FACULTY OF ENGINEERING,
TECHNOLOGY AND MANAGEMENT
SCIENCES

VINAYAKA MISSION’S RESEARCH
FOUNDATION (Deemed to be University)
SALEM (TAMILNADU)

REGULATION - 2016
B.E AUTOMOBILE ENGINEERING
(REGULAR) – CBCS

AARUPADAI VEDU INSTITUTE OF TECHNOLOGY, PAIYANOOR, CHENNAI
VINAYAKA MISSIONS RESEARCH FOUNDATION, SALEM
VINAYAKA MISSSION’S KIRUPANANDA VARIYAR ENGINEERING COLLEGE
SALEM
AND
AARUPADAI VEEDU INSTITUTE OF TECHNOLOGY, PAIYANOOR, CHENNAI

DEPARTMENT OF MECHANICAL ENGINEERING

BOARD : MECHANICAL ENGINEERING
REGULATION : 2016
PROGRAM : B.E – AUTOMOBILE ENGINEERING - FULL TIME

CURRICULUM & SYLLABUS

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Aim: To impart analytical ability in solving mathematical problems as applied to the respective branches of Engineering.

Objectives:
To provide students with mathematical knowledge and skills needed to support their concurrent and subsequent engineering and science studies
- To improve their ability in solving geometrical applications of differential calculus problems
- To equip themselves familiar with the functions of several variables.
- To have knowledge in multiple calculus
- To improve their ability in Vector calculus

Outcome:
To impart analytical ability in solving Mathematical problems as applied as the respective branches of Engineering.

UNIT I APPLICATION OF DIFFERENTIAL CALCULUS
Curvature – Cartesian and Parametric Co-ordinates – Centre and radius of curvature – Circle of curvature – Evolute

UNIT II FUNCTIONS OF SEVERAL VARIABLES

UNIT III INTEGRATION
Concept of integration-Integration of Rational and Trigonometric functions – Using Partial Fractions – Integration by parts.

UNIT IV MULTIPLE INTEGRAL
Double integration – change of order of integration- Cartesian and polar coordinates – Area as a double integral – Triple integration.

UNIT V VECTOR CALCULUS
Directional derivatives – Gradient, Divergence and Curl – Irrotational and solenoidal- vector fields – Vector integration – Green”s theorem, Gauss divergence theorem and Stoke”s theorem (excluding proof).

TEXT BOOK:
1. “Engineering Mathematics” by Department of Mathematics, VMU

REFERENCES:
Aim: To Strengthens the basic LSRW (Listening, Speaking, Reading and Writing) skills.

Objectives:
1. To enable students to develop LSRW skills in English.
2. To become effective communicators in English.
3. To ensure that learners use Electronic media materials for developing language skills.

Outcome:
Out come of the revised English for Engineers syllabus for the first semester UG engineering students for the academic year 2015-2016.
1. By teaching this syllabus, our UG Engineering graduates will enable to enhance wide range vocabulary to use at right place in right time.
2. Students who undergo this syllabus will fulfill practice in professional writing and comprehension skill and meet the industry requirements.

Unit – I

Unit – II
Articles - Phonetics (Vowels, Consonants and Diphthongs) – Pronunciation Guidelines – Listening to Indian speakers from different regions, intrusion of mother tongue – Homophones – Homonyms, Note taking and Note making - Difference between Spoken and Written English- Use of appropriate language - Listening and Responding to Video Lectures (Green India, environment, social talks) - Extempore.

Unit – III
Tense forms- Verbal &Non verbal communication – Describing objects – Process Description- Speaking Practice – Paragraph Writing on any given topic (My favourite place, games / Hobbies / School life, etc.) –Types of paragraphs- Telephone Etiquettes.

Unit – IV

Unit – V
Sentence Pattern (SVOCA) - Statement of Comparison - Transcoding – Informal letters - SWOT analysis– Resume Writing- Difference –Bio – data, Resume and CV.
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**Aim:** To strengthens the fundamental knowledge in physics will improve the scientific thinking of students.

**Objective:** The fundamental knowledge in physics will improve the scientific thinking of students.

**Outcome:**
- To understand the elastic properties of materials.
- To understand the properties of crystals.
- To understand the significance of laser and its applications in technology.
- To understand the basic principles of optical fibres and their applications.
- To understand the Non-Destructive Testing techniques.

**UNIT I – Properties of matter**
- Elasticity – Hooke’s law – Stress-strain diagram - Relationship between three moduli of elasticity (qualitative) - Poisson’s ratio – Young’s modulus by uniform bending and non-uniform bending – Experimental determination of rigidity modulus – I-shaped girders.

**UNIT II – Crystal Physics**
- Unit cell – Bravais lattice – Miller indices – Calculation of number of atoms per unit cell – atomic radius – coordination number – packing factor for SC, BCC, FCC, HCP structures – Crystal imperfections – point, line, surface and volume defects.

**UNIT III – Lasers**

**UNIT IV – Fibre Optics**
- Principle and propagation of light in optical fibres – numerical aperture and acceptance angle – types of optical fibres (material, refractive index, mode) – Applications: Fibre optic communication system – fibre optic displacement sensor and pressure sensor.

**UNIT V - Non – Destructive Testing**

**Total hours** 45

**TEXT BOOK**
“Engineering Physics”, compiled by Department of Physics, Vinayaka Missions University, Salem.

**REFERENCE BOOKS**
AIM: To study the basics of Computer, Hardware, Software Applications, Algorithms and Problem solving methodologies.

OBJECTIVES:

- To provide basic knowledge on hardware and software components of computers.
- To introduce and demonstrate various software applications
- To introduce Problem solving methodologies
- To learn about Implementation of Algorithms
- To learn about HTML

OUTCOME

At the end of this course, student shall be able to:
Do Problem Solving using Programming and algorithms, Describe working of Internet based applications, Document artifacts using common quality standards, Design simple data store using DBMS concepts and implement, Develop a working website with all above learning

UNIT I - Basics of Computer and Information Technology

10


UNIT II - Software Applications (Practical Learning)

7

Office Automation: Application Packages - Word processing (MS Word) - Spread sheet (MS Excel) – Presentation (MS PowerPoint).

UNIT III - Problem Solving Methodologies

10

Problems Solving Techniques - Program Development Cycle – Algorithm Development - Flow chart generation – Programming Constructs (Sequential, Decision-Making, Iteration) - Types and generation of programming languages

UNIT IV Implementation of Algorithms

9

Implementation of Algorithms-program verification-The efficiency of algorithms-The analysis of algorithms-Fundamental Algorithms
UNIT V HTML

Basics of HTML – Applications of HTML – HTML Fonts – anchor tag and its attributes –
Using images in HTML programs – list tag - Table tag – HTML forms

TOTAL HOURS: 45

TEXT BOOKS

1. Essentials of Computer Science and Engineering – by VMU
OBJECTIVE: To provide the basic knowledge about EEE
To provide an understanding of fundamentals of Electrical and Electronics Engineering.

OUTCOME:
The student will be able to identify and understand the operation of electrical and electronic components and design circuits.

A) ELECTRICAL ENGINEERING
UNIT I Electrical Circuits & Meters
Definition of electromotive force, current, power and energy-International System of units- Ohm’s law and Kirchhoff’s laws-solution of series and parallel Circuits.
Generation of alternating voltage-average and RMS values-solution of simple R,RL,RC and RLC circuits- Calculation of power and power factor in AC circuits.
Construction and principles of operation of moving coil, moving iron and dynamometer instruments.

UNIT II DC Machines (Qualitative Treatment Only)
DC machines –parts-DC generator-EMF equation-Different types of DC generators and their applications-DC motors and their applications-different types-speed control-Starter.

UNIT III AC Machines (Qualitative Treatment Only)
Construction & principle of operation of transformers-Single phase & Three phase transformers-Construction and operation of AC motors-Single phase and three phase Induction motors-applications-construction, principles of operation and application of synchronous motors.

B) BASIC ELECTRONICS ENGINEERING
UNIT I: SEMICONDUCTOR DEVICES

UNIT II: DIGITAL FUNDAMENTALS
Number Systems – Binary, Octal, Decimal and Hexa-Decimal – Conversion from one to another – Logic Gates – AND, OR, NOT, XOR, Universal Gates – Adders, Multiplexer, De Multiplexer, Encoder, Decoder – Memories – PAL, PLA.

UNIT III: COMMUNICATION AND ADVANCED GADGETS

TEXT BOOKS
3. “Basic Electrical and Electronics Engineering”, Compiled by Department of EEE & ECE, Faculty of Engineering and Technology, VMRFDU, Anuradha agencies,2006.
5. "Basic Electrical and Electronics Engineering", Compiled by Department of EEE & ECE, Faculty of Engineering and Technology, VMRFDU, Anuradha agencies, 2006

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**Aim:** To provide the knowledge about basics of physics

**Objective:** Students will have the knowledge of taking measurements precisely.

**Outcome:** To understand the experiments through online virtual demonstration followed by real hands-on experience.

**List of Experiments**

1. Young's modulus of a bar - Non-uniform bending
2. Rigidity modulus of a wire - Torsional Pendulum
3. Viscosity of a liquid - Poiseuille's method
4. Velocity of ultrasonic waves in liquids - Ultrasonic Interferometer
5. Particle size determination using Laser
6. Wavelength of spectral lines – grating - Spectrometer
7. Thickness of a wire - Air wedge Method
8. Thermal conductivity of a bad conductor - Lee's disc
9. Band gap determination of a thermistor - Post Office Box
10. Specific resistance of a wire – Potentiometer
AIM: To provide the basic skills of EEE
OBJECTIVE:
To provide exposure to the students with hands on experience on various basic Engineering practices in Electrical and Electronics Engineering.

OUTCOME:
  Development of skills in electrical and electronic devices.

LIST OF EXPERIMENTS
  A) ELECTRICAL ENGINEERING LAB

1. Residential house wiring using switches, fuse, indicator, lamp and energy meter.
2. Fluorescent lamp wiring.
3. Stair case wiring
5. Measurement of energy using single phase energy meter.

  B) ELECTRONICS ENGINEERING LAB

1. Characteristics of PN junction Diode.
2. Characteristics of Zener diode.
3. Input, Output characteristics of BJT.
4. Transfer characteristics of JFET.
5. Amplitude Modulation
6. Frequency Modulation.
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**AIM**

To practice the basics of office automation application, SQL and basic HTML coding.

**OBJECTIVE**

To familiarize students with the basic tools of computer and their application in engineering & technology.

**OUTCOME**

At the end of the course, the students would have develop their skills for Office automation, SQL queries and Html

1. Implement Mail Merge in MS-Word and send letters to parents regarding the semester fee structure of the student.
2. Using MS-Word, create a leave letter addressed to your faculty advisor.
3. A) Using MS-Word, create a table for a list of students with different font sizes and colours.
   B) Using MS-Word, create a flow-chart using the basic shapes available. Use page border, a watermark, header and footer.
4. Using MS-PowerPoint, create a presentation about the university.
5. Using MS-PowerPoint, create a story line with various animations and transition effects.
7. Using MS-Excel, create a pivot table.
8. Using MS-Excel, create look-up tables.
9. Using MS-Excel, create graphs for the weather condition in various cities of India.
10. Create an HTML page Create an HTML page to
    a) Click on a link and go to the bottom of the page using `<a href>`
    b) Display an image.
11. Create an HTML page to
    a) Display ordered and unordered lists of your friends names and sports persons
    b) Display a table with 3 columns and 4 rows.
AIM
The aim of the lab to learn Business fitting, Carpentry and welding technics.

OBJECTIVE
To learn the experience of practice in basic sections of the workshop namely fitting, Carpentry and welding in order to know the various methods involved in making parts of the various machines.

OUTCOME
The students would have been completely exposed to the various basic methods that are going to play in the manufacture of even very heavy machines.

FITTING
1. Square Joint
2. Dove Tail Joint

CARPENTRY
1. Half Lap Joint
2. Dove Tail Joint

WELDING
1. Arc Welding of butt Joint.
2. Arc Welding of Lap Joint

CASTING
1. Foundry – Mould Preparation using single piece pattern

DEMONSTRATION
1. Sheet Metal – Fabrication of cone
2. Black Smithy – Round to square rod

Reference:
1.“Basic Workshop Practice”, Department of Mechanical Engineering, Vinayaka Missions University
Aim: To provide students with mathematical knowledge and skills needed to support their concurrent and subsequent engineering and science studies

Objectives:
The syllabus for the Engineering Mathematics I have been framed catering to the needs of the Engineering students. It is purely applications oriented. To mention a few

- To utilize the powerful features of MATLAB one has to be an expert in Matrix theory
- The matrix theory plays a vital role in simplifying large arrays of equation and in determining their solution.
- Partial differential equation frequently occurred in the theory of elasticity and Hydraulics.
- In circuit branches the current flow can be calculated by using Laplace transform when EMF, resistance and inductions are known.

Outcome:
- At the end of this course the students will be in a position to apply the knowledge of Mathematics in the respective Engineering branches.

UNIT I
MATRICES
Characteristic equation – Eigen values and eigenvectors of a real matrix – Properties of eigenvalues and eigenvectors (Without proof) – Cayley-Hamilton theorem (excluding proof) – Orthogonal transformation of a symmetric matrix to diagonal form.

UNIT II
LAPLACE TRANSFORMS

UNIT III
INVERSE LAPLACE TRANSFORMS & APPLICATIONS
Inverse Laplace transform – Convolution theorem – Initial and Final value theorem-Solution of linear ODE of second order with constant coefficients and first order simultaneous equation with constant coefficients using Laplace transforms.

UNIT IV
FOURIER TRANSFORMS
UNIT V

TRANSFORMS

TEXT BOOKS
1. “Engineering Mathematics” by Department of Mathematics, VMU

REFERENCE BOOKS
Aim: To provide the basic knowledge of business English

Objectives:
1. To impart and enhance corporate communication.
2. To enable learners to develop presentation skills.
3. To build confidence in learners to use English in Business contexts.

Outcome:
Outcome of the revised Business English syllabus for the second semester UG engineering students for the academic year 2015-2016.
1. It is hoped that this syllabus will enable the students to undergo in activities, demonstrating interaction skills and consider how own communication is adjusted in different scenario.

Unit – I
Subject and verb agreement (Concord) – Preposition and Relative Pronoun – Cause and effect- Phrasal Verbs – Idioms and Phrases – Listening comprehension - Listening to Audio Files and Answering Questions – Framing Questions – Negotiation skills, Persuasion Skills and Debating skills.

Unit – II

Unit – III
Reading Skills – Understanding ideas and making inferences – Group Discussion – Types of Interviews, FAQs – e- mail Netiquette, Sample e-mails – Watching Documentary Films and responding to questions.

Unit – IV
Corporate communication – Recommendation - Instruction – Check List- circulars- Inter office memo – Minutes of meeting and Writing agenda – Discourse Markers- Rearranging the jumbled sentences – Technical Articles – Project Proposals, Making Presentations on given topics – Preparing Power Point Presentations.

Unit – V

References:
2. Technical English-Writing, Reading and Speaking- Pickett and Lester, Harper and Row publication
AIM
To impart in basic knowledge in chemistry so that the student will understand the engineering concept and they can face the competitive examinations effectively.

OBJECTIVE
With a solid foundation in basic scientific and engineering principles, while allowing specialization in Engineering chemistry and ability to assess the impact of engineering solutions in a global and societal context.

OUTCOME
The student will come out with the ability to assess the impact of engineering solutions.

UNIT I: ELECTROCHEMISTRY, BATTERIES AND FUEL CELLS 9 Hrs
Primary battery (Daniel and dry cell) – secondary battery (lead Acid storage battery and Nickel-Cadmium battery) – Fuel cell (H2-O2 fuel cell)

UNIT II: WATER TECHNOLOGY & CORROSION 9 Hrs
Corrosion – Types – principles – corrosion control methods (Electroplating,Electroless plating, Sacrificial anode and Impressed current method).

UNIT III: CHEMISTRY OF ADVANCED MATERIALS 9 Hrs
Organic electronic material, shape memory alloys, smart materials,polymers(PVC,Teflon, Bakelite)- fibers(optical fibre) & composites (FRP,MMC & PMC)

UNIT IV: PHASE EQUILIBRIA & NUCLEAR CHEMISTRY 9 Hrs
Phase rule: statement and explanation of terms involved – One component system (water) – Condensed phase rule – Two component system (Lead-silver).
Nuclear Chemistry – Fission – Fusion – working of nuclear reactor – Radiations and harmful effects.

UNIT V: CHROMATOGRAPHY AND SPECTROSCOPY 9 Hrs

TEXT BOOK: Engineering Chemistry by VMU.
References:

AIM:
The aim is to introduce C programming to the students.

OBJECTIVES:
- To introduce Basics of C
- To understand Control Structures & Arrays
- To learn about String concept, Structure and Union in C
- To introduce the concepts of Functions and Pointers
- To introduce Memory and File management concepts in C

OUTCOME
At the end of this course, student shall be able to know the concepts of C programming techniques.

UNIT I - Basics of C
Identifiers, variables, expression, keywords, data types, constants, scope of variables. Operators: arithmetic, logical, relational, conditional and bitwise operators - Special operators: size of () & comma (,) operator - Precedence and associatively of operators - Type conversion in expressions.

UNIT II - Control Structures & Arrays
Basic input/output and library functions: Single character input/output i.e. getch(), getchar(), getche(), putchar() - Formatted input/output: printf() and scanf() – Library functions (mathematical and character functions). Decision Making and Branching – Looping statements. Arrays – Initialization – Declaration – One dimensional and two dimensional arrays.

UNIT III String, Structure & Union
Strings: Declaration-Initialization and string handling functions. Structure and Union: structure declaration and definition – Accessing a Structure variable – Structure within a structure – Union.

UNIT IV Functions and Pointers

UNIT V Memory and File management

TOTAL HOURS: 45

TEXT BOOKS:

REFERENCE BOOKS:

AIM:
The aim is to introduce basics of solid mechanics to the students.

OBJECTIVES:
To create and understanding of statics and dynamics of bodies in rest or in motion.

OUTCOME
At the end of this course, student will be in a position to design mechanical systems independently.

UNIT 1. BASICS & STATICS OF PARTICLES

UNIT 2. EQUILIBRIUM OF RIGID BODIES
Free body diagram - Types of supports and their reactions - requirements of stable equilibrium - Moments and Couples - Moment of a force about a point and about an axis - Vectorialrepresentaion of moments and couples - Scalar components of a moment - Varignon's theorem - Equilibrium of Rigid bodies in two dimension - Equilibrium of Rigid bodies in three dimensions.

UNIT 3. PROPERTIES OF SURFACES AND SOLIDS
Determination of Areas and Volumes - First moment of area the Centroid of sections - Rectangle, circle, triangle from integration - T section, I section, Angle section, Hollow section by using standard formula - second and product moments of plane area - Rectangle, triangle, circle from integration - T section, I section, Angle section, Hollow section by using standard formula - Parallel axis theorem and perpendicular axis theorem - Polar moment of inertia - Principle moments of inertia of plane areas - Principle axes of inertia - Mass moment of inertia.

UNIT 4. FRICTION AND ELEMENTS OF RIGID BODY DYNAMICS
Frictional force - Laws of Coloumb friction - simple contact friction - Rolling resistance - Belt friction. Translation and Rotation of Rigid Bodies - Velocity and acceleration - General Plane motion.

UNIT 5. DYNAMICS OF PARTICLES

TOTAL: 45 PERIODS

TEXT BOOKS:

**REFERENCE BOOKS:**
### SEMESTER II

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#### AIM
To practice and develop applications using C Programming languages.

#### OBJECTIVE
To make the students to develop program in C languages.

#### OUTCOME
At the end of the course, the students will be able to develop applications using C Programming languages.

1. Write a C Program to Implementation of Sine and cosine series
2. Write a C Program to calculate Simple Interest
3. Write a C Program to generate Fibonacci Series using for loop
4. Write a C program to calculate factorial using while loop
5. Write a C Program to
   a) Find the greatest of three numbers using if condition.
   b) Find the greatest of three numbers using conditional operator.
6. Write a C program for finding the roots of a given quadratic equation using conditional control statements
7. Write a C program to
   a) Compute matrix multiplication using the concept of arrays.
   b) Illustrate the concept of string handling functions.
8. Write a C program to
   a) Find the largest element in an array using pointers.
   b) Convert a binary number to decimal or decimal to binary using functions.
9. Write a C program to read data from keyboard, write it to a file named student again read the same data from student file and write it into data file.
10. Write a C program to store employee details using the concept of structures.
AIM:
AN INTRODUCTION OF CAD SOFTWARE AND ITS UTILITIES IN ENGINEERING FIELDS.

OBJECTIVES:
1. To improve imagination skills.
2. Increase ability to communicate with people.
3. Learn to sketch and take field dimensions.
4. Learn to take data and transform it into graphic drawings.
5. Learn basic engineering drawing formats.
6. Prepare the student for future Engineering positions.

COURSE OUTCOMES:
At the end of course the student will be able to:
1. Get acquainted with the knowledge of various lines, geometrical constructions and construction of various kinds of scales, and Ellipse.
2. Improve their imagination skills by gaining knowledge about points, lines and planes.
3. Become proficient in drawing the projections of various solids.

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 drawing sheets – Lettering and dimensioning.

UNIT I PLANE CURVES AND FREE HAND SKETCHING
Conics – Construction of ellipse-Free hand sketching-Representation of Three Dimensional objects – General principles of orthographic projection – Need for importance of multiple views and their placement – First angle projection – layout views – Developing visualization skills through free hand sketching of multiple views from pictorial views of objects.

UNIT II PROJECTION OF POINTS, LINES
Projection of points, Projection of straight lines located in the first quadrant: inclined to both planes – Determination of true lengths and true inclinations – rotating line method only.

UNIT III PROJECTION OF SOLIDS
Projection of simple solids like prisms, pyramids, cylinder and cone when the axis is inclined to one reference plane by change of position method.

UNIT IV SECTION OF SOLIDS AND DEVELOPMENT OF SURFACES
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.
Development of lateral surfaces of simple and truncated solids – Prisms, pyramids, cylinders and cones

UNIT V ISOMETRIC VIEW AND PERSPECTIVE PROJECTION

9

Principles of isometric View – isometric scale – isometric view of simple solids- Introduction to Perspective projection

TEXT BOOKS:


REFERENCES:

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**AIM**
To impart in basic knowledge in chemistry so that the student will understand the engineering concept.

**OBJECTIVE**
To learn the relevant experience using laboratory experiments

**OUTCOME**
The student will have the experience in handling the instruments relevant to his/her theory.

1. Estimation of total hardness of water sample by EDTA method.
2. Estimation of dissolved oxygen by Winkler’s method.
3. Estimation of ferrous ion by Potentiometry.
4. Precipitation reaction by Conductometry.
5. Acid base reaction by pH metry.
6. Estimation of copper from its ore.
7. Estimation of iron by spectrophotometer.
8. Estimation of sodium by flame photometer.
10. Corrosion experiment by weight loss methods.
Aim: The aim of the subject is to provide a fundamental knowledge of Partial differential equation and Fourier series.

Objectives:
1. Partial differential equation arises in most of the Engineering discipline when the number of independent variables in the given problem under discussion is two or more.
2. Fourier series is used to express even aperiodic functions in terms of periodic functions making them amenable for further processing.

Outcome:
1. The student will understand the usage of Fourier series application in the field of heat diffusion, wave propagation and in signal and systems analysis.

UNIT-I PARTIAL DIFFERENTIAL EQUATIONS
Formation - Solutions of standard types \( f(p,q)=0 \), clairauts form, \( f(z,p,q)=0 \), \( f(p,x)=g(q,y) \) of first order equations - Lagrange's Linear equation - Linear partial differential equations of second and higher order with constant coefficients.

UNIT-II FOURIER SERIES
Dirichlet's conditions - General Fourier series - Half-range Sine and Cosine series - Parseval's identity – Harmonic Analysis.

UNIT-III BOUNDARY VALUE PROBLEMS
Classification of second order linear partial differential equations - Solutions of one-dimensional wave equation, one-dimensional heat equation - Steady state solution of two-dimensional heat equation - Fourier series solutions in Cartesian coordinates.

UNIT-IV STANDARD DISTRIBUTIONS

UNIT-V STATISTICS
Measures of central tendency, Curve fitting - Straight line and Parabola by least square method, Correlation, Rank correlation and Regression.

TUTORIAL : 15 HOURS
TOTAL HOURS: 60 HOURS
TEXT BOOKS:

REFERENCES
Aim: The aim of the subject is to provide fundamental knowledge of automotive petrol engines.

Objectives: 1. To understand fundamentals of SI engine construction and operations. 2. To provide an in-depth study of SI engine fuel supply systems. 3. To understand the concept of ignition system and types. 4. To provide in-depth study of cooling systems and lubrication systems. 5. To understand the types of combustion and combustion chamber.

Outcome: 1. The student will undergo a sequential understanding of the concept, construction and required components of automotive petrol engine to provide environmental friendliness.

UNIT- I ENGINE CONSTRUCTION AND OPERATION
Constructional details of four stroke petrol engine, working principle, air standard Otto cycle, actual indicator diagram, two stroke engine construction and operation, comparison of four stroke and two stroke engine operation, firing order and its significance. Port Timing, Valve Timing of petrol engines, valve actuation mechanism.

UNIT- II SI ENGINE FUEL SYSTEM
Carburetor working principle, requirements of an automotive carburetor, starting, idling, acceleration and normal circuits of carburettors. Compensation, maximum power devices, constant choke and constant vacuum carburettors, fuel feed systems; mechanical and electrical fuel feed pumps. Petrol injection, MPFI.

UNIT- III IGNITION SYSTEM
Types and working of battery coil and magneto ignition systems, relative merits and demerits, centrifugal and vacuum advance mechanisms. Types and construction of spark plugs, electronic ignition systems.

UNIT- IV COOLING AND LUBRICATION SYSTEM
Need for cooling system, Types of cooling system: air cooling system, liquid cooling system, forced circulation system, pressure cooling system. Lubrication system; mist, wet sump lubrication system, properties of lubricants.

UNIT- V COMBUSTION AND COMBUSTION CHAMBERS
Combustion in SI engine; stages of combustion, flame propagation, rate of pressure rise, abnormal combustion, detonation, effect of engine variables on knock, knock rating. Combustion chambers; different types, factors controlling combustion chamber design, scavenging methods.

TOTAL: 45HOURS

TEXT BOOKS
Delhi, 2003.

REFERENCES
Aim:  The aim of the subject is to provide a fundamental knowledge of thermodynamics.

Objectives:  
3. To achieve an understanding of fundamentals of thermodynamic systems and first law of thermodynamics.
4. To provide an in-depth study of availability and second law of thermodynamics.
5. To understand the concept of working fluid and its properties.
6. To provide in-depth study of power cycles applying the different working fluids studied in the previous chapter.
7. To understand the Thermodynamic Relations and also to understand combustion equations.

Outcome:  
2. The student will understand concept of heat and work to implement the efficient conversion between them in the applications like IC engine, steam power plant, domestic refrigerators and air conditioners.

UNIT –I BASIC CONCEPTS AND FIRST LAW OF THERMODYNAMICS 9

Definition of Thermodynamics, macroscopic and microscopic approach, thermodynamic systems and surroundings, thermodynamic properties, thermodynamic equilibrium, state, path, process and cycle, reversible and irreversible processes, work, energy, and heat, state postulate and Zeroth law of thermodynamics, thermometer and thermometric property, temperature Scales.

Internal energy, First law of thermodynamics, perpetual motion machine of the first kind PMM I, application of first law to non-flow processes or closed system and related problems, application of first law to steady flow process, steady flow energy equation. Problems

UNIT –II SECOND LAW OF THERMODYNAMICS 9


UNIT –III PURE SUBSTANCES AND THERMODYNAMIC RELATIONS 9

Definition of pure substance, phase change of a pure substance, p-T diagram, p-V-T Surface, phase change terminology, property diagram in common use. Formation of steam, sensible heat, latent heat, dryness fraction, enthalpy, superheated steam, thermodynamic properties of steam and steam table, work, internal energy, entropy calculation, Mollier diagram, calorimeters for determination of dryness fraction.
Problems determining thermodynamic properties of steam.

Thermodynamic relations: Thermodynamic potentials, thermodynamic gradients, general thermodynamics relations, entropy (Tds) equations, equations for internal energy and enthalpy, equation of state, coefficient of expansion and compressibility, specific heats, Joule Thomson coefficient, Clausius–Clapeyron equation, Maxwell’s relations.

UNIT –IV GASES AND VAPOUR MIXTURES

Ideal gas, equation of state for a perfect gas, Joules law, internal energy, enthalpy & specific heat capacities of an ideal gas, real gases, Van der waals equation – Amagats experiment, the cooling effect. Law of corresponding states, reduced properties, compressibility chart. Problem on calculation of properties ideal and real gases. Daltons law, Gibbs – Dalton law, volumetric analysis of a gas mixture, apparent molecular weight and gas constant, specific heats of a gas mixture, adiabatic mixing of perfect gases. Problems on gas mixture property values.

UNIT –V FUELS AND COMBUSTION

Characteristics of an ideal fuel, properties of fuel, flash point, fire point, cloud point, pour point, viscosity, combustion reaction and combustion analysis, theoretical air and excess air, stoichiometric air fuel ratio, analysis of combustion products, internal energy and enthalpy of formation, calorific value, determination of calorific value of fuels, Junkers gas calorimeter, Orsat apparatus, exhaust gas analyser, problem on calculation of air fuel ratio.

TUTORIAL : 15 HOURS
TOTAL HOURS: 60 HOURS

TEXT BOOKS


REFERENCES

2. Spalding & Cole., Engineering Thermodynamics, ELBS.
4. Rogers & Mayhew, Engineering Thermodynamics – Addision Wesley.
Aim: The aim of the subject is to provide fundamental concepts of fluid mechanics and strength of materials.

Objectives: 1. To understand basic mechanical forces acting on rigid and deformable bodies.
2. To draw shear force and bending moment diagram for various types of beams.
3. To form deflection equations of beams and columns for different end conditions.
4. To understand fluid property and flow characteristics.
5. To understand flow dynamics and measurement.

Outcome: 3. The student will understand fundamental concepts of mechanics of materials and fluids. The knowledge acquisition will enhance the selection, design and application of materials and fluids in the desired fields of functioning.

UNIT –I STRESS- STRAIN AND DEFORMATION OF SOLIDS 9

UNIT- II BEAMS - LOADS AND STRESSES 9
Types of beams: Supports and Loads – Shear force and Bending Moment in beams – Cantilever- Simply supported and Overhanging beams – Stresses in beams – Theory of simple bending – Stress variation along the length and in the beam section – Shear stresses in beams.

UNIT- III DEFLECTION OF BEAMS 9

UNIT-IV FLUID PROPERTY AND FLOW CHARACTERISTICS 9
Surface tension – Capillarity – Viscosity – Newton's law – Fluid pressure and pressure head - Fluid velocity – Uniform and steady flow – Reynolds number - Classification as laminar and turbulent flow – Continuity equation.

UNIT-V FLOW DYNAMICS AND MEASUREMENT IN PIPE NETWORKS 9
Euler’s and Bernoulli’s Equations – Manometer, Venturi meter and orifice meter - Pressure losses along the flow – Categorisation into minor losses - Flow through circular pipes – Statement of Darcy – Weisbach equation – Friction factor – Pipes in series and parallel - Hydraulic gradient
TEXT BOOKS

REFERENCES
Aim:  
The aim of the subject is to study and understand the automotive diesel engines.

Objectives:  
1. To impart the knowledge of basic theory of diesel engines.  
2. To understand the entire fuel injection systems.  
3. To understand the various air motion and combustion chambers.  
4. To impart the knowledge of super charging and turbo charging.  
5. To impart the knowledge of various engine performances

Outcome:  
1. The student will undergo a sequential understanding of the concept, construction and required components of automotive diesel engine to provide environmental friendliness.

UNIT- I BASIC THEORY  
Diesel engine construction and operation. Two stroke and four stroke diesel engines. Diesel cycle – Fuel-air and actual cycle analysis. Diesel fuel-Ignition quality, Cetane number, Laboratory tests for diesel fuel, Standards and specification

UNIT- II FUEL INJECTION SYSTEM  

UNIT- III AIR MOTION, COMBUSTION AND COMBUSTION CHAMBERS  

UNIT- IV SUPERCHARGING AND TURBOCHARGING  

UNIT- V ENGINE PERFORMANCE AND EVALUATION  

TUTORIAL : 15 HOURS  
TOTAL HOURS: 60 HOURS

TEXT BOOKS  

REFERENCES
Aim: The aim of the subject is to provide knowledge and understanding on various types of automotive electrical and electronics systems.

Objectives:
1. To understand the types of battery and its constructions.
2. To impart the knowledge of starting systems of the vehicle.
3. To understand the various types of charging system & lighting system.
4. To impart the knowledge of fundamental of automotive electronics.
5. To impart the knowledge of sensors and actuators.

Outcome: 1. The student will understand construction and required components of automotive electrical and electronics systems to provide efficient and environmental friendly operation of automobiles.

UNIT- I BATTERIES
Principle and construction of lead-acid battery. Characteristics of battery, rating, capacity and efficiency of batteries. Various tests on battery condition, charging methods. Details of modern storage batteries.

UNIT- II STARTING SYSTEM

UNIT- III CHARGING SYSTEM & LIGHTING SYSTEM
Generation of direct current, shunt generator characteristics, armature reaction, third brush regulation, cutout. Voltage and current regulators, compensated voltage regulator, alternators principle and constructional aspects and bridgetrectifiers, new developments. Lighting system: insulated and earth return system, details of head light and sidelight, LED lighting system, head light dazzling and preventive methods – Horn, wiper system and trafficator.

UNIT- IV FUNDAMENTALS OF AUTOMOTIVE ELECTRONICS
Current trends in automotive electronic engine management system, electromagnetic interference suppression, electromagnetic compatibility, electronic dashboard instruments, onboard diagnostic system, security and warning system.

UNIT- V SENSORS AND ACTUATORS
Types of sensors: sensor for speed, throttle position, exhaust oxygen level, manifold pressure, crankshaft position, coolant temperature, exhaust temperature, air mass flow for engine application. Solenoids, stepper motors, relay.

TOTAL: 45 HOURS
TEXT BOOKS

REFERENCES
Aim: To impart training in assembling and dismantling of different types of engine components.

Objectives:
1. To understand the dismantling of 4 and 6 cylinder engines.
2. To understand the assembly of 4 and 6 cylinder engines.
3. To study the engine accessories and their functions.

Outcome: 4. The student will undergo training in the dismantling and assembly of engine components and acquire knowledge to modify them according to the need.

1. Dismantling of 4 cylinder petrol engine.
3. Dismantling 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.

TOTAL: 30 HOURS
Aim: The main objective of this lab is to practice the mechanisms behind fluid flow and understand the property measurement and strength of materials.

Objectives:
1. To get practice in fluid flow measurement and losses.
2. To understand the operation of pumps.
3. To get practice in material property measurement.

Outcome: 1. The student will undergo training in the fluids and materials mechanisms and properties.

LIST OF EXPERIMENTS:
1. A comparative analysis of Coefficient of discharge using Orifice meter & venturi meter.
2. Determination of pipe loses-major & minor.
3. Demonstration of centrifugal pump/submersible pump/jet pump/reciprocating pump.
4. Determination of Tensile strength and Compression strength on a given specimen.
5. Determination of shear strength of Mild steel and Aluminium rods
6. Determination of Torsional strength of mild steel rod
7. Determination of Impact strength
8. Conduct of Hardness test on metals - Brinell and Rockwell Hardness.
9. Conduct of Deflection test on beams

TOTAL: 30 HOURS
Aim: To familiarize and train the students on the constructional arrangements of different electrical system of automobiles and study the automobile electronics components.

Objectives:  
1. To get practice in battery tests and starting system trouble shooting.  
2. To understand the operation of alternator.  
3. To study temperature and speed measurement.

Outcome:  
1. The student will undergo training in the electrical systems and automotive electronics.

1. Testing, charging and discharging of lead acid battery used in automobiles.  
2. Testing and troubleshooting of starting system in automobiles.  
4. Testing and troubleshooting of charging system in automobiles.  
5. Alternator component test.  
6. Testing and troubleshooting of lighting system in automobiles.  
8. Study of Temperature measurement using thermocouple.  
9. Study of Speed & Torque measurement using thermocouple.  
10. Study of optical sensor

TOTAL: 30 HOURS
Aim: To impart knowledge on numerical methods for engineers.

Objectives:
1. Computing the trajectory of a spacecraft requires the accurate numerical solution of a system of ordinary differential equations.
2. It is used in Kinematics Simulation, Complex System Optimization.
3. Car companies can improve the crash safety of their vehicles by using computer simulations of car crashes. Such simulations essentially consist of solving partial differential equations numerically.
4. Numerical linear algebra is important for data analysis.
5. Airlines use sophisticated optimization algorithms to decide ticket prices, airplane and crew assignments and fuel needs. Historically, such algorithms were developed within the overlapping field of operations research.

Outcome: The student will understand the usage of numerical methods application in the field of engineering.

UNIT- I SOLUTION OF EQUATIONS AND EIGEN VALUE PROBLEMS 12


UNIT- II INTERPOLATION AND APPROXIMATION 12

Interpolation with Newton's divided differences, Lagrange's polynomial, Newton forward and backward differences, central difference Formula (Stirling’s and Bessel’s).

UNIT- III NUMERICAL DIFFERENTIATION AND INTEGRATION 12

UNIT- IV INITIAL VALUE PROBLEMS FOR ORDINARY DIFFERENTIAL EQUATIONS


UNIT- V BOUNDARY VALUE PROBLEMS FOR ORDINARY AND PARTIAL DIFFERENTIAL EQUATIONS

Finite difference solution for the second order ordinary differential equations, Finite difference solution for one dimensional heat equation (both implicit and explicit). One dimensional wave equation and two dimensional Laplace and Poisson equations.

LECTURE : 45 HOURS
TUTORIAL : 15 HOURS
TOTAL HOURS: 60 HOURS

TEXT BOOKS

REFERENCES
Aim: To provide knowledge and understanding on various types of manufacturing processes

Objectives:
1. To understand the entire process involved in metal casting technology.
2. To impart the knowledge of various metal forming processes and powder metallurgy.
3. To understand the various conventional machining and metal forming processes.
4. To impart the knowledge of classification of welding.
5. To impart the knowledge of various unconventional machining processes.

Outcome: 4. The student will acquaint with various types of manufacturing processes.

UNIT- I  INTRODUCTION AND CASTING
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 die casting, centrifugal casting, continuous casting, casting defects.

UNIT- II  WELDING

UNIT III  MACHINING
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 dischargemachining, Electro chemical machining, Plasma arc machining and Electron beam machining and Laser beam machining.

UNIT- IV  FORMING AND SHAPING OF PLASTICS

UNIT- V 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 HOURS

TEXT BOOKS

REFERENCES
Aim: To provide knowledge and understanding on various types environmental pollutions and social issues.

Objectives:
1. To create awareness on the various pollutions and their impact.
2. To provide comprehensive insight in natural resources.
3. To educate the ways and means to protect natural resources.
4. To impart fundamental knowledge on human welfare measures.

Outcome:
5. The student will acquaint with various measures to counter environmental pollutions.

UNIT - I - ENVIRONMENT AND NATURAL RESOURCES 9 hrs

Environment - Definition, scope & importance - Public awareness- Forest resources, mineral resources , water resources, food resources , energy resources (uses, over -exploitation & adverse effects in each case) - Scope & role of environmental engineers in conservation of natural resources - Sustainability development.

UNIT-II-ECOSYSTEMS AND BIO-DIVERSITY 9 hrs

Ecosystem - Definition, structure and function - Energy flow -Ecological succession - food chain, food web, ecological pyramids- Introduction, types, characteristics, structure and function of forest, grassland, desert and Aquatic ecosystems - Bio - Diversity :values and uses, hotspots, threats and conservation.

UNIT - III - ENVIRONMENTAL POLLUTION 9hrs


UNIT-IV-SOCIAL ISSUES AND ENVIRONMENT 9 hrs

Urban problems related to energy - Water conservation – Resettlement and rehabilitation of people - Environmental ethics - Climate change - Global warming - Acid rain - Ozone depletion- Waste land reclamation, Environment Protection Act for air, water, wild life and forests - Pollution Control Board.

UNIT - V - HUMAN POPULATION AND ENVIRONMENT 9 hrs

Population growth - Population explosion - Family welfare programme -

**TOTAL: 45 HOURS**

**TEXT BOOKS :**

**REFERENCES :**
2. Bharucha Erach "The Biodiversity of India" Mapin Publishing Pvt Ltd, Ahmedabad, India
Aim: To provide knowledge and understanding on mechanics of machines

Objectives:
1. To understand the types of kinematics of mechanisms.
2. To impart knowledge on the various types of gears and gear trains.
3. To understand the effect of friction.
4. To impart the knowledge of static force analysis.
5. To impart the knowledge of balancing and vibrations.

Outcome: The student will understand concept of kinematics and kinetics to apply in the field of engineering.

UNIT- I KINEMATIC OF MECHANICS


UNIT- II GEARS AND GEAR TRAINS


UNIT- III FRICTION


UNIT- IV FORCE ANALYSIS


UNIT- V BALANCING AND VIBRATION

TUTORIAL : 15 HOURS
TOTAL HOURS: 60 HOURS

TEXT BOOKS

REFERENCES
Aim: To provide knowledge and understanding on various types of automotive chassis

Objectives:
1. To understand the entire process involved in vehicle frame and steering.
2. To impart the knowledge of propeller shaft and final drive of the vehicle.
3. To understand the various types of axles and tyres.
4. To impart the knowledge of suspension systems.
5. To impart the knowledge of braking systems.

Outcome: 1. The student will acquaint with chassis components of automobiles.

UNIT- I INTRODUCTION, FRAME, STEERING SYSTEM

Types of Chassis layout, with reference to Power Plant location and drive, various types of frames, Loads acting on vehicle frame, Constructional details and materials for frames, Testing of frames, Types of Front Axles and Stub Axles, Front Wheel Geometry, namely, Castor, Camber, King Pin Inclination and Toe–in, Condition for True Rolling Motion of Wheels during Steering, Ackerman’s and Davis Steering Mechanisms, Steering Error Curve, Steering Linkages, Different Types of Steering Gears, Slip Angle, Over–Steer and Under–Steer, Reversible and Irreversible Steering, Power–Assisted Steering.

UNIT- II PROPELLER SHAFT AND FINAL DRIVE


UNIT- III AXLES AND TYRES

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

UNIT- IV SUSPENSION SYSTEM

UNIT- V BRAKING SYSTEM


TOTAL: 60 HOURS

TEXT BOOKS
1. Kripal Singh, Automobile Engineering, Standard Publisher, New Delhi, 2006

REFERENCES
Aim: To impart awareness on disasters and preparedness during disasters.

Objectives:
1. To Understand basic concepts in Disaster Management
2. To Understand Definitions and Terminologies used in Disaster Management
3. To Understand the Challenges posed by Disasters
4. To understand Impacts of Disasters

Outcome: The student will acquaint awareness on disasters and preparedness during disasters.

UNIT 1 INTRODUCTION
Concept of disaster; Different approaches; Concept of Risk; Levels of disasters; Disaster phenomena and events (Global, national and regional); Natural and man-made hazards

UNIT 2 RISK ASSESSMENT AND VULNERABILITY ANALYSIS
Response time, frequency and forewarning levels of different hazards; Characteristics and damage potential of natural hazards; hazard assessment; Dimensions of vulnerability factors; vulnerability assessment; Vulnerability and disaster risk; Vulnerabilities to flood and earthquake hazards

UNIT 3 DISASTER MANAGEMENT MECHANISM
Concepts of risk management and crisis management - Disaster management cycle; Response and Recovery; Development, Prevention, Mitigation and Preparedness-Planning for relief

UNIT 4 DISASTER RESPONSE
Mass media and disaster management-Disaster Response Plan; Communication, Participation, and Activation of Emergency Preparedness Plan-Logistics Management-Psychological Response-Trauma and Stress Management-Rumour and Panic Management-Minimum Standards of Relief-Managing Relief-Funding

UNIT 5 DISASTER MANAGEMENT IN INDIA
Strategies for disaster management planning; Steps for formulating a disaster risk reduction plan; Disaster management Act and Policy in India; Organisational structure for disaster management in India; Preparation of state and district disaster management plans

Text books


References


Aim: The main objective of this course is to impart knowledge in the assembling and dismantling of different types of systems like steering system, transmission system, electrical system, ignition system, injection system, and braking system.

Objectives:
1. To impart the knowledge of Vehicle chassis.
2. To understand the steering system.
3. To understand the injection and brake system.

Outcome: 1. At the end of the course the student will be well versed in the assembling and dismantling of any vehicles.

STUDY AND MEASUREMENT OF THE FOLLOWING CHASSIS

- Leyland
- Hyundai i20
- Maruthi car (Front engine, front wheel drive & constant velocity joint)

STUDY, DISMANTLING & ASSEMBLING

- Front axle – Rzeppa joint assembly
- Rear axle
- Clutch 2 types – Coil spring & Diaphragm spring clutches
- Gear box – Sliding mesh, Constant mesh & Synchromesh Gear Box
- Transfer case
- Steering system
- Braking system
- Differential mechanism
- Power steering mechanism

TOTAL: 30 HOURS
Aim: To impart training in turning, milling and grinding operations in different types of machines

Objectives:
1. To impart training in turning.
2. To understand the drilling machine operations.
3. To understand the shaping and grinding machines.

Outcome:
1. At the end of the course the student will be well versed in the turning, milling and grinding operations.

OBJECTIVES:
To impart training in turning, milling and grinding operations in different types of machines

1. Plain turning and step turning on lathe.
2. Taper turning on lathe.
3. Thread cutting on lathe.
4. Drilling, reaming and tapping in a drilling machine.
5. Plain milling.
6. Making square shape job in shaping machine.
7. Making Cutting key ways in a slotting machine.
8. To Perform Grinding process using a grinding machine.

TOTAL: 30 HOURS
Aim: To study about 2D and 3D modeling techniques of automobile components.

Objectives:
1. To impart the knowledge of Knuckle Joint, Gib and Cotter Joint.
2. To impart the knowledge of engine components modelling in 3D.

Outcome:
1. Students will skillfully assemble simple machine components, measure and create assembly drawings using Computer Aided drafting software.

INTRODUCTION TO 2D MODELING

1. 2D Drawing by using CAD software - Knuckle Joint
2. 2D Drawing by using CAD software – Gib and Cotter Joint
3. 2D Drawing by using CAD software - Screw Jack

INTRODUCTION TO 3D MODELING


4. 3D Modeling by using CAD software – Valve Assembly
5. 3D Modeling by using CAD software – Bushed Bearing
6. 3D Modeling by using CAD software – Crank shaft
7. 3D Modeling by using CAD software – Piston and Connecting Rod

TOTAL HOURS: 30

3 TEXT BOOKS

REFERENCES
Aim: To study and purpose is to understand automotive engine design.

Objectives:
1. To understand the introduction of materials.
2. To understand the limits fits and tolerances
3. To understand the design of piston and cylinder
4. To impart the design knowledge of connecting rod and crankshaft.
5. To understand the design of valves and flywheel

Outcome: The student will acquaint with chassis components design.

UNIT- I INTRODUCTION


UNIT- II DESIGN OF SHAFTS AND SPRINGS


UNIT-III DESIGN OF CYLINDER AND PISTON

Choice of material for cylinder and piston, piston friction, piston slap, design of cylinder, piston, piston pin, piston rings, piston failures, lubrication of piston assembly.

UNIT- IV DESIGN OF CONNECTING ROD AND CRANKSHAFT

Material for connecting rod, determining minimum length of connecting rod, small end and big end design, shank design, design of big end cap bolts, connecting rod failures, balancing of I.C. Engines, significance of firing order, material for crankshaft, design of crankshaft under bending and twisting, balancing weight calculations.

UNIT- V DESIGN OF VALVES AND FLYWHEEL

Design aspects of intake and exhaust manifolds, inlet and Exhaust valves, valve springs, tappets, valve train. Materials and design of flywheel.

TUTORIAL : 15 HOURS

TOTAL HOURS: 60 HOURS

TEXT BOOKS
1. A.Kolchin and V.Demidov, “Design of Automotive Engines”, MIR

REFERENCES
Aim: To provide knowledge and understanding on various types of gear drives and transmission in automobiles.

Objectives:
1. To impart the knowledge of trends in clutch and gear box.
2. To understand the hydrodynamic drive.
3. To understand the various types of planetary gear box.
4. To impart the knowledge of automatic transmission applications.
5. To impart the knowledge of hydrostatic and electric drive.

Outcome:
1. The student will acquaint with transmission gearboxes and drives.

UNIT- I CLUTCH AND GEAR BOX
Problems on performance of automobile - such as resistance to motion, tractive effort, engine speed, engine power and acceleration. Requirement of transmission system. Different types of clutches, principle, Construction and torque capacity. Determination of gear ratios for vehicles. Different types of gearboxes such as Sliding mesh gearbox, Constant mesh gearbox and Synchromesh gearbox.

UNIT- II HYDRODYNAMIC DRIVE

UNIT-III PLANETARY GEAR BOXES

UNIT- IV AUTOMATIC TRANSMISSION APPLICATIONS

UNIT- V HYDROSTATIC AND ELECTRIC DRIVE

TUTORIAL : 15 HOURS
TOTAL HOURS: 60 HOURS
TEXT BOOKS

REFERENCES
2. SAE Transactions 900550 & 930910.
SEMESTER | SUBJECT | L | T | P | C
---|---|---|---|---|---
V | COMBUSTION THERMODYNAMICS AND HEAT TRANSFER | 3 | 1 | 0 | 4

Aim: *To provide knowledge and understanding on combustion and heat transfer in engineering applications.*

Objectives: 1. *To impart the knowledge of trends in introduction to combustion processes.*  
2. *To understand the thermodynamics of combustion.*  
3. *To understand the various normal, abnormal combustion in SI engines.*  
4. *To impart the knowledge of combustion and heat transfer in IC engines.*  
5. *To impart the knowledge of experimental investigation of combustion and heat transfer in IC engines.*

Outcome: 1. *The student will acquaint with the concept and application of fuel combustion and heat transfer in engineering components.*

UNIT- I INTRODUCTION TO COMBUSTION PROCESSES 10  

UNIT- II THERMODYNAMICS OF COMBUSTION 11  

UNIT-III NORMAL, ABNORMAL COMBUSTION IN SI ENGINES 7  
Stages of combustion – Flame propagation — Flame Limits –Flame Extinction - Rate of pressure rise – Cycle to cycle variation – Abnormal combustion – Theories of detonation – Effect of engine operating variables on combustion –Example problems.

UNIT- IV COMBUSTION AND HEAT TRANSFER IN IC ENGINES 11  

UNIT- V EXPERIMENTAL INVESTIGATION OF COMBUSTION AND HEAT TRANSFER IN IC ENGINES 6  
Photographic studies of combustion processes – P-θ diagrams in SI and CI engines, Assembly – Temperature measurement in piston – cylinder liner – Cylinder head and engine valves.

TUTORIAL : 15 HOURS
TOTAL HOURS: 60 HOURS

TEXT BOOKS

REFERENCES
Aim: To provide knowledge and understanding on the use of fuels and lubricants in various types of automobiles.

Objectives:
1. To understand the manufacture of fuels and lubricants.
2. To understand the theory of lubrication
3. To understand the lubricants.
4. To impart the knowledge on properties and testing of fuels
5. To understand the combustion & fuel ratings.

Outcome: 1. The student will acquaint with the use of fuels and lubricants.

UNIT- I MANUFACTURE OF FUELS AND LUBRICANTS
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
Engine friction: introduction, total engine friction, effect of engine variables on friction, hydrodynamic lubrication, elasto hydrodynamic lubrication, boundary lubrication, bearing lubrication, functions of the lubrication system, introduction to design of a lubricating system.

UNIT- III LUBRICANTS
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, tests on lubricants. Grease, classification, properties, test used in grease.

UNIT- IV PROPERTIES AND TESTING OF FUELS
Thermo-chemistry of fuels, properties and testing of fuels, relative density, calorific value, distillation, vapour pressure, flash point, spontaneous ignition temperature, viscosity, pour point, flammability, ignitability, diesel index, API gravity, aniline point etc.

UNIT- V COMBUSTION & FUEL RATING

TOTAL: 45 HOURS
TEXT BOOKS

REFERENCES
Aim: To study and understand the modern vehicle’s technology.

Objectives:
1. To impart the knowledge of Modern Vehicles.
2. To understand the Power System and New Generation Vehicles.
3. To Understand the Vehicle Operation and Control.
4. To Impart The Knowledge of Vehicle Automated Tracks.
5. To Impart The Knowledge of Suspension, Brakes, Aerodynamics and Safety.

Outcome:
1. The student will understand concept of modern vehicles like maglev, HCCI, FFV and fuel cell.

UNIT I INTRODUCTION
Electric and hybrid vehicles, flexible fuel vehicles (FFV), solar powered vehicles, magnetic track vehicles, fuel cells vehicles.

UNIT II POWER SYSTEM AND NEW GENERATION VEHICLES
Hybrid Vehicle engines, Stratified charge engines, learn burn engines, low heat rejection engines, hydrogen engines, HCCI engine, VCR engine, surface ignition engines, VVTI engines. High energy and power density batteries, fuel cells, solar panels, flexible fuel systems.

UNIT III VEHICLE OPERATION AND CONTROL
Computer Control for pollution and noise control and for fuel economy – Transducers and actuators - Information technology for receiving proper information and operation of the vehicle like optimum speed and direction.

UNIT IV VEHICLE AUTOMATED TRACKS
Preparation and maintenance of proper road network - National highway network with automated roads and vehicles - Satellite control of vehicle operation for safe and fast travel, GPS.

UNIT V SUSPENSION, BRAKES, AERODYNAMICS AND SAFETY
Air suspension – Closed loop suspension, compensated suspension, anti skid braking system, retarders, regenerative braking, safety gauge air backs - crash resistance. Aerodynamics for modern vehicles, safety systems, materials and standards

TOTAL: 45 HOURS

TEXT BOOKS:

REFERENCES
1. Light weight electric for hybrid vehicle design.
2. Advance hybrid vehicle power transmission, SAE.
Aim: 

To impart knowledge on fuel and lubricant properties and its measurement techniques.

Objectives: 
1. To impart the knowledge of fuel property testing..
2. To understand the Temperature dependence of viscosity of lubricants & Fuels.
3. To understand the properties of grease.

Outcome: 
4. The student will understand the methods of measurement of fuel and lubricant properties.

List of experiments:
2. Study of Octane and Cetane Number of fuels.
3. ASTM distillation test of gasoline.
4. Aniline Point test.
5. Calorific value of liquid fuel.
7. Flash and Fire points of petrol, diesel and lubricants.
8. Temperature dependence of viscosity of lubricants & Fuels by Redwood Viscometer.
9. Viscosity Index of lubricants & Fuels by Saybolt Viscometer
10. Drop point of grease and mechanical penetration in grease.

TOTAL: 30 HOURS
Aim:    
To impart knowledge on heat transfer

Objectives:
1. To impart the knowledge of conductive, radiative and convective heat transfer in engineering applications.

Outcome:  
1. The student will understand the methods of heat transfer in engineering components.

List of Experiments:

1. To determine the thermal conductivity of a lagged pipe.
2. To determine the thermal conductivity of a solid by the guarded hot plate method.
3. To determine the heat transfer through composite wall apparatus.
4. To find the effectiveness of a pin fin in a rectangular duct under natural convective & forced convective condition and plot temperature distribution along its length.
5. To determine the surface heat transfer coefficient for a heated vertical tube under natural convection and plot the variation of local heat transfer coefficient along the length of the tube. Also compare the results with those of the correlation.
6. To determine average heat transfer coefficient for an externally heated horizontal pipe under forced convection & plot Reynolds and Nusselt numbers along the length of pipe. Also compare the results with those of the correlations.
7. To measure the emissivity of the gray body (plate) at different temperature and plot the variation of emissivity with surface temperature.
8. To find overall heat transfer coefficient and effectiveness of a heat exchange under parallel & counter flow conditions. Also plot the temperature distribution in both the cases along the length of heat of heat exchanger.
9. To verify the Stefan-Boltzmann constant for thermal radiation.
10. Study and demonstration of boiler.

TOTAL: 30 HOURS
Aim: To impart knowledge on vehicle design and data characteristics.

Objectives: 1. To impart the knowledge of resistances and performance of automobile.

Outcome: 1. The student will design a vehicle countering various resistances to provide the desired performance.

List of Experiments

1. Performance Curve
   Resistance, power and torque curves. Driving force against vehicle speed. Acceleration and gradability in different gear for a typical car or truck plotted from specifications available in automobile journals

2. Expectancy curves
   Calculation and plotting the curves of air and rolling resistances. Driving force, horse power, rear axle ratio engine speed, torque and mechanical efficiency for different vehicle speeds. Pressure volume diagram, frictional mean effective pressure, engine capacity, bore and stroke length. Connecting rod length to crank radius ratio. Piston velocity and acceleration against crank angle. Turning moment, side thrust against crank angle on cylinder wall determination of gear ratios. Acceleration and gradability. Typical problem on vehicle performance.

TOTAL: 30 HOURS
Aim: The aim of the subject is to study and understand the automotive body building technology.

Objectives:
1. To understand the car body details.
2. To understand the vehicle aerodynamics
3. To understand the bus body details
4. To impart the commercial vehicle details
5. To understand the body materials, trim and mechanisms

Outcome: The student will undergo a sequential understanding of the different types of car, tanker, bus and commercial vehicle bodies.

UNIT-I CAR BODY DETAILS
Types: saloon, convertibles, limousine, estate car, racing and sports car. Visibility: regulations, driver’s visibility, tests for visibility, methods of improving visibility and space in cars. Safety: safety design, safety equipments for cars. Car body construction; design criteria, prototype making, initial tests, crash tests on full scale model, Dummies and Instrumentation

UNIT-II VEHICLE AERODYNAMICS
Objectives. Vehicle drag and types; various types of forces and moments, effects of forces and moments, side wind effects on forces and moments. Various body optimization techniques for minimum drag, wind tunnel testing: flow visualization techniques, scale model testing, component balance to measure forces and moments.

UNIT-III BUS BODY DETAILS
Types: mini bus, single decker, double-decker, two level and articulated bus. Bus body layout; floor height, engine location, entrance and exit location, seating dimensions. Constructional details: frame construction, double skin construction, types of metal sections used, windscreen and doors, Regulations, Conventional and integral type construction.

UNIT-VI COMMERCIAL VEHICLE DETAILS
Types of body; flat platform, drop side, fixed side, tipper body, tanker body, Light commercial vehicle body types. Dimensions of driver’s seat relation to controls. Drivers cab design.

UNIT-V BODY MATERIALS, TRIM AND MECHANISMS
Steel sheet, timber, plastic, GRP, properties of materials; Corrosion, anticorrosion methods. Selection of paint and painting process, spray painting and components. Body trim items. Body mechanisms.

TOTAL: 45 HOURS
TEXT BOOKS

REFERENCES
Aim: To study and purpose is to design of chassis.

Objectives: 1. To understand the design and calculation of clutch.
2. To understand the performance of vehicle total resistance.
3. To understand the design vehicle frame and suspension systems.
4. To impart the design of front axle and steering systems.
5. To understand the design of final drive and rear axle.

Outcome: The student will understand to design chassis of automobiles.

UNIT- I CLUTCH DESIGN CALCULATION

Design of single plate clutch, multi plate clutch, design of centrifugal clutch, cone clutch, energy dissipated, torque capacity of clutch, design of clutch components, design details of roller and springs type of clutches.

UNIT- II GEAR BOX

Performance of vehicle, total resistance to motion, traction and tractive effort, acceleration, calculation of gear ratio, design of three speed gear box, design of four speed gear boxes.

UNIT-III VEHICLE FRAME AND SUSPENSION

Study of loads, moments and stresses on frame members, computer aided design of frame for passenger and commercial vehicles, computer aided design of leaf springs, coil springs and torsion bar springs.

UNIT- IV FRONT AXLE AND STEERING SYSTEMS

Analysis of loads, moments and stresses at different sections of front axle, determination of loads at kingpin bearings, wheel spindle bearings, choice of bearings, determination of optimum dimensions and proportions for steering linkages ensuring minimum error in steering.

UNIT- V FINAL DRIVE AND REAR AXLE

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.
TEXT BOOKS

REFERENCES
Aim: To study and purpose is to understand automotive pollution control.

Objectives:
1. To understand the introduction of pollutions.
2. To understand the pollution formation in SI engines.
3. To understand the pollution formation in CI engines.
4. To impart the control of emission in CI engines.
5. To understand the measurement technique and emission standards.

Outcome: The student will understand concept of pollutant formation and control techniques.

UNIT- I INTRODUCTION
Introduction pollution control act- norms and standards. Vehicle population assessment in metropolitan cities and contribution to pollution, effects on human health and environment, global warming, types of emission, transient operational effects on pollution.

UNIT- II POLLUTANT FORMATION IN SI ENGINES
Pollutant formation in SI Engines, mechanism of HC and CO formation in four stroke and two stroke SI engines, NOx formation in SI engines, effects of design and operating variables on emission formation, control of evaporative emission. Two stroke engine pollution.

UNIT-III POLLUTANT FORMATION IN CI ENGINES
Pollutant formation in CI engines, smoke and particulate emissions in CI engines, effects of design and operating variables on CI engine emissions. Nox and Sox formation and control. Noise pollution from automobiles, measurement and standards.

UNIT- IV CONTROL OF EMISSIONS FROM SI AND CI ENGINES
Design of engine, optimum selection of operating variables for control of emissions, EGR, Thermal reactors, secondary air injection, catalytic converters, catalysts, fuel modifications, fuel cells, Two stroke engine pollution control.

UNIT- V MEASUREMENT TECHNIQUES - EMISSION STANDARDS
NDIR, FID, Chemiluminescent analyzers, Gas Chromatograph, smoke meters, emission standards, driving cycles – USA, Japan, Euro and India. Test procedures – ECE, FTP Tests. SHED Test – chassis dynamometers, dilution tunnels.

TOTAL: 60 HOURS
TEXT BOOKS

REFERENCES
Aim: To study and purpose is to understand engine management system

Objectives:
1. To understand the types sensors.
2. To impart knowledge on SI and CI engine management system.
3. To understand the vehicle management systems.

Outcome: The student will understand concept of electronic management of engine and vehicle.

UNIT I FUNDAMENTALS OF AUTOMOTIVE ELECTRONICS
Microprocessor architecture, open and closed loop control strategies, PID control, Look up tables, Introduction to modern control strategies like Fuzzy logic and adaptive control. Parameters to be controlled in SI and CI enignes and in the other parts of the automobile.

UNIT II SENSORS
Inductive, Hall effect, hot wire, thermistor, piezo electric, piezoresistive, based sensors. Throttle position, air mass flow, crank shaft position, cam position, engine and wheel speed, steering position, tire pressure, brake pressure, steering torque, fuel level, crash, exhaust oxygen level (two step and linear lambda), knock, engine temperature, manifold temperature and pressure sensors.

UNIT III SI ENGINE MANAGEMENT

UNIT IV CI ENGINE MANAGEMENT

UNIT V VEHICLE MANAGEMENT SYSTEMS

TOTAL: 45 HOURS
TEXT BOOKS:

REFERENCES:
Aim: To impart knowledge on performance and emission characteristics on petrol and diesel engine.

Objectives:
1. To understand SI engine testing procedures.
2. To impart knowledge on the various types pollution measuring instruments and methods.

Outcome: The student will understand concept of measurement of emissions by various methods.

List of Experiments:

2. Performance Test on 4-stroke Diesel Engine.
3. Heat Balance Test on 4-stroke Diesel Engine.
4. Morse Test on Multicylinder Petrol Engine.
5. Retardation Test to find Frictional Power of a Diesel Engine.
6. Study of NDIR gas Analyser and FID.
7. Study of Chemiluminescent NOx Analyser.
8. Demonstration of HC, CO, CO$_2$, O$_2$ using exhaust gas analyzer.

TOTAL: 30 HOURS
Aim: To impart knowledge on types of vehicles drafting using CAD software.

Objectives:
1. To understand the drafting of various types of car models.
2. To understand the tanker and tractor body model.
3. To impart the knowledge of Aerodynamic car models.

Outcome: The student will understand to model different types of automobile models by using CAD software.

List of Experiments

1. Drafting Three-box type car model.
2. Drafting Fastback type car model.
3. Drafting Multi Utility Vehicle type model.
4. Drafting Sports Car model.
5. Drafting Bus Body model.
6. Drafting Tanker Body model.
7. Drafting Tractor and Trailer Body model.
8. Study of Aerodynamic car models.
10. Study of Double Decker Bus body model.

TOTAL: 30 HOURS
Aim: 1. To gain knowledge about CNC programming

Objectives: 1. To get the hands on training in CNC trainer machines

Outcome: The student will simulate various CNC machining and generate codes using CAM software.

Introduction:

1. Study of G and M codes
3. Machining practice on Trainer Type CNC Machines
4. Simulation of tool path using any CAM Software

Part programming in CNC Milling:
1. Point to point motions
2. Linear motions
3. Circular interpolations
4. Contour motions
5. Rectangular pocketing
6. Mirroring
7. Circular Pocketing
8. Fixed/canned cycles
9. Subroutines

Part programming for CNC Turning:
1. Turning and facing
2. Step turning, Taper Turning
3. Grooving
4. Fixed/Canned Cycles:
5. Thread cutting Cycles
6. Peek Drilling Cycles
Aim: The aim of the subject is to study and understand the transport systems.

Objectives: 1. To understand the transport systems.
2. To understand the scheduling and fare structure.
3. To understand the motor vehicle act.
4. To impart the various types of maintenance.
5. To understand the fare structure.

Outcome: 1. The student will undergo a sequential understanding of the vehicle transport systems and management.

UNIT- I INTRODUCTION 9
Personnel management; objectives and functions of personnel management, psychology, sociology and their relevance to organization, personality problems. Selection process: job description, employment tests, interviewing, introduction to training objectives, advantages, methods of training, training procedure, psychological tests.

UNIT- II TRANSPORT SYSTEMS 9
Introduction to various transport systems. Advantages of motor transport. Principal function of administrative, traffic, secretarial and engineering divisions. Chain of responsibility, forms of ownership by state, municipality, public body and private undertakings.

UNIT-III SCHEDULING AND FARE STRUCTURE 9
Principal features of operating costs for transport vehicles with examples of estimating the costs. Fare structure and method of drawing up of a fare table. Various types of fare collecting methods. Basic factors of bus scheduling. Problems on bus scheduling.

UNIT- IV MOTOR VEHICLE ACT 9
Traffic signs, fitness certificate, registration requirements, permit insurance, constructional regulations, description of vehicle-tankers, tippers, delivery vans, recovery vans, Power wagons and fire fighting vehicles. Spread over, running time, test for competence to drive.

UNIT- V MAINTENANCE 9
Preventive maintenance system in transport industry, tyre maintenance procedures. Causes for uneven tyre wear; remedies, maintenance procedure for better fuel economy, Design of bus depot layout.

TOTAL: 45 HOURS

TEXT BOOKS
REFERENCES

1. Government Motor Vehicle Act, Publication on latest act to be used as on date
Aim: To study and understand the substitute for conventional automobile fuels and energy source.

Objectives: 1. To impart the knowledge of various alternate fuels in vehicles. 2. To understand the entire properties of alcohols. 3. To understand the various fuels like natural gas, LPG, hydrogen and biogas. 4. To impart the knowledge of vegetable oils. 5. To impart the knowledge of electric and solar vehicles.

Outcome: 6. The student will select the alternate fuels according to the need and apply in the engineering applications of automobile power plants.

UNIT- I INTRODUCTION


UNIT- II ALCOHOLS

Properties as engine fuel, alcohols and gasoline blends, performance in SI engine. Methanol and gasoline blends Combustion characteristics in engines - emission characteristics.

UNIT- III CNG, LPG, HYDROGEN AND BIOGAS

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 for LPG - Hydrogen – Storage and handling, performance and safety aspects.

UNIT- IV VEGETABLE OILS

Various vegetable oils for engines - Esterification - Performance in engines - Performance and emission Characteristics

UNIT- V ELECTRIC AND SOLAR POWERED VEHICLES

Layout of an electric vehicle - Advantage and limitations - Specifications - System component. Electronic control system - High energy and power density batteries - Hybrid vehicle - Solar powered vehicles.

TOTAL: 45 HOURS

TEXT BOOKS
REFERENCES
2. SAE Paper Nos. 840367, 841156, 841333, 841334.
Aim:  
To study and purpose is to understand various vehicle maintenance.

Objectives:
1. To understand the maintenance of records and schedules.
2. To understand the engine maintenance and repair and overhauling.
3. To understand the chassis maintenance and repair and overhauling
4. To impart the various electrical system maintenance service and repairs.
5. To understand the various maintenance of cooling, fuel, lubrication and body.

Outcome:  
1. The student will able to attend the maintenance of automobiles.

UNIT- I MAINTENANCE OF RECORDS AND SCHEDULES  9

Importance of maintenance, preventive (scheduled) and breakdown (unscheduled) maintenance, requirements of maintenance, preparation of check lists. Inspection schedule, maintenance of records, log sheets and other forms, safety precautions in maintenance.

UNIT- II ENGINE MAINTENANCE – REPAIR AND OVERHAULING  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.

UNIT-III CHASSIS MAINTENANCE - REPAIR AND OVERHAULING  9

Mechanical and automobile clutch 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.

UNIT- IV ELECTRICAL SYSTEM MAINTENANCE - SERVICING AND REPAIRS  9

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

UNIT- V MAINTENANCE OF FUEL SYSTEM, COOLING SYSTEMS,
LUBRICATION SYSTEM AND VEHICLE BODY

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: 45 HOURS

TEXT BOOKS
2. Venk Spicer, “Automotive Maintenance and Trouble Shooting”.

REFERENCES
Aim: To study and purpose is to understand two and three wheeler technology.

Objectives:
1. To understand the power units.
2. To understand the fuel and ignition systems
3. To understand the chassis and sub systems.
4. To understand the brakes and wheels
5. To impart the various types of two and three wheeler case study

Outcome: 1. The student will able to attend the maintenance of two and three wheeler.

UNIT- I THE POWER UNIT
Two stroke and four stroke SI engine, merits and demerits, symmetrical and unsymmetrical port timing diagrams. Types of scavenging processes, merits and demerits, scavenging efficiency. scavenging pumps. rotary valve engine.

UNIT- II FUEL AND IGNITION SYSTEMS

UNIT- III CHASSIS AND SUB-SYSTEM

UNIT- IV BRAKES AND WHEELS
Drum brakes, disc brakes, front and rear brake links layouts. spoked wheel, cast wheel. Disc wheel. Disc types. Tyres and Tubes.

UNIT- V TWO AND THREE WHEELERS CASE STUDY
Case study of Sports bike, Motor cycles, Scooters and Mopeds - Auto rickshaws, Pick up van, Delivery van and Trailer. Servicing and maintenance. Recent developments.

TOTAL: 45 HOURS

TEXT BOOKS

REFERENCES
Aim: To teach the students about the various sensors and engine management systems used in petrol and diesel engines.

Objectives: 1. To understand the introduction of electronics.
2. To understand the various sensors.
3. To understand the gasoline injection systems.
4. To impart the various types diesel injection system
5. To understand the various types ignition system.

Outcome: 1. The student will able to attend the maintenance of engine and trouble suitting.

UNIT-I ELECTRONICS


UNIT-II SENSORS

Sensors for Air flow, Pressure, Temperature, Speed, Exhaust Oxygen, Knock and Position in engine management systems – Principle of operation, construction and characteristics.

UNIT-III GASOLINE INJECTION SYSTEM

Open loop and closed loop systems, Mono point, Multi point, Direct injection systems and Air assisted systems – Principles and Features, examples of Bosch injection systems. Idle speed, lambda, knock and spark timing control. Three way catalytic converters, Lean NOx converters.

UNIT-IV DIESEL INJECTION SYSTEM

Heat release in the diesel engine and need for control of fuel injection. Inline injection pump - Rotary Pump and injector – Construction and principle of operation, Electronic control of these pumps. Common rail and unit injector system – Construction and principle of operation.

UNIT-V IGNITION SYSTEMS

Ignition fundamentals, solid state ignition systems, high energy ignition distributors, Electronic spark timing and control. Combined ignition and fuel management systems. Dwell angle calculation, Ignition timing calculation.

TOTAL: 45 HOURS
TEXT BOOKS
  2. Bosch Technical Instruction Booklets.

REFERENCES
Aim:  
To provide in house training in vehicle servicing, maintenance and engine reconditioning.

Objectives:
1. To understand the clutch and gear box servicing.
2. To understand the Differential unit.
3. To understand the Ackermann Steering geometry.

Outcome:
1. The student will able to attend the maintenance of vehicle and engine reconditioning.

List of Experiments

1. Clutch assembly and servicing
2. Gearbox assembly and servicing
3. Differential unit assembly and servicing
4. Different types of rear axle assembly and servicing
5. Brake system trouble shooting
6. Ackermann Steering geometry verification
7. Engine Reboring
9. Wheel drum grinding

TOTAL: 30 HOURS
<table>
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<tr>
<th>SEMESTER</th>
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<tr>
<td>VII</td>
<td>TWO AND THREE WHEELER LAB</td>
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**Aim:**  
To impart knowledge on clutch, gear box and performance on two and three wheeler.

**Objectives:**
1. To understand the performance shock absorber and coil spring.
2. To understand the two wheeler chain tension.
3. To study three wheeler chassis frame.

**Outcome:**  
The student will able to attend the maintenance of two and three wheeler.

**List of Experiments**

1. Performance test of a shock absorber.
2. Performance test on coil spring.
3. Two wheeler chain tension test.
4. Brake and Clutch adjustment as per specification.
5. Dismantling and assembling of two wheeler gear box and finding gear ratio.
6. Dismantling and assembling of three wheeler gear box and finding gear ratios.
7. Dismantling and assembling of three wheeler steering system.
8. Study of three wheeler chassis frame and power transmission system.

**TOTAL: 30 HOURS**
The objective of the mini project work is to enable the students to form the groups of not more than 4 members on a project involving the activity based learning concept and to design a model/mechanism related to the branch of study.

Formation of Group as follows
- Category A: 8.5CGPA and above
- Category B: 7 to 8.49 CGPA
- Category C: 5 to 6.9 CGPA

A group will be formed with at least one student from each category.

Every mini project work shall have a guide who is the member of the faculty of the institution. Three periods per week shall be allotted in the timetable 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 mini project.
OBJECTIVE

- The objective of the project work is to enable the students to form the groups of not more than 4 members on a project involving theoretical and experimental studies related to the branch of study.

- Formation of Group as follows
  - Category A : 8.5CGPA and above
  - Category B : 7 to 8.49 CGPA
  - Category C : 5 to 6.9 CGPA
  A group will be formed with at least one student from each category.

- 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 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.

- The aim of the project work is to deepen comprehension of principles by applying them to a new problem which may be the design and manufacture of a device, a research investigation, a computer or management project or a design problem.

- The progress of the project is evaluated based on a minimum of three reviews. The review committee may be constituted by the Head of the Department.

- 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 in the regulations.
Aim: To teach the students about the various Automobile accessories in Modern Vehicles

Objectives: 1. To understand the Engine Management Systems
2. To understand the Chassis.
3. To understand the Heating and Air Conditioning
4. To impart the various Comfort and Convenience
5. To understand the various Safety And Security Systems

Outcome: 1. The student will able to attend the various Automobile accessories in Modern Vehicles

UNIT –I ENGINE MANAGEMENT SYSTEMS
Electronically controlled SI and CI engine fuel injection systems, related hardware and software. Closed loop ignition system. Catalytic converters and particulate traps.

UNIT –II CHASSIS
Active suspension control, Pneumatic suspensions

UNIT – III HEATING AND AIR CONDITIONING
Principles of vehicle air conditioning and heating.

UNIT – IV COMFORT AND CONVENIENCE
Adaptive cruise control, car entertainment, power windows, navigation system, adaptive noise control, electric seats, driver information system. Power windows, power steering.

UNIT – V SAFETY AND SECURITY SYSTEMS
Airbags, seat belt tightening system, collapsible and tilt able steering column, Anti theft system, anti lock braking system, electronic stability control system/traction control system, roll over protection system.

TOTAL: 45

TEXT BOOKS

REFERENCE BOOKS
Aim: To study and purpose is to understand Automotive Safety

Objectives:
1. To understand the Safety Systems
2. To understand the Safety Concepts.
3. To understand the Safety Equipments
4. To understand the Collision Warning And Avoidance
5. To understand the Comfort And Convenience System
   1. standards.

Outcome: The student will understand concept of Automotive Safety techniques.

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

UNIT II SAFETY CONCEPTS
Active safety: driving safety, conditional safety, perceptibility safety, operating safety, passive safety: exterior safety, interior safety, deformation behaviour of vehicle body, speed and acceleration characteristics of passenger compartment on impact.

UNIT III SAFETY EQUIPMENTS
Seat belt, regulations, automatic seat belt tightener system, collapsible steering column, tiltable steering wheel, air bags, electronic system for activating air bags, bumper design for safety.

UNIT IV COLLISION WARNING AND AVOIDANCE
Collision warning system, causes of rear end collision, frontal object detection, rear vehicle object detection system, object detection system with braking system interactions.

UNIT V COMFORT AND CONVENIENCE SYSTEM
Steering and mirror adjustment, central locking system, Garage door opening system, tyre pressure control system, rain sensor system, environment information system

TOTAL : 45
TEXT BOOKS

REFERENCES:
Aim: To study and purpose is to understand combustion theory of IC engines.

Objectives:
1. To understand the cycle analysis.
2. To understand the combustion of fuels.
3. To understand the combustion modeling.
4. To impart the various advances in IC engines.
5. To understand the various performance and operations.

Outcome: The student will understand the concept of combustion theory of IC engines.

UNIT-I CYCLE ANALYSIS
9
Operating cycles of S.I. and C.I. engines and Gas turbines - Comparison of Air standard cycles - Fuel air cycle and actual cycle.

UNIT-II COMBUSTION OF FUELS
9

UNIT-III COMBUSTION MODELLING
9
Basic concepts of engine simulation - Governing equations – Flow models, thermodynamic models- SI engine and CI engine models.

UNIT-IV ADVANCES IN IC ENGINES
9
Adiabatic and LHR engines – MAN combustion chamber and multi fuel engines - stratified charge and lean burn engines - surface ignition concept – Locomotive and Marine engines.

UNIT- V OPERATIONAL AND PERFORMANCE
9
Computer control of engine parameters for pollution control and better efficiency-closed loop control of engine parameters – hybrid operating- performance maps.

TOTAL: 45 HOURS

TEXT BOOKS
REFERENCES

Aim: To study and purpose is to understand about the various Off Road Vehicles.

Objectives: 1. To understand the classification and requirements of off road vehicles
2. To understand the earth moving machines.
3. To understand the scrappers, graders, shovels and ditchers.
4. To impart the various types farm equipments, military and combat vehicles
5. To understand the various vehicle systems, features.

Outcome: The student will understand about the various Off Road Vehicles.

UNIT-I CLASSIFICATION AND REQUIREMENTS OF OFF ROAD VEHICLES
Construction layout, capacity and applications. Power Plants, Chassis and Transmission, Multivalve vehicles.

UNIT –II EARTH MOVING MACHINES
Earthmovers like dumpers, loaders - single bucket, Multi bucket and rotary types-bulldozers, excavators, backhoe loaders, scrappers, drag and self powered types, Bush cutters, stumpers, tree dozer, rippers etc. – Power and capacity of earthmoving machines.

UNIT – III SCRAPPERS, GRADERS, SHOVELS AND DITCHERS

UNIT– IV FARM EQUIPMENTS, MILITARY AND COMBAT VEHICLES
Power take off, special implements. Special features and constructional details of tankers, gun carriers and transport vehicles.

UNIT –V VEHICLE SYSTEMS, FEATURES

TOTAL : 45

TEXT BOOKS
1. Off the road wheeled and combined traction devices – Ash gate Publishing Co.Ltd. 1988
2. Satyanarayana. B., Construction planning and equipment, standard
publishers and distributors, New Delhi.

REFERENCE
Aim: To teach the students about the various automotive instrumentation.

Objectives:
1. To understand the linear and angular measurements
2. To understand the measurement of screw thread and gear.
3. To understand the pressure & flow measurement.
4. To study about temperature measurement
5. To study load and torque measurement.

Outcome: The student will understand the various automotive instrumentation.

UNIT I LINEAR AND ANGULAR MEASUREMENTS 9
Errors in measurement & calibration - Length standards - Length measuring instruments - Vernier, micrometers, dial gauges, comparators, Limits, fits, tolerances. Gauges and their types - Angular measuring instruments - bevel protractor, spirit level, sine bar - measurement of straightness and flatness - Measurement of surface finish

UNIT II MEASUREMENT OF SCREW THREAD AND GEAR 9
Various elements of thread - Two wire & three wire method – Thread gauge - Various elements of gears – Various gear tooth measurement methods, composite error measurement.

UNIT III PRESSURE & FLOW MEASUREMENT 9
Diaphragm-Various elastic elements- Transduction methods-Potentiometric strain gauge, variable reluctance and capacitive device, LVDT type transducer, piezo electric transducers and its application to high speed engine. Farnboro Engine indicator. Low pressure measurement – McLeod gauge, pirani gauge, thermocouple type conductivity gauge.

UNIT IV TEMPERATURE MEASUREMENT 9

UNIT V LOAD AND TORQUE MEASUREMENT 9

TOTAL: 45

TEXT BOOKS
REFERENCE

Aim: To teach the students about the vehicle dynamics

Objectives: 1. To understand the degree of freedom.
            2. To understand the multi degree freedom systems.
            3. To understand the stability of vehicles.
            4. To study about suspension tyres and vehicles handling
            5. To study numerical methods.

Outcome: The student will understand the vehicle dynamics.

UNIT I INTRODUCTION 9
Single degree of freedom, two degree of freedom, free, forced and damped vibrations modeling and simulation studies, magnification factor, transmissibility, vibration absorber.

UNIT II MULTI DEGREE FREEDOM SYSTEMS 9
Closed and coupled far system, orthogonality of mode shapes, modal analysis.

UNIT III STABILITY OF VEHICLES 9
Load distribution, stability on a curved track slope and a banked road, calculation of tractive effort and reactions for different drives, cornering force behavior.

UNIT IV SUSPENSION TYRES AND VEHICLES HANDLING 9
Requirements, sprung mass frequency, wheel hop, wheel wobble, wheel shimmy, choice of suspension spring rate, calculation of effective spring rate, vehicle suspension in fore and aft, roll axis and vehicle under the action of side forces, tyre, dynamics, ride characteristics power consumed by a tyre. Oversteer, under steer, steady state cornering, effect of braking, driving torques on steering, effect of camber, transient effects in cornering.

UNIT V NUMERICAL METHODS 9
Approximate methods for determining fundamental frequency, Dunkerleys lower bound, Rayleighs upper bound, Holzer method for closed coupled system and branched system.

TOTAL: 45

TEXT BOOKS

REFERENCE
Aim: To teach the students about the vehicle air-conditioning

Objectives:
1. To understand the automotive air-conditioning fundamentals.
2. To understand the air conditioner – heating system.
3. To understand the refrigerant.
4. To study about air routing and temperature control
   1. To study heater- air conditioner trouble shooting & service

Outcome: The student will understand the vehicle air-conditioning.

UNIT I AUTOMOTIVE AIR CONDITIONING FUNDAMENTALS
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 and Orific tube – expansion valve calibration – evaporator temperature controls for TXV and CCOT systems.

UNIT II AIR CONDITIONER – HEATING SYSTEM
Manually controlled air conditioner- Heater system- ford automatically controlled air conditioner- Heater systems- Chrysler automatically controlled air conditioner- heater system, general motors automatically controlled Air conditioner- heater system- Flushing and evacuating.

UNIT III REFRIGERANT
Containers- handling refrigerant – discharging, charging and leak detection – refrigeration system Diagnosis – Diagnostic procedure – Ambient conditions affecting system pressures.

UNIT IV AIR ROUTING AND TEMPERATURE CONTROL
Objectives – Evaporators case air flow through the Dash recalculating unit – Automatic Temperature control – Duct system- Controlling flow – vacuum reserve – testing the air control and handling systems.

UNIT V HEATER- AIR CONDITIONER TROUBLE SHOOTING & SERVICE
Air conditioner maintenance and service- servicing heater system. removing and replacing components. trouble shooting of air conditioner- heating system- compressor service.

TOTAL : 45

TEXT BOOKS
REFERENCE

Aim: To teach the students about the tractor and farm equipments

Objectives:
1. To understand the general design of tractors.
2. To understand the fundamentals of engine operation.
3. To understand the engine frame work and valve mechanism of tractor.
4. To study about cooling system.
5. To study farm equipments.

Outcome: The student will understand the tractor and farm equipments.

UNIT I GENERAL DESIGN OF TRACTORS
Classification of tractors – Main components of tractor – Safety rules

UNIT II CONTROLAL DESIGN OF THE TRACTOR AND FUNDAMENTALS OF ENGINE OPERATION
Tractor controls and the starting of the tractor engines – Basic notions and definition – Engine cycles – Operation of multi cylinder engines - General engine design – Basic engine performance characteristics.

UNIT III ENGINE FRAME WORK AND VALVE MECHANISM OF TRACTOR
Cylinder and pistons – Connecting rods and crankshafts – Engine balancing – Construction and operations of the valve mechanism – Valve mechanism troubles

UNIT IV COOLING SYSTEM, LUBRICATION SYSTEM AND FUEL SYSTEMS OF A TRACTOR
Cooling system – Classification – Liquid cooling systems – Components, Lubricating system servicing and troubles – Air cleaner and turbo charger – Fuel tanks and filters – Fuel pumps

UNIT V FARM EQUIPMENTS
Working attachment of tractors – Farm equipments – Classification – Auxiliary equipment – Trailers and body tipping mechanism.

TOTAL : 45

TEXT BOOKS

REFERENCE BOOKS
Aim: To teach the students about the automotive aerodynamics

Objectives:
1. To understand the general aerodynamics.
2. To understand the fundamentals of aerodynamic drag of cabs.
3. To understand the engine shape optimization of cabs.
4. To study about vehicle handling.
5. To study wind tunnels for automotive aerodynamics.

Outcome: The student will understand the automotive aerodynamics.

UNIT I INTRODUCTION

UNIT II AERODYNAMIC DRAG OF CABS

UNIT III SHAPE OPTIMIZATION OF CABS
Front and modification – front an drear wind shield angel – Boat tailing – Hatch back, fast back and square back Dust flow patterns at the rear – Effect of gap configuration – effect of fasteners.

UNIT IV VEHICLE HANDLING
The origin of force and moments on a vehicle – side wind problems – methods to calculate forces and moments – vehicle dynamics under side winds – the effects of forces and moments – characteristics of forces and moments - Dirt accumulation and the vehicle wind noise – drag reduction in commercial vehicles.

UNIT V WIND TUNNELS FOR AUTOMOTIVE AERODYNAMICS

TOTAL : 45

TEXTBOOKS

REFERENCE
3. Vehicle Aerodynamics, SP -1145, SAE, 1996
Aim: To teach the students about the combustion engineering

Objectives:
1. To understand the combustion of fuels.
2. To understand the thermodynamics of combustion.
3. To understand the kinetics of combustion.
4. To study about engine combustion
1. To study flames

Outcome: The student will understand the combustion engineering

UNIT I COMBUSTION OF FUELS
Combustion equations, Theoretical air, excess air, airfuel ratio, equivalence ratio, exhaust gas composition, Airfuel ratio from exhaust gas composition, heating value of fuels.

UNIT II THERMODYNAMICS OF COMBUSTION
Thermo-chemistry, First law analysis of reacting systems, Adiabatic combustion temperature, Second law analysis of reacting systems, criterion for chemical equilibrium, Equilibrium constant for gaseous mixtures, Evaluation of equilibrium composition, chemical availability.

UNIT III KINETICS OF COMBUSTION
Rates of reaction, Reaction order and molecularity of complex reactions, Chain reactions, Arrhenius rate equation, Collision theory, activated complex theory, Explosive and general oxidative characteristics of fuels.

UNIT IV ENGINE COMBUSTION
Combustion in SI and CI engines, stages of combustion in SI and CI engines, Normal combustion and Abnormal combustion, Emissions from premixed combustion, Emission from Non premixed combustion, Control of emissions

UNIT V FLAMES
Laminar and Turbulent flames, Premixed and Diffusion flames, Burning velocity and its determination, Factors affecting burning velocity, Quenching, Flammability and Ignition, Flame stabilization in open burners

TOTAL: 45
TEXT BOOKS


REFERENCE

SEMESTER | SUBJECT | L | T | P | C
--- | --- | --- | --- | --- | ---
ELECTIVE | FUEL CELL TECHNOLOGY | 3 | 0 | 0 | 3

Aim: To teach the students about the fuel cell technology

Objectives:
1. To understand the thermodynamics.
2. To understand the electrode kinetics.
3. To understand the alkaline fuel cells
4. To study about phosphoric acid fuel cells.
5. To study proton exchange membrane fuel cells

Outcome: The student will understand the fuel cell technology

UNIT I INTRODUCTION AND THERMODYNAMICS
Introduction: Basic operating principles – Historical highlights – Classification.
Thermodynamics: Electrochemical energy conversion – Theoretical efficiency – Electrochemical energy conversion – Factors affecting electrochemical energy conversion

UNIT II ELECTRODE KINETICS

UNIT III ALKALINE FUEL CELLS & PHOSPHORIC ACID FUEL CELLS

UNIT IV SOLID OXIDE FUEL CELLS & MOLTEN CARBONATE FUEL CELLS
Molten Carbonate Fuel Cell: General principle – Components – Electrode reactions – Lifetime

UNIT V DIRECT METHANOL FUEL CELLS & PROTON EXCHANGE MEMBRANE FUEL CELLS

TOTAL : 45

TEXTBOOKS

REFERENCE
Aim: To teach the students about the advanced production processes for automotive components

Objectives:
1. To understand the powder metallurgy.
2. To understand the forming process.
3. To understand the gear manufacturing.
4. To study about programming of CNC machines
5. To study manufacturing of auto components

Outcome: The student will understand the advanced production processes for automotive components

UNIT I  POWDER METALLURGY

UNIT II  FORMING PROCESS

UNIT III  GEAR MANUFACTURING

UNIT IV  CONCEPT & PROGRAMMING OF CNC MACHINES

UNIT V  RECENT TRENDS IN MANUFACTURING OF AUTO COMPONENTS

TOTAL : 45
TEXT BOOKS


REFERENCE

Aim:  
To teach the students about the rubber technology for Automobiles

Objectives:  
1. To understand the plastics.
2. To understand the structure-property relationship of rubber.
3. To understand the vibration and rubber spring.
4. To study about fluid sealings.
5. To study compounding and manufacture.

Outcome:  
The student will understand the rubber technology for Automobiles

UNIT I  INTRODUCTION  
Identification of plastics / rubber components in automobiles - function - selection criteria.

UNIT II  STRUCTURE-PROPERTY RELATIONSHIP OF RUBBER  
Resilience, creep, hysteresis and damping, stability, set and stress relaxation, behaviour in dynamic applications.

UNIT III  VIBRATION AND RUBBER SPRING  
Principle of vibration isolation - Rubber mounts - spring design - comparison with metallic springs - shape factor and its effect - forced and free vibrations with damping - typical mounts, compounding and manufacture.

UNIT IV  FLUID SEALINGS AND FLEXIBLE COUPLING AND HOSES  
Seals for static and dynamic applications - effect of heat/ oil ageing - frictional behaviour - fundamental of sealability.

UNIT V  COMPOUNDING AND MANUFACTURE  
Types of couplings - specification and selection - torque vs deflection relationships - brake fluid/hydraulic hoses, materials and manufacture.

TOTAL : 45

TEXTBOOKS  

REFERENCE BOOKS  
2. Blow,C.M. and Hepburn.C, Rubber Technology and Manufacture
Aim: To teach the students about the simulation of IC engine processes

Objectives:
1. To understand the measurement of URP.
2. To understand the SI engine simulation.
3. To understand the progressive combustion.
4. To study about simulation of SI engine.
5. To study diesel engine simulation.

Outcome: The student will understand the simulation of IC engine processes

UNIT I INTRODUCTION

UNIT II SI ENGINE SIMULATION WITH AIR AS WORKING MEDIUM
Deviation between actual and ideal cycle – problems, SI engine simulation with adiabatic combustion, temperature drop due to fuel vaporization, full throttle operation – efficiency calculation, part – throttle operation, super charged operation.

UNIT III PROGRESSIVE COMBUSTION
SI Engines simulation with progressive combustion with gas exchange process, Heat transfer process, friction calculation, compression of simulated values, validation of the computer code, engine performance simulation, pressure crank angle diagram and other engine performance.

UNIT IV SIMULATION OF SI ENGINE
Intake – Exhaust - Charging and Combustion Simulation for two stroke and four stroke spark ignition engines.

UNIT V DIESEL ENGINE SIMULATION
Zero, one and multi zone model for combustion, different heat release and heat transfer models, equilibrium calculations, simulation of engine performance.

TOTAL : 45

TEXT BOOKS

REFERENCE BOOKS
Aim: To teach the students about the computer controlled vehicle systems

Objectives:
1. To understand the autonomy cruise control and abs.
2. To understand the engine control system.
3. To understand the drive line control system.
4. To study about intelligent transportation system.
5. To study safety impacting devices.

Outcome: The student will understand the computer controlled vehicle systems.

UNIT I INTRODUCTION
Understanding autonomy – review of the role of control in autonomy (speed control, suspension control & integrated vehicle dynamics) – Role of sensors and actuators. Examples of autonomy cruise control and ABS.

UNIT II ENGINE CONTROL SYSTEM
Fuel control - Ignition control in SI engines - Lamda control- idle speed control- Knock control- cylinder balancing.

UNIT III DRIVE LINE CONTROL SYSTEM
Speed control – gear shifting control – traction /braking- steering- suspension – vehicle handling and ride characteristics of road vehicles- adaptive cruise control.

UNIT IV INTELLIGENT TRANSPORTATION SYSTEM
Overview – control architecture – collision avoidance, pitch, yaw, bounce control – traffic routing system- automated high way systems- lane warning system- driver information system- data communication within the car.

UNIT V SAFETY IMPACTING DEVICES

TOTAL : 45

TEXT BOOKS
REFERENCE BOOKS

Aim: To teach the students about the cryogenic engineering

Objectives: 1. To understand the construction details and heat transfer.
2. To understand the liquefaction and low temperature refrigeration.
3. To understand the separation and purification systems.
4. To study about insulation and vacuum technology.
5. To study storage and instrumentation.

Outcome: The student will understand the cryogenic engineering

UNIT I CONSTRUCTION DETAILS AND HEAT TRANSFER 9

UNIT II LIQUEFACTION AND LOW TEMPERATURE REFRIGERATION 9

UNIT III SEPARATION AND PURIFICATION SYSTEMS 9
General characteristics of mixtures-composition diagrams. Gas separation-principles of rectification-flash calculations - Rectification column analysis- Flash calculations.

UNIT IV INSULATION AND VACUUM TECHNOLOGY 9
Thermal insulation and their performance at cryogenic temperatures- Super Insulations- Vacuum insulation- Powder insulation- Cryo pumping Applications.

UNIT V STORAGE AND INSTRUMENTATION 9
Cryogenic Storage vessels and Transportation- Transfer devices. Pressure flow-level and temperature measurements.

TOTAL HOURS 45

TEXT BOOK:

REFERENCES:
Aim: To teach the students about the computational fluid dynamics

Objectives:
1. To understand the governing equations and boundary condition.
2. To understand the finite difference method.
3. To understand the finite volume method.
4. To study about finite volume method for convection diffusion
5. To study calculation flow field by FVM.

Outcome: The student will understand the computational fluid dynamics

UNIT I GOVERNING EQUATIONS AND BOUNDARY CONDITIONS 12
Objective : To understand the basics of governing equations and boundary conditions

UNIT II FINITE DIFFERENCE METHOD 12
Objective : To gain knowledge about finite difference method

UNIT III Finite Volume Method (FVM) For Diffusion 12
Objective : To enable student to learn about FVM - Diffusion
Finite volume formulation for steady state One, Two and Three -dimensional diffusion problems. One dimensional unsteady heat conduction through Explicit, Crank – Nicolson and fully implicit schemes.

UNIT IV Finite Volume Method For Convection Diffusion 12
Objective: To inherit knowledge about FVM-Convection diffusion
Steady one-dimensional convection and diffusion – Central, upwind differencing schemes- properties of discretization schemes – Conservativeness, Boundedness, Trasnportiveness, Hybrid, Power-law, QUICK Schemes.

UNIT V Calculation Flow Field By FVM 12
Objective : To elaborate about FVM flow field calculation
Representation of the pressure gradient term and continuity equation – Staggered grid – Momentum equations – Pressure and Velocity corrections – Pressure Correction equation, simple algorithm and its variants. Turbulence models, mixing length model, two equation (k-ε) models – High and low Reynolds number models

TOTAL CONTACT HOURS: 60
TEXT BOOKS:

REFERENCES:
5. Introduction to Computational Fluid Dynamics Anil W. Date Cambridge University Press, 2005.
Aim: To teach the students about the Emerging Automotive Materials

Objectives:
1. To understand the classification of Engineering Materials and their relevant applications.
2. To understand the powder metallurgy concepts, process techniques, applications.
3. To understand the basics in composites, fabrication methods, types and applications.
4. To understand the various forms of Smart Materials, applications.
5. To understand the various types of Nano-material’s, production & applications.

Outcome: The student will understand the Emerging Automotive Materials

UNIT 1: ENGINEERING MATERIALS CLASSIFICATION, PROPERTIES & APPLICATIONS

UNIT 2: POWDER METALLURGY

UNIT 3: COMPOSITES
Composites – Types of composites - Naturally occurring, synthetic & engineered composites - MMC – CMC – PMC - Fibre and whisker reinforced composites (continuous and discontinuous) - particulate composites layered or sheet composites, composite coating or thin fibre, inter metallic composites - properties and characteristics of composites – commercially important components and their applications

UNIT 4: SMART MATERIALS
Introduction to intelligent/smart materials, shape memory alloys-types, NiTiNol-origin, properties, martensitic transformation, Memorization process- applications-medical, satellite etc.

UNIT 5: NANO MATERIALS
Nanomaterials-Definition, Classification of Nanostructured materials, causes of interest in nanomaterials, some present and future applications of nanomaterials. Processes for
producing ultrafine powders-mechanical grinding, wet chemical synthesis of nanomaterials. 
Gas phase synthesis of Nano materials, gas condensation processes, chemical vapour 
condensation, laser ablation. Carbon nanotubes, Nano composites.

**TEXTBOOKS:**
Selection, 9th Edition, PHI.
2. M.V.Gandhi., Thomson - Smart Materials and Structures- Chapman and Hall
3. A.K.Bandhopadyay-Nanomaterials-New Age

**REFERENCES:**
2. Ramesh, Nanomaterials: Mechanics and Mechanisms, Springer Verlag, EPZ, 
Paperback edition.
3. Angelo P.C., Subramanian R., Powder Metallurgy, Science, Technology and 
Aim: To teach the students about the Metrology and Instrumentation

Objectives:
1. To understand the measurements and sensors.
2. To understand the variable resistance and inductance sensors.
3. To understand the other special sensors.
4. To study about automotive pressure and force/torque sensor
5. To study automotive position and rpm/velocity sensors.

Outcome: The student will understand the Metrology and Instrumentation

UNIT I INTRODUCTION TO MEASUREMENTS AND SENSORS 9


UNIT II VARIABLE RESISTANCE AND INDUCTANCE SENSORS 9

Principle of operation- Construction details- Characteristics and applications of resistive potentiometer- Strain gauges- Resistive thermometers- Thermistors- Piezoresistive sensors Inductive potentiometer- Variable reluctance transducers:– EI pick up and LVDT

UNIT III VARIABLE AND OTHER SPECIAL SENSORS 9

Variable air gap type, variable area type and variable permittivity type- capacitor microphone Piezoelectric, Magnetostrictive, Hall Effect, semiconductor sensor- digital transducers- Humidity Sensor. Rain sensor, climatic condition sensor, solar, light sensor, antiglare sensor.

UNIT IV AUTOMOTIVE PRESSURE AND FORCE/TORQUE SENSOR 9

Pressure Sensor:
Typical automotive applications- Thick film pressure sensor- Semiconductor pressure sensor- Integrated silicon intake-manifold pressure sensor-Integrated silicon combustion-pressure sensor- Piezo electric sensor-High pressure sensor with metal diaphragm.

Force/Torque Sensor:
Typical automotive applications- Magneto elastic bearing-pin sensor- Magneto elastic tension/compressive-force sensor according to the cross-ductor principle – Basic principle of torque measurement –Stress and Angle measuring torque sensor

UNIT V AUTOMOTIVE POSITION AND RPM/ VELOCITY SENSORS 9

**Temperature Sensors:**- Typical automotive applications - Sintered-Ceramic resistors-Thin film resistors-Thick film resistors- Monocrystalline silicon semiconductor resistor-Thermopile sensors

**Flow Sensors:**- Ultrasonic flow sensors-Pitot tube air-flow sensor- Hot wire air-mass flow meter- Micro mechanical hot-film air-mass flow meter- Lambda sensor - Imaging sensor-Rain Sensor Introduction to MEMs

**TOTAL CONTACT HOURS: 45**

**TEXT BOOKS:**

**REFERENCES:**
Aim: To teach the students about the new generation and hybrid vehicles

Objectives:
1. To understand the hybrid vehicles.
2. To understand the power system and new generation vehicles.
3. To understand the vehicle operation and control.
4. To study about vehicle automated tracks
5. To study automotive suspension, brakes, aerodynamics and safety.

Outcome: The student will understand the new generation and hybrid vehicles

UNIT I INTRODUCTION 7
Electric and hybrid vehicles, flexible fuel vehicles (FFV), solar powered vehicles, magnetic track vehicles, fuel cells vehicles.

UNIT II POWER SYSTRM AND NEW GENERATION VEHICLES 12
Hybrid Vehicle engines, Stratified charge engines, learn burn engines, low heat rejection engines, hydrogen engines, HCCI engine, VCR engine, surface ignition engines, VVTI engines. High energy and power density batteries, fuel cells, solar panels, flexible fuel systems.

UNIT III VEHICLE OPERATION AND CONTROL 9
Computer Control for pollution and noise control and for fuel economy – Transducers and actuators - Information technology for receiving proper information and operation of the vehicle like optimum speed and direction.

UNIT IV VEHICLE AUTOMATED TRACKS 9
Preparation and maintenance of proper road network - National highway network with automated roads and vehicles - Satellite control of vehicle operation for safe and fast travel, GPS.

UNIT V SUSPENSION, BRAKES, AERODYNAMICS AND SAFETY 8
Air suspension – Closed loop suspension, compensated suspension, anti skid braking system, retarders, regenerative braking, safety gauge air backs- crash resistance. Aerodynamics for modern vehicles, safety systems, materials and standards.

TOTAL CONTACT HOURS: 45

TEXT BOOKS:

REFERENCES
1. Light weight electric for hybrid vehicle design.
2. Advance hybrid vehicle power transmission, SAE.
Aim: To teach the students about the operations research

Objectives:
1. Linear Programming is useful in finding either maximum or minimum of an expression subject to given constraints
2. To minimize the cost of transporting items from various sources to different destinations
3. When number of activities are to be carried out most economical way with less time consumptions can be found
4. Inventory is essential to provide flexibility in operating a system or organization.
5. Decision making is an integral part of any business organization. It uses to select the best among several decisions through a proper evaluation of the parameters of each decision environment

Outcome: The student will understand the operations research

1. Linear programming

2. Transportation model
   - Transporations problem – Assignment problem – Under Assignment - Traveling salesman problem

3. Network model

4. Inventory Models
   - Inventory Model – Economic Order Quantity Model – Purchasing Model (with and without shortages) – Manufacturing Model (with and without shortages) - Stochastic Inventory Model (Stock in discrete and continuous units).

5. Decision Model
   - Decision Model – Game theory – Two Person Zero sum game – Algebraic solutions

Tutorial 15

Total Hours: 60
TEXT BOOK

REFERENCES:
Aim:  
To teach the students about the total quality management

Objectives:
1. To understand the introduction about management.
2. To understand the TQM principles.
3. To understand the statistical process control
4. To impart the various TQM tools
5. To understand the quality systems.

Outcome:  
The student will understand the total quality management

UNIT – I INTRODUCTION  

UNIT –II - TQM PRINCIPLES  

UNIT –III - STATISTICAL PROCESS CONTROL (SPC)  
The seven tools of quality- Statistical Fundamentals – Measures of central Tendency and Dispersion- Population and Sample- Normal Curve- Control Charts for variables and attributes- Process capability- Concept of six sigma- New seven Management tools.

UNIT –IV - TQM TOOLS  

UNIT –V - QUALITY SYSTEMS  

Total Hours 45

TEXT BOOK:

REFERENCES:
Aim: To teach the students about the entrepreneurship for engineering students

Objectives:
1. To understand the importance of entrepreneurship for engineering students.
2. To inculcate entrepreneurship skills for engineering students.
3. To create awareness of business and train in preparing the project report and create awareness for engineering students.
4. To understand the importance of finance and its transactions.
5. To develop the skills of consequence of business sickness and take corrective measures.

Outcome: The student will understand the entrepreneurship for engineering students.

UNIT 1 ENTREPRENEURSHIP 9

UNIT 2 MOTIVATION 9

UNIT 3 BUSINESS AND ENTERPRISE MANAGEMENT 9

UNIT 4 FINANCIAL MANAGEMENT 9

UNIT 5 BUSINESS SICKNESS AND GROWTH STRATEGIES 9
TOTAL HOURS : 45
TEXT BOOKS:

REFERENCES:
1. EDII - “A manual for Entrepreneurs”- Entrepreneurship Development Institute of India, Ahmedabad- Tata McGrawHill-2006...
Aim:  
To teach the students about the Basics of Aircraft Systems and Aircraft Structures

Objectives:  
1. To understand the Aircraft Overview.
2. To understand the Aircraft.
3. To understands the system.
4. To study about Principles of Flight
5. To study Basics of Flight Mechanics

Outcome:  
The student will understand the Basics of Aircraft Systems and Aircraft Structures

Chapter-1 –Aircraft industry overview, Duration- 3 hours

Evolution and History of Flight, Types Of Aerospace Industry, Key Players in Aerospace Industry, Aerospace Manufacturing, Industry Supply Chain, Prime contractors, Tier 1 Suppliers, Key challenges in Industry Supply Chain, OEM Supply Chain Strategies, Mergers and Acquisitions, Aerospace Industry Trends, Advances in Engineering/CAD/CAM/CAE Tools and Materials technology, Global and Indian Aircraft Scenario

Chapter-2 –Introduction to Aircrafts, Duration- 5 hrs

Basic components of an Aircraft, Structural members, Aircraft Axis System, Aircraft Motions, Control surfaces and High lift Devices. Types of Aircrafts - Lighter than Air/Heavier than Air Aircrafts Conventional Design Configurations based on Power Plant Location, Wing vertical location, intake location, Tail Unit Arrangements, Landing Gear Arrangements. Unconventional Configurations-Biplane, Variable Sweep, Canard Layout, Twin Boom Layouts, Span loaders, Blended Body Wing Layout, STOL and STOVL Aircraft, Stealth Aircraft. Advantages and disadvantages of these Configurations.

Chapter-3-Introduction to Aircraft Systems, Duration- 16 hrs


Chapter-4-Basic Principles of Flight, Duration- 10 hrs

Significance of speed of Sound, Air speed and Ground Speed, Properties of Atmosphere, Bernoulli’s Equation, Forces on the airplane, Airflow over wing section, Pressure Distribution over a wing section, Generation of Lift, Drag, Pitching moments, Types of Drag, Lift curve, Drag Curve, Lift/Drag Ratio Curve, Factors affecting Lift and Drag, Center
of Pressure and its effects. Aerofoil Nomenclature, Types of Aerofoil, Wing Section- Aerodynamic Center, Aspect Ratio, Effects of lift, Drag, speed, Air density on drag,

**Chapter-5-Basics of Flight Mechanics , Duration 6 hrs**

Mach Waves, Mach Angles, Sonic and Supersonic Flight and its effects

**Stability and Control**

Degree of Stability- Lateral, Longitudinal and Directional Stability and controls of Aircraft. Effects of Flaps and Slats on Lift Coefficients, Control Tabs, Stalling, Landing, Gliding Turning, Speed of Sound, Mach Numbers, Shock Waves

**Aircraft Performance and Maneuvers**

Power Curves, Maximum and minimum speeds of horizontal flight, Effects of Changes of Engine Power, Effects of Altitude on Power Curves, Forces acting on aAeroplane during a Turn, Loads during a Turn, Correct and incorrect Angles of Bank, Aerobatics, Inverted Maneuvers, Maneuverability

Reference Books:
4. Introduction to Flight by Dave Anderson
5. Aircraft Systems: Mechanical, Electrical and Avionics Subsystems Integration by Ian moir, Allan Seabridge
6. An Introduction to Aircraft Certification; A Guide to Understanding Jaa, Easa and FAA by Filippo De Florio, Butterworth-Heinemann
Aim: To teach the students about the process planning and cost estimation

Objectives:
1. To study tools and technique of work study.
2. To understand process planning concepts.
3. To understand cost estimation.
4. To know about depreciation and ladder cost.
5. To study production cost estimation.

Outcome: The student will understand the process planning and cost estimation

1. WORK STUDY AND ERGONOMICS 9

2. PROCESS PLANNING 9
Definition – Objective – Scope – approaches to process planning- Process planning activities – Finished part requirements - operating sequences - machine selection – material selection parameters- Set of documents for process planning - Developing manufacturing logic and knowledge- production time calculation – selection of cost optimal processes – Introduction to ERP

3. INTRODUCTION TO COST ESTIMATION 9

4. ELEMENTS OF COST 9

5. PRODUCTION COST ESTIMATION 9

TOTAL HOURS 45

TEXT BOOKS
REFERENCES