| **Walchand College of Engineering, Sangli**  *(Government Aided Autonomous Institute)* | | | | | | | | | |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **AY 2023-24** | | | | | | | | | |
| **Course Information** | | | | | | | | | |
| **Programme** | | | | B. Tech. (Mechanical Engineering) | | | | | |
| **Class, Semester** | | | | Third Year B. Tech., Sem. VI | | | | | |
| **Course Code** | | | | 6ME336 | | | | | |
| **Course Name** | | | | Basics of Automobile Engineering | | | | | |
| **Desired Requisites:** | | | |  | | | | | |
|  | | | | | | | | | |
| **Teaching Scheme** | | | | **Examination Scheme (Marks)** | | | | | |
| **Lecture** | | | 3 Hrs./week | **MSE** | **ISE** | **ESE** | | **Total** | |
| **Tutorial** | | | - | 30 | 20 | 50 | | 100 | |
|  | | |  | **Credits: 3** | | | | | |
|  | | | | | | | | | |
| **Course Objectives** | | | | | | | | | |
| **1** | To make students familiar with various basic of Engine and modern automobile. | | | | | | | | |
| **2** | To introduce the mathematical treatments required for vehicle performance and for some of important systems such as steering system and brake system. | | | | | | | | |
| **3** | To make students aware about latest trends in transportation towards a safe, pollution free and fully automatic vehicle. | | | | | | | | |
| **4** | To empower students to face the real life automotive usage with greater confidence. | | | | | | | | |
|  | | | | | | | | | |
| **Course Outcomes (CO) with Bloom’s Taxonomy Level** | | | | | | | | | |
| At the end of the course, the students will be able to, | | | | | | | | | |
| **CO** | **Course Outcome Statement/s** | | | | | | **Bloom’s Taxonomy Level** | | **Bloom’s Taxonomy Description** |
| **CO1** | Comprehend about I C Engines, various automotive systems, components and recent trends in automotive systems. | | | | | | II | | Understand |
| **CO2** | Apply vehicle dynamics concepts to investigate influence of various parameters in automotive system. | | | | | | III | | Applying |
| **CO3** | Analyze acceleration, barking and steering performance of a vehicle in different driving conditions. | | | | | | IV | | Analyze |
|  | | | | | | | | | |
| **Module** | | **Module Contents** | | | | | | | **Hours** |
| I | | **Introduction, classification, Types of I C Engine.**  Engine cycles, Combustion in SI & CI engines, Supercharging & emission control techniques, Engine performance parameters. | | | | | | | 6 |
| II | | **Introduction, classification and Automotive power plants**  Introduction, Broad classification of Automobiles. Major components and their functions. Types of vehicle layouts, Types of bodies.  Requirements of automotive power plants, Comparison and suitability considerations. Engine cycles. | | | | | | | 6 |
| III | | **Vehicle Performance**  Resistance to vehicle motion, Air, Rolling and Gradient resistance, Acceleration,  Gradeability and draw bar pull, Traction and Tractive effort, Distribution of weight, Power required for vehicle propulsion, Selection of gear ratio, Rear axle ratio. | | | | | | | 8 |
| IV | | **Electric and Hybrid Electric vehicles**  Classification and working of Electric and Hybrid vehicles, Design considerations, Electric and Hybrid vehicles- Layout, advantages and limitations. Present scenario of Electric vehicles, issues and challenges in the Electric Vehicle. | | | | | | | 6 |
| V | | **Transmission System ,Suspension, Steering, Braking and Electrical System**  Automobile clutch requirements, Types & functions - clutches,  gearboxes, construction and Working, Principle of operation of automatic transmission, Torque converter, Epicyclic gear train, Propeller shaft, Universal joint, Final drive, Differential, Rear axles. Suspension requirements, Sprung and Unsprung mass, Types of automotive suspension systems. Function of steering, Steering system layout, Automotive steering mechanism, Types of steering gear boxes, , Types of braking mechanism, Calculation of braking force required, stopping distance and dynamic weight transfer Automotive batteries, Automotive electric systems, Engine electronic control modules, Safety devices. | | | | | | | 8 |
| VI | | **Recent trends in Automotive Development**  NVH and crashworthiness of vehicles, Emission norms and control, Testing and certification of vehicles. Introduction to Electric and Hybrid power trains. | | | | | | | 5 |
|  | | | | | | | | | |
| **Text Books** | | | | | | | | | |
| 1 | V Ganesan, “Internal combustion Engine”, McGraw Hill Education ,4th Edition, 2012 | | | | | | | | |
| 2 | Kripal Singh, “Automobile Engineering Vol. II”, Standard Publishers Distributors, Tenth Edition , 2007 | | | | | | | | |
| 3 | P S Gill, “Automobile Engineering II”, S K Kataria and Sons, Second Edition, 2012 | | | | | | | | |
| 4 | R K Rajput, “Automobile Engineering”, Laxmi Publications, First Edition, 2007 | | | | | | | | |
|  | | | | | | | | | |
| **References** | | | | | | | | | |
| 1 | John B Heywood, “Internal Combustion Engines fundamentals”, McGraw-Hill, Revised 2nd Edition, 2017 | | | | | | | | |
| 2 | Newton, Steeds and Garrett, “The Motor Vehicle”, Butterworths International Edition, 11th Edition, 1989 | | | | | | | | |
| 3 | Crouse and Anglin, “Automotive Mechanics”, McGrawhill Publication, Tenth Edition, 2007 | | | | | | | | |
| 4 | P W Kett, “ Motor Vehicle Science Part - 2, “ Chapman & Hall” , 2nd Edition, 1982 | | | | | | | | |
|  | | | | | | | | | |
| **Useful Links** | | | | | | | | | |
| 1 | https://onlinecourses.nptel.ac.in/noc21\_me69/preview | | | | | | | | |
| 2 | <https://nptel.ac.in/courses/107/106/107106088/> | | | | | | | | |
| 3 | <https://nptel.ac.in/courses/107/106/107106080/> | | | | | | | | |
| 4 | <https://ed.iitm.ac.in/~shankarram/Course_Files/ED5160/ED5160_Journal_Complete_Notes.pdf> | | | | | | | | |

| **CO-PO Mapping** | | | | | | | | | | | | | | | |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | **Programme Outcomes (PO) Civil** | | | | | | | | | | | | **PSO** | | |
|  | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 1 | 2 |  |
| **CO1** |  | 1 | 1 |  |  |  |  |  |  |  | 1 |  |  |  |  |
| **CO2** | 1 | 1 |  | 1 |  |  |  |  |  |  |  |  |  |  |  |
| **CO3** |  | 1 |  | 2 |  |  |  |  |  |  |  | 1 |  |  |  |
|  | **Programme Outcomes (PO) Electrical** | | | | | | | | | | | | **PSO** | | |
|  | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 1 | 2 |  |
| **CO1** |  |  | 2 |  |  |  |  |  |  |  | 1 |  |  |  |  |
| **CO2** | 3 |  |  | 2 |  |  |  |  |  |  |  |  |  |  |  |
| **CO3** |  | 3 |  | 2 |  |  |  |  |  |  |  | 1 |  |  |  |
|  | **Programme Outcomes (PO) Electronics** | | | | | | | | | | | | **PSO** | | |
|  | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 1 | 2 |  |
| **CO1** |  | 2 | 2 |  |  |  |  |  |  |  | 1 |  |  |  |  |
| **CO2** |  |  |  | 1 |  |  |  |  |  |  |  |  |  |  |  |
| **CO3** |  | 1 |  | 2 |  |  |  |  |  |  |  | 1 |  |  |  |
|  | **Programme Outcomes (PO) Information technology** | | | | | | | | | | | | **PSO** | | |
|  | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 1 | 2 |  |
| **CO1** |  | 1 |  |  |  |  |  |  |  |  | 1 |  |  |  |  |
| **CO2** |  | 1 |  | 1 |  |  |  |  |  |  |  |  |  |  |  |
| **CO3** |  |  |  | 1 |  |  |  |  |  |  |  | 1 |  |  |  |
|  | **Programme Outcomes (PO) Computer science and engineering** | | | | | | | | | | | | **PSO** | | |
|  | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 1 | 2 |  |
| **CO1** |  | 1 | 1 |  |  |  |  |  |  |  | 1 |  |  |  |  |
| **CO2** |  | 1 |  | 1 |  |  |  |  |  |  |  |  |  |  |  |
| **CO3** |  |  |  |  |  |  |  |  |  |  |  | 1 |  |  |  |
| The strength of mapping is to be written as 1,2,3; Where, 1:Low, 2:Medium, 3:High | | | | | | | | | | | | | | | |

| **Assessment** |
| --- |
| The assessment is based on MSE, ISE and ESE.  MSE shall be typically on modules 1 to 3.  ISE shall be taken throughout the semester in the form of teacher’s assessment. Mode of assessment can be field visit, assignments etc. and is expected to map at least one higher order PO.  ESE shall be on all modules with around 40% weightage on modules 1 to 3 and 60% weightage on modules 4 to 6.  For passing a theory course, Min. 40% marks in (MSE+ISE+ESE) are needed and Min. 40% marks in ESE are needed. (ESE shall be a separate head of passing) |