Shivaji University, Kolhapur

Structure of Third Year Engineering (Revised)

(To be implemented from Academic year 2015-16)

Automobile Engineering

Scheme of Teaching and Examination

Semester-V

Sr.No.	Subject	Teaching Scheme (Hrs.)				Examination Scheme(Marks)				
		L	T	P	Total	Theory	T/W	OE	POE	Total
01	Dynamics of Machines	3	---	2	5	100	25	---	25	150
02	Hydraulics and Pneumatics	3	---	2	5	100	25	--	---	125
03	Automotive Chassis	3	---	2	5	100	25	---	---	125
04	Metrology and Quality Control	3	---	2	5	100	25		---	125
05	Heat and Mass Transfer	3	---	2	5	100	25	---	25	150
06	Industrial organization and Engineering Economics	3	---	---	3	100	--	---	---	100
07	Professional Skills – II	--	--	2	2	---	25	--	--	25
	Total	18	---	12	30	600	150	--	50	800

Semester-VI

Sr.No.	Subject	Teaching Scheme (Hrs.)				Examination Scheme(Marks)				
		L	T	P	Total	Theory	T/W	OE	POE	Total
01	I.C. Engine	3	---	2	5	100	25	25	---	150
02	Vehicle Body Engineering	3	---	2	5	100	25	---	---	125
03	Automotive Transmission	3	---	2	5	100	25	25*	---	150
04	Machine Design	3	---	2	5	100	25	---	---	125
05	Automotive Refrigeration and Air Conditioning	3	---	2	5	100	25	---	---	125
06	CAD/CAM Lab	---	---	2	2	---	50	---	25	75
07	Seminar	---	---	2	2	---	50	--	--	50
	Total	15	---	14	29	500	225	50	25	800

***Indicates oral based of Automotive Chassis and Automotive Transmission**

Automotive Industrial Training is compulsory and should be completed in vacation after Sem. VI.

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T.E. (Automobile) Semester V (Revised)

1. DYNAMICS OF MACHINES

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

Examination Scheme:
Theory Paper: 100 marks (3 hrs. duration)
Term Work: 25 marks
Practical and oral: 25 marks

COURSE LEARNING OUTCOMES: After completion of the course, the student shall be able to:

- Apply mathematical principles to perform dynamic force analysis on machine components.
- Establish methods for balancing of machine components.
- Analyze free vibration of various systems.
- Analyze forced vibration of various systems.
- Describe the working principle of gyroscopes.

1. Gears and Gear Trains: 6

Introduction, law of gearing, types of gear tooth profile- involute & cycloidal, Interference in involute tooth gears and methods for its prevention, contact ratio, path of contact, arc of contact, Efficiency and center distance of spiral gears. Types of Gear trains Simple, Compound, Epicyclic, Reverted gear train, Tabular method for finding the speeds of elements in epicyclic gear train.

2. Kinetic Analysis of Mechanisms: 6

Inertia force and torque, D'Alembert's principle, dynamically equivalent system, force analysis of reciprocating engine mechanism.

Gyroscope :

Gyroscopic couple, Spinning and Precessional motion, Gyroscopic couple and its effect on i) Aero plane ii) Ship iii) Four-Wheeler iv) Two –Wheeler

3. Balancing: 6

Static and dynamic balancing of rotary and reciprocating masses, primary and secondary forces and couples, direct and reverse cranks. Balancing of single cylinder, multi cylinder- in-line and V-engines.

4. Vibrations : 6

Basic concepts and definitions, vibration measuring instruments, free and forced vibrations. Types of damping, Equivalent Springs

Single Degree of Freedom Systems :

Free vibrations with and without damping (Rectilinear, Torsional & Transverse), over, under & critical damping, damping factor, logarithmic decrement, equivalent viscous damping, Coulomb damping.

5. Forced Vibrations: 6

Forced vibrations with viscous damping, magnification factor, frequency response curves, vibration isolation and transmissibility, Whirling of Shafts and Critical speeds

6. Two Degree of Freedom systems (No numerical treatment): 6

Introduction, Principal modes of Vibration, Simple two degree freedom systems, and two masses fixed on tightly stretched string, double pendulum, torsional system, Vibration absorbers, types, Vibration isolation and its methods.

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Termwork: (Any Ten)

1. Experiment on Gyroscope
2. Generation of involute gear tooth profile
3. Problems on Epicyclic gear train using tabular method
4. Determination of M.I. by Bi-filar suspension, Trifilar suspension or Compound pendulum
5. Balancing of rotary masses
6. Determination of logarithmic decrement (Free Damped Vibrations) – Water damping
7. Determination of logarithmic decrement (Free Damped Vibrations) – Air damping
8. Forced vibration characteristics (Undamped and Damped vibrations)
9. Experiment on whirling of shafts.
10. Demonstration/Study of Vibration measuring instruments
11. Determination of natural frequency of vibration of simple structures

Recommended Books:

1. Rattan S.S., Theory of Machines, Tata McGraw Hill Pub. Co. Ltd., New Delhi, Fourth Edition
2. R. Venchatachalam, 2014, Mechanical Vibrations, PHI Publication, 1st Edition.
3. Thomas Bevan, Theory of Machines, C.B.S. Publishers & Distributors.
4. Shigley J.E., Theory of Machines & Mechanisms, Oxford University Press, Third Edition.
5. Rao J.S. and Dukkipati R. V., Mechanism and Machine Theory, Wiley Eastern Ltd.
6. Grover G. K., Mechanical Vibrations, New Chand & Bros., Roorkee.
7. Ballaney P. L.,Theory of Machines, Khanna Publishers, Delhi.
8. Jagdishlal,Theory of Machines, Metropolitan Book Co. Pvt. Ltd., New Delhi.
9. William J. Palm III, Mechanical Vibration, Wiley Publication India.
10. Debabrata Nag, Mechanical Vibrations, Wiley Publication India,

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2. HYDRAULICS AND PNEUMATICS

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

Examination Scheme:
Theory Paper: 100 marks (3 hrs. duration)
Term Work: 25 marks

COURSE LEARNING OUTCOMES: After completion of the course, the student shall be able to,

- Explain the basics of hydraulics.
- Describe the working principle of hydraulic systems including pumps and controllers.
- Explain the basics of pneumatics.
- Design hydraulic and pneumatic power circuits.
- Identify components of hydraulic and pneumatics systems

1. Introduction to Fluid Power 6

Application of hydraulics and pneumatics in various fields of engineering, properties of fluids, effect of temperature, Hydraulic symbols- Circuit elements, fluid pumps, motors, valves, types of control, reservoirs, advantages and disadvantages of hydraulic systems.

2. Elements of Hydraulic System 6

Pumps- Types of pumps and its selection. Hydraulic cylinders and rams- Single acting and double acting, telescopic, seals, design considerations for pump, motor, cylinder and ram, fluid power plumbing requirements, type and purpose of strainer, filter, accumulator and its types, design considerations, reservoir, fluid temperature control, types of heat exchangers.

3. Control of Hydraulic Elements & Hydraulic Circuits 6

Types of pressure control, Directional control valves-Two way, four way two position, four way three position, manual operated, solenoid operated. Flow control valves, pressure switches, check valves, quick exhaust valve.

Pressure regulating circuit, speed control circuit, accumulator circuit, booster and intensifier circuit, motion synchronizing circuit, servo circuit.

4. Pneumatic system and their elements 6

Application of pneumatics in engineering, basic requirements of pneumatic system, comparison with hydraulic system

Air compressor - Types, selection criteria, capacity control, piping layout, fittings and connectors, pneumatic control, Direction control valves, two way, three way, four way check valves, flow control valves, pressure control valves, speed regulators. Quick exhaust valves, solenoid, pilot operators, Cylinders- Types and their mountings, hoses and connections, Air motors- Types, comparison with hydraulic and electric motor. Filters- Types of filters, regulators, lubricators, mufflers, dryers.

5. Pneumatics Circuits and Maintenance, safety of hydraulic and pneumatic system 6

Basic pneumatic circuit, impulse operation, speed control, pneumatic motor circuit, sequencing of motion time delay circuit & their applications, Maintenance & safety of hydraulics and pneumatics systems

6. Introduction to Control Engineering: 6

Need of control: Manual v/s automatic control, advantages of automatic control, open loop v/s closed loop control, generalized control system, merits, demerits and applications. Mathematical conversion of control components: Helical spring, viscous damper and their combinations, resister, inductors, capacitor, series and parallel electrical circuits and mech. Systems, thermal and fluid systems.

Termwork: (Any Ten)

1. ISO/JIC symbols for hydraulic and pneumatic system.
2. Study of Accumulators, actuators, intensifiers, hydraulic and pneumatic power brakes.
3. Building of sequence circuits on trainer kits
4. Speed control circuits of hydraulics
5. Speed control circuits of pneunatics.
6. Experiment on On-Off temperature controller.
7. Experiment on DC/AC Motor speed control.
8. Experiment on various modes of control P, I, P+I
9. Experiment on various modes of control P+D, P+I+D.
10. Design of hydraulic system and related components for hydraulic system for agricultural tractor
11. Design of hydraulic system and related components for hydraulic system for tipper/hydraulic clamps, pneumatic clamp.
12. Design of hydraulic system and related components for shaping machine/ broaching machine/slotting machine

BOOKS:

1. J.J. Pippenger, Industrial Hydraulic, Mc Graw Hill Book Co. Ltd., New Delhi
2. Vicker spery, Industrial hydraulics manual.
3. S.R. Majumdar, Pneumatics systems Principles and Maintenance, Tata Mc Graw Hill Book Co., New Delhi.
4. D. A. Pease, Basic fluid power, Prentice Hall of India, New Delhi
5. H.L. Stewart, Pneumatics and Hydraulics, Taraporevala, Mumbai.
6. A Esposito, Fluid power with application, Prentice Hall of India, New Delhi
7. B la-Inhti, Oil hydraulics, Literature.
8. Yeaple, Fluid power design handbook, Marcel Dekkar Inc, New York.
9. R.S.Warrring, Pneumatic handbook.
10. Joji P. Pneumatic Controls, Wiley Precise Textbook, Wiley India.

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3. AUTOMOTIVE CHASSIS

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

Examination Scheme:
Theory Paper: 100 marks (3 hrs. duration)
Term Work: 25 marks

COURSE LEARNING OUTCOMES: After completion of the course, the student shall be able to,

- Explain the different types of chassis frames.
- Summaries the different steering geometry and types of front axle.
- State the various suspension systems
- Describe the types of wheels and tyres
- Identify the different braking systems like power brake, assisted brakes, disc brakes.

1. Introduction to Frames 6

Types of chassis layout with reference to power plant locations and drives, vehicle frames, various types of frames, constructional details, materials, testing of vehicle frames, unitized frame body construction, Chassis lubrication, General classification of vehicles.

2. Steering System 8

Front wheel geometry: castor, camber, king pin inclination, toe-in. conditions for true rolling motion of wheels during steering, steering geometry, Slip angle, Cornering force, Cornering Stiffness, Ackermann and Davis steering system, constructional details of steering linkages, different types of steering gear boxes, steering linkages and layouts, turning radius, wheel wobble, power assisted steering, steering of crawler tractors.

3. Wheels 6

Function, Types, Specifications.

Tyres

Function, Types, Tyre specifications, Tyre tread pattern, Tyre material, Parameters affecting life of Tyre.

4. Suspension System 6

Need of suspension system, types of suspension, suspension springs, constructional details and characteristics of leaf, coil and torsion bar springs, independent suspension, rubber suspension, pneumatic suspension, shock absorbers, composite spring.

5. Braking Systems 6

Classification of brakes, drum brakes and disc brakes, constructional details, theory of braking, concept of dual brake system, parking brake, material, hydraulic system, vacuum assisted system, air brake system, antilock braking, retarded engine brakes, eddy retarders.

6. Front Axle 4

Function of Front axle, types of front axles, construction details, materials.

Advanced Chassis Systems

Advanced chassis systems like active suspension system, ESP, electronic controlled transmission system etc.

Term Work: (Any Ten)

1. Demonstration of front wheel steering geometry and steering system layout
2. Demonstration of power steering
3. Demonstration of steering gear boxes
4. Experiment on computerized wheel balancing and front wheel alignment
5. To open the master cylinder, wheel cylinder, identify the different components, sketch and assemble
6. Demonstration of compressed air, vacuum servo and parking brake
7. Demonstration of conventional leaf spring suspensions of light, heavy vehicle
8. Demonstration of independent suspensions systems
9. Demonstration of shock absorbers
10. Demonstration of front & rear axles
11. Demonstration of wheel and tyre construction
12. Visit to tyre retreading unit

References:

1. William F. Milliken, Douglas L. Milliken, Maurice Olley, 2012, *Chassis design*, SAE.
2. Newton, Steeds and Garret, 2012, *Motor vehicle*, Illifee Books Ltd., London.
3. Kirpal Singh, *Automobile Engineering*, Standard Publishers, Distributor, Delhi, 2012
4. Heldt P. M., 1990, Automotive Chassis, Chilton Co., New York.
5. Steed W., 1960, Mechanics of Road Vehicles, Illiffe Books Ltd., London.
6. Crouse W. H., 1971, Automotive Chassis and Body, McGraw-Hill, New York.
7. G.B.S. Narang, Automobile Engineering, Khanna Publication, New Delhi.

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4. METROLOGY AND QUALITY CONTROL

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

Examination Scheme:
Theory Paper: 100 marks (3 hrs. duration)
Term Work: 25 marks

COURSE LEARNING OUTCOMES: After completion of the course, the student shall be able to:

1. Analyze the skills to calibrate linear and angular measuring instruments.
2. Select suitable equipment to measure different parameters of a given specimen.
3. Determine the thread parameters of the given specimen and check the dimensional tolerance using comparators.
4. Measure surface roughness and flatness.
5. Analyze and implement the data obtained from the different measurement processes and present in statistical form.

1. Introduction to Metrology: 9

Fundamental principles: Definitions, measurement standards / primary and tertiary standards, errors, distinction between precision and accuracy.

Limits, fits and tolerances: Tolerance grades, Types of fits, Types of Gauges, Design of GO and NO GO gauges, GO and NO GO gauges- Taylor's principle.

Comparators: Constructional features and operation of mechanical, optical, electrical/electronic and pneumatic comparators, advantages, limitations and field of applications. Introduction to angular measurement.

2. Flat Surface Measurement: Principles of interference, concept of flatness, flatness testing, autocollimator, optical flats, optical interferometer and laser interferometer 8

Surface texture measurement: Importance of surface conditions, roughness and waviness, surface roughness standards specifying surface roughness parameters- Ra, RMS value etc., surface roughness measuring instruments.

3. Thread measurement: Two wire and three wire methods, floating carriage micrometer. 6

Gear measurement: Gear tooth comparator, Master gears, measurement using rollers and Parkinson's Tester.

Special measuring Equipments: Principles of measurement using Tool Maker's microscope, profile projector and Coordinate Measuring Machine (CMM).

4. Quality Control: Introduction, definition and concept of quality & quality control, set up policy and objectives of quality control, quality of design and quality of conformance, Concept of quality & cost, quality cost and planning for quality. 4

5. SQC and SQC tools: Importance statistical methods in QC, measurement of statistical control variables and attributes, Types of charts, control charts, X-bar chart, R-bar charts & P charts - their preparation, analysis and applications. SQC tools. 6

6. Sampling Techniques: Sampling inspection and basic concepts, OC curves, consumer & producer risk, single & double sampling plans and use of sampling tables, Introduction to Lean Tools. 4

Term work:

1. Demonstration & use of various measuring instruments.
2. Measurements of different automotive components.
3. Demonstration of comparators.
4. Thread measurement using floating carriage diameter measuring machine.
5. Gear measurement using gear tooth caliper
6. Measurement of template/ thread using Tool makers microscope
7. Use of sine bar
8. Measurement of surface roughness.
9. Measurement of flatness.
10. Measurement of Automobile components
11. Use of X- bar and R-bar charts.
12. Use of P- charts

References

1. K.W.B.Sharp, Practical Engineering Metrology, Pitman Publication.
2. K.J.Hume, Engineering Metrology, Kalyani publication.
3. I.C. GUPTA, Engineering. Metrology, DhanpatRai Publications.
4. A.L. Grant, Statistical quality control, McGraw Hill International, New York.
5. R.K.Jain, Engineering. Metrology, Khanna Publisher.
6. Taher, Metrology.
7. R.C. Gupta, Statistical Quality control,
8. Hume K.G., M C Donald, Engineering. Metrology, Technical &Scientific ,London.
9. Duncon A.J., Quality Control and Industrial Statistics, –D.B. Taraporevela & Co. Bombay.
10. Mahajan M., Statistical quality Control, DhanpatRai& Sons, Delhi.
11. P. Narayana, Engineering Metrlogy, Scitech Publication, -2nd Edition.
12. P. Narayana et.al, Metal working & Metrology, Scitech Publication.
13. D.H. Besterfield, Quality control, Pearson education, 7th Edition.
14. Juran's Quality Control Handbook.
15. I.S. 919/1963.
16. I.S. 2709/1964.

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5. HEAT AND MASS TRANSFER

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

Examination Scheme:
Theory Paper: 100 marks (3 hrs. duration)
Term Work: 25 marks
Practical and oral: 25 marks

COURSE LEARNING OUTCOMES: After completion of the course, the student shall be able to,

1. Understand the basic modes of heat transfer.
2. Compute temperature distribution in steady state and unsteady state heat conduction.
3. Demonstrate phase-change principles and analyze for the performance of heat exchangers.
4. Solve radiation heat transfer problems.
5. Interpret and analyze forced and free convection heat transfer.

1 Conduction 8

Basic Concepts – Mechanism of Heat Transfer – Conduction, Convection and Radiation – Fourier Law of Conduction, General Differential equation of Heat Conduction in Cartesian and Cylindrical Coordinates, spherical coordinate system, One Dimensional Steady State Heat Conduction – Conduction through Plane Wall, Cylinders and Spherical systems – Composite Systems – Conduction with Internal Heat Generation – Heat conduction problems with variable thermal conductivity, critical radius of insulation

2 Extended surfaces 6

Extended Surfaces – classification –Straight fin of uniform cross section, fin efficiency, fin effectiveness, applications. Unsteady state heat conduction – Negligible internal thermal resistance, negligible surface resistance, lumped heat capacity method.

3 Convection 6

Basic Concepts – Convective Heat Transfer Coefficients –velocity and thermal boundary layer, Forced Convection – External Flow – Flow over Plates, Cylinders Spheres and Bank of tubes – Internal Flow – Free Convection – Flow over Vertical Plate, Horizontal Plate, Inclined Plate, Cylinders and Spheres, Dimensional analysis for natural and forced convection.

4 Radiation **4**

Basic Concepts, Laws of Radiation – Wiens Displacement Law - Stefan Boltzman Law, Kirchoff Law – Black Body Radiation – Grey body radiation - Shape Factor – Electrical Analogy – Radiation Shields.

5 Heat Exchangers 6

Definition, basic principle of working of heat exchanger, classification, overall heat transfer coefficient and fouling, heat exchanger analysis- LMTD, Effectiveness-NTU method, Chart solution procedures for solving heat exchanger problems. Heat exchanger applications pertaining to Automobiles. Heat Pipe - component and working principle.

6 Mass Transfer

Basic Concepts – Diffusion Mass Transfer – Fick's Law of Diffusion – Steady state Molecular Diffusion – Convective Mass Transfer – Momentum, Heat and Mass Transfer Analogy – Convective Mass Transfer Correlations. **6**

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Termwork: (Any Ten)

1) Determination of thermal conductivity of insulating powder.
2) Determination of thermal conductivity of metal rod at different temperatures.
3) Determination of natural convection heat transfer coefficient for a vertical cylinder.
4) Determination of forced convection heat transfer coefficient in internal pipe flow.
5) Determination of emissivity of given test plate
6) Determination of Stefan Boltzmann constant.
7) Determination of fin efficiency and effectiveness.
8) Boiling and Condensation Heat Transfer.
9) Trial on parallel and counter flow heat exchanger.
10) Experiment on unsteady state heat transfer.
11) Assignment on any two above experiments using C programme.

Recommended Books:

1. Welty, Wicks, Wilson and Rorrer, Fundamentals of Momentum Heat and Mass Transfer, Wily Student Edition, 5th Edition.
2. C. Gururaja Rao, 2006, A Text book on Heat Transfer, Hi-Tech Publishers, Hyderabad, First Edition.
3. Yunus.A.Cengel, Heat Transfer, Tata McGraw Hill publishing company Ltd., New Delhi, Second Edition.
4. Dr. S. P. Sukhatme, 2004,A Text Book on Heat Transfer, Universities Press (India) Pvt. Ltd., Hyderabad, Third Reprint.
5. J. P. Holman, 2005, Heat Transfer, Tata McGraw Hill publishing Company Ltd, New Delhi, Ninth Edition.
6. A. J. Chapman, Heat Transfer, Macmillan Publishing Company, New York.
7. F. P. Incropera and D. P., 2005, Dewittt, Fundamentals of Heat and Mass Transfer, John Willey and sons, New York, fifth edition.
8. S.C. Arora and S.Domkundwar, 1993, A Course in Heat and Mass Transfer, Dhanpat Rai and Sons, New Delhi,.
9. R. C. Sachdeva, 2008, Fundamentals of Engineering Heat and Mass Transfer, New age International publishers, New Delhi, Third Edition.
10. R. K. Rajput, Heat and Mass Transfer, S. Chand & Company Ltd., New Delhi.
11. P. K. Nag, 2005, Heat Transfer, Tata McGraw hill Publishing Company Ltd., New Delhi, Fifth Reprint.
12. P. S. Ghoshdastidar, 2005, Heat Transfer, Oxford University Press, New Delhi, Second Impression.

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6. INDUSTRIAL ORGANIZATION AND ENGINEERING ECONOMICS

Teaching Scheme:
Lectures: 3 hrs/week

Examination Scheme:
Theory Paper: 100 marks (3 hrs. duration)

COURSE LEARNING OUTCOMES: After completion of the course, the student shall be able to:

- State the concept of business environment and social responsibility
- Summarize various functions of management like planning, organizing, staffing, leading etc.
- Explain basic economic terms and different methods for cost accounting analysis.
- Describe financial management and marketing.
- Explain production, material management, industrial safety and concept of entrepreneurship.

1. Business Environment and Functions of Management **09**

Environmental factors influencing business, external environment, General environment, Task environment, business ethics and social responsibility of business, Effect of Globalization.

Planning-Steps, Decision Making, Forecasting.

Organizing- Type Of Organization, authority, responsibility, Delegation, span of control,

Staffing-Recruitment procedure ,training, performance appraisal

Leading- leadership styles, Qualities required, Motivational theories, factors required for smart communications

Controlling- steps in controlling

2. Engineering Economics **05**

Introduction to basic economics terms such as demand and supply, Introduction, Time value of money, cash flows, Concept of GDP -impact on business, depreciation, Types of depreciation, reasons for depreciation, Methods of computing depreciation, sinking fund method, Declining balance method, Investment decisions for capital assets, evaluation criteria for Investment decisions, Payback period, average rate of return. Benefit cost ratio (BCR), cost accounting.

3. Financial Management **04**

Sources of Finance, financial statements, Balance sheet and P & L Account, Break even Analysis and its applications, accounting ratios, Cost and cost control, classification of cost - Direct cost, Indirect cost, overheads, cost estimation of processes, principles of taxation , cost control and cost reduction, industrial insurances-life, fire, machinery.

4. Production Management **05**

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.

5. Materials Management **05**

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 selection, vendor rating, Make or buy decisions, Inventory Control - ABC Analysis, EOQ, and Inventory cost relationships.

6. Marketing, Industrial Acts and Safety, Entrepreneurship and small scale industry **08**

Marketing Concepts – Objective –Types of markets, Market Segmentation, Market strategy- 4 AP's of market, Market Research, Salesmanship, Advertising.

Industrial safety-Important provisions & rules of Indian Factories Act, Reasons for accidents, prevention of accidents, Promotion of safety mindness.

Entrepreneurship-Concept of an entrepreneurship, Qualities required to become entrepreneurs, Definition of small scale industry, Procedure to start small scale industry, assistance & incentives to SSI, Feasibility report writing.

Recommended Books:

1. James A.F. Stoner, R. Edward Freeman, Management –Prentice Hall of India, New Delhi.
2. Gene Burton and Manab, Thakur, Management, Today – Principles and Practice – Tata McGraw Hill Publishing Company, New Delhi.
3. Human Behavior at Work Organizational Behavior – Keith Davis, Tata McGraw Hill Publishing Company, New Delhi.
4. Business Management – J.P.Bose, S. Talukdar, New Central Agencies (P) Ltd.,
5. Industrial Organization & Management - M. T. Telsang – S. Chand
6. Industrial Organization & Engineering Economics – T. R. Banga/S.C Sharma – Khanna Publishers
7. Industrial Engineering & Management – O.P. Khanna, Dhanpat Rai & Sons, New Delhi
8. Industrial Engineering & Production Management – M. T. Telsang – S. Chand
9. Marketing Management – Philip Kotler, Prentice Hall of India New Delhi.
10. Managerial Economics – Mote & Paul, Tata McGraw Hill
11. Financial Management – Prasanna Chandra, Tata McGraw Hill, 6th Edition
12. Costing & cost control – Jawahar Lal, Tata McGraw Hill
13. Engineering Economics by E.Paul Degermo.
13. Engineering Economics by James L. Riggs.

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7. PROFESSIONAL SKILLS – II

Teaching Scheme:
Practical: 2 hrs/week

Examination Scheme:
Term Work: 25 marks

COURSE LEARNING OUTCOMES: After completion of the course, the student shall be able to:

1. Possess Good communication skills.
2. Form network between the students and other community
3. Apply Corporate ethics
4. Conduct assembly meeting and documentation.

List of Assignments

1. Report Writing (Synopsis or the first draft of the Report)
2. Technical Proposal (Group activity, document of the proposal)
3. Interpersonal Skills (Group activity and Role play)
4. Interpersonal Skills (Documentation in the form of soft copy or hard copy)
5. Meetings and Documentation (Notice, Agenda, Minutes of Mock Meetings)
6. Corporate ethics and etiquettes (Case study, Role play)
7. Cover Letter and Resume
8. Right to information act 2005
9. Apprentice training act 1961
10. Interlinked skills-personal-social-professional

References

1. Fred Luthans, "*Organisational Behavior"* , Mc Graw Hill, edition
2. Lesiker and Petit, "*Report Writing for Business"* , Mc Graw Hill, edition
3. Huckin and Olsen, "*Technical Writing and Professional Communication"*, McGraw Hill
4. Wallace and Masters, "*Personal Development for Life and Work"* , Thomson Learning, 12th edition.
5. Heta Murphy, "*Effective Business Communication"* , Mc Graw Hill, edition.
6. R.C Sharma and Krishna Mohan, "*Business Correspondence and Report Writing"*.
7. B N Ghosh, "*Managing Soft Skills for Personality Development*", Tata McGraw Hill. Lehman.
8. Dufrene, Sinha, "*BCOM*", Cengage Learning, 2nd edition
9. Bell Smith, "Management Communication" Wiley India Edition,3rd edition.
10. Dr. K. Alex , "Soft Skills", S. Chand and Company.
11. R. Subramaniam, 2013, "Professional Ethics" Oxford University Press. =

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1. I. C. ENGINE

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

Examination Scheme:
Theory Paper: 100 marks (3 hrs. duration)
Term Work: 25 marks
Oral: 25 marks

COURSE LEARNING OUTCOMES: After completion of the course, the student shall be able to:

- Explain the constructional and working principles of SI and CI engine.
- Comprehend various modern technologies of fuel systems.
- Describe the concept of SI and CI engine combustion in microscopic level.
- Illustrate factors affecting design of combustion chambers.
- Illustrate the methods of turbo charging and super charging in addition to engine performance and combustion measurement.
- Differentiate the types of cooling system and lubrication systems employed in IC engines

1. Construction and Operation: 6

Constructional details of spark ignition (SI) and compression ignition (CI) engines. Working principles. Two stroke SI and CI engines – construction and working. Comparison of SI and CI engines and four stroke and two stroke engines. Engine classification, firing order. Otto, diesel and dual cycles.

2. Fuel Systems: 6

Air fuel ratio requirements of SI engines, Air fuel ratio and emissions, Working of a simple fixed venturi carburetor, Complete carburetor. Diesel fuel injection systems, Jerk pumps, distributor pumps, types of nozzles, Injection pumps calibration. Need for a governor for diesel engines. Description of a simple diesel engine governor.

3. Combustion and Combustion Chambers: 6

Introduction to combustion in SI and diesel engines and stages of combustion. Dependence of ignition timing on load and speed. Knock in SI and CI engines. Combustion chambers for SI and CI engines. Direct and indirect injection combustion chambers for CI engines. Importance of Swirl, squish and turbulence. Factors controlling Combustion chamber design.

4. Cooling and Lubrication Systems: 6

Need for cooling, types of cooling systems- air and liquid cooling systems. Thermo syphon and forced circulation, cooling with thermostatic regulator and pressurized cooling systems, Radiators. Properties of coolants. Requirements of lubrication systems. Types-mist, dry and wet sump systems. Types of wet sump lubrication, Properties of lubricants.

5. Induction and Exhaust System: 6

Air intake system, volumetric efficiency on engine power, filters & manifolds, need & methods of supercharging, types of superchargers, limitations, need & methods of turbocharging, effect of turbocharging on engine performance. Scavenging of two stroke and four stroke engines, methods, scavenging efficiency, types of mufflers.

6. Engine Performance: 6

Performance parameters and its measurement- BP, FP, IP, bsfc, Engine efficiencies, Performance characteristics, Heat balance, IS codes of engine testing.

Termwork: (Any Ten)

1. Construction details of I.C. engine.
2. Demonstration & plotting valve timing and port timing diagram
3. Demonstration on ignition systems
4. Demonstration of fuel feed pumps
5. Demonstration on complete carburetor (Solex/SU/Carter-with compensating devices and additional systems)
6. Demonstration of fuel injection pump, injector and governor.
7. Demonstration of MPFI & CRDI.
8. Demonstration of lubrication system.
9. Demonstration on cooling system
10. Demonstration on intake and exhaust system.
11. Demonstration of supercharging and turbocharging.
12. Study and demonstration of engine starting system

References:

1. V. Ganeshan, I.C. Engine, 3rd Edition, Tata McGraw Hill
2. V. L.Maleev, I. C. Engine, McGraw Hill Book Co. Ltd., New Delhi, Second Edition
4. E. F. Obert, I.C. Engine & Air Pollution, Harper & Row Publishers, New York.
5. Mathur & Sharma, I. C. Engine, Dhanpat Rai & Sons, New Delhi.
6. Heywood J.B., I. C. Engine Fundamentals, Mc Graw Hill Book Co., New Delhi.

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T.E. (Automobile) Semester VI (Revised)

2. VEHICLE BODY ENGINEERING

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

Examination Scheme:
Theory Paper: 100 marks (3 hrs. duration)
Term Work: 25 marks

COURSE LEARNING OUTCOMES: After completion of the course, the student shall be able to:

- Explain the concept of car body design, passenger safety, crumple zone and crash testing.
- Identify the concepts of wind tunnel testing and vehicle body optimization techniques to reduce drag.
- Demonstrate the various types of bus body construction, seating layout, regulations and comfort.
- Correlate the various heavy vehicle bodies, driver's visibility and cabin design.
- Distinguish the different types of materials and painting techniques for vehicle body

1. Vehicle Aerodynamics

Importance of Aerodynamics, Vehicle drag and types; various types of forces and moments, effects of forces and moments. Side wind effects on forces and moments, Various body optimization techniques for minimum drag, problems on drag and forces. Wind tunnel testing: flow visualization techniques, scale model testing, component balance to measure forces and moments. — 6

2. Car Body

Different types of car bodies, Visibility: regulations, driver's visibility, methods of improving visibility, safety design, constructional details of roof, under floor, bonnet, importance of bumper. seat belts, air bags used in automobile, impact protection from steering — 6

3. Bus Body

Different types of bus bodies. Ordinary bus and luxury bus bodies and its layouts. Floor height, engine location- Entrance and exit location, emergency door location, luggage space location, passenger comfort, Constructional details, frame construction, Double skin construction, Types of metal section used, regulations, Conventional and integral type constructional. — 6

4. Commercial Vehicle Body

Types of body; flat platform, drop side, fixed side, tipper body, tanker body, Light commercial vehicle body types. Dimensions of driver's seat relation to controls. Drivers cab design. — 7

5. Body Materials, Loads and Stress Analysis

Steel sheet, timber, plastic, GRP, properties of materials. Corrosion, anticorrosion methods. Denting, Selection of paint and painting process.
Idealized structure- Structural surface-Shear panel method-Symmetric and Asymmetrical vertical loads in a car- Longitudinal loads- Different loading situations-Load distribution on vehicle structure- Stress analysis of bus body structure under bending and torsion-Stress analysis in integral bus body. Analysis of shock and impulse. — 7

6. Ergonomics

Importance of ergonomics in automobile, anthropometry, driver seat design with relation to control. Different types of seats used in automobile. 4

Termwork :

1. Calculation of aerodynamic forces and pitching, rolling, yawing moments
2. Study / Measurement of drag, lift force of a scaled model in wind tunnel.
3. Study of typical Car - body construction with sketches.
4. To study and prepare layouts of ordinary passenger bus.
5. To study and prepare layout of luxury coach.
6. To study seats used in automobile, its requirement and construction.
7. To study the construction of typical truck body and draw sketches.
8. To demonstrate constructional and operational features of power window.
9. To prepare the analysis of vehicle body weight and weight distribution.
10. To study the ergonomics of human beings, driver's seat position, size and construction.

References:

1 Powloski, J., 1989, Vehicle Body Engineering, Business Ltd.

2 John, Fenton, 2011, Vehicle Body Layout and Analysis, Mechanical Engineering Publications, Ltd., London.

3 Sydney F. Page, Body Engineering, Chapman & Hill Ltd., London, 3rd Edition.

4 Wolf-Heinrich Hucho, Aerodynamics of Road Vehicles, Published by SAE International, USA.

5 John Fenton, Handbook of Automotive Body Construction and Design Analysis, Professional Engineering Publishing.

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T.E. (Automobile) Semester VI (Revised)

3. AUTOMOTIVE TRANSMISSION

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

Examination Scheme:
Theory Paper: 100 marks (3 hrs. duration)
Term Work: 25 marks
Oral: 25 marks

COURSE LEARNING OUTCOMES: After completion of the course, the student shall be able to:

- Generate the concept of gear motions, drive line positions.
- List the different types of gearboxes and clutches.
- Explain the multi stage and polyphase torque converters, performance characteristics
- Illustrate Automatic transmission
- Describe the different drive systems.

1. Clutches and Gearbox 7

Gear Box: method of calculation of gear ratios for vehicles, performance characteristics in different speeds, different types of gear boxes, speed synchronizing devices, gear materials, lubrication.

Fluid coupling: advantages and limitations, construction details, torque capacity, slip in fluid coupling, Means used to reduce drag torque in fluid coupling.

2. Hydrodynamics Drive All spur and internal gear type planetary gearboxes, Ford T-model, Cotal and Wilson Gear box, determination of gear ratios, automatic overdrives. 5

3. Torque converters 6

Principal of torque conversion, single, multi stage and polyphase torque converters, performance characteristics, constructional and operational details of typical hydraulic transmission drives (e.g.) Leyland, White Hydro torque drives.

4. Automatic transmission 7

Automatic transmission: relative merits and demerits when compared to conventional transmission, automatic control of gears, study of typical automatic transmissions, Ford and Chevrolet drive, and automatic control of gear box.

5. Hydrostatic drives 6

Hydrostatic drives: advantages and disadvantages, principles of hydrostatic drive systems, construction and working of typical hydrostatic drives, Janney Hydrostatic drive.

6 Electric drive 5

Electrical drives: advantages and limitations, principles of Ward Leonard system of control Modern electric drive for buses and performance characteristics.

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Term Work: (Any Ten)

1. Demonstration, study and sketching of different vehicle layouts and its comparison
2. Demonstration, study and prepare dimensional sketch of single plate clutch
3. Demonstration, study and prepare dimensional sketch of centrifugal clutch.
4. Demonstration, study and prepare dimensional sketch of multi-plate clutch
5. Demonstration, study and prepare dimensional sketch of diaphragm clutch
6. Demonstration, study and prepare dimensional sketch of constant mesh gear box
7. Demonstration, study and prepare dimensional sketch of synchromesh gear box
8. Demonstration, study and prepare dimensional sketch of Continuous variable transmission unit (CVT)
9. Demonstration, study and prepare dimensional sketch of differential and final drive
10. Demonstration and study of fluid flywheel & torque converters
11. Demonstration and study of semi-automatic transmission
12. Demonstration and study of automatic transmission

Recommended Books:

1. Newton, Steed & Garrot, Motor Vehicles, 13th Edition, Butterworths London.
2. Judge A. W., 1989, Modern Transmission, Chapman & Hall Std.,
3. Chek Chart, Automatic Transmission, A Harper & Raw Publications.
4. Giles J. G., Steering, Suspension & Tyres, Lliffe Book Ltd., London.
5. Steed W., Mechanics of Road Vehicles, Lliffe Book Ltd.
6. N K Giri, Automotive Mechanics, Khanna Publishers, Delhi, Eighth Edition.
7. Heisler, Vehicle and Engine Technology, SAE International Publication, Second Edition.
8. Heisler, Advanced Vehicle Technology, SAE International Publication, Second Edition

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4. MACHINE DESIGN

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

Examination Scheme:
Theory Paper: 100 marks (3 hrs. duration)
Term Work: 25 marks

COURSE LEARNING OUTCOMES: After completion of the course, the student shall be able to:

- Explain aesthetic and ergonomics to design machine components.
- Design shafts and couplings for specific requirements.
- Design against static Loads for specific requirements.
- Design against Fluctuating Loads for specific requirements.
- Design different machine components.
- Design and selection of standard components for specific requirements.

1. Introduction to Mechanical Engineering Design: Design methods, Aesthetic and Ergonomics consideration in design, Material properties and their uses in design, Manufacturing consideration in design, Design considerations of casting and forging, Basic principles of Machine Design, Modes of failures, Factor of safety, Design stresses, Principal stresses and strains, Theories of failures, Standards, I. S. codes, Preferred Series and Numbers. 6

2. Design of Shafts, Keys and Couplings: 6
Design of shafts for torsion, bending, combined loading and rigidity. Design of keys and splines, Design of muff and flange couplings

3. Design against static Loads: 6
Bolted and welded joints under eccentric loading.
Power Screw - Screw Presses, C- Clamps along with the Frame, Screw Jack

4. Design of Gears: 7
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, Incremental dynamic tooth load, Effective load on gear tooth, Estimation of module based on beam strength and wear strength, Spur gear design for maximum power transmission.
Helical Gears: Virtual number of teeth, Tooth proportions, Force analysis, Beam strength and Wear strength of helical gears, Effective load on gear tooth, Herringbone Gear.
Bevel Gears: Types, Terminology of bevel gears, Force analysis, Beam strength and Wear strength of bevel gears, Effective load on gear tooth, Spiral bevel gears.
Worm Gears: Terminology, Force analysis, Friction in worm gears, Vector method, Strength rating and wear rating of worm gears, Thermal considerations.

5. Design of Springs 5
Helical compression, tension springs under static and variable loads, Leaf springs.

6. Design and selection of standard components: 6
Design of flat pulleys, wire ropes, Selection of flat belts, V belts, chains, electric motors, oil seals and gaskets

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Termwork:

1. Exercise on engineering material selection
2. (Students are required to prepare a chart/table on A3 size sheet which will comprise of various engineering materials, composition, properties for given applications)
3. Design and drawing of welded and bolted joints subjected to eccentric loading
4. Design of Shaft
5. Design and drawing of rigid or flexible coupling
6. Design and Drawing of screw jack
7. Design against Fluctuating Loads
8. Design of helical compression spring
9. Design of leaf spring
10. Selection of standard components like belts, chains, electric motors for given application.

References

1. Robert C. Juvinall and Marshek, Machine Component Design, Wiley Student Edition, Wiley 5th Edition.
2. V. B. Bhandari, Design of machine elements,Tara Mc-Graw Hill Pub.
3. Sharma & Purohit, Design of machine elements, Prentice Hall India Pub.
4. Robert L. Norton, Machine Design - An Integrated Approach Pearson Education.
5. Pandya & Shah, Machine Design Charotar PI/blishing.
6. J. E. Shigley, Mechanical Engineering Design, McGraw Hill
7. K. Mahadevan, Recommended Data Books - PSG
8. Reshetov, Machine Design, Mir Publication
9. Black Adams. Machine Design, McGraw Hill
10. Hawrock & Jacobson, Fundamentals of Machine Elements - Mcgraw Hill
11. Patel, Pandya, Sikh, Machine Design - Vol. - I & II, C. Jamnadas & Co. Educational & Law Publishers

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T.E. (Automobile) Semester VI (Revised)

5. AUTOMOTIVE REFRIGERATION AND AIR CONDITIONING

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

Examination Scheme:
Theory Paper: 100 marks (3 hrs. duration)
Term Work: 25 marks

COURSE LEARNING OUTCOMES: After completion of the course, the student shall be able to:

- Revise the fundamentals of applied thermodynamics and explain its application to refrigeration and air conditioning.
- Analyze and distinguish the various systems and processes in refrigeration and air conditioning,
- Compare important thermodynamic and environmental properties influencing refrigerant selection for various applications.
- Select the refrigeration equipments for refrigeration and air conditioning system,

1 Refrigeration **7**

Principles of refrigeration, Performance parameters, Types of refrigeration systems, Study of simple Vapor compression refrigeration system, and System components, effects of sub cooling, superheating, liquid t liquid & liquid to vapor heat exchangers on system performance. Calculation of performance of Vapor compression system, Applications of refrigeration.

2 Refrigerants **5**

Definition, desired properties like thermodynamic, chemical & physical and classification. Selection of refrigerants, Effect on ozone depletion and global warming, introduction to alternative refrigerants.

3 Transport Refrigeration **6**

Need, Introduction to food preservation, Types of transport refrigeration systems constructional details and merits and demerits, applications of individual systems. Need of defrosting.

4 Psychrometry: **7**

Psychrometric properties of air, Use of Psychrometric charts & tables, Representation of psychrometric processes on the chart such as heating and Cooling with humidification and dehumidification, adiabatic dehumidification, chemical dehumidification and mixing processes. Calculations of various moist air properties.

5 Comfort – **4**

Thermal exchange between human body and environment, factors affecting comfort, effective temperature, comfort chart, ventilation requirements, outside and inside design conditions

6 Air conditioner-Heating Systems **7**

Factors contributing the Cooling/ Heating in automobiles (car/bus). Concept of bypass factor, Sensible heat factor, Apparatus Dew Point, Room Sensible Heat Factor (RSHF), Gross Sensible Heat Factor (GSHF), Problems on design of A/C systems: All fresh air,

Re-circulated air with bypassed air, Design of Summer, Winter and Year round air conditioning systems

Term work: (1 to 6 compulsory , any four from 7 to 11)

1. Study of various methods of transport refrigeration systems
2. Study components and layout of car & bus air conditioning systems.
3. Study of compressors used in automotive refrigeration and A/C systems
4. Study of condensers & Evaporators used in automotive refrigeration and A/C systems
5. Study of expansion valves used in automotive refrigeration and A/C systems
6. Study and demonstration of various controls in refrigeration.
7. Trial on refrigeration bench
8. Trial on air conditioning system.
9. Study and demonstration of a/c charging methods
10. Study and trial on vapor absorption system.
11. Study of defrosting methods
12. Industrial visit to refrigeration or A/C plant (Optional)

References

1. McQuiston, Parker and Spitler, *Heating, Ventitating and Air Conditioning, Analysis and Design*, Wiley Student Edition, Wiley 6th Edition.
2. Stoecker, W.F., *Refrigeration & Air conditioning*, McGraw Hill, New York, 2nd edition, 2009.
3. Dossat, R.J., *Refrigeration & Air conditioning*, Prentice hall, 4th edition, 2010
4. Arora, C.P., *Refrigeration & Air conditioning*, McGraw Hill, 2nd edition 2013.
5. Noman C. Harris, *Modern Air conditioning Practice,* McGraw-Hill, 2nd edition 2008.
6. William,H., Crouse, Donald, L., Anglin, *Automotive Air Conditioning*, McGraw Hill, 2012.
7. Tom, Birch, *Automotive Heating and Air Conditioning*, Prentice Hall, 2010.
8. Mitchel Information Services, Inc., Mitchell, *Automatic Heating and Air Conditioning Systems*, Prentice Hall, Inc., 2010.
9. Paul Weisler, *Automotive Air Conditioning*, Reston Publishing Co., Inc., 1990.

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6. CAD/CAM LAB

Teaching Scheme:
Practical: 2 hrs/week

Examination Scheme:
Term Work: 50 marks
Practical and oral: 25 marks

COURSE LEARNING OUTCOMES: After completion of the course, the student shall be able to:

- Explain use of CAD/CAM
- Prepare any 3D assembly by using any 3D modeling software
- Develop part programming for simple operations
- Explain various advanced methods of metal cutting

List of Experiments:

1. CAD/CAM definition, its significance in product cycle and automation, Hardware requirements for CAD System.
2. Prepare any 3D components (mechanical/automobile minimum five) by using 3D modeling software.
3. Prepare assembly of selected component by using any 3D modeling software.
4. Introduction to part programming, G and M Codes, Subroutines, Canned cycles.
5. Develop part programs for plain turning and facing.
6. Develop part programs for taper and profile turning.
7. Develop part programs for thread cutting.
8. Develop part programs for plain and key way milling.
9. Develop part programs for pocket milling.
10. Simulate and Perform any one job by using CAM software.

Recommended Books:

1. M.P.Grover. and E.W.Zimmer, CAD/CAM, Prentice Hall of India Pvt. Ltd., New Delhi
2. Tien-Chien Chang, Richard A., Computer Aided Manufacturing/ Wysk and Hsu-Pin Wang/Pearson/ 2009
3. Krishnamorthy & Rajeev, Computer Aided Design Narosa Publishing House.
4. Zeid,CAD/CAM Theory and Practice, Tata McGraw Hill, New Delhi
5. V.B.Bhandari, Design of Machine Element Tata McGraw Hill, New Delhi
6. P. RadhaKrishna & S. Subramanyan, CAD/CAM/CIM New age International (P) Ltd. Publishing
7. Pabla B.S., CNC Machine, Wiley Eastern Ltd., Bombay
8.P.N.Rao,CAD/CAM,TATA McGraw Hill Education PVT Ltd., NewDelhi

Note: For simulation use any one CNC simulation software

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T.E. (Automobile) Semester VI (Revised)

7. SEMINAR

Teaching Scheme:
Practical: 2 hrs/week

Examination Scheme:
Term Work: 50 marks

COURSE LEARNING OUTCOMES: After completion of the course, the student shall be able to:

- Identify and compare technical and practical issues related to cause-and-effect of specific phenomena related to the area of course specialization.
- Outline annotated bibliography of research with clearly identified research question demonstrating scholarly skills, technical writing and correct source citation format.
- Prepare a well organized report employing elements of good writing and critical thinking
- Demonstrate the ability to describe, interpret and analyze technical issues from historical and contemporary perspectives and develop competence in writing, speaking and presenting.

Topic:-

Any topic of Automobile/Mechanical engineering application may be a seminar topic. The seminar may be based on proposed project work also.

Seminar Load:-

Maximum 9-10 students in one batch, Maximum 9-10students shall work under one Faculty Member Group of one student is not allowed under any circumstances

Seminar Term :

Seminar report should be of 25 to 35 pages. For standardization of the seminar reports the following format should be strictly followed.

1 Page size : Trimmed A4
2. Top Margin : 1.00 Inches
3. Bottom Margin : 1.32 Inches
4. Left Margin : 1.5 Inches
5. Right Margin : 1.0 Inches
6. Para Text : Font - Times New Roman; 12 point
7. Line Spacing : 1.5 Lines
8. Page Numbers: Right aligned and in footer.
Font Times New Roman; 12 point
9.Headings : New Times Roman, 14 point, Boldface
10. Certificate : All students should attach standard format

The entire seminar should be documented as one chapter. References should have the following format

For Books:
1. “Title of Book”; Authors; Publisher; Edition;

For Papers:
1. “Title of Paper”; Authors; Conference Details; Year.

Marks
1. Seminar Report: 25
2. Presentation: 25

All students have to present their seminars individually in front of the faculties.

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Equivalence for T.E.

(To be implemented from Academic year 2015-16)

Automobile Engineering Course

Semester- V

Name of the Subject in Old Syllabus		Equivalent Subject for Examination from 2015-16	
1.	Dynamics of Machines	**1.**	Dynamics of Machines
2.	Heat & Mass Transfer	**2.**	Heat and Mass Transfer
3.	Principles of Design & Component Design	**3.**	Machine Design (Sem-VI)
4.	Metrology & Quality Control	**4.**	Metrology and Quality Control
5.	Automotive Transmission	**5.**	Automotive Transmission (Sem-VI)
6.	Garage Training Evaluation	**6.**	----
7.	Vehicle Maintenance Laboratory – I	**7.**	Vehicle Maintenance (Sem- VII)
8.	Advanced Welding & CNC Machine Shop	**8.**	CAD/CAM Lab (Sem-VI)

Semester – VI

Name of the Subject in Old Syllabus		Equivalent Subject for Examination from 2015-16	
1.	Automotive Component Manufacturing	**1.**	----
2.	Industrial Organization & Management	**2.**	Industrial organization and Engineering Economics (Sem-V)
3.	I. C. Engines	**3.**	I.C. Engine
4.	Automotive Chassis	**4.**	Automotive Chassis (Sem-V)
5.	Vehicle Body Engineering	**5.**	Vehicle Body Engineering
6.	Hydraulics & Pneumatics	**6.**	Hydraulics and Pneumatics (Sem-V)
7.	Vehicle Maintenance Laboratory II	**7.**	Vehicle Maintenance (Sem- VII)
8.	Mini Project on Modeling and or Design & seminar on project	**8.**	Seminar