

**SHIVAJI UNIVERSITY, KOLHAPUR****(Introduced from June, 2005)****COURSE STRUCTURE****CLASS : B.E. (Automobile) Revised (Implemented from July 2005) PART – I**

Sr. No	Name of the subject	Teaching Scheme				Examination Scheme			
		L	P	Dr	Total	TH	TW	P/O	Total
1	Finite Element Methods	3	2	-	5	100	50	-	150
2	Automobile Body Engineering	3	2	-	5	100	25	25	150
3	Automobile Maintenance	3	2	-	5	100	25	25	150
4	Automobile Electrical & Electronics	3	2	-	5	100	25	25	150
5	Elective – I	3	2	-	5	100	25	-	125
6	Project	-	2	-	2	-	25	-	25
7	Seminar	-	*2	-	1	-	50	-	50
8	Industrial Case Study	-	*2	-	1	-	50	-	50
	Total	15	14	-	29	500	275	75	850

* Practicals will be conducted alternate weeks

CLASS : B.E. (Automobile) Revised**PART - II**

Sr. No	Name of the subject	Teaching Scheme				Examination Scheme			
		L	P	Dr	Total	TH	TW	P/O	Total
1	Automobile Dynamics	3	-	-	3	100	-	-	100
2	Vehicle Performance	3	2	-	5	100	25	25	150
3	Transport Management	3	2	-	5	100	25	25	150
4	Automotive Emission & Control	3	2	-	5	100	25	25	150
5	Elective – II	3	2	-	5	100	25	-	125
6	Project	-	6	-	6	-	75	100	175
	Total	15	14	-	29	500	175	175	850

Elective – I**Elective – II**

1. Two & Three Wheelers
2. Alternative Fuels & Energy Systems for Automobile
3. Entrepreneurship Development
4. Automobile Metallurgy

1. Special Purpose Vehicles
2. Computer Aided Automobile Design
3. Automobile Air Conditioning
4. Automobile Manufacturing Processes



SHIVAJI UNIVERSITY, KOLHAPUR

(Implemented from June, 2005)

B. E. (Automobile) Revised Part – I

1. FINITE ELEMENT METHODS

Teaching scheme :

Lectures: 3hrs/week

Practical: 2hrs/week

Examination scheme :

Theory paper: 100 marks (3 hrs duration)

Term work : 50 marks

Section – I

1. Introduction to Finite Element Method, Stress Analysis, Thermal Analysis
2. Types of elements, simplex, complex, multiplex
3. Discretization of the problem, geometric approximations, symmetry, size and number of elements, element shape and distortion, location of nodes
4. Interpolation functions, convergence and compatibility requirements, isoparametric elements
5. Global, local and natural coordinate systems, relation between them
6. Shape functions for simple elements

Section – II

7. Formulation of characteristic matrix, principle of minimum potential energy, Galerkin method
8. Axisymmetric elasticity, torsion of prismatic bar, thermal problems
9. Assembly of finite element equations, boundary conditions, Solution of finite element equations
10. Introduction to higher order elements
11. Errors in modeling and their detection, post processing
12. Applications of FEM in stress, thermal, dynamic analysis (up to 2D), Model Analysis

Term Work

Assignments / seminars based on above topics with simple numerical treatment.

References

1. Rajasekaran S., “Finite Element Analysis in Engineering Design”, Wheeler Publishing, (Allahabad) & Klaus Jurgen.
2. Bathe, “Finite Element Procedures”, Prentice-Hall of India (P) Ltd., New Delhi.
3. Tirupathi R. Chandrupatla & Ashok D. Belegundu, “Introduction to Finite Elements in Engineering”, Third Edition, Pearson Publications.
4. O C Zienkiewicz, “The Finite Element Method”, Tata McGraw-Hill Publishing Co Ltd., New Delhi.
5. Krishnamoorthy C. S., “Finite Element Analysis – Theory & Programming”, Tata McGraw-Hill Publishing Co Ltd., New Delhi.
6. Fegan, “The Finite Element Method”.
7. J. N. Reddy, “An Introduction to FEM”, McGraw Hill International Edition

B.E. (Automobile) Revised Part – I

2. AUTOMOBILE BODY ENGINEERING

Teaching scheme :

Lectures: 3hrs/week

Practical: 2hrs/week

Examination scheme :

Theory paper: 100 marks (3 hrs duration)

Term work : 25 marks

Oral examination: 25 marks

Section – I

1. Vehicle Aerodynamics: Vehicle drag and types – various types of forces and moments – effects of forces and moments – side wind- various body optimization techniques for minimum drag – wind tunnel testing – scale model testing – component balance to measure forces and moments.
2. Car Body: Types, Regulations, drivers visibility, tests for visibility, methods for improving visibility and space in cars, safety design, safety requirements for car, car body construction.
3. Bus Body Details: Types, Mini bus, single decker, double decker, two level, split level and articulated bus, bus body layout, floor height, engine location, entrance and exit locations, seating dimensions, constructional details, frame construction, double skin construction, types of metal sections used, regulations, conventional and integral type construction.

Section – II

4. Commercial Vehicle Details: Types of body, flat platform, drop side, fixed side, tipper body, tanker body, light commercial vehicle body types, dimensions of drivers seat in relation to control, drivers cab design,
5. Body Loads: Idealized structure, structural surface, shear panel method, symmetric and asymmetric vertical loads in a car, longitudinal load, different loading situations, chassis frame design.
6. Body Materials: Metal sheets (Steel, Aluminum etc.), plastics, timber, GRP, FRP, Composite materials, Properties of materials, corrosion, anti-corrosion methods, selection of paint and painting process, body trim items, body mechanisms.

Term Work

Term work consists of report on following experiments:

1. Study the ergonomics of human beings, drivers seat position, size and construction.
2. Study of typical Car - body construction with sketches.
3. Study passenger seat position, requirement and construction.
4. Study and prepare layouts of seating arrangement of a typical passenger bus.
5. Study the construction of typical truck body and draw sketches.
6. Study the requirements of luxury coach.
7. Study of aerodynamic forces and pitching, rolling, yawing moments.
8. Study / Measurement of drag, lift force of a scaled model in wind tunnel.
9. To prepare the analysis of the vehicle body weight and the weight distribution.

References :

1. Sydney F. Page, “Body Engineering”, Chapman & Hill Ltd., London, 3rd Edition -
2. J Fairbrother, “Fundamentals of Vehicle Body work”, Hutchinson, London.
3. P.M. Heldt, “Automotive Chassis”, Chilton Co. NK
4. John Fenton, “Vehicle Body Layout & Analysis”, Hutchinson, London.
5. J Powloski, “Vehicle Body Engineering”, Business Books Ltd., London.
6. J.G. Giles, “Body Construction and Design”, Vol. 6., Iife Books/Butterworth & Co. London
7. Crouse W. H. & Anglin D. L., “Automotive Chassis”, McGraw-Hill Int. Book Co.
8. P. L. Kohli, “Automotive Chassis & Body”, Papyrus Publishing House, New Delhi.

B.E. (Automobile) Revised Part - I

3. AUTOMOBILE MAINTENANCE

Teaching scheme :

Lectures : 3 Hrs. /Week

Practical : 2 Hrs./Alternate Week

Examination scheme :

Theory Paper: 100 Marks(3 hrs duration)

Term Work : 25 Marks

Practical & oral examination: 25 marks

Section – I

1. Maintenance Records and Schedule: Importance of maintenance, scheduled and unscheduled maintenance, preventive maintenance details, breakdown maintenance details vehicle log books, maintenance record forms, different service garages & its layout.
2. Maintenance, Servicing of Auxiliaries: Cooling system service, radiator, water pump service aspect, anti corrosion additives, anti freezing solutions
Petrol fuel and diesel fuel system maintenance, lubrication system service, engine oil change, engine oil topping up, oil filters maintenance, oil relief valve
Chassis lubrication, lubrication charts, head light focusing and adjustment.
3. Maintenance, Repair and Overhauling of Engine: Dismantling of engine, cleaning, inspection and checking of components visually and dimensionally, reconditioning methods of engine components, engine tune-ups, assembly of engine components, special tools used for maintenance, repair and overhauling of engine.

Section - II

4. Maintenance, Repair and Overhauling of Chassis Drive-line Components: Servicing, repair & maintenance of clutch, maintenance, repair and servicing of gear box, servicing of propeller shaft, servicing and maintenance aspects of differential unit, servicing of front axle and rear axle, suspension system of both rigid and independent types, servicing of brake systems, hydraulic, air systems, brake bleeding and brakes adjustments, maintenance and servicing of steering system, wheel balancing, wheel alignment, maintenance of tyres, tyre rotation.
5. Maintenance and Repair of Vehicle Body: Special tools used for body repair, minor body panel beating, tinkering of body works, polishing and painting of new and old vehicle body, servicing of door locks, passenger seat maintenance

Term Work

1. Demonstration of petrol / diesel engine tune up
2. Engine cylinder compression & vacuum testing
3. Engine decarburizing & top overhaul
4. Inspection & wear measurement of engine components
5. Spark plug cleaning & testing
6. Injector cleaning & testing
7. Setting of ignition timing of multicylinder engine
8. Routine servicing, testing, trouble shooting and overhauling of -
a) Clutch b) Gear Box
9. Study of chassis dynamometer

Note : Some of the demonstrations are to be arranged by planning visits to automotive industries & garages.

Books Recommended:

1. W. Steed, "Mechanics of Road Vehicles", Iffe Books Ltd. London
2. P. M. Heldt, "Automotive Chassis", Chilton Co. NK
3. Venk Ernest, Billiet Walter, "Automobile Engines & Maintenance & Repairs", D.B. Taraporevaela & Co. P. Ltd..
4. A.W. Judge, "Car Maintenance & Repair – Motor Manual".
5. Heisler Hein Z., "Vehicle and Engine Technology", Vol. I, English Language Book Co.
6. Heisler Hein Z., "Advance Vehicle Technology", A Member of the Hodder Head Line Group-
7. John B. Heyhood, "Internal Combustion Engines Fundamentals", McGraw Hill

B.E. (Automobile) Revised Part - I

4. AUTOMOBILE ELECTRICAL & ELECTRONICS

Teaching scheme :

Lectures: 3hrs/week

Practical: 2hrs/Alternate weeks

Examination scheme :

Theory Paper : 100 marks(3 hrs duration)

Term work : 25 marks

Oral examination: 25 marks

Section – I

1. Automobile Electrical Systems : Generation, Storage & Distribution systems, Starting system, Ignition System, Lighting system, 24 volt system
2. Battery : Lead Acid battery, principle, constructional details, recharging the battery, Battery rating, Battery Performance, Battery capacities, Battery efficiency, Battery tests, Battery failures, Alkaline battery,
3. Generators : Types, Dynamo, Generator Drives, Cut-out relay, Ammeter, Alternator, Alternator types, Regulations of alternators, Principles of Magnetos, Flywheel magneto.
4. Regulator : Constant current & voltage systems, D.C. generator regulator, Current & voltage regulator, Semi conductor type regulator, Regulator for alternators.
5. Cranking Motors : Principles, Starting torque and power requirement, Construction of Cranking motor, Selection of cranking motor, Cranking motor data, Cranking motor efficiency, Different drive mechanisms.

Section – II

6. Ignition Systems : Introduction, Ballast Resistance, Ignition coil, Distributor, Cam angle & Contact angle gap, Spark advance mechanism, Limitations of coil ignition, Transistorized Ignition systems, Spark Plug, characteristics, material, types, plug fouling, Electronic Ignition system.
7. Electrical Equipments & Accessories : Fuel gauge, oil pressure gauge, Temperature gauges, Speedometer, Warning Lights, Electric Horn, Horn Relay, Wind Shield wipers, Heaters & defrosters.
8. Testing Instruments: Ignition coil tester, Condenser Tester, Distributor tester, Battery tester, Timing devices, Inspection of electrical systems.
9. Engine / Vehicle Sensors & Actuators : Introduction, Basic sensors arrangement, types of sensors, actuators
10. Electronic Systems : Introduction, Electronic Ignition system, Electronic Spark timing control, Electronic fuel injection systems
11. Introduction to Microprocessor & Applications in Automobiles

Term work:

1. Battery charging techniques & setting of regulators, cutouts.
2. Study of Alternator
3. Study of Dynamo
4. Starting motor & Starting motor drive mechanisms
5. Study of Dash board panel instruments & controls
6. Study of head light construction & setting
7. Study of Electronic Ignition system
8. Demonstration of Electronic fuel injection system
9. Study the layout of electrical & electronic systems of any car
10. Testing of the Automobile Electrical components

Books Recommended:

1. Tom Denton, "Automobile Electrical & Electronic Systems", Allied Publishers Pvt. Ltd., Chennai.
2. Young, Griffiths, "Automobile Electrical & Electronic Equipments", The English Language Book Co., London.
3. Bechfold SAE 1998, "Understanding Automotive Electronics".
4. V.A.W.Hilliers, "Fundamentals of Automotive Electronics", Hatchin, London
5. Tomwather J. R., Cland Hunter, "Automotive Computer & Control System", Prentice Inc. NJ
6. Robert N. Brandy, "Automotive Computers & Digital Instrumentation", Prentice Hall Eaglewood, Cliffs, NJ
7. John Hartly, "The Fundamentals of Electrical Systems", Longman Scientific & Technical
8. Wiliam B. Ribbens, "Understanding Automotive Electronics", Allied Publishers Pvt. Ltd., Chennai.
9. Douglas V Hall, "Microprocessor & Interfacing Program & Hardware", McGraw Hill Boo Co. Aockland.
10. A. P. Mathur, "Introduction to Microprocessor", Tata McGraw-Hill Pub. Co. Ltd.
11. P. L. Kohli, "Automotive Electrical Equipments", Tata McGraw Hill Pub. Co. Ltd.

B.E. (Automobile) Revised Part - I

5. ELECTIVE – I TWO & THREE WHEELERS

Teaching scheme :

Lectures: 3hrs/week

Practical: 2hrs/ week

Examination scheme :

Theory Paper: 100 marks (3 hrs duration)

Term work : 25 marks

Section – I

1. Introduction : Development, Classification & layouts of two wheelers (motorcycles, scooters, mopeds) and Three wheelers, applications & capacity – goods & passengers, study of technical specification of Two & Three wheelers.
2. Power Plant : Selection of engine for two wheeler & three wheeler, Design considerations for two wheeler & three wheeler power plants, special systems requirements for lubrication, cooling, starting. Recent engine developments
3. Transmission Systems : Clutch – special requirements, different types used in two & three wheelers, need of primary reduction, selection of transmission - gear transmission, gear shift mechanism, belt transmission, automatic transmission (Continuous Variable Transmission - CVT, Epicyclic), final drive & differential for three wheeler, wheel drive arrangement.
4. Steering & Suspension : Steering geometry, steering column construction, steering system for three wheelers, Suspension requirements, design considerations, trailing & leading link, swinging arm, springs & shock absorbers.

Section – II

5. Brake, Wheel & Tyres: Design consideration of brake, types of brakes – disc, drum, braking mechanism – mechanical, hydraulic & servo, wheel types - spokes, disc, split, special tyre requirements for two & three wheelers.
6. Frames & Body : Types of frame, construction, loads, design consideration, materials, Types of three wheeler bodies, layout, RTO regulations, aerodynamic, aesthetic & ergonomics considerations for body work, side car.
7. Road Performance: Handling characteristics, driver & pillion seating arrangement, ergonomics & comfort, road holding & vehicle stability, riding characteristics, safety arrangements, Racing bikes – special requirements.
8. Maintenance: Preventive & brake down maintenance, factors affecting fuel economy & emission.

Term Work

1. Dismantling & assembling of a two wheeler engine
2. Study of motorcycle & scooter carburetors & petrol injection system.
3. Dismantling & assembling of two wheeler gear box
4. Study of I) Kick starter mechanism ii) Moped cranking mechanism iii) Button Start mechanism
5. Study of three wheeler drive line & chassis
6. Rear & front brake overhauling & adjustments
7. Study of handle bar controls & adjustments
8. Dismantling & assembling of flywheel magneto & setting ignition timing
9. Study of wiring diagram & electrical systems
10. Dismantling & assembling of the suspension system

Reference Books

1. Newton Steed, "The Motor Vehicle", McGraw Hill Book Co. Ltd., New Delhi
2. Siegfried Herrmann, "The Motor Vehicle", Asia Publishing House, Bombay.
3. "Two stroke Motor Cycles", Staff & Motor Cycles, London Iife Books.
4. G.B.S. Narang, "Automobile Engineering", 5th Edition, Khanna Publishers, Delhi.
5. Service Manuals of Manufacturers of Indian Two & Three wheelers.
6. Service Manual, Jeep Utility Vehicles, Villys Motors, Ioc., USA.

B.E. (Automobile) Revised Part - I

ELECTIVE – I ALTERNATIVE FUELS & ENERGY SYSTEMS FOR AUTOMOBILE

Teaching scheme :

Lectures: 3hrs/week

Practical: 2hrs/ week

Examination scheme :

Theory Paper: 100 marks (3 hrs duration)

Term work : 25 marks

Section –I

1. Introduction : Working processes in I.C. engine, fuel efficiency, fuel requirement, rating of fuels, ignition quality, volatility, sources of fossil fuels, scope of availability of fossil fuels, need for alternative fuels, Calculation of Air / fuel ratio, calorific value, engine efficiency, engine life
2. Alcohols : Sources, methanol & ethanol, production methods, properties of methanol & ethanol as engine fuels, Use of alcohols in S.I. & C.I. engines, performance of methanol & gasoline blends, alcohol diesel emulsions, dual fuel systems, emission characteristics.
3. Hydrogen : Properties of hydrogen with respect to its utilization as a renewable forms of energy, sources of hydrogen, production, transportation, storage, application & economics of hydrogen.
4. Fuel Cells: Hydrogen, methanol fuel cells, power rating and performance. Heat dissipation, layout of a fuel cell vehicle

Section –II

5. Gaseous Fuel : L.P.G., C.N.G., bio-gas, their properties as engine fuels, fuel metering systems, combustion characteristics, effect on performance & emission, cost, safety
6. Bio-Diesels : Karanji oil, Neem oil, Rice bran oil, Linseed oil, Sunflower oil, properties, diesel & vegetable oil blends, engine performance.
7. Solar Power : Solar cells for energy collection, layout of solar powered automobiles,
8. Electric Vehicles : Layout of an electric vehicles, advantages & limitations, significations, systems components, electronic controlled systems, high energy & power density batteries, hybrid vehicles.

Term Work

1. Study of physical & chemical properties of fuels
2. Study of use of alternate liquid fuels for S.I. engines
3. Study of use of alternate liquid fuels for C.I. engines
4. Study of fuel cell powered vehicle
5. Study of use of alternate gaseous fuels for S.I. engines
6. Study of use of alternate gaseous fuels for C.I. engines
7. Study of solar powered vehicle.
8. Study of battery operated vehicles.
9. Layout preparation for Hybrid vehicles

Reference Books

1. Richard Stone, "Introduction to Internal Combustion Engines", McMillan, London
2. Mathur & Sharma, "A Course in I. C. Engines", Dhanpatrai & Sons, Delhi
3. V. L. Maleev, "I. C. Engines", McGraw Hill Book Co.
4. John B. Heywood, "Internal Combustion Engines Fundamentals", McGraw Hill
5. Edward F. Obert, "I. C. Engines & Air Pollution", Int. Text Book Co., Pennsylvania
6. Litchy L. C., "I. C. Engine", McGraw Hill Book Co., New Delhi.
7. Richard Stone, "Introduction to Internal Combustion Engines", McMillan, London
8. Ferguson, "I. C. Engines"
9. G. D. Rai, "Non – conventional Energy Sources", Khanna Publications, Delhi
10. H. P. Garg & J. Prakash, "Solar Energy", Tata McGraw Hill Pub. Co. Ltd., Delhi
11. S. P. Sukhatme, "Solar Energy", Tata McGraw Hill Pub. Co. Ltd., Delhi.

B.E. (Automobile) Revised Part - I

ELECTIVE – I ENTREPRENEURSHIP DEVELOPMENT

Teaching scheme :
Lectures: 3hrs/week
Practical: 2hrs/ week

Examination scheme :
Theory Paper: 100 marks (3 hrs duration)
Term work : 25 marks

Section – I

1. Meaning and definition of Entrepreneur, reasons for becoming an entrepreneur, characterization of an entrepreneur
2. Government's policy in promoting small scale industries, incentives & benefits to S.S.I.'s.,
3. Identifying business opportunities, product identification, scanning business environment
4. Management of SSI, organizing, planning, personal management, marketing management & market research
5. Problems faced by entrepreneurs & SSI

Section – II

6. Sourcing for finance SIDBI, state financial co-operations, commercial banks, shares & debentures
7. Fixed capital and working capital, estimation and analysis of working capital management.
8. Preparation of trading and profit and loss accounts, balance sheet, ratio analysis
9. Cash flow statement, time value of money, present value and future value
10. Preparation of a project report, appraisal of a project

Term Work

Students have to write two assignments. Each student will have to prepare a feasibility report oral examination will be based on feasibility report.

Assignments : 10 marks
Feasibility report : 10 marks
Viva Voice : 05 marks

Reference Books

1. Uadi Pareek & T.V. Venkateswara, "Developing Entrepreneurship – A Hand Book Learning Systems", ND. 1978
2. Faculty & External Experts, "A Band Book for New Entrepreneurs", Entrepreneurship Development Institute of India, 1986, Edition I.
3. P. Saravanavel, "Entrepreneurship Development", Ess Pee Key Publishing House, Madras 1987.
4. Dr. P. K. Gupta, "Strategic Entrepreneurship", Everest Publishing House

B.E. (Automobile) Revised Part - I
ELECTIVE – I AUTOMOTIVE METALLURGY

Teaching scheme :
Lectures: 3hrs/week
Practical: 2hrs/ week

Examination scheme :
Theory Paper: 100 marks (3 hrs duration)
Term work : 25 marks

Section – I

1. Elastic & Plastic Behavior of Materials : Elastic, visco-elasticity, plasticity - stress and strain relationship in engineering materials - deformation mechanism, strengthening materials, deformation mechanism, strain hardening, alloying, precipitation hardening, dispersion hardening, fibre & texture strengthening.
2. Fracture, Fatigue & Creep : Fracture, factography, classification & types - Griffith's theory - notch effect, stress concentration, concept of fracture toughness - ductile, brittle transition - fatigue, mechanisms of crack, initiation & growth, factors affecting fatigue, creep - creep curve, long term test, Ashby deformation, mechanism maps, creep mechanisms, metallurgical variables of creep.
3. Characteristics of Materials : Castability, Machinability, Formability & Weldability of engineering materials such as steel, cast iron, alloy steel, brass, bronze & Al alloys, composite materials, fabrication techniques, materials for high temperature, cryogenic wear, corrosion, fatigue, creep & oxidation resistance, applications.

Section – II

4. Selection Materials : Criteria of selecting materials for automotive components viz. Cylinder block, cylinder head, piston, piston ring, gudgeon pin, connecting rod, crank shaft, crank case, cam, cam shaft, engine valves, gear wheels, clutch plate, axle, bearing, chassis, spring, body panels, steering gear, radiator, brake lining etc.
5. Applications of non metallic materials such as composite, ceramic, polymers, plastics and fibres in automobiles.
6. Casting Design : Casting design considerations for different sections like thin, uniform, unequal, joints, (L, T joints), casting design of automobile components, riser design, gating design.
7. Surface Hardening Techniques: Induction, flame & chemical hardening. Types of corrosion, coatings for wear & corrosion resistance, electro plating, phosphating, chromeplating, anodizing, hot dipping, thermal spraying, hard facing, powder coating, Teflon coating, plastic coating & thin film coatings.

Term Work : Ten tutorials based on above topics.

Reference Books

1. Avner Sidney H., "Introduction to Physical Metallurgy", McGraw Hill International Book Co.
2. G. E. Dieter, "Mechanical Metallurgy", McGraw Hill International Book Co.
3. Rao T. V. Ramana, "Metal Casting", New Age International Publishers
4. B. K. Agrawal & Mikhallow, "Material Science", MIR Publisher, Moscow.
5. K. M. Gupta & Khangaon P. R., "Physical Metallurgy" , Vol. II, Pune Vidyarti Griha Prakashan, Pune
6. A.F.S. Handbook for casting design
7. Gupta R. B., "Material Science", Satya Prakashan, New Delhi.

B.E. (Automobile) Revised Part - I

PROJECT

Teaching scheme :
Practical: 2hrs/ week

Examination scheme :
Term work : 25 marks

Term Work

Number of students in a Batch may be up-to ten. Group of project depends on the nature of project, may be 2, 3, 4 or 5.

Number of students in a Batch (Ten): Four / five students should work in a group for a topic. Project may be taken by an individual or in a group. A batch of 10 students shall work under the guidance of a teaching staff member.

The student will submit a report on the project work undertaken by one or group.

The term work under this, submitted by the student shall include –

1. Work diary maintained by the student and counter signed by his guide
2. The contents of work diary shall reflect the efforts taken by candidate for
 - a. Searching the suitable project work
 - b. Visits to different factories or organizations
 - c. Brief report of journals and various papers referred
 - d. Brief report of web sites seen for project work
 - e. The brief of feasibility studies carried to come to final conclusion
 - f. Rough sketches
 - g. Design calculations, drawings etc. carried by the student.

The faculty members, based on the quality of the work & preparation and understanding of the candidate, shall do an assessment of the project internally – jointly.

B.E. (Automobile) Revised Part - I

SEMINAR

Teaching scheme :
Practical: 2 hrs/ alternate week

Examination scheme :
Term work : 50 marks

Term Work

Seminar should be based on the literature survey on any topic relevant to Automobile Engineering and related areas.

Each student has to prepare a write up of about 25 – 30 pages of “A4” size sheets and submit it in duplicate as term work.

The student has to deliver a seminar in front of the faculty members of the department and his classmates. The faculty members, based on the efforts, understanding and quality of seminar of the candidate, shall do an assessment of the seminar internally – jointly.

B.E. (Automobile) Revised Part - I

INDUSTRIAL CASE STUDY

Teaching scheme :
Practical: 2 hrs/ alternate week

Examination scheme :
Term work : 50 marks

Term Work

The student has to undergo in-plant training of three to four weeks in the **vacation after T.E. (Automobile)** Semester II.

Each student has to prepare a report on in-plant training up of about 25 pages of “A4” size sheets and submit it in three copies as the term work.

The student has to deliver a talk in front of the faculty members of the department and his classmates. The faculty members, based on the quality of the work & preparation and understanding of the candidate, shall do an assessment of the industrial case study internally – jointly.



SHIVAJI UNIVERSITY, KOLHAPUR
(Introduced from June, 2005)
B. E. (Automobile) Revised Part – II

1. AUTOMOBILE DYNAMICS

Teaching scheme :
Lectures: 3hrs/week

Examination scheme :
Theory paper: 100 marks (3 hrs duration)

Section – I

1. Performance Characteristics of Road Vehicles :

- A) Steady State Operation : Various external forces acting on vehicle, Nature of the forces and factors affecting the forces, Tractive effort & Power available from the engine, Equation of motion, Maximum tractive effort, Weight distribution, Stability of vehicle on slope, Road performance curves, Acceleration, Gradability & Drawbar Pull.
- B) Transient Operation : Inertia effect, Equivalent mass, Equivalent moment of inertia, Equivalent ungeared system, Time to produce synchronizing during gear change, Effect of engine flywheel on acceleration, Dynamics of vehicles on Banked tracks, Gyroscopic Effects, Net driving power.

2. Braking Performance : Braking of vehicle - Braking applied to rear wheels, Front wheels and all the four wheels, On straight & Curved path, Mass transfer & its effect, Braking efficiency & stopping distance, Reaction time & stopping time, Brake locking, Anti-lock drives, Calculation of mean lining pressure & heat generation during braking.

Section - II

3. Handling Characteristics : Pitching, bouncing, yawing & rolling, wheel wobbling, Steering geometry, Fundamental condition for true Rolling, Ackerman's & Davis Steering mechanism,

Steady State Handling, Slip angle, cornering power, Neutral steer, Under steer and over steer, Steady state response, Yaw velocity, Lateral Acceleration, Curvature response & Directional stability.

4. Ride Characteristics : Human response to vibrations, Single degree & Two degree freedom, Vehicle Ride Model, Two degree freedom model for sprung & unsprung mass, Two degree freedom model for pitch & bounce, Vibrations due to road roughness, Motion of vehicle on undulating road & Compensated suspension systems, roll centre & roll axis.

References

1. J. Y. Wong, "Theory of Ground Vehicles", John Willey & Sons, NY
2. J. G. Giles, "Steering, Suspension & Tyres", Ilfe Books Ltd., London
3. Mechanics of Road Vehicles – W. Steed, Ilfe Books Ltd. London
4. P. M. Heldt, "Automotive Chassis", Chilton Co. NK
5. Jack Erjavec, "Automotive Technology – A Systems Approach's".

B.E. (Automobile) Revised Part – II

2. VEHICLE PERFORMANCE

Teaching scheme :
Lectures: 3hrs/week
Practical: 2hrs/week

Examination scheme :
Theory paper: 100 marks (3 hrs duration)
Term work : 25 marks
Oral examination: 25 marks

Section – I

1. Vehicle Performance Estimation & Prediction: Aerodynamic drag, methods of estimation of resistance to motion, power requirement for propulsion, Power plant characteristics & transmission related requirements, arrangement of power train, vehicle controls, vehicle acceleration, maximum speed, and gradability drive systems comparison, hill climbing, handling and ride characteristics on different road surfaces..
2. Vehicle Transmission Performance : Characteristics & features of friction clutches, mechanical gear transmission & Epicyclic gear boxes, fluid coupling & torque converters
3. Operational Performance : Engine performance & operating characteristics, Operation at full load and part load conditions, fuel economy, effect of vehicle condition, tyre and road condition, traffic condition and driving habits on fuel economy, vehicle safety.

Section – II

4. Control Systems: Braking arrangements & Characteristics, weight transfer, steering arrangements, rigid & independent suspension, roll centre, torsion bar, stabilizer, radius bar.
5. Vehicle Performance Testing: Laboratory Testing – Testing of major components of vehicle like clutch, suspension, braking, steering etc., Engine testing – noise, vibrations, emission, power & fuel consumption, Vehicle testing on chassis dynamometers, Road and Track Testing, Initial inspection, running in and durability, extensive driving, maximum speed & acceleration, Brake testing on the road, Hill climbing, handling & ride characteristics on different road surfaces, ride comfort, corrosion testing.

Term Work

1. Estimation of power requirement for vehicle propulsion
2. Engine testing for finding performance characteristic
3. On road fuel consumption measurement
4. Brake efficiency measurement
5. Noise measurement in passenger compartment
6. Vibration measurement in passenger compartment
7. Study of chassis dynamometer for vehicle performance testing
8. Study of vehicle component testing
9. Report based on visit to vehicle testing & research organization

References

1. Gousha H. M., “Engine Performance Diagnosis & Tune Up Shop Manual”
2. J. G. Giles, “Vehicle Operation & Performance”.
3. W. H. Crouse & D. L. Anglin, “Motor Vehicle Inspection”.
4. SAE Transactions Papers – 831814 / 820346 / 820367 / 820371 / 820375
5. CIRT & VRDE Manuals

B.E. (Automobile) Revised Part - II

3. TRANSPORT MANAGEMENT

Teaching scheme :

Lectures : 3 Hrs. /Week

Practical : 2 Hrs./Alternate Week

Examination scheme :

Theory Paper: 100 Marks(3 hrs duration)

Term Work : 25 Marks

Oral examination: 25 marks

Section – I

1. Motor Vehicle Act: Short titles & definitions, Laws governing to use of motor vehicle & vehicle transport, Licensing of drivers & conductors, Registration of vehicle, State & interstate permits, Traffic rules, Signals & controls, Accidents, Causes & analysis, Liabilities & preventive measures, Design of road complex, Responsibility of driver, Public & public authorities, Offences, penalties & procedures, Different types of forms. Government administration structure, Personnel, Authorities & duties, Rules & regulations, Rules regarding construction of motor vehicles
2. Taxation : Objectives, Structure & methods of laving taxation, One time tax, Tax exemption & tax renewal
3. Insurance : Insurance types & significance, Comprehensive, Third party insurance, Furnishing of particulars of vehicles involved in accident, Award of the claims tribunal, MACT (Motor Accident Claims Tribunal), Solatium Fund, Hit & Run case, Duty of driver in case of accident, Surveyor & Loss Assessor, Surveyor's report

Section – II

4. Passenger Transport Operation: Structure of passenger transport organizations, Typical depot layouts, requirements, Problems on fleet management, Fleet maintenance, Planning - Scheduling operation & control, personal & training-training for drivers & conductors, Public relations, Propaganda, publicity, passenger amenities, Advertisement work, Parcel traffic. Theory of fares, Basic principles of fare charging ,Differential rates for different types of services, Depreciation & debt charges, operation cost, Revenues, Economics & records.
5. Goods Transport Operation: Structure of goods transport organizations, scheduling of goods transport, Management Information System (MIS) in passenger / goods transport operation, storage & transportation of petroleum products
6. Advance Techniques in Traffic Management – Traffic navigation, global positioning system

Term Work

1. Organization & Management of Motor Vehicle Department
2. Collection & study of different types of RTO forms.
3. Central Motor Vehicle rules
4. Taxation, Insurance & Permits
5. Study of accidents claims & survey report including post accident procedure
6. Study of depot layouts (passenger & goods transport)
7. Case study of MIS in passenger / goods transport organization
8. Collection & study of goods transport records.
9. Study of vehicle navigation system
10. Advanced traffic control devices

Books Recommended

1. Motor Vehicle Act - Govt. of India Publications.
2. Santosh Sharma, "Productivity in Road Transport", 2nd Edition, Association of State Road Transport Undertakings, New Delhi.
3. P.G.Patankar, "Road Passenger Transport in India", CIRT, Pune.
4. S.K. Shrivastava, "Economics of Transport"
5. "Transport Development in India", S. Chand & Co. Pvt. Ltd., New Delhi.

B.E. (Automobile) Revised Part - II
4. AUTOMOBILE EMISSION & CONTROL

Teaching scheme :
Lectures: 3hrs/week
Practical: 2hrs/Alternate weeks

Examination scheme :
Theory Paper: 100 marks (3 hrs duration)
Term work : 25 marks
Oral examination: 25 marks

Section – I

1. Air Pollution due to Automobile Exhaust : Exhaust gas constituents & analysis, Ingredients responsible for air pollution, Harmful effects of various ingredients on plant ecology & human life, .
2. Pollution Norms : European pollution norms, Indian pollution norms as per Central Motor Vehicle Rules (C.M.V.R.).
3. Sources of Emission : Air Pollution due to engine exhaust, Emission from petrol tank & carburetor, crankcase blow-by. Effect of valve timing, ignition timing, Combustion chamber design, Fuel injection, fuel composition, air fuel ratio, mechanical condition of engine components and driving mode.
4. Smoke : Smoke problems, types of smoke, factors affecting diesel smoke, odor, Smog formation.

Section – II

5. Exhaust Emission Control: Basic method of emission control, catalytic converter, After burners, reactor manifold, air injection, crank case emission control, evaporative loss control, Exhaust gas recirculation, Fuel additives.
6. Alternative Fuels : CNG, LPG, Bio-Diesel, Hydrogen, fuel cells, Eco-friendly vehicles, Electric & Solar operated vehicle
7. Instrumentation for Exhaust Emission Measurement: Measurement procedure, Sampling Methods, Orsat Apparatus, Infrared Gas analyzer, Flame Ionization Detector (FID), Gas chromatograph, Smoke meters.

Term work:

1. Study of Emission Norms
2. Measurement of emission by portable exhaust gas analyzer.
3. Measurement of emission by Infra Red Gas Analyzer (IRGA)
4. Measurement of smoke by Bosch smoke meter
5. Measurement of smoke by Hartridge smoke meter
6. Study of Exhaust Gas Recirculation (EGR)
7. Study of Evaporative Loss Control Device (ELCD)
8. Study of catalytic converter
9. Analysis of exhaust gas using Orsat Apparatus
10. Study of LPG / CNG Kit

Books Recommended:

1. E.F. Oberts, "Internal Combustion Engine and Air Pollution", Harper & Row Publisher, NY.
2. J.G. Giles, "Vehicle Operation & Testing" (Automotive Vehicle Technology Vol. 7)
3. C.H. Fisher, "Carburetion", Vol. 4.
4. A.W. Judge, "Carburetion and Fuel Injection System", Motor Manual, Vol. 2, The Caxton Pub. Co. Ltd., London.
5. H.H. Willard and Others, "Instrumental Method of Analysis", CBS Publishers & Distributors, Delhi.
6. G.B.S. Narang, "Automobile Engineering", CBS Publishers & Distributors, Delhi.
7. Gupta B. R., "Electronics & Instrumentation Handbook", Wheeler Publishing.

B.E. (Automobile) Revised Part - II

5. ELECTIVE – II SPECIAL PURPOSE VEHICLES

Teaching scheme :

Lectures: 3hrs/week

Practical: 2hrs/ week

Examination scheme :

Theory Paper: 100 marks (3 hrs duration)

Term work : 25 marks

Section – I

1. Classification of Special Purpose Vehicles, wheel type & track type, applications.
2. Study of working principles & design considerations of different systems involved like power system, transmission, final drive, lubrication, electrical, braking, steering, pneumatic & hydraulic control circuits.
3. Constructional & working features of different types of earth moving machinery such as rippers, shovels, loaders, Excavators, Dumpers, Dozers, Fork Lift
4. Study of instrumentation applied to such machines

Section – II

5. Farm Tractor : Layout, Load distribution, Engine, Transmission & Drive line, Steering, Braking system, Wheels & Tyres, Hydraulic system, Auxiliary Systems, Draw bar, PTO Shaft.
6. Mobile Cranes : Basic characteristics of truck cranes, stability & design features, control systems & safety devices.
7. Tracked Vehicles, Articulated Vehicles, Multi-axle Vehicles

Term Work

1. Study of tipping mechanism of a dumper
2. Study of fork lift truck
3. Study of operation of a truck crane
4. Study of technical & operational features of a tractor
5. Study of technical & operational features of a hole drill
6. Study of technical & operational features of a power scraper
7. Study of technical & operational features of a power hoe and shovel
8. Study of an electric van

Reference Books

1. Y. Pokras and M. Tushnyakov, "Construction Equipment Operation & Maintenance", MIR, Moscow.
2. A. Astskhov, "Truck Cranes", MIR, Moscow.
3. E.G. Poninson, "Motor Graders", MIR, Moscow.
4. Hand book of Earth Moving Machinery - Central Water & Power Commission (Govt. of India)
5. N. Rudenko, "Material Handling Equipment", M.R. Publishers.
6. Sheldon, R.Shacket, "Electric Vehicles", Domus Books, New York

B.E. (Automobile) Revised Part - II

ELECTIVE – II COMPUTER AIDED AUTOMOBILE COMPONENT DESIGN

Teaching scheme :
Lectures: 3hrs/week
Practical: 2hrs/ week

Examination scheme :
Theory Paper: 100 marks (3 hrs duration)
Term work : 25 marks

Section – I

1. Vehicle Frame & Suspension: Study of loads - moments & stresses on frame members, computer aided design of frame for passenger & commercial vehicles, computer aided design of leaf springs - coil spring & torsion bar spring.
2. Front Axle & Steering System : Analysis of loads, Moments & stresses at different sections of front axle, Determination of bearing load at king pin bearings, wheel spindle bearing, choice of bearings, determination of optimum dimensions & proportions for steering linkages ensuring minimum error in steering.
3. Clutch : Torque capacity of clutch, computer aided design of clutch components, design details of roller & spring type clutches.

Section – II

4. Gear Box : Computer aided selection of suitable gear ratios for an automobile, Computer aided design of 3 speed & 4 speed gear boxes.
5. Drive Line & Rear Axle : Computer aided design of propeller shaft, Design details of final drive gearing, design details of full floating, semi - floating rear axle shaft & rear axle housing.

Term Work

1. One assignment each related to above topics
2. Computer aided design of gear box of an automobile
3. Computer aided design of any of the remaining system

Reference Books

1. J. G. Giles, "Steering, Suspension & Tyres", Iife Books Ltd., London
2. W. Steed, "Mechanics of Road Vehicles", Iife Books Ltd. London
3. P. M. Heldt, "Automotive Chassis", Chilton Co. NK
4. Steeds W & Newton K & Garrett T. K., "The Motor Vehicle", The English Language Book Co., London.
5. P. M. Heldt, "Torque Converter", Chilton Co. NK
6. N. K. Giri, "Problems in Automobile Mechanics", Khanna Publishers, Delhi.

B.E. (Automobile) Revised Part - II

ELECTIVE – II AUTOMOBILE AIR CONDITIONING

Teaching scheme :

Lectures: 3hrs/week

Practical: 2hrs/ week

Examination scheme :

Theory Paper: 100 marks (3 hrs duration)

Term work : 25 marks

Section – I

1. Refrigeration : Introduction, methods of refrigeration, vapour compression refrigeration system, vapour absorption refrigeration system, applications of refrigeration & air conditioning, Automobile air conditioning, air conditioning for passengers, isolated vehicles, transport vehicles, applications related with very low temperatures
2. Refrigerant : Classification, properties, selection criteria, commonly used refrigerants, alternative refrigerants, eco-friendly refrigerants, applications of refrigerants, refrigerants used in automobile air conditioning
3. Psychometry : Psychometric properties, tables, charts, psychometric processes, comfort charts, factor affecting comfort, effective temperature, ventilation requirements
4. Air Conditioning Systems : Classification, layouts, central / unitary air conditioning systems, components like compressors, evaporators, condensers, expansion devices, fan blowers, heating systems etc.

Section – II

5. Load Analysis : Outside & inside design consideration, factors forming the load on refrigeration & air conditioning systems, cooling & heating load calculations, load calculations for automobiles, effect of air conditioning load on engine performance,
6. Air Distribution Systems : Distribution duct system, sizing, supply / return ducts, type of grills, diffusers, ventilation, air noise level, layout of duct systems for automobiles and their impact on load calculations
7. Air Routine & Temperature Control : Objectives - evaporator care air glow, through the dash recirculating unit, automatic temperature control, controlling flow, control of air handling systems.
8. Air Conditioning Service : Air conditioner maintenance & service - servicing heater system, removing & replacing components, trouble shooting of air conditioning system, compressor service, methods of dehydration, charging & testing.
9. Air Conditioning Control : Common control such as thermostats, humidistatus, control dampers, pressure cutouts, relays.

Term Work (Any Ten)

1. Study of refrigeration methods & controls
2. Study of air conditioning systems & controls
3. Study of different components with the help of cut section/models/charts- Compressor, condenser, Evaporators, expansion device, Blower, Fans, heating systems etc.
4. Trial on Refrigeration Tutor.
5. Study of window air conditioning system & packaged units.
6. Trail on air conditioning tutor
7. Study of layout of air conditioning system for Car & Bus
8. Study of different tools, equipments used for automobile air conditioning systems.
9. Study of joints, dehydration, charging, & testing system,
10. Study of Leak testing, leak detection methods
11. Automobile air conditioning system design- case studies.

Reference Books

1. Heating & Air Conditioning Systems – Mitchell Information Services
2. Paul Lung, “Automotive Air Conditioning”, C.B.S. Publisher & Distributor, Delhi.
3. Harris, “Modern Air Conditioning”.
4. ASHRAE Handbook – 1985 Fundamentals, American Society of Heating, Refrigeration & Air Conditioning

B.E. (Automobile) Revised Part - II

ELECTIVE – II AUTOMOBILE MANUFACTURING PROCESSES

Teaching scheme :

Lectures: 3hrs/week

Practical: 2hrs/ week

Examination scheme :

Theory Paper: 100 marks (3 hrs duration)

Term work : 25 marks

Section – I

1. Automobile Manufacturing Industry: Automotive Component manufacturing & vehicle manufacturing, automotive manufacturing plant layout.
2. Casting of Automobile Components: Different components & methods of casting - Piston, cylinder block, liners, head, carburetor, housings, gears, brake drum, material suitability for above components
3. Forging of Automotive Components : Different components & methods of forging – gudgeon pin, Crankshaft, connecting rod, cam shaft, rocker arm, gears, shaft & axles, material suitability for above components
4. Sheet Metal Automotive Components: Different components & methods of manufacturing sheet metal components – body components, wheel disc, different covers, fuel tanks, chassis frame components, Selection of sheet metal.

Section – II

5. Plastic, Rubber & Glass Component Manufacturing: Different components & methods of manufacturing plastic, rubber, reinforced plastic, glass. Plastic – dashboard, handles & knobs, door panels, semi-transparent components, bumpers, fan, grills. Rubber – Seals, door trims, bushes, packing, hoses, tubes & tyres, mountings. Glass – Windshield, door glasses, lamps.
6. Joining Processes : Joining techniques like welding, riveting, brazing, soldering used for sheet metal components, chassis frame components. Automated joining processes.
7. Machining Operations for Major Components : Automotive components like piston, crankshaft, cylinder block, head, connecting rod, gears, axles, shafts.
8. Surface Treatment : Anti corrosive treatment - body components, chassis frame, Surface hardening – gears, crankshaft, cam shaft, piston rings, piston pin, valves.
9. Advanced Manufacturing Processes : EDM, ECM, ECG, laser machining for manufacturing automobile components.

Term Work

1. Report based on visit to body sheet metal manufacturing industry
2. Report based on visit to automotive component manufacturing industry
3. Eight assignments based on detail manufacturing processes for any eight of the following components –
 - a) Piston
 - b) Connecting rod
 - c) Crankshaft
 - d) Camshaft
 - e) Cylinder head or Cylinder block
 - f) Gears
 - g) Axles
 - h) Body shell
 - i) Chassis frame component
 - j) Propeller shaft
 - k) Radiator
 - l) Fuel tank
 - m) Rubber seals
 - n) Dashboard
 - o) Bumper

Reference Books

1. Hazara S. K. & Choudhari A. K., “Elements of Workshop Technology Vol. I & II”, Media Promoters & Publishers Pvt. Ltd.
2. Raghuwanshi B. S., “Workshop Technology Vol. I & II”, Dhanpat Rai & Sons,
3. Gupta K. N. & Kaushik J. P., “Workshop Technology Vol. I & II”, New Heights, Delhi
4. Atherton W. H., “Workshop Practice Vol. I to V”.
5. Korem Y & J. B. Uri, “Workshop Technology”.

B.E. (Automobile) Revised Part - II

PROJECT

Teaching scheme :
Practical: 6 hrs/ week

Examination scheme :
Term work : 75 marks
Practical & oral examination: 100 marks

Term Work

The project work submitted by the student started at B.E. Part – I shall be according to following guidelines –

Format of project report –

The project report shall be typed with double space on A4 size bond paper. The total number of pages shall not be more than 150 and not less than 60 including figures, graphs, annexures etc. as per requirement. The report shall be written in the following format.

1. Title sheet
2. Certificate
3. Acknowledgement
4. List of figures / photographs / graphs / tables
5. Abbreviations
6. Abstract / Synopsis
7. Literature survey
8. Contents
9. Text with usual scheme of chapters
10. Discussion of the results and Conclusion
11. Bibliography (The source of illustrative matter be acknowledged clearly at appropriate place)

The student has to present the project work in front of the faculty members of the department and his classmates. The faculty members, based on the quality of the work & preparation and understanding of the candidate, shall do an assessment of the project internally – jointly.

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SURESH P SAWANT

BIRJE SR/ JC