GE4) strictly from **02** subjects / disciplines of choice taking exactly **02** courses from each subjects of disciplines. Such a student shall have to study the curriculum of Generic Elective (GE) of a subject or discipline specified for the relevant semester.

**SEMESTER-II**  
**Core Course (CC)**

**CC-3: Theory of Machine**

**Credits 06**

**C3T: Theory of Machine**

**Credits 04**

**Course Contents:**

**Theory of Machine:**

**Unit-I:** Friction: Introduction, types of friction, coefficient of friction, limiting friction, laws of solid friction and kinetic friction, screw jack.

**Unit-II:** Belt, Rope and Chain Drive: Introduction, Belt drive, types of belts, Materials used, Velocity ratio, Slip, Length of belt, Comparison, flat and v-belt, Rope drive & Chain Drive.

**Unit-III:** Gear and Gear Trains: Fundamental laws of gearing, spur, bevel and worm gears, gear train, Interference, epicyclic gear trains.

**Unit-IV:** Cam: Types, displacement diagrams.

**Unit-V:** Flywheels: Turning moment diagrams, fluctuations of energy and speed.

**Unit-VI:** Governors: Types, Principles, working, Characteristics and performance.

**Unit-VII:** Torsion and torsional effect, Shear force and bending moment diagram, bending stress.

**C3P: Practical**

**Credits 02**

**Unit-I**

Valve timing: C.I. & S.I. valve timing adjustment of 2-stroke & 4-stroke.

**Unit-II**

Firing order set (Multi cylinder S.I. & C.I. 4-stroke) petrol- tappet timing, gear timing, chain timing, ignition timing. Diesel- tappet timing, gear timing, fuel timing.

**Unit-III**

Electronics components checking (Resistor, Capacitor, Diode, Transistor, and I.C), Construction of D.C Generator, Starter motor, Wiper Motor, Alternator, Transformer.

**CC-4: Suspension system, Steering system, Ignition system and Auto Air conditioning**

**Credits 06**

**C4T: Suspension system, Steering system, Ignition system and Auto Air conditioning**

**Credits 04**

**Course Contents:**

**Unit-I :** Suspension system:- Objectives, principles of working, types of suspension system, independent and rigid axle suspension system, shock absorber and damper, troubles in a suspension system.

**Unit-II:** Steering system:- Steering geometry, their effect, steering angle, steering mechanism, steering linkages, power steering , trouble shooting.

**Unit-III:** Ignition System: Battery, electrical, magneto and electronic ignition systems and their troubles.

**Unit-IV:** Auto Air conditioning: Introduction, Air conditioning system, components, effect of Air conditioning of fuel economy, car Air conditioning system, Truck Air conditioning, trouble shooting.

**C4P: Practical**

**Credits 02**

**Unit-I**

**Suspension system:** Replacing shock absorber, servicing shackle, over hauling leaf spring, over hauling coil spring, over hauling front suspension system.

**Unit-II**

**Spark plug cleaning and testing:** Spark plug cleaning, spark plug gap setting and spark plug testing.

**Unit-III**

Use of general hand tools (Vice, Screw driver, Spanner, Pliers etc. ), identify of various types (Bolts, Nuts, Washers, Keys, pins, Bearing, Pulley , Gear etc.), Limit, Fit and Tolerance, Transmission of power.

**Unit-IV**

Practice to Operate the lathe machine tools , Welding(Arc), sheet metal work and Forging.

**Job training or Garage practice**

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# Vidyasagar University

## Curriculum for Automobile Maintenance (Major) [Choice Based Credit System]

### Semester-III

Course	Course Code	Name of the Subjects	Course Type/ Nature	Teaching Scheme in hour per week			Credit	Marks
				L	T	P		
CC-5		C5T: Transmission system Part -I	Core Course - 5	4	0	0	6	75
		C5P: Lab		0	0	4		
CC-6		C6T: Transmission System Part -II	Core Course - 6	4	0	0	6	75
		C6P: Lab		0	0	4		
CC-7		C7T: Manufacturing process or Production Engineering - 1	Core Course - 7	4	0	0	6	75
		C7P: Lab		0	0	4		
GE-3		TBD	Generic Elective -3				4/5	75
							2/1	
SEC-1		SEC1T: Assembling Simple Electronics Circuits	Skill Enhancement Course-1	1	1	0	2	50
<b>Semester Total</b>							<b>26</b>	<b>350</b>

L=Lecture, T= Tutorial, P=Practical, CC = Core Course, GE= Generic Elective, SEC = Skill Enhancement Course, TBD = to be decided

**Generic Elective (GE)** (Interdisciplinary) from other Department [Paper will be of 6 credits]. Papers are to be taken from following discipline: **Physics/Electronics/Mathematics/Computer Science/Economics**

**Modalities of selection of Generic Electives (GE):** A student shall have to choose **04** Generic Elective (GE1 to GE4) strictly from **02** subjects / disciplines of choice taking exactly **02** courses from each subjects of disciplines. Such a student shall have to study the curriculum of Generic Elective



**SEMESTER-III**  
**Core Course (CC)**

**CC-5: Transmission system Part -I**

**Credits 06**

**C5T: Transmission system Part –I**

**Credits 04**

**Course Contents:**

**Unit-I:** General principle, objectives and types (Manual, Semi-automatic, Automatic, Hydraulic transmission)

**Unit-II:** Gear boxes, resistance to motion of a vehicle, power required for propulsion

**Unit-III:** acceleration and hill climbing, necessity of gear box, function and types of gears, synchromesh gear box, free wheel drive, gear lubrication, transmission troubles.

**C5P: Practical**

**Credits 02**

1. Over hauling, sliding mesh, constant mesh and synchromesh gear box and other gear box.
2. Moulds – Describe of Mould materials, Types of sand, Sand moulding, Pit moulding, machine moulding.
3. Melting practice. Types of furnaces with specific application Cupola furnace, Electric arc furnace.
4. Special casting processes die casting, centrifugal casting, investment casting, Shell moulding
5. Casting defects & its remedies. Green sand mould making process
6. Patterns - Material used, types, Patterns allowances, Cores, Core allowances. Core Prints.

**CC-6: Transmission System Part –II**

**Credits 06**

**C6T: Transmission System Part -II**

**Credits 04**

**Course Contents:**

**Unit-I** Clutch System: Function, types, clutch linkage, clutch facing & friction material, common faults.

**Unit-II:** Propeller Shaft: Types, fluid drives, Hotchkiss drive, universal & slip joint, Torque convertors.

**Unit-III:** Final drive and rear axle: Types of final drives, differential gears and its principles of operation, rear axle and its types.

**Unit- IV:** Front Axle: Types and their components, swivelling mechanism, front form of motor cycle.

**C6P: Practical**

**Credits 02**

1. Clutch: Overhauling single plate, multi plate, diaphragm clutch and other clutch.
2. Steering System and power steering: Overhauling steering linkage, steering gear box adjustment, power steering overhauling.
3. Servicing tyre: Repairing tube and tyre puncture.

**CC-7: Manufacturing process or Production Engineering - 1**

**Credits 06**

**C7T: Manufacturing process or Production Engineering - 1**

**Credits 04**

**Course Contents:**

**Unit-I:**

Mechanical properties of metals, ferrous and non ferrous metals used in engineering practice, Influence of carbon on iron and steel. Heat treatment of metals-different process-heat treatment equipments and materials.

**Unit-II:**

Hand tools used in different shops, bench work and fitting shop, Hand tools used in fitting shops, chipping, filing, scraping, measuring tools and gauges, limit, fit, allowance and clearance, jig stand and fixtures.

**Unit-III:**

Definition and concept of different mechanical process like rolling, drawing, spinning, firing, casting, welding, brazing, and soldering.

**Unit-IV:** Machine shops- Elementary ideas about different machines like Lathe, Shaper, Grinder, Drill & Milling.

**C7P: Practical**

**Credits 02**

1. Forgeable material and forgeability, forging temperature, Grain flow in forged parts, Types of Presses and hammers.
2. Forging Processes – Drop forging, Upset forging, Die forging or press forging. Hot working & Cold working.
3. Types of dies - Open Die, Closed Die (Single Impression and Multi impression) Closed Die forging operations - Fullering, Edging, Bending, Blocking, Finishing.
4. Types of rolling mills: 2 Hi, 3 Hi & 4 Hi mills. Different rolled sections.

**SEC-1: Assembling Simple Electronics Circuits**

**Credits 02**

**SEC1T: Assembling Simple Electronics Circuits**

**Course Contents:**

**Unit- 1: Semiconductor and Diode**

P-type and N-type semiconductor, Junction of P-type & N type i.e. PN junction, Barrier voltage , depletion region ,Junction Capacitance, Forward biased & reversed biased junction, Diode symbol ,circuit diagram for characteristics (forward & reversed),Characteristics of PN junction diode, Specifications:-Forward voltage drop , Reversed saturation current, maximum forward current , power dissipation, Package view of diodes of different power ratings (to be shown during practical hours) Zener diode: Construction, Symbol, Circuit diagram for characteristics of zener diode (Forward & Reverse),Zener & Avalanche Breakdown, Zener diode specifications – zener voltage, power dissipation, break over current, dynamic resistance & maximum reverse current.

**Unit- 2: Rectifiers, Filters and Power Supply**

Need of rectifier , definition ,Types of rectifier – Half wave rectifier, Full wave rectifier,(Bridge & centre tapped ) Circuit operation Input/output waveforms for voltage & current, Average (dc) value of current & voltage ( no derivation), Ripple , ripple factor , ripple frequency , PIV of diode used , efficiency of rectifier.(no derivation only definition), Comparison of three types of rectifier, Need of filters, Types of filters- A] shunt capacitor, B] Series inductor, C] LC filter , D] - filter --- only circuit operation (no mathematical derivation),limitations & advantages 2.5 Voltage regulator- Simple voltage regulator circuit using zener, familirisation with IC regulator circuit (like 78XX , 79XX series etc.), IC 723 adjustable power supply, concept of Switch mode power supply (SMPS) block diagram only.

**Unit-3: Transistors, Switching and Optoelectronics Devices**

Bipolar Junction Transistor (BJT): Symbol of NPN & PNP types, Construction, Different types of package, Operation of NPN and PNP transistor – current flow, relation between different currents ,Transistor configurations – CB, CE, CC circuit diagram for input & output characteristics of each configuration, Input & output characteristics, Comparison between three configuration, Transistor parameters – input & output resistance and relation between them. Transistor specification – VCE Sat, IC Max, VCEO, ICEO, VCE Breakdown, Power dissipation. Field effect Transistor (FET): Symbol, Construction of JFET, Working principle and V-I characteristics of JFET, pinch- off voltage, drain resistance, trans conductance, amplification factor and their relationship, Enhancement and depletion type MOSFET. TRIAC, DIAC, Silicon control rectifier (SCR):-Symbol, working, application (elementary ideas only) Comparison

between Transistor and SCR. Elementary ideas of LED, LCD, photodiode, phototransistor and solar cell and their applications only.

#### **Unit- 4: Transistor Biasing**

Need of biasing, concept of DC load line and AC load line, selection of Q point and Stabilization, Types of biasing circuits (no mathematical derivation) – a) Fixed biased circuit, b) Collector-to-base biased circuit, c) Voltage divider bias circuit

#### **Unit – 5: Small Signal Transistor Amplifiers**

Concept of amplification----Small signal amplifier using BJT, Determination of current, voltage & power gain, Input & output resistance. Single stage CE amplifier with voltage divider bias. Its explanation. Frequency response of single stage CE Amplifier, Bel and Decibel unit. Bandwidth & its significance. Cascade Amplifiers (Multistage Amplifier), Need of Multistage Amplifiers, Gain of amplifier. Types of amplifier coupling – RC, transformer & direct coupling. Two stage amplifier circuit diagram, working (briefly), frequency response, merits & demerits & applications of each.

#### **Unit- 6: Oscillator**

Oscillator – Requirement of oscillator circuit, Barkhausen's criteria of oscillator, circuit diagram and its application only -.Phase shift oscillator, Hartley oscillator, Colpitts oscillator, Crystal oscillator

#### **Unit – 7: Op-Amp**

OP-Amp Block diagram and use of op amp as - Inverting, non inverting, summing amplifier, differentiator, integrator, buffer, comparator, Schmitt's trigger.

# Vidyasagar University

## Curriculum for Automobile Maintenance (Major) [Choice Based Credit System]

### Semester-IV

Course	Course Code	Name of the Subjects	Course Type/ Nature	Teaching Scheme in hour per week			Credit	Marks
				L	T	P		
CC-8		C8T: Chassis, Frame &Body, Brake & Braking System, Wheel & Tyres.	Core Course - 8	4	0	0	6	75
		C8P: Lab		0	0	4		
CC-9		C9T: Engine Servicing And Tuning, Garage & Service Station, Electrical System and Motor Vehicles Act.	Core Course - 9	4	0	0	6	75
		C9P: Lab		0	0	4		
CC-10		C10T: Manufacturing Process and Machine Tools-II	Core Course - 10	4	0	0	6	75
		C10P: Lab		0	0	4		
GE-4		TBD	Generic Elective - 4				4/5	75
SEC-2		SEC2T: Electro Magnetism and Digital Electronics	Skill Enhancement Course-2	1	1	0	2	50
<b>Semester Total</b>							<b>26</b>	<b>350</b>

L=Lecture, T= Tutorial, P=Practical, CC = Core Course, GE= Generic Elective, SEC = Skill Enhancement Course, TBD = to be decided

**Generic Elective (GE)** (Interdisciplinary) from other Department [Paper will be of 6 credits]. Papers are to be taken from following discipline: **Physics/Electronics/Mathematics/Computer Science/Economics**

**Modalities of selection of Generic Electives (GE):** A student shall have to choose **04** Generic Elective (GE1 to GE4) strictly from **02** subjects / disciplines of choice taking exactly **02** courses from each subjects of disciplines. Such a student shall have to study the curriculum of Generic Elective

**SEMESTER-IV**  
**Core Course (CC)**

**CC-8: Chassis, Frame & Body, Brake & Braking System, Wheel & Tyres.**

**Credits 06**

**C8T: Chassis, Frame & Body, Brake & Braking System, Wheel & Tyres.**

**Credits 04**

**Course Contents:**

**Unit-I: Chassis, Frame and Body:**

Chassis layout and its main components, design features, types of chassis and frames, materials and dimensions for auto body work, method of manufacturing and space requirements.

**Unit-II: Brake and braking system:**

Principles of brakes, braking mechanisms, classifications, bleeding in hydraulic system, brake troubles.

**Unit-III: Wheels and tyres:**

Types of tyres and their specification, tubeless tyres, radial tyres, friction due to pavement and earth in relation to wear, care and maintenance of tyres and tubes, repair and retreading of tyres.

**C8P: Practical**

**Credits 02**

**1:** Wheel alignment and wheel balancing: toe-in, toe-out, caster angle, camber angle, king pin, inclination, adjustment and setting and wheel balance.

**2:** Brake system: Over hauling master cylinder, wheel cylinder, front and rear brake, air servo unit, unloaded valve, release valve, hand brake, vacuum 2uffer, single brake chamber,

**3:** Brake bleeding, Relining, brake shoes, servicing air tank, servicing brake valve and disc brake, demonstration of working of ABS system, sensors.

**CC-9: Engine Servicing And Tuning, Garage & Service Station, Electrical System and Motor Vehicles Act.**

**Credits 06**

**C9T: Engine Servicing And Tuning, Garage & Service Station, Electrical System and Motor Vehicles Act.**

**Credits 04**

**Course Contents:**

**Unit-I: Engine servicing and tuning:**

Basic requirements of automobiles engine servicing types and procedures.

**Unit-II: Garage and service station:**

Location and layout, equipment required in a service station, types of service.

**Unit-III: Servicing of Motor vehicles:**

Signification of servicing and its types, engine tuning and various instruments used, decarbonizing of engine parts, servicing of batteries,

**Unit-IV:** Electrical systems, servicing of fuel injection and ignition system, lubrication system, cooling system, braking system and other accessories.

**Unit-V :** Inspection and Testing of motor vehicles, types of inspection , inspection card , inspection and repair accident inspection , diagnosis of faults , Laboratory road testing of motor vehicles.

**Unit-VI:** Concept of Motor vehicles Act, different rules of Motor vehicles Act, Motor vehicle Act with special reference to pollution control and measure required to safe drive, Effect of pollutant.

**C9P: Practical****Credits 02**

1. Specifications of drilling machine. Types of drills and reamers
2. Basic parts and their functions – Pillar drilling machine & Radial drilling machine.
3. drilling, boring, reaming, Counter boring, countersinking, chamfering, Spot facing, Trepanning
4. Arc Welding – working Principle, component, working Applications
5. Principle & Application of Shielded metal arc welding, Submerged arc welding. TIG / MIG welding
6. Principle & Application of process Resistance welding.(Principle & Application) - Spot welding, Seam welding, Projection welding
7. Types of Brazing and soldering application process, Inspection of Welding defects.

## **CC-10: Manufacturing Process and Machine Tools-II**

**Credits 06**

### **C10T: Manufacturing Process and Machine Tools-II**

**Credits 04**

#### **Course Contents:**

**Unit-I:** Casting process, Permanent mould casting, semi permanent mould casting, die casting ,centrifugal casting , investment casting, continuous casting , defect in casting ,inspection of casting ,cleaning of casting.

**Unit-II:** Definition and concept of smithy and forging, sheet metal work, rivets and screws,

**Unit-III ;** Machine Shops:- Elementary ideas about different machines like Slotting machine ,planning machine , boring machine , broaching machine , press machine.

**Unit- IV:** Elementary ideas about different non-traditional machine like Ultrasonic machining (USM) , Electro chemical machining (ECM) , Electrical discharge machining (EDM) , Laser beam machining (LBM)

**Unit-V :** Definition and concept of N.C Machine tools and C.N.C Machine tools.

### **C10P: Practical**

**Credits 02**

1. Transmission system: Over hauling universal joint, differential, remove and refitting propeller shaft over hauling slip joint.
2. Cutting tool nomenclature & tool signature of single point cutting tool.Orthogonal & oblique cutting, chip formation & type of chips
3. Types of lathes – Centre lathe, Capstan & Turret Lathe, CNC Lathe Specification of Centre lathe. Basic parts and their functions of centre lathe.
4. Operations and tools Centering, facing, Turning, parting off, undercutting, grooving, Knurling, boring, thread cutting



## *Skill Enhancement Course (SEC)*

### **SEC-2: Electro Magnetism and Digital Electronics**

**Credits 02**

#### **SEC2T: Electro Magnetism and Digital Electronics**

##### **Course Contents:**

**Unit-1: Steady electric current:** Current density, equation of continuity, condition for the steady current, Kirchhoff's laws and analysis of multi loop circuits.

**Unit-2: Magneto statics:** Force on a moving charge, Lorentz force and definition of B, force on a straight current carrying conductor in a uniform magnetic field, torque on a current loop. Biot-Savart law, Ampere's circuital law, determination of magnetic fields (B) due to a straight current carrying conductor, a circular coil, a solenoid, magnetic field due to a small current loop, concept of magnetic dipole as a tiny current loop.

**Unit-3: Magnetic fields in matter-** magnetization (M), relation between B, H, and M, magnetic susceptibility and permeability, diamagnetic, paramagnetic and ferromagnetic materials, Curie's law, hysteresis in ferromagnetic material.

**Unit-4: Electromagnetic induction and Maxwell's Equations:** Faraday's law (both the integral and the differential forms), self and mutual inductances, transformers, energy stored in a coil of self inductance L, displacement current, Maxwell's equations.

**Unit-5: Transients in DC:** Growth and decay of current in LR circuit, charging and discharging of capacitor in CR circuit, time constants.

**Unit-6: Alternating current:** LR and CR circuits, complex number and their applications in AC circuits, impedance and reactance, series and parallel resonances, Q-factor, power dissipation in AC circuit, power factor.

**Unit-7: Digital Electronics** - binary number system, conversion from decimal to binary and vice versa. Logic gates- OR, AND, NOT gates, truth tables, de Morgan's theorem, NOR and NAND universal gates.

Combinational logic - Half adder, full adder, digital comparator, decoder, encoder (ROM), digital to analog conversion, analog to digital conversion, multiplexer.

Sequential logic - Flip - Flops - RS, D, JK, JKMS, edge triggering and locked operation, shift registers, ripple counter (binary and decade).

# Vidyasagar University

## *Curriculum for Automobile Maintenance (Major)* [Choice Based Credit System]

### Semester-V

Course	Course Code	Name of the Subjects	Course Type / Natu	Teaching Scheme in hour per			Credit	Marks
				Week	T	P		
CC- 11		C11T: Electrical	Core Course-11	4	0	0	6	75
		System Lab		0	0	4		
CC- 12		C12T: Estimating, Costing and Machine Design	Core Course-12	5	1	0	6	75
DSE-1		TBD	Discipline Specific Elective	4	0	0	6	75
				0	0	4		
DSE-2		TBD	Discipline Specific Elective	4	0	0	6	75
				0	0	4		
<b>Semester Total</b>			- 2				<b>24</b>	<b>300</b>

L= Lecture, T= Tutorial, P = Practical, CC - Core Course, TBD - To be decided, DSE: Discipline Specific Elective.

## **SEMESTER- V**

### **List of Core Course (CC)**

**CC-11: Electrical System**

**CC-12: Estimating, Costing and Machine Design**

### **Discipline Specific Electives (DSE)**

**DSE-1: Computer Integrated Manufacturing**

**Or**

**DSE-1: Alternate Fuels and Energy Systems**

**DSE-2: Motor Vehicle Act & Pollution Control**

**Or**

**DSE-2: Urban Transportation Requirement and Planning**

## Core Course (CC)

**CC-11: Electrical System**

**Credits 06**

**C11T : Electrical System**

**Credits 04**

### **Course Contents:**

#### **Unit-I : Generator, Alternator and Batteries, Maintenance**

Various electrical Instruments in an automobile, Automobile batteries and its maintenance and function of generator, alternator, battery charging system, voltage and current regulator, self-starter and bendix drive, ignition system and its components, ignition timing, setting of contact breaker gap, spark plug, firing order, checking electrical system.

#### **Unit – II: Lighting System**

Concept of Wiring system, wiring diagram, colour coding with diagram.

#### **Unit-III: Accessories and control**

Horn and its type, wind screens, wiper, direction indicators and flashing units, signalling system, lamps and their types, starter switch, Speedo meter , Antitheft devices, fuel gauge, oil pressure gauge, Temperature gauge.

**C11P: Electrical System (Practical)**

**Credits 02**

### **Practical**

#### **01. Disassemble the engine component:**

Overhauling cylinder head rockenarm piston, connecting rod, crankshaft pulley, timing geals-chain, fly wheel, crank shaft, of multi-cylinder engine. Injector testing with bench tester Fresing and calibration of diesel engine

#### **02. Electrical system**

Battery, battery testing, ignition circuit , lighting circuit, battery charging circuit, dynamo circuit, alternator circuit, Overhauling starter motor, dynamo alternator, Wiper motors, horn operation

#### **03. M.P.F.I system**

Fuel pump overhauling, common rail service, injector testing and service, M.P.F.I Total Sensor System, Fuel line service. . Bleed air from the fuel lines

#### **04. ECU**

Carryout Identification of Electronic control Unit, Perform Set up for testing, Testing of Electronic Control Circuit. Perform Identification of various sensors installed in engine & it's

mounting. Check instruments & Gauges on dash board & replace defective gauges. Test Temperature sensor, Pressure sensor, potentiometer, magnetic induction sensor, cam shaft sensor, crankshaft position sensor and all sensor

**05. Turbocharger & super charger**

Overhauling turbo charger & supercharger unit, impalas shaft inspect and impeller service.

**06. Total light circuit**

Trace the light circuit - test bulbs, align head lamps, aiming headlights. Changing a headlight bulb, checking of a head light switch and to replace if faulty Check the all wiring wire with MultiMate, service head light, fog light, indicator light, parking light, break light tell light , check ignition switch

**CC- 12: Estimating, Costing and Machine Design**

**Credits 06**

**C12T: Estimating, Costing and Machine Design**

**Credits 06**

**Course Contents:**

**Unit-I: Estimating and Costing**

Definition of estimating and costing, elements of costing, Determination of weight of various parts such as block, cylinder, nuts, bolts, rivets, Estimate of machining price of several parts.

**Unit-II: Machine Design**

Concept and definition of machine Design, Types of stress, strain such as tension, compression, shear, bearing pressure.

**Unit-III: Design of simple machine parts**

Design of Rivets joint such as single rivet lap joint, Double rivet lap joint, single rivet butt joint, Double rivet butt joint. Flange coupling, universal coupling, Gears.

**Suggested Books/ Reading:**

- Auto Electrical Technology-A.K.Babu, Tom Delton
- Industrial Management- Bhadra & Roy
- Machine Design- J.K Gupta, V.B Bhandari, R.B Gupta

**Discipline Specific Electives (DSE)**

## **DSE-1: Computer Integrated Manufacturing**

**Credits 06**

### **DSE1T: Computer Integrated Manufacturing**

**Credits 04**

#### **Course Contents:**

#### **Unit-I: Concept of Computer Integrated Manufacturing (CIM)**

Basic components of CIM, Distributed database system, distributed communication system, computer networks for manufacturing; future automated factory.

#### **Unit-II: Computer Aided Design (CAD)**

CAD hardware and software, product modeling, automatic drafting, engineering analysis, FEM design review and evaluation.

#### **Unit-III: Computer Aided Manufacturing (CAM)**

Computer assisted NC part programming; Computer assisted robot programming, computer aided process planning (CAPP), computer aided material requirements planning (MRP), computer aided production scheduling, computer aided inspection planning, computer aided inventory planning, flexible manufacturing system (FMS), concept of flexible manufacturing, Integrating NC machines, robots, AGVs, and other NC equipment, Computer aided quality control, business functions, computer aided forecasting.

### **DSE-1P: Computer Integrated Manufacturing (practical)**

**Credits 02**

1. Designing practical using CAD software.
2. Practical on CAM - examples.
3. Project work

#### **Suggested Books/ Readings**

1. CAD, CAM, CIM by P.Radhakrishnan and S.Subramanyan, New Age International Publishers.
2. Computer Integrated Manufacturing by Paul G. Rankey, Prentice Hall.
3. Computer Integrated Manufacturing by Harrington J. Jr., Industrial Press, Inc., New York.
4. Computer Integrated Manufacturing by K.Rathmill and P.Macconal, IFS Publications.
5. Automation, Production Systems and Computer Integrated Manufacturing by M. P. Groover, Prentice Hall.

**Or**

## **DSE-1: Alternate Fuels and Energy Systems**

**Credits 06**

### **DSE1T: Alternate Fuels and Energy Systems**

**Credits 04**

#### **Course Contents:**

#### **Unit-I: Introduction to alternate fuels and energy systems:**

Estimation of petroleum reserve; Need for alternate fuel; Availability and properties of alternate fuels; general use of alcohols, LPG, Hydrogen, Ammonia, CNG, and LNG; Vegetable oils and Biogas; Merits and demerits of various alternate fuels.

#### **Unit-II: Alcohols:**

Properties as engine fuels; alcohols and gasoline blends; Combustion characteristics in engines; emission characteristics.

#### **Unit-III: Natural Gas, LPG, Hydrogen and Biogas**

Availability of CNG, properties modification required to use in engines-performance and emission characteristics of CNG using LPG in SI & CI engines. Performance and emission for LPG, Hydrogen; Storage and handling, performance and safety aspects; Vegetable Oils - Various vegetable oils for engines, esterification, performance and emission characteristics

#### **Unit-IV: Electrical and Solar Powered Vehicles:**

Layout of an electric vehicle, Advantage and limitations, Specifications-System component, Electronic control system-High energy and power density batteries, Hybrid vehicle, Solar powered vehicles

### **DSE-1P: Alternate Fuels and Energy Systems (practical)**

**Credits 02**

1. Physical demonstration of engines powered with alternative fuels/ energies
2. Perform Checking of petroleum and alternate fuel engine
3. Training on Solar/ Electrical powered vehicle.
4. Laboratory note book and Viva Voce: Students will be required to maintain records of all works done in connection with the topic taught in this paper.
5. Visit to industry / Project work

#### **Suggested Books/ Readings**

1. Maheswar Dayal, Energy today & tomorrow, I & B Horishr India,1982
2. Nagpal, Power Plant Engineering, Khanna Publishers,1991.
3. Alcohols and Motor fuels progress in technology, Series No.19,SAEPublication USA 1980.
4. SAE paper Nos.840367, 841156,841333,841334.
5. The properties and performance of modern alternate fuels SAE paper No 841210.

6. Bechtold.R.L. Alternative Fuels Guide Book, SAE, 1997.

## **DSE- 2: Motor Vehicle Act & Pollution Control**

**Credits 06**

### **DSE2T: Motor Vehicle Act & Pollution Control**

**Credits 04**

#### **Course Contents:**

##### **Unit I: Motor vehicle act**

Various section of the motor vehicle act, Licensing of drivers of motor vehicles, Registration of motor vehicles, Control of transport vehicles, Control of traffic, Insurance of motor vehicles, Offence - Penalties and Procedure, Mandatory signs, Accident claims, Accident claims tribunals.

##### **Unit II: Introduction**

Vehicle population assessment in metropolitan cities and contribution to pollution, effects on human health and environment, global warming, types of emission, transient operational effects on pollution.

##### **Unit III: Pollutant Formation in SI Engines**

Pollutant formation in SI Engines, mechanism of HC and CO formation in four stroke and two stroke SI engines, NO<sub>x</sub> formation in SI engines, effects of design and operating variables on emission formation, control of evaporative emission. Two stroke engine pollution.

##### **Unit IV: Pollutant Formation in CI Engines**

Pollutant formation in CI engines, smoke and particulate emissions in CI engines, effects of design and operating variables on CI engine emissions, No<sub>x</sub> formation and control. Noise pollution from automobiles, measurement and standards

##### **Unit V: Measurement Techniques Emission Standards and Test Procedure**

NDIR, FID, Chemiluminescent analyzers, Gas Chromatograph, smoke meters, emission standards, driving cycles - USA, Japan, Euro and India. Test procedures - ECE, FTP Tests. SHED Test - chassis dynamometers, dilution tunnels

### **DSE2P: Motor Vehicle Act & Pollution Control (Practical)**

**Credits 02**

#### **List of Practical**

1. Identification of Informatory, Warning and Mandatory Road Signs.
2. Knowing various traffic signals.
3. Familiarising with layout and identifying various items and parts of various emission controlling system e.g :-EGR system, Cat Con , PCV System and Fuel vapour Purge Control System.
4. Laboratory note book and Viva Voce.

**Or**



## **DSE-2: Urban Transportation Requirement & Planning**

**Credits 06**

## **DSE2T: Urban Transportation Requirement & Planning**

**Credits 04**

### **Course Contents:**

#### **Unit 1: Urban Transportation System Planning**

- Role of transportation in urban development
- Transportation problems in urban areas
- Purpose of transportation planning
- Transportation planning process and factors affecting it
- Travel demand and actors affecting it
- Urban transport forecasting

#### **Unit 2: Transportation Surveys**

- Study area and zoning
- Survey Types: Home interview surveys, Commercial vehicle surveys, Taxi surveys, Road side interview surveys, Post card questionnaire surveys, Registration number surveys, Tag surveys, Public transport surveys, Telephone surveys.
- Inventory of existing transport Facilities

#### **Unit 3: Trip Generation and Distribution**

- Trip generation: Trip purpose, Problems of trip generation
- Factors governing trip generation and attraction rates
- Trip distribution
- Methods of trip distribution: Uniform factor, Average factor, Detroit, Fratar, Furness and Time factor method
- Problems based on trip distribution

#### **Unit 4: Transportation Plan Preparation**

- Definitions: corridor, corridor traffic forecasting, corridor traffic study, count, segment, point, segment capacity, screen line
- Corridor identification
- Mass transit system
- Urban mass rapid transit system
- Rail based transit – Metro, Light rail transit system (LRT), Mono rail, Sky rail
- Road based transit – Bus rapid transit system (BRTS), Electric trolley bus, commuter Bus / City

## **DSE2P: Urban Transportation Requirement & Planning (Practical)**

**Credits 02**

### **List of Practical:**

- Identifying problems like parking, delay at intersection - students will make a brief report regarding problems.
- Make any two transport survey and prepare a report of outcome.
- Prepare write up on transportation planning process.
- Model project on Urban mass rapid transit system.

### **Suggested Books/ Readings**

1. Kadiyali, L. R., Traffic Engineering and Transportation Planning, Khanna Publishers, New Delhi
2. Hutchison, B. G., Introduction to Transportation Engg and Planning, McGraw-Hill Book Co.
3. Morlok, Edward K., Introduction to Transportation Engg. and Planning. McGraw-Hill Book Co.
4. Vuchic, Vukan R, Urban Public Transit System and Technology, PHI Learning, New Delhi
5. The properties and performance of modern alternate fuels SAE paper No 841210.
6. Dickey, John W. Metropolitan Transportation Planning, McGraw-Hill Book Co.

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# Vidyasagar University

## *Curriculum for Automobile Maintenance (Major)* [Choice Based Credit System]

### Semester-VI

Course	Course Code	Name of the Subjects	Course Type/ Nature	Teaching Scheme in hour per week			Credit	Marks
				L	T	P		
CC- 13		C13T: Automotive Air Conditioning	Core Course-13	4	0	0	6	75
		C13P : Lab		0	0	4		
CC- 14		C14T: Vehicle Performance and Testing	Core Course-14	4	0	0	6	75
		C41P : Lab		0	0	4		
DSE-3		TBD	Discipline Specific Elective - 3	4	0	0	6	75
				0	0	4		
DSE-4		TBD	Discipline Specific Elective - 4	4	0	0	6	75
				0	0	4		
<b>Semester Total</b>							<b>24</b>	<b>300</b>

**L**= Lecture, **T**= Tutorial, **P** = Practical, **CC** - Core Course, **TBD** - To be decided, **DSE**: Discipline Specific Elective.

## **SEMESTER- VI**

### **List of Core Course (CC)**

**CC-13: Automotive Air Conditioning**

**CC-14: Vehicle Performance and Testing**

### **Discipline Specific Electives (DSE)**

**DSE-3: Automotive Safety**

**Or**

**DSE-3: Two and Three Wheelers**

**DSE-4: Industrial Managements**

**Or**

**DSE-4: Industrial Training**

## Core Course (CC)

### **CC-13: Automotive Air Conditioning**

**Credits 06**

#### **C13T : Automotive Air Conditioning**

**Credits 04**

#### **Course Contents:**

##### **Unit-I : Air-conditioning Fundamentals**

Basic air conditioning system - location of air conditioning components in a car, schematic layout of a refrigeration system, compressor components, condenser and high pressure service ports, thermostatic expansion valve, expansion valve calibration, controlling evaporator temperature, evaporator pressure regulator, evaporator temperature regulator.

##### **Unit – II: Air Conditioner - Heating System**

Automotive heaters, manually controlled air conditioner, heater system, automatically controlled air conditioner and heater systems, automatic temperature control, air conditioning protection, engine protection.

**Refrigerant:** Containers handling refrigerants, tapping into the refrigerant container, refrigeration system diagnosis, diagnostic procedure, ambient conditions affecting system pressures.

##### **Unit-III: Air Routing and Temperature Control**

Objectives, evaporator airflow through the recirculating unit, automatic temperature control, duct system, controlling flow, vacuum reserve, testing the air control and handling systems.

##### **Unit-IV: Air Conditioning Service**

Air conditioner maintenance and service, servicing heater system removing and replacing components, trouble shooting of air controlling system, compressor service.

### **C-13P: Automotive Air Conditioning (practical)**

**Credits 02**

1. Layout of car AC system
2. Construction and operation of condenser and evaporator.
3. Construction and operation of heating system.
4. Case study of AC system.
5. Controlling system of AC.
6. Servicing of AC system.

### **Suggested Books/ Reading:**

1. William H. Crouse and Donald I. Anglin “Automotive Air conditioning” McGraw Hill
2. Mitchell information Services, Inc “Mitchell Automatic Heating and Air Conditioning Systems” - Prentice Hall.
3. Paul Weiser “Automotive Air Conditioning” Reston Publishing Co.
4. MacDonald, K. I. , “Automotive Air Conditioning”, Theodore Audel series
5. Goings L. F. “Automotive Air Conditioning” American Technical services
6. Boyce H. Dwiggins “Automotive Air Conditioning”, Delmar

## **CC- 14: Vehicle Performance and Testing**

**Credits 06**

### **C14T: Vehicle Performance and Testing**

**Credits 04**

### **Course Contents:**

#### **Unit-I: Vehicle Performance Parameters**

Vehicle Performance parameters, Fuel economy, acceleration, deceleration, grad ability, top speed, handling, comfort, life durability, EGR systems, and Vehicular systems: Suspension steering, Brakes & carriage unit testing, test procedure. Test procedure for gear box noise and shifting force.

#### **Unit-II: Vehicle Testing**

Vehicle Testing - Road test, Free acceleration test, Coast down test, Passer by noise test, Wheel alignment and balancing test, Test tracks û proving ground testing, high speed track, pavement track, corrugated track, mud track, steering pad, gradient track, deep wading through shallow water, Laboratory testing û testing on chassis dynamometer transition testing- Euro III onwards, accelerated testing, Virtual testing, Evaporative emission testing, Oil consumption testing.

#### **Unit-III: Collisions and Crash Testing**

Crash testing: Human testing, Dummies, crashworthiness, pole crash testing, rear crash testing, vehicle to vehicle impact, side impact testing, crash test sensors, sensor mounting, crash test data acquisition, Braking distance test.

#### **Unit-IV: Noise Vibration**

Noise & vibration: Mechanism of noise generation, engine noise & vibration, causes and remedies, road shocks wind noise & measurement, vehicle measurement testing. Instrumentation for functional tests, Battery testing, endurance test.

### **C-14P: Vehicle Performance and Testing (practical)**

**Credits 02**

1. Engine / vehicle performance, P.V. diagram, mechanical efficiency, volumetric efficiency and losses of fuel economy.
2. Construction and working principle of EGR and catalytic convertor. Testing procedure of suspension, brake and steering system.
3. Exhaust emission testing, oil consumption testing and road test.
4. Construction and operation of automatic clutch epicyclic transmission and torque converter. Testing of clutch, gear box, final drive and differential
5. Safety of driver and occupants like seat belt, air bags, GPS, ESP, functions and operations.

#### **Suggested Books/ Reading:**

1. SAE Transaction Papers 831814/820346/820367/820371/820375
2. SAE handbook vol 2 & 3
3. Automobile Engineering by Ramlingam
4. Automobile engineering by Kripal Singh
5. Automotive Mechanics by Joseph Heitner
6. ARAI vehicle emission test manual
7. Automobile Engineering by Rangawala

### **Discipline Specific Electives (DSE)**

#### **DSE-3: Automotive Safety**

**Credits 06**

#### **DSE3T: Automotive Safety**

**Credits 04**

#### **Course Contents:**

##### **Unit-I: Safety Concepts**

Active safety, driving safety, conditional safety, perceptibility safety, operating safety- passive safety: exterior safety, interior safety, deformation behaviour of vehicle body, and speed and acceleration characteristics of passenger compartment on impact.

##### **Unit-II: Safety Equipments**

Seat belt, regulations, automatic seat belt tightener system, collapsible steering column, tiltable steering wheel, air bags, electronic system for activating air bags, bumper design for safety.

##### **Unit-III: Collision Warning and Avoidance**

Collision warning system, causes of rear end collision, frontal object detection, rear vehicle

object detection system, object detection system with braking system interactions.

#### **Unit-IV: Comfort and Convenience System**

Steering and mirror adjustment, central locking system, Garage door opening system, tyre pressure control system, rain sensor system, environment information system.

#### **DSE-3P: Automotive Safety (practical)**

**Credits 02**

1. Aerodynamic body shape advantages
2. Use of seat belt, automatic seat belt adjustment system
3. Collapsible steering column servicing, Adjustment of steering wheel
4. Operation of front and rear vehicle object detection system
5. Rear view mirror adjustment
6. Operation of central locking system tyre pressure control system, Dicky opening system and rain sensor system
7. Servicing of door hinged and door lock.

#### **Suggested Books/ Readings**

- Bosch - "Automotive Handbook" - 5th edition - SAE publication - 2000.
- J. Powloski - "Vehicle Body Engineering" - Business books limited, London
- Ronald. K. Jurgen - "Automotive Electronics Handbook" - Second edition- McGraw-Hill

**Or**

#### **DSE-3: Two and Three Wheelers**

**Credits 06**

#### **DSE3T: Two and Three Wheelers**

**Credits 04**

#### **Course Contents:**

##### **Unit-I: Power system:**

Two stroke SI engine, four stroke SI engine; merits and demerits, Symmetrical and unsymmetrical port timing diagrams, Types of scavenging processes, merits and demerits, scavenging pumps, Rotary valve engine; Fuel system, Lubrication system. Magneto coil and battery coil spark ignition system, electronic ignition system; Starting system, Kick starter system.

##### **Unit-II: Chassis Systems:**

Mainframe and its types. Chassis and shaft drive, Single, multiple plates and centrifugal clutches. Gear box and gear controls. Front and rear suspension systems; Shock absorbers; Panel meters and controls on handle bar.



### **Unit-III: Brakes, Wheels and Tyres**

Drum brakes, disc brakes, front and rear brake links, layouts, Spoked wheel, cast wheel, disc Wheel, disc types; Tyres and tubes.

### **Unit-IV: Case studies:**

Two Wheelers: Case study of major Indian models of motorcycles, scooters and mopeds, TVS mopeds and motorcycles, Hero Honda motorcycles, Bajaj scooters and motorcycles, Yamaha, Enfield motorcycles; Servicing and maintenance.

Three Wheelers: Case study of Indian models, Auto rickshaws, pickup van, delivery van and trailer, Maintenance: daily, weekly, monthly, Fault tracing.

### **DSE-3P: Two and Three Wheelers (practical)**

**Credits 02**

1. Construction and operation of 4stroke SI engine.
2. Construction and operation of 2stroke petrol.
3. Fuel supply circuit of 2 wheeler and 3 wheeler.
4. Operation of lubricating system.
5. Operation of Magneto coil and Magneto coil ignition.
6. Operation electronic ignition.
7. Starting system and operation.
8. Construction and working of clutching system.
9. Construction and operation of Transmission Gear box.
10. Construction and operation of suspension system.
11. Construction and operation of Braking system.
12. Fitment and operation of wheels, tyre and tube.
13. Case study of motor cycles and scooter.

### **Suggested Books/ Readings**

- Irving, P. E. - Motor Cycle Engineering - Temple Press Book, London
- The Cycle Motor Manual - Temple Press Limited, London
- Encyclopedia of Motorcycling - 20 volume Marshall, Cavensih, UK
- Brayant R. V, Vespa - Maintenance and Repair Series - S. Chand & Co. , New Delhi
- Raymond Broad Lambretta - A Practical Guide to maintenance and repair - S. Chand & Co., New Delhi

## **DSE- 4: Industrial Managements**

**Credits 06**

### **DSE4T: Industrial Managements**

**Credits 04**

#### **Course Contents:**

##### **Unit-I : Organisation Management**

Concept of organisation, Structure, Types, function of organisation, Concept of stock.

##### **Unit – II: Human Resource Management (HRM)**

Introduction and Definition of human resource management (HRM), Scope and function of HRM, Planning of HRM, Selection process, Recruitment and selection, Training and Development.

##### **Unit-III: Financial management**

Object and function of financial of financial management, Capital generation and management, Type of taxes.

##### **Unit-IV: Materials management**

Importance of material managements, function of material managements, organisation structure of materials managements, function of store department.

##### **Unit-V: Safety Managements**

Types and causes of industrial accidents, Elements of safety program, Steps for preventing industrial accidents, Safety program, Safety committee.

### **DSE4P: Practical**

**Credits 02**

#### **List of Practical**

1. Two week training at Automotive/ ancillary industry for Management Practices
2. Case studies
3. PPT presentation on recent HR practices
4. Viva Voce

#### **Suggested Books/ Readings**

- Industrial Management, S.C. Sharma, Khanna Publishing House

**Or**

**DSE-4: Industrial Training**

**Credits 06**

**DSE4P: Industrial Training**

**Credits 06**

1. Industrial Training of 4 (four) weeks
2. Training may be done from industries/Skill knowledge providers (SKPs)/Sector Skill Councils (SSCs)/Training centers/Institutes dealing with automotive
3. Trainings are to be carried out during summer vacations or Semester break
4. Training Report submission
5. Viva - Voce.

Evaluation- Cumulative performance will be evaluated in Semester VI.

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