



VELS



INSTITUTE OF SCIENCE, TECHNOLOGY & ADVANCED STUDIES (VISTAS)
(Deemed to be University Estd. u/s 3 of the UGC Act, 1956)
PALLAVARAM - CHENNAI

ACCREDITED BY NAAC WITH 'A' GRADE
Marching Beyond 25 Years Successfully

B.E Automobile Engineering

Curriculum and Syllabus
(Based on Choice Based Credit System)
Effective from the Academic Year
2018-2019

**Department of Automobile Engineering
School of Engineering**

COURSE OUTCOMES:(Skill Development)

- CO1: To develop the **language proficiency** of a technical under-graduate in English with emphasis on Learn, Speak, Read and Write skills.
- CO2: To develop the ability to **speak effectively in English** in real life situations.
- CO3: To implement learning environment to practice listening, **speaking, reading and writing skills**.
- CO4: To understand the tasks and activities **through guided instructions and materials**.
- CO5: To inculcate **reading habit** and to develop effective reading skills.

UNIT I VOCABULARY BUILDING**10**

General Vocabulary-Nouns-Compound nouns, Word borrowing & Word making, Foreign machinery in English, Dictionary and Thesaurus usages, **Synonyms, Antonyms**, Prefixes and Suffixes, Homonyms, Homographs and Homophones, Changing words from one form to another, Acronyms and Abbreviations.

UNIT II BASIC WRITING**10**

Sentences structures-

Kinds of sentences, Types of sentences, Clauses and Phrases, **Punctuations**, Word Links and Connectives, Summarizing, Precise writing, Paragraph Writing.

UNIT III IDENTIFYING COMMON ERRORS IN ENGLISH**10**

Articles, Prepositions, Subject-verb Agreement, Pronouns- **Relative pronouns**, Demonstrative pronouns, Misplaced Modifiers, Redundancies, Clichés, Infinitives & Gerund

UNIT IV NATURE AND STYLE OF SENSIBLE WRITING**10**

Describing people, place and situations, **Process description**, Definitions, Numerical Expressions, Information Transfer- Flowchart Bar chart and Pie chart, Checklists, Writing introduction and conclusion.

UNIT V WRITING PRACTICES**10**

Letter Writing- Formal & Informal Letters, **Report Writing**- Letter Report, Accident Report, Investigation Report and Survey, Essay writing, Comprehension Passages.

TOTAL Hrs:50**TEXTBOOKS:**

1. **'English for Scientists'**, Prof. K.R. Lakshminarayanan, Former Head, Department of Humanities and Social Sciences, Sri Venkateswara College of Engineering, Pennalur, Sriperumbudur, Tamilnadu SCITECH PUBLICATIONS (INDIA PVT.LTD) 2014
2. Department of English, Anna University, Mindscapes, **'English for Technologists and Engineers'**, Orient Longman Pvt. Ltd, Chennai: 2012.

3. Department of Humanities and Social Sciences, Anna University, 'English for Engineers and Technologists' Combined Edition (Volumes 1 and 2), Chennai: Orient Longman Pvt. Ltd., 2006.
4. Department of English, Anna University, Mindscapes, 'English for Technologists and Engineers', Orient Longman Pvt. Ltd, Chennai: 2012.
5. Department of Humanities and Social Sciences, Anna University, "English for Engineers and Technologists" Combined Edition (Volumes 1 and 2), Chennai: Orient Longman Pvt. Ltd., 2006.
6. M. Ashraf Rizvi, "Effective Technical Communication", Tata McGraw-Hill Publishing Company Limited, New Delhi. 2009.

Suggested Readings:

- (i) Practical English Usage. Michael Swan. OUP. 1995.
- (ii) Remedial English Grammar. F. T. Wood. Macmillan. 2007
- (iii) On Writing Well. William Zinsser. Harper Resource Book. 2001
- (iv) Study Writing. Liz Hamp-Lyons and Ben Heasley. Cambridge University Press. 2006.
- (v) Communication Skills. Sanjay Kumar and Pushp Lata. Oxford University Press. 2011.
- (vi) Exercises in Spoken English. Parts. I-III. CIEFL, Hyderabad. Oxford University Press

COURSE OUTCOME: (Employability)

CO 1: To Formulate general mechanics parameters between **central and non-central forces**.

CO 2: To learn the **basics of ultrasonic**.

CO 3: To Understanding about the **Fiber optics**.

CO 4: To Explain types of waves and **interference of light**.

CO 5: To identify **thermodynamic parameters** and apply fundamental laws to solve thermodynamic problems.

UNIT-1: ELECTROSTATICS IN VACUUM**9**

Coulomb's inverse square law, **Super position principle** - Gauss theorem - proof and its application (intensity at a point due to charged sphere and cylinder), Laplace's and Poisson's equations for electrostatic potential-potential difference-equipotential surface-potential at a point due to a point charge.

UNIT-2: ELECTROSTATICS IN A LINEAR DIELECTRIC MEDIUM**9**

Electric dipole- potential energy of a dipole - Electric field due to an electric dipole (axial point and equatorial line) - Dielectric constant - Electric susceptibility - **Types of polarization**- point charge at centre of dielectric sphere in uniform magnetic field-Lorentz method-Clausius-Mosotti equation-Dielectric loss- Applications of capacitor and transformer in dielectric materials

UNIT-3: MAGNETOSTATICS IN A LINEAR MAGNETIC MEDIUM**9**

Biot-Savart law - magnetic induction at a point due to a straight conductor carrying current - magnetic field at centre of a circular coil carrying current- **Ampere's circuital law and its application** -Field along the axis of a circular coil and solenoid. Intensity of magnetisation-Magnetic susceptibility-Magnetic permeability- Classification of magnetic materials- Domain theory of ferromagnetism -BH curve.

UNIT-4: FARADAY'S LAW AND MAXWELL'S EQUATION**9**

Faraday's law - Differential form of Faraday's law - Self and Mutual inductance- Self-inductance of a long solenoid- Experimental determination of self-inductance (Rayleigh's method) and Mutual inductance - Maxwell's equations and their derivation - **Physical significance of Maxwell's equation** - Application - Refraction of radio wave in ionosphere (bending of radio waves).

UNIT-5: ELECTROMAGNETIC WAVES**9**

The wave equation - **Plane electromagnetic waves in vacuum**, their transverse nature - Relation between electric and magnetic fields of an electromagnetic wave- Hertz experiment: production and detection of electromagnetic wave - Practical electromagnetism - Carbon microphone - Electrodynamical microphone - Condenser microphone and Crystal microphone.

TOTAL Hrs: 45**TEXTBOOKS**

1. R. Murugesan, Electricity and Magnetism, S. Chand & Co, 2017
2. T. L. Chow, Introduction to Electromagnetic Theory: A Modern Perspective, Laxmi Publications (2012)

REFERENCE BOOKS:

1. David Griffiths, Introduction to Electrodynamics, Pearson Publishers, (2015)
2. Halliday and Resnick, Physics, Wiley, (2015)
3. Dr. Wayne M. Saslow, Electricity, Magnetism and Light, Academic Press, (2002)

COURSE OUTCOMES:: (Skill Development)

CO1: To introduce the idea of applying differential and integral calculus to Notion of curvature and to improper integrals. Apart from some applications it gives a basic introduction on Beta and Gamma functions.

CO2: To introduce the fall out of Rolle's Theorem that is fundamental to application of analysis to Engineering problems.

CO3: To develop the tool of power series for learning advanced Engineering Mathematics.

CO4: To familiarize the student with functions of several variables that is essential in most branches of engineering. CO5: To develop the essential tool of matrices in engineering.

UNIT I: CALCULUS

12

Evolutes and involutes- Evaluation of definite and improper integrals- Beta and Gamma functions and their properties

UNIT II: CALCULUS

12

Rolle's Theorem, Mean value theorems, Taylor's and Maclaurin theorems with remainders- indeterminate forms and L'Hospital's rule.

UNIT III: SEQUENCES AND SERIES

12

Convergence of sequence and series, tests for convergence- Power series, Taylor's series, series for exponential, trigonometric and logarithm functions.

UNIT IV: MULTIVARIABLE CALCULUS (DIFFERENTIATION)

12

Limit, continuity and partial derivatives, directional derivatives, total derivative- Tangent plane and normal line- Maxima, minima and saddle points- Method of Lagrange multipliers.

UNIT V: MATRICES

12

Introduction to matrix and rank of a matrix- System of linear equations- Symmetric, skew-symmetric and orthogonal matrices- Eigenvalues and eigenvectors- Diagonalization of matrices- Cayley-Hamilton Theorem, and Orthogonal transformation.

TOTAL: 60 Hrs.

TEXTBOOKS

1. G.B. Thomas and R.L. Finney, Calculus and Analytic Geometry, 9th Edition, Pearson, Reprint, 2002.
2. Ramana B.V., Higher Engineering Mathematics, Tata McGraw Hill New Delhi, 11, Reprint, 2010

REFERENCE BOOKS

1. Erwin Kreyszig, Advanced Engineering Mathematics, 9th Edition, John Wiley & Sons, 2006.
2. Veerarajan T., Engineering Mathematics for first year, Tata McGraw-Hill, New Delhi, 2008.
3. D. Poole, Linear Algebra: A Modern Introduction, 2nd Edition, Brooks/Cole, 2005.
4. N.P. Bali and Manish Goyal, A text book of Engineering Mathematics, Laxmi Publications, Reprint, 2008.
5. B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 36th Edition, 2010.

COURSE OUTCOMES: (Employability)

After successful completion of the Basic Electrical Engineering course, the student will be able to

- CO1:** Apply the basics of electrical circuits and measurements.
- CO2:** Use the Ohm's and Kirchhoff's Laws.
- CO3:** Understand the principle and construction of DC motor and generator.
- CO4:** Remember the principle and construction of single phase and three phase induction motors.

UNIT I	DCCIRCUITS	12
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Electrical circuit elements (R, L and C), voltage and current sources, Kirchoff current and voltage laws, Mesh and Nodal analysis, Analysis of simple circuits with dc excitation, Wye↔Delta Transformation, Superposition, Thevenin and Norton Theorems. Time-domain analysis of first-order RL and RC circuits.

UNIT II	ACCIRCUITS	12
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Representation of sinusoidal waveforms, peak and rms values, phasor representation, real power, reactive power, apparent power, power factor. Analysis of single-phase ac circuits consisting of R, L, C, RL, RC, RLC combinations (series and parallel), resonance. Three phase balanced circuits, voltage and current relations in star and delta connections.

UNIT III	TRANSFORMERS	12
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Magnetic materials, BH characteristics, ideal and practical transformer, equivalent circuit, losses in transformers, regulation and efficiency. Auto-transformer and three-phase transformer connections.

UNIT IV	ELECTRICAL MACHINES & POWER CONVERTERS	12
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Generation of rotating magnetic fields, Construction and working of a three-phase induction motor, Significance of torque-slip characteristic. Single phase induction motor. Construction, working, torque-speed characteristic and speed control of separately excited dc motor. DC-DC buck and boost converters, duty ratio control. Single phase Bridge Rectifier, Single Phase voltage source inverters.

UNIT V	ELECTRICAL INSTALLATIONS	12
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Components of LT Switchgear: Switch Fuse Unit (SFU), MCB, ELCB, MCCB, Types of Wires and Cables, Earthing. Types of Batteries, Important Characteristics for Batteries. Elementary calculations for energy consumption, power factor improvement and battery backup.

TOTAL Hrs: 60

TEXT/REFERENCES:

1. D.P. Kothari and J. Nagrath, "Basic Electrical Engineering", Tata McGraw Hill, 2010.
2. D.C. Kulshreshtha, "Basic Electrical Engineering", McGraw Hill, 2009.
3. L.S. Bobrow, "Fundamentals of Electrical Engineering", Oxford University Press, 2011.
4. E. Hughes, "Electrical and Electronics Technology", Pearson, 2010.
5. V.D. Toro, "Electrical Engineering Fundamentals", Prentice Hall India, 1989.

COURSE OUTCOMES: (Employability)

- CO1: Construct the various types of projection.
- CO2: Use the conventions and the methods of engineering drawing.
- CO3: Improve their visualization skills so that they can apply these skills in developing new products.
- CO4: Apply the simple layout of factory buildings.
- CO5: Impart and inculcate a proper understanding of the theory of projection.

CONCEPTS AND CONVENTIONS (Not for Examination)

Importance of graphics in engineering applications - Use of drafting instruments - BIS conventions and specifications - Size, layout and folding of drawings sheets - Lettering and dimensioning.

UNIT I INTRODUCTION TO ENGINEERING DRAWING AND PLANE CURVES 12

Curves used in engineering practices: Conics - Construction of ellipse, Parabola and hyperbola by eccentricity method - Construction of cycloid, Epicycloid, Hypocycloid - construction of involutes of square and circle - Drawing of tangents and normals to the above curves. Scales - Plain, Diagonal and Vernier Scales.

UNIT II PROJECTION OF POINTS, LINES AND PLANE SURFACES 12

Projection of points and straight lines located in the first quadrant - Determination of true lengths and true inclinations - Projection of polygonal surface and circular lamina inclined to both reference planes - Auxiliary Planes

UNIT III PROJECTION OF SOLIDS 12

Projection of simple solids like prisms, pyramids, cylinder and cone when the axis is inclined to one reference plane by change of position method - Auxiliary Views

UNIT IV SECTION OF SOLIDS AND DEVELOPMENT OF SURFACES 12

Sectioning of above solids in simple vertical position by cutting planes inclined to one reference plane and perpendicular to the other - Obtaining true shape of section - Auxiliary Views. Development of lateral surfaces of simple and truncated solids - Prisms, pyramids, cylinders and cones - Development of lateral surfaces of solids with cylindrical cutouts, perpendicular to the axis.

UNIT V ORTHOGRAPHIC PROJECTION AND ISOMETRIC PROJECTION 12

Free hand sketching: Representation of Three Dimensional objects - General principles of orthographic projection - Need for importance of multiple views and their placement - layout views - Developing visualization skills through free hand sketching of multiple views from pictorial views of objects.

Principles of isometric projection - isometric scale - isometric projections of simple solids, truncated prisms, pyramids, cylinders and cones.

TOTAL: 60 PERIODS

TEXTBOOKS:

1. N.D. Bhatt, "Engineering Drawing" Charotar Publishing House, 46th Edition, (2003).

REFERENCES:

1. K.V. Natrajan, "A text book of Engineering Graphics", Dhanalakshmi Publishers, Chennai (2006).
2. M.S. Kumar, "Engineering Graphics", D.D. Publications, (2007).
3. K. Venugopal & V. Prabhu Raja, "Engineering Graphics", New Age International (P) Limited (2008).
4. M.B. Shah and B.C. Rana, "Engineering Drawing", Pearson Education (2005).
5. K.R. Gopalakrishnan, "Engineering Drawing" (Vol. I & II), Subhas Publications (1998).
6. Dhananjay A. Jolhe, "Engineering Drawing with an introduction to AutoCAD" Tata McGraw Hill Publishing Company Limited (2008).
7. Basant Agarwal and Agarwal C.M., "Engineering Drawing", Tata McGraw Hill Publishing Company Limited, New Delhi, (

2008).

Publication of Bureau of Indian Standards:

1. IS10711-2001: Technical products Documentation- Size and layout of drawings sheets.
2. IS9609(Parts 0&1)-2001: Technical products Documentation-Lettering.
3. IS10714(Part 20)- 2001&SP46-2003: Lines for technical drawings.
4. IS11669-1986&SP46-2003: Dimensioning of Technical Drawings.
5. IS15021(Parts 1 to 4)- 2001: Technical drawings-Projection Methods.

Special points applicable to University Examinations on Engineering Graphics:

1. There will be five questions, each of either or type covering all units of the syllabus.
2. All questions will carry equal marks of 20 each making a total of 100.
3. The answer papers shall consist of drawings sheets of A3 size only. The students will be permitted to use appropriate scale to fit solution within A3 size.
4. Whenever
the total number of candidates in a college exceeds 150, the University Examination in that college will be conducted in two sessions (FN and AN on the same day) for 50 percent of student (approx) at a time.

COURSE OUTCOMES: (Skill Development)

- CO1: To Design and Conduct experiments as well as to Analyze and Interpret Data.
CO2: To Identify, Formulate, and Solve Engineering Problems.
CO3: To use Techniques and Skills associated with Modern Engineering Tools such as Lasers and Fiber Optics.
CO4: To Provide pre requisite hands-on experience for engineering laboratories.
CO5: To understand the basic physics concepts and study the Young's modulus of the uniform and nonuniform bending of the materials.

LIST OF EXPERIMENTS (Any'8')

1. Deflectionmagnetometer-TanAnulldeflectionmethod
2. Deflectionmagnetometer-TanBnulldeflectionmethod 3.
Deflectionmagnetometer-TanAequaldeflectionmethod
4. Laser-determinationofwavelengthandparticlesize
5. Potentiometer-CalibrationofLowrangevoltmeter
6. Determinationofbandgapofasemiconductor diode
7. Spectrometer -Grating
8. Spectrometer- Dispersivepowerofprism
9. Torsional Pendulum
10. UltrasonicInterferometer.

TOTAL:30Hrs

COURSE OUTCOMES: (Skill Development)

- CO1:** Evaluate power in three phase circuits.
- CO2:** Distinguish between the effects of Eddy current and hysteresis losses in magnetic materials.
- CO3:** Measure performance characteristics of DC generators and three-phase induction motors.
- CO4:** Perform power transformer open and short circuit tests and determine the values of elements of the equivalent circuit.
- CO5:** Understand the experiments for measuring characteristics of different semiconductor diodes.

LIST OF LABORATORY EXPERIMENTS/DEMONSTRATIONS:

1. Basic safety precautions. Introduction and use of measuring instruments - voltmeter, ammeter, multi-meter, oscilloscope. Real-life resistors, capacitors and inductors.
2. Sinusoidal steady state response of R-L, and R-C circuits - impedance calculation and verification.
3. Resonance in R-L-C circuits.
4. Loading of a transformer: measurement of primary and secondary voltages and currents, and power
5. Three-phase transformers: Star and Delta connections. Voltage and Current relationships (line-voltage, phase-to-neutral voltage, line and phase currents).
6. Load Characteristics of a DC Motor
7. Torque-Slip Characteristic of an Induction motor
8. Three phase induction motors - Direction reversal by change of phase-sequence of connections.
9. Demonstration of dc-dc converter.
10. Demonstration of dc-ac converter.
11. Demonstration of ac-dc converter.

TOTAL: 30Hrs

COURSE OUTCOMES: (Skill Development)

After successful completion of the Language Laboratory course, the student will be able to

- CO1:** Develop the listening capability.
- CO2:** Develop the writing capability through the practices.
- CO3:** Use strong vocabulary and fluently like foreigners.
- CO4:** Prepare their own resume in professional method.
- CO5:** Understand the structure of presentation and the tools available in the powerpoint presentation.

ORAL COMMUNICATION

40

(This unit involves interactive practice sessions in Language Lab)

Listening comprehensions, Pronunciation, Phonology, Intonation, Stress and Rhythm, Situational Dialogues, Communication in workplace, Interviews, Seminar, Formal Presentations, Group Discussions, Debates, JAM sessions

TEXTBOOKS:

1. Anderson, P.V., Technical Communication, Thomson Wadsworth, Sixth Edition, New Delhi, 2007.
2. Prakash, P., Verbal and Non-Verbal Reasoning, Macmillan India Ltd., Second Edition, New Delhi, 2004.

REFERENCES:

1. John Seely, The Oxford Guide to Writing and Speaking, Oxford University Press, New Delhi, 2004.
2. Evans, D., Decisionmaker, Cambridge University Press, 1997.
3. Thorpe, E., and Thorpe, S., Objective English, Pearson Education, Second Edition, New Delhi, 2007.
4. Turton, N. D. and Heaton, J. B., Dictionary of Common Errors, Addison Wesley.

COURSE OUTCOMES: (Employability)

After successful completion of the Engineering Chemistry course, the student will be able to

CO1: Analyze microscopic chemistry in terms of atomic and molecular orbital and **intermolecular forces**.

CO2: Rationalize **bulk properties and processes** using thermodynamic considerations.

CO3: Distinguish the ranges of the **electromagnetic spectrum** used for exciting different molecular energy levels in various spectroscopic techniques.

UNIT I ATOMIC AND MOLECULAR STRUCTURE, INTERMOLECULAR FORCES AND POTENTIAL ENERGY SURFACES 14

Molecular orbitals of diatomic molecules and plots of the multicentre orbitals. Equations for atomic and molecular orbitals. **Energy level diagrams of diatomics**. Pi-molecular orbitals of butadiene and benzene and aromaticity. Crystal field theory and the energy level diagrams for transition metal ions and their magnetic properties. Ionic, dipolar and van Der Waals interactions. Equations of state of real gases and critical phenomena. Potential energy surfaces of H_3 , H_2F and HCN .

UNIT II SPECTROSCOPIC TECHNIQUES AND APPLICATIONS 12

Principles of spectroscopy and selection rules. **Electronic spectroscopy**. Vibrational and rotational spectroscopy of diatomic molecules. Applications. Diffraction and scattering

UNIT III USE OF FREE ENERGY IN CHEMICAL EQUILIBRIA 12

Thermodynamic functions: energy, entropy and free energy. **Estimations of entropy and free energies**. Free energy and ΔG . Cell potentials, the Nernst equation and applications. Acid base, oxidation reduction and solubility equilibria. Water chemistry. Corrosion.

UNIT IV PERIODIC PROPERTIES 12

Variation of s , p , d and f orbital energies of atoms in the periodic table, electronic configurations, atomic and ionic sizes, ionization energies, electron affinity and **electronegativity**, polarizability, oxidation states, coordination numbers and geometries, hard soft acids and bases, molecular geometries.

UNIT V ORGANIC REACTIONS AND SYNTHESIS OF A DRUG MOLECULE 10

Introduction to reactions involving substitution, addition, elimination, **oxidation, reduction**, cyclization and ring openings. Synthesis of a commonly used drug molecule.

TOTAL Hrs: 60

TEXTBOOKS

1. Chemistry: Principles and Applications, by M.J. Sienko and R.A. Plane.
2. Fundamentals of Molecular Spectroscopy, by C.N. Banwell.
3. Engineering Chemistry (NPTEL Web-book), by B.L. Tembe, Kamaluddin and M.S. Krishnan.

REFERENCEBOOKS

1. Physical Chemistry, by P. W. Atkins.
2. Organic Chemistry: Structure and Function by K. P. C. Vollhardt and N. E. Schore, 5th Edition <http://bcs.whfreeman.com/vollhardtschore5e/default.asp>.
3. University Chemistry, by B. H. Mahan.

COURSE OUTCOMES: (Skill Development)

CO1: To implement the idea of applying integral calculus.

CO2: To evaluate Differential equations in engineering

CO3: To develop the ordinary differential equation for learning advanced Engineering Mathematics.

CO4: To understand with functions of several variables that is essential in most branches of engineering.

CO5: To develop the essential tool of complex variable (Integration) in engineering.

1 UNIT1: MULTIVARIABLE CALCULUS (INTEGRATION)

12

Multiple Integration: Double integrals (Cartesian)-change of order of integration in double integrals-Change of variables (Cartesian to polar)- Triple integrals (Cartesian)-orthogonal curvilinear coordinates- Green, Gauss and Stokes theorems (statement only)- Simple problems.

UNIT2: FIRST ORDER ORDINARY DIFFERENTIAL EQUATIONS

12

Exact, linear and Bernoulli's equations, Euler's equations, Equations not of first degree: equations solvable for p, equations solvable for y, equations solvable for x and Clairaut's type.

UNIT3: ORDINARY DIFFERENTIAL EQUATIONS OF HIGHER ORDERS

12

Second order linear differential equations with variable coefficients, method of variation of parameters, Cauchy-Euler equation; Power series solutions; Legendre polynomials,

UNIT4: COMPLEX VARIABLE – DIFFERENTIATION

12

Differentiation, Cauchy-Riemann equations, analytic functions, harmonic functions, finding harmonic conjugate; elementary analytic functions (exponential, trigonometric, logarithm) and their properties; Conformal mappings, Möbius transformations and their properties.

UNIT5: COMPLEX VARIABLE – INTEGRATION

12

Contour integrals, Cauchy-Goursat theorem (without proof), Cauchy Integral formula (without proof)- Taylor's series, zeros of analytic functions, singularities, Laurent's series; Residues, Cauchy Residue theorem (without proof), Evaluation of definite integrals involving sine and cosine.

TOTAL: 60 Hrs.**TEXT/REFERENCE BOOKS**

1. G.B. Thomas and R.L. Finney, Calculus and Analytic geometry, 9th Edition, Pearson, Reprint, 2002.
2. Erwin Kreyszig, Advanced Engineering Mathematics, 9th Edition, John Wiley & Sons, 2006.
3. W.E. Boyce and R.C. DiPrima, Elementary Differential Equations and Boundary Value Problems, Wiley India, 2009.
4. S.L. Ross, Differential Equations, 3rd Ed., Wiley India, 1984.
5. E.A. Coddington, An Introduction to Ordinary Differential Equations, Prentice Hall India, 1995.
6. E.L. Ince, Ordinary Differential Equations, Dover Publications, 1958.
7. J.W. Brown and R.V. Churchill, Complex Variables and Applications, 7th Ed., Mc-Graw Hill, 2004.
8. N.P. Bali and Manish Goyal, A text book of Engineering Mathematics, Laxmi Publications, Reprint, 2008.
9. B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 36th Edition, 2010.

COURSE OUTCOME: (Employability)

At the end of this course, the student will be able to

CO1. To implement the principles of algorithm and pseudocode.

CO2. To use the order of time complexity of algorithms.

CO3. To complete programs involving control instructions, arrays, structures and unions.

CO4. To use string manipulations using C programming constructs.

CO5. To recall file operations in C programming

UNIT I INTRODUCTION TO PROGRAMMING**9**

Introduction to Programming (Flow chart/pseudo code, compilation etc.), Variables (including data types) - Arithmetic expressions and precedence, **Conditional Branching and Loops** - Writing and evaluation of conditionals and consequent branching-iteration and loops

UNIT II ARRAYS AND BASIC ALGORITHMS**9**

Arrays (1-D, 2-D), Character arrays and Strings, **Searching, Basic Sorting Algorithms**, Finding roots of equations, Notion of order of time complexity through example programs

UNIT III FUNCTION AND POINTERS**9**

Functions (including using built-in libraries), Parameter passing in functions, call by value, Passing arrays to functions: idea of call by reference, Recursion with example programs such as **Finding Factorial, Fibonacci series, etc.** **Pointers** - Defining pointers, Use of Pointers in self-referential structures

UNIT IV STRUCTURES AND UNIONS**9**

Structures - Defining structures and Array of Structures, **Structures containing Pointers**, Unions - Storage classes: auto, static, extern, register - Dynamic memory allocation

UNIT V STRING FUNCTIONS AND FILES**9**

Strings-library string functions, pointers in strings, pointers and function arguments, Files - file operations, processing a file, Preprocessor directives, use of typedef, Command line arguments, Enumerated data types.

TOTAL Hrs: 45**TEXTBOOKS:**

1. Byron Gottfried, "Schaum's Outline of Programming with C", McGraw-Hill
2. E. Balaguruswamy, "Programming in ANSI C", Tata McGraw-Hill

REFERENCES:

1. Brian W. Kernighan and Dennis M. Ritchie, "The C Programming Language", Prentice Hall of India
2. Yashavant Kanetkar, "Let Us C", BPB Publications
3. Ashok N. Kamthane, "Computer Programming", Pearson Education (India)

COURSE OUTCOME (Skill Development)

CO 1: To estimate the rate constants of reactions, **freezing point depression** and partial coefficient of immiscible liquids.

CO 2: To Synthesize a small drug molecule and **analyse a salt sample**.

CO 3: To find the viscosity and **partition coefficient of a substance**.

CHOICE OF 10-12 EXPERIMENTS FROM THE FOLLOWING

1. **Determination of surface tension and viscosity**
2. Thin layer chromatography
3. **Ion exchange column for removal of hardness of water**
4. Determination of chloride content of water
5. **Colligative properties using freezing point depression**
6. Determination of the rate constant of a reaction
7. Determination of cell constant and conductance of solutions
8. Potentiometry-determination of redox potentials and emfs
9. Synthesis of a polymer/drug
10. Saponification/acid value of an oil
11. Chemical analysis of a salt
12. Lattice structures and packing of spheres
13. Models of potential energy surfaces
14. Chemical oscillations-Iodine clock reaction
15. Determination of the partition coefficient of a substance between two immiscible liquids
16. **Adsorption of acetic acid by charcoal**
17. Use of the capillary viscosimeters to demonstrate the isoelectric point as the pH of minimum viscosity for gelatin sols and/or coagulation of the white part of egg.

TEXTBOOKS

1. S. Sundaram and K. Raghavan "Practical Chemistry", S. Viswanathan Co. 3rd edition 2011.
2. Gnanaprakasam, Ramamurthy, "Organic Chemistry Lab Manual" S. Viswanathan Pvt. Ltd. 3rd edition 2011

REFERENCE BOOKS

1. Vogel's- "Textbook of qualitative organic Analysis", Longmann, 12th edition, 2011
2. J.N. Gurtu and R. Kapoor "Advanced experimental Chemistry", S. Chand and Co. 6th edition, 2010

TOTAL Hrs: 30

COURSEOUTCOME:(Skill Development)

- CO1. Familiarizewiththe **ProgrammingEnvironment**.
- CO2. Developprogramsusingvariouscontrolinstructionsandoperatorprecedencein**CProgramming**.
- CO3. Implement **stringmanipulations**, arraysandfunctions forvarious applicationsinC.
- CO4. Analyze the **use of structures**, unions and pointers in
- C.CO5. Handlevarious file operationsinC.

LIST OF EXPERIMENTS:

1. **Familiarizationwithprogrammingenvironment**
2. Simplecomputationalproblemsusingarithmeticexpressions
3. **Problemsinvolvingif-then-elsestructures**
4. **Iterativeproblems**
5. 1DArray manipulation
6. Matrixproblems
7. Stringoperations
8. Simple functions
9. SolvingNumericalmethodsproblems
10. Recursivefunctions
11. Pointersandstructures
12. Fileoperations

TOTALHrs:30

COURSE OUTCOMES: (Skill Development)

After successful completion of the Engineering Practices Laboratory course, the student will be able to

- CO1: To **Produce various joints** in the given object with the available work material.
 CO2: To judge how much time a joint will take for the assessment of time.
 CO3: To examine different types of woods used and tools used in **wood Working technology**.
 CO4: To explain different types of tools used in **sheet metal working**.
 CO5: To recall the Developments of sheet metal jobs from GI sheets, knowledge of **basic concepts of soldering**.

Workshop/Manufacturing Practices [[L : 1; T:0; P : 0 (1**credit)] Lectures & videos: (10 hours)****Detailed contents:**

- Manufacturing Methods- casting, forming, machining**, joining, advanced manufacturing methods (3 lectures)
- CNC machining, Additive manufacturing** (1 lecture)
- Fitting operations & power tools (1 lecture)
- Electrical & Electronics (1 lecture)
- Carpentry (1 lecture)
- Plastic moulding, glass cutting** (1 lecture)
- Metal casting (1 lecture)
- Welding (arc welding & gas welding), brazing (1 lecture)

(ii) Workshop Practice: (60 hours) [L : 0; T: 0 ; P: 4 (2 credits)]**1. Machineshop (10 hours)**

To make Facing and plain turning, step turning, drilling in the lathe

2. Fittingshop (8 hours)

To make square, V joint in bench fitting as per the given dimension and Tolerances

3. Carpentry (6 hours)

To make half lap joint, dovetail, TEELap joint

4. Electrical & Electronics (8 hours)

- To make fluorescent lamp wiring.
- To make stair case wiring.
- To make residential wiring.
- To measure Peak-peak, rms, period, frequency using CRO.
- To solder components devices and circuits by using general purpose PCB.

5. Weldingshop (8 hours (Arc welding 4hrs + gas welding 4hrs)

- To make single, butt, lap and T fillet joint by arc welding with the backhand and forehand welding techniques as per the given dimensions.

6. Plumbing Works

- Study of pipeline joints, its location and functions: valves, taps, couplings, unions, reducers, elbows in household fittings.
- Basic pipe connections-Mixed pipe material connection- Pipe connections with different joining components.

7. Sheet Metal Work

- To make simple Dustpan, Rectangular trays in sheet metal with the jigs as per the given Dimensions.

18MCAU21

CONSTITUTION OF INDIA

L	T	P	C
0	0	0	0

COURSE OUTCOME: [EMPLOYABILITY]

- To invent the basic concepts of constitution law.
- To Justify the Perspective of the Constitution of India
- To Classify the fundamental rights.
- To Apply the concepts of Fundamental duties and its Legal Status.
- To describe the Parliamentary form of Government in India

COURSE CONTENT

1. Meaning of the constitution law and constitutionalism
2. Historical perspective of the Constitution of India
3. Salient features and characteristics of the Constitution of India
4. Scheme of the fundamental rights
5. The scheme of the Fundamental Duties and its legal status
6. The Directive Principles of State Policy- Its importance and implementation
7. Federal structure and distribution of legislative and financial powers between the Union and the States
8. Parliamentary Form of Government in India- The constitution powers and status of the President of India
9. Amendment of the Constitutional Powers and Procedure
10. The historical perspectives of the constitutional amendments in India
11. Emergency Provisions: National Emergency, President Rule, Financial Emergency
12. Local Self Government- Constitutional Scheme in India
13. Scheme of the Fundamental Right to Equality
14. Scheme of the Fundamental Right to certain Freedom under Article 19
15. Scope of the Right to Life and Personal Liberty under Article 21

Course Outcome: (Skill Development)

- To implement the Fourier series representation of periodic signals. The analysis of signal is far more convenient in the frequency domain.
- To select the Fourier series for different types of functions.
- To classify the Fourier Transform.
- To solve and obtain the solution of wave, heat equation
- To explain the Problems of Fourier series and Fourier transforms used in engineering applications. CO5: Students understand the z-transforms and its properties

UNIT I FOURIER SERIES**12**

Dirichlet's conditions – General Fourier series – Odd and even functions – Half range sine series – Half range cosine series – Parseval's identity – Harmonic Analysis.

UNIT II FOURIER TRANSFORM**12**

Fourier integral theorem (without proof) – Fourier transform pair – Fourier Sine and Cosine transforms – Properties – Transform of simple functions – Convolution theorem – Parseval's identity.

UNIT III PARTIAL DIFFERENTIAL EQUATIONS**12**

Formation of partial differential equations – singular integrals –

Solutions of standard types of first order partial differential equations – Lagrange's linear equation – Linear partial differential equations of second and higher order with constant coefficients of homogeneous functions.

UNIT IV APPLICATIONS OF PARTIAL DIFFERENTIAL EQUATIONS**12**

Classification PDE – Method of separation of variables – One dimensional wave and heat equation – Steady state solution of two-dimensional heat equation (square plate only).

UNIT V Z - TRANSFORM AND DIFFERENCE EQUATIONS**12**

Z-transform – Introduction – properties – Inverse Z-transform (using partial fraction and residues) – Convolution theorem – Formation of difference equations – Solution of difference equations using Z-transform.

TOTAL: 60 Hours**TEXTBOOKS:**

- Grewal, B.S., "Higher Engineering Mathematics", Khanna Publications, Delhi, 43rd Edition, 2013.
- Ramana B.V., "Higher Engineering Mathematics", Tata McGraw Hill Publishing Company, New Delhi, 6th reprint, 2008.

REFERENCEBOOKS:

1. Bali.N.P.andManishGoyal‘ATextbookofEngineeringMathematics’,LaxmiPublications,9thedition,2011.
2. ErwinKreyszig,“AdvancedEngineeringMathematics”,WileyIndia,9thEdition,2011.
3. 3.GlynJames,“AdvancedModernEngineeringMathematics”,PearsonEducation,3rdEdition,2012.
4. SivaramakrishnaDas.P&Vijayakumari.C,ATextbookofEngineeringMathematics-III
5. Transformsandpartialdifferentialequations-A.Singaravelu

18PCAU31 ENGINEERINGTHERMODYNAMICS

L T P C
3 0 0 3

Course Outcomes: **(Employability)**

- To implement the first law of thermodynamics for simple open and closed systems under steady and unsteady conditions.
- To justify the second law of thermodynamics to open and closed systems and calculate entropy and availability.
- To classify the Rankine cycle to steam power plant and compare few cycle improvement methods
- To use simple thermodynamic relations of ideal and real gases
- To explain the properties of gas mixtures and moist air and its use in psychometric processes

UNIT I BASIC CONCEPT AND FIRST LAW

12

Basic concepts - concept of continuum, macroscopic approach, thermodynamic systems - closed, open and isolated. Property, state, path and process, quasi-static process, work, modes of work, Zeroth law of thermodynamics – concept of temperature and heat, Concept of ideal and real gases, First law of thermodynamics – application to closed and open systems, internal energy, specific heat capacities, enthalpy, steady flow process with reference to various thermal equipments.

UNIT II SECOND LAW AND ENTROPY

12

Second law of thermodynamics – Kelvin’s and Clausius statements of second law, Reversibility and irreversibility. Carnot theorem, Carnot cycle, reversed Carnot cycle, efficiency, COP, Thermodynamic temperature scale, Clausius inequality, concept of entropy, entropy of ideal gas, principle of increase of entropy.

UNIT III THERMODYNAMIC AVAILABILITY

12

Basics – Energy in non-flow processes: Expressions for the Energy of a closed system –

Equivalence between mechanical energy forms and Energy – Flow of energy associated with heat flow

- Energy consumption and entropy generation. Energy in steady flow processes: Expressions for Energy in steady flow processes – Energy dissipation and entropy generation.

UNIT IV PROPERTIES OF PURE SUBSTANCE AND STEAM POWER CYCLE

12

Properties of pure substances – Thermodynamic properties of pure substances in solid, liquid and vapour phases, phase rule, P-V, P-T, T-V, T-S, H-S diagrams, PVT surfaces, thermodynamic properties of steam. Calculations of work done and heat transfer in non-flow and flow processes, Standard Rankine cycle, Reheat and regenerative cycle.

UNIT V PSYCHROMETRY

12

Psychrometry and psychrometric charts, property calculations of air vapour mixtures. Psychrometric process – Sensible heat exchange processes. Latent heat exchange processes. Adiabatic mixing, evaporative cooling, problems.

18ESAU31

ELECTRICAL DRIVES AND CONTROL

L	T	P	C
3	0	0	3

COURSE OUTCOME: [Employability]

- To Design the electrical drives and components
- To Analyze with speed control of DC machines
- To Apply with speed control of AC machines
- To use the various starters and relays
- To Organize the heating and power rating of drive motors

UNIT I INTRODUCTION

9

Fundamentals of electric drives - advances of electric drive - characteristics of loads - different types of mechanical loads - choice of an electric drive - control circuit components: Fuses, switches, circuit breakers, contactors, Relay - control transformers.

UNIT II SPEED CONTROL OF DC MACHINES

9

DC shunt motors - Speed Torque characteristics - Ward Leonard method, DC series motor - series parallel control - solid state DC drives - Thyristor bridge rectifier circuits - chopper circuits.

UNIT III SPEED CONTROL OF AC MACHINES

9

Induction motor - Speed torque Characteristics - pole changing, stator frequency variation - slip-ring induction motor - stator voltage variation - Rotor resistance variation, slip power recovery - basic inverter circuits - variable voltage frequency control.

UNIT IV MOTOR STARTERS AND CONTROLLERS

9

DC motor starters: using voltage sensing relays, current sensing relays and time delay relays - wound rotor induction motor starters – starters using frequency sensing relays - DOI -starter and auto transformers starter.

UNIT V HEATING AND POWER RATING OF DRIVE MOTORS

9

Load diagram, over load capacity, insulating materials, heating and cooling of motors, service condition of electric drive - continuous, intermittent and short time - industrial application.

TOTAL 45 Hours

TEXT BOOKS:

1. N.K De and P.K Sen 'Electric Drives' Prentice Hall of India Private Ltd, 2002.
2. Vedam Subramaniam 'Electric Drives' Tata McGraw Hill, New Delhi, 2007.
3. V.K Mehta and Rohit Mehta 'Principle of Electrical Engineering', S Chand & Company, 2008.

REFERENCES:

1. S.K Bhattacharya Brinjinder Singh 'Control of Electrical Machines' New Age International Publishers, 2002.
2. John Bird 'Electrical Circuit theory and technology' Elsevier, First Indian Edition, 2006.

18PCAU32

AUTOMOTIVE ENGINES

L T P C
3 0 0 3

COURSE OUTCOME: [EMPLOYABILITY]:

- To Create the construction and operation of engines.
- To Analyze the Importance of cooling and its types
- To Examine the Importance and its type of Engines.
- To Evaluate with Supercharging, Turbo charging and Engine Testing
- To apply the various types of fuel injection systems

UNIT I CONSTRUCTION AND OPERATION

9

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.

UNIT II FUEL SYSTEMS

9

Air fuel ratio requirements of SI engines, Air fuel ratio and emissions, working of a simple fixed venturi carburetor, Constant vacuum carburetor. Diesel fuel injection systems-Jerk pumps, distributor pumps, pintle and multihole nozzles, Unit injector and common rail injection systems. Injection pump calibration. Need for a governor for diesel engines. Description of a simple diesel engine governor.

UNIT III COMBUSTION AND COMBUSTION CHAMBERS

9

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.

UNIT IV SUPERCHARGING ,TURBOCHARGING AND ENGINE TESTING 9

Supercharging and Turbocharging, Different methods of turbocharging, Intercooling, Turbocharger controls including waster gate, variable geometry, variable nozzle types. Dynamometers, Indicated thermal, brake thermal and volumetric efficiencies. Measurement of friction, Cylinder pressure measurement. Engine performance maps, Engine testing standards.

UNIT V COOLING AND LUBRICATION SYSTEMS 9

Need for cooling, types of cooling systems- air and liquid cooling systems. Thermosyphon and forced circulation and pressurized cooling systems. Properties of coolants. Requirements of lubrication systems. Types-mist, pressure fed, dry and wet sump systems. Properties of lubricants.

TOTAL: 45 Hours

TEXT BOOKS:

1. Bosch - "Automotive Handbook" - 5th edition - SAE publication - 2000.
2. Kirpal Singh, "Automobile Engineering", Standard publishers, Distributors, Delhi, 1999.
3. G.B.S.Narang, "Automobile Engineering", Khanna Publishers, Twelfth reprint New Delhi, 2005.

18PCAU33	MANUFACTURING TECHNOLOGY	L	T	P	C
		3	0	0	3

Course Outcome: (Employability)

- To design the automobile components production processes involving in casting.
- To select the various welding processes.
- To classify the working and commonly performed operations in the machines.
- To apply the Characteristics of the forming and shaping processes.
- To explain the Principles and applications involved in Forging, Rolling, Extrusion.

UNIT I CASTING 8

Casting types, procedure to make sand mould, types of core making, moulding tools, machine moulding, special moulding processes – CO2 moulding; shell moulding, investment moulding,

permanent mould casting, pressure diecasting, centrifugal casting, **continuous casting**, casting defects.

UNITII WELDING 8

Classification of welding processes. Principles of Oxy-acetylene gas welding. A.C metal arc welding, resistance welding, submerged arc welding, tungsten inert gas welding, metal inert gas welding, plasma arc welding, thermit welding, electron beam welding, **laser beam welding**, defects in welding, soldering and brazing.

UNITIII MACHINING 13

General principles (with schematic diagrams only) of working and commonly performed operations in the following machines: **Lathe, Shaper, Planer, Horizontal milling machine**, Universal drilling machine, Cylindrical grinding machine, Capstan and Turret lathe. Basics of CNC machines. General principles and applications of the following processes: Abrasive jet machining, Ultrasonic machining, Electric discharge machining, Electro chemical machining, Plasma arc machining, Electron beam machining and Laser beam machining.

UNITIV FORMING AND SHAPING OF PLASTICS 7

Types of plastics - **Characteristics of the forming and shaping processes** - Moulding of Thermoplastics - Working principles and typical applications of - Injection moulding - Plunger and screw machines - Blow moulding - Rotational moulding - Film blowing - Extrusion - Typical industrial applications - Thermoforming - Processing of Thermosets - Working principles and typical applications - Compression moulding - Transfer moulding - Bonding of Thermoplastics - Fusion and solvent methods - Induction and Ultrasonic methods

UNITV METAL FORMING AND POWDER METALLURGY 9

Principles and applications of the following processes: Forging, Rolling, Extrusion, Wire drawing and Spinning, Powder metallurgy - **Principal steps involved advantages, disadvantages and limitations of powder metallurgy.**

TOTAL: 45 Periods

TEXTBOOKS:

1. Hajra Choudhury, "Elements of Workshop Technology", Vol. I and II, Media Promoters and Publishers Pvt., Ltd., Mumbai, 2005.
2. Nagendra Parashar B.S. and Mittal R.K., "Elements of Manufacturing Processes", Prentice-Hall of India Private Limited, 2007.

REFERENCES:

1. Adithan. M. and Gupta. A.B., "Manufacturing Technology", New Age, 2006.
2. "H.M.T. Production Technology - Handbook", Tata McGraw-Hill, 2000.
3. Jain. R.K. and S.C. Gupta, "Production Technology", Khanna Publishers. 16th Edition, 2001.
4. Roy. A. Linberg, "Process and Materials of Manufacture", PHI, 2000.
5. Serop Kalpajian, Steven R. Schmid, "Manufacturing Processes for Engineering Materials", Fourth Edition, Pearson Education, Inc. 2007.

Course Outcome: (Employability)

- To develop the importance of various types of flow in pumps and turbines
- To select the importance of dimensional analysis
- To distinguish of the conservation laws to flow through pipes and hydraulic machines are studied.
- To apply the working of rotodynamic machines.
- To explain the positive displacement machines.

UNIT I INTRODUCTION 9

Units & Dimensions. Properties of fluids – Specific gravity, specific weight, viscosity, compressibility, vapour pressure and gas laws – capillarity and surface tension. Flow characteristics: concepts of system and control volume. Application of control volume to continuity equation, energy equation, momentum equation and moment of momentum equation.

UNIT II FLOW THROUGH CIRCULAR CONDUITS 9

Laminar flow through circular conduits and circular annuli, Boundary layer concepts, Boundary layer thickness. Hydraulic and energy gradient, Darcy – Weisbach equation, Friction factor and Moody diagram, Commercial pipes, Minor losses, Flow through pipes in series and in parallel.

UNIT III DIMENSIONAL ANALYSIS 9

Dimension and units: Buckingham's II theorem, Discussion on dimensionless parameters, Models and similitude, Navier-Stokes equations Introduction of dimensionless parameters, Applications of dimensionless parameters.

UNIT IV ROTODYNAMIC MACHINES 9

Homologous units, Specific speed, Elementary cascade theory, Theory of turbo machines, Euler's equation, Hydraulic efficiency, Velocity components at the entry and exit of the rotor.

Velocity triangle for single stage radial flow and axial flow machines, Centrifugal pumps, turbines, performance curves for pumps and turbines.

UNIT V POSITIVE DISPLACEMENT MACHINES 9

Reciprocating pumps Single acting, Double acting-advantages and disadvantages, Indicator diagrams, air vessels Worksaved by air vessels, Rotary pumps, Classification, Working principle and performance curves.

TOTAL: 45 Hours**TEXTBOOKS:**

1. Streeter, V.L., and Wylie, E.B., Fluid Mechanics, McGraw Hill, 1983.

2. Rathakrishnan.E,FluidMechanics,PrenticeHallofIndia(IIEd.),2007.

REFERENCES:

1. Ramamritham.S,FluidMechanics,HydraulicsandFluid Machines,DhanpatRai&Sons,Delhi,1988.
2. Kumar.K.L.,EngineeringFluidMechanics(VIIEd.)EurasiaPublishingHouse(P)Ltd.,NewDelhi,1995.
- Bansal,R.K.,FluidMechanicsandHydraulics Machines,LaxmiPublications(P)Ltd.,NewDelhi.

18PCAU35

ELECTRONICS AND MICROPROCESSORS LAB

L	T	P	C
0	0	2	1

COURSE OUTCOME:[SKILL DEVELOPMENT]

- To Evaluate the characteristics of PN Junction Diode and Zener Diode
- To Examine the characteristics of CE Transistor, JFET and Uni Junction Transistor
- To Analyze the RC/Wein Bridge Oscillator and Logic Gates
- To Construct the Half Adder and Full Adder and Shift Registers, Counters and Operational Amplifier
- To organize the Block Transfer, 8 bit Addition, Subtraction

LIST OF EXPERIMENTS

ELECTRONICS

30

- 1.VI Characteristics of PN Junction Diode
- 2.VI Characteristics of Zener Diode
- 3.Characteristics of CE Transistor
- 4.Characteristics of JFET
- 5.Characteristics of Uni Junction Transistor
- 6.RC or Wein Bridge Oscillator
7. Study of Logic Gates (Basic Gates)
8. Half Adder and Full Adder
9. Shift Registers and Counters
10. Operational Amplifier (Adder, Subtractor, Differentiator, Integrator, Inverting and Non - Inverting

MICROPROCESSOR

15

1. Block Transfer
2. 8 bit Addition, Subtraction
3. Multiplication and Division
4. Maximum and Minimum of block of data
5. Sorting
6. Stepper Motor Interfacing

TOTAL : 45 Hours

LIST OF EQUIPMENTS

- | | |
|---|--------|
| 1. Voltmeters | 5 No. |
| 2. Ammeters | 5 No. |
| 3. PN Diode, BJT, JFET, Logic Gates, Shift Registers and Counters | 1 set. |

4. Digital Logic Trainer Kits	1 No.
5. Breadboards	1 No.
6. Microprocessor Kits - 8085	5 No.
7. D/A Converter Interface	1 No.
8. Stepper Motor Interface	1 No.
9. CRO	1 No.
10. Waveform Generator	1 No.
11. Multimeter	1 No.

COURSE OUTCOME[SKILL DEVELOPMENT]

- To Analyze the mechanical properties of materials when subjected to different types of loading.
- To Examine the principles studied in Fluid Mechanics theory by performing experiments in lab.
- Perform Tension, Torsion, Hardness, Compression, and Deformation test on Solid materials.
- Perform test on different fluid machinery.
- Ability to perform Tension, Torsion, Hardness, Compression, and Deformation test on Solid materials.

STRENGTH OF MATERIALS (30Hrs)**LIST OF EXPERIMENTS (Any Five of the following)**

1. Tension test on a mild steel rod
2. Double shear test on Mild steel and Aluminium rods
3. Torsion test on mild steel rod
4. Impact test on metal specimen
5. Hardness test on metals - Brinnell and Rockwell Hardness Number
6. Deflection test on beams
7. Compression test on helical springs

LIST OF EQUIPMENT FOR BATCH OF 30 STUDENTS

S.No.	NAME OF THE EQUIPMENT	Qty.
1	Universal Tensile Testing machine with double 1 shear attachment - 40 Ton Capacity	1
2	Torsion Testing Machine (60 NM Capacity)	1
3	Impact Testing Machine (300 J Capacity)	1
4	Brinell Hardness Testing Machine	1
5	Rockwell Hardness Testing Machine	1
6	Spring Testing Machine for tensile and compressive loads (2500 N)	1

FLUID MECHANICS AND MACHINES LABORATORY (30Hrs)**LIST OF EXPERIMENTS (Any Five of the following)**

1. Determination of the Coefficient of discharge of given Orifice meter.
2. Determination of the Coefficient of discharge of given Venturi meter.
3. Calculation of the rate of flow using Rota meter.
4. Determination of friction factor for a given set of pipes.
5. Conducting experiments and drawing the characteristic curves of centrifugal pump/ submergible pump
6. Conducting experiments and drawing the characteristic curves of reciprocating pump.
7. Conducting experiments and drawing the characteristic curves of Gear pump.

TOTAL: 60 PERIODS**COURSE OUTCOME:****LIST OF EQUIPMENT FOR A BATCH OF 30 STUDENTS**

S. NO.	NAME OF THE EQUIPMENT	Qty.
1	Orifice meter setup	1
2	Venturi meter setup	1
3	Rota meter setup	1
4	Pipe Flow analysis setup	1
5	Centrifugal pump/submergible pump setup	1
6	Reciprocating pump setup	1
7	Gear pump setup	1

18HSPD31

**PERSONALITY
DEVELOPMENT I**

L T P C
2 0 0 2

**COURSE OUTCOME: [SKILL
DEVELOPMENT]**

6

To Apply the Features of
Personality Development

To Create Soft Skills in Action

To Analyze Self Awareness and
Self Esteem

To Examine Self Motivation

SOFT SKILLS I

UNIT I

Introduction to Personality Development - Meaning-Features of personality=Dimensions of Personality=Determinants of Personality-Features and Traits- Components of self concept-Barriers-Self analysis

UNIT II SOFT SKILLS II 6

Importance of Soft Skills – First impression-Work Place requirements-Discipline-Cleanliness-Hygiene-general Appearance--Building Confidence--Concept of Thinking and Usage-Value of Time-Focus & Commitment.

UNIT III SOFT SKILLS IN ACTION 6

Grooming - Attire - Understanding others- - Stability & Maturity Development - Strength s - Weakness -Opportunities- threats -Merits of SWOT Analysis-Components-how to convert weakness into strengths-Goal settings

UNIT IV SELF AWARENESS AND SELF ESTEEM 6

Definitions-Components of self awareness-Developing Self awareness-Self esteem-meaning-Steps to improve self esteem

UNIT V SELF MOTIVATION 6

Motivation -Meaning-Techniques of self motivation-Motivation & goal setting - Motivation and emotion - Motivation at work.

Total: 30 Hours

REFERENCES:

1. Personality Development And Soft Skills---Barun K Mitra, Oxford Publication
2. Seven habits of Higly Effective people - Stephen R. covey
3. Emotion, motivation and Self regulation - Nathan C. Hall , McGill University, Canada, Thomas Goetz, University of Konstanz, Germany
4. <http://www.emeraldgrouppublishing.com/>
5. Psychology of Selfesteem - Nathaniel Branden, Nash (1st edition), Jossey-Bass (32nd anniversary edition)

COURSE OUTCOME:[SKILL DEVELOPMENT]

To Create the safety in metal and wood working machinery

To Organize the principles of machine guarding.

To Examine the safety in welding and gas cutting

To apply the safety in cold farming and hot working of metals.

To Demonstrate with the safety in finishing, inspection and testing

	SAFETY IN METAL WORKING MACHINERY AND WOOD	
UNIT I	WORKING MACHINES	6
	General safety rules, principles, maintenance, Inspections of turning machines, boring machines, milling machine, planning machine and grinding machines, CNC machines.	
UNIT II	PRINCIPLES OF MACHINE GUARDING	6
	Guarding during maintenance, Zero Mechanical State (ZMS), Definition, Policy for ZMS – guarding of hazards - point of operation protective devices, machine guarding, types, fixed guard, interlock guard, automatic guard, trip guard, electron eye, positional control guard, fixed guard fencing- guard construction- guard opening. Selection and suitability: lathe-drilling-boring-milling -grinding-shaping	
UNIT III	SAFETY IN WELDING AND GAS CUTTING	6
	Gas welding and oxygen cutting, resistances welding, arc welding and cutting, common hazards, personal protective equipment, training, safety precautions in brazing, soldering and metalizing – leak detection-pipe line safety-storage and handling of gas cylinders.	
UNIT IV	SAFETY IN COLD FARMING AND HOT WORKING OF METALS	6
	Cold working, power presses, point of operation safe guarding, auxiliary mechanisms, feeding and cutting mechanism, hand or foot-operated presses, power press electric controls.Hot working safety in forging, hot rolling mill operation,safe guards in hot rolling mills. Safety in gas furnace operation.	
UNIT V	SAFETY IN FINISHING, INSPECTION AND TESTING	6
	Heat treatment operations, electro plating, sand and shot blasting, safety in inspection and testing, dynamic balancing, hydro testing. Health and welfare measures in engineering industry-pollution control in engineering industry-industrial waste disposal.	

TOTAL: 30 PERIODS

REFERENCES

1. "Accident Prevention Manual" - NSC, Chicago, 1982.
2. "Occupational safety Manual" BHEL, Trichy, 1988.
3. "Safety Management by John V. Grimaldi and Rollin H. Simonds, All India Travelers Book seller, New Delhi,1989.
4. "Safety in Industry" N.V. Krishnan Jaico Publishery House, 1996.

5. Indian Boiler acts and Regulations, Government of India.
6. Safety in the use of wood working machines, HMSO, UK 1992.
7. Health and Safety in welding and Allied processes, welding Institute, UK, High Tech. Publishing Ltd., London, 1989.

18BSAU41 MATHEMATICS - IV (STATISTICS AND NUMERICAL METHODS)

L	T	P	C
4	0	0	3

COURSE OUTCOME: (Skill Development)

- To revise the skill on testing of hypothesis
- To select with the design of experiment
- To examine the knowledge on solution of equations and eigenvalue problems
- To use the applications of interpolation, numerical differentiation and numerical integration
- To identify the knowledge on numerical solution of ordinary differential equations.

UNIT I TESTING OF HYPOTHESIS

12

Sampling distributions – Large samples-Tests for single mean, Proportion, Difference of means Small samples – Tests for single mean, two mean and paired t-test-F-test – chi-square test for goodness of fit – Independence of attributes-Design of Experiments-Completely randomized design-Randomized block design-Latin square design.

UNIT II CORRELATION AND REGRESSION ANALYSIS

12

Introduction to Correlation Analysis- Karl Pearson's Coefficient of Correlation-Rank Correlation-Regression Analysis-Curve fitting-Introduction- method of least squares.

UNIT III SOLUTION OF EQUATIONS

12

Introduction-Bisection method-Newton-Raphson's method- Regula falsi method- Gauss Elimination method -Gauss-Jordan methods –Matrix Inversion by Gauss-Jordan method.

UNIT IV INTERPOLATION, NUMERICAL DIFFERENTIATION AND NUMERICAL INTEGRATION

12

Introduction-Newton's forward and backward interpolation-Lagrange's Interpolation formula-Derivatives using Newton's forward and backward difference formula -Numerical integration using Trapezoidal, Simpson's 1/3 rules and Simpson's 3/8 rules.

UNIT V NUMERICAL SOLUTION OF ORDINARY DIFFERENTIAL EQUATIONS

12

Introduction-Taylor's series method -Euler's method - Modified Euler's method – Second and Fourth order Runge-Kutta method for solving first order equations-Milne's Predictor corrector method and Adams-Bashforth method (Simple problems).

TOTAL: 60 Hours

TEXTBOOKS:

1. Grewal, B.S. and Grewal, J.S., "Numerical methods in Engineering and Science", 9th Edition, Khanna Publishers, New Delhi, 2012. (For units 3, 4 and 5).
2. Johnson R.A. and Gupta C.B., "Miller and Freund's Probability and Statistics for Engineers", Pearson Education, Asia, 7th edition, 2007 (For units 1 and 2).
3. Dr. Kandasamy .P, Dr. Thilagavathi, Dr. Gunavathi.K, "Statistics and numerical methods", s.chand and company, first edition, 2010.

REFERENCE BOOKS:

1. Chapra, S.C. and Canale, R.P. "Numerical Methods for Engineers", Tata McGraw-Hill, New Delhi, 7th Edition, 2014.
2. Walpole R.E, Myers R.H, Myers S.L, and Ye.K, "Probability and Statistics for Engineers and Scientists", Pearson Education, Asia, 9th edition, 2011.

18PCAU41	AUTOMOTIVE FUELS AND LUBRICANTS	L	T	P	C
		3	0	0	3

Course Outcome: (Employability)

- To design the manufacture of fuels and lubricants
- To evaluate the theory of lubrication
- To classify the lubricants used in automobiles
- To use the properties and testing of fuels
- To explain the combustion & fuel rating

UNIT I MANUFACTURE OF FUELS AND LUBRICANTS 9

Structure of petroleum, refining process, fuels, thermal cracking, catalytic cracking, polymerization, alkylation, isomerisation, blending, products of refining process. Manufacture of lubricating oil base stocks, manufacture of finished automotive lubricants.

UNIT II THEORY OF LUBRICATION 9

Engine friction: introduction, total engine friction, effect of engine variables on friction, hydrodynamic lubrication, elastohydrodynamic lubrication, boundary lubrication, bearing lubrication, functions of the lubrication system, introduction to design of a lubricating system.

UNIT III LUBRICANTS 9

Specific requirements for automotive lubricants, oxidation deterioration and degradation of

lubricants, additives
and additive mechanism, synthetic lubricants, classification of lubricating oils, properties of lubricating oils,
test on lubricants. Grease, classification, properties, test used in grease.

UNIT IV PROPERTIES AND TESTING OF FUELS

9

Thermo-chemistry of fuels, properties and testing of fuels, relative density, calorific value, flash point, fire point, distillation, vapour pressure, spontaneous ignition temperature, viscosity, pour point, flammability, ignitability, diesel index, API gravity, aniline point, carbon residue, copper strip corrosion etc.

UNIT V COMBUSTION & FUEL RATING

9

SI Engines – flame propagation and mechanism of combustion, normal combustion, knocking, octane rating,
fuel requirements. CI Engine, mechanism of combustion, diesel knock, cetane rating, fuel requirements. Additive-mechanism, requirements of an additive, petrol fuel additives and diesel fuel additives – specifications of fuels.

TOTAL: 45 PERIODS

TEXTBOOKS:

1. Ganesan.V., "Internal Combustion Engineering", Tata McGraw-Hill Publishing Co., New Delhi, 2003.
2. Mathur.M.L., Sharma.R.P. "A course in internal combustion engines", Dhanpatra publication, 2003.
3. Obert.E.F "Internal Combustion Engineering and Air Pollution", International book Co., 1988.

REFERENCES:

1. Brame, J.S.S. and King, J.G. - "Fuels Solids, Liquids, Gaseous". Edward Arnold, 1961
2. Francis, W., "Fuels and Fuel Technology", Vol. I & II, Pergamon, 1965
3. Hobson, G.D. & Pohl, W. "Modern Petroleum Technology", 1974
4. Lansdown. A.R., "Lubrication, A practical guide to lubricant selection", Pergamon press, 1982.
5. Raymond.C. Gunther, "Lubrication", Chilton Book Co., 1971.

COURSE OUTCOME: (Employability)

- To **invent alloys** and phase diagram, Iron-Iron carbide diagram and steel classification.
- To **select the isothermal transformation**, continuous cooling diagrams and different heat treatment processes.
- To **classify the mechanism** of plastic deformation and testing mechanical properties.
- To **use the effect of alloying** elements on ferrous and non-ferrous metals.
- To **explain the Differentiate** different non-metallic materials.

UNIT I ALLOYS AND PHASE DIAGRAMS

9

Constitution of alloys – **Solid solutions, substitutional and interstitial** –

phase diagrams, Isomorphous, eutectic, eutectoid, peritectic, and peritectoid reactions, Iron – carbon equilibrium diagram. Classification of steel and cast Iron microstructure, properties and application.

UNIT II HEAT TREATMENT

9

Definition – Full annealing, stress relief, **recrystallisation** and spheroidising – normalising, hardening and Tempering of steel. Isothermal transformation diagrams – cooling curves superimposed on I.T. diagram CCR – Hardenability, Jominy end quench test – Austempering, martempering – case hardening, carburizing, Nitriding, cyaniding, carbonitriding – Flame and Induction hardening – Vacuum and Plasma hardening.

UNIT III FERROUS AND NON-FERROUS METALS

9

Effect of alloying additions on steel – α and β stabilisers – stainless and tool steels – HSLA, Maraging steels – Cast Iron – Grey, white, malleable, spheroidal – alloy cast irons, Copper and copper alloys. Brass, Bronze and Cupronickel – **Aluminium and Al-Cu** – precipitation strengthening treatment – Bearing alloys, Mg-alloys, Ni-based super alloys and Titanium alloys.

UNIT IV NON-METALLIC MATERIALS

9

Polymers – types of polymer, commodity and engineering polymers –

Properties and application of various thermosetting and thermoplastic polymers (PP, PS, PVC, PMMA, PET, PC, PA, ABS, PI, PAI, PPO, PPS, PEEK, PTFE, Polymers – Urea and Phenol formaldehydes) –

Engineering Ceramics

Properties and application of Al_2O_3 , SiC, Si_3N_4 , PSZ and SIALON – Composites – Classifications – Metal Matrix and FRP – Applications of Composites.

UNIT V MECHANICAL PROPERTIES AND DEFORMATION MECHANISMS

9

Mechanisms of plastic deformation, **slip and twinning** – Types of

fracture – Testing of

materials under tension, compression and shear loads – Hardness tests (Brinell, Vickers and Rockwell), hardness tests, Impact test Izod and Charpy, fatigue and creep failure mechanisms.

TOTAL: 45 PERIODS

TEXTBOOKS:

1. Avner, S.H., "Introduction to Physical Metallurgy", McGraw Hill Book Company, 1997.
2. Williams D Callister, "Material Science and Engineering" Wiley India Pvt Ltd, Revised Indian Edition 2014

REFERENCES:

1. Kenneth G. Budinski and Michael K. Budinski, "Engineering Materials", Prentice Hall of India Private Limited, 2010.
2. Raghavan V, "Materials Science and Engineering", Prentice Hall of India Pvt. Ltd., 2015.
3. U.C. Jindal: Material Science and Metallurgy, "Engineering Materials and Metallurgy", First Edition, Dorling Kindersley, 2012
4. Upadhyay G.S. and Anish Upadhyay, "Materials Science and Engineering", Viva Books Pvt. Ltd., New Delhi, 2006.

18PCA43	AUTOMOTIVE CHASSIS	L	T	P	C
		3	0	0	3

Course Outcome: (Employability)

- To develop the vehicle layout and drives.
- To defend the steering system and its components.
- To classify the driveline system components and its working.
- To implement the concept of various types of braking system and its components.
- To explain the suspension systems and its components.

UNIT I LAYOUT, FRAME, FRONT AXLE AND STEERING SYSTEM 9

Basic construction of chassis, Types of Chassis layout, with reference to Power Plant location and drive, various types of frames, Loads acting on vehicle frame, Types of Front Axles and Stub Axles, Front Wheel Geometry. Condition for True Rolling Motion. Ackerman's and Davis's Steering Mechanisms, Steering Linkages, Different Types of Steering Gearboxes, Slip Angle, Over-Steer and Under-Steer, Reversible and Irreversible Steering, Power Steering.

UNIT II DRIVELINE, FINAL DRIVE AND DIFFERENTIAL 9

Driving Thrust and its effects, torque reactions and side thrust, Hotchkiss drive, torque tube drive, radius rods and stabilizers, Propeller Shaft, Universal Joints, Constant Velocity Universal Joints, Final drive, different types of final drive, Worm and Worm wheel, straight bevel gear, spiral bevel gear and hypoid gear final drive. Differential principle. Constructional details of differential unit, Differential housings, Non-Slip differential, Differential locks.

UNIT III REAR AXLES, WHEELS, RIMS AND TYRES**9**

Construction of rear axles, Types of Loads **acting** on rear axles, Full –Floating, Three–Quarter Floating and Semi–Floating Axles, Twist beam rear axle, Types, Multi axles vehicles. Wheels and Rims, Types of Tyres and their constructional details.

UNIT IV BRAKE SYSTEMS**9**

Need for Brake systems, Stopping Distance, **Time** and Braking Efficiency, Effect of Weight Transfer during Braking, Classification of brakes, Braking Torque, drum brake and disc Brake Theory, Types and Construction of Hydraulic Braking System, Mechanical Braking System, Pneumatic Braking System, Power–Assisted Braking System, Servo Brakes, Retarders–antilock braking systems (ABS).

UNIT V SUSPENSION SYSTEM**9**

Requirement of Suspension System, Types of Suspension Springs, Constructional details and characteristics of Single Leaf, Multi–Leaf spring, Coil and Torsion bar Springs, Rubber, Pneumatic and Hydro – elastic Suspension Spring Systems, **Independent** Suspension System, Shock Absorbers, Types and Constructional details of Leaf and Coil Springs.

TOTAL: 45 Hours**TEXTBOOKS:**

1. K. Newton, W. Steeds and T. K. Garret, "The Motor Vehicle", 13th Edition, Butterworth Heinemann, India, 2004.
2. P. M. Heldt, "Automotive Chassis", Chilton Co., New York, 1982.
3. W. Steed, "Mechanics of Road Vehicles", Illiffe Books Ltd., London, 1992.

REFERENCES:

1. Harban Singh Rayat, "The Automobile", S. Chand & Co. Ltd, New Delhi, 2000.
2. G. J. Giles, "Steering Suspension and Tyres", Illiffe Books Ltd., London, 1975.
3. Kirpal Singh, "Automobile Engineering", Standard publishers, Distributors, Delhi, 1999.
4. G. B. S. Narang, "Automobile Engineering", Khanna Publishers, Twelfth reprint New Delhi, 2005.
5. R. P. Sharma, "Automobile Engineering", Dhanpat Rai & Sons, New Delhi, 2000.

18PCAU44**HEAT AND MASS TRANSFER**

L	T	P	C
3	1	0	4

Course Outcome: (Employability)

- To **develop the thermal analysis** and sizing of heat exchangers and to understand the basic
- To **justify the concepts** of heat transfer through extended surfaces.
- To **classify the mechanisms** of heat transfer under steady and transient conditions. concepts of mass transfer.
- To **complete the design and analyze** the performance of heat exchangers
- To **explain the physical phenomena** associated with convection.

(Use of standard HMT data book permitted)

UNIT CONDUCTION**12**

Basic Concepts – **Mechanism of Heat Transfer** – Conduction, Convection and Radiation – General Differential equation of Heat Conduction – Fourier Law of Conduction – Cartesian and Cylindrical

Coordinates – One Dimensional SteadyState Heat Conduction – Conduction through Plane Wall, Cylinders and Spherical systems – Composite Systems –Conduction with Internal Heat Generation – Extended Surfaces – Unsteady Heat Conduction – Lumped Analysis – UseoffHeislrsChart.

UNITII CONVECTION

12

Basic Concepts – Convective Heat Transfer Coefficients – **Boundary Layer Concept** – Types of Convection – ForcedConvection – Dimensional Analysis – External Flow – Flow over Plates, Cylinders and Spheres – Internal Flow –Laminar and Turbulent Flow – Combined Laminar and Turbulent – Flow over Bank of tubes – Free Convection –DimensionalAnalysis–FlowoverVerticalPlate, HorizontalPlate,InclinedPlate,CylindersandSpheres.

UNITIII PHASECHANGEHEATTRANSFERANDHEATEXCHANGERS

12

Nusselts theory of condensation-pool boiling, flow boiling, correlations in boiling and condensation. Types of HeatExchangers – **LMTD Method of heat Exchanger Analysis** – Effectiveness – NTU method of Heat Exchanger Analysis –OverallHeatTransfer Coefficient–Fouling Factors.

UNITIV RADIATION

12

Basic Concepts, Laws of Radiation – **Stefan Boltzman Law**, Kirchoff Law –Black Body Radiation –Grey body radiationShapeFactorAlgebra –Electrical Analogy–RadiationShields–IntroductiontoGas Radiation.

UNITV MASS TRANSFER

12

Basic Concepts – Diffusion Mass Transfer – **Fick’s Law of Diffusion** – Steady state Molecular Diffusion – ConvectiveMassTransfer–Momentum, HeatandMass TransferAnalogy–ConvectiveMassTransfer Correlations

TOTAL:60Hours

TEXTBOOKS:

1. SachdevaRC,“FundamentalsofEngineeringHeatandMassTransfer”NewAgeInternational,1995.
2. YadavR“HeatandMassTransfer”CentralPublishingHouse,1995.

REFERENCES:

1. NagP.K,“HeatTransfer”,TataMcGraw-Hill,NewDelhi,2002
2. HolmanJ.P“HeatandMassTransfer”TataMcGraw-Hill,2000.
3. KothandaramanC.P“FundamentalsofHeatandMassTransfer”NewAgeInternational,NewDelhi,1998
4. FrankP.IncroperaandDavidP.DeWitt,“FundamentalsofHeatandMassTransfer”,JohnWileyandSons,1998.
5. VelrajR,“Heat&MassTransfer”,AneBooks,NewDelhi,2004

18MCAU41

ENVIRONMENTAL SCIENCE ANDENGINEERING

L	T	P	C
3	0	0	3

Course Outcome: (Employability)

- To build the environment, what are **precious resources** in the environment, how to conserve these resources, what is the role of a human being in maintaining a clean environment and useful environment for the future.

- To **justify** the environmental pollution.
- To classify the **natural** resources.
- To solve the social **issues** and the environment.
- To review the human **population** and the environment

UNIT I ENVIRONMENT, ECOSYSTEMS AND BIODIVERSITY 9

Definition – Scope and importance – **Need** for public awareness – Concepts of an Ecosystem – Structure and Function of an Ecosystem – Producers, **Consumers** and Decomposers – Energy Flow in the Ecosystem – Ecological Succession - Food Chains, Food Webs and Ecological Pyramids – Introduction, Types, Characteristic Features, Structure and Function of the (A) Forest Ecosystem (B) Grassland Ecosystem (C) Desert Ecosystem (D) Aquatic Ecosystems (Ponds, Streams, Lakes, Rivers, Oceans, Estuaries) – Introduction to Biodiversity – Definition: Genetic, Species and Ecosystem Diversity – Bio-geographical Classification of India – Value of Biodiversity: Consumptive Use, Productive Use, Social, Ethical, Aesthetic and Option Values – Biodiversity at Global, National and Local Levels – India as a Mega-Diversity Nation – Hot-Spots of Biodiversity – Threats to Biodiversity: Habitat Loss, Poaching of Wildlife, Man-Wildlife Conflicts – endangered and Endemic Species of India – Conservation of Biodiversity: In-Situ and Ex-Situ conservation of Biodiversity. Field Study of Common Plants, Insects and Birds. Field study of simple ecosystems-pond, river, hillslopes, etc.

UNIT II ENVIRONMENTAL POLLUTION 9

Definition – Causes, Effects and **Control Measures** of (A) Air Pollution (B) Water Pollution (C) Soil Pollution (D) Marine Pollution (E) Noise Pollution (F) Thermal Pollution (G) Nuclear Hazards – Solid Waste Management:- Causes, Effects and Control Measures of municipal solid Wastes – Role of an Individual in Prevention of Pollution – Pollution Case Studies – disaster Management - Floods, Earthquake, Cyclone and Landslides. Field study of local polluted site – Urban/ Rural/ Industrial / Agricultural.

UNIT III NATURAL RESOURCES 9

Forest resources - Use and over – Exploitation – Deforestation – **Case studies** – Timber extraction – Mining – Dams and their groundwater – Floods – Drought – Conflict over water – Dams – Benefits and Problems – Mineral Resources – Use and Exploitation, Environmental Effects of Extracting and Using Mineral Resources, Case Studies – Food Resources: World Food Problems, Changes caused by Agriculture and Overgrazing, Effects of **Modern Agriculture**, Fertilizer- Pesticide Problems, Water Logging, salinity, Case Studies – Energy Resources:- Growing Energy Needs, Renewable and Non Renewable Energy Sources, Use of Alternate Energy Sources, Case Studies – Land Resources - Land as a Resource, Land Degradation, Man Induced Landslides, Soil Erosion and Desertification – Role of an Individual in Conservation of Natural Resources – Equitable use of Resources for Sustainable Lifestyles.

COURSE OUTCOME [SKILL DEVELOPMENT]

To Apply the Heavy duty vehicle frame

To Analyze the Light duty Vehicle

To Examine the dismantling and assembling of Front Axle, Rear Axle and Differential

To Organize the Steering systems along with any two types of steering gear box

LIST OF EXPERIMENTS

Study and measurement of the following chassis frames:

1. Heavy duty vehicle frame (Leyland, Tata etc)
2. Light duty vehicle frame (Ambassador, Maruti van etc)
3. Front Axle
4. Rear Axle
5. Differential
6. Steering systems along with any two types of steering gear box
7. Braking systems - hydraulic servo vacuum, compressed air power brakes.
8. Leaf spring, coil spring, torsion bar spring, Hydraulic shock absorber
9. Clutch assembly of different types
10. Gear Box
11. Transfer case

THE LIST OF EQUIPMENTS - Each 1 No (For A Batch of 30 Students)

1. Heavy duty vehicle chassis frame (Leyland or Tata)
2. Light duty vehicle chassis frame
3. Front axle
4. Rear axle
5. Steering system
2. Steering gear box (Rack and pinion, recirculating Ball type)
3. Hydraulic brake system
4. Air brake system
5. Leaf spring, coil spring, torsion bar
6. Hydraulic shock absorber
7. Diaphragm clutch assembly
8. Gear box (light duty, heavy duty)
9. Transfer case

TOTAL: 45 Hours

COURSE OUTCOME: [SKILL DEVELOPMENT]

To Demonstrate the Dismantling and Assembling of 4 cylinder petrol engine.

To Apply the oil filter, fuel filter, fuel injection system, carburetor, MPFI

To Evaluate the ignition system components - coil, magneto and electronic ignition systems.

To Evaluate the Ovality and taper measurement of cylinder bore.

LIST OF EXPERIMENTS

1. Dismantling of 4 cylinder petrol engine.
2. Assembling of 4 cylinder petrol engine.
3. Dismantling of 6 cylinder diesel engine.
4. Assembling of 6 cylinder diesel engine.
5. Study of oil filter, fuel filter, fuel injection system, carburetor, MPFI
6. Study of ignition system components - coil, magneto and electronic ignition systems.
7. Study of engine cooling system components
8. Study of engine lubrication system components
9. Ovality and taper measurement of cylinder bore and comparison with standard specifications
10. Ovality and taper measurement of engine crank shaft and comparison with standard specification

LIST OF EQUIPMENTS - Each 1 No

1. Four cylinder petrol engine
2. Six cylinder diesel engine
3. Fuel filter, fuel injection pump, injector, carburetor, MPFI component
4. Ignition coil, magneto, electronic ignition system components
5. Water pump, thermostat, radiator, temperature gauge
6. Lub oil pump, pressure relief valve, filter, oil pressure gauge
7. Internal micrometer, external micrometer, dial gauges.

TOTAL: 45 Hours

COURSE OBJECTIVE:[SKILL DEVELOPMENT]

To Analyze the physical health

To Examine the life force

To apply the mental health

To Organize the human values
and morality

UNIT I: PHYSICAL HEALTH 6

1. **Manavalakalai (SKY) Yoga: Introduction - Education as a means for youth empowerment - Greatness of Education - Yoga for youth Empowerment.**
2. Simplified Physical Exercises: Hand, Leg, Breathing, Eye exercises - Kapalabathi, Makarasana Part I, Makarasana Part II, Body Massage, Acu pressure, Relaxation exercises - Benefits.
3. Yogasanas: Pranamasana - Hastha Uttanasana - Pada Hasthasana – AswaSanjalana Asana - Thuvipatha asva Sanjalana asana - Astanga Namaskara - Bhujangasana - Atha Muktha Savasana - Aswa Sanjalana Asana - Pada Hasthasana - Hastha Uttanasana - Pranamasana.
4. Pranayama : Naddi suddi - Clearance Practice - Benefits.

UNIT II: LIFE FORCE 6

1. **Reasons for Diseases - Natural reasons (Genetic / imprints, Planetary Position, Natural calamities and climatic changes) - Unnatural reasons (Food habits, Thoughts, Deeds)**
2. Philosophy of Kaya kalpa - Physical body - Sexual vital fluid - Life force - Bio-Magnetism - Mind.
3. Maintaining youthfulness : Postponing old age - Transformation of food into seven components - Importance of sexual vital fluid.
4. Measure and method in five aspects of life - Controlling undue Passion.
5. Kayakalpa practice - Aswini Mudra - Ojas breath - Benefits of Kaya Kalpa.

UNIT III: MENTAL HEALTH 6

- 1) Mental Frequencies - Beta, Apha, Theta and Delta wave - Agna Meditation explanation - benefits.
- 2) **Shanthi Meditation explanation - Benefits**
- 3) **Thuriya Meditation explanation - Benefits**
- 4) Benefits of Blessing - Self blessing (Auto suggestion) - Family blessing - Blessing the others - World blessing - Divine protection

UNIT IV: VALUES 6

• **Human Values:**

- 1) **Self control - Self confidence - Honesty**
- 2) Contentment - Humility - Modesty
- 3) Tolerance - Adjustment - Sacrifice - Forgiveness
- 4) Purity (Body, Dress, Environment) - Physical purity - Mental purity - Spiritual purity

• **Social Values:**

- 1) Non violence - Service
- 2) Patriotism - Equality
- 3) Respect for parents and elders - care and protection - Respect for teacher
- 4) Punctuality - Time Management

UNIT V: MORALITY (VIRTUES) 6

- 1) **Importance of Introspection - I - Mine (Ego, Possessiveness).**
- 2) Six Evil Temperaments - Greed - Anger - Miserliness - Immoral sexual passion - Inferiority and superiority Complex - Vengeance.
- 3) Maneuvering of Six Temperaments - Contentment - Tolerance - Charity - Chastity - Equality - Pardon (Forgiveness).
- 4) Five essential Qualities acquired through Meditation: Perspicacity - Magnanimity - Receptivity - Adaptability - Creativity.
- 5) Improved Memory Power - Success in the Examination.

Total: 30 hrs.

REFERENCE BOOKS:

1. Vethathiri Maharishi, 16th Edi.2013, Yoga for Modern Age, Vethathiri Publications, Erode.
2. Vethathiri Maharishi, 2014, Simplified Physical Exercises, Vethathiri Publications, Erode.
3. Vethathiri Maharishi, 3rd Edi.2014, Kayakalpam, Vethathiri Publications, Erode.
4. Rev.Dr.G.U.pope, 2016, Thirukkural, Giri Trading Agency,
5. Vethathiri Maharishi, 1994, Mind, Vethathiri Publications, Erode.
6. Chandrasekaran.K, 1999, Sound Health through yoga, Sedapati, Tamilnadu, Premkalyan Publications.
7. Iyengar, B.K.S. 2008, Light on Yoga, Noida, UP India, Harber Collins Publishing India Ltd.,

Course Outcome: (Employability)

- To **implement knowledge** in automotive transmission concept, construction and principle of operation of various types of mechanical transmission components, hydrodynamic devices, hydrostatic devices and automatic transmission system will be taught to the students.
- To **assess the concept** of gear motions, drive line positions.
- To **classify the different** types of gearboxes.
- To **apply the multi stage** and polyphase torque converters, performance characteristics CO-4: Study about Automatic transmission.
- To **Explain the working of various parts like engine, transmission, clutch, brakes**

UNIT I CLUTCH AND GEAR BOX 9

Requirement of Transmission system. Different types of clutches: **Principle**, construction and operation of friction clutches. Objective of the gear box. Problems on performance of automobile such as Resistance to motion, Tractive effort, Engine speed & power and acceleration. Determination of gear box ratios for different vehicle applications. Different types of gearboxes.

UNIT II HYDRODYNAMIC DRIVES 9

Principles, performance and limitations of fluid coupling. Constructional **details** of a typical fluid coupling. Reduction of drag torque, Principle, construction and advantages of hydrodynamic torque converters. Performance characteristics, converter couplings. Multi-stage Torque converter and polyphase torque converter.

UNIT III AUTOMATIC TRANSMISSION 9

Automatic transmission: relative merits and demerits when compared to conventional transmission, automatic control of gears, **study** of typical automatic transmissions, Ford—T-model gearbox, Wilson gearbox, Electro-magnetic transmission, Automatic overdrive, Hydraulic control system for automatic transmission.

UNIT IV HYDROSTATIC DRIVE AND ELECTRIC DRIVE 9

Principle of hydrostatic drive systems. Construction and working of typical drives. Advantages and limitations. Control of hydrostatic transmissions, **Principle** of electric drive. Early and modified Ward Leonard control systems.

UNIT V AUTOMATIC TRANSMISSION APPLICATIONS 9

Chevrolet "Turboglide" transmission. Toyota's Automatic transmission with Electronic control system, Aut

omaticTransmissionwithIntelligentElectroniccontrolssystem,HydraulicActuationsystem.Continuously
VariableTransmission (CVT) – types – **Operations**.

TOTAL:45Hours

TEXTBOOK:

1. HeldtP.M,TorqueConverters,ChiltonBookCo.,1992.
2. K.Newton,W.SteedsandT.K.Garret,“TheMotorVehicle”,13thEdition,ButterworthHeinemann,India, 2004.

REFERENCES:

1. HaraldNaunheimer,BerndBertsche,JoachimRyborz,WolfgangNovak,“AutomotiveTransmission s:Fundamentals,Selection, DesignandApplication”,2nded.,Springer,2011.
2. HeinzHeisler,“AdvancedVehicleTechnology”,secondedition,Butterworth–Heinemann,NewYork,2002
3. Dr.N.K.Giri,“AutomobileMechanics”,Seventhreprint,KhannaPublishers,Delhi,2005.

Course Outcome: (Employability)

- To design concept and principles of various engine components. These concepts and principles are familiarized for design of components.
- To select the interference fits & surface finish.
- To compare the Rankine's formula, Tetmajer's formula & Johnson formula.
- To apply the concepts of cylinder and piston design.
- To explain the front and rear-end details.

UNIT I INTRODUCTION

9

Engineering materials - Introduction endurance limit, notch sensitivity. Tolerances, types of tolerances and fits, design considerations for interference fits, surface finish, surface roughness, Rankine's formula - Tetmajer's formula - Johnson formula - design of push- rods.

UNIT II DESIGN OF CYLINDER, PISTON AND CONNECTING ROD

9

Choice of material for cylinder and piston, design of cylinder, piston, piston pin, piston rings, piston failures, lubrication of piston assembly. Material for connecting rod, determining minimum length of connecting rod, small end design, shank design, design of big end cap bolts.

UNIT III DESIGN OF CRANKSHAFT

9

Balancing of I.C. engines, significance of firing order. Material for crankshaft, design of crankshaft under bending and twisting, balancing weight calculations, development of short and long crank arms. Front and rear-end details.

UNIT IV DESIGN OF FLYWHEELS

9

Determination of the mass of a flywheel for a given coefficient of speed fluctuation. Engine flywheel stresses on the rim of the flywheels. Design of hubs and arms of the flywheel, turning moment diagram.

UNIT V DESIGN OF VALVES AND VALVE TRAIN

9

Design aspects of intake & exhaust manifolds, inlet & exhaust valves, valve springs, tappets and valve train. Design of cam & camshaft. Design of rocker arm. Cam profile generation.

TOTAL: 45 Hours**TEXTBOOK:**

1. Khurmi, R.S. & Gupta, J.K., A text book of Machine Design, Eurasia Publishing House (Pvt) Ltd, 2001.

REFERENCES:

1. Jain.R.K,“MachineDesign”,KhannaPublishers,NewDelhi,2005.
2. Giri.N.K,AutomobileMechanics,KhannaPublishers,NewDelhi,2007.

Course Objective: (Skill Development)

- To develop the designing the vehicle and various resistances.
- To review the vehicle and engine performance curves.
- To solve the calculation of vehicle gear ratios.
- To apply the concepts and assumptions to be made in designing a vehicle.
- To explain the various resistances to vehicle motion and plot the graphs.

UNIT I INTRODUCTION**12**

Assumptions to be made in designing a vehicle, Range of values for Gross Vehicle Weight, Frontal Area, maximum speed, maximum acceleration, grad ability of vehicle in different gears, Basics of Automobile Design.

UNIT II RESISTANCE TO VEHICLE MOTION**12**

Calculation, Tabulation and Plotting of Curves for Air and Rolling Resistances at various vehicle speeds, Calculation and Plotting of Driving force, Power requirement for different loads and acceleration, Maximum Power calculation.

UNIT III PERFORMANCE CURVES-I**12**

Calculation, Tabulation and Plotting of Torque and Mechanical Efficiency for different vehicle speeds, Interpolation of Pressure - Volume diagram, Calculation of frictional Mean Effective Pressure, Calculation of Engine Cubic Capacity, Bore and Stroke Length.

UNIT IV PERFORMANCE CURVES-II**12**

Connecting rod length to Crank Radius Ratio, Plotting of Piston Velocity and Acceleration against Crank Angle, Plotting Gas force, inertia force and Resultant force against Crank Angle, Turning Moment and Side Thrust against Crank Angle.

UNIT V GEAR RATIOS**12**

Determination of Gear Ratios for first, second, third and top gears, Acceleration and Grad ability vehicle,
Typical problems occur on Vehicle performance.

TOTAL: 60 Hours

TEXT BOOKS:

- 1 N. K. Giri, Automotive Mechanics, Khanna Publishers, New Delhi, 2005.
2. Heldt, P.M., High Speed Combustion Engines, Oxfore and I.B.H. Publishing Co.,Kolkata, 2002.

REFERENCES:

1. Heinz Heisler, Advanced Vehicle Technology, Butterworth-Heinemann Ltd; 2nd Revised edition edition. 2002.
2. R.B.Gupta, Automobile Engineering, Satya Prakashan, New Delhi, 2012.

TOTAL:45Hours

Course Outcome: (Employability)

- To implement knowledge in automotive pollution control techniques of pollutants like UBHC, CO, NO_x, particulate matter and smoke for both SI and CI engine will be taught to the students.
- To defend the impact of vehicle population on pollution
- To examine the emission and its effect on human health and environment
- To solve the formation of pollutant in SI engine.
- To explain the various noise and noise reduction in automobile.

UNIT I EMISSION FROM AUTOMOBILES 5

Vehicle population assessment in metropolitan cities and contribution to pollution, effects on human health and environment, global warming, various emissions from Automobiles— Formation, transient operational effects on pollution.

UNIT II EMISSIONS FROM SPARK IGNITION ENGINE AND ITS CONTROL 12

Emission formation in SI Engines- Carbon monoxide- Unburned hydrocarbon Nitric oxide. Lead particulate— Poly-nuclear Aromatic hydrocarbon emissions— Effects of design and operating variables on emission formation- controlling of pollutants from Engine- Thermal reacts— Catalytic converters— Charcoal Canister Control for evaporative emission — Positive Crankcase ventilation system for UBHC emission reduction.

UNIT III EMISSION FROM COMPRESSION IGNITION ENGINE AND ITS CONTROL 12

Physical and Chemical delay — Significance — Intermediate Compounds Formation — emission formation due to incomplete Combustion — Effect of Operating variables on Emission formation — White, Blue, and Black Smokes. Nitric Oxide and Particulate controlling of Emission — Operating Behavior- Fumigation EGR- Air Injection — Cetane number Effect.

UNIT- IV NOISE POLLUTION FROM AUTOMOBILES 8

Causes for Noise from Automobiles— Traffic Noise— Engine Noise— Transmission Noise— vehicle structural Noise, Exhaust Noise, Noise reduction in Automobiles — Encapsulation technique for noise reduction — Silencer Design on Sound reduction in automobiles.

UNIT- V TEST PROCEDURES AND EMISSION MEASUREMENTS 8

Constant Volume Sampling I and 3 (CVSI & CVS3) Systems- Sampling Procedures — Seven mode and thirteen mode cycles for Emission Sampling — Sampling problems — Quantifying Emissions — Measurement of CO, CO by NDIR. Hydrocarbon emission by FID- Chemiluminescent detector for Measurement of NOR— Smoke meters — Dilution Tunnel Technique for particulate Measurement- Sound level meters.

TOTAL: 45 Hours**TEXTBOOKS:**

- G.P. Springer and D.J. Patterson, Engine Emissions, Pollutant formation, Plenum Press, New York, 1986.
- D.J. Patterson and N.A. Henin, 'Emission from Combustion Engine and their control', Anna Arbor Science Publication, 1985.

REFERENCES:

1. V.Ganesan, 'Internal combustion Engines', Tata McGraw Hill Book Co, Eighth Reprint, 2005.
2. Crouse and Anglin, 'Automotive Emission Control', McGraw Hill company, New York 1993.
3. L.Lberanek, 'Noise Reduction', McGraw Hill Company, New York 1993.
4. C.Duerson, 'Noise Abatement', Butterworths Ltd., London 1990.

18PEAU12	ADVANCED THEORY OF I.C.ENGINES	L	T	P	C
		3	0	0	3

Course Outcome: **(Employability)**

- To design the various cycles with actual cycles.
- To select the combustion reactions and stoichiometry.
- To compare the premixed and diffusion combustion in SI and CI engines.
- To implement the concepts of engine simulation governing equations.
- To describe simulation of various engine processes for SI and CI engines.

UNIT I CYCLE ANALYSIS

9

Otto, Diesel, Dual, Stirling and Brayton cycles, comparison of air standard, fuel air and actual cycles, simple problems on the above topics.

UNIT II COMBUSTION

9

Combustion reactions and stoichiometry, heat of reaction, adiabatic flame temperature in constant pressure and constant volume systems, fuels for internal combustion engines and their properties, premixed and diffusion combustion as applicable to SI and CI engines, concepts of burning rate and flame velocity, fuel spray characteristics and combustion in diesel engines.

UNIT III COMBUSTION MODELLING

9

Basic concepts of engine simulation, governing equations, simulation of various engine processes for SI and CI engines. Adiabatic flame temperature, Heat release calculations. Thermodynamic and Fluid mechanics based models.

UNIT IV ADVANCES IN IC ENGINES

9

LHR engines, surface ignition concept and multi fuel engines, stratified charge and lean burn engines, performance and emission characteristics, merits and demerits.

UNIT V ELECTRONIC ENGINE MANAGEMENT

9

-Managing Productivity-Cost Control-Purchase Control-Maintenance Control-Quality Control-Planning operations.

UNIT IV ENGINEERING ETHICS & HUMAN VALUES 9

Definition - Societies for engineers – Code of Ethics – Ethical Issues involved in cross border research - Ethical and Unethical practices – case studies – situational decision making - Morals, values and Ethics – Integrity – Work ethic – Service learning – Civic virtue – Respect for others – Living peacefully – Caring – Sharing – Honesty – Courage – Valuing time – Cooperation – Commitment – Empathy – Self confidence – Character – Spirituality – Introduction to Yoga and meditation for professional excellence and stress management.

UNIT V SAFETY RESPONSIBILITIES AND RIGHTS 9

Safety and Risk – Assessment of Safety and Risk – Risk Benefit Analysis and Reducing Risk - Respect for Authority – Collective Bargaining – Confidentiality – Conflicts of Interest – Occupational Crime – Professional Rights – Employee Rights – Intellectual Property Rights (IPR) – Discrimination – Global issues – Multinational Corporations – Environmental Ethics – Computer Ethics – Weapons Development – Engineers as Managers – Consulting Engineers – Engineers as Expert Witnesses and Advisors – Moral Leadership – Code of Conduct – Corporate Social Responsibility.

TOTAL: 45 Hours

TEXTBOOKS:

1. Stephen P. Robbins and Mary Coulter, 'Management', Prentice Hall of India, 8th edition.
2. Charles W. L. Hill, Steven L. McShane, 'Principles of Management', McGraw Hill Education, 2007.
3. Mike W. Martin and Roland Schinzinger, "Ethics in Engineering", Tata McGraw Hill, New Delhi, 2003.

REFERENCES:

1. Hellriegel, Slocum & Jackson, 'Management - A Competency Based Approach', Thomson South Western, 2007.
2. Harold Koontz, Heinz Weihrich and Mark V. Cannice, 'Management - Global & Entrepreneurial Perspective', Tata McGraw Hill, 12th edition, 2007.
3. Andrew J. Dubrin, 'Essentials of Management', Thomson South Western, 7th edition, 2007.

18HSPD51	PERSONALITY DEVELOPMENT III	L	T	P	C
		2	0	0	2

Course Outcome: (Skill development)

- To develop the students to study the verbal aptitude I
- To rate the Singular/plural-present tense/past tense
- To distinguish the soft skills
- To compute the time management
- To explain the role of team building

UNIT I VERBAL APPTITUDE I 6

Phonetics/Neutral Accent/Pronunciation – Speech Mechanism/Mouth & Face Exercise – Vowels & Consonants – Sounds – Syllable and Syllable Stress/ Word Stress – Sentence Stress & Intonation – Articulation Exercise – Rate of Speech /Flow of Speech / Idiomatic Phrases.

Course outcome: (skill development)

- To design the Pressure pickups, charge amplifier, storage oscilloscope and signal analyzers.
- To evaluate the performance of petrol and diesel engines both at full load and part load conditions.
- To examine Morse test on petrol engine.
- To compute the compression ratio, volumetric efficiency in engines.
- To explain the Heat balance test on an automotive engine.

LIST OF EXPERIMENTS

1. Study of Pressure pickups, charge amplifier, storage oscilloscope and signal analyzers used for IC engine testing.
2. Performance study of petrol and diesel engines both at full load and part load conditions.
3. Morse test on petrol and diesel engines.
4. Determination of compression ratio, volumetric efficiency and optimum cooling water flow rate in engines.
5. Heat balance test on an automotive engine.
6. Testing of 2 and 4 wheelers using chassis dynamometers.
7. Study of NDIR Gas Analyser and FID
8. Study of Chemiluminescent NOx analyzer
9. Measurement of HC, CO, CO₂, O₂ using exhaust gas analyzer
10. Diesel smoke measurement.

TOTAL: 45 Hours

Course outcome: (skill development)

- To develop the students to use modeling software to model engine components design
- To review the design and drawing of piston.
- To examine the drawing of Piston pin and piston pin.
- To apply the concept of the connecting rod assembly
- To explain the design of crankshaft, balancing weight calculations.

LIST OF EXPERIMENTS

1. Design and drawing of piston.
2. Piston pin and piston rings and drawing of these components.
3. Design of connecting rod small end and big end, shank design, design of big end cap, bolts and drawing of the connecting rod assembly
4. Design of crankshaft and balancing weight calculation.
5. Development of short and long crank arms, front end and rear end details, drawing of the crankshaft assembly.
6. Design and drawing of flywheel.
7. Ring gear design, drawing of the flywheel including the development of ring gear teeth.
8. Design and drawing of the inlet and exhaust valves.
9. Design of cam and camshaft, cam profile generation, drawing of cam and camshaft
10. Completed design of clutch components.

THE LIST OF EQUIPMENTS FOR A BATCH OF 30 STUDENTS

1. Computer nodes-30 Nos.
2. Software like AutoCAD or Pro-E- 15 licenses

TOTAL:45Hours

Course Outcome: (Employability)

- To develop the electrical and electronic components used in automobiles.
- To select the sub-systems of an Automobile and 4 stroke I.C Engine.
- To classify the automotive sensors and actuators, their application and uses
- To compute the Engine System, Chassis, Transmission, Power train, Braking Systems etc
- To explain an overview of automotive components, subsystems, design cycles, communication protocols.

UNIT I BATTERIES AND STARTING SYSTEM**10**

Different types of Batteries –

principle, rating, testing and charging. Starter motors characteristics, capacity requirements. Drive mechanisms. Starter switches.

UNIT II CHARGING SYSTEM LIGHTING AND ACCESSORIES**9**

DC Generators and Alternators their characteristics. Control unit – cut out, electronic regulators. Vehicle interior lighting system. Vehicle exterior lighting system. Wiring requirements. Lighting design. Dashboard instruments. Horn, trafficator.

UNIT III ELECTRONIC IGNITION AND INJECTION SYSTEM**9**

Sparkplugs. Advance mechanisms. Different types of ignition systems. Electronic fuel injection systems, mono and multipoint fuel injection system (MPFI).

UNIT IV SAFETY SYSTEMS**8**

Antilock braking system, air bag restraint system, voice warning system, seat belt system, road navigation system, anti theft system.

UNIT V SENSORS AND MICROPROCESSORS IN AUTOMOBILES**9**

Basic sensor arrangements. Types of sensors – oxygen sensor, hot wire anemometer sensor, vehicle speed sensor, detonation sensor, accelerometer sensor, crank position sensor. Microprocessor and microcomputer controlled devices in automobiles such as voice warning system, travel information system, keyless entry system, automatic transmission system, electronic steering system.

TOTAL: 45 Hours**TEXTBOOKS:**

- Young A.P. & Griffiths. L. "Automotive Electrical Equipment", ELBS & New Press-1999.
- William B. Riddens "Understanding Automotive Electronics", 5th edition - Butterworth Heinemann Woburn, 1998.
- Crouse, W.H. "Automobile Electrical Equipment", McGraw-Hill Book Co., Inc., New York, 3rd edition, 1986.

REFERENCES:

- Bechhold "Understanding Automotive Electronics", SAE, 1998.

2. Judge A.W. "Modern Electrical Equipment of Automobiles", Chapman & Hall, London, 1992.
3. Kholi P.L. "Automotive Electrical Equipment", Tata McGraw-Hill Co., Ltd., New Delhi, 1975.
4. Robert Bosch "Automotive Hand Book", SAE (5th Edition), 2000.
5. Ganesan V. "Internal Combustion Engines", Tata McGraw-Hill Publishing Co., New Delhi, 2003.

Course Outcome: (Employability)

- To design the Constructional details and Theory of important driveline.
- To select the Steering, Braking and Suspension Systems of Automobile.
- To examine the knowledge on Problem-Solving in Steering, and Suspension Systems.
- To apply the concept in gear box.
- To describe the Drive Line and Rear Axle.

Propeller Shaft, Braking

UNIT I VEHICLE FRAME AND SUSPENSION**9**

Study of loads-moments and stresses on frame members. Design of frame for passenger and commercial vehicle - Design of leaf springs - Coil springs and torsion bars springs.

UNIT II FRONT AXLE AND STEERING SYSTEMS**9**

Analysis of loads-moments and stresses at different sections of front axle. Determination of bearing loads at Kingpin bearings. Wheel spindle bearings. Choice of Bearings. Determination of optimum dimensions and proportions for steering linkages, ensuring minimum error in steering. Design of front axle beam.

UNIT III CLUTCH**9**

Design of single plate clutch, multiplate clutch and cone clutch. Torque capacity of clutch. Design of clutch components, Design details of roller and sprag type of clutches.

UNIT IV GEAR BOX**9**

Gear train calculations, layout of gearboxes. Calculation of bearing loads and selection of bearings. Design of three speed and four speed gearboxes.

UNIT V DRIVELINE AND REAR AXLE**9**

Design of propeller shaft. Design details of final drive gearing. Design details of full floating, semi-floating and three quarter floating rear shafts and rear axle housings and design aspects of final drive.

TOTAL: 45 Hours**TEXTBOOKS:**

- Giri, N.K., "Automobile Mechanics", Khanna publishers, New Delhi, 2007.
- Khurmi. R.S. & Gupta. J.K., "A textbook of Machine Design", Eurasia Publishing House (Pvt) Ltd, 2001.

REFERENCES:

- Dean Avern, "Automobile Chassis Design", Illife Book Co., 2001.
- Heldt, P.M., "Automotive Chassis", Chilton Book Co., 1992.

Course Outcome: (Employability)

- To **implement the constructional details** operating characteristics and vehicle design aspect
- To **select** the chassis and sub-systems
- To **differentiate** the brakes, wheels and tyres
- To **compute** the two wheelers in industry
- To **demonstrate** the three wheelers

UNIT I POWER UNIT**9**

Two stroke SI engine, four stroke SI engine; merits and demerits, **Symmetrical** and unsymmetrical port timing diagrams, Types of scavenging processes, merits and demerits, scavenging pumps, Rotary valve engine. Fuel system, Lubrication system. Magneto coil and battery coil spark ignition system, electronic ignition system. Starting system, Kickstarter system.

UNIT II CHASSIS AND SUB-SYSTEMS**9**

Mainframe and its types. Chassis and shaft drive, Single, multiple plates and centrifugal clutches. Gear box and gear controls. Front and rear suspension **systems**. Shock absorbers. Panel meters and controls on handlebar.

UNIT III BRAKES, WHEELS AND TYRES**9**

Brakes-Drum brakes, disc brakes, front and rear brake links, **layouts**, Wheels-Spoked wheel, cast wheel, disc wheel, disc types. Tyres and tubes.

UNIT IV TWO WHEELERS**9**

Case study of major Indian models of motorcycles, scooters and mopeds, TVS mopeds and motorcycles, Hero Honda motorcycles, Bajaj scooters and motorcycles, Yamaha, Enfield motorcycles. Servicing and maintenance.

UNIT V THREE WHEELERS**9**

Case study of major Indian **models** of three wheeler-, Bajaj Auto rickshaws, pickup vans, delivery vans, Ape load autos and trailer, Servicing and **Maintenance**: daily, weekly, monthly, Fault tracing.

Total: 45 Hours**TEXTBOOKS:**

1. Irving, P.E.-Motor Cycle Engineering-Temple Press Book, London-1992.

REFERENCES:

1. The Cycle Motor Manual- Temple Press Limited, London-1990
2. Encyclopedia of Motorcycling- 20 volume Marshall, Cavensih, UK-1989

3. Brayant R.V, Vespa-Maintenance and Repair Series – S.Chand & Co., New Delhi-1986.
4. Raymond Broad Lambretta- A Practical Guide to maintenance and repair – S.Chand. & Co., New Delhi-1987.

18PEAU01

VEHICLE DYNAMICS

L T P C
3 0 0 3

Course Outcome: (Employability)

- To produce the vibrations and how to reduce the vibration under different loads.
- To review the road conditions in order to improve the comfort for the passengers.
- To compare the performance characteristics of vehicle
- To compute the handling characteristics of vehicles
- To review the dynamics of suspension system

UNIT I BASIC OF VIBRATION 12

Classification of vibration, definitions, mechanical vibrating systems, mechanical vibration and human comfort. Modeling and simulation studies. Single degree of freedom, free, forced and damped vibrations. Magnification factor and transmissibility. Vibration absorber. Vibration measuring instruments. Two degree of freedom system. Modal analysis.

UNIT II TYRES 12

Tire forces and moments, Tire structure, Longitudinal and Lateral force at various slip angles, rolling resistance, Tractive and cornering property of tire. Performance of tire on wet surface. Ride property of tires. Test on Various road surfaces. Tire vibration.

UNIT III PERFORMANCE CHARACTERISTICS OF VEHICLE 12

Equation of motion and maximum tractive effort. Aerodynamics forces and moments. Power plant and transmission characteristics. Prediction of vehicle performance. Braking performance- Braking Force, Brake Factor, Braking Efficiency and Stopping Distance.

UNIT IV HANDLING CHARACTERISTICS OF VEHICLES 12

Mathematical model of handling, Fundamental condition for true Rolling Steady State Handling: Slip angle, cornering power, Neutral steer, under steer and over steer, Steady state response, Lateral Acceleration, Transient response characteristics. Directional stability of vehicle.

UNIT V DYNAMICS OF SUSPENSION SYSTEM 12

Requirements of suspension system. Spring mass frequency, wheel hop, Wheel wobble, wheel shimmy, choice of suspension spring rate. Calculation of effective spring rate. Vehicle suspension in fore and aft, Hydraulic dampers and choice of damping characteristics. Compensated suspension systems.

TOTAL: 60 Hours

TEXTBOOKS:

1. Rao J. Sand Gupta. K "Theory and Practice of Mechanical Vibrations", Wiley Eastern Ltd., 2002.
2. J.Y. Wong, "Theory of ground vehicle", 4th Edition, John Wiley and Sons Inc., New York, 2008
3. Dr. N.K. Giri, "Automobile Mechanics", Seventh reprint, Khanna Publishers, Delhi, 2005

REFERENCES:

1. Massimo Guiggiani, "The Science of Vehicle Dynamics: Handling, Braking, and Ride of Road and Race Cars", Springer, 2014 edition
2. Groover, "Mechanical Vibration", 7th Edition, Nem Chand & Bros, Roorkee, India, 2003.
3. W. Steeds, 'Mechanics of road vehicle' Illiffe Books Ltd, London 1992
4. J.G. Giles, 'Steering, Suspension tyres', Illiffe Books Ltd London 1975
5. P.M. Heldt, 'Automotive chassis', Chilton Co., New York, 1982

18PEAU06

ALTERNATIVE FUELS AND ENERGY SYSTEM

L	T	P	C
3	0	0	3

Course Outcome: (Employability)

- To develop the need of the alternative fuels
- To select the need of the Gaseous fuels.
- To classify the performance characteristics of alcohols fuels
- To implement the natural gas, LPG, hydrogen, and biogas.
- To explain the electric, hybrid, fuel cell and solar cars

UNIT I INTRODUCTION

12

Need for alternate fuel, availability and properties of alternate fuels, general use of alcohols, LPG, hydrogen, ammonia, CNG and LNG, vegetable oils and biogas, merits and demerits of various alternate fuels, introduction to alternate energy sources. Like EV, hybrid, fuel cell and solar cars.

UNIT II ALCOHOLS

12

Properties as engine fuel, alcohols and gasoline blends, performance in SI engine, methanol and gasoline blends, combustion characteristics in CI engines, emission characteristics, DME, DEE properties performance analysis, performance in SI & CI Engines.

UNIT III NATURAL GAS, LPG, HYDROGEN AND BIOGAS

12

Availability of CNG, properties, modification required to use in engines, performance and emission characteristics of CNG using LPG in SI & CI engines, performance and emission of LPG. Hydrogen; storage and handling, performance and safety aspects.

UNIT IV VEGETABLE OILS

12

Various vegetable oils for engines, desertification, performance in engines, performance and emission characteristics, bio diesel and its characteristics

UNIT V ELECTRIC, HYBRID, FUEL CELL AND SOLAR CARS

12

Layout of an electric vehicle, advantage and limitations, specifications, system components, electronic control system, high energy and power density batteries, hybrid vehicle, fuel cell vehicles, solar

powered vehicles.

Total: 60 Hours

TEXT BOOK:

1. Richard.L.Bechfold – Alternative Fuels Guide Book - SAE International Warrendale - 1997.

REFERENCES:

1. Maheswar Dayal - “Energy today & tomorrow“ - I & B Horishr India - 1982.
2. Nagpal - “Power Plant Engineering” - Khanna Publishers - 1991.
3. “ Alcohols as motor fuels progress in technology” - Series No.19 - SAE Publication USE - 1980. 4. SAE paper nos. 840367, 841333, 841334, 841156, Transactions, SAE, USA.

18GEAU06	ENERGYAUDITANDENERGYCONSERVATIONMETHODS	L	T	P	C
		3	0	0	3

Course Outcome: (Employability)

- To develop the knowledge about energy audit and energy conservation methods in I.C. Engines.
- To select the energy sources, utilization and policies
- To classify the energy conservation in industries and buildings
- To use the various energy developing systems
- To explain the energy management and auditing

UNIT I ENERGY AND ENVIRONMENT 9

Introduction - fossil fuels reserves - world energy consumption - green house effect, global warming - Renewable energy sources - environmental aspects utilization - energy prizes - **energy policies.**

UNIT II ENERGY CONSERVATION 9

Energy conservation schemes - industrial energy use - **energy surveying** and auditing - energy index - Energy cost - cost index - energy conservation in engineering and process industry, in thermal Systems, in buildings and non-conventional energy resources scheme

UNIT III ENERGY TECHNOLOGIES 9

Fuels and consumption - boilers - furnaces - waste heat recovery systems - heat pumps and Refrigerators - **storage systems** - insulated pipework systems - heat exchangers.

UNIT IV ENERGY MANAGEMENT 9

Energy **management principles** - energy resource management - energy management information Systems - instrumentation and measurement - computerized energy management - energy Auditing.

UNIT V ECONOMICS AND FINANCE 9

Costing techniques - cost optimization - optimal target investment schedule - **financial appraisal** and

TEXTBOOKS:

1. MurphyW.R.andMcKAYG.,“EnergyManagement,Butterworths,London,1982.
2. TrivediP.R.,JulkaB.R.,“EnergyManagement”,Commonwealthpublishers,1997.

REFERENCES:

1. DavidMerick,RichardMarshal,“Energy,presentandfutureoptions”,Vol.IandII,JohnWileyandSons,1981.
2. ChaigierN.A.“EnergyConsumptionandEnvironment”,McGraw-Hill,1981.
3. IkkenP.A.SwartR.JandZwerves.S,“ClimateandEnergy”,1989.
4. RayD.A.“IndustrialEnergyConservation”,PergamaonPress,1980.

18HSPD61

PERSONALITYDEVELOPMENTIV

L	T	P	C
2	0	0	2

Course Outcome: (Skill development)

- To develop the studentsto study thesoft skills
- To rate the communication skills
- To distinguish the presentation skills
- To computethe slide presentation
- To explain the role of change management

UNITI SOFTSKILLS V 6

Assertiveness—Meaning—Importance of assertiveness- Characteristics of assertive communication- Merits -forms ofassertion—Causesofmisunderstanding

UNITII COMMUNICATIONSKILLS 6

Meaning—Elementsofcommunication—Functionsofcommunication—Principlesofcommunication— FormalandInformalcommunication—BarriersinCommunication— Characteristicsofgoodcommunication— Feedback—communication systems.

UNITIII PRESENTATION SKILLS I 6

Meaning—ImportanceofPresentation—Conceptof5w’sandoneH -- understandingtheaudience— Typesofpresentations—Howto make effectivepresentation

UNITIV PRESENTATION SKILLS II 6

Use of slide, PPT’s. and visuals—Rules for slide presentation—precautions ---seminars and conferences-Steps toeliminateStage fear.

UNITV CHANGEMANAGEMENT

6

Definition – Necessity - Resistance towards Change – **10 Principles of Change Management** – Leaders approach –EffectiveChangemanagement.

TOTAL:30Hours

REFERENCES:

1. Helpingemployeesembracechange-
LaClair,J.andRao,R.HelpingEmployeesEmbraceChange,McKinseyQuarterly,2002,Number4.
2. WhoMovedMyCheese bySpencerJohnsonpublishedbyVermilionfirstedition
3. EffectiveCommunication.Adair,John.London:PanMacmillanLtd.,2003.
4. BusinessCommunicationToday:Bovee,CourtlandL,JohnV.Thill&BarbaraE.Schatzman.TenthEdition.NewJersey:Prentice Hall,2010.

Course Outcome: (Skill Development)

- To **design** the batteries
- To **justify** the starting motors and generators
- To examine the **Testing** of regulators
- To compute the **Diagnosis** of ignition system faults
- To **describe** the automobile electrical wiring.

LIST OF EXPERIMENTS**a. Electrical Laboratory**

1. Testing of batteries and battery maintenance
2. Testing of starting motors and generators
3. Testing of regulators and cut-outs relay
4. Diagnosis of ignition system faults
5. Study of automobile electrical wiring

b. Electronics Laboratory

6. Study of rectifiers and filters
7. Study of logic gates, adder and flip-flops
8. Study of SCR and IC timer
9. Interfacing A/D converter and simple data acquisition
10. Microcontroller programming and interfacing

**THE LIST OF EQUIPMENTS - Each 1 No
(For A Batch of 30 Students)**

- i. Battery, hydrometer, voltagetester
- ii. Starter motor, regulator, cutout
- iii. Distributor, ignition coil, spark plug
- iv. Auto electrical wiring system
- v. Rectifiers, filters
- vi. Amplifier
- vii. IC timer
- viii. Datalogger

TOTAL: 45 Hours

Course Outcome: (Skill Development)

- To develop the real life challenges in the workplace by analysing work environment and conditions, and selecting appropriate skill sets
- To select the career options by considering opportunities in company, sector, industry, professional and educational advancement
- To compare the Communicate and collaborate effectively and appropriately with different professionals in the work environment
- To apply the critical thinking and problem solving skills by analysing underlying issue/s to challenges
- To Demonstrate the ability to harness resources by analysing challenges and considering Opportunities

The objective of the Summer Internship training is to enhance and improve the skill set and knowledge of the automobile engineering students which boost their performance and consequently helping them to meet their career objectives. Training helps learners to acquire the latest techniques, skills, methodologies and to build a strong foundation for their career growth. Three periods per week shall be allotted in the time table and this time shall be utilized by the students to receive the directions from the faculty. The student has to undergo a training of 10 to 12 days during the semester in the automotive related industries and submit a detailed report based on the industry, products and services, things learned from the industry. This final report shall be typewritten form as specified in the guidelines

18PEAU02**VEHICLE MAINTENANCE**

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Course Outcome: (Employability)

- To propose complete knowledge of the vehicle maintenance procedures.
- To rate the knowledge on engine maintenance–repair and overhauling.
- To distinguish the maintenance and servicing of suspension systems.
- To solve the fault diagnosis and maintenance of modern electronic controls.
- To Explain the Servicing and maintenance of fuel system of different types of vehicles.

UNIT I MAINTENANCE OF RECORDS AND SCHEDULES**10**

Requirements and importance of maintenance, types of maintenance, preparation of check lists, Inspection schedule, maintenance of records, log sheets and other forms, safety precautions in maintenance. Motor vehicle acts, insurance etc and traffic rules, motor vehicle driving rules and regulation.

UNITII ENGINEMAINTENANCE – REPAIRANDOVERHAULING**9**

Dismantling of engine components and cleaning, cleaning methods, visual and dimensional inspections, minor and major reconditioning of various components, reconditioning methods, engine assembly, special tools used for maintenance overhauling, engine tune up, including modern engines.

UNITIII CHASSISMAINTENANCE - REPAIRANDOVERHAULING**10**

Mechanical and automobile clutch, fluid flywheel, torque converter, automatic transmission and gear box, servicing and maintenance. Maintenance servicing of propeller shaft and differential system. Maintenance servicing of suspension systems. Brake systems, types and servicing techniques. Steering systems, overhauling and maintenance. Wheel alignment, computerized alignment and wheel balancing.

UNITIV ELECTRICAL ANDELECTRONICSYSTEM MAINTENANCE**8**

Testing methods for checking electrical and electronic components, checking battery, starter motor, charging systems, DC generator and alternator, ignition system, lighting systems. Fault diagnosis and maintenance of modern electronic controls, checking and servicing of dashboard instruments.

UNITV MAINTENANCEOFFUEL,COOLING,LUBRICATIONSYSTEMSANDVECHICLEBODY**8**

Servicing and maintenance of fuel system of different types of vehicles, calibration and tuning of engine for optimum fuel supply. Cooling systems, water pump, radiator, thermostat, anticorrosion and antifreeze additives. Lubrication maintenance, lubricating oil changing, greasing of parts. Vehicle body maintenance, minor and major repairs. Door locks and window glass actuating system maintenance.

TOTAL:45Hours**TEXTBOOKS:**

1. JohnDoke“FleetManagement”,McGraw-HillCo.1984.
2. Automotive Mechanics W.H. crouse

REFERENCES:

1. JamesDHalderman-AdvancedEnginePerformanceDiagnosis–PHI1998.
2. ServiceManualsfromDifferentVehicleManufacturers.66
3. AutomobileEngineering byKirpalSingh
4. BoschHandBook–3rdEditionSAE1993.

Course Outcome: (Employability)

- To develop the combustion phenomenon inside the cylinder and its computer simulation
- To review the SI engine simulation with fuel air as working medium
- To compare the Actual cycle simulation in SI engines
- To compute the Simulation of 2-stroke SI engine
- To identify the Diesel engine simulation

UNIT – I INTRODUCTION**9**

Introduction. Heat of reaction, complete combustion in C/H/O/N Systems, Constant volume adiabatic combustion, constant pressure adiabatic combustion. Calculation of adiabatic flame temperature.

UNIT – II SI ENGINE SIMULATION WITH FUEL AIR AS WORKING MEDIUM**9**

Deviation between actual and air standard cycles of operation- problems, SI engine simulation with adiabatic constant volume combustion with fuel and air being considered, calculation of temperature drop due to fuel vaporization, calculation of mean effective pressure, torque and thermal efficiency at full throttle, part throttle and supercharged conditions.

UNIT – III ACTUAL CYCLE SIMULATION IN SI ENGINES**9**

Progressive combustion; gas exchange process, heat transfer process, friction. Validation of the computer code with experimental data based on performance parameters and pressure crank angle diagram.

UNIT – IV SIMULATION OF 2-STROKE SI ENGINE**9**

Simulation of the scavenging process, determination of the pressure-crank angle variation, computation of performance parameters.

UNIT – V DIESEL ENGINE SIMULATION**9**

Main difference between SI and CI engine simulation, differences between ideal and actual cycles, zero dimensional combustion model for diesel engine, heat transfer and gas exchange processes. Performance prediction and comparison of results.

TOTAL:45Hours**TEXTBOOKS:**

1. Ganesan.V.-ComputerSimulationofsparkignitionengineprocess,-UniversitiesPress(I)Ltd,1996.
2. Ganesan.V.-ComputerSimulationofcompressionignitionengineprocess–UniversitiesPress(I)Ltd,2000.
3. AshleyCampbel- Thermodynamicanalysisofcombustionengines-JohnWileyandSons,NewYork- 1986.

REFERENCES:

1. Benson.R.S.,Whitehouse.N.D.,-InternalCombustionEngines-PergamonPress,oxford,1979

2. Ramoss.A.L.,-ModellingofInternalCombusionEnginesProcesses-McGraw-HillPublishingCo.,1992

Course Outcome: (Employability)

- To develop knowledge in the construction of vehicle.
- To assess the aerodynamic concept & panelling of passenger car body trim.
- To examine the design of external vehicle body.
- To implement the various heavy vehicle bodies.
- To describe the different types of painting techniques for vehicle body

UNIT I CAR BODY DETAILS 9

Types of car bodies-visibility: regulation, driver's visibility, methods of improving visibility- safety: safety design, safety aspects. Constructional details of a passenger car.

UNIT II BUS BODY DETAILS 9

Classification of bus bodies- based on distance traveled, based on capacity of the bus and based on style & shape. Types of metal section used in the construction. Construction of Conventional and integral type bus.

UNIT III CAR AERODYNAMICS 9

Objects—Vehicle types of drag. Various types of forces and moments. Effects of forces and moments. Various body optimization techniques for minimum drag. Principle of wind tunnel technology. Flow visualization techniques. Test with scale models.

UNIT IV COMMERCIAL VEHICLE DETAILS 9

Classification of commercial vehicle bodies. Construction of Tanker body and Tipper body. Dimensions of driver's seat in relation to controls. Driver's cab design. Compactness of Driver's cab. Segmental construction of driver's cab.

UNIT V COMMERCIAL VEHICLE AERODYNAMICS 9

Effects of rounding sharp front body edges. Effects of different cab to trailer body Fore body pressure distribution. Effects of a cab to trailer body roof height. Commercial vehicle drag reducing devices. Modern painting process of a passenger car body.

TOTAL: 45 Hours**TEXTBOOKS:**

1. Powloski, J., 'Vehicle Body Engineering', Business Books Ltd, 1970
2. J.G. Giles, 'Body Construction and Design', Butterworth and Co., 1975

REFERENCES:

1. John Fenton 'Vehicle Body layout and analysis', Mechanical Engineering Publication Ltd., 1984
2. Heinz Heisler, 'Advanced Vehicle Technology', second edition, Butterworth-Heinemann, New York, 2002

Course Outcome: (Employability)

- To develop the understanding of Quality Management principles and process.
- To select the TQM principles.
- To organize TQM tools & techniques I
- To implement TQM tools & techniques II
- To explain the quality systems

UNIT I INTRODUCTION 9

Introduction - Need for quality - Evolution of quality - Definition of quality - Dimensions of manufacturing and service quality - Basic concepts of TQM - Definition of TQM - TQM Framework - Contributions of Deming, Juran and Crosby - Barriers to TQM.

UNIT II TQM PRINCIPLES 9

Leadership - Strategic quality planning, Quality statements - Customer focus - Customer orientation, Customer satisfaction, Customer complaints, Customer retention - Employee involvement - Motivation, Empowerment, Team and Teamwork, Recognition and Reward, Performance appraisal - Continuous process improvement - PDCA cycle, 5s, Kaizen - Supplier partnership - Partnering, Supplier selection, Supplier Rating.

UNIT III TQM TOOLS & TECHNIQUES I 9

The seven traditional tools of quality - New management tools - Six-sigma: Concepts, methodology, applications to manufacturing, service sector including IT - Benchmarking - Reason to benchmark, Benchmarking process - FMEA - Stages, Types.

UNIT IV TQM TOOLS & TECHNIQUES II 9

Quality circles - Quality Function Deployment (QFD) - Taguchi quality loss function - TPM - Concepts, improvement needs - Cost of Quality - Performance measures.

UNIT V QUALITY SYSTEMS 9

Need for ISO 9000 - ISO 9000-2000 Quality System - Elements, Documentation, Quality auditing - QS 9000 - ISO 14000 - Concepts, Requirements and Benefits - Case studies of TQM implementation in manufacturing and service sectors including IT.

TOTAL: 45 Hours**TEXTBOOK:**

1. Dale H. Besterfield, et al. "Total Quality Management", Pearson Education Asia, Third Edition, 2006.

REFERENCES:

1. James R. Evans and William M. Lindsay, "The Management and Control of Quality", 6th Edition, South-Western (Thomson Learning), 2005.
2. Suganthi, Land Anand Samuel, "Total Quality Management", Prentice Hall (India) Pvt. Ltd., 2006.
3. Janakiraman, Band Gopal, R.K, "Total Quality Management- Text and Cases", Prentice Hall (India) Pvt. Ltd.
4. R. Pugazhenthir, A. Baradeswaran, K. Balachandran, and P. Balamurali, "Total Quality Management", sams publications, 2015.

L T P C

18PCAU71 VEHICLE MAINTENANCE & RECONDITIONING LAB

0 0 2 1

Course Outcome: (Skill Development)

- To develop the maximum availability of vehicle without any major problem.
- To select the customer for safe driving.
- To organize the students in maintaining the vehicle in good condition.
- To use the students in identifying the fault and rectification.
- To explain the Fault Diagnosis of Ignition, Starting and Charging System.

LIST OF EXPERIMENTS FOR VEHICLE MAINTENANCE

1. Study and Layout of Automobile Repair Shop.
2. Study and Preparation of Workshop Statements.
3. Study and List of Tools and Instruments.
4. Minor and Major Tuning of Diesel and Petrol Engines.
5. Fault Diagnosis of Ignition, Starting and Charging System.
6. Fault Diagnosis of Petrol and Diesel Fuel System and Filters & Air Cleaners.
7. Fault Diagnosis of Lighting System Horn & Wiper.
8. Performing Body Repair Works.
9. Adjustment of Pedal Play in Clutch Brake, Hand Brake and Steering Wheel.
10. A) Bleeding of Hydraulic Brake System and Diesel Fuel System.
B) Wheel Bearing Adjustment.
C) Adjustment of Head Lights.

LIST OF EQUIPMENTS FOR VEHICLE MAINTENANCE LABORATORY

1. Cylinder re-boring - checking the cylinder bore.
2. Valve grinding, valve lapping.
3. Setting the valve angle and checking for valve leakage.
4. Wheel alignment - testing of camber, caster.
5. Testing kingpin inclination, toe-in and toe-out.
6. Brake adjustment.
7. Brake bleeding.

8. Removal of Tyre & Tube.

LIST OF EXPERIMENTS FOR VEHICLE RECONDITIONING

1. Engine Analyzer
2. Cylinder compression pressure gauge
3. Vacuum gauge
4. Spark plug cleaner and tester
5. Cam angle and rpm tester
6. Tacho-meter
7. Wheel alignment apparatus
8. Gas welding equipment
9. Bearing puller
10. Headlight alignment gauge
11. Service manuals of petrol, diesel engines

LIST OF EQUIPMENTS FOR VEHICLE RECONDITIONING

1. Cylinder re-boring machine
2. Valve grinding machine
3. Valve lapping machine
4. Wheel alignment apparatus
5. Tyre remover

TOTAL: 45 Hours

Course Outcome: (Skill Development)

- To design a sound technical knowledge of their selected project topic.
- To review the problem identification, formulation and solution.
- To compare the engineering solutions to complex problems utilising a systems approach.
- To compute an engineering project.
- To explain the project working model.

The objective of the project work is to enable the Student who individually carryout the project. This Project which involves theoretical and experimental studies related to the branch of study. Every project work shall have a guide who is the member of the faculty of the institution. Six periods per week shall be allotted in the time of the institution. Six periods per week shall be allotted in the time table and this time shall be utilized by the students to receive the directions from the guide, on library reading, laboratory work, computer analysis or field work as assigned by the guide and also to present in periodical seminars on the progress made in the project. Each student shall finally produce a comprehensive report covering background information, literature survey, problem statement, project work details and conclusion. This final report shall be typewritten form as specified in the guidelines. The continuous assessment shall be made as prescribed by the regulation.

18HSAU71

N.S.S

L	T	P	C
1	0	1	2

Course Outcome: (Skill Development)

- To develop the concepts of NSS.s
- To evaluate NSS programs and activities.
- To organize understanding youth
- To apply the community mobilization
- To explain the volunteerism and shramdan

UNIT I INTRODUCTION AND BASIC CONCEPTS OF NSS 6

NSS: History, philosophy, aims, objectives -Emblem: flag, motto, song, badge- NSS functionaries: Organizational structure, roles and responsibilities.

UNIT II NSS PROGRAMS AND ACTIVITIES 6

Concept of regular activities- special camping-day camps-Basis of adoption of village/slums, Methodology of conducting survey-Financial pattern of the scheme- other youth program/schemes of GOI- Coordination with different agencies-Maintenance of the dairy

UNIT III UNDERSTANDING YOUTH 6

Youth: Definition, profile of youth, categories – youth: Issues, challenges and opportunities - Youth as an agent of social change.

UNIT IV COMMUNITY MOBILIZATION 6

Mapping of community stakeholders-Designing the message in the context of the problem and the culture of the community-Identifying methods of mobilization-Youth adult partnership

UNIT V VOLUNTEERISM AND SHRAMDAN **6**
 Indian Tradition of volunteerism-Needs & Importance of volunteerism-Motivation and constraints of volunteerism-Shramdanas a part of volunteerism.

TOTAL: 30 Hours

18PEAU24 AUTOMOTIVE AIR-CONDITIONING **L T P C**
3 0 0 3

Course Outcome: (Employability)

- To invent the components of the automotive air-conditioning and their functions.
- To rank with latest developments in this field.
- To classify the air conditioning protection.
- To compute the handling refrigerants & diagnostic procedure.
- To explain the air conditioner maintenance and service.

UNIT I AIR CONDITIONING FUNDAMENTALS **9**

Basic air conditioning system - location of air conditioning components in a car, schematic layout of a refrigeration system, compressor components, condenser and high pressure service ports, thermostatic expansion valve, expansion valve calibration, controlling evaporator temperature, evaporator pressure regulator, evaporator temperature regulator.

UNIT II AIR CONDITIONER- HEATING SYSTEM **9**

Automotive heaters, manually controlled air conditioner, heater system, automatically controlled air conditioner and heater systems, automatic temperature control, air conditioning protection, engine protection.

UNIT III REFRIGERANT **9**

Containers handling refrigerants, tapping into the refrigerant container, refrigeration system diagnosis, diagnostic procedure, ambient conditions affecting system pressures.

UNIT IV AIR ROUTING AND TEMPERATURE CONTROL **9**

Evaporator airflow through the recirculation unit, automatic temperature control, duct system, controlling flow, vacuum reserve, testing the air control and handling systems.

UNIT V AIR CONDITIONING SERVICE **9**

Air conditioner maintenance and service, servicing heater system removing and replacing

components, trouble shooting of air conditioning system, compressor service.

TOTAL:45Hours

TEXTBOOKS

1. William H. Crouse and Donald I. Anglin-“Automotive Air Conditioning”-McGraw Hill.-1990.
2. Boyce H. D. Wiggins-”Automotive Air Conditioning”-Delmar-2002

REFERENCES

1. Mitchell Information Services, Inc-“Mitchell Automatic Heating and Air Conditioning Systems”- Prentice Hall Ind.-1989.
2. Paul Weiser-“Automotive Air Conditioning”-Reston Publishing Co., Inc.,-1990.
3. Mac Donald, K.I.,- “Automotive Air Conditioning”- Theodore Audel series-1978
4. Goings, L.F.-“Automotive Air Conditioning”- American Technical Services-1974.

18GEAU09	INDUSTRIAL MARKETING AND MARKET RESEARCH	L	T	P	C
		3	0	0	3

Course Outcome: (Skill Development)

- To build the newer concepts of marketing concepts like strategic marketing segmentation, pricing, advertisement and strategic formulation.
- To rank the industrial marketing, industrial demand and customer.
- To distinguish the product pricing, price decision, discounts, purchase and leasing.
- To compute the market research and its types, sources and collection of marketing data.
- To describe in detail about the market research techniques.

UNIT I INDUSTRIAL MARKETING 9

Nature of Industrial Marketing: Industrial Marketing Vs Consumer Marketing Relational approach to Industrial Marketing- The Nature of Industrial Demand & Industrial Customer. Types of Industrial Products: Major Equipment; Accessory Equipment; Raw and Processed Materials; Component Parts and Sub-Assemblies; Operating Supplies; Standardized and Non-standardized parts, Industrial services.

UNIT II PRICING 9

Pricing for Industrial Products – Pricing COURSE OUTCOME: (EMPLOYABILITY) - Price Decision Analysis – Breakeven analysis – net pricing – discount pricing – trade discounts – geographic pricing – factory pricing – freight allowance pricing – Terms of Sale – Outright purchase – Hire-purchase – Leasing.

UNIT III MARKET RESEARCH 9

Introduction to Market Research, Types of Research – Basic & Applied, Nature, Scope, objective, Importance & Limitations of Market Research. Sources and collection of Marketing Data. Secondary data – Advantages & Limitations, Sources – Govt. & Non Govt. Primary Data – Advantages & Limitations, Sources, Methods of Collection Primary Data – Observation, Mail, Personal Interview, Telephonic Interview, Internet Interviewing.

UNIT I TECHNIQUES 9

Market Research Techniques. National readership survey, Retail Store Audit, Consumer Panels, Test Marketing, Research in Advertising Decisions, Marketing Audit, Database Marketing, Focus Group Interviews. Sampling, Questionnaire & Scaling Techniques. Probability and Non Probability Sampling, Sampling methods, Sample Design, Questionnaire design and drafting. Scaling techniques like Nominal, Ordinal, Interval, Ratio, Perceptual Map, Semantic Differential, Likert, Rating & Ranking Scales.

UNIT II IMPLEMENTATION 9

Setting up & Implementation of Marketing Research Project, Steps in formulating Market Research Projects, One project for consumer durables and one for non-durables to be discussed.

TOTAL: 45 Hours

TEXTBOOKS:

1. Ralph S. Alexander, James S. Cross, Richard M. Hill, "Industrial Marketing", Homewood, 1967.
2. Rajendra Nargundkar, "Marketing Research", Tata McGraw Hill, 2008.

REFERENCES:

1. Robert R. Reeder; Edward G. Brierty; Betty H. Reeder, "Industrial Marketing - Analysis, Planning and Control", Prentice Hall, 1991.
2. Ghosh PK, "Industrial Marketing", Oxford University Press, India.
3. Ramanuj Majumdar, "Marketing Research - Text, Applications and Case Studies".
4. Donald R. Cooper, "Business Research Methods", McGraw-Hill, 2005.

18GEAU07	ENTREPRENEURSHIP DEVELOPMENT	L	T	P	C
		3	0	0	3

Course Outcome: (Entrepreneurship)

- To implement the entrepreneurial quality and motivation in students and to impart basic entrepreneurial skills and understanding to run a business efficiently and effectively.
- To rate the entrepreneur towards motivation
- To organize the business
- To compute the financing and accounting
- To identify for support to entrepreneurs

UNIT I ENTREPRENEURSHIP 9

Entrepreneur - Types of Entrepreneurs- Difference between Entrepreneur and Intrapreneur Entrepreneurship in Economic Growth, Factors Affecting Entrepreneurial Growth.

UNIT II MOTIVATION 9

Major Motives Influencing an Entrepreneur – Achievement Motivation Training, Self Rating, Business Games, Thematic Apperception Test–Stress Management, Entrepreneurship Development Programs–Need, objective.

UNIT III BUSINESS

9

Small Enterprises – Definition, Classification – Characteristics, Ownership Structures – Project Formulation – Steps involved in setting up a Business – identifying, selecting a Good Business opportunity, Market Survey and Research, Techno Economic Feasibility Assessment – Preparation of Preliminary Project Reports – Project Appraisal – Sources of Information– Classification of Needs and Agencies.

UNIT IV FINANCING AND ACCOUNTING

9

Need – Sources of Finance, Term Loans, Capital Structure, Financial Institution, Management of working Capital, Costing, Break Even Analysis, Taxation – Income Tax, Excise Duty–Sales Tax.

UNIT V SUPPORT TO ENTREPRENEURS

9

Sickness in small Business– Concept, Magnitude, Causes and Consequences, Corrective Measures– Business Incubators – Government Policy for Small Scale Enterprises – Growth Strategies in small industry – Expansion, Diversification, Joint Venture, Merger and Sub Contracting.

TOTAL: 45 Hours

TEXTBOOKS:

1. Khanka.S.S., "Entrepreneurial Development" S.Chand & Co.Ltd., Ram Nagar, New Delhi, 2013.
2. Donald F.Kuratko, "Entrepreneurship–Theory, Process and Practice", 9th Edition, Cengage Learning, 2014.

REFERENCES:

1. Hisrich R.D., Peters M.P., "Entrepreneurship" 8th Edition, Tata McGraw-Hill, 2013.
2. Mathew J.Manimala, "Entrepreneurship theory at crossroads: paradigms and praxis" 2nd Edition Dreamtech, 2005.
3. Rajeev Roy, "Entrepreneurship" 2nd Edition, Oxford University Press, 2011.
4. EDII "Faulty and External Experts– A Handbook for New Entrepreneurs Publishers: Entrepreneurship Development", Institute of India, Ahmadabad, 1986.

REFERENCES:

1. Logistics and Supply Chain Management –Strategies for Reducing Cost and Improving Service. Martin Christopher, Pearson Education Asia, Second Edition.
2. Modeling the supply chain, Jeremy F.Shapiro, Thomson Duxbury, 2002.
3. Handbook of Supply chain management, James B.Ayers, St.Lucie Press, 2000.

Course Outcome: (Employability)

- To design a sound technical knowledge of their selected project topic.
- To review the problem identification, formulation and solution.
- To compare the engineering solutions to complex problems utilising a systems approach.
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