Bansilal Ramnath Agarwal Charitable Trust’s

Vishwakarma Institute of Technology
(An Autonomous Institute affiliated to Savitribai Phule Pune University formerly University of Pune)

Structure & Syllabus of
Honors in Automobile Engineering
Pattern ‘H 15 Revised’
Effective from Academic Year 2016-17

Prepared by: - Board of Studies in Mechanical Engineering
Approved by: - Academic Board, Vishwakarma Institute of Technology, Pune
Signed by

Chairman – BOS    Chairman – Academic Board

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2016-17
Note- H 15 Rev Structure which is effective from academic year 2016-17 for Honors in Automobile Engineering is also applicable for the students who have registered for H 15 Structure in the academic year 2015-16.
ME 38111 :: AUTOMOBILE SYSTEMS

Credits: 2

Teaching Scheme: 2 Hours / Week

Unit I : Basic Concepts and Clutches

(A) Engine components, basic engine nomenclature, engine classification, working of four stroke & two stroke engines, Vehicle specifications, classification, layout, applications. Purpose of clutch, classification, single plate clutch, multiple plate clutch, centrifugal clutch, cone clutch, diaphragm spring clutch, vacuum operated clutch, clutch plate, lining material.

(B) Preventive maintenance, trouble shooting and diagnosis of clutches.

Automotive Electricals - Battery, Ignition system.

Unit II : Gearbox

(A) Function, various resistances, tractive effort, performance curves, sliding mesh gearbox, constant mesh gearbox and synchromesh gearbox, epycyclic gearbox, torque converter, automatic transmission, overdrive.

(B) Preventive maintenance, trouble shooting and diagnosis of gearbox.

Automotive Electricals - Starting system

Unit III: Steering System

(A) Purpose, requirement, steering mechanisms, wheel alignment and wheel balancing, centre point steering, cornering force, slip angle, scrub radius, steering characteristic, steering gearboxes, power steering.

(B) Preventive maintenance, trouble shooting and diagnosis of steering system.

Wheels and Tyres.

Unit IV: Propeller Shaft, Universal joints, Differential and Rear Axle

(A) Propeller shaft, universal joints, final drive, differential and their types, rear axle arrangements, two speed rear axle, single, double and triple reduction rear axles. driving thrust, torque reaction, Hotchkiss drive, Torque tube drive.

(B) Preventive maintenance, trouble shooting and diagnosis of propeller shaft, Universal joints, differential and rear axle. Automotive Electricals - Charging system.
independent suspension systems, air suspension, hydrolastic suspension, hydrgas suspension, interconnected suspension, self leveling suspension.

Braking System
Purpose, stopping distance and time, braking force, brake efficiency, classification, mechanical, hydraulic, air brakes, antiskid braking system.

(B) Preventive maintenance, trouble shooting and diagnosis of suspension system and braking system. Automotive Electricals - Dashboard instruments.

(4 Hrs.)

Text Books:

Reference Books
6. AA Book of Car.

Course Outcomes:
The student will be able to-
1. Describe construction, working and other details of Internal Combustion Engines, Clutches, Battery and Ignition system
2. Demonstrate knowledge about construction, working and other details of different Gearboxes and Starting system
3. Understand and explain about construction, working and other details of Steering system, Wheels and Tyres
4. Demonstrate knowledge about construction, working, and other details of Propeller Shaft, Universal joints, Differential, Rear Axle and Charging system
5. Describe construction, working and other details of Suspension System, Braking System and Dashboard instruments
ME38112 :: AUTOMOBILE DESIGN

Credits : 02  Teaching scheme :- Theory : 2 Hrs /Week

Unit 1: Design Considerations, Vehicle Body and Chassis Design

(A) Vehicle Body & Chassis Design
Vehicle body structures, Body engineering. Overall structural design, Aerodynamic considerations in styling and shaping of body, Design for crashworthiness / safety.

(B) Introduction and Design Considerations

(6 hrs.)

Unit 2: Design of Engine Components and systems

(A) Engine Components: Design of Cylinder block and Head, Piston, pin, crown, rings, Valve gear mechanism. Material Selection.

(B) Engine Systems: Design and calculation of Major Engine systems – Cooling system, Lubricating system

(6 hrs.)

Unit 3: Design of Engine Components and systems

(A) Engine Components: Connecting rod, Crankshaft, Camshaft, Material Selection.

(B) Engine Systems: Design and calculation of Major Engine systems – Air/fuel intake system, Exhaust system,

(6 hrs.)

Unit 4: Drive train Design

(A) Design of clutch, drive-shaft, gears, gearbox, selection of proper gear ratios, differential.
(B) Belts, couplings / joints, bearings.

(6 hrs.)

Unit 5: Chassis System (Steering, Suspension & Brake) Design:

(A) Design considerations in steering, suspension, brake systems and their components.
(B) Design / selection considerations of Wheels/Rims, Tyres, and other related components.

(4 hrs.)

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Text Books:

1. Design of Machine Elements : Prof. V. B. Bhandari
2. Machine design : Dr. P. C. Sharma & Dr. D. K. Agarwal
3. Automobile Design : R. B. Gupta

Reference Books:


Course Outcomes:
The student will be able to -
1. Demonstrate knowledge about design considerations, design process in vehicle design
2. Design of Cylinder, Piston, Valve gear mechanism, Cooling system and lubrication system
3. Design of Connecting rod, Crankshaft, Camshaft, Air/Fuel intake system and Exhaust system
4. Design Drive train components
5. Understand design considerations of automobile systems such as steering, suspension and brake systems and components like Wheels/Rims and Tyres
ME 48113 :: AUTOMOTIVE ELECTRONICS AND CONTROLS

Credits : 02  Teaching scheme :- Theory : 2 Hrs /Week

Unit I (6 Hrs)
Switches and Relays

Relays: Construction, working, specifications, selection criteria and applications of Electromechanical relay, Reed relay, hermetically sealed relay, Solid-state relays. Wiring diagrams related to switches and relays.

B. Specifications of switches and relays used in automobiles.

Unit II (6hrs)
Sensors and Transducers

A. Basic sensor arrangement, Introduction to automotive sensors and instrumentation, Market perspective for sensors and instrumentation techniques, Sensor electronics and techniques, Overview of sensor measurements, Sensor classification
Types of sensors such as- Fuel metering/ vehicle speed sensors and destination sensors, Flow sensor, exhaust temperature, air mass flow sensors. Throttle position sensor, speedometer, fuel, oil and temperature gauges.
Pressure, position, flow, temperature, humidity, speed, acceleration, torque, distance and level sensors

B. Oxygen sensors, crank angle position sensors, Altitude sensor

UNIT –III (6 hrs)
Sensors and Transducers


B. Pollution measuring sensors, Gas analyzer, FID, Measurement of NOx, smoke, etc.

Unit IV (6 Hrs)
Actuators

A. Solenoid, stepper motor, relays, Horn, wiper system, flasher, electric fuel pump, Trafficator, clutch

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Principles of actuation and control, DC motors, stepper motors, Relays and solenoids, Hydraulic and pneumatic, climate control and electronic displays.

B. Vehicles lighting Circuits Signaling Circuit, electric windows systems, seat belt tensioners

Unit V (4 Hrs)

Control Systems

A. Automatic Cabin climate control, Automatic Cruise Control, Air Bag Control, ABS Control, Automatic Transmission Control, Electronic steering Control, Automatic gear control, Electric Power Steering, Electronic Distributor-less ignition control, Exhaust Gas Recirculation Control, Electronic Fuel Control

B. Electronic Clutch Control, Electronic Damping Control, Traction Control, Automotive central locking and anti-theft system control

Text Books


Reference Books


Course Outcomes:
The student will be able to -

1. Demonstrate knowledge about fundamentals, construction and other details of switches and relays

2. Demonstrate knowledge about sensors and transducers

3. Demonstrate knowledge about electronic dashboard instruments and other details

4. Demonstrate knowledge about actuators

5. Understand and explain the control systems using sensing and actuation devices.
ME48114:: VEHICLE DYNAMICS

Credits: 02  Teaching Scheme: 2 Hours / Week

Unit I  (5 Hrs)
Mechanics of Pneumatic tyres
A: Tyre forces and moments, rolling resistance, tractive properties, cornering properties
B: Tyre construction

Unit II  (5 Hrs)
Performance characteristics of road vehicles
A: Dynamic axle loads, Equations of motion, transmission characteristics, vehicle performance, power limited and traction limited acceleration
B: Braking performance, Brake proportioning, braking efficiency

Unit III  (5 Hrs)
Ride Characteristics
A: Excitation sources, human response, vehicle ride models
B: Vehicle response

Unit IV  (5 Hrs)
Handling characteristics
A: Steady state cornering, suspension effects on cornering, Understeer effects, Experimental measurement of understeer gradient, testing of handling characteristics
B: Directional stability of single track vehicles, 3-wheelers & 4-wheelers

Unit V  (4 Hrs)
Suspensions and Steering system
A: Roll centre analysis, Leaf Spring suspension. Steering geometry, steering forces and moments, axles, independent suspensions, suspension geometry
B: Quarter car and half car modeling with ADAMS software,

Text Books
2. Giles J. G., Steering, Suspension and Tyres, ILIFFE Books Ltd.

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Reference Books
1. John Dixon, Suspension Geometry and Computation, John Wiley & Sons Ltd

Course Outcomes:
The student will be able to-
1. Understand characteristics of the components related to the vehicle handling.
2. Understand vehicle performance criteria and able to solve simple problems on the same.
3. Understand vehicle models and analyse dynamic response of the vehicle.
4. Understand handling characteristics of the vehicles and able to perform mathematical analysis.
5. Understand basics characteristics of different components and assemblies responsible for vehicle handling.
ME 38311 :: AUTOMOBILE ENGINEERING LABORATORY

Credits : 01  Teaching scheme :- 2 Hrs /Week

List of Experiments:
1. Freehand sketching / CAD Modeling of prototypes of structural components of a car.
2. Design of exterior body by using a CAD / graphics software.
3. Study of design evolution of a mass produced car platform.
4. Study of new trends in the design of electric or hybrid vehicles.
5. Wheel alignment and balancing.
6. Mechatronic system used in a vehicle. (E.g, Power window mechanism, Power steering, ABS, etc.).
7. Engine pollution measurement and its analysis.
10. Report on visit to automobile manufacturing industry/service station.

Text Books:

Reference Books
6. AA Book of Car.

Course Outcomes :
The student will be able to -
1. Demonstrate knowledge about CAD Modeling, exterior body design and other design considerations
2. Understand about automobile systems
3. Perform engine testing and do programming and simulation and do engine pollution measurement and its analysis

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ME 48312 :: ADVANCED AUTOMOBILE ENGINEERING LABORATORY

Credits : 01  Teaching scheme :- 2 Hrs /Week

List of Experiments:
1. Advanced safety measures and comforts adopted in automotive vehicles.
2. Engine management system
3. Variable valve timing (VVT) and Variable valve lift engine control (VTEC) mechanism.
5. Automatic transmission.
6. Advanced braking systems.
7. Advanced suspension systems.
8. Electronic power steering.
9. Vehicle reliability and testing.
10. Simulation of vehicle drive system.

Text Books:


Reference Books:

4. AA Book of Car.

Course Outcomes:
The student will be able to -
1. Demonstrate knowledge about safety measures and comforts and latest trends in I.C. engine
2. Understand and explain various advanced systems used in automobiles.
3. Demonstrate knowledge about vehicle testing and Simulation of vehicle drive system

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