

**NORTH MAHARASHTRA UNIVERSITY,
JALGAON (M.S.)**

**FINAL YEAR ENGINEERING
(B.E.)**

(AUTOMOBILE ENGINEERING)

TERM-I & II

W.E.F.: 2008-09

NORTH MAHARASHTRA UNIVERSITY, JALGAON
STRUCTURE OF TEACHING AND EVALUATION
B.E.(AUTOMOBILE ENGINEERING)

FIRST TERM

W.E.F. 2008-09

Sr. No.	Subject	Teaching Scheme Hours/week			Examination Scheme				
		Lectures	Tutorial	Practical	Paper Duration Hours	Paper	TW	PR	OR
1	Elective –I	4	--	--	3	100	25	--	--
2	Vehicle Testing And Evaluation	4	--	2	3	100	25	--	25
3	***Mechatronic Systems	4	--	2	3	100	25	--	25
4	Automobile Electric Systems	4	--	2	3	100	25	--	25
5	Special Purpose Vehicle	4	--	--	3	100	--	--	--
6	***Seminar	--	--	2	--	--	25	--	--
7	***Project	--	--	2	--	--	25	--	25
Total		20	--	10	--	500	150	--	100
Grand Total		30			750				

*** Common with Production Engineering and Mechanical Engineering

SECOND TERM

Sr. No.	Subject	Teaching Scheme Hours/week			Examination Scheme				
		Lectures	Tutorial	Practical	Paper Duration Hours	Paper	TW	PR	OR
1	Elective-II	4	--	--	3	100	25	--	--
2	Automobile Design	4	--	4	4	100	25	--	25
3	Automobile Dynamics	4	--	2	3	100	25	--	25
4	Automobile Services And Repairs	4	--	2	3	100	25	--	25
5	***Project	--	--	4	--	--	100	--	50
6	***Industrial Visit/Case Study	--	--	--	--	--	25	--	--
Total		16	--	12	--	400	225	--	125
Grand Total		28			750				

*** Common with Production Engineering and Mechanical Engineering

Elective-I

1. Numerical Analysis And Computational Methods
2. Tribology
3. Vehicle Body Engineering
4. Machine Tool Design
5. Advance Welding Technology

Elective-II

1. CAD-CAM & Automation
2. Supply Chain Management
3. Analysis And Synthesis of Mechanism
4. Automobile Painting And Collision Repairs
5. Finite Element Methods

**B.E. (AUTOMOBILE ENGINEERING):FIRST TERM
NUMERIAL ANALYSIS AND COMPUTATIONAL METHODS
ELECTIVE - I**

Teaching Scheme
Lecture : 4 Hrs/week

Examination Scheme
Theory Paper : 100 marks
Term work : 25 marks
Paper duration : 3 Hours

UNIT - I **10 Hours (20 Marks)**

SOFTWARE DEVELOPMENT PRINCIPLES: Software development principles mathematical modeling problem solving, Algorithm Flowchart, Computational Errors, Graphical method, Transcendental Equation: Bisection method, False position, successive approximation method, Newton-Raphson method, Horner's method, Rate of convergence.

UNIT - II **10 Hours (20 Marks)**

NUMERICAL INTEGRATION METHODS: Trapezoidal rule Simpsons 1/3rd rule, Simpson's 3/8 rule, Gauss quadrature technique
ORDINARY DIFFERENTIAL EQUATION : Taylor's series method, Euler's method, Improved & modified Euler's method, Fourth order range - kutta method.

UNIT - III **10 Hours (20 Marks)**

INTERPOLATION : Linear and quadratic interpolation, Lagrange's interpolation, Newton's forward interpolation, Newton's backward interpolation, Newton's divided difference interpolation, Stirling interpolation.
CURVE FITTING: Linear & quadratic regression, Logarithmic curve fitting, Exponential curve fitting.

UNIT - IV **10 Hours (20 Marks)**

LINEAR ALGEBRAIC EQUATION
Gauss elimination method, Gauss Jordan method LU - decomposition method
ITERATIVE METHOD : Jacobi iteration method, Gauss-Seidel iterative method, Cholesky method convergence analysis, choice of method.

UNIT - V **10 Hours (20 Marks)**

FINITE DIFFERENCE METHOD: Solution of ordinary differential, solution of elliptical equation for various boundary condition, solution of parabolic equation by explicit, implicit and Crank-Nicolson method
FINITE ELEMENT METHOD : Finite element method introduction, comparison with finite difference method, general approach, interpolation function, finite element application on one dimensions.

TERM WORK

Term work shall consist minimum eight assignments based on above syllabus.

REFERENCE BOOKS

- 1) Chapra Canale, "Numerical Method for Engineer", McGraw Hill Co.
- 2) Joh H. Mathews, "Numerical Methods", Pearson Education
- 3) P. Kandaswamy, "Numerical Methods", S. Chand & Co. New Delhi.
- 4) J.N. Reddy, "Finite Element Method", McGraw Hill Co.
- 5) Jain, Jain & Iyengar, "Numerical Method for Scientist & Engineering Computation", New Age Interpolation Pvt., Ltd.
- 6) S.S. Shashri, "Introductory Method of Numerical Analysis", Prentice Hill India.
- 7) Belegundupala, "Introduction to Finite Element Method", Prentice Hill India.
- 8) P.K. Dey, "Programming in C", Oxford, New Delhi.
- 9) Y. Kanitkar, "Let us C", BPB Publications
- 10) Balgurusamy, "Programming in C", TMH
- 11) Kaye, "An Introduction to Quantum Computing", OUP.
- 12) Reddy, "An Introduction to Nonlinear Finite Element Analysis", Oxford, Delhi.

**B.E. (AUTOMOBILE ENGINEERING):FIRST TERM
TRIBOLOGY
ELECTIVE-I**

Teaching Scheme
Lecture : 4 Hrs/week

Examination Scheme
Theory Paper : 100 marks
Term work : 25 marks
Paper duration : 3 Hours

UNIT - I

10 Hours (20 Marks)

TRIBOLOGY: Introduction, Applications, Tribology in Industry Tribology in design, Economic considerations.
FRICTION: Introduction, Kinds of friction Laws of friction, , Causes of friction, Friction measurement, stick slip oscillations & its elimination.
WEAR: Introduction, Types of wear, Various factors affecting wear Theory of wear, measurement of wear, wear between solids and flowing liquids, theory of wear.

UNIT - II

10 Hours (20 Marks)

LUBRICANTS - Lubricant properties - physical and chemical.
LUBRICATION - introduction, basic modes of lubrication. Flow of viscous fluid through rectangular slot. Seals-Mechanical and dynamic seals.
HYDROSTATIC BEARINGS: Basic concept, operations, advantages and limitations. Hydrostatic conical and spherical bearings, load carrying capacity and flow of lubricants. Bearing power and film thickness, bearing temperature and power. Compensators and their action. Optimum design step bearing.

UNIT - III

10 Hours (20 Marks)

HYDRODYNAMIC BEARING: Theory of hydrodynamic lubrication, Mechanism of pressure development in oil film. Two Dimensional Reynolds equation, Infinite tapered shoe slider bearings and infinite long journal bearing. Short bearing theory applied to journal bearing.

UNIT - IV

10 Hours (20 Marks)

HYDRODYNAMIC THRUST BEARING: Introduction, flat plate thrust bearing, step thrust bearing, tapered land thrust bearing, tilting pad thrust bearing, spring mounted thrust bearing, hydrodynamic pocket thrust bearing.
Friction and power losses in journal bearings: ratio of heat conducted, Evaluation of friction loss in concentric & eccentric journal bearing & quantity of oil flow with circumferential groove and hole.

UNIT - V

10 Hours (20 Marks)

Hydrostatic squeeze film, circular & rectangular plates, impact conditions between lubricated solids, applications to journal bearing.
AIR LUBRICATED BEARINGS: Tilting pad bearings, electromagnetic bearing, hydrodynamic thrust bearing with air lubrications. Lubrication practice, quality control & management - characteristics of lubricating methods, lubricating devices & systems, organizing application charts.

TERMWORK

Term work shall consist minimum eight assignments based on above syllabus.

REFERENCE BOOKS

- 1) B. C. Majumdar "Introduction Tribology and Bearings", H. Wheeler and Company Pvt. Ltd.
- 2) Cameron A. "Basic Lubrication Theory , Wiley Eastern Ltd.
- 3) Fuller D. D., "Theory and Practice of Lubrication for Engineers". John Wiley and Sons.
- 4) Halling J. "Principles of Tribology", McMillan Press Ltd.
- 5) Hrassan & Powel , "Gas Bearing".

**B.E. (AUTOMOBILE ENGINEERING):FIRST TERM
VEHICLE BODY ENGINEERING
ELECTIVE – I**

Teaching Scheme

Lecture :4 Hrs/week

Examination Scheme

Theory Paper : 100 marks

Term work : 25 marks

Paper duration : 3 Hours

UNIT - I

10 Hours (20 Marks)

INTRODUCTION

Classification, nomenclature of car body, different types, basic requirements & structures of different vehicle bodies, regulations & standards, constructional trends & styling forms.

MATERIALS

Timber, reinforced plastic molding, sandwich construction, light alloys, expanded metals, fasteners, adhesives, glass, steel sheets, insulating materials, use of aluminum structure for bus body building.

UNIT - II

10 Hours (20 Marks)

PRIVATE CAR BODY WORK

Sheet metal construction, body work aerodynamics (drag & lift, pitching, yawing & rolling) forces & moments, sideways forces, hull sealing,

Commercial vehicle body design - bus & truck body weight analysis, payload, methods employed in loading & discharge, body builders drawing, body mounting, wood working joints, roof construction floor construction.

UNIT - III

10 Hours (20 Marks)

BODY MECHANISM

Design of windows, door construction, design of luggage carrier, design of spare wheel carrier, design of passenger seats & driver seats, comfort factors, circle of riding comfort, effect of discomfort, safety consideration.

BODY WORK DRAFTING

Full size layout on draft, proportional developments, timber framing for composite body work, body draughtsman curves.

UNIT - IV

10 Hours (20 Marks)

AUTO BODY REPAIRS & TESTING

Broad review of manufacturing processes & equipments, manufacture of prototype, static & dynamic testing, sources of body noises, testing & elimination, leakage testing, testing for safety & road testing, sheet metal working tools, timber body repairs, light alloy & steel body repair, repairs to reinforced plastics body work, corrosion repairs.

UNIT - V

10 Hours (20 Marks)

PAINTING & ANTI-CORROSION FINISHES

Introduction, cleaning, pretreatment, priming, finish coating, stoving, internal corrosion & sealing, materials of construction, painting processes, protection of a finished cars, water leaks, water drainage system, windscreens, apron panel & heating/ventilation, rear drip, tail gate.

TERMWORK

Term work shall consist minimum eight assignments based on above syllabus.

REFERENCE BOOKS

1. Giles, "Vehicle operation & performance".
2. Crouse, "Motor vehicle inspection".
3. CIRT & VRDE manuals.
4. Glencoe, "Automotive Excellence I & II"
5. Birch, "Automotive chassis system".
6. D. Whitney, "Mechanical Assemblies", Oxford

**B.E. (AUTOMOBILE ENGINEERING):FIRST TERM
ADVANCED WELDING TECHNOLOGY
ELECTIVE - I**

Teaching Scheme
Lecture : 4 Hrs/week

Examination Scheme
Theory Paper : 100 marks
Term work : 25 marks
Paper duration : 3 Hours

UNIT – I

10 Hours (20 Marks)

WELDING- Introduction, Arc & Resistance welding, Classification of welding process. Advantages, Disadvantages of welding, Gas welding – Definitions, Principle, Oxyacetylene welding, Types of welding, Types of welding flames, Gas welding techniques, Application of gas welding. Air-acetylene welding, definition, Principle of operation & applications
Arc welding Process – TIG, MIG, CO2 welding, carbon Arc welding, Plasma Arc welding, Arc spot welding.

UNIT – II

10 Hours (20 Marks)

RESISTANCE WELDING – Definition, Fundamentals of electric resistance welding, variables in resistance welding, Advantages of resistance welding, Disadvantages & Applications.
Spot welding – Introduction, Use, Definition, Procedure, Heat Shrinkage, Heat balance Spot weld able materials, Spot welding methods, Advantages applications, Seam welding, Definition, Principles of operations, Applications.

UNIT – III

10 Hours (20 Marks)

RADIANT ENERGY WELDING PROCESSES – Electron beam welding, Introduction, definition, Principle of operation, Application, Advantages & Disadvantages, Laser Beam Welding – Definition, Principle & Theory of operation, forms of lasers, Applications, Advantages & Disadvantages, Under Water welding process – Introduction, Problems encountered in under water welding, Types, Characteristics of a good under water welding process, under water welding processes applications.

UNIT – IV

10 Hours (20 Marks)

WELD ABILITY & WELD ABILITY TESTING – Definition & Concept & Weld ability, Effect of alloying elements on weld ability, purpose, types of weld ability tests, Hot cracking tests, Root cracking tests, Hydrogen induced cracking tests.
Welding of Cast iron, Welding of carbon steels, Welding of tool steels etc.

UNIT – V

10 Hours (20 Marks)

Computer Systems for welding engineering introduction, computer systems, software for welding engineers.
COMPUTER AIDED WELDING DESIGN – Introduction, Welding analysis, Engineering design V/s welding design solutions to the welding design problems, computer aided welding analysis, Computer aided welding design.
Welding robots, Introduction, Robotic welding system, Types of welding robots, Design of welding robots.
WELDING AUTOMATION – Concept, welding operations, welding operations, Basic operations, programming operations, control operations, classification of welding automation.

TERM WORK

Term work shall consist minimum eight assignments based on above syllabus.

REFERENCE BOOKS

- 1) O. P. Khanna, :” Welding Technology”, Dhanpat Rai Publications
- 2) R. K. Jain ,” Production Technology”
- 3) M. Lal ,” Fabrication Technology”
- 4) P. N. Rao ,” Manufacturing Tech. Vol I & II”
- 5) P.C. Sharma ,:” Production Engineering”

**B.E. (AUTOMOBILE ENGINEERING): FIRST TERM
VEHICLE TESTING & EVALUATION**

Teaching Scheme

Lectures : 4 Hours/week

Practical : 2 Hours/week

Examination Scheme

Theory Paper : 100 Marks

Term Work : 25 Marks

Oral : 25 Marks

Paper Duration : 3 Hours

UNIT - I

10 Hours (20 Marks)

TESTING OF VEHICLES: Scope, test procedure, vehicle performance trials, instrumentation calibration, performance evaluation tests for maximum speed, acceleration fuel consumption, grade bilserpentine, noise level measurements, cooling performance evaluation, brake tests, steering torque measurement, engine test, use of chassis dynamometer for vehicle test.

UNIT - II

10 Hours (20 Marks)

NATIONAL PROVING GROUND, VARIOUS TESTING TRACKS - High speed track, Belgian pave track, corrugated track, deep wading through, shallow water trough, mud track, steering pad serpentine courses, gradient track.

EVALUATION AND MEASUREMENT: Evaluation and measurement of various parameters speed, distance and acceleration, fuel consumption, vibration, noise and sound, radio interference, exhaust emission and miscellaneous.

UNIT - III

10 Hours (20 Marks)

COMPONENT TESTING : Importance of component testing methods of testing and correlation to field failure, feedback, failure pattern.

Performance evaluation and endurance, testing of aggregates such as - engine and its aggregates / components. Gear box, clutch, axles, shock absorber, springs, rubber components, Auto transmission, various filters, headlams, spark plug, Tyres, radiators, injectors, pumps, electrical item brakes.

UNIT - IV

10 Hours (20 Marks)

VEHICLE SAFETY IN DESIGN / MANUFACTURE : Vehicle configuration requirements and function safety. Performance and safety suspension system, steering system, crach worthiness.

Morphology of vehicles general layout of passenger cars and commercial vehicles. Effects of shocks and vibrations on human being, comfort criteria.

Safety regulation of EEC and central motor vehicles rules.

UNIT - V

10 Hours (20 Marks)

VISIBILITY & LIGHTING : Illumination and glare front rear and side visibility, safety glasses, warning and signaling devices. Antitheft devices, child protection devices.

Study of various kinds of collisions and impacts such as frontal side and rear. Crush zone, bumpers, roll over. Stability & safety, seat belts and passenger restraint systems.

Methods of measurement of CO, HC & (NO) x by infrared, FID - flameionisation detector and chemiluminescence's methods.

TERM WORK:

Term work shall consist of any eight experiments .

- 1) Study and demonstration of the following :
 - i) Tractive effort measurement
 - ii) Acceleration time test.
 - iii) Fuel consumption test at different speeds
 - iv) Brake efficiency test.
- 2) Testing of different auto components on UTM, SPM, etc.
- 3) PUC testing of petrol and diesel on exhaust gas analyzer and diesel some meter.
- 4) Vehicle testing on chassis dynamometer.

- 5) Visit to local computerized wheel alignment service center.
- 6) Study of different engine dynamometer.
- 7) Performance & Pollution characteristics study of petrol and diesel engine.
- 8) Heat balance sheet on diesel engine.
- 9) Study of vehicle testing.

Note: Oral will be based on the prescribed term-work presented in the form of certified journal.

REFERENCE BOOKS

- 1) Birch, "Automotive Chassis system".
- 2) CIRT & VRDE manuals
- 3) Giles, "Vehicle operation and performance".
- 4) Giles, "Motor Vehicle inspection".

**B.E. (AUTOMOBILE ENGINEERING): FIRST TERM
MECHATRONICS SYSTEMS**
(Common with Mechanical And Production Engineering)

Teaching Scheme

Lectures : 4 Hours/week
Practical : 2 Hours/week

Examination Scheme

Theory Paper : 100 Marks
Term Work : 25 Marks
Oral : 25 Marks
Paper Duration : 3 Hours

UNIT - I

10 Hours (20 Marks)

INTRODUCTION TO MECHATRONICS

Scope and importance of mechatronics, Key issue, Systems, Measurement systems.

TRANSDUCERS AND SENSORS

Introduction, Difference between transducer and sensor, Transducer types, Transduction principle, Photoelectric transducers – photoemissive transducers, photoconductive transducers, photovoltaic transducers, Thermistors, Thermodevices, Thermocouple, Inductive transducers, Capacitive transducers, Pyroelectric transducers, Piezoelectric transducer, Half-effect transducer, Ionization transducers, Light Emitting diode, Optical encoder – incremental encoder, absolute optical encoder, Bimetallic strip, Bourdon tube, Strain gauge, Load cell, Diaphragms, Mechanical switches, Flow transducers, Fibre optic transducers.

UNIT - II

10 Hours (20 Marks)

SIGNAL CONDITIONING

Introduction, Voltage divider, Rectification, Diode voltage stabilizer, Clipping and Clamping circuit, Amplifier – OPAMP circuits, more about filter circuits, Isolator, Instrumentation amplifier, Bridge circuit, Comparator, Oscillator, 555 Timer, Sample and Hold, Clock, Analog to Digital conversion – digital to analog converter, counter based analog to digital converter, successive approximation, Galvanometer, Ammeter and Voltmeter, Cathode ray oscilloscope.

DATA PRESENTATION AND DATA LOGGING SYSTEMS

Introduction, Recorders - Graphic recorders, Strip chart recorders, X-Y recorders, Magnetic tape recorder.

Data loggers – block diagram description , Data acquisition system – generalized data acquisition system, computer based data acquisition system.

UNIT - III

10 Hours (20 Marks)

ACTUATORS AND MECHANISMS

Introduction, Actuator types and application areas, Electromechanical actuators, DC Motors – brushed DC motor, brushless, coreless, AC Motors – induction motors, synchronous motors, stepper motor, Fluid power actuators – pneumatic actuators, valves actuators, hydraulic actuators, comparison, Piezoelectric actuators – an illustration, piezoelectric motor, Magnetostrictive actuators, Memory metal actuators, Ion-exchange polymer metal composites, Chemical actuator.

Mechanisms, Bearings – slide bearing, journal bearing, rolling element bearing, magnetic bearing, molecular bearing, Belt, Chain, Pulleys, Gears – gear ratio, Rack and pinion, Ratchet, Pawl and Crank, Slider and crank, Cam and Follower – shape of the cam, shape of the follower, Chain and Sprocket, Geneva wheel, Four bar linkages.

UNIT - IV

10 Hours (20 Marks)

INTRODUCTION TO MICROPROCESSORS AND MICROCONTROLLERS

Microprocessor - Introduction, Basic element of control systems

Microcontrollers - Introduction, Difference between Microprocessors and Microcontrollers

Programmable logic controllers - Introduction.

CONTROL SYSTEMS AND CONTROLLERS

Introduction, Control system, Open-loop control systems, Closed-loop control systems – notations, reachability, transfer function.

The Controllers - on-off controller, proportional controller, integral controller, derivative controller, proportional plus integral controller, proportional plus derivative controller, proportional plus integral plus derivative controller, comparison, More about automatic control, Diving automatic control methods.

UNIT - V

10 Hours (20 Marks)

INTEGRATION

Introduction, Background, Advanced actuators – advanced motorized actuators, pneumatic actuators, servo actuator systems, Consumer mechatronic products, Hydraulic fingers, Surgical equipment, Industrial robot – different parts of a robot, controller, drive, arm, end effector, sensor, functional requirements, robot based automation, Autonomous guided vehicle – AGV architecture, components based DCS view, man machine interface, design with fieldbus technology, Drilling machine, Conveyor based material handling systems – validation, design.

INDUSTRIAL DESIGN, AESTHETICS AND ERGONOMICS

Introduction, Element of product design – product physiognomy aesthetics, product physiognomy ergonomics, ergonomics in machine tool design, ergonomics in machine tool safety, product safety audit, Ergonomic factors for advanced manufacturing systems – machine oriented industrial design, factory without people, ergonomic problems in new technology.

TERM WORK

Term work shall consist of any five experiments and three assignments.

- 1) Study of Basic block diagram of mechatronics system components.
- 2) Study and demonstration of motion / force transducers.
- 3) Study and demonstration of temperature / pressure transducers.
- 4) Study and demonstration of AD / DA converter
- 5) Study and demonstration of hydraulic actuator / pneumatic actuator.
- 6) Study and demonstration of graphic / magnetic tape recorders.
- 7) Study of Microprocessors and Microcontrollers
- 8) Study of Robot / Autonomous guided vehicle

Note: Oral will be based on the prescribed term-work presented in the form of certified journal.

REFERENCE BOOKS

- 1) D.R. Appukuttan, "Introduction to Mechatronics", Oxford, New Delhi.
- 2) N.P. Mahalik, "Mechatronics", Tata McGraw-Hill Publishing Company Limited, New Delhi
- 3) A. Smaili, "Applied Mechatronics", Oxford, New Delhi.
- 4) W. Bolton, "Mechatronics", Pearson Education, New Delhi
- 5) Dan Neculescu, "Mechatronics", Pearson Education, New Delhi
- 6) R.P. Borole, "Mechatronics", Nirali Prakashan, Jalgaon.
- 7) D. V. Alciatore, "Introduction to Mechatronic and Measurement Systems", Tata McGraw- Hill Publishing Company Limited, New Delhi
- 8) HMT Limited, "Mechatronics", Tata McGraw-Hill Publishing Company Limited, New Delhi
- 9) J.G. Joshi, "Mechatronics", Prentice Hall of India, New Delhi

**B.E. (AUTOMOBILE ENGINEERING): FIRST TERM
AUTOMOBILE ELECTRIC SYSTEMS**

Teaching Scheme

Lectures : 4 Hours/week

Practical : 2 Hours/week

Examination Scheme

Theory Paper : 100 Marks

Term Work : 25 Marks

Oral : 25 Marks

Paper Duration : 3 Hours

UNIT - I

10 Hours (20 Marks)

GENERATORS & REGULATORS:-Automobile generators, Types & principle of generators, Types of dynamos, Cut-out relay, Ammeter, Alternator.Constant current & voltage systems, DC generator regulator, Current & voltage regulator, Semi-conductor type regulator, Regulator for alternator.

UNIT - II

10 Hours (20 Marks)

CRANKING MOTORS:-Requirements, Principles of starting torque & power, Construction of cranking motors, Selection of cranking motors, Drive mechanism, Types of cranking motors, Bendix drive, Rubber compression, Over running clutch, Friction clutch etc. Cranking motor efficiency.

UNIT - III

10 Hours (20 Marks)

LIGHTING SYSTEMS:-Introduction, Types of lamps, Headlights, Construction & types, Reflector design, Anti-dazzle devices, Fog lamp, Side & tail lamp, Brake warning light, Ignition warning light, Reversing lamp, Directional indicators parking light, Fluorescent lighting, Interior lighting, Electro luminescent panel.

UNIT - IV

10 Hours (20 Marks)

INDICATING & WARNING DEVICES:-Introduction, Fuel gauges, Types, Oil pressure gauges, Water temp gauges, Speedometer, Electrical speedometer, Warning lights, Fuel efficiency gauges, Wind-shield wipers, Electric horn, Heater & De-frosters, Electrically operated radiators, cooling fans, windows & seats, Automatic rear view mirror dimmer, Troubleshooting.

UNIT - V

10 Hours (20 Marks)

WIRING & TESTING INSTRUMENTS:-Introduction, Automatic cables, Cable colours, Wiring harness, Cable connector, Circuit breaks, Fuses.Testing instruments- Ignition coil tester, Condensor tester, Distributor tester, Cam angle RPM tester, Ignition scope, Electric system inspection.

TERMWORK

Term work shall consist of any five experiments and three assignment

1. To study DC generator and alternator motor construction.
2. To study Head-light construction & setting.
3. To study Dash-board instrument panel.
4. To study Electrical harness.
5. To study Cranking motors.
6. To study Automobile electrical components using test bench.
7. To study colour codes & Wiring harness.

Note: Oral will be based on the prescribed term-work presented in the form of certified journal.

REFERENCE BOOKS

1.P.L.KOHLI - "Automotive Electric Equipment",Tata Mc Graw Hill, New Delhi.

**B.E. (AUTOMOBILE ENGINEERING):FIRST TERM
SPECIAL PURPOSE VEHICLE**

Teaching Scheme
Lecture :4 Hrs/week

Examination Scheme
Theory Paper : 100 marks
Paper duration : 3 Hours

UNIT- I

10 Hours (20 Marks)

Introduction:- General classification & application of earth moving machinery in open cast mining & other places. Operations involved in such application.

Constructional & working features of different types of earth moving machinery, such as drills, rippers, shovels, wheel loaders, lifts, tractors, brack vehicles, Excavators, Dampers, Dozers, Cranes, Crushers, Feeders & compressors.

UNIT - II

10 Hours (20 Marks)

Study of working principles & design considerations of different systems involved like power systems, Transmission, Final drive, Lubrication, electrical, braking, steerig & pneumatic & hydraulic control circuits.

Study of instrumentation applied to such machines.

UNIT - III

10 Hours (20 Marks)

Intra-plant transporting & handling equipment:- Types & principles groups of materials handling equipment, choice of hoisting equipments surface & overhead equipments.

Components & theory of Hoisting equipments:- Chains & ropes, Pulleys suckcket drums, load handling attachments, arresting gear & brakes.

UNIT - IV

10 Hours (20 Marks)

Drives:- Hand drive & operating levers, Power driver, Hoisting mechanisms traveling gear slowing, jib & lifting gears.

Mobile cranes:- Basic characteristic of truck cranes, stability & design features, control systems & safety devices.

UNIT-V

10 Hours (20 Marks)

Elevators:- Cage elevators, portable air operated hoist portable hydraulic jacks, car lift, stakers, handling & safety.

Battery operated electric vans:- principles of operation, special features.

REFERENCE BOOKS

1. N. Rudenko," Material Handling Equipments", M.R. Publishers
2. "Truck Cranes" , M.R. Publishers.
3. Sheldon, R. "Shacket, Electric Vehicles" , Domus Book, New York.
4. Y.Fokras & M. Tushnyakov , "Construction Equipments operation & maintenance", (MIR Mosco.)
5. A. Astskhov , "Truck cranes " , (MIR)
6. E.G. Poninson ,Motor Grader , (MIR)
7. "Handbook of Barth moving machinery" Central Waster & power Commision

**B.E. (AUTOMOBILE ENGINEERING): FIRST TERM
PROJECT I**

(Common with Mechanical And Production Engineering)

Teaching scheme

Practical: 2 hrs / week

Examination scheme

Oral : 25 Marks

Term Work : 25 Marks

1. Every student individually or in a group (group size is of 4 students. However, if project complexity demands a maximum group size of 5 students, the committee should be convinced about such complexity and scope of the work.) Shall take a project in the beginning of the (B.E. first Term) seventh term in consultation with the guide and the project must be completed in the (B.E. Second Term) eighth term.

2. The project proposal must be submitted in the institute in the beginning of the (B.E. first Term) seventh term. While submitting project proposal care is to be taken that project will be completed within the available time of two term i.e. 2 Hrs per week for (B.E. first Term) seventh term and 4 Hrs per week for (B.E. Second Term) eighth semester (total time become $12 \times 2 + 12 \times 4 = 72$ Hrs per project partner). The final title of the project work should be submitted at the beginning of the (B.E. Second Term) eighth semester.

3. Project title should be precise and clear. Selection and approval of topic:

Topic should be related to real life application in the field of MECHANICAL, AUTOMOBILE AND PRODUCTION ENGINEERING

OR

Investigation of the latest development in a specific field of MECHANICAL, AUTOMOBILE AND PRODUCTION ENGINEERING

OR

The investigation of practical problem in manufacture and / or testing of MECHANICAL, AUTOMOBILE AND PRODUCTION ENGINEERING equipments

OR

The MECHANICAL, AUTOMOBILE AND PRODUCTION ENGINEERING based applications project is preferable.

OR

Software development project related to MECHANICAL, AUTOMOBILE AND PRODUCTION ENGINEERING and Agriculture Engineering with the justification for techniques used / implemented is accepted.

OR

Interdisciplinary projects should be encouraged. The examination will be conducted independently in respective departments.

4. The group should maintain a logbook of activities. It should have entries related to the work done, problems faced, solution evolved etc., duly signed by guide.

5. The group is expected to complete details system design, layout etc. in (B.E. first Term) seventh term, as a part of term work in the form of a joint report. Project report must be submitted in the prescribed format only. No variation in the format will be accepted.

6. One guide will be assigned at the most three project groups.

7. The guides should regularly monitor the progress of the project work.

8. Assessment of the project for award of TW marks shall be done by the guide and a departmental committee (consisting of minimum two teachers with experience more than three years) as per the guidelines given in the following table.

A) ASSESSMENT OF PROJECT I TERMWORK B.E. FIRST TERM

NAME OF THE PROJECT _____

NAME OF THE GUIDE: _____

Sr No	Exam Seat No	Name Of Student Marks	Assessment by guide (70%)					Assessment by Departmental committee (30%)			Grand Total	Out of 25 Marks
			Literature survey	Topic Selection	Documentation	Attendance	Total	Evaluation (10%)	Presentation (20%)	Total		
			10	05	15	05	35	05	10	15		

Sign of Guide

Sign. of Committee Members

Sign. Of H. O. D.

9. The guide should be internal examiner for oral examination (If experience is greater than three years).

10. The external examiner should be from the related area of the concerned project. He should have minimum of five Years of experience at degree level / industry.

11. The evaluations at final oral examination should be done jointly by the internal and external examiners.

**B.E. (AUTOMOBILE ENGINEERING): FIRST TERM
SEMINAR**

(Common with Mechanical And Production Engineering)

Teaching scheme

Practical: 2 hrs / week

Examination scheme

Term Work:25 Marks

1. For seminar every student will individually study a topic assigned to him / her and submit a report and shall deliver a short lecture / Seminar on the topic at the end of term.
2. Selection of topic should be done by students in consultation with concerned guide
 - a. Topic should be related to branch but it should be extended part of the branch (latest and advance topic).
 - b. The topic should be such that the student can gain latest knowledge. Student should preferably refer at least one research paper
3. Seminar topic should not be repeated in the department and registration of the same should be done on first come first served basis
4. Seminar report should be submitted in paper bound copy prepared with computer typing
 - a. Size of report depends on advancement of topic.
 - b. Student should preferably refer minimum 5 reference books / magazines.
 - c. Format of content
 - i. Introduction.
 - ii. Literature survey.
 - iii. Theory 1) Implementation 2) Methodology
 3) Application 4) Advantages, Disadvantages.
 - iv. Future scope.
 - v. Conclusion.

5 ASSESSMENT OF SEMINAR for TERM WORK

Title of seminar: _____

Name of guide: _____

Sr. No.	Exam Seat No.	Name of Student	Assessment by examiners					Grand Total
			Topic Selection	Literature Survey	Report Writing	Depth of understanding	Presentation	
			5	5	5	5	5	25

6. Assessment of Literature survey will be based on
 - a. Collection of material regarding history of the topic.
 - b. Implementation.
 - c. Recent applications.
7. Assessment of Depth of understanding will be based on
 - a. Questioning by examiners.
 - b. Questioning by students.
 - c. What the student understands i.e. conclusion regarding seminar.
8. Assessment of presentation will be based on;
 - a. Presentation time (10 minutes)
 - b. Presentation covered (full or partial)
 - c. Way of presentation
 - d. Questioning and answering (5 minutes)
9. Examiners should be a panel of two one of them must be guide. Examiner must have experience at least 3 years. Examiners will be appointed by HOD in consultation with Principal.

**B.E. (AUTOMOBILE ENGINEERING):SECOND TERM
CAD-CAM & AUTOMATION
ELECTIVE - II**

Teaching Scheme
Lecture : 4 Hrs/week

Examination Scheme
Theory Paper : 100 marks
Term work : 25 marks
Paper duration : 3 Hours

UNIT - I

10 Hours (20 Marks)

TRANSFORMATION, MANIPULATION & DATA STORAGE:-

Introduction, 2D & 3D transformation (Translation, rotation & scaling & magnification), Windowsing transformation, three dimensional computer graphics viewing transformation, hidden line removal & hidden surface algorithm, light & shade ray tracing, Bill of material attribute data, the use of object & associativity, Engg. Data Management system, object oriented database, representation of knowledge, knowledge base engineering.

UNIT - II

10 Hours (20 Marks)

CAM [Computer Aided Manufacturing]:-

NC Technology- Introduction, basic components of NC system, NC procedure, NC co-ordinate systems, NC motion control systems, application, advantages & disadvantages of NC machines.

NC PART PROGRAMMING:-

Introduction, the punched tape in NC, tape coding & format, manual part programming.

UNIT - III

10 Hours (20 Marks)

COMPUTER AIDED NC PART PROGRAMMING:-

Introduction, part programming jobs, function of a post processor, NC part programming language, element of APT language, NC programming with interactive graphics.

CNC:-

Problem with conventional NC, CNC functions & advantages, DNC, Adaptive control CNC programming concept, trends & new developments in NC.

UNIT - IV

10 Hours (20 Marks)

AUTOMATION:-

Introduction, semi automatic, multi tool center lathe, classification of automatic machines, sliding head, type, automatic screw, turret automatic screw, multiple spindle, special purpose machine tools, automation, automation strategies, transfer machining, programmer controller machine tool, automatic assembly machine, assembly cell.

UNIT - V

10 Hours (20 Marks)

Numerical control of machine tools, fundamental concept, classification & structure of NC systems, CAD based process planning, structure of process planning software, programmable logic controller, parts of typical PLC system, operation of PLC, programming of PLC & its application in CNC machine, computer aided quality control.

TERM WORK

Term work shall consist minimum eight assignments based on above syllabus.

REFERENCE BOOKS

- 1) P. Radhkrishnan, S. Subramanyam, V. Raju ,”CAD/CAM/CIM” , New Age Publication
- 2) Grover, Automation, ”Production System and Computer Integrated Manufacturing” ,Pearson Education.
- 3) Mikell P. Grover, Emory W. Zimmers ,”Computer Aided Design and Manufacturing” , P.H.I
- 4) Rao, Tiwari, Kundra ,”Computer Aided Manufacturing” ,T.M.H
- 5) Zeid ,”CAD/CAM”,T.M.H
- 6) James G. Keramas ,”Robot Technology Fundamentals”, Vikas Publication House
- 7) Rudra Pratap, ”Getting Started with Matlab 7”, Oxford, New Delhi.
- 8) B.S.Pabla, M.Adithan ,”CNC Machine”, New Age International(P) Ltd

**B.E. (AUTOMOBILE ENGINEERING):SECOND TERM
SUPPLY CHAIN MANAGEMENT
ELECTIVE - II**

Teaching Scheme

Lecture -4 Hrs/week

Examination Scheme

Theory Paper : 100 marks

Term work : 25 marks

Paper duration : 3 Hours

UNIT – I

10 Hours (20 Marks)

MATERIAL MANAGEMENT:-

Importance, scope, need & definition of material management, advantages, concept of MBO, Material planning & budgeting, techniques, guidelines, budgeting, ABC analysis, advantages purpose & objective of ABC analysis.

UNIT - II

10 Hours (20 Marks)

PURCHASING MANAGEMENT:-

Importance, goals, purchase system, pre-purchase system, ordering system, post-purchase system, special purchasing system.

International purchasing- Need, procedure, nature of documents.

UNIT – III

10 Hours (20 Marks)

INVENTORY MANAGEMENT:-

Introduction, norms for inventory, relevant cost, economical ordering quantity, Q-system, P-system programme evaluation review technique [PERT].

UNIT - IV

10 Hours (20 Marks)

STORE MANAGEMENT & WARE HOUSING:-

Purpose of store, cost aspects & productivity receipt system, physical systems.

Stores accounting, costing of the receipts of materials.

FIFO, LIFO, Stork verification, valve analysis selection of products for value analysis.

UNIT - V

10 Hours (20 Marks)

TRANSPORTATION & TRAFFIC MANAGEMENT:-

Individual freight & passenger modes, Intermodal transportation & third party transportation services, Economic social & political roles of transportation, demand, cost & service characteristics of different transport services, carrier selection, freight rate structure, private fleet management claim management, international transportation dispatch decision, routing decision, routing models.

TERM WORK

Term work shall consist minimum eight assignments based on above syllabus.

REFERENCE BOOKS

- 1) Ammer DS Taraporewala - "Material Management & Purchasing".
- 2) Martin Christopher & Richard Irwin - "Logistics & Supply Chain Management".
- 3) P.Gopalkrishnan & M. Sundaesan - "Material Management", Prentice hall of India, Pvt ltd, New Delhi.
- 4) Mohanty, S.G.Deshmukhh, " Supply Chain Management",Wiley India Pvt.Ltd. New Delhi

**B.E. (AUTOMOBILE ENGINEERING):SECOND TERM
ANALYSIS AND SYNTHESIS OF MECHANISM
ELECTIVE-II**

Teaching Scheme
Lecture : 4 Hrs/week

Examination Scheme
Theory Paper : 100 marks
Term work : 25 marks
Paper duration : 3 Hours

UNIT – I

10 Hours (20 Marks)

KINEMATICS :-

Kinematics element in pair mechanisms with lower & higher pairs, geometry of motion type number of synthesis of mechanisms, chebyshov- polynomials, spacing of accuracy points.

UNIT – II

10 Hours (20 Marks)

Four bar coupler point curves, equation of coupler curves- robert chebyshov theorem- doybke oiubts & symmetry- Euler savary equation & cubic of stationary curvature.

UNIT – III

10 Hours (20 Marks)

Geometry method of synthesis of planar mechanisms, two finitely separated link positions- three finitely separate link positions- poles and relative poles- synthesis with three accuracy points, four finitely separated link positions- pole triangle, image poles- opposite poles, quadrilateral circle point and center point curves- synthesis with four accuracy points.

UNIT – IV

10 Hours (20 Marks)

Algebra method of synthesis of planar mechanisms :- Displacement equations of the four bar linkage- synthesis with three accuracy points- synthesis with prescribed velocity & acceleration synthesis with four accuracy points- compatibility synthesis with five accuracy points structural error curve respecting analysis of mechanical error in linkages.

UNIT – V

10 Hours (20 Marks)

Synthesis of spatial linkages- displacement analysis matrix method of analysis function generators for symmetric function- Application of spatial mechanisms to robotics- kinematics analysis of as industrial robots manipulators- gripper theory.

TERM WORK

Term work shall consist minimum eight assignments based on above syllabus.

REFERENCE BOOKS

- 1) Arthur G. Erdman and George. N. Sandor "Mechanisms Design Analysis and Synthesis Vol. I & II", Prentice hall of India.
- 2) J.E.Shigley "Kinematic analysis of Mechanisms", Mc Graw Hill, New York.
- 3) J.E.Shigley and J,J.Vicke - Theory of Machines & Mechanisms, International students edition, Mc Graw Hill, New York.
- 4) Robert L.Norton "Design of Machinery", Mc Graw Hill, New York.

**B.E. (AUTOMOBILE ENGINEERING):SECOND TERM
AUTOMOBILE PAINTING & COLLISION REPAIRS
ELECTIVE - II**

Teaching Scheme
Lecture : 4 Hrs/week

Examination Scheme
Theory Paper : 100 marks
Term work : 25 marks
Paper duration : 3 Hours

UNIT - I

10 Hours (20 Marks)

Painting techniques & Topcoat refinishing, definition & objectives of painting, elements of paint, pigments, resin, solvent, paint drying, paint drying characteristics, drying forms & film mesh works, automobile paints, topcoat paints, special paint, painting method, spraying, immersion, painting new vehicles, body components, new vehicle painting process, global refinish system, HVLP recommendations, sanding recommendations, wet sanding, dustless dry sanding, vehicle protective coating, unpainted surfaces, filling dented or irregular surfaces.

UNIT – II

10 Hours (20 Marks)

Refinishing facilities, equipments & tools & repainting process, refinish & OE paint, types, individual characteristics, painting & drying facilities, drying equipments, colour matching scales, air spray gun, electrostatic painting equipments, accessories, repainting, types of paints & repainting process, spray gun, surface treatment, primer surface & sanding, fundamental of colour, match masking, top coat process, whole body & block repainting, spot repainting, waxing, repainting of bumpers, metallic colour appearance charger due to painting conditions.

UNIT – III

10 Hours (20 Marks)

Paint defects, causes & correction, small body paint repair, correction for paint finish defects, defects occurring during painting, seeds fish eyes, orange peels, runs, blushing, shrinkage, bleeding, lin holes, pretty traces, abrasion mane, blisters, peeling, spotting discoloration, chalking, yellowing, nibs, loss of gloss, repairing a hole small dert, cout truck bed, defects occurring with time, fale(absorption).

UNIT – IV

10 Hours (20 Marks)

Safety & cleanliness minor body repair, paint & solvent toxicity & its prevention, paint & solvent toxicity, toxicity prevention, five hazards, fire extinguishing, health & safety, organic solvents, heavy metals, acute chronic effects, respiratory sensitization, skin & eye effects, stability of isocyanates, storage, incompatibility, hazardous decomposition, body filters, door dig repairs, scratch repair, drip repair.

UNIT - V

10 Hours (20 Marks)

Paint mixing systems, OEM color selection process, paint codes, tints, mixing, paint mixing, single stage paint, three stage paint, two tone paint, troubleshooting, painting plastic parts, flexible paint additives, painting new plastic parts, repairing plastic parts, compressed air supply equipments, air & fluid control equipment, hose & connections, air systems maintenance.

TERM WORK

Term work shall consist minimum eight assignments based on above syllabus.

REFERENCE BOOKS

1. Anil Chikara , "Automobile Paint Techniques" , (satya prakashan, New Delhi).
- 2 . Micheal Crandell, "Painting For Collision Repair" .

**B.E. (AUTOMOBILE ENGINEERING):SECOND TERM
FINITE ELEMENT METHODS
ELECTIVE-II**

Teaching Scheme
Lecture : 4 Hrs/week

Examination Scheme
Theory Paper : 100 marks
Term work : 25 marks
Paper duration : 3 Hours

UNIT - I

10 Hours (20 Marks)

INTRODUCTORY CONCEPT

Introduction to FEM, brief history, general FEM procedure, application of FEM in various fields, advantages & disadvantages of FEM.

Differential equation in different field, types of differential equation, primary & secondary variables & types of boundary conditions, methods of solving differential equation, exact method, finite difference method.

UNIT - II

10 Hours (20 Marks)

Finite E.M of one dimensional problems second order boundary value problems, basic steps of F.E analysis, application to heat transfer, fluid mechanics & solid mechanics, problems.

UNIT - III

10 Hours (20 Marks)

BENDING OF BEAMS :-

Introduction, Euler-Bernoulli beam element, plane truss & Euler Bernoulli frame elements, inclusion of constrained equation, finite element error analysis, approximation errors, various measures of errors, conversions of solutions, accuracy of solution.

UNIT - IV

10 Hours (20 Marks)

F.E.A of 2D problems, interpolation functions, numerical integration, model consideration.

Library of elements & interpolation function, numerical integration.

Plane elasticity :- Governing equation & weak formulation, finite element model.

UNIT - V

10 Hours (20 Marks)

Weighted- Residual finite element models & finite element model of non-linear & 3-D problems, alternative formulations, non-linear problems.

large deflection of bending of beam solution models of non-linear algebraic equation, the 2-D Navier stokes equation.

TERM WORK

Term work consist minimum eight assignments based on above syllabus

REFERENCE BOOKS

1. J.N. Reddy, "An Introduction to Nonlinear Finite Element Analysis", Oxford, New Delhi
2. J.N.Reddy, "Finite Element Method", Mc Graw Hill International.
3. O.C.Zienkiewier, "Finite Element in Engg.", Prentice hall of India, New Delhi.
4. Chandrupatala & A.D.Belegundu, "Introduction to Finite Element in Engg.", Prentice hall of India, New Delhi.
5. K.Bathe, "Finite Element Procedure", Prentice hall of India, New Delhi.
6. Rajasekaran, "Finite Element Procedure", Wheeler publishing, New Delhi.
7. Kenneth Lt. Huebner, " The FEM for Engineers ",Wiley India Pvt.Ltd. New Delhi

**B.E. (AUTOMOBILE ENGINEERING):SECOND TERM
AUTOMOBILE DESIGN**

Teaching Scheme

Lecture : 4 Hrs/week
Practical : 4 Hrs/week

Examination Scheme

Theory Paper : 100 marks
Term work : 25 marks
Oral : 25 marks
Paper duration : 4 Hours

UNIT - I

10 Hours (20 Marks)

DESIGN OF PISTON AND CONNECTING ROD :Material selection, construction of piston, types of piston manufacturing process, design of piston, design of piston pin, design of piston rings,Material selection and construction of connecting rod, types of connecting rod, manufacturing process, design calculation of split type connecting rod and its drawing

UNIT - II

10 Hours (20 Marks)

DESIGN OF CRANK SHAFT AND FLYWHEEL : Material selection, construction of crank shaft, types of crank shaft, manufacturing process ,design calculation and drawing,Material selection and construction of flywheel, types of flywheel, manufacturing process, design calculation and drawing.

UNIT - III

10 Hours (20 Marks)

DESIGN OF CAM SHAFT, VALVE OPERATING MECHANISM:-Material selection & construction of cam shaft, Types of cam profile, manufacturing processes design for-1. Tangent cam 2.Generated cam design calculation & drawing, calculation & Drawing of valve operating mechanism like Rocker arm, Valves & Springs.

UNIT - IV

10 Hours (20 Marks)

Design of propeller shaft & Universal joint & material selection, Design of differential, Numerical problems on steering systems, Design of front & rear axles.

UNIT - V

10 Hours (20 Marks)

STATISTICAL CONSIDERATION IN DESIGN:-Statistics consideration in design, Statistics in design, Design for natural tolerance, Statistical analysis, Mechanical reliability,OPTIMUM DESIGN:- Introduction to optimum design to mechanical element, Adequate & optimum design, Johnsons method of optimum design, Simple problems in optimum design.

TERM WORK

Term work consist -

- 1) Term work shall consist of two A-2 size sheets based on design of any one system mentioned below.
Piston connecting rod assembly, Propeller shaft & Universal joint, Front axle, Rear axle, Cam & valve actuating mechanism.
- 2) Components drawing of the above assembly in A-2 size sheet.
- 3) Repair giving design calculation of above assembly.

REFERENCE BOOKS

- 1) Joseph E Shigley & Larry D. Mitchell , "Mechanical Engg. Design" (IV Edition) ,Mc Graw Hill International Book Company.
- 2) M.F.Spotts & T.E.Shout, "Design of machine element"(7th Edition),Tata Mc Graw Hill, New Delhi.
- 3) V.B.Bhandari, "Design of machine element",Tata Mc Graw Hill, New Delhi.
- 4) R.C.Johnson, "Optimum design of mechanical element",John Willey & Sons.
- 5) J.S.Arora , "Introduction to optimum design", Mc Graw Hill Book Company.
- 6) R.B.Gupta, "Auto Design", Satya prakashan, Delhi.

**B.E. (AUTOMOBILE ENGINEERING):SECOND TERM
AUTOMOBILE DYNAMICS**

Teaching Scheme

Lecture : 4 Hrs/week
Practical : 2 Hrs/week

Examination Scheme

Theory Paper : 100 marks
Term work : 25 marks
Oral : 25 marks
Paper duration : 3 Hours

UNIT - I

10 Hours (20 Marks)

VEHICLE VIBRATIONS :Single degree & two degree of freedom system, free & forced vibrations, vehicle ride model, two degree of freedom model for sprung & unsprung mass, two degree freedom model for pitch & bounce, vibrations due to road roughness and engine unbalance, transmissibility of engine mounting, motion of vehicle on undulating road and compensated suspension system human response to vibrations.

UNIT - II

10 Hours (20 Marks)

HANDLING CHARACTERISTICS : Steering geometry, fundamental condition for true rolling, Ackerman steering gear, Davis steering gears, steady state handling neutral steer, under steer & oversteer, steady state response, yaw velocity, lateral acceleration, curvature response & directional stability.

UNIT - III

10 Hours (20 Marks)

STEADY STATE OPERATION OF ROAD VEHICLES : Various forces opposing vehicle motion, nature of the forces & factors affecting the forces, tractive effort & power available from the engine, equation of motion & maximum tractive effort, weight distribution, stability of a vehicle on slope, road performance curves, acceleration, gradeability & draw bar pull.

UNIT - IV

10 Hours (20 Marks)

TRANSIENT OPERATION OF ROAD VEHICLE : Inertia effect, equivalent moment of inertia ungeared system, time to produce synchronization during gear change, effect of engine flywheel on acceleration, dynamics of vehicle on banked track, gyroscopic effect, net driving power.

UNIT - V

10 Hours (20 Marks)

BRAKING PERFORMANCE : Braking of vehicle- braking applied to gear wheels, front wheels & all the four wheels, on straight & curved paths mass transfer & its effects, braking efficiency & stopping distance, reaction time & stopping time, brake locking & antilock devices, calculation of mean lining pressure & heat generation during braking.

TERMWORK

Term work shall consist of any five experiments and three assignments

1. Tractive effort measurement.
2. In house simulation of maximum speed conditions.
3. Acceleration time test.
4. Fuel consumption test at different speeds.
5. Brake efficiency test.
6. Measurements of turning circle radians.

REFERENCE BOOKS

- 1) Wong, "Theory of ground vehicles".
- 2) Dr. Giri, "Problems in automobile mechanics"
- 3) Gillespie, "Fundamentals of vehicle dynamics"
- 4) Grover, "Mechanical vibration"
- 5) Eills, "Vehicle dynamics" .

**B.E. (AUTOMOBILE ENGINEERING):SECOND TERM
AUTOMOBILE SERVICE & REPAIRS**

Teaching Scheme

Lecture : 4 Hrs/week
Practical : 2 Hrs/week

Examination Scheme

Theory Paper : 100 marks
Term work : 25 marks
Oral : 25 marks
Paper duration : 3 Hours

UNIT - I

10 Hours (20 Marks)

ENGINE SERVICE & TUNING

Introduction, Engine removal Engine head, Removing cylinder head, Cleaning & inspection, Refitting the cylinder head. Valve & valve mechanism, Piston connecting rod assembly, Cylinder block, Reinstalling the assembly in the cylinder, Crank shaft & main bearing, Engine reassembly, Precautions.

UNIT - II

10 Hours (20 Marks)

TUNING

Tuning procedure, Crankshaft thumping, Connecting rod noise, Piston noise, Piston pin noise, Valve & tappet noise, Abnormal oil consumption, Ignition timing. Servicing of propeller shaft & differential assembly, Assembling & disassembling of steering assembly.

UNIT - III

10 Hours (20 Marks)

CHASSIS DRIVE LINE COMPONENTS SERVICE

Introduction, Suspension systems & springs of rigid & independent types, Disassembling of leaf spring, coil spring & its service. Disassembling of clutch system (mechanical & hydraulic types) repair, maintenance & trouble shooting, Removal of gear-box assembly, Procedure of gearbox dismantling, trouble shooting & refitting.

UNIT - IV

10 Hours (20 Marks)

BRAKES & TYPES

Servicing & repair of braking systems:- Brake testing, Brake service, Bleeding of brakes, Brake padel adjustment, Brake adjustment, relining wheel brake, reconditioning master & wheel cylinder Fast braking by means of accelerated speed, Servicing of parking brake, Wheel & tyre servicing causes of tyre wear & its remedies, Tyre maintenance, Wheel balance, Static balancing of front wheel, Dynamic balancing of front & rear wheel, Trouble shooting.

UNIT - V

10 Hours (20 Marks)

SERVICING OF MOTOR VEHICLE

Servicing & its necessity, Types of servicing, cleaning of motor vehicle & its part, Steam cleaning, Engine de-coking, Precaution to minimize carbon, Method of de- carburising, Greasing of motor vehicle.

GARAGE & FLEET MANAGEMENT:-

Introduction, Specimen of job card, Work charge, Procedure & records, Garage tools & equipments.

TERMWORK

Term work shall consist of any Six experiments and Two assignments

- 1) Observe & sketch figures of various garage tools used in automobile garage.
- 2) Removal of engine from vehicle for overhaul & engine disassembly as per prescribed sequence for multicylinder engine.
- 3) Engine tune up
- 4) Study & dismantling of clutch system.
- 5) Study & dismantling of gear box system.
- 6) To study brake trouble, their causes & maintenance of brake.
- 7) Demonstration of engine de-carburising machine.
- 8) Demonstration of ignition timing of multicylinder engine.

NOTE - Some of demonstration may be arrange by planning visit to automobile industry & garages.

RECOMMENDED BOOKS

- 1) G.B.S Narang "Automobile Engineering", Khanna Publishers.
- 2) Dr.Kirpal Singh "Automobile Engineering"(VOL -I & II) , Standard Publishers Distributors.

**B.E. (AUTOMOBILE ENGINEERING): FIRST TERM
PROJECT II**
(Common with Mechanical And Production Engineering)

Teaching scheme
Practical : 4 hrs / week

Examination scheme
Oral : 50 Marks
Term Work: 100 Marks

1. The Project group in (B.E. first Term) seventh term will continue the project work in (B.E. Second Term) eighth term and complete project in all respect (assembly, testing, fabrication, tabulation, test result etc.)
2. The group should maintain a logbook of activities. It should have entries related to the work done, problems faced, solution evolved etc., duly signed by guide.
3. The guides should regularly monitor the progress of the project work.
4. The project work along with project report should be submitted as part of term work in (B.E. Second Term) eighth term on or before the last day of the (B.E. Second Term) eighth term
5. Project report must be submitted in the prescribed format only. No variation in the format will be accepted.
6. Assessment of the project for award of TW marks shall be done by the guide and a departmental committee (consisting of minimum two teachers with experience more than three years) as per the guidelines given in the following table.

B) ASSESSMENT OF PROJECT II TERMWORK (B.E. SECOND TERM)

NAME OF THE PROJECT: _____

NAME OF THE GUIDE: _____

Sr. No	Exam. Seat No	Name Of Students	Assessment by guide (70%)						Assessment by department (30%)			Grand Total
			Fabrication /software / actual work	Execution of project	Project report	Scope/ Cost / Utility	Attende- nece	Total	Evalu- ation (10%)	Prese- ntaion (20%)	Total	
		Marks	20	10	20	10	10	70	10	20	30	100

Sign of Guide

Sign. of Committee Members

Sign. of H. O. D.

7. The guide should be internal examiner for oral examination (If experience is greater than three years).
8. The external examiner should be from the related area of the concerned project. He should have minimum of five years of experience at degree level / industry.
9. The evaluation at final oral examination should be done jointly by the internal and external examiners.

NORTH MAHARASHTRA UNIVERSITY JALGAON
B.E. (Common with Mechanical Engineering and Production Engineering)
W.E.F : 2008- 09
TERM - II
INDUSTRIAL VISIT / CASE STUDY

Teaching scheme:
NIL

Examination scheme:
Term Work : 25 Marks

EDUCATION TOUR / TECHNICAL VISITS / CASE STUDY AND ITS EVALUATION

1. During (B.E. First Term / Second Term) seventh and / or eighth terms or during vacation between (B.E. First Term / Second Term) seventh and eighth terms, every student; shall visit minimum two industries, factories arranged by colleges and accompanied by teachers. There shall be at least one teacher for a group of 20 students and at least one non-teaching staff accompanied with the students.
2. The colleges should obtain appropriate certificates of visit from the concerned organizations just after the visits.
3. Students should submit written report about the visits individually at the end of (B.E. Second Term) eighth term.
4. The report should contain information about the following points:
 - (a) The organization - activities of organization and administrative setup technical personnel and their main duties.
 - (b) The project / industry brief description with sketches and salient technical information.
 - (c) The work / processes observed with specification of materials, products, equipments etc. and role of engineers in that organization.
 - (d) Suggestions (if any) for improvement in the working of those organizations.
5. The evaluation of the report of technical visits will be made by panel of two teachers appointed by principal based on following points:
 - (a) Coverage aspect: All above points should be covered.
 - (b) Detailed observations: System / Process / Product explained with data, diagram specifications.
 - (c) Quality of presentation: Report should be very objective and should consist of clear and systematic organization of topics and information.
 - (d) Viva - voce: A viva -voce shall be conducted on the technical visit report by the teachers to assess the specific knowledge gained by the students for technical applications.
6. The case study should include the study problem in Mechanical Engineering, Automobile Engineering and Production branch.

NORTH MAHARASHTRA UNIVERSITY, JALGAON
ENGINEERING AND TECHNOLOGY FACULTY
Equivalent Subjects of B.E. Automobile Engineering

FIRST TERM

S.N.	Old Subjects	S.N.	Equivalent Subjects	Year
1	Automobile Design	1	Automobile Design	B.E. Auto Sem-II (New)
2	Automobile Maintenance	2	--	--
3	Automobile Dynamics	3	Automobile Dynamics	B.E. Auto Sem-II (New)
4	Elective – I	4		
	1. Automobile Emission and Pollution Control		1. --	--
	2. Non-conventional Energy Sources		2. --	--
	3. Tool Design		3. --	--
	4. Tribology		4. Tribology	B.E. Auto Elective-I (New)
	5. Body Engineering		5. Vehicle Body Engineering	B.E. Auto Elective-I (New)

SECOND TERM

S.N.	Old Subjects	S.N.	Equivalent Subjects	Year
1	Automobile System – II	1	--	--
2	Transport Management	2		
3	Vehicle Testing and Evaluation	3	Vehicle Testing and Evaluation	B.E. Auto Sem-I (New)
4	Elective - II	4		
	1. Special Purpose Vehicles		1. Special Purpose Vehicle	B.E. Auto Sem-I (New)
	2. Total Quality Management		2. --	--
	3. Operation Research		3. --	--
	4. Automobile Painting and Collision Repair		4. Automobile Painting and Collision Repairs	B.E. Auto Elective-II (New)
	5. Automobile and Robotics		5. --	--