

Syllabi ODD SEMESTER

Annexure-I

V Semester Syllabi – Automobile Engineering

Sr. No.	Course Code	Course Name	L	T	P	Credits
1.	AU3CO11	Automotive Chassis Systems	4	0	2	5
2.	AU3CO12	Automotive Component Drawing	4	0	2	5
3.	AU3CO13	Machine Design-II	3	0	2	4
4.		Program Elective -01	3	0	0	3
5.		Program Elective -02	3	0	0	3
6.	EN3MC02	Technical English	2	0	0	0
7.	EN3MC04	Human Values & Ethics	2	0	0	0
8.		Open Elective - 01	3	0	0	3
		Total	24	0	6	23
		Total Contact Hours	30			

Program Electives

AU3EL02	Automotive Safety Systems
AU3EL04	Finite Element Methods
AU3EL07	Measurement & Instrumentation

Open Electives

OE00001	Statistical Signal Processing
OE00002	Neural Networks and Fuzzy Systems
OE00003	Industrial Electronics
OE00004	Electronics Engineering Materials
OE00005	Digital Electronics
OE00006	Basics of Entrepreneurship
OE00007	Mechanical Estimation and Costing
OE00008	Fundamentals of Service Marketing
OE00013	Photovoltaic System

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Course Code	Course Name	Hours per Week			Total
		L	T	P	Credits
AU3CO11	Automotive Chassis Systems	4	0	2	5

UNIT I

Introduction: Definition of Chassis, Types of Chassis layout, with reference to Power Plant location and drive, various types of frames, Loads acting on vehicle frame, Constructional details and materials for frames, Testing of frames.

UNIT II

Steering System: Types of Front Axles and Stub Axles, Front Wheel Geometry, namely, Castor, Camber, King Pin Inclination and Toe-in, Condition for True Rolling Motion of Wheels during Steering, Steering Linkages, Different Types of Steering Gears, Slip Angle, Over-Steer and Under-Steer, Reversible and Irreversible Steering, Power-Assisted Steering.

UNIT III

Axles, Wheels and Tire: Construction and Design of Drive Axles, Types of Loads acting on drive axles, Full – Floating, Three-Quarter Floating and Semi-Floating Axles, Axle Housings and Types, Types and Constructional Details of Different Types of Wheels and Rims, Different Types of Tires and their constructional details.

UNIT IV

Suspension System: Need for Suspension System, Types of Suspension Springs, Constructional details and characteristics of Single Leaf, Multi-Leaf, Coil, Torsion bar, Rubber, Pneumatic and Hydro-elastic Suspension Spring Systems, Independent Suspension System, Shock Absorbers.

UNIT V

Braking System: Theory of Automobile Braking, Stopping Distance Time and Braking Efficiency, Effect of Weight Transfer during Braking, Theory of Drum Brakes, Leading and Trailing Shoes, Braking Torque, Constructional Details of Drum Brake and its Activators, Disc Brake, Hydraulic Braking System, Mechanical Braking System, Pneumatic Braking System, Power-Assisted Braking System, Servo Brakes, Retarders, Anti-Lock Braking System.

Text Books

1. Kirpal Singh, Automobile Engineering, Standard Publishers Distributors
2. R.K. Rajput, A Text-Book of Automobile Engineering, Laxmi Publications Private Limited
3. N.K. Giri, Automotive Mechanics, Khanna Publishers.

References Books

1. Newton Steeds and Garrot, Motor Vehicles, Butterworths
2. A.W. Judge, Mechanism of the Car, Chapman and Halls Ltd.
3. J.G. Giles, Steering, Suspension and tyres, Iiffe Book Co.

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Course Code	Course Name	Hours per Week			Total
		L	T	P	Credits
AU3CO12	Automotive Component Drawing	4	0	2	5

UNIT I

Conventional representation of surface finish, Roughness number symbol, Symbols of Machine elements and welded joints. Limits, Fits and Tolerances: General aspects, Nominal size and basic dimensions, Definitions, Basis of fit or limit system, Designation of holes, Shafts and fits. Fasteners: Drawings of various views of Screw threads, metric and BSW threads, Square thread and multi start threads. Nut bolts, Washers, Setscrew, Locknuts and foundation bolts. Riveted joints: Forms and proportions of rivet heads, Different views of different types of riveted Lap and Butt joints.

UNIT II

Drawings of various views of Shaft joints: Cotter joint and Knuckle joint. Keys & Shaft coupling: Muff, Flanged, Flexible, Universal and Oldhams coupling. Shaft bearing: Solid and bush bearing, Plummer block, Footstep bearing. Pulley: Belt pulley, V belt pulley, Fast and loose pulley, Speed cone pulley, built up pulley.

UNIT III

Drawing of piston, piston pin and piston rings, drawing of connecting rod small end and big end, shank design, drawing of the connecting rod assembly.

UNIT IV

Drawing of crankshaft, development of short and long crank-arms, drawing of flywheel, drawing of Cam and Camshaft, drawing of the inlet and exhaust valves, drawing of engine complete assembly with cylinder block, cylinder head, crankcase, valve ports, water jackets, front and rear end details.

UNIT V

Clutch Components and assembly drawing using CAD Software, Layout of gearbox, Complete assembly drawing using CAD Software.

Text Books

1. N. D. Bhatt, Machine drawing, R.C. Patel Charotar Book Stall Tulshi Sadan, Station Road, Annad, India.
2. P.S. Gill, Machine drawing, S.K. Kataria & Sons Delhi.
3. K. C. John, Machine Drawing, Eastern EE PHI Delhi.
4. Rohit Gowan & Goutam Ghosh, Machine Drawing with AutoCAD, Pearson.

Reference Books

1. R. K. Dhawan, Machine drawing, S. Chand Pub.
2. N. Siddeshwar, Machine Drawing, TMH.
3. Ajeet Singh, Machine Drawing includes AutoCAD, TMH.
4. Engineering Drawing Practice for school and colleges, Bureau of Indian Standards.

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List of Practicals

1. Prepare a drawing sheet for Conventional representation.
2. Prepare a drawing sheet for various views of Screw threads, Nut bolts and Washers.
3. Draw assembly of Cotter joint and Knuckle joint.
4. Draw assembly of Universal and Oldhams coupling.
5. Drawing of piston, piston pin and piston rings Assembly.
6. Draw assembly of box type connecting rod.
7. Drawing of engine assembly with cylinder block & cylinder head.
8. Drawing of crankshaft.
9. Clutch Components and assembly drawing using CAD Software.
10. Complete assembly drawing of gear box using CAD Software.

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Course Code	Course Name	Hours per Week			Total
		L	T	P	Credits
AU3CO13	Machine Design-II	3	0	2	4

UNIT I

Journal Bearing: Types of lubrication, viscosity, hydrodynamic theory, design factors, temperature and viscosity considerations, Reynold's equation, stable and unstable operation, heat dissipation and thermal equilibrium, boundary lubrication, dimensionless numbers, Design of journal bearings, Rolling-element Bearings: Types of rolling contact bearing, bearing friction and power loss, bearing life; Radial, thrust & axial loads; Static & dynamic load capacities; Selection of ball and roller bearings.

UNIT II

Spur Helical and Bevel Gears: Force analysis of gear tooth, modes of failure, beam strength, Lewis equation, form factor, formative gear and virtual number of teeth; Gear materials; Surface strength and wear of teeth; strength against wear; Design of straight tooth spur and Helical Gears. Bevel Gears: Application of bevel, formative gear and virtual number of teeth; Force analysis; Lewis equation for bevel gears; Strength against wear.

UNIT III

Design of I.C. Engine Components: General design considerations in I C engines; design of cylinder; design of piston and piston-rings; design of connecting rod; design of crankshaft.

UNIT IV

Design of Brakes

Brakes: Various types of Brakes, band brakes. Self energizing condition of brakes, Design of shoe brakes Internal & external expanding.

UNIT V

Design of Clutches

Clutches: Various types of clutches in use, Design of friction clutches, Disc. Multidisc, Cone & Centrifugal, Torque transmitting capacity.

Text Books

1. J.E.Shigley, Machine Design, TMH
2. V. B.Bhandari, Design of Machine Elements, TMH
3. P.C.Sharma and D.K.Agrawal, Design of Machine Elements, S. K. Kataria & Sons Pub.

Reference Books

1. Hall, Holowenko, Laughlin, **Schaum's Outlines series**, Adapted by S. K. Somani, TMH
2. Abdul Mubeen, Machine Design, Khanna Publishers.
3. Robert L.Norton, Design Of Machinery, TMH



List of Practicals

1. Design of Journal bearing.
2. Design and drawing of Roller bearing.
3. Design and drawing of Spur Gears.
4. Design and drawing of Helical Gears.
5. Design and drawing of Bevel Gears.
6. Design and drawing of Cylinder head and Piston.
7. Design and drawing of Connecting rod/Crankshaft.
8. Design and drawing of Single plate/Multiplate clutch.
9. Design and drawing of Centrifugal Clutch.
10. Design and drawing of Shoe Brakes.

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Course Code	Course Name	Hours per Week			Total
		L	T	P	Credits
AU3EL02	Automotive Safety Systems	3	0	0	3

UNIT I

Introduction: Design of the body for safety, energy equation, engine location, deceleration of vehicle inside passenger compartment, deceleration on impact with stationary and movable obstacle, concept of crumple zone, safety sandwich construction.

UNIT II

Safety Concepts: Active safety: driving safety, conditional safety, perceptibility safety, operating safety- passive safety: exterior safety, interior safety, deformation behavior of vehicle body, speed and acceleration characteristics of passenger compartment on impact.

UNIT III

Safety Equipments: Seat belt, regulations, automatic seat belt tightener system, collapsible steering column, tiltable steering wheel, air bags, electronic system for activating air bags, bumper design for safety.

UNIT IV

Collision Warning and Avoidance: Collision warning system, causes of rear end collision, frontal object detection, rear vehicle object detection system, object detection system with braking system interactions.

UNIT V

Comfort and Convenience System: Steering and mirror adjustment, central locking system, Garage door opening system, tyre pressure control system, rain sensor system, environment information system.

Text Books

1. Bosch, Automotive Handbook, Robert Bosch publication.
2. Urich Seiffert and Lothar Wech, Automotive Safety Handbook, SAE publication.
3. George A. Peters and Barbara J. Peters, Automotive Vehicle Safety, CRC Press.

References Books

1. J. Powloski, Vehicle Body Engineering, Business books limited, London.
2. Ronald. K. Jurgen, Automotive Electronics Handbook, TMH.
3. U.Seiffert, and L.Wech, Automotive Safety Hand Book, Society of Automotive Engineers (SAE).

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Course Code	Course Name	Hours per Week			Total
		L	T	P	Credits
AU3EL04	Finite Element Methods	3	0	0	3

UNIT I

Introduction to Finite Element Method: General description of Finite Element Method, Historical development, Comparison with classical methods, General procedure of FEM. General field problems, discrete and continuous models, Variational formulation in finite elements, Ritz method, Weighted residual methods, Galerkin, sub domain, method of least squares and collocation method, numerical problems.

UNIT II

Discretization and Interpolation Function: Discretization: Geometrical approximations, Simplification through symmetry, Element shapes and behavior, Choice of element types, size and number of elements, Element shape and distortion, Location of nodes, Node and Element numbering. Interpolation Function: Simplex, Complex and Multiplex elements, Selection of interpolation polynomials, Convergence requirements, Natural coordinate systems, Derivation of shape functions for various elements, Iso-parametric elements, Numerical Integration.

UNIT III

Applications in structural: One dimensional elasticity, Castigliano's first theorem, Principle of minimum potential energy, Linear spring, Elastic bar with constant and varying cross sections using linear and quadratic elements, Truss structures and Beams.

UNIT IV

Applications in plane elasticity: Introduction to plane elasticity theory, Plane stress, Plane strain and Axisymmetric problems, Finite Element formulations of plane elasticity problems using CST and four noded quadrilateral elements only.

UNIT V

Applications in Heat Transfer and Fluid Mechanics: Finite Element formulation of One dimensional and Two-dimensional steady state heat conduction problems with convection Simplex elements only. Finite Element formulation of inviscid and incompressible flow, Potential function formulation, Stream function formulation.

Text Books

1. T.R.Chandrupatla and A.D.Belugundu, Introduction to Finite Elements in Engineering, PHI.
2. D.V. Hutton, Fundamentals of Finite Element Analysis, TMH.
3. D. L.Logan, A First Course in the Finite Element Method, Cengage Learning.

Reference Books

1. Klaus-Jurgen Bathe, Finite element procedures, PHI.
2. S.S. Rao, The Finite Element Method in Engineering, Elsevier.
3. O.C.Zienkiewicz, R.L.Taylor and J.Z. Zhu, The Finite Element Method: Its basis and fundamentals, Butterworth Heinmann.

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Course Code	Course Name	Hours per Week			Total Credits
		L	T	P	
AU3EL07	Program Elective V-1 Measurement & Instrumentation	3	0	0	3

UNIT I

General concepts of measurement: Definition, Standards of measurement, Errors in measurement, various systems of limits, fits and tolerance, ISI and ISO, Calibration; Static calibration, dynamic calibration, static sensitivity, range, accuracy and precision, Introduction to uncertainty, zero order, first order, and second order system.

Strain Measurement: Stress and strain, resistance strain gauges, gauge factor, strain gauge electrical circuits and multiple gauge bridge.

UNIT II

Force Measurement: Displacement measurement, Potentiometers, Linear variable differential transformers (LVDT), rotary variable differential transformer (RVDT)

Torque measurement: Measurement of torque on rotating shafts.

Vibration measurements: Working principle of Vibrometer and accelerometer, Frequency measurement.

UNIT III

Temperature Measurement: Measurement of temperature, liquid in glass thermometer, resistance thermometers – constructional details, resistance thermometer circuits, laws of thermocouples, pyrometers.

Pressure Measurement: Standards of pressure measurement, measurement of high pressure, measurement of low pressure – The McLeod Gauge.

Flow measurement: Pressure differential meters: Orifice meter, Venturi meter.

UNIT IV

Linear and Angular Measurements: Slip gauges, micrometres, vernier callipers, dial gauges, surface plates, comparators- mechanical, angular measuring instruments- sine bar, angle gauges, spirit level, autocollimators.

Measurement of surface finish: Surface finish- definition, terminology, types of surface texture, surface roughness measurement methods, comparison, profile-meters.

Metrology of screw threads and gears: Internal/external screw threads, terminology, measurement of various elements of threads, thread micrometre method,

Gears : terminology, measurement of various elements, constant chord method, base tangent method.

CMM – Types, constructions and measurements.

UNIT V

Transducers and data acquisition systems: Classification of transducers, selection of transducers, resistive, capacitive & inductive transducers, piezoelectric, optical and digital transducers, Elements of data acquisition system – Analog to digital (A/D) and Digital to analog (D/A) converters, Smart sensors.

Electrical and electronics instruments: Principle and types of analog and digital voltmeters, ammeters, multi-meters, Single and three phase wattmeter's and energy meters,

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Magnetic measurements, Determination of B-H curve and measurements of iron loss – Instrument transformers, Instruments for measurement of frequency and phase.

Text Books

1. J. B. Gupta, 'A Course in Electronic and Electrical Measurements', S. K. Kataria & Sons
2. R. K. Jain, Engineering Metrology, Khanna Publishers, New Delhi.
3. R.K.Rajput, Mechanical Measurement and Instrumentation, Katson Books.
4. C. Sujatha, Vibration and Acoustics, TMH

Reference Books

1. I.C. Gupta, Engineering Metrology, Danpat Rai Publications.
2. H.S. Kalsi, 'Electronic Instrumentation', TMH.
3. B. C. Nakra, K. K. Chaudhry, Instrumentation, Measurement And Analysis, TMH
4. Robert J. Hocken, Paulo H. Pereira, Coordinate Measuring Machines and Systems, CRC Press.

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Course Code	Course Name	Hours per Week			Total Credits
		L	T	P	
EN3MC02	Technical English	2	0	0	0

UNIT I

Higher grammar and Vocabulary-Idioms and phrases, Antonyms and Synonyms. Modals, Narration, Voices, Clauses,

UNIT II

Reading Skills-Three –Pass system, Comprehending passage.

UNIT III

Writing skills- Precis writing, Story writing, Report writing, Paragraph writing, Unseen prose, Letter writing, Interpretation of charts, Translation- from Indian to English and vice-versa, Writing speeches, Paraphrasing
Citing resources- Editing book and Media Review

UNIT IV

Speaking Skills- Critical Thinking: syntheses, analysis and evaluation, Oral presentation, Importance of Audio-Visual aids, Speeches, Jam.

UNIT V

Soft Skills- Team Work, Emotional Intelligence, Adaptability, Leadership and problem solving.

Text books

1. S C Sharma and Krishna Mohan Business Correspondance and Report Writing a: a practical approach to business and technical communication, TMH
2. A J Thomson & A V Martinet, A Prcatical English Grammar Fourth Edition, Oxford University Press New Delhi India.
3. Kalex, Soft Skills: Know yourself and know the world, S Chand & Company Ltd. New Delhi.

Reference Books

1. L Bovee Courtland, John V Thill and Mukesh Chaturvedi Business Communication Today Dorling Kindersley (India) Pvt. Ltd.
2. Ranjan Bhanu, Communication Skills, Dhanpat Rai & Co. (Pvt) Ltd Delhi.
3. P. C. Wren; H. Martin, High School English Grammar & Composition, S Chand & Company Ltd

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Course Code	Course Name	Hours per Week			Total Credits
		L	T	P	
EN3MC04	Human Values & Ethics	2	0	0	0

UNIT I

Human Values: Introduction, Important Human Values: Trust, Honesty, forms of Dishonesty, Courage, Integrity, Kindness, Humility, Gratitude, Hope, Perseverance, Empathy and Compassion.

Values in Engineering Profession: Safety, Risk, Accidents, Human progress; Clean, Clear, Decision Making; Community, Partnership with Nature. Commitment and Cooperation.

UNIT II

Ethics and Ethical Theories: Morality and moral systems, Introduction to Ethics, Consequentiality and Non-consequentiality theories, Hedonism, Utilitarianism, Deontological theories, Ethical Rules (with reference to W D Ross), Situation Ethics, Virtue Ethics

UNIT III

Ethics in Engineering Profession: Introduction, Historical context of ethics, Definition of Profession, Engineering and Professionalism, Professional Ethics, Engineering Ethics, Role and Responsibilities of Engineers, Working towards Safety, Sample Code of Ethics for Engineers, National Society of Professional Engineers (NSPE).

Practicing ethics as an engineering student: Plagiarism & Cheating, Academic Dishonesty and Cheating v/s Teamwork.

UNIT IV

Decisions Making: Decision Making, Characteristics of Decision Making, Advantages of Decision Making, Steps Involved in Decision Making Process.

UNIT V

Ethics in The Indian Tradition and Some Case Studies: Contribution of Moral Thinkers: Indian Moral Thinker, Western Moral Thinker. Case studies on human values and engineering ethics. Case studies on decision making in engineering ethics.

Text Books

1. Simon Blackburn, The Oxford dictionary of philosophy. Oxford University Press.
2. Anthony Weston, A 21st Century Ethical Toolbox. Oxford University Press.
3. John Hospers: An Introduction to Philosophical Analysis, Pearson

Reference Books

1. W.K Frankena, Ethics. PHI
2. LaFollette Hugh, Ethics in Practice: An Anthology. Cambridge, Blackwell.

Web Sources

1. <http://ethics.sandiego.edu/>
2. <http://www.bbc.co.uk/ethics/introduction/>
3. <http://plato.stanford.edu/>

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