

GUJARAT UNIVERSITY
TEACHING & EXAMINATION SCHEME

B.E. SEM-VI (AUTOMOBILE)

w.e.f. Jan.- 2007

Subject Code	Subject Name	Teaching Scheme (Hrs)			Examination Scheme (Marks)					
		Theory	Practical	Tutorials	Theory Hrs	Theory Marks	Practical Oral Marks	Term Work Marks	Sessional Marks	Total Marks
A-601	Automobile Engines & Design	4	3	--	3	100	25	50	50	225
A-602	Automobile Systems & Design	4	3	--	3	100	25	50	50	225
A-603	Mechanical Measurement & Instrumentation	4	2	--	3	100	25	25	50	200
A-604	CAD/CAM & Automation	4	2	--	3	100	25	25	50	200
A-605	Industrial Organization & Management	4	--	--	3	100	--	---	50	150
TOTAL		20	10	--	--	500	100	150	250	1000

**B.E. SEM- VI (AUTOMOBILE ENGG.)
AUTOMOBILE ENGINES & DESIGN**

Teaching Scheme		Examination Scheme					
Theory Hrs	Practical Hrs	Theory Marks	Hrs.	Sessional Marks	Practical/ Oral Marks	Term Work Marks	Total Marks
4	3	100	3	50	25	50	225

(a) **Automobile Engines | L- 2 , P- 2 Hours Per Week]**

1 **Combustion in S.I. Engines**

Ignition limits, Stages of combustion in S.I. engine. Ignition lag, Effect of engine variables on ignition lag, Effect of engine variables on flame propagation, Abnormal combustion, and knocking in S.I. Engines, Factors affecting the knocking, Effects of knocking, control of knocking , rating of S.I. Engine fuels, highest useful compression ratio. Combustion chambers of S.I. Engine, design consideration and different types of combustion chambers

2 **Combustion in C.I. Engine**

Air fuel ratio in C.I. engine, Stages of combustion in C.I. engine, Delay period, Variables affecting on delay period, Detonation in C.I. Engines, factors affecting the detonation , comparison of knocking in S.I. and C.I. Engines , Rating of C.I. Engine Fuels, Combustion chambers for C.I. engines , Direct injection type, Open type, Turbulent type, Pre chamber , M combustion chamber, Cold starting of C.I. engine- decompression devices, heater plug, inlet manifold heater, Chemical spray

3 **Supercharging**

Objects of supercharging, Relative power with and without supercharging, Supercharging of S.I. & C.I. engines, Effects of supercharging on performance of engine, Supercharging limits for S.I. and C.I. engine, Methods of super charging, Supercharges, Turbo charging. Comparison with supercharging, Methods of turbo charging, Limitations of turbo charging.

4 **Non-conventional Engines**

Stratified Charge Engines, Sterling engines, Wankel Rotary Engine, Variable compression ratio engine, Free piston engine, adiabatic engines

5 **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 , Engine testing for noise, vibrations & emission

(b) **Design | L- 2 , P- 1 Hours Per Week]**

1 **Design for Fluctuating Loads:**

Fluctuating stresses, S-N diagram for fatigue loading, Endurance limit, Endurance strength modifying factors, Stress concentration-causes and remedies, Notch sensitivity, Design for finite and infinite life under reverse stresses, Cumulative damage in fatigue failures, Soderberg and Goodman diagrams, Modified Goodman diagram, Fatigue design for Components such as shafts, bolted joints and springs under combined stresses.

2 **Design of I.C. Engine Components**

Engine power requirements, Selection of engine type, Stroke & Bore, Design of , -Combustion chamber , Piston , Piston pin, Connecting Rod, Crankshaft, Cylinder, Valve mechanism (Valve, rocker arm, Push rod, cam shaft & cam follower etc.), Flywheel etc.

3 **Computer Aided Design of I.C. Engine Components**

Term Work: The term work shall be based on the topics mentioned above.

Practical / Oral: The candidate shall be examined on the basis of term-work.

Books :

1. I.C. Engine by Maleev V. L., McGraw Hill Book, Co.
2. I.C. Engines by Domkundwar & Domkundwar , Dhanpatrai & Co.
3. I.C. Engines by Mathur & Sharma, Dhanpatrai Pub.
4. I.C. Engines by V.Ganeshan, TMH Pub.
5. I.C. Engines by R.Yadav, Central Pub. House, Allahabad
6. Machine Design by Sharma- Aggarwal , S.K.Kataria & Sons
7. Machine Design by Seducing, Khanna Pub.

**B.E. SEM- VI (AUTOMOBILE ENGG.)
AUTOMOBILE SYSTEMS & DESIGN**

A-602

Teaching Scheme		Examination Scheme					
Theory Hrs.	Practical Hrs.	Theory Marks	Hrs.	Sessional Marks	Practical/ Oral Marks	Term Work Marks	Total Marks
4	3	100	3	50	25	50	225

(a) **Automobile Systems [L- 2 , P- 2 Hours Per Week]**

1 **Braking Systems:**

Need, functions and requirements of braking system, drum brake arrangements, disc brake arrangement, brake friction material, hydraulic brake system & components, hydraulic brake fluids, air brakes, vacuum servo assisted braking, parking brake systems, hydraulic power brakes, anti-lock brakes, engine exhaust brake, dual brake system, regenerative brake system, fail-safe brake, brake efficiency & testing, Weight transfer, braking ratio, numerical problems.

2 **Front Axle and Steering System:**

Functions of front axle, types of front axle, constructional details, front wheel geometry, its significance with different characteristics – castor, camber, king – pin inclination, toe-in, toe-out, correct steering angle the effect of incorrect steering geometry, adjusting and checking of front wheel geometry, Steering geometry – Ackerman's & Davis, steering linkages, Different types of steering gear boxes, Power & power assisted steering, Numerical problems on Ackerman's steering

Vehicle Suspension Systems:

Need of suspension system, different types, types of different suspension springs with their requirements, constructional details and characteristics of leaf spring, coils spring and torsion bar springs, Independent suspension, rubber suspension, pneumatic suspension, hydro-elastic suspension, use of anti-roll bar and stabilizer bar, shock absorbers- need, operating principles different types.

Wheels and Tyres:

Basic requirements of wheels & tyres, types of road wheels construction of wheel assembly, wheel balancing, tyre construction, types – tubeless, cross ply, radial type, Tyre sizes and designation, aspect ratio, tyre trade pattern, tyre valve, tyre inflation pressure, Safety precautions in tyres, Tyre rotation & matching, types of tyre wear and their causes, Selection of tyres under different applications, tyre retreading – hot & cold, Factors affecting on tyre performance.

Vehicle Performance Testing:

Laboratory Testing – Testing of major components of vehicle like clutch, suspension, braking, steering etc., Engine, 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.

Design [L- 2 , P- 1 Hours Per Week]

Design of Brakes :

Design considerations in brakes, band, internal expanding shoe, external contracting long and short, Energy equations, Thermal considerations and rating of brakes.

Design of Axles & Propeller Shafts:

Design of front and rear axle for automobiles, Design of Propeller shafts for bending, torsion, & rigidity, universal joints and slip joints.

Design of Suspension System:

Types & applications, material of spring, Stress-deflection Equation for helical springs, Wahl Correction Factor, Design of helical springs, Buckling of Compression springs, Tension springs, Springs in Series & in parallel, Design Considerations of Belleville springs, Elastomeric springs, Air (Pneumatic) springs, Design of leaf spring for automobile suspension system, Design of coil spring for front independent suspension system

Optimum Design:

Introduction to optimum design, for mechanical elements, adequate & optimum design, Johnson's method of optimum design-Simple problems in optimum design like axially loaded members like shaft subjected to torsional and bending moments and other machine elements.

Term Work. The term work shall be based on the topics mentioned above
Practical / Oral: The candidate shall be examined on the basis of term-work.

Books :

1. Automobile Chasis Design by Dean Avern, Llife Books Ltd (1992)
2. Automotive Chasis by P.M.Heldt , Chilton Co., NY (1992)
3. Automobile Engg. Vol-I & II by Kirpasingh, Standard Pub.,
4. Automobile Engg. Vol-I & II by K.M.Gupta. Umesh Pub.
5. Automotive Mechanics by Dr. N.K.Giri, Khanna Publishers,
6. Auto Design by R.B. Gupta, Satya Prakashan
7. Machine Design by Sharma-Aggarwal, S.K.Kataria and sons
8. Machine Design by Sadhusingh , Khanna Publ shers
9. Machine Design by A.Mubeen. Khanna Publis rers,
10. Machine Design Vol-II & III by F.Haideri, Nirali Prakashan,Pune

B.E. SEM - VI (AUTOMOBILE ENGG.)

MECHANICAL MEASUREMENT & INSTRUMENTATION

A-603

Teaching Scheme		Examination Scheme					
Theory Hrs.	Practical Hrs.	Theory Marks	Hrs.	Sessional Marks	Practical/ Oral Marks	TermWork Marks	Total Marks
4	2	100	3	50	25	25	200

(a) **Metrology :**1 **Introduction :**

International standards of length-Line and end measurement, Need of measurement, possible errors in measurement, slip gauges, precision & accuracy, Sources of errors in measurement. -

2 **Tolerances and Gauging:**

Unilateral and bilateral tolerances, Limits, Fits. Types of Fits, IS specifications of limits. Importance of limits, System in mass production, limit gauges used for plain and taper works.

3 **Magnification :**

Principles and characteristics of measuring instruments, Mechanical, Optical, electrical, Pneumatic method of magnification, different types of Verniers , Micrometers, Dial gauges, Mechanical and pneumatic types of comparators. Use of comparators in inspection.

4 **Measurement of Angles, Tapers and Radius:**

Bevel Protractor, Spirit level, Clinometers, angle Decker, standard balls and rollers for angle measurement, angle slip gauges, radius measurement of circular portion, measurement of concave and convex surface radius

5 **Straightness and Flatness:**

Straight edge, use of level beam comparator. autocollimator testing of flatness of surface plate (Theoretical treatment only)

6 **Surface Finish:**

Types of textures obtained during machine operation, range of C.L.A. value in different operations in numerical assessment of surface finish (B.I.S. Specifications of C.L.A. value)-sample length of different machining operations, Direction of lay, texture, symbols, instruments used in surface finish assessment.

7 **Measurement of Threads:**

Different errors in screw threads, measurement of forms of thread with profile projector, pitch measurement, measurement of thread diameter with standard wire, screw thread micrometer.

8 **Measurement of Spur Gears:**

Run out checking, Pitch measurement, profile checking, backlash checking, tooth thickness measurement, alignment checking, errors in gears, checking of composite errors.

(b) **Instrumentation**1 **Introduction**

Need of Mechanical Measurement, Instruments, Measurement methods, Generalized measurement system and its functional elements instrument characteristic: static and dynamic and analytical treatment calibration, Classification and various types of transducers.

2 **Measurement of Temperature:**

Importance of temperature measurement, Thermometer, Thermocouple-Principle, types, calibration, RTD, Thermister measurement of low temperature.

3 **Measurement of Pressure and Vacuum:**

Importance of pressure and vacuum measurement, range of high pressure and vacuum, Bourdon tubes, Dead weight pressure gauge tester, Diaphragm gauge, LVDT, Piezo electrical pressure gauge, low vacuum gauges-McLeod gauge, thermal conductivity gauge, Pitot gauge, Ionization gauge

4 **Measurement of Angular Speed:**

Importance of angular speed measurement, mechanical tachometers, Electrical tachometers- Drag cup, Tacho generator, Inductive, capacitive and photo electric pick up

5 **Measurement of Flow:**

Importance of flow measurement, Water meter, Rota meter, Gas flow meter, Hot wire anemometer, drag press flow meter (analytical treatment)

6 **Measurement of Strain:**

Classification of strain gauges, principle of electrical strain gauge, gauge factor (analytical treatment) analysis of wheatstone's network using strain gauges, types of electrical strain gauges, mounting, application to measure –load / force, torque

7 **Measurement of Vibration and Sound:**

Importance of vibration measurement, classification of vibration measuring instruments, importance of acoustical measurement, sound pressure and power levels, types of microphones- capacitive, crystal, electrodynamics, carbon, sound level meter

Term Work: The term work shall be based on the topics mentioned above.

Practical / Oral: The candidate shall be examined on the basis of term-work.

Suggested list of practicals /term work :

1. Study and use (care & maintenance) of various measuring instruments
2. Measurement of machined automobile components
3. Use of comparator
4. Screw thread measurement using floating carriage diameter measuring machine
5. Gear inspection like tooth thickness & profile, composite error, module etc.
6. Use of optical profile projector
7. Use of sine bar
8. Use of standard balls and rollers for angle measurement.
9. Calibration of pressure gauge & vacuum gauge
10. Calibration of Angular speed measuring instrument
11. Flow Measurement using Water Rotameter
12. Measurement of force / load using Strain Gauges & calibration of load cells
13. Vibration Measurement using Seismic Instrument and acoustic measurement using a sound level meter

Books :

1. Engg. Metrology by R.K.Jain, Khanna Publishers, Delhi
2. Mechanical Measurements and Control by D S Kumar, Metropolitan books
3. Text Book of Engg Metrology- I.C. Gupta, Dhanpat Rai & Sons, New Delhi
4. Practical Engg. Metrology- Sharp K.W.B. Pitman, London
5. Mechanical Measurement & Instrumentation by R.K.Rajput, S.K. Kataria & Sons.

B.E. SEM VI (AUTOMOBILE ENGG.)

CAD, CAM & AUTOMATION

A-604

Teaching Scheme		Examination Scheme					
Theory Hrs	Practical Hrs.	Theory Marks	Hrs.	Sessional Marks	Practical/ Oral Marks	TermWork Marks	Total Marks
4	2	100	3	50	25	25	200

- 1 **Introduction :**
Introduction to CAD, conventional design Vs CAD, applications & advantages of CAD to Mechanical Engineering Field, etc., selection of programming language and salient features of CAD software.
 - 2 **Computer Graphics :**
Graphic input/output devices, concept of window & view-port, 2-D Transformation, scan conversion, DDA method for generation of vector, Bresenham's algorithm for generation of line, Graphics standard functions in C graphics, introduction to various graphics driver in 'C', Boolean operations etc, 2D & 3D modeling, wire frame , solid modeling, advanced features of CAD software
 - 3 **Introduction to Finite Element Method :**
Introduction to design and analysis, generalized procedure for FEM, types of elements, one dimensional linear modeling, intrinsic co-ordinate system, shape function, displacement , strain and stress relationships, element stiffness matrix by potential energy approach & Galerkin approach, Elimination approach, Penalty approach , thermal effects in 1D elements ,simple design problems. Application to automobile components
 - 4 **Computer aided design of Auto. Components like brakes, axle , suspension system etc.**
 - 5 **CAD to CAM :**
CAD as a pre requisite to CAM - Interfacing, conversion of graphic information to part program, simple geometrical shape – typical examples of surfaces and other specifications, interactive tape preparation system and manual data input systems.
 - 6 **Computerized Numerical Control :**
Construction and working of main parts , programming preliminaries .
Manual part programming :- Various types of programming formats, G codes, M codes and other codes, Canned cycles , radius compensation, programming exercises for drilling, milling and turning, subroutine, parametric subroutine.
Computer assisted programming:- Enlist languages, Automated programmed Tools (APT)-geometrical motion, auxiliary and post processor statements, APT programs for drilling, milling and turning, tool path generation and verification. CNC programming based on CAD/CAM , part programs for lathe, milling machine etc.
 - 7 **Automation**
Concepts in manufacturing systems, types of automation, advantages and limitations of automation,- strategies in automation, Group Technology, Merits & Demerits of group technology, Concepts of machining cell, flexible manufacturing systems - its elements and applications , work-piece handling, Work-piece transport using automated guided vehicles. Merits & Demerits of FMS, Introduction to computer integrated manufacturing systems
 - 8 **Introduction to Robotics :**
Industrial robot, elements of a robot , robot controller unit, manipulator, end effectors , robot operations, types of robots , robot joints and degrees of freedom, robot axes and configuration , robot sensors, robot cell layout, robot applications
- Term Work:** The term work shall be based on the topics mentioned above.
- Practical / Oral:** The candidate shall be examined on the basis of term-work.
- Books :**
1. Computer aided Design and Manufacturing- Groover & Zimmers, Prentice Hall
 2. CAD/CAM theory and practice by Ibrahim Zeic. Mc Graw Hill
 3. CAD, CAM & Automation by F.Haideri, Nirali Prakashan,Pune
 4. Computer Graphics by Plastock and Kalley – Mc Graw Hill – Schaum series.
 5. Numerical control and Computer aided manufacturing – T.K. Kundra & P.A. Rao. TMH
 6. Numerical control & Machine Tools -- Martin S.J. – ELBS – London.
 7. Computer integrated Manufacturing- S.K. Vajpayee.,Prentice Hall.
 8. CAD/CAM/CIM - P. Radhakrishnan & S. Subramarayan. New Age International.
 9. Technology of computer aided Design and Mfg by S.Kumar & Dr.A.K.Jha. Dhanpat Rai & Sons.

A-605 INDUSTRIAL ORGANIZATION AND MANAGEMENT

Teaching Scheme		Examination Scheme					
Theory Hrs.	Practical Hrs.	Theory Marks	Hrs.	Sessional Marks	Practical/ Oral Marks	TermWork Marks	Total Marks
4	--	100	3	50	--	--	150

- 1 **Business Environment:**
Introduction, Environmental factors influencing business, external environment, General environment, Task environment, business ethics and social responsibility of business, Effect of Globalization.
- 2 **Functions of Management:**
Definition of Management, Management environment,
Planning – Need, Objectives, Strategy, policies, Procedures, Steps in Planning, Decision making, Forecasting.
Organizing -- Process of Organizing importance and principle of organizing, departmentation, Organizational relationship, Authority, Responsibility, Delegation, Span of control.
Staffing -- Nature, Purpose, Scope, Human resource management, Policies, Recruitment procedure training and development, appraisal methods.
Leading -- Communication process, Barriers, remedies, motivation, importance,
- 3 **Financial Management :**
Sources of Finance, Financial institutions, financial statements, Balance sheet and P & L Account (Contents only), use and importance, Break even Analysis and its applications, accounting ratios, Cost and Cost Control - Classification of cost - Direct material, Direct labour, Direct expenses, Factory overhead, Methods of costing cost control and cost reduction.
- 4 **Marketing :**
Marketing Concepts - Objective –Types of markets, Market Segmentation, Market strategy- 4 AP's of market ,Market Research, Salesmanship, Advertising
- 5 **Production Management:**
Selection of site, plant layout – objectives, principles, types, merits & demerits of different types of layout, function of PPC, PERT / CPM, Maintenance Management, Introduction to Industrial Engineering, Work Study, Method study, Work Management, wages & incentives.
- 6 **Materials Management :**
Definition , Scope, advantages of materials management ,functions of materials management, Materials requirements planning, Purchasing objectives, 5-R Principles of purchasing, Functions of Purchase department ,Purchasing cycle, Purchase policy & procedure, Evaluation of Purchase Performance. Vendor development. Make or buy decisions, Inventory Control - ABC Analysis, EOQ, Inventory cost relationships
- 7 **Personal Management :**
Functions of personal department, Industrial relations, training & development, important provisions & rules of Indian Factories Act.
- 8 **Industrial Safety:**
Reasons for accidents, prevention of accidents, Promotion of safety mind ness.
- 9 **EDP and SSI :**
Modern concept of an entrepreneur, Scheumpeter's and Peter Drucker's concepts of an entrepreneur, Qualities required to become entrepreneurs, Factors conducive for promoting entrepreneurship reasons for entrepreneurial failure, entrepreneurship development, Role of Industrial interaction, Schools, training in the odevelopment of entrepreneurship. S S I :
Definition of SSI, Procedure to start Small Scale Industry. Institutions of offering assistance to SSI, Incentives offered to SSI, Problems of SSI, Feasibility report writing.
- 10 **Introduction to E- Commerce :**
Introduction to Management Information System (MIS), Introduction to ISO 9000 procedures.

Books

1. Management – James A.F. Stoner, R. Edward Freeman, Prentice Hall of India New Delhi.
2. Management, Today – Principles and Practice – Gene Burton and Manab Thakur, Tata McGraw Hill
3. Essentials of Management – Koontz & O' Donell.
4. Human Behaviour at Work Organisational Behaviour – Keith Davis, Tata McGraw Hill Publishing
5. Business Management – J.P. Bose, S. Talukdar, New Central Agencies (P) Ltd.,
6. Industrial Organisation & Management - M. T. Telsang – S. Chand & Co.
7. Industrial Organisation & Engineering Economics – T. R. Banga/S.C Sharma – Khanna Publishers
8. Industrial Engineering & Management – O.P. Khanna., Dhanpatrai co.
9. Industrial Engineering & Production Management -- M. T. Telsang – S. Chand
10. Marketing Management – Philip Kotler, Prentice Hall of India New Delhi.
11. Management Information System, Conceptual Foundation – W.S. Jawadekar Venus Prakashan.

GUJARAT UNIVERSITY
TEACHING & EXAMINATION SCHEME

B.E. SEM-VII (AUTOMOBILE)

w.e.f. July-2007

Subject Code	Subject Name	Teaching Scheme (Hrs)			Examination Scheme (Marks)					
		Theory	Practical	Tutorials	Theory Hrs	Theory Marks	Practical Oral Marks	Term Work Marks	Sessional Marks	Total Marks
A-701	Automobile Body Engineering	3	2	--	3	100	25	25	50	200
A-702	Heat Transfer	3	2	--	3	100	25	25	50	200
A-703	Automobile Electrical & Electronic Systems	4	2	--	3	100	25	25	50	200
A-704	Design of Automobile Components	4	2	--	4	100	25	25	50	200
A-705/1	Two & Three Wheelers (EP-I)	4	2	--	3	100	25	25	50	200
A-705/2	Alternate Fuels & Energy Systems for Automobiles (EP-I)	4	2	--	3	100	25	25	50	200
A-706	Garage Practice	--	2	--	--	--	25	25	--	50
A-707	Seminar	--	2	--	--	--	25	25	--	50
TOTAL		18	14	--	--	500	175	175	250	1100

B.E. SEM VII (AUTOMOBILE ENGG.)

A-701

AUTOMOBILE BODY ENGINEERING

Teaching Scheme		Examination Scheme					
Theory Hrs.	Practical Hrs.	Theory Marks	Hrs.	Sessional Marks	Practical/ Oral Marks	TermWork Marks	Total Marks
3	2	100	3	50	25	25	200

- 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
- 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: The term work shall be based on the topics mentioned above.

Practical / Oral: The candidate shall be examined on the basis of term-work.

Suggested list of practicals / Term Work

Term work consists of report on following experiments:

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

Books :

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

B.E. SEM -VII (AUTOMOBILE ENGG.)

A- 702

HEAT TRANSFER

Teaching Scheme		Examination Scheme					
Theory Hrs.	Practical Hrs.	Theory Marks	Hrs.	Sessional Marks	Practical/ Oral Marks	Term Work Marks	Total Marks
3	2	100	3	50	25	25	200

- 1 **Conduction:**
Fourier's law of heat conduction, derivation of generalized equation in the Cartesian, cylindrical and spherical co-ordinates, one dimensional steady state conduction. Thermal conductivity of metals, refractory and building materials, liquids & gases. Temperature distribution and heat flow in steady state through plane, cylindrical and spherical walls with constant and variable thermal conductivity, composite walls, electrical analogy, transient heat conduction, critical thickness of insulation.
- 2 **Convection:**
Newton – Rikhman law, dimensional analysis applied to forced and free convection, Dimensionless numbers & their physical significance, empirical correlations for free and forced convection. Hydrodynamic boundary layer, continuity and momentum equations, Blasius solution for laminar boundary layer, Von – Karman integral momentum equation, thermal boundary layer, energy equation for thermal boundary layer, use of Pohlhausen solution for energy equation, integral energy equation.
- 3 **Radiation :**
Concept of radiation, absorptivity, reflectivity & transmissivity, black, white and grey surfaces, emissive power & emissivity. Laws of radiation – Planck, Stefan – Boltzman , Wein's displacement, Kirchoff. Intensity of radiation & solid angle, Lambert's cosine law, shape factor. Radiation exchange between non black bodies, radiation shield, heat exchange between two grey surfaces, electrical analogy.
- 4 **Heat transfer from extended surfaces :**
Heat flow through rectangular fin, Heat dissipation from an infinitely long fin, fin insulated at tip and fin losing heat at the tip, efficiency and effectiveness of fin, Biot number, estimation of error in temperature measurement in a thermometer well.
- 5 **Heat Exchangers :**
Types, Heat exchanger analysis, LMTD for parallel & counter flow heat exchanger, overall heat transfer coefficient, fouling, correction factor for multi-pass arrangement, effectiveness and number of transfer unit for parallel and counter flow heat exchanger.
- 6 **Boiling & Condensation :**
General aspects of boiling, boiling regimes, bubble growth, nucleate boiling, film boiling, boiling correlations, filmwise & dropwise condensation, Laminar film condensation on vertical plate, turbulent film condensation, film condensation on tubes.
- 7 **Automobile Application of Heat Transfer :**
Cooling system, necessity of cooling, types of cooling and components of cooling system., Temperature distribution in piston, cylinder, cylinder block etc.

Term Work: The term work shall be based on the topics mentioned above.

Practical / Oral: The candidate shall be examined on the basis of term-work.

Books :

1. Heat Transfer – A Practical approach by – Yunus Cengel (Tata McGraw Hill)
2. A Text Book on Heat Transfer by Dr. S. P. Sukhatme.
3. Heat Transfer by J.P. Holman , McGraw Hill Book Company, New York.
4. Heat Transfer by Chapman A.J. McGraw Hill Book Company, New York.
5. Heat and Mass Transfer, S.C. Arora and S. Donkundwar, Dhanpat Rai and Sons,
6. Fundamentals of Heat and Mass Transfer by R.C. Sachdev, New Age International
7. Fundamentals of Heat and Mass Transfer by C.P. Kothandaraman
8. Heat and Mass Transfer by R.K. Rajput, S. Chand & Company Ltd., New Delhi.
9. Heat and Mass Transfer by D.S.Kumar, S.K.Kataria & Sons
10. Engineering Heat & Mass Transfer by M.M. Rathore, Laxmi Prakashan

7/2/22

B.E. SEM VII (AUTOMOBILE ENGG.)

A-703 AUTOMOBILE ELECTRICAL & ELECTRONIC SYSTEMS

Teaching Scheme		Examination Scheme					
Theory Hrs.	Practical Hrs.	Theory Marks	Hrs.	Sessional Marks	Practical/ Oral Marks	TermWork Marks	Total Marks
4	2	100	3	50	25	25	200

- 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.
- 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: The term work shall be based on the topics mentioned above.

Practical / Oral: The candidate shall be examined on the basis of term-work.

Suggested list of practicals / 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 :

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. Bechford 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 Hall NJ
6. Robert N. Brandy, "Automotive Computers & Digital Instrumentation", Prentice Hall,, NJ
7. John Hartly, "The Fundamentals of Electrical Systems", Longman Scientific & Technical
8. Wiliam B. Ribbens, "Understanding Automotive Electronics", Allied Publishers Pvt. Ltd.
9. Douglas V Hall, "Microprocessor & Interfacing Program & Hardware", McGraw Hill .
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. SEM VII (AUTOMOBILE ENGG.)

A-704

DESIGN OF AUTOMOBILE COMPONENTS

Teaching Scheme		Examination Scheme					
Theory Hrs.	Practical Hrs.	Theory Marks	Hrs.	Sessional Marks	Practical/ Oral Marks	Term Work Marks	Total Marks
4	2	100	4	50	25	25	50

1 **Design Considerations :**

Manufacturing and assembly considerations, Design of components for casting, welding, forging, hot and cold working, machining, welding etc. assembly considerations in design. Design for creep – thermal considerations – wear considerations in design – Human considerations in design.

2 **Application of standardization in machine design**

preferred numbers – preferred series – derived series- limits fits and tolerances and their applications in design.

3 **Design of Bearings:****Rolling Contact Bearing:**

Types of rolling contact bearings, static and dynamic load capacities, Stribeck's Equation, Equivalent bearing load, load life relationship, Bearing life, Load factor, Selection of bearings from manufacturers catalogue. Lubrication and mountings, dismounting and preloading of bearings, Oil seals and packing.

Sliding Contact Bearings:

Bearing material and their properties, Bearing types, and their constructional details, Hydrodynamic Lubrication- Basic theory, Design consideration in hydrodynamic bearings, Raimondi and Boyd method relating bearing variables.

4 **Gears:**

Design consideration of gears, material selection, Types of gear failures, Gear lubrication.

Spur Gears:

Force analysis, Number of teeth, Face width & Beam strength of gear tooth. Dynamic tooth load. Effective load on gear tooth. Estimation of module based on beam strength. Wear strength of gear tooth. Estimation of module based on wears strength. Spur gear design for maximum power transmission.

Helical Gears:

Virtual number of teeth, Tooth proportions, Force analysis, Beam strength of helical gears, Effective load on gear tooth, Wear strength of helical gears, Design of helical gears

Bevel Gears:

Terminology of bevel gears, Force analysis, Beam strength of bevel gears, Wear strength of bevel gear, Effective load on gear tooth, Design of bevel gear.

Worm Gears:

Force analysis, Friction in worm gear, Vector method. Strength rating of worm gears, Wear rating of worm gear.

Design of Gearbox:

Design considerations of gearbox, selection of proper gear ratios for an automobile gearbox, design of shafts, splines, and gears for gear box

Clutches:

Design requirements of friction clutches, selection criterion, torque transmission capacity, single plate clutch, multi-plate clutch, and centrifugal clutch, lining material.

Miscellaneous Design:

Design of power screw- Self-locking of power screws. Recalculating ball screws, Design of levers- Hand lever, foot lever, bell crank lever, rocker arm, & c- clamp.

Computer Aided Design of Clutch & Gear Box used in Automobiles

Term Work: The term work shall be based on the topics mentioned above.

Practical / Oral: The candidate shall be examined on the basis of term-work.

Suggested Term-Work :

1. Study of ball bearing, Mounting & it's Selection
2. Design of gear systems –spur, helical, bevel etc.
3. Design & working drawing of details and assembly of clutch system
4. Design & working drawing of details and assembly of gear box

Books

1. Joseph E. Shigley & Larry D. Mitchell, "Mechanical Engineering Design" Fourth Edition. McGraw-Hill International Book Company.
2. M.F. Spotts & T.E. Shoup," Design of machine Elements", Seventh Edition, Pearson Education.
3. George E. Dieter," Engineering Design- A Material and Processing Approach", Second Edition, McGraw-Hill International Edition.
4. Robert C. Junivall," Fundamentals of Machine Component Design", John Wiley & Sons.
5. Bhandari V. B., "Design of machine Elements", Tata McGraw-Hill Publishing Company Ltd
6. Machine Design by Sharma-Agarwal, S.K.Katari & Sons
7. Machine Design Vol-II & III by F.Haideri, Nirali Prakashan, Pune
8. Machine Design by Sadhusingh, Khanna Publishers,
9. Machine Design by R.K.Jain, Khanna Publishers
10. Bearing Manufacturers Catalogues
11. PSG Design Data Book.

B.E. SEM VII (AUTOMOBILE ENGG.)

A-705/1 [ELECTIVE PAPER-I] TWO & THREE WHEELERS

Teaching Scheme		Examination Scheme					
Theory Hrs.	Practical Hrs.	Theory Marks	Hrs.	Sessional Marks	Practical/ Oral Marks	TermWork Marks	Total Marks
4	2	100	3	50	25	25	200

- 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, SNS for suspension
- 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: The term work shall be based on the topics mentioned above.

Practical / Oral: The candidate shall be examined on the basis of term-work.

Suggested list of practicals /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 magnet & setting ignition timing
9. Study of wiring diagram & electrical systems
10. Dismantling & assembling of the suspension system

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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 Heffe 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, Willy Motors, Inc., USA.

B.E. SEM VII (AUTOMOBILE ENGG.)

**[ELECTIVE PAPER-I] ALTERNATIVE FUELS & ENERGY SYSTEMS FOR AUTOMOBILE
A-705/2**

Teaching Scheme		Examination Scheme					
Theory Hrs.	Practical Hrs.	Theory Marks	Hrs.	Sessional Marks	Practical/ Oral Marks	TermWork Marks	Total Marks
4	2	100	3	50	25	25	200

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

5 Gaseous Fuel :

L.P.G., C.N.G., L.N.G. , bio-gas, their properties as engine fuels, fuel metering systems, combustion characteristics, effect on performance & emission, cost, safety

6 Bio-Diesels :

Jatropha oil, Karanjia oil, Neem oil, Rice bran oil, Soyabean oil, Pam oil, Linseed oil, Sunflower oil, Mustard 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: The term work shall be based on the topics mentioned above.

Practical / Oral: The candidate shall be examined on the basis of term-work.

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

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 Engine: 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

B. E. SEM-VII (AUTOMOBILE) PART – I

A-706.

GARAGE PRACTICE

Teaching Scheme		Examination Scheme					
Theory Hrs.	Practical Hrs.	Theory Marks	Hrs.	Sessional Marks	Practical/ Oral Marks	TermWork Marks	Total Marks
--	2	--	-	--	25	25	50

Term-Work : Students will undergo garage practice & will prepare a report on it .

Practical / Oral: The candidate shall be examined on the basis of term-work.

Garage Practice :

Service station, functions and operations, activities, depot and workshop layouts, good layouts, I-flow, U-flow, L-flow, O-f low, transport services undertaking garages

Equipment for garage and their function, operations, measuring instruments and testing procedures
Repairing processes and machines used for servicing and lubrication

Inspection procedures for wear, dimensions, surface finish and hardness

Repairing of engines and vehicle components

Maintenance of electrical and ignition system

Computer aided testing of vehicle :

Computer engine analyzer, fuel monitor, air-fuel ratio analyzer, wheel alignment, brake testing, dynamic wheel balancing, exhaust gas analysis, gas chromatography, MPFIR tester, fuel injector and fuel pump setting up, IS standards for testing of vehicles

B. E. SEM-VII (AUTOMOBILE) PART – I

A-707.

SEMINAR

Teaching Scheme		Examination Scheme					
Theory Hrs.	Practical Hrs.	Theory Marks	Hrs.	Sessional Marks	Practical/ Oral Marks	TermWork Marks	Total Marks
--	2	--	-	--	25	25	50

Term Work

The student has to undergo in-plant training (in any automobile design/manufacturing /repair unit) of three to four weeks in the vacation after B.E. III Sem-VI (Automobile) or during weekend for equivalent period .Each student has to prepare a write up of about 25 – 30 pages of "A4" size sheets on topic of training and submit it in three copies as the 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.