



Maratha Vidya Prasarak Samaj's
Karmaveer Adv. Baburao Ganpatrao Thakare College of Engineering
An Autonomous Institute affiliated to Savitribai Phule Pune University, Pune
Udoji Maratha Boarding Campus, Gangapur Road, Nashik - 422 013,
Maharashtra, India

Syllabus of Under-Graduate Program
Third Year B.Tech. Mechanical Engineering –
Honors in Vehicle Engineering (2024 Pattern)
(As per NEP 2020)
Academic Year 2026-27
(Copy for Student Circulation Only)

Third Year B.Tech. Mechanical Engineering – Honors in Vehicle Engineering
Curriculum Structure (2024 Pattern) Semester – V

Course Code	Course Type	Course Name	Teaching Scheme (Hrs/Week)			Evaluation Scheme and Marks					Credits			
			TH	PR	TU	CCE	ESE	TW	PR + OR	TOT	TH	PR	TU	TOT
101507	HON-1	Systems in Automobile Engineering	3	2	-	40	60	25	25	150	3	1	-	4
Total			3	2	0	40	60	25	25	150	3	1	0	4

Third Year B.Tech. Mechanical Engineering – Honors in Vehicle Engineering
Curriculum Structure (2024 Pattern) Semester – VI

Course Code	Course Type	Course Name	Teaching Scheme (Hrs/Week)			Evaluation Scheme and Marks					Credits			
			TH	PR	TU	CCE	ESE	TW	PR + OR	TOT	TH	PR	TU	TOT
101607	HON-2	Design of Automotive Systems	3	2	-	40	60	25	25	150	3	1	-	4
Total			3	2	0	40	60	25	25	150	3	1	0	4

Semester - V

Course Code: 101507	Course Name: Systems in Automobile Engineering	
Teaching Scheme	Credit	Evaluation Scheme
Theory : 3 Hours/Week Practical : 2 Hours/Week	3 1	CCE : 40 Marks ESE : 60 Marks TW : 25 Marks PR + OR : 25 Marks

Expected Prerequisite Courses:

- Engineering Physics, Engineering Mechanics.

Course Objectives:

- To provide fundamental understanding of construction and working of automobile subsystems.
- To equip students with tools and methods to measure and analyze performance of automobiles.
- To acquaint students with contemporary automotive technologies.

Course Outcomes:

After successful completion of the course, learner will be able to:

CO1: Compare the chassis and drive train of an automobile.

CO2: Analyze axles, wheels, tyres and the steering system of an automobile.

CO3: Select suspension and braking systems of an automobile.

CO4: Measure and analyze the performance of an automobile and describe the safety aspects.

CO5: Discuss electrical systems and assess modern propulsion technologies of an automobile.

Course Contents:

Unit-I: Introduction to Chassis and Drive Train

08 Hours

Introduction: Current scenario in Indian auto/ancillary industries, vehicle specifications and classification.

Chassis and Frames: Types of chassis layout with reference to power plant locations and drive, various types of frames and constructional details.

Drive Train: Necessity and selection of clutch, necessity of gearbox and different types, overdrive, torque convertor, continuous variable transmission, dual clutch transmission, automated manual transmission, propeller shaft, final drive, and differential.

**Unit-II: Axles, Wheels, Tyres and Steering System****08 Hours**

Axles: Purpose, requirement and types of front and rear axle, loads acting on rear axles.

Wheels and tyres: Wheel construction, alloy wheel, wheel balancing and rotation, type of tyres, tyre construction, tyre materials, factors affecting tyre life.

Steering system: Steering mechanism, steering geometry, cornering force, slip angle, scrub radius, steering characteristics, steering linkages and gearbox, power steering, collapsible steering, reversibility of steering, four-wheel steering, wheel alignment.

Unit-III: Suspension and Brake System**08 Hours**

Suspension: Types of suspension linkages, types of suspension springs- leaf, coil, air springs, hydrogas, interconnected suspension, self-levelling suspension (active suspension), shock absorbers (hydraulic and air).

Brake systems: Drum, disc, mechanical, hydraulic, air brakes, power-assisted brakes, hand brake, ABS, EBD, BA.

Unit-IV: Vehicle Performance and Safety**08 Hours**

Vehicle performance: parameters; vehicle resistances; traction and tractive effort; power requirements for propulsion; road performance curves (numerical examples); vehicle stability; vehicle testing on a chassis dynamometer; NVH in automobiles.

Vehicle safety: Types of active and passive safety, vehicle interior and ergonomics.

Unit-V: Electrical System and Modern Propulsion Technologies**08 Hours**

Batteries: Principles and construction of lead-acid battery, characteristics of battery, rating capacity and efficiency of batteries, various tests on battery condition, charging methods, introduction to lithium batteries.

Electrical system and accessories: Basic electric layout of the vehicle, automotive sensors and actuators, electronic control unit/module.

Modern propulsion technologies: Concept and environmental importance of EVs and HEVs, Layout, construction and working, Challenges and future scope of EVs and HEV.

Learning Resources:**Text Books:**

1. William H. Crouse., “Automotive Mechanics”, Tata McGraw Hill Publishing House.
2. Narang G. B. S, “Automobile Engineering”, S. Chand and Company Ltd.

Reference Books:

1. Kirpal Singh, “Automobile Engineering”, Volume 1, Standard Publishers distributors.
2. R. K. Rajput, “Automobile Engineering”, Laxmi Publications.

Web link for MOOC / NPTEL Links:

1. Fundamentals of Automotive Systems:
https://onlinecourses.nptel.ac.in/noc20_de06/preview
2. Autotronics: https://onlinecourses.nptel.ac.in/noc26_me101/preview
3. Vocational: Automotive Services Technician (Four-Wheeler):
https://onlinecourses.swayam2.ac.in/nos24_ge28/preview
4. Automotive Industrial Engineering:
<https://www.coursera.org/learn/automotive-industrial-engineering>
5. Automotive Engineering: Automobile Fundamentals
<https://www.udemy.com/course/automotive-engineering-automobile-fundamentals-and-advanced/>

List of Practicals:

1. Identify four vehicles having different chassis layouts and compare their performance.
2. Identify four vehicles equipped with different types of automatic transmission and compare their performance.
3. Visit an automobile service centre for a demonstration of wheel alignment and write a detailed report on the axle, wheels, tyres and wheel alignment of one car.
4. Experimental study of the shock absorber.
5. Measurement of noise and vibration in an automobile.
6. Study of the requirements of the BNCAP test.
7. Demonstration on basic maintenance and checks of an automobile, such as door setting, consumable checking and replacing, brake pad checking & replacing, checking tyre wear, etc.

Semester - VI

Course Code: 101607	Course Name: Design of Automotive Systems	
Teaching Scheme	Credit	Evaluation Scheme
Theory : 3 Hours/Week Practical : 2 Hours/Week	3 1	CCE : 40 Marks ESE : 60 Marks TW : 25 Marks PR + OR : 25 Marks

Expected Prerequisite Courses:

- Engineering Physics, Engineering Mechanics, Machine Design, Solid Mechanics, Systems in Automobile Engineering.

Course Objectives:

- To provide an understanding of the industrial design process.
- To acquaint learners with the principles of design of the automotive system.
- To impart the knowledge of vehicle dynamics, noise and vibrations.

Course Outcomes:

After successful completion of the course, learner will be able to:

CO1: Apply principles of industrial design used in automotive systems.

CO2: Design IC engine components.

CO3: Design brake and suspension system.

CO4: Design chassis and body.

CO5: Model vehicle dynamics and measure noise and vibrations.

Course Contents:

Unit-I: Industrial Design Process 08 Hours

Concurrent Engineering, Aesthetic and ergonomic considerations in design, Design Review, DFMEA, Design for Assembly, Design for Manufacturing, Introduction to Reliability Engineering.

Unit-II: Design of IC Engine components 08 Hours

Introduction to selection of material for I. C. engine components, Design of cylinder and cylinder head, construction of cylinder liners, design of piston and piston-pins, piston rings, design of connecting rod. Design of crankshaft and crankpin.

Unit-III: Design of Brake and Suspension System 08 Hours

Drum brake and disc brake, braking performance parameters, mechanical and hydraulic braking system, coil spring, materials, suspension system and linkages, hydraulic damper.

Unit-IV: Design of Chassis and Body**08 Hours**

Chassis design of static and dynamic loads, loads on the vehicle body, vehicle body aerodynamics, and design for crash.

Unit-V: Vehicle Dynamics and NVH**08 Hours**

Modelling of car as a spring-mass system, Vehicle directional stability and ride characteristics, Noise fundamentals, Sources of noise and control, Vibrations fundamentals, vibrations measurement and control.

Learning Resources:**Text Books:**

1. V. B. Bhandari, "Design of Machine elements", Tata McGraw-Hill (India) Pvt. Ltd.

Reference Books:

1. J. Reimpell, H. Stoll, J. W. Betzler, "The Automotive Chassis: Engineering Principles", Society of Automobile Engineers Inc.
2. W. H. Crouse, "Automotive Chassis and Body", McGraw-Hill Ltd., New York
3. T. D. Gillespie, "Fundamentals of Vehicle Dynamics", Society of Automobile Engineers Inc.
4. G. K. Grover, "Mechanical Vibrations", Nem Chand & Bros.
5. K. Pujara, "Vibrations and Noise for Engineers", Dhanpat Rai & Sons.

Web link for MOOC / NPTEL Links:

1. Fundamentals of Automotive Systems:
https://onlinecourses.nptel.ac.in/noc20_de06/preview
2. Automotive Engineering: Automobile Fundamentals:
<https://www.udemy.com/course/automotive-engineering-automobile-fundamentals-and-advanced/>

List of Practicals:

1. Case study on aesthetics / ergonomics / DFMEA / Design for assembly / Design for manufacturing.
2. Group Project: Design project on IC Engine / Brakes and suspension system / Chassis and body.
3. Software simulation on multi-body dynamics / Measurement of vibration and noise of an automobile.