### Scheme of Teaching and Examination

**B.E. VIII Semester - Automobile Engineering**

<table>
<thead>
<tr>
<th>S. No.</th>
<th>Board of Study</th>
<th>Sub. Code</th>
<th>Subject</th>
<th>Periods Per Week</th>
<th>Scheme of Exam</th>
<th>Total Marks</th>
<th>Credit</th>
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<tbody>
<tr>
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<tr>
<td>1</td>
<td>Mech. Engg</td>
<td>337831(37)</td>
<td>Robotics</td>
<td>4 1 -</td>
<td>80 20 20 120 5</td>
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<td>2</td>
<td>Mech. Engg</td>
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<td>Industrial Engineering &amp; Management</td>
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<tr>
<td>4</td>
<td>Refer Table - III</td>
<td>Professional Elective-III</td>
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<td>5</td>
<td>Refer Table - IV</td>
<td>Open Elective-IV</td>
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<td>80 20 20 120 5</td>
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<tr>
<td>6</td>
<td>Mech. Engg</td>
<td>382861(37)</td>
<td>Robotics Lab</td>
<td>- - 2</td>
<td>40 - 20 60 1</td>
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<td>7</td>
<td>Mech. Engg</td>
<td>382862(37)</td>
<td>Manufacturing Technology Lab</td>
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<td>40 - 20 60 1</td>
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<td>8</td>
<td>Mech. Engg</td>
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<td>Computer Aided Chassis Design Lab</td>
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<td>40 - 20 60 1</td>
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<td>9</td>
<td>Mech. Engg</td>
<td>382864(37)</td>
<td>Major Project</td>
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<td>10</td>
<td>Mech. Engg</td>
<td>382865</td>
<td>Report Writing &amp; Seminar</td>
<td>- - 2</td>
<td>- - 40 40 1</td>
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<td>Library</td>
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**Total** 20 5 15 620 100 280 1000 32

- **L** – Lecturer
- **T** – Tutorial
- **P** – Practical
- **ESE** – End Semester Exam
- **CT** – Class Test
- **TA** – Teacher’s Assessment

**Table – III Professional Elective - III**

<table>
<thead>
<tr>
<th>S.No.</th>
<th>Branch</th>
<th>Subject Code</th>
<th>Subject</th>
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<tbody>
<tr>
<td>1</td>
<td>Mech</td>
<td>337841(37)</td>
<td>Mechatronics</td>
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<tr>
<td>2</td>
<td>Automobile</td>
<td>382842(82)</td>
<td>Vibration and Noise Control in Automobiles</td>
</tr>
<tr>
<td>3</td>
<td>Automobile</td>
<td>382843(82)</td>
<td>Combustion Process</td>
</tr>
<tr>
<td>4</td>
<td>Automobile</td>
<td>382844(82)</td>
<td>Vehicle Design Characteristics</td>
</tr>
<tr>
<td>5</td>
<td>Mech</td>
<td>337845(37)</td>
<td>Soft Computing Techniques</td>
</tr>
<tr>
<td>6</td>
<td>Automobile</td>
<td>382846(82)</td>
<td>Fuel Cell Technology</td>
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</tbody>
</table>

**Note:** (1) 1/4th of total strength of students subject to minimum strength of 20 students is required to offer and elective in the college in a particular academic session.

**Note:** (2) Choice of elective course once made for an examination cannot be changed in future examinations.
### Open Elective – IV

<table>
<thead>
<tr>
<th>S.No.</th>
<th>Board of Studies</th>
<th>Code</th>
<th>Name of Subject</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Management</td>
<td>300851(76)</td>
<td>Enterprise Resource Planning (Except CSE &amp; IT Branch)</td>
</tr>
<tr>
<td>2</td>
<td>Information Technology</td>
<td>300852(33)</td>
<td>E-Commerce &amp; strategic IT (Except CSE &amp; IT Branch)</td>
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<tr>
<td>3</td>
<td>Management</td>
<td>300853(76)</td>
<td>Technology Management</td>
</tr>
<tr>
<td>4</td>
<td>Information Technology</td>
<td>300854(33)</td>
<td>Decision Support &amp; Executive Information system</td>
</tr>
<tr>
<td>5</td>
<td>Computer Science &amp; Engg.</td>
<td>300855(22)</td>
<td>Software Technology</td>
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<tr>
<td>6</td>
<td>Management</td>
<td>300856(76)</td>
<td>Knowledge Entrepreneurship</td>
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<tr>
<td>7</td>
<td>Management</td>
<td>300857(76)</td>
<td>Finance Management</td>
</tr>
<tr>
<td>8</td>
<td>Management</td>
<td>300858(76)</td>
<td>Project Planning, Management &amp; Evaluation</td>
</tr>
<tr>
<td>9</td>
<td>Mechanical Engg.</td>
<td>300859(37)</td>
<td>Safety Engineering</td>
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<tr>
<td>10</td>
<td>Computer Science &amp; Engg.</td>
<td>300801(22)</td>
<td>Bio Informatics</td>
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<td>11</td>
<td>Mechanical Engg.</td>
<td>300802(37)</td>
<td>Energy Conservation &amp; Management</td>
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<tr>
<td>12</td>
<td>Nanotechnology</td>
<td>300803(47)</td>
<td>Nanotechnology</td>
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<tr>
<td>13</td>
<td>Management</td>
<td>300804(76)</td>
<td>Intellectual Property Rights</td>
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<tr>
<td>14</td>
<td>Mechanical Engg.</td>
<td>300805(37)</td>
<td>Value Engineering</td>
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<tr>
<td>15</td>
<td>Civil Engg.</td>
<td>300806(20)</td>
<td>Disaster Management</td>
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<tr>
<td>16</td>
<td>Civil Engg.</td>
<td>300807(20)</td>
<td>Construction Management</td>
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<tr>
<td>17</td>
<td>Civil Engg.</td>
<td>300808(20)</td>
<td>Ecology and Sustainable Development</td>
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<tr>
<td>18</td>
<td>Chem. Engg.</td>
<td>300809(19)</td>
<td>Non Conventional Energy Sources</td>
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<tr>
<td>19</td>
<td>Electrical Engg.</td>
<td>300810(24)</td>
<td>Energy Auditing &amp; Management (Except Electrical Engg. Branch)</td>
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<tr>
<td>20</td>
<td>Mechanical Engg.</td>
<td>300811(37)</td>
<td>Managing Innovation &amp; Entrepreneurship</td>
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<tr>
<td>21</td>
<td>Information Technology</td>
<td>300812(33)</td>
<td>Biometrics</td>
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<tr>
<td>22</td>
<td>Information Technology</td>
<td>300813(33)</td>
<td>Information Theory &amp; Coding</td>
</tr>
<tr>
<td>23</td>
<td>Computer Science &amp; Engg.</td>
<td>300814(22)</td>
<td>Supply Chain Management</td>
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<tr>
<td>24</td>
<td>Computer Science &amp; Engg.</td>
<td>300815(22)</td>
<td>Internet &amp; Web Technology</td>
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<tr>
<td>25</td>
<td>Electrical Engg.</td>
<td>300816(24)</td>
<td>Electrical Estimation and Costing</td>
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<tr>
<td>26</td>
<td>Electrical &amp; Electronics Engg.</td>
<td>300817(25)</td>
<td>Non Conventional Energy Sources</td>
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<tr>
<td>27</td>
<td>Computer Science &amp; Engg.</td>
<td>300818(22)</td>
<td>Big Data and Hadoop</td>
</tr>
</tbody>
</table>

**Note:**
- (1) 1/4th of total strength of students is required to offer an elective in the college in a particular academic session.
- (2) Choice of elective course once made for an examination cannot be changed.
Name of the program: Bachelor of Engineering  
Branch: Automobile Engineering  
Subject: Robotics  
Semster: VIII  
Total Theory Periods: 40  
Class Tests:2(minimum)  
Total Tutorial Periods: 10  
Assignments: 2(minimum)  
ESE duration: 3 hours  
Maximum Marks: 80  
Minimum marks: 28

UNIT – I  
Introduction to Robotics  

UNIT – II  
Coordinate Frames, Mapping and Transforms  
Coordinate Frames, Description of Objects in Space, Transformation of Vectors, Inverting a Homogeneous Transform, Fundamental Rotation Matrices.

UNIT – III  
Symbolic Modeling of Robots – Direct Kinematic Model  
Mechanical Structure and Notations, Description of Links and Joints, Kinematic Modeling of the Manipulator, Denavit – Hartenberg Notation, Kinematic Relationship between Adjacent Links, Manipulator Transformation Matrix.  
Introduction to Inverse Kinematic model.

UNIT – IV  
Robotic Sensors and Vision  

UNIT – V  
Robot Applications  

TEXT BOOKS  

REFERENCE BOOKS  
2. Kinematics and Synthesis of linkages - Hartenberg and Denavit - McGrew Hill Book Co  
UNIT I

UNIT II
Unconventional Machining: Advantages, application and limitation. Processes - Electro Discharge Machining (EDM), Electro Chemical Machining (ECM), Ultrasonic Machining (USM), Abrasive Jet Machining (AJM), Electron Beam Machining (EBM), Laser Beam Machining (LBM), Electro Chemical grinding (ECG). Mechanics of metal removal, tooling, equipment, process parameters and surface finish obtained and specific applications.

UNIT III

UNIT IV

UNIT V
Sheet metal forming

TEXT BOOKS:

REFERENCE BOOKS:
**Name of the program:** Bachelor of Engineering  
**Branch:** Automobile Engineering  
**Subject:** Industrial Engineering & Management  
**Semester:** VIII  
**Total Theory Periods:** 40  
**Class Tests:** 2 (minimum)  
**ESE duration:** 3 hours  
**Maximum Marks:** 80  
**Minimum marks:** 28

**Unit-I**  
**Introduction**  
History & development, objective, place of Industrial Engineering in an organization, relation with other department, system approach.

**Plant Location**  
Need for a suitable location, Plant location problems factors affecting location, quantitative method for evaluation of plant location.

**Plant Layout**  
Objective & Principles, factors affecting layout, types of layout.

**Unit-II**  
**Work Study**  
Purpose, objectives and applications of work study, Productivity and work study.

**Method Study**  
Introduction, procedure, flow process charts, Multiple activity chart, motion economy principles, Therbligs, cycle graph and chronocycle graph.

**Work Measurement**  
Definition, types, Time Study- selection & timing the job, rating, allowances, Numerical on Normal and standard time calculation.

**Unit-III**  
**Job Evaluation and Merit Rating**  
Definition, objectives, methods.

**Wages and Incentives**  
Terminology, characteristics, factors, types of incentives, wage incentive plan, Rowan plan, Taylor’s differential piece rate system, Emerson’s efficiency plan, Halsey’s 50-50 plan, Bedaux plan, Group task & Bonus system.

**Unit-IV**  
**Basic concepts and Functions of management**  
Nature, Purpose and Objectives of basic functions of management, Authority and Responsibility, social responsibility of manager, ethics and management.

**Human Resource Management**  

**Unit-V**  
**Marketing Management**  
Marketing Environment, Marketing Mix, Advertising and Sales Promotion, Channels of Distribution.

**Financial Management**  

**TEXT BOOKS**  
1. Industrial Engineering and Production Management - Martand Telsang - S.Chand  

**REFERENCE BOOKS**  
1. Industrial Engineering & Management , A new perspective- Philip E Hicks - Mcgraw Hill  
3. Marketing Management- Kotler Philip- Prentice Hall of India  
4. Flexibility in Management - Sushil, Vikas publication - New Delhi  
5. Fundamentals of Business Organizations and Management - Y.K. Bhusan - S. Chand  
8. Motion and Time Study - Ralph M. Bannes - John Wiley & Sons  
EXPERIMENTS TO BE PERFORMED (MINIMUM FIVE NUMBERS)
1. To detect the sensor scanning system to overcome limitation of fixed sensors on various robotic applications, Ultrasonic sensor, laser range finders, infrared detectors and miniature.
2. To find the horizontal and vertical movement up to 180° in either direction.
3. To detect objects with infrared ray detector.
4. To determine object distance (3cm – 300cm).
5. To detect distance (10cm to 80 cm) with infrared object detector.
6. To determine 5 Axis Robotic Arm movement and its degree of rotation.
7. To lift the object and place 100m away in various directions.
8. To find the gripper movement (0 to 50mm).
9. To study various Robotic Arm Configurations.
10. To study Pick and Place Robot

LIST OF EQUIPMENTS/MACHINES REQUIRED
1. 5 Axis Robotic Arm System
2. Hex Crawler Robot. The Mechatronics Robot
3. Ultrasonic Range Finder
4. Servo Power Supply
5. Infrared Object/Distance Detector
6. A 7.2V Battery Charger
7. Blue Tooth Transducer
8. Blue Tooth Pc Adaptor
9. Various Wooden Models to study Robotic Arm Configuration
10. Working model of Pick and Place Robot
Name of the program: Bachelor of Engineering
Branch: Automobile Engineering
Subject: Manufacturing Technology Lab
Total Lab Periods: 24
Maximum Marks: 40
Semester: VIII
Code: 382862(37)
Batch Size: 30
Minimum Marks: 20

List of Experiments to be Performed (Minimum ten experiments are to be performed by each student)

Foundry
1. Moulding of a multi-piece pattern by green sand moulding
2. Making a mould (with core) and casting.

Machine Tool
3. Taper turning in a Lathe
4. Thread cutting in Lathe
5. Slot cutting in Shaper
7. Alignment testing of Lathe
8. Drilling, boring and reaming of a hole.

Cutting Tool
9. Study of turning tool of Lathe (Tool signature)
10. Study of twist drill

Welding
11. Joining MS plates by arc welding (SMAW,MIG)
12. Joining metal sheet by resistance welding
13. Joining metal by soldering/brazing

Inspection and Testing
14. Inspection of casting defect and welding defects
15. Non destructive testing of casting and welding defects

LIST OF EQUIPMENTS/MACHINES REQUIRED
1. Moulding equipment
2. Melting facility
3. Lathe
4. Shaper
5. Drilling Machine
6. Milling Machine
7. Reamers
8. Arc welding equipments
9. Soldering/Brazing equipments
10. Non destructive testing equipments
LIST OF EXPERIMENTS

CLUTCH

1. Complete design of clutch components.
2. Assembly drawing of clutch using drafting software.

GEAR BOX

3. Gear train calculations.
4. Layout of gear box.
5. Calculation of bearing loads
6. Selection of bearings.
7. Assembly drawing of gear box using drafting software.

DRIVE LINE AND REAR AXLE

8. Design of propeller shaft.
10. Design details of full floating, semi-floating and three quarter floating rear shafts and rear axle housings.
11. Design aspects of final drive.

LIST OF EQUIPMENTS

(for a batch of 30 students)

2. Software like AutoCAD or Pro-E - 30 licenses
**Chhattisgarh Swami Vivekanand Technical University, Bhilai**

Name of the program: Bachelor of Engineering  
Branch: Automobile Engineering  
Subject: Report Writing & Seminar  
Total No. of Periods: 2 per week  
Class Tests: 2 (minimum)  
Teachers’s Assessment: 40 Marks  
Maximum Marks: NA  
Minimum marks: NA

<table>
<thead>
<tr>
<th>Unit</th>
<th>Introduction to Technical Writing</th>
<th>Correspondence</th>
<th>Summary</th>
<th>Report Writing</th>
<th>Proposals &amp; Presentation</th>
<th>Text Books</th>
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<tbody>
<tr>
<td>-II</td>
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<tr>
<td>-III</td>
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<td>1. Sunita Mishra, &quot;Communication Skills for Engineers&quot; Pearson Education</td>
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<td>-IV</td>
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<td></td>
<td></td>
<td></td>
<td>2. Davies J.W. &quot;Communication for engineering students&quot;, Longman</td>
</tr>
</tbody>
</table>

**Reference Books:**
1. Sunita Mishra, "Communication Skills for Engineers" Pearson Education  
2. Davies J.W. "Communication for engineering students", Longman  
Name of the program: Bachelor of Engineering
Branch: Automobile Engineering
Subject: Mechatronics
Semester: VIII
Code: 337841(37)
Total Theory Periods: 45
Total Tutorial Periods: 10
Class Tests: 2 (minimum)
Assignments: 2 (minimum)
ESE duration: 3 hours
Maximum Marks: 80
Minimum marks: 28

UNIT – I
Introduction about Mechatronics, scope of Mechatronics, application, process control automation and N/c Machines.

UNIT – II
Sensors and Transducers
Introduction, classification, specification, characteristics of transducers, type of transducers-displacement, strain, vibration pressure, flow, temperature, force & torque, tactile.

UNIT – III
Hydraulic Pneumatic & Electrical actuators
Pumps & Compressors, control valves & accessories, actuators, fluid power symbols, fluid power systems, switching devices, solenoids, motors.

UNIT – IV
Data Acquisition and Control System
Introduction, Quantizing theory, Analog to Digital Conversion, Digital to Analog (D/A) conversion, transfer function, transient response & frequency response & frequency response, stability criteria.

UNIT – V
Design of Mechatronic systems
Introduction, Automatic front and book and cutting in steel rolling mill, lift control system, CNC lathe, temperature control of a heat treatment furnace, EOT crane control panel, Grey grain separators, electrode arm control in electric arc furnace.

TEXT BOOKS
1. Mechatronics, Revised – N. Shanmugam – Anuradha Agencies, 2004

REFERENCE BOOKS
UNIT – I

**Basics of vibrations**: Introduction, classification of vibration: free and forced vibration, undamped and damped vibration, linear and non-linear vibration, response of damped and undamped systems under harmonic force, analysis of single degree and two degree of freedom systems, torsion vibration, determination of natural frequencies.

UNIT – II

**Basics of noise**: Introduction, amplitude, frequency, wavelength and sound pressure level, addition, subtraction and averaging decibel levels, noise dose level, legislation, measurement and analysis of noise, measurement environment, equipment, frequency analysis, tracking analysis, sound quality analysis.

UNIT – III

**Automotive noise sources**: Noise Characteristics of engines, engine overall noise levels, assessment of combustion noise, assessment of mechanical noise, engine radiated noise, intake and exhaust noise, engine accessory contributed noise, transmission noise, aerodynamic noise, tire noise, brake noise.

UNIT – IV

**Control techniques**: Vibration isolation, tuned absorbers, untuned viscous dampers, damping treatments, application dynamic forces generated by IC engines, engine isolation, crank shaft damping, modal analysis of the mass elastic model shock absorbers.

UNIT – V

**Source of noise and control**: Methods for control of engine noise, combustion noise, mechanical noise, predictive analysis, palliative treatments and enclosures, automotive noise control principles, sound in enclosures, sound energy absorption, sound transmission through barriers.

**TEXT BOOKS**


**REFERENCE BOOKS**

UNIT – I

COMBUSTION OFFUELS
Combustion equations, Theoretical air, excess air, airfuel ratio, equivalence ratio, exhaust gas composition, Air-fuel ratio from exhaust gas composition, heating value of fuels.

UNIT – II

THERMODYNAMICS OF COMBUSTION
Thermo-chemistry, First law analysis of reacting systems, Adiabatic combustion temperature, Second law analysis of reacting systems, criterion for chemical equilibrium, Equilibrium constant for gaseous mixtures, Evaluation of equilibrium composition, chemical availability.

UNIT – III

KINETICS OF COMBUSTION
Rates of reaction, Reaction order and molecularity of complex reactions, chain reactions, Arrhenius rate equation, Collection theory, activated complex theory, Explosive and general oxidative characteristics of fuelled.

UNIT – IV

FLAMES
Laminar and Turbulent flames, Premixed and Diffusion flames, Burning velocity and its determination, Factors affecting burning velocity, Quenching, Flammability and Ignition, Flame stabilization in open burners.

UNIT – V

ENGINE COMBUSTION
Combustion in SI and CI engines, stages of combustion in SI and CI engines, Normal combustion and Abnormal combustion, Emissions from premixed combustion, Emission from Non-premixed combustion, Control of emissions

TEXTBOOK

REFERENCE BOOKS
Name of the program: Bachelor of Engineering

Branch: Automobile Engineering                Senster: VIII
Subject: Vehicle Design Characteristics       Code: 382844(82)
Total Theory Periods: 40                     Total Tutorial Periods: 10
Class Tests: 2 (minimum)                     Assignments: 2 (minimum)
ESE duration: 3 hours                       Maximum Marks: 80
                                              Minimum marks: 28

UNIT – I
Introduction:

Study and selection of vehicle specifications - Choice of Cycle, fuel, speed, cylinder arrangement, number of cylinders, method of cooling, material, design variables and operating variables affecting performance and emission.

UNIT – II
Performance curves :

Residence, Power and torque curve, Driving force against vehicle speed – Acceleration and gradability in different gears for a typical car or truck plotted from specifications.

UNIT – III
Resistance to vehicle motion:

Calculation and plotting the curves of air, rolling and gradient resistances, driving force – Engine power, speed, rear axle ratio, Torque and mechanical efficiency at different vehicle speeds.

UNIT – IV
Engine design:

Pressure volume diagram, frictional mean effective pressure, engine capacity, calculation of bore and stroke length, velocity and acceleration, gas force, inertia and resultant force at various crank angles – Side thrust on cylinder walls.

UNIT – V
Gear ratios:

Determination of Gear Ratios, Acceleration and gradability - typical problems.

TEXT BOOKS


REFERENCE BOOKS:

chattisgarh swami vivekanand technical university, bhilai

name of the program: bachelor of engineering
branch: automobile engineering
subject: soft computing techniques

semester: viii

subject: soft computing techniques
code: 337845(37)
total theory periods: 40
total tutorial periods: 10
class tests: 2 (minimum)
assignments: 2 (minimum)
ese duration: 3 hours

maximum marks: 80
minimum marks: 28

unit – i

introduction - introduction to soft computing; introduction to biological and artificial neural network, introduction to fuzzy sets and fuzzy logic systems.

unit – ii

artificial neural networks and applications - different artificial neural network models, learning inartificial neural networks, neural network applications in control systems.

unit – iii

fuzzy systems and applications - fuzzy sets; fuzzy reasoning, fuzzy inference systems, fuzzy control, fuzzy clustering, applications of fuzzy systems.

unit – iv


unit – v

applications- pattern recognitions, image processing, biological sequence alignment and drug design, robotics and sensors, information retrieval systems, share market analysis, analysis language processing.

text books

1. fuzzy logic and soft computing – chen, guoging, ving, mingsheng & cai, kai yuan ed – kluwar academic publications, usa
2. soft computing and intelligent systems design theory tools and applications – karray f o &desilva c – pearson, new delhi

reference books

1. a computational intelligence: principles, techniques, and applications – konar – springer.
3. neuro-fuzzy and soft computing: a computational approach to learning and machine intelligence - jang, j sr, sun, c t, &mizutani e - prentice hall.
4. an introduction to genetic algorithms- mitchell m - mit press.
5. fuzzy logic with engineering applications - ross t j - john wiley & sons
UNIT – I

INTRODUCTION AND THERMODYNAMICS
Introduction: Basic operating principles – Historical highlights – Classification. Thermodynamics: Electrochemical energy conversion – Theoretical efficiency – Electrochemical energy conversion – Factors affecting electrochemical energy conversion

UNIT – II

ELECTRODE KINETICS

UNIT – III

ALKALINE FUEL CELLS & PHOSPHORIC ACID FUEL CELLS

UNIT – IV

SOLID OXIDE FUEL CELLS & MOLTEN CARBONATE FUEL CELLS
Molten Carbonate Fuel Cell: General principle – Components (electrolyte and matrix, cathode and anode materials) – Electrode reactions – Life time

UNIT – V

DIRECT METHANOL FUEL CELLS & PROTON EXCHANGE MEMBRANE FUEL CELLS
Proton Exchange Membrane Fuel Cells: Operating principle (membranes, electrodes and electrolysis, optimization of membrane and electrode assembly, impurities) – Technology development (single cell and stacks, composite plates) – Fuel processing – Modeling studies (membrane, electrode, membrane-electrode assembly, fuel cell, stack and system) – Technology development and applications.

TEXT BOOKS

REFERENCE BOOKS