

V Semester

MODERN MOBILITY & AUTOMOTIVE MECHANICS			
Course Code	21ME54	CIE Marks	50
Teaching Hours/Week (L:T:P: S)	3:0:0:0	SEE Marks	50
Total Hours of Pedagogy	40	Total Marks	100
Credits	03	Exam Hours	03

Course Learning objectives:

- To understand the different chassis design & main components of automobile
- To understand the working of transmission and control system employed in automobiles
- To understand the automotive pollution and alternative automotive technologies under trail
- To understand the upcoming electric vehicle technology

Teaching-Learning Process (General Instructions)

These are sample Strategies, which teacher can use to accelerate the attainment of the various course outcomes.

1. Explain clearly through Power Point presentations
2. showing live Videos for working of components
3. Demonstration of live working of components through cut section models
4. Inspecting live vehicles
5. Visiting nearby service centres

Module-1		Chassis & Power Plant
History of Automobile, Classification of Automobile w.r.t Usage, Chassis, Body, Power Sources, capacity, main components of Internal Combustion Engines and their Functions, Fuel supply system, Cooling System, Lubrication System & Ignition System, Engine Management System, super charged engines, hybrid engines, modern GT engines		
Teaching-Learning Process	Power Point presentations Live Videos for working of components Explaining through live components in class room	

Module-2		Transmission & Suspension System
Clutches; Plate Clutches, Cone Clutch, Centrifugal Clutch, Fluid Flywheel Gear Box; Gear Shifting mechanism, synchromesh Gear box, Torque converter, Automatic Manual Transmission (AMT), Automatic Transmission (AT), intelligent manual Transmission (IMT) Continuously Variable Transmission (CVT), Infinitely Variable Transmission (IVT)- Working of Differential, Rear Axle types & construction. Suspension – layout & working of Hydraulic & Air suspension, Independent suspension, Functions & advantages of Leaf Spring, Coil Spring, Telescopic Shock Absorber, Torsion Bar		
Teaching-Learning Process	Power Point presentations Live Videos for working of components Explaining through live components in class room	

Module-3		Control & Safety systems
Steering system- mechanisms & Linkages, Steering gear boxes- Rack & pinion, worm & wheel construction & working,, power Steering construction & working, steering geometry, Wheel balancing Braking System- Mechanism and Linkages; Mechanical Brakes, Hydraulic Brakes, Power Brakes, Parking brakes, ABS, Safety system – Safety measures in modern vehicle – safety frames – working of - air bags, seat belt, collapsible steering, spoilers, defoggers, fire safety measures in heavy vehicles, bullet proof vehicles		
Teaching-Learning	Power Point presentations Live Videos for working of components	

Process	Explaining through live components in class room
Module-4 Automotive Emission & Alternate Vehicles	
Exhaust gas pollutants and their effects on environment, Emission norms, IC engine fuels types, extraction & availability, BIO Fuels – Production and impact. Ethanol engines, CNG vehicles- operation, advantages & disadvantages, over view of Hydrogen - fuel cell vehicles, advantages & disadvantages, IC engine/ electric hybrid vehicles over view, layout, transmission & control system, solar powered vehicles- wind powered vehicles, super capacitors, supply rails	
Teaching-Learning Process	Power Point presentations Live Videos for working of components
Module-5 Electric Vehicles & Storage Batteries	
Electric vehicles principle and components- layout of two & 4 wheeler, Motors used in Electric vehicles –types- over view of construction and working, power transmission & control system in Electric vehicles. Batteries –construction & working principle of Lead acid, nickel based, sodium based, Lithium & Metal Air batteries. Battery charging types and requirements, battery cooling, fire safety measures in EV vehicles	
Teaching-Learning Process	Power Point presentations Live Videos for working of components
Course outcome (Course Skill Set)	
At the end of the course the student will be able to :	
5. Understand the working of different systems employed in automobile 6. Analyse the limitation of present day automobiles 7. Evaluate the energy sources suitability 8. Apply the knowledge for selection of automobiles based on their suitability	

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Assessment Details (both CIE and SEE)

The weightage of Continuous Internal Evaluation (CIE) is 50% and for Semester End Exam (SEE) is 50%. The minimum passing mark for the CIE is 40% of the maximum marks (20 marks out of 50). A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to each subject/ course if the student secures not less than 35% (18 Marks out of 50) in the semester-end examination(SEE), and a minimum of 40% (40 marks out of 100) in the sum total of the CIE (Continuous Internal Evaluation) and SEE (Semester End Examination) taken together

Continuous Internal Evaluation:

Three Unit Tests each of 20 Marks (duration 01 hour)

- First test at the end of 5th week of the semester
- Second test at the end of the 10th week of the semester
- Third test at the end of the 15th week of the semester

Two assignments each of 10 Marks

- First assignment at the end of 4th week of the semester
- Second assignment at the end of 9th week of the semester

Group discussion/Seminar/quiz any one of three suitably planned to attain the COs and POs for 20 Marks (duration 01 hours)

- At the end of the 13th week of the semester

The sum of three tests, two assignments, and quiz/seminar/group discussion will be out of 100 marks and will be scaled down to 50 marks

(To have less stressed CIE, the portion of the syllabus should not be common /repeated for any of the methods of the CIE. Each method of CIE should have a different syllabus portion of the course).

CIE methods /question paper is designed to attain the different levels of Bloom's taxonomy as per the outcome defined for the course.

Semester End Examination:

Theory SEE will be conducted by University as per the scheduled timetable, with common question papers for the subject (duration 03 hours)

- The question paper will have ten questions. Each question is set for 20 marks. Marks scored shall be reduced proportionally to 50 marks
- There will be 2 questions from each module. Each of the two questions under a module (with a maximum of 3 sub-questions), should have a mix of topics under that module.

Suggested Learning Resources:**Books**

- Electric Vehicle Technology Explained James Larminie Oxford Brookes University, Oxford, UK John Lowry Acenti Designs Ltd., UK
- Automobile engineering, Kirpal Singh, Vol I and II (12th Edition) Standard Publishers 2011 2
- Automotive Mechanics, S. Srinivasan, (2nd Edition) Tata McGraw Hill 2003.
- Automotive Systems & Modern Mobility by Dr T Madhusudhan, et al., Cengage publications
- Automotive mechanics, William H Crouse & Donald L Anglin (10th Edition) Tata McGraw Hill Publishing Company Ltd., 2007.
- Modern Electric, Hybrid Electric, and Fuel Cell Vehicles, Mehrdad Ehsani, Yimin Gao, CRC Press, Taylor & Francis Group
- Automotive mechanics: Principles and Practices, Joseph Heitner, D Van Nostrand Company, Inc
- Fundamentals of Automobile Engineering, K.K. Ramalingam, Scitech Publications (India) Pvt. Ltd. 4.
- Automobile Engineering, R. B. Gupta, Satya Prakashan, (4th Edition) 1984.

Web links and Video Lectures (e-Resources):

<https://archive.nptel.ac.in/courses/107/106/107106088/>

https://onlinecourses.nptel.ac.in/noc20_de06/preview

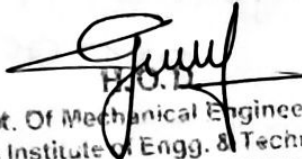
<https://www.digimat.in/nptel/courses/video/107106088/L01.html>

<https://nptel.ac.in/courses/107106088>

https://www.youtube.com/watch?v=LZ82iANWBLO&list=PLbMVogVj5nJTW50jj9_gvJmdwFWHagR5J

Activity Based Learning (Suggested Activities in Class)/ Practical Based learning

- Operate the cut section models of complete vehicle chassis and observe the working of all components
- Dismantle & Assemble the Automotive Engine, Gear Box, Clutch, brakes
- Prepare the posters of automobile chassis & display
- Visit nearby automobile showrooms/ service station
- Prepare a comparison statement of different automobiles using specification provided by respective manufacturers
- Visit auto expo


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