Structure of Second Year Engineering (Revised)
(To be implemented from Academic year 2014-15)
Automobile Engineering
Scheme of Teaching and Examination
Semester-III

Sr.No.	Subject	Teaching Scheme (Hrs.)				Examination Scheme (Marks)				
		L	T	P	Total	Theory	T/W	OE	POE	Total
01	Engineering Mathematics III	3	1	---	4	100	25	---	---	125
02	Electrical Technology	3	---	2	5	100	25	---	---	125
03	Applied Thermodynamics	3	---	2	5	100	25	---	25	150
04	Automotive Materials and Manufacturing	3	---	2	5	100	25	---	---	125
05	Fluid Mechanics	3	---	2	5	100	25	---	---	125
06	Instrumentation Laboratory	---	---	2	2	---	25	25	---	50
07	Automotive Component Drawing	---	---	2	2	---	50	25	---	75
08	Workshop Practice-III	---	---	2	2	---	25	---	---	25
	Total	15	1	14	30	500	225	50	25	800

Semester-IV

Sr.No.	Subject	Teaching Scheme (Hrs.)				Examination Scheme(Marks)				
		L	T	P	Total	Theory	T/W	OE	POE	Total
01	Computational Methods	3	1	---	4	100	25	---	---	125
02	Kinematics of Machines	3	---	2	5	100	25	---	---	125
03	Metallurgy and Metal Treatment	3	---	2	5	100	25	---	---	125
04	Fluid Machinery	3	--	2	5	100	25	---	25 *	150
05	Strength of Materials	3	1	--	4	100	25	---	---	125
06	Computer Programming in C++	---	---	2	2	---	50	---	25	75
07	Workshop Practice-IV	---	---	2	2	---	50	---	---	50
08	Professional Skills – I	---	---	2	2	---	25	---	---	25
	Total	15	2	12	29	500	250	--	50	800

*** Oral based on Fluid Mechanics and Fluid Machinery**

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	---	---	150
03	Automotive Transmission	3	---	2	5	100	25	25*	---	125
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	50
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.

Shivaji University, Kolhapur

Structure of Final Year Engineering (Revised)

(To be implemented from Academic year 2016-17)

Automobile Engineering

Scheme of Teaching and Examination

Semester-VII

Sr.No.	Subject	Teaching Scheme (Hrs.)				Examination Scheme(Marks)				
		L	T	P	Total	Theory	T/W	OE	POE	Total
01	I.C. Engine Design	3	---	2	5	100	25	---	---	125
02	Vehicle Dynamics	3	---	2	5	100	25	---	---	125
03	Finite Element Analysis	3	---	2	5	100	25	25	---	150
04	Vehicle Maintenance	3	---	2	5	100	25	---	---	125
05	Elective-I	3	---	--	3	100	--	--	---	100
06	I.C.Engine Testing Lab	---	---	2	2	---	25	---	25	50
07	Automotive Industrial Training	--	---	---	---	---	25*	---	---	25
08	Project Phase-I	---	---	2	2	---	50	50	---	100
	Total	15	---	12	27	500	200	75	25	800

*** Assessment of Automotive Industrial Training will be carried out with Project Phase-I**

Semester-VIII

Sr.No.	Subject	Teaching Scheme (Hrs.)				Examination Scheme(Marks)				
		L	T	P	Total	Theory	T/W	OE	POE	Total
01	Alternative Fuels and Emission	3	---	2	5	100	25	---	---	125
02	Automotive Electronics	3	---	2	5	100	25	---	---	125
03	Automotive System Design	3	---	2	5	100	25	25	---	150
04	Vehicle Performance and Testing	3	---	2	5	100	25	25	---	150
05	Elective-II	3	---	--	3	100	---	---	---	100
06	Project Phase-II	---	---	4	4	---	75	75	---	150
	Total	15	---	12	27	500	175	125	--	800

Elective –I

1. Advanced Engine Technology
2. Computational Fluid Dynamics
3. Tribology
4. Optimizations Methods in Engineering Design
5. Transport Management

Elective-II

1. Automotive Noise, Vibration and Harshness (NVH)
2. Automotive Aerodynamics
3. Fuels, Combustion and Emission Control
4. Automotive Control Systems
5. Energy Engineering

Shivaji University, Kolhapur

S.E. (Automobile) Semester III (Revised)
1. ENGINEERING MATHEMATICS III

Teaching Scheme:	**Examination Scheme:**
Lectures: 3 hrs/week	Theory Paper: 100 marks (3 hrs.)
Tutorial: 1 hr/week	Term Work: 25 marks

Course Objectives:
After completing this course, student will be able to

1. Develop abstract, logical and critical thinking and the ability to reflect critically upon their work.
2. Apply probability theories and statistical techniques to practical engineering problems.
3. Devise engineering solutions for given situations in their profession.
4. Formulate a mathematical model of a real life and engineering problem, solve and interpret the solution in real world.

Prerequisite:

1. Engineering Mathematics - I
2. Engineering Mathematics - II

Unit 1 Linear Differential Equations: [6]

Linear Differential Equations with constant coefficients Definition, Complementary function and Particular integral (without method of variation of Parameters) , Homogeneous Linear differential equations.

Unit 2 Applications of Linear Differential Equations with constant coefficients: [8]

The Whirling of Shafts., Mass – spring Mechanical system, Free oscillations, Damped Oscillations, Forced oscillations without damping.

Unit 3. Probability Distributions: [6]

Random variable, Binomial Distribution, Poisson Distribution, Normal Distribution

Unit 4 Laplace Transform: [7]

Definition, Transforms of elementary functions, Properties of Laplace transform. Transforms of derivatives and Integral. Inverse Laplace transforms formulae. Inverse Laplace transforms by using partial fractions and Convolution theorem. Solution of Linear differential equation with constants coefficients by Laplace transforms method.

Unit 5 Fourier series: [6]

Definition, Euler's Formulae, Dirchilt's Condition. Functions having points of discontinuity Change of interval, Expansion of odd and even periodic functions Half range series.

Unit 6 Application of Partial differential equations: [7]

The Wave Equation, The method of separation of variables. Fourier Series solution of wave equation. One dimensional heat flow equation The method of separation of variables. Fourier Series solution of wave equation. The Laplace equation in two dimensional heat flow (Steady State). Solutions of Laplace equations by the Gauss – Siedel iterative method.

General Instructions:

- For the term work of 25 marks, batch wise tutorials are to be conducted. The number of students per batch should be as per university pattern for practical batches.
- Minimum number of assignments should be 10 covering all topics.

Reference Books:

1. J. N. Wartikar & P. N. Wartikar, A Textbook of Applied Mathematics: Vol. I, II and III, Vidyarthi Griha Prakashan, Pune.
2. Dr. B. S. Grewal, Higher Engineering Mathematics.
3. Erwin Kreyszig, Advanced Engineering Mathematics.
4. H. K. Das, Advanced Engineering Mathematics, S. Chand Publication.
5. Merle C. Potter, Advanced Engineering Mathematics, OXFORD University Press.

Shivaji University, Kolhapur

S.E. (Automobile) Semester III (Revised)
2. ELECTRICAL TECHNOLOGY

Teaching Scheme:	**Examination Scheme:**
Lectures: 3 hrs/week	Theory Paper: 100 marks (3 hrs.)
Practical: 2 hrs/week	Term Work: 25 marks

Course Objectives:
After completing this course, student will be able to

1. Get the basics ideas about Electrical Engineering.
2. Study the basics of Electronics devices.
3. Get information about Amplifiers.
4. Get information about Electrical Measuring Instruments.
5. Get the basics about Microprocessor.

Prerequisite:

1. Basic of Electrical Engineering
2. Basic of Electronics Engineering

Unit 1. Generation system: (7)
Construction of DC machine, Principal of generation of DC, Essential parts of DC machine, Armature winding, Types of windings: Lap & Wave, EMF equation, Introduction to armature reaction, Commutation, Type of DC generators, Characteristics, Voltage regulation, Condition for self excitation, Causes of failure to built up voltage, Applications of DC generators, AC generation, Principal of AC generation, Three phase alternator, Construction, Armature winding, Classification of winding, Voltage regulation, Rating of alternator, Voltage regulator in automotive alternator.

Unit 2. Electric Drives: (7)
D.C. motors, Construction and working principle, Types of motors-series, shunt & compound, Motor characteristics and comparison, Speed control methods of series & shunt motors, Electric braking of DC series and shunt motor-plugging and regenerative braking, Faults in DC machines, Trouble shooting in DC motors, Three phase induction motor- Working principal, Rotating magnetic field, Rotor frequency, Rotor emf, Torque equation, Starting, Maximum and running torque, Torque speed characteristics, Speed control methods, AC series motor – Construction, Working principal, characteristics, method of speed control, Calculation of rating of motors based on torque requirement.

Unit 3. Electrical Heating: (6)
Advantages, Types of electric heating, resistance heating-resistance oven, arc heating-direct and indirect furnace, induction heating, dielectric and infrared heating, induction furnaces-direct, vertical and coreless furnaces, High frequency eddy current heating-principal, advantages and applications.

Unit 4. Power Semiconductor devices and applications: (7)
Power diode-Construction and rating, Half wave and full wave single phase and three phase uncontrolled Rectifier, SCR-Construction, operating characteristics, voltage rating, current rating, SCR as a switch, FET & MOSFET-Construction operating characteristics and applications, IGBT-Construction, operating characteristics and applications.

Unit 5. Electrical Measurements & Transducers (7)

PMMC-Principle, construction and use, Wattmeter-Construction and use, Digital multi-meter- block diagram and working, LCD, CRO-CRT, block diagram, measurement of voltage & current, XY plotters, Definition, classification, transducer selection, different types of transducers, strain gauges, RTD, thermistor, thermocouple, LVDT, capacitive transducers, piezoelectric transducer, photovoltaic cell, LDR, Pressure transducer.

Unit 6. Operational Amplifiers and overview of microprocessor: (6)

Operation amplifier, OP-Amp as an adder, substractor, integrator, differentiator, comparator, Introduction to microprocessor based system, Architecture of 8085.

TERM WORK (any 10)

A) A batch shall report to Electrical Engineering Laboratory and Electronics laboratory in alternate weeks.

B) All experiments must be set simultaneously and the number of students in each group working on a set up shall not exceed 5 students.

Electrical Technology: - Any five experiments from the following list.

1) Load test on D.C. Shunt Generator
2) Speed control of D.C. Shunt motor by flux control and armature control method.
3) Load test on D.C. Shunt motor.
4) Load test on D.C. Series motor.
5) Determination of Regulation of alternator.
6) Load test on three phase Induction motor.
7) Measurement of voltage and current by CRO.

Electronics: -any five experiments from the following list.

1) Characteristics of SCR
2) Study of operational amplifier as adder, and substractor.
3) Operation Amplifier as level detector (Comparator).
4) Speed control of DC motor by 1 Phase fully controlled converter.
5) Study of Displacement measurement using LVDT.
6) Speed measurement using magnetic pick-up.
7) Addition and subtraction of two 8-bit numbers using 8085.

BOOKS

1. B. L. Thereja, Electrical Technology, S. Chand Publications, Volume 2.
2. H. Partap, Utilisation of electrical energy, Dhanpat Rai and Sons.
3. Malvino, Electronic Principles 6/e, Tata McGraw Hill, New Delhi
4. Allen Mottershed, Electronic Devices and circuits, PHI, New Delhi.
5. Ramakant Gaikwad, Operational Amplifiers and Linear integrated circuit Technology, S. Chand Company Ltd.
6. A. K. Sawhney, A Course in Electrical and Electronics measurement and Instrumentation, 11/e, Dhanpat Rai & Sons.
7. Milman and Halkias, Electronic devices and circuits, Tata McGraw-Hill Book Company, New Delhi
8. R.S. Gaonkar, Microprocessor, Architecture Programming and Applications with 8085A, Penram INTL. Publishing Pvt. Ltd. Mumbai.

Shivaji University, Kolhapur

S.E. (Automobile) Semester III (Revised)
3. APPLIED THERMODYNAMICS

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

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

Course Objectives:
After completing this course, student will be able to

1. Identify Various Thermodynamic Processes and Cycles
2. Analyze Thermodynamic Cycles
3. Understand concept of entropy, available and unavailable energy
4. State and Illustrate Fundamentals of refrigeration and Air-Conditioning

Prerequisite:

1. Basic Mechanical Engineering
2. Engineering Mathematics
3. Engineering Chemistry

Unit 1. Review of Laws of thermodynamics (7)
Review of Zeroth, First, second and third law, Equation of state for ideal gas and real gases; behavior of real gases and its deviation from Ideal gas, compressibility factor, Law of corresponding states and use of generalized compressibility chart; Thermodynamics square, Helmoltz and Gibbs functions- Definitions and importance; Simple Maxwell's relations with its importance. (Numerical treatments restricted to First and Second law of Thermodynamics ONLY)

Unit 2. Entropy (6)
Clausius inequality, entropy as a property of system. entropy of pure substance. T-s and h-s planes, entropy change in a reversible and irreversible processes, increase of entropy principle, calculation of entropy changes of gases and vapours. Entropy of generation, entropy change for various processes.

Unit 3. Properties of Pure substances and Availability (6)
Properties of steam, use of steam table and Mollier chart, P-V-T surface. Availability of a closed and open system, availability of work and heat reservoirs, Anergy, energy and exergy and simple numerical.

Unit 4. Gas Power Cycles (6)
Carnot cycle, Otto cycle, Diesel cycle, Dual cycle, Ericson Cycle, Stirling Cycle, Atkinson Cycle, Effect of various operating conditions on performance of cycles.

Unit 5. Gas Turbines: (7)
Working principle, applications, open, closed cycle and their comparison, Cycle modified to regeneration, reheat, inter cooling performance, Calculation of gas turbine work ratio, efficiency etc.

Unit 6. Introduction to Refrigeration and Air-Conditioning (8)
Methods of Refrigeration, applications of refrigeration, Basic refrigeration cycles- Reversed Carnot cycle, P-h Chart, VARS, VCRS, types and properties of refrigerant
Air Conditioning- Psychrometry, Psychrometric processes, Applications of Air-Conditioning
(Numerical Treatment is restricted to VCRS cycle ONLY)

TERM WORK (any 10)

The number of students in each group working on a set up shall not exceed 5 students.

1. Significance and relevance of lubrication properties and systems
2. Test on grease penetrometer and dropping point apparatus
3. Test on redwood viscometer
4. Test on aniline point apparatus
5. Test on carbon residue, cloud and pour point apparatus
6. Test on flash and fire point apparatus
7. Study and demonstration on water tube and fire tube boilers
8. Study and demonstration of boiler mountings and accessories
9. Estimation of calorific value of fuel
10. Trial on Refrigeration bench
11. Trial on Air Conditioning Test Rig
12. Trial on Ice-Plant
13. Report on industrial visit to RAC plant

BOOKS

1. P.K. Nag, Engineering Thermodynamics, Tata Mc Graw Hill ,New Delhi
2. R. K. Rajput, Thermal Engineering, S. Chand
3. M. M. Rathore, Thermal Engineering, Mc Graw Hill
4. Kumar and Vasandani, Thermal Engineering, Metropolitan Book Co., Delhi.
5. Mathur and Mehta, Thermal Engineering, Jain Bros. Publishers, Delhi.
6. Ballaney P.L., Thermal Engineering, Khanna Publishers, New Delhi.
7. Holman, Thermodynamics, Mc Graw Hill, London
8. R.S. Khurmi/ J.K.Gupta, A Text Book of Thermal Engg., S. Chand and Company, New Delhi.
9. R. Yadav, Steam & Gas Turbine, Central Publishing House, Allahabad.
10. Cengel, Thermodynamics: An Engineering Approach, 3/e, Tata McGraw-Hill,
11. R. S. Khurmi, Refrigeration and Air –Conditioning, S. Chand and Company, New Delhi.
12. Arora – Domkundvar, Refrigeration and Air-Conditioning, Dhanpat Rai Publications.

Shivaji University, Kolhapur

S.E. (Automobile) Semester III (Revised)
4. AUTOMOTIVE MATERIALS AND MANUFACTURING

Teaching Scheme:	Examination Scheme:
Lectures: 3 hrs/week	Theory Paper: 100 marks (3 hrs.)
Practical: 2 hrs/week	Term work: 25 marks.

Course Objectives:
After completing this course, student will be able to
1. Identify various types of manufacturing processes
2. Identify and Study manufacturing materials.
3. Identify and Study advanced manufacturing processes.

Pre-requisite:
1. Applied Physics.
2. Engineering Chemistry.

Unit 1: Engineering materials and their properties: (6)
Classification of engineering material: metals, nonmetals, plastics, ceramics, composites- properties and wood. Mechanical properties of engineering materials- creep, fatigue properties of materials, modulus of elasticity, yield strength, plastic deformation and toughness, Compressive strength, tensile strength and elongation at break, hardness and impact strength. Ductility: Importance of material properties in manufacturing.

Unit 2: Ferrous Alloys: (10)
Study of Fe-Fe3C equilibrium diagram with all phases and critical temperatures
i) Steels: plain carbon steels, mild steels, medium carbon structural steels, high carbon tool steel.
ii) Alloy Steels: Effect of alloying elements on physical and mechanical properties of steels, Free cutting steels, high carbon low alloy steels, creep resisting steels, high temperature or super alloys, study of low expansion and controlled expansion alloys; alloys for heating elements, Stainless steels: different types, Tool steels: cold work tool steel, hot work tool steels, high-speed tool steel (HSS), special purpose tool steels.
iii) Cast Irons: factors affecting structures of cast irons, White C.I., malleable C.I., Grey C.I., Mechanite, Nodular C. I.

Unit 3: Engineering Non Ferrous Alloys: (3)
i) Al –based alloys
ii) Cu –based alloys- Different types of Brass and bronze.
iii) Tin and lead based alloys

Unit 4: Casting Process and Metal Forming: (10)
Importance of casting as manufacturing Process, advantages and disadvantages of Casting processes, Pattern making- types of allowances, Molding sand its types and properties, types of molding process, Investment casting, Gravity and pressure die-casting, Centrifugal casting, Continuous casting. Melting and pouring-Gating system, runners and risers, Types of Furnaces (Induction and Cupola), Cleaning-fettling and inspection of casting, casting defects. Hot and Cold forming, rolling, forging process.

Unit 5: Conventional Machining Process: (6)
Introduction to Lathe: Centre, Capstan and Turret Lathes, Drilling & Boring Machine, Milling Machine, Grinding Machine: Working principles, types, specifications, principal parts.

Unit 6: Introduction to non-conventional machining processes and Automation: (5)
EDM, ECM, LBM, AJM, Photo-chemical, NC machines, CNC, VMC, HMC.

TERM WORK

1. Study of crystal Atomic packing factor, Average on of atoms per Unit cell, Density.
2. Study of recent composite Materials
3. Study of recent Smart and Nano-materials.
4. Case study of selection of materials according to applications- bearings, magnets, springs, automobile applications such as cylinder block, piston etc.
5. Sand testing for given sand and core sand for Size analysis, Grain fineness number and Hardness (mould/core).
6. Sand testing for given sand and core sand for Permeability and Moisture percentage.
7. Sand testing for given sand and core sand for Clay content and given compressive strength
8. Study of casting defects.
9. Industrial visit to a foundry.
10. Industrial visit to study the machining processes

TEXT BOOKS:

1. V D Kodgire, Material science and metallurgy, Everest Publishers, Pune
2. Swroop and Saxena, Elements of metallurgy, Rastogi Publications, Meerut.
3. P L Jain, Principles of foundry technology, Tata McGraw-Hill, New Delhi.
4. O. P. Khanna, Foundry technology, Khanna Publishers, New Delhi.
5. P. C. Sharma, Production technology, S. Chand and Company Ltd.,
6. Vijendra Singh, Material science, Standard Publication, standard Publishers, Delhi.
7. Lawrence H. Vanvlack, “Elements of Material Science and Engineering”, Addison- Wesley
8. Raghvan, V., “Material Science and Engineering”. Prentice Hall of India.
9. Agrawal, B. K., “Introduction to Engineering Materials” Tata McGraw Hill, New Delhi.
10. Avner, Physical Metallurgy, Tata McGraw Hill, New Delhi.
11. Autar K. Kaw, Mechanics of composite material, Taylor & Francis, 2/e.
12. P.C. Pandey, H.S. Shan, Modern machining processes, Tata McGraw Hill, New Delhi.

Shivaji University, Kolhapur

S.E. (Automobile) Semester III (Revised)
5. FLUID MECHANICS

Teaching Scheme:	**Examination Scheme:**
Lectures: 3 hrs/week	Theory Paper: 100 marks (3 hrs.)
Practical: 2 hrs/week	Term Work: 25 marks

Course Objectives:

After completing this course, student will be able to,

1. Identify Various Properties of Fluids & Their SI Units.
2. State & Illustrate Fundamentals of Fluid Statics, Kinematics & Dynamics.
3. Identify & Explain the Concept of Boundary Layer, Drag & Lift force.
4. Understand the Internal & External Flows.

Prerequisite:

1. Engineering Mathematics
2. Engineering Physics & Chemistry

UNIT 1. Properties of Fluids (6)

Fluid Properties: Definition of Fluid, Properties of Fluids, Viscosity, Compressibility, Surface Tension and Capillarity, Vapour Pressure & Cavitation, Static pressure, Pressure Head, Insensitivity of Pressure, Pascal's Law, Absolute gauge, Vacuum, Atmosphere pressures, Manometers, Pressure measurement devices.

UNIT 2. Fluid Statics and Kinematics (8)

Fluid Statics: Total pressure & C. P. for Horizontal, Vertical and Inclined Rectangular, Triangular &Circular Plane Surface (Without Proof), Buoyancy, Centre of Buoyancy, Meta Centre, Metacentric Height.

Fluid Kinematics: Flow Visualization, Types of Flow, Streamline, Pathline, Streakline, Streamtube, Continuity Equation in Cartesian Coordinates in Three Dimensional Forms, Velocity & Acceleration of Fluid Particles.

UNIT 3. Fluid Dynamics (6)

Equation of Motion, Integration of Euler's Equation as Energy Equation (Bernoulli's Equation), Energy Correction Factor, Steady and Unsteady flow through Orifice, Venturimeter, Orificemeter, Flow over Triangular and Rectangular Notches, Derivation of Momentum Equation, Momentum Correction Factor, Applications of Momentum Equation.

UNIT 4. Laminar Flow & Pipe Flow (8)

Laminar Flow: Laminar Flow through Circular Pipes, Laminar Flow through Parallel Plates.
Pipe Flow: Energy losses in transition, expansion and contraction (Darcy's & Chezy's Equation), Parallel Pipe, Siphon Pipes, Branching Pipes and Equivalent Pipes, Hydraulic Gradient & Total Energy Line

UNIT 5. Boundary Layer Theory & Dimensional Analysis (6)

Boundary Layer Theory: Boundary Layer Thickness, its Characteristics, Laminar and Turbulent Boundary Layers, Separation, Boundary Layer Control.

Dimensional Analysis: Dimensionally Homogeneous Equations, Buckingham's Pi Theorem, Calculation of Dimensionless Parameters, Similitude, Complete Similarity, Model Scales.

UNIT 6. Forces on Immersed Bodies Compressible Flow (6)

Forces on Immersed Bodies: Types of Drags on a Flat Plate, Drag on Aerofoil, Development of Lift, (Magnus Effect), Stalling Condition of Aerofoil.

Compressible Flow: Propagation of Elastic Waves, Mach Number & Mach Cone, Energy Equation of Compressible Flows, Stagnation Pressure, Temperature and Density,

TERM WORK:

The Term Work Shall Consist of the Report on Any Ten Experiments From the Following:

1. Flow Visualization by Plotting of Streamlines (Heleshaw Apparatus).
2. Verification of Bernoulli's Equation.
3. Reynolds Experiment.
4. Calibration of Venturimeter and Orificemeter.
5. Calibration of Notches.
6. Determination of coefficient of friction in pipe flow for G. I. and PVC pipes.
7. Determination of loss of friction losses in series & parallel pipes.
8. Determination of minor losses in pipe-fittings.
9. Orifice under steady and unsteady flow condition.
10. Determination of velocity profile through circular pipes for laminar flow.
11. Pressure and velocity distribution over aerofoil.
12. Measurement of lift and drag on model in wind tunnel.

BOOKS:

1. V. L. Streeter and E. B. Wyline, Fluid Mechanics, Wiley Eastel Limited, New Delhi
2. K. L. Kumar, Fluid Mechanics, S. Chand Publication, New Delhi
3. K. Subramanya, Theory and Applications of machines, Tata McGraw Hill Publication.
4. Fox and McDonald, Fluid Mechanics, John Wiley and Sons, India.
5. R. K. Bansal, Fluid Mechanics and Hydraulic machines, Laxmi publications, New Delhi.
6. R. K. Rajput, Fluid Mechanics, S Chand Publications, New Delhi.
7. Fraizini, Fluid Mechanics, 4/e, Tata McGraw-Hill, New Delhi.
8. White, Fluid Mechanics, 4/e, Tata McGraw-Hill, New Delhi.
9. P. N. Modi, S. M. Seth, Hydraulics and Fluid Mechanics, Standard Book House, New Delhi.

Shivaji University, Kolhapur

S.E. (Automobile) Semester III (Revised)
6. INSTUMENTATION LABORATORY

Teaching Scheme:
Practical: 2 hrs/week

Examination Scheme:
Term Work: 25 marks
Oral Exam : 25 marks

Course Objectives:
After completing this course, student will be able to,

1. Know about importance of measurement in engineering field.
2. Study the methods of measurement
3. Identify elements of measurement system in general
4. Handle various measuring instrument and interpret the results

Prerequisite:

1. Various measuring techniques and elements of measuring system.

Term Work: - Any 10 experiments

1. Study of static and dynamic characteristics of an Measuring Instrument
2. Introduction to various types of transducers
3. Temperature measurement using Thermocouple, RTD & Thermister
4. Calibration of strain gauges for various measurements.
5. Preparation of Thermocouple bit and Calibration of thermocouple
6. Measurement of Low pressure – Pirani gauge, Mc-loed gauge
7. Calibration of pressure gauge & vacuum gauge – Dead weight pressure gauge tester
8. Angular speed measurement (non contact type) – stroboscope, photo pickup, magnetic pickup
9. Flow Measurement by rotameter, turbine meter and target meter.
10. Measurement of force / load using Strain Gauges & calibration of load cell
11. Vibration Measurement and acoustic measurement – Accelerometer, sound intensity meter

TEXT BOOKS

1. D. S. Kumar, Mechanical Measurements and Control, Metropolian, Delhi.
2. Sirohi & Dr. Radhakrishnan, Mechanical Measurements, New Age International (P) Ltd.
3. Beckwith & Buck and Roy D. Marangoni, Mechanical Measurements, Narosa Publishing House, New Delhi.

Shivaji University, Kolhapur

S.E. (Automobile) Semester III (Revised)
7. AUTOMOTIVE COMPONENT DRAWING

Teaching Scheme:
Practical: 2 hrs/week

Examination Scheme:
Term Work: 50 marks
Oral Exam: 25 marks

Sheet no. 1: Based on BIS conventions
Significance and importance of BIS Conventions, Conventional representation of engineering Materials, all type of gear and assemblies, helical and leaf springs, Internal and external threads, square head, spline shaft, diamond knurling, BIS conventions for sectioning, type of sections, BIS methods of linear and angular dimensioning. Symbolic representation of welded joints. (First angle method of projection recommended by BIS is to be used)

Sheet no. 2: Based on sketching (Free hand drawing) of various machine components mentioned Sketches of nut, bolts, square and hexagonal flanged nuts, lock nuts, dome nut, capstan nut, wing nut, castle nut, split pin, square headed bolt, cup headed bolt, Threaded bolt, Rag foundation bolt, stud, washer, Various types of rivets and riveted joints, Various types of keys, Muff coupling, Protected and unprotected flanged coupling, universal coupling, solid and bush bearing, Plumber block (pedestal bearing), foot step bearing, Flat and V-belt pulleys, Fast and loose pulleys, speed cone pulleys, Pipe joint for C.I. Flanged, socket and spigot type pipe joint, Union pipe joint and standard pipe-fitting, First angle method of projection is to be used.

Sheet no. 3: Drawing details and assembly containing maximum twelve parts by taking actual measurement on parts. (Different automotive assemblies should be given to a group of four students.)

Sheet no. 4: Drawing assembly from given drawing of details and entering limits, fits, tolerances, surface finish symbols, geometrical requirements etc.

Sheet no. 5: Sheet based on auxiliary view.

Sheet no. 6: Sheet based on interpenetration of solids. Interpenetration of prism with prism, prism with cylinder, prism with cone, prism with pyramids. (Prisms and Pyramids limited up to rectangular), cylinder with cylinder, Cone with cylinder. (Minimum three problems)

Note: Theoretical part of above content should be taught by faculty before assigning sheet to students

Shivaji University, Kolhapur

S.E. (Automobile) Semester III (Revised)
8. WORKSHOP PRACTICE - III

Teaching Scheme:	**Examination Scheme:**
Practical: 2 hrs/week	Term Work: 25 marks

1. Preparation of mould and non ferrous casting (2 practical)
2. One job of plain turning, step turning, threading, taper turning and knurling operation. (8 practical)

The job assessment is to be done by concern workshop instructor. The marks should be given on the basis of workshop dairy, compliance and quality of job.

Shivaji University, Kolhapur

S.E. (Automobile) Semester IV (Revised)
1. COMPUTATIONAL METHODS

Teaching scheme:
Lectures: 3 hrs/week
Tutorial: 1 hr/week

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

Course Objectives:
After completing this course, student will be able to,

1. Apply numerical methods to find out roots of equations.
2. Solve ordinary and partial differential equations by numerical methods.
3. Introduce basics of FEA for engineering applications.
4. Apply least square method for curve fitting.
5. Apply computational techniques for the optimization problems.

Prerequisite:

1. Applied Mathematics

Unit 1. Roots of Equations **(5)**

Secant Method, Newton Raphson Method, Multiple Roots, System of non-linear Equations, Iteration method (Successive approximation method), Muller's Method, Lin Bairstow method.

Unit 2. Interpolation and Regression Analysis **(7)**

Interpolation: Gauss forward and backward formulae, Bessel's interpolation formula, Laplace - Everett' formula, Lagrange's Interpolation formula, Newton's divided difference interpolation formula.

Regression Analysis: Principle of least squares, Linear regression (line of regression of x on y and conversely), Nonlinear regression (second degree parabolic curve)

Unit 3. Numerical Differential & Integration **(7)**

Newton's Cote's Integration of Equation - Trapezoidal rule, Simpson's rules,

Integration Unequal Segments.

Integration of equations - Romberg's Integration & Gauss quadrature.

Numerical Differentiation - Differentiation formulae, Richardson Extrapolation,

Derivation of unequally spaced data, Forward difference, Central difference, Backward difference.

Unit 4.Ordinary and Partial Differential Equation **(9)**

Ordinary differential equation:-Finite Difference Method, Eigen Value Problems-Power Method & Polynomial Method

Partial Differential Equation: Elliptical Equations, Laplace's equation, Liebmen's Method, Secondary Variables, Boundary condition, Parabolic Equations, Explicit and Implicit Method, Crank Nicolson Method, Hyperbolic Equations (Wave equation)

Unit 5. Linear Programming **(5)**

Introduction, Formulation of problem,

a) Graphical Method

b) Simplex Method, Duality concept.

Unit 6. Introduction to Finite Element Method **(7)**

Steps in FEM, Types of element, Solutions to boundary value problems, integral formulations for numerical solutions, One dimensional linear element, Applications of FEM in 1D and 2D conduction and convection heat transfer problems.

Term Work:

Ten assignments based on above topics.

Reference Books:

1) S C. Chapra, Numerical method for Engineers, Tata McGraw Hill Publications, Canale
2) Dr. B.S. Grewal Numerical Methods, Khanna Publications.
3) E. Balguruswamy, Numerical methods, Tata McGraw Hill Publications.
4) S.V. Patankar, Numerical Heat transfer and Fluid flow, McGraw Hill Publications.
5) S.S.Sastry, Introductory Methods of Numerical Analysis, Prentice Hall Publication.
6) J. B. Dixit, Numerical Methods, Laxmi Publication.
7) D. L. Logan, First course in the finite element method, Thomson,2007.

Shivaji University, Kolhapur

S.E. (Automobile) Semester IV (Revised)
2. KINEMATICS OF MACHINES

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

Examination scheme:
Theory Paper: 100 Marks (4 hrs.)
Term work: 25 Marks

Course Objectives

After completing this course, student will be able to,
i) Select appropriate mechanism to design and develop a machine for an application
ii) Design a mechanism to get the desired motion for the application under consideration
iii) Analyze the mechanisms to determine velocity and acceleration of various links of the mechanism
iv) Design and Draw profile of the cam to obtain specified follower motion for an application
v) Analyze the governor to determine height of the governor for the corresponding change in speed and sleeve displacement
vi) Explain lower pair mechanisms and select them to meet the need where they are suitable.

Prerequisite:

1. Engineering Mathematics.
2. Engineering Mechanics.
3. Engineering Graphics.

Unit 1. Basic Concepts of Mechanism:

Kinematics Links, kinematics pair - types, kinematic chain, mechanism, constrained motions, mobility of mechanisms, Grubbler's and Kutzbach criterion, inversions of mechanisms, types of kinematic chains and their inversions. 06

Unit 2. Kinematic analysis of the mechanisms:

Velocity and acceleration diagrams for different mechanisms using Relative velocity and acceleration method, Coriollis component of acceleration 09

Unit 3. Lower Pair Mechanisms:

Classification, Exact and approximate straight-line mechanisms, Pantograph, steering gear mechanisms, Hooke's joint 05

Unit 4. Kinematics of CAM and Synthesis

Types of cams, types of followers, Terminology, displacement, velocity and acceleration diagrams for various follower motions, generation of cam profile for specified motion of different followers.

Chebychev method to find precision points, graphical method of position synthesis for four bar chain and slider crank mechanism – two position, three position synthesis 10

Unit 5. Friction:

Sliding and Rolling friction, Friction in Bearings, Friction in screw threads, Friction clutches, Belt and rope drives, Friction aspects in Brakes 05

Unit 6. Governors:

Types of governors, Porter and Hartnell governor, controlling force and stability of governor, hunting, sensitivity, isochronisms, governor effort and power, insensitiveness of governors. 05

TERM WORK

A term work shall consist of following.

1) Sketch the various mechanisms and their inversions for various applications.
2) Kinematic Analysis of mechanisms using relative velocity and acceleration method.
3) Kinematic Analysis of mechanisms using instantaneous centre method
4) Kinematic Analysis of mechanisms using Klein's construction method
5) Determination of velocity and acceleration of mechanisms using Analytical method.
6) Verification of ratio of angular displacement of shafts connected by Hooks joint.
7) Synthesis of mechanisms for various applications.
8) Plot of displacement curves and generation of cam profile for different follower motions.
9) Plot of governor characteristics for Porter governor.
10) Plot of governor characteristics for Hartnell governor.

TEXT BOOKS

1) Ratan S.S, Theory of Machines, Tata McGraw Hill, New Delhi.
2) Ballany, Theory of Machines, Khanna Publication, New Delhi.
3) V.P.Singh, Theory of Machines, DhanpatRai and Sons.
4) Phakatkar, Theory of Machines I and II, Nirali Publication, Pune
5) Sadhu Singh, Theory of Machines, Tata McGraw Hill, New Delhi.

REFERENCE BOOKS

1) Thomas Bevan, Theory of Machines, CBS Publishers, New Delhi.
2) Shigley, Theory of Machines and Mechanism, McGraw Hill, New York.
3) G.S. Rao and R.V. Dukipatti, Theory of Machines and Mechanism, New Age Int. Publications Ltd. New Delhi.
4) Shah and Jadhawani, Theory of Machines, Dhanpat Rai & Sons.
5) Abdullah Shariff, Theory of Machines, McGraw Hill, New Delhi.

Shivaji University, Kolhapur

S.E. (Automobile) Semester IV (Revised)
3. METALLURGY AND METAL TREATMENT

Teaching Scheme:	Examination Scheme:
Lecture: 3 hrs/week	Theory Paper: 100 marks (3hrs.)
Practical: 2 hrs/week	Term work: 25 Marks

Course objectives:
After completing this course, student will be able to,

1. Classify the different metal alloys
2. Test the metallurgical properties of metals.
3. Select the suitable heat treatment process.
4. Compare the metals with non metals.

Prerequisite:

1. Automotive Materials and Manufacturing
2. Applied Physics.
3. Engineering Chemistry.

Unit 1: Metal Alloy Systems: **(7)**
a) Metals, metallic bonds, crystal structure (BCC, FCC, HCP only), imperfection in crystals
b) Alloy formation by crystallization, solidification, cooling curves
c) Solid solutions and intermediate phases
d) Phases and phase rule
e) Construction of equilibrium diagrams from cooling curves, components of different solubility in liquid and solid state. Eutectic, Eutectoid, Peritectic transformations. Lever arm principles, Long and short-range freezing, dendritic structure and coring.

Unit 2. Fe- Fe3C- Ferrous and non ferrous alloys. **(10)**
Cu- Sn, Cu- Zn, Cu- Be-Copper alloys
Al-Si, Al- Cu – Aluminum alloys
Pb-Sn, Sn-Sb – Other alloys.
Study of phase diagrams with respect to typical compositions, properties and
Applications. Selection of materials based on applications such as Tools, magnets, springs, bearings, Nuclear, Aerospace, Rocket Propulsion and automobile applications
Specifications – IS, BS, ASTM, DIN, SAE, AISI, ISO

Unit 3. Metallurgical Testing **(5)**
a) Destructive Testing methods: Tensile, Compressive, Impact, Fatigue, Creep, Hardness etc.
b) Non- Destructive Testing: - Dye penetrant, magnetic, ultrasonic, Radiography, Eddy Current testing.

Unit 4. **Principles of Heat Treatment Processes of Steels** **(5)**
a) Transformation of Pearlite into austenite upon heating, Transformation of austenite into Pearlite, Bainite and Martensite on cooling.
b) TTT – Diagram – significance, Effect of alloying elements on TTT diagram
and its significance.
c) CCT – Diagrams

Unit 5. Heat Treatment Processes **(9)**

a)Annealing – Full, Sub critical, Spherodising.
b) Normalizing
c) Hardening - Quenching Baths, Hardening types
d) Tempering – Types, Structural transformations during tempering.
e) Precipitation hardening – stages, common alloys, variables, theories.
f) Surface hardening – Flame and induction
g) Chemical heat treatments – Carburizing, nitriding, cyniding, carbon nitriding Heat treatment defects and remedies

Unit 6. Powder Metallurgy of metals, non-metals and composites with respect to flow charts **(4)**

Stage - Powder manufacturing types- Mixing/ Blending, Compaction- types, Sintering, Sizing/ impregnation
Flowcharts for – Tool materials, bearings and bushes, electrical contacts, magnets, sintered aluminum products.

TERM – WORK

1) Tensile testing of mild steel. Cast iron, Brass and aluminium.
2) Hardness testing (Rockwell and Brinell) of steel, CI, Brass, and alloy steel.
3) Impact testing: Mild steel, Brass, C.I., Aluminium
4) Demonstration of N.D.T. (Any two of different NDT tests)
5) Macroscopic Examinations such as spark test Sulphur printing.
6) Examination of microstructure of steels.
7) Examination of microstructure of C.I.
8) Examination of microstructure of Non ferrous alloys.
9) Jominy end – quench test for hardenability
10) Industrial visit for heat treatment processes.

BOOKS

1. Vijendra Singh, Engg. Physical Metallurgy, Standard Publishers, Delhi
2. V.D. Kodgire, Material science and metallurgy, Everest Publishers Pune
3. Avner, Physical Metallurgy, TMH publication.
4. Clerk, Verney, Engineering Metallurgy.
5. Higgins R. A., Hodder, Engineering Metallurgy I and II, English language Book Society.
6. A.K. Sinha, Powder Metallurgy, Dhanpat Rai Publications (P) Ltd.
7. Rollson, Metallurgy for Engg. Technicians, English language Book Society.

Shivaji University, Kolhapur

S.E. (Automobile) Semester IV (Revised)
4. FLUID MACHINERY

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

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

Course Objectives:
After completing this course, student will be able to,

1. Identify and Explain the Details of Impulse and Reaction Turbines.
2. Describe the Details of Centrifugal and Reciprocating Pumps.
3. Interpret Model Testing of Turbines.
4. Discuss the Working of Rotary and Reciprocating Compressors

Prerequisite:

1. Fluid Mechanics
2. Basic Mechanical Engineering

UNIT 1. Introduction to Water Turbines (8)

Impact of Jet, Impulse & Reaction Water Turbines, Principle of Operation, Construction & Working of Pelton, Francis & Kaplan Turbines, Draft Tube, Velocity Triangles, Calculation of Efficiency, Power, Discharge etc, Governing of Turbine, Performance Characteristic of Turbines.

UNIT 2. Centrifugal Pumps (6)

Working Principles, Construction, Types, Various Heads, Multistage Pumps, Velocity Triangles, Minimum Starting Speed, Cavitation, MPSH and NPSH, Methods of Priming, Calculations of Efficiencies, Discharge, Blade Angles, Head, Power Required, Impeller Dimensions etc., Similarity Principles of Centrifugal Pumps, Performance Characteristics.

UNIT 3. Reciprocating Pumps (6)

Working Principle, Construction & Working, Gear Pumps, Vane Pumps, Types, applications, Air Vessels, Performance Characteristics.

UNIT 4. Air Compressors (7)

Application of Compressed Air, Classification of Compressor, Reciprocating Compressors, Construction & Working, Necessity of Cooling, Isothermal Efficiency, Heat Rejected, Effect of Clearance Volume, Volumetric Efficiency, Necessity of Multistage, Construction, Optimum Intermediate Pressure for Minimum Work Required, After Cooler, Free Air Delivered, Air Flow Measurement, Capacity Control, Roots Blower and Vane Blower (Descriptive Treatment).

UNIT 5. Rotodynamic Air Compressors (6)

Centrifugal Compressor, Velocity Diagram, Theory of Operation, Losses, Adiabatic Efficiency, Effect of Compressibility, Diffuser, Prewhirl, Pressure Coefficient, Slip Factor, Performance,

UNIT 6. Axial Flow Compressor and Jet Propulsions: **(7)**

Axial Flow Compressors: Velocity Diagram, Degree of Reaction, Polytrophic Efficiency, Surging, Chocking, Stalling, Performance, Comparison with Centrifugal Compressor.

Jet Propulsions: Types, Construction, Working Principle, Applications.

TERM WORK:

The Term Work Shall Consist of the Report on Any Ten Experiments From the Following:

1. Trial on Pelton Wheel.
2. Trial on Francis Turbine.
3. Trial on Kaplan Turbine.
4. Trial on Reciprocating Pump.
5. Trial on Centrifugal Pump.
6. Trial on Reciprocating Compressor.
7. Trial on Centrifugal Blower.
8. Study of Hydraulic Devices- Intensifier, Accumulator.
9. Study of hydraulic devices Hydraulic Jacks, Press, Crane.
10. Study of Other Types of Pumps and Compressors – Gear pump, Jet pump, Submersible Pump, Air Lift Pump.
11. Industrial Visit to Hydro Power Plant.

*** Oral based on Fluid Mechanics and Fluid Machinery**

INSTRUCTIONS FOR PRACTICAL EXAMINATION:

1. Oral will be based on Fluid Mechanics and Fluid Machines practical performance.
2. Four to five experiments shall be selected for practical examination.
3. A group of four/five students for each practical set up.

BOOKS:

1. V.P. Vasantdani, Hydraulic Machines, Khanna Publishers.
2. Cohen & Rogers, Gas turbines & Compressor,
3. P. N. Modi & S. M. Seth, Hydraulics and Fluid Mechanics, Standard Book House, New Delhi.
4. N.S. Govindrao, Fluid flow machines,
5. R. K. Bansal, Fluid Mechanics and Hydraulic machines, Laxmi publications, New Delhi.
6. R. K. Rajput, Fluid Mechanics and Hydraulic Machines, S Chand Publications, New Delhi.
7. S.M. Yahya, Turbo machines, Tata McGraw Hill Publications.
8. D.S. Kumar, Fluid power Engineering, Katson Publishing House.
9. R. Yadav, Steam & gas Turbines, Central Publishing House, Allahabad.
10. V. Ganeshan, Steam & gas Turbines, Tata McGraw Hill Publishing Company.
11. Kumar Vasantdani, Thermal Engg.
12. R. Yadav, Thermodynamics & Heat Engines, Central Publishing House, Allahabad.

Shivaji University, Kolhapur

S.E. (Automobile) Semester IV (Revised)
5. STRENGTH OF MATERIALS

Teaching scheme:
Lectures: 3 hrs/week,
Tutorial: 1hr/week

Examination scheme:
Theory Paper: 100Marks (3 hrs.)
Term work: 25Marks

Course Objectives

After completing this course, student will be able to,

1. Apply elementary knowledge of stresses and strains in various design problems.
2. Compare different types of beams on the basis of strength.
3. Understand stiffness criteria of design.
4. Identify behaviour of column based on end conditions.
5. Apply energy methods for solid body analysis.

Prerequisite:

1. Engineering Mathematics and Physics
2. Engineering Mechanics

Unit 1.Simple Stresses and Strains (7)

Concept of stress and strain, (Linear, lateral, shear and volumetric), Hooke's Law, Poisson's ratio, Modulus of Elasticity, Modulus of rigidity, stress-strain diagram for ductile and brittle material, factor of safety, working stress, Complementary shear stress, Bulk Modulus, interrelationship between elastic constants, Thermal stresses

Unit 2. Shear Force and Bending Moment Diagram (6)

SFD and BMD for cantilever, Simply Supported and overhanging beams, SFD and BMD for point load, UDL, UVL and couple. Relation between shear force, bending moment and intensity of loading.

Unit 3. Stresses in Beams (7)

Bending Stresses: Symmetric pure bending of beams, flexure formula, moment of resistance of cross-sections, simple built-up section, design of rectangular and circular (solid and hollow) sections; L, I and T sections

Shear stresses: Distribution of shear stresses in beams of various commonly used sections such as circular, I, T, and L angles, combined effect of bending and shear.

Unit 4.Deflection of Beams and Column (7)

Deflection of beams: Strain curvature and moment curvature relation, Deflection of Cantilever and simply supported beam by Double integration method, Area moment method.

Columns: Euler's formula for different end connections, concept of equivalent length, eccentric loading, Rankine's formula

Unit 5.Principal Stresses and Strains (7)

Normal and shear stresses on oblique planes, concept of Principal stresses and planes, derivation for Principal stresses and maximum shear stress, Positions of principal planes and planes of maximum shear, Mohr's circle for principal stresses

Unit 6.Torsion and Strain energy (6)

Torsion: Basic assumptions, Torsion formula, Hollow and solid circular shafts, Angular deflection, Combined bending and Torsion,

Strain energy: Strain energy for axial load, bending and shear loads, use of energy theorem to determine deflections and twist of shafts

Term work: 10 Tutorials based on above topics

Reference Books:

1. Ferdinand P Beer E.R. Johnston, Mechanics of Materials, McGraw Hill Book Company, New Delhi.
2. Timoshenko and Young, Elements of Strength of Materials, East-West Press Pvt. Limited
3. Ramamurthum, Strength of Materials, Dhanpat Rai and Sons, New Delhi
4. R.K.Rajput, Strength of Materials, S. K. Kataria and Sons.
5. W.A.Nash, Strength of Materials, Tata,McGraw Hill Book Company.
6. Den Hartong, Strength of Materials, McGraw Hill, New York.
7. B.K.Sarkar, Strength of materials, McGraw Hill Pub.

Shivaji University, Kolhapur

S.E. (Automobile) Semester IV (Revised)
6. COMPUTER PROGRAMMING IN C++

Teaching scheme:
Practical: 2 hrs/week

Examination scheme:
Term Work: 50 marks
Practical & Oral: 25 marks

---

1. Object-Oriented programming:

Introduction, Basic concepts, Benefits, object oriented languages, Applications.

2. Introduction to C++:

C character set, keywords, Data types, Declarations, Expressions, statements and symbolic constants, Pre-processor commands (#include, #define), Input-Output functions (Cin, Cout), Operators and expressions, Loop control statements(While, do-while, for statements, nested loops, if else, switch, break, Continue, and goto statements), Functions, Arrays, Pointers.

3. Classes & Objects:

Introduction, structures & classes, Declaration of class, Member functions; defining the object of a class; accessing a member of a class; Array of class objects.

4. Inheritance:

Introduction, single inheritance; Types of base classes: Direct, Indirect; Types of derivation: Public, Private, Protected.

5. Overloading:

Function overloading with various data types, arguments; operator overloading: assignment operator; arithmetic & comparison operators.

(***Practical & Oral:** Compilation and execution of any one program on OOPS concept followed by oral)

Term Work:

1. Minimum 3 programs on Input/ Output & arithmetic expressions, branching and loop control statements
2. Minimum 2 programs on Function.
3. Minimum 1 programs on Pointers.
4. Minimum 2 programs on arrays.
5. Minimum 1 program on structures.
6. Minimum 2 programs on Class & Objects
7. Minimum 1 program on Array of class objects
8. Minimum 2 programs on Inheritance
9. Minimum 1 programs on Overloading
10. Minimum 5 programs on any five Computational Methods

Reference Books:

1) E. Balguruswami, Object Oriented Programming, Tata McGraw hill Publication.
2) Yashwant Kanitkar, Let us C++, BPB Publication.
3) Veerarajan & Ramachandran, Numerical Methods: With Programs in C, Tata McGraw hill Publication.
4) Dr. B.S. Grewal, Numerical Methods, Khanna Publications.
5) Yashwant Kanitkar, Let us C, BPB Publication.
6) C. Xavier, C Language and Numerical Methods, New Age International Publication.

Shivaji University, Kolhapur

S.E. (Automobile) Semester IV (Revised)
7. WORKSHOP PRACTICE - IV

Teaching Scheme:	Examination Scheme:
Practical: 2 hrs/ week	Term Work: 50 marks

A Job, with 3 to 5 component (Composite Job); excludes standard and commercial components. The job should facilitate operation like turning, boring, drilling, tapping, threading, milling, shaping, taper turning etc.

1) One job of at least taper turning, external threading and knurling operation with its process sheet.

2) One job on spur gear manufacturing on Milling/Shaping Machine

3) Journal Consists of Following:-
   a. Process sheet and tool layout on Capstan /Turret lathe.
   b. Description on thread manufacturing processes and gear train calculations for thread cutting of required pitch.
   c. Setting of milling machine for gear cutting.
   d. Study and demonstration of grinding machine (Surface, cylindrical and center less).
   e. Study and demonstration of shaper/planer/slotting machine (mechanisms and stroke).

4) Industrial visit to study other gear manufacturing processes and finishing processes.

Assessment of journal based on above term work and industrial visit report is to be done by the teaching staff member assisted by workshop staff.

[Jobs carry 30 marks and journal carries remaining 20 marks.]

Shivaji University, Kolhapur

S.E. (Automobile) Semester IV (Revised)
8. PROFESSIONAL SKILLS - I

Teaching Scheme:
Practical: 2 hrs/ week

Examination Scheme:
Term Work: 25 marks

Course Objectives
After completing this course, student will be able to,

1. Acquire English as a language for specific purpose.
2. Prepare themselves according to the requirements of professional life.
3. Improve his personality traits.

Prerequisite: Adequate knowledge of English as a language

1. Communicative Concepts: Greeting people; Inviting people; Leave taking; Likes and dislikes; Agreement and disagreement; Expressing – joy, fear, surprise, worry; Opinions, beliefs, disbeliefs; Possibility and ability; Prediction and probability; Permission.

2. Natural English: Begin the conversation, Keep the conversation moving, Ask questions, Receive visitors, asking for information, Making offers, Friendly warnings and instructions, Giving advice and making suggestions.

3.Interpersonal Skills: Self-esteem and strategies for developing self-confidence; SMART goal setting; Dealing with emotions – anger, conflict, depression; Developing assertiveness.

4. Lifelong Learning: Steps in lifelong learning, Tips to achieve effective learning, Challenges in lifelong learning, Misconceptions about lifelong learning.

5. Body Language: Non verbal communication – Eye contact, Facial expressions, Gestures, Posture and body orientation, Proximity, Vocal; Non-verbal behavior interpretation.

6. Acting Ethically: Ethics and self-righteousness, Right and wrong in the workplace, Striving for integrity.

7. Creative and Critical Thinking: Developing your creativity, Factors that block creativity, Creativity in workplace, Importance of critical thinking.

8. Entrepreneurial Skills Development: Entrepreneurial competencies, Entrepreneurship in daily life, Venture project planning.

Details of Practical: Students in group of 5-6 will be engaged in following activities so as to improve english communication and overall personality development.

1. Personality Type Testing (This will be done in introductory session)
2. Goal Setting
3. Interpersonal Skills and Body Language - A Case Study
4. Presentation Skills
5. Teamwork

6. Creative Thinking and Divergent Thinking
7. Debate
8. Problem Solving and Proactive Mindset
9. Decision Making - A Case Study

Recommended Readings:

1. Masters, L. Ann, Personal Development for Life and Work, New Delhi: Cengage Learning, 2012. Print.
2. Gopalaswamy Ramesh, The ACE of Soft Skills: Attitude, Communication and Etiquette for Success, New Delhi: Pearson Education, 2012. Print.
3. Soft Skills: Module 1 to 5 (Infosys Campus Connect Programme).

Shivaji University, Kolhapur

Equivalence for Second Year Engineering (Revised)
(To be implemented from Academic year 2014-15)
Automobile Engineering

Semester-III

Name of the Subject in Old Syllabus		Equivalent Subject for Examination (Revised)	
1.	Engineering Mathematics – III	1.	Engineering Mathematics – III
2.	Engineering Thermodynamics	2.	Applied Thermodynamics
3.	Fluid Mechanics	3.	Fluid Mechanics
4.	Engineering Materials	4.	Automotive Materials and Manufacturing
5.	Electrical Technology	5.	Electrical Technology
6.	Measurement Techniques - I	6.	Instrumentation Laboratory
7.	Automotive Component Drawing	7.	Automotive Component Drawing

Semester – IV

Name of the Subject in Old Syllabus		Equivalent Subject for Examination (Revised)	
1.	Programming and Computational Methods	1.	Computational Methods
2.	Kinematics of Machines	2.	Kinematics of Machines
3.	Metallurgy and Metal Treatments	3.	Metallurgy and Metal Treatments
4.	Fluid Machines	4.	Fluid Machinery
5.	Strength of Materials	5.	Strength of Materials
6.	Manufacturing Processes	6.	Automotive Materials and Manufacturing