

# 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)

<b>CC-13: Automotive Air Conditioning</b>	<b>Credits 06</b>
<b>C13T : Automotive Air Conditioning</b>	<b>Credits 04</b>

### **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.

<b>C-13P: Automotive Air Conditioning (practical)</b>	<b>Credits 02</b>
<ol style="list-style-type: none"><li>1. Layout of car AC system</li><li>2. Construction and operation of condenser and evaporator.</li><li>3. Construction and operation of heating system.</li><li>4. Case study of AC system.</li><li>5. Controlling system of AC.</li><li>6. Servicing of AC system.</li></ol>	

### **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 ad troque 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 Ramalingam
4. Automobile engineering by Kripal Singh
5. Automotive Mechanics by Josef 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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