

Vehicle Technology

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|--|----------|---------------------------------|-------|----------------------|--------|
| Course Code | 23ME2604 | Year | III | Semester | II |
| Course Category | OE- II | Branch | ME | Course Type | Theory |
| Credits | 3 | L-T-P | 3-0-0 | Prerequisites | - |
| Continuous Internal Evaluation: | 30 | Semester End Evaluation: | 70 | Total Marks: | 100 |

| Course Outcomes | | |
|---|---|----|
| Upon successful completion of the course, the student will be able to | | BL |
| CO1 | Explain advanced engine technologies and their role in improving performance and efficiency. | L2 |
| CO2 | Analyze advanced combustion technologies and evaluate their benefits in terms of efficiency and emission reduction. | L4 |
| CO3 | Identify low-carbon and alternative fuels and assess their significance in sustainable automotive applications. | L3 |
| CO4 | Describe and compare various hybrid and electric vehicle configurations and their operating principles. | L3 |
| CO5 | Explain the working principles of fuel cell systems and analyze their applications in automotive technology. | L4 |

| Mapping of course outcomes with Program outcomes (CO/ PO/PSO Matrix) | | | | | | | | | | | | | |
|---|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|------|
| Note: 1- Weak correlation 2-Medium correlation 3-Strong correlation | | | | | | | | | | | | | |
| * - Average value indicates course correlation strength with mapped PO | | | | | | | | | | | | | |
| COs | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PSO1 | PSO2 |
| CO1 | 3 | | 2 | 2 | | | | 2 | | 2 | | | |
| CO2 | 3 | | 2 | 2 | 2 | | | 2 | | 2 | | | |
| CO3 | 3 | | 2 | 2 | 2 | | | 2 | | 2 | | | |
| CO4 | 3 | | 2 | 2 | 2 | | | 2 | | 2 | | | |
| CO5 | 3 | | 2 | 2 | 2 | | | 2 | | 2 | | | |
| Average | 3 | | 2 | 2 | 2 | | | 2 | | 2 | | | |

| Syllabus | | |
|----------|--|-----------|
| Unit No. | Contents | Mapped CO |
| 1 | Advanced Engine Technology: Gasoline Direct Injection, Common Rail Direct Injection, Variable Compression Ratio Turbocharged Engines, Electric Turbochargers, VVT, Intelligent Cylinder De-activation, After Treatment Technologies, Electric EGR, Current EMS architecture | CO1 |
| 2 | Combustion Technology: Spark Ignition combustion, Compression Ignition Combustion, Conventional Dual Fuel Combustion, Low Temperature Combustion Concepts– Controlled Auto Ignition, Homogeneous Charge Compression Ignition, Premixed Charge | CO2 |

| | | |
|---|---|-----|
| | Compression Ignition, Partially Premixed Compression Ignition, Reactivity Controlled Compression Ignition, Gasoline Direct Injection Compression Ignition. | |
| 3 | Low Carbon Fuel Technology: Alcohol Fuels, Ammonia Fuel and Combustion, Methane Technology, Dimethyl Ether, Hydrogen Fuel Technology, Challenges, and way forward | CO3 |
| 4 | Hybrid And Electric Vehicle (Battery Powered): Conventional Hybrids (Conventional ICE + Battery), Modern Hybrids (RCCI/GDCI Engine + Battery), Pure Electric Vehicle Technology – Challenges and Way forward | CO4 |
| 5 | Fuel Cell Technology: Fuel cells for automotive applications - Technology advances in fuel cell vehicle systems - Onboard hydrogen storage - Liquid hydrogen and compressed hydrogen - Metal hydrides, Fuel cell control system - Alkaline fuel cell - Road map to market. | CO5 |

Learning Resource

Text books:

1. Mehrdad Ehsani, Yimi Gao, Sebastian E. Gay, Ali Emadi, Modern Electric, Hybrid Electric and Fuel Cell Vehicles: Fundamentals, Theory and Design, CRC Press, 2004.
2. Rakesh Kumar Maurya, Characteristics and Control of Low Temperature Combustion Engines. ISBN 978-3-319-68507-6, Springer, 2018

References

1. Iqbal Hussein, Electric and Hybrid Vehicles: Design Fundamentals, CRC Press, 2003.
2. James Larminie, John Lowry, Electric Vehicle Technology Explained, Wiley, 2003
3. Rand D.A.J, Woods, R & Dell RM Batteries for Electric vehicles, John Wiley & Sons, 1998
4. Iqbal Hussein, Electric and Hybrid Vehicles: Design Fundamentals, CRC Press, 2003.
5. James Larminie, John Lowry, Electric Vehicle Technology Explained, Wiley, 2003

E-Resources:

1. Fundamentals of Automotive Systems (NPTEL – IIT Madras) – https://onlinecourses.nptel.ac.in/noc25_de02/preview
2. Vehicle Dynamics (NPTEL Study Materials / SWAYAM)- link via NPTELprep/SWAYAM
3. Fundamentals of Electric Vehicles: Technology & Economics (NPTEL) – <https://archive.nptel.ac.in/... NPTEL+2NPTELPrep+2>
4. Electric Vehicles Part 1 (NPTEL Archived Course) – <https://onlinecourses-archive.nptel.ac.in/... NPTEL Online Courses Archive>
5. Autotronics (NPTEL – Automotive Electronics) – https://onlinecourses.nptel.ac.in/noc26_me101/preview NPTEL