### CURRICULUM & SYLLABUS

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*Dr.K.G.MUTHURAJAN  Prof.K.V.KRISHNASASTRY  Prof.T.RAJA  Prof.S.LOGANATHAN*
## DEPARTMENT OF AUTOMOBILE ENGINEERING

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**Dr.K.G.MUTHURAJAN  Prof.K.V.KRISHNASASTRY  Prof.T. RAJA  Prof.S.LOGANATHAN**
## DEPARTMENT OF AUTOMOBILE ENGINEERING

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Dr.K.G.MUTHURAJAN  Prof.K.V.KRISHNASASTRY  Prof.T.RAJA  Prof.S.LOGANATHAN
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Dr.K.G.MUTHURAJAN  Prof.K.V.KRISHNASASTRY  Prof.T.RAJA  Prof.S.LOGANATHAN
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*Dr.K.G.MUTHURAJAN  Prof.K.V.KRISHNASASTRY  Prof.T.RAJA  Prof.S.LOGANATHAN*
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ENGLISH FOR EFFECTIVE COMMUNICATION
(For I year B.E., all branches)
Syllabus 2012-2013 Regulations – First Semester

UNIT – I
Word formation with prefixes and suffixes, Antonyms & Synonyms-Tense Forms, Active and Passive voices- Different kinds of Nouns and Pronouns - Use of Verbs and Adverbs – Adjectives, Degrees of Comparison - Conditional Sentences — Common Errors in English- Reported Speech- Articles.

UNIT – II
Phonetics (Vowels, Consonants and Diphthongs) - Pronunciation Guidelines - Vocabulary (Homophones).

UNIT – III
Principles of Communication - Defining and Describing Objects -.Role Play- Debate- Telephonic Etiquettes.

UNIT – IV
How to write reports, report writing – Recommendations - Discussing data and coming to conclusions –Technical Reports –Project proposals- Brochures- News Letters- Memorandum (or) Memo

UNIT – V
Flowcharts - Pie-charts – Bar charts- Interpreting tables- Formal and Informal letters - Resume Writing.

TEXT BOOK

1. English for Effective Communication,
Departments of English, VMKV & AVIT.

REFERENCE BOOKS

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: (i) To utilize the powerful features of MATLAB one has to be an expert in Matrix theory (ii) The matrix theory plays a vital role in simplifying large arrays of equations and in determining their solution. (iii) Partial differential equation frequently occurred in the theory of elasticity and Hydraulics. (iv) 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
DIFFERENTIAL CALCULUS

Curvature – Cartesian and Parametric Co-ordinates – Centre and radius of curvature – Circle of curvature – Evolute

UNIT III
FUNCTIONS OF SEVERAL VARIABLES


UNIT IV
LAPLACE TRANSFORMS

UNIT V

APPLICATIONS OF LAPLACE TRANSFORMS

Inverse Laplace transform – Convolution theorem – Initial and Final value theorem-
Solution of linear ODE of second order with constant coefficients and first order simultaneou
s equation with constant coefficients using Laplace transforms.

Total hours : 60
Lecture Hours: 45
Tutorial Hours: 15
Credit : 04

TEXT BOOKS

1. “Engineering Mathematics” by Department of Mathematics, VMU
   New Delhi, 2006.
3. Dr. A. Singaravelu, Engineering Mathematics Volume I & Volume II by
   Meenakshi Publications.

REFERENCE BOOKS


Dr. K.G. MUTHURAJAN  Prof. K.V. KRISHNASASTRY  Prof. T. RAJA  Prof. S. LOGANATHAN
DEPARTMENT OF AUTOMOBILE ENGINEERING

COMPUTER FOUNDATION PROGRAM
(COMMON TO ALL BRANCHES)

OBJECTIVE:
The proposed course exposes the students to IT Essentials. The Core Modules of this paper includes Programming, Database and Operating system and other related topics.

OUTCOMES:
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
9
Basics of Computer and Information Technology: Digital computer fundamentals- Block diagram of a computer-component of a computer system Hardware and software definitions-Categories of software-Booting-Installing and Uninstalling Software-Software piracy-Software terminologies-Application of Computer-Role of Information Technology-History of Internet-Internet Services.

UNIT II
9
Problem Solving Methodologies and Techniques: Problems solving Techniques- Program development cycle-Algorithm-Design-Flow chart-Program control structures- Types and generation of programming languages-Development of algorithms for simple problems. Top down and Bottom up approaches of software development.

UNIT III
9

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UNIT IV

UNIT V
Software Applications: Office Automation: Application Packages-word processing-Spread sheet Application and Basics of HTML.

TOTAL HOURS: 45

TEXT BOOK:
1. Faculties, School of Computer Science, VMKVEC, “An Introduction to Computer Foundation Program”.

REFERENCES
**ENVIRONMENTAL SCIENCE AND ENGINEERING** Credit: 3
(Common to B.E all branches)

**OBJECTIVE:** It is the branch of science which deals with the effects of human activities & modern technology on environment. It creates awareness among the engineering students about environmental pollution and the role of the engineers in conservation of environment.

**OUT COME:** The students will get the knowledge about environment and they will work their corresponding field with eco friendly. It will protect our environment from pollution

**UNIT – I INTRODUCTION TO ENVIRONMENTAL STUDIES AND NATURAL RESOURCES** 10

Definition, scope and importance – need for public awareness - forest resources: use and over exploitation, deforestation, case studies. Timber extraction, mining, dams and their ground water, floods, drought, conflicts over water, dams-benefits and problems-mineral resources: use effects on forests and tribal people-water resources: use and over-utilization of surface and exploitation, environmental effects if extracting and using mineral resources, case studies-food resources: world food problems, changes caused by agriculture and overgrazing, effects of modern agriculture, fertilizer-pesticide problems, water logging, salinity, case studies-energy resources: growing energy needs, renewable and non renewable energy sources, use of alternate energy sources. Case studies –land resources: land as a resource, land degradation, man induced landslides, soil erosion and desertification –role of an individual in conservation of natural resources-equitable use of resources for sustainable lifestyles.

Field study of local area to document environmental assets: river/forest/grassland/hill/mountain.

**UNIT – II ECOSYSTEMS AND BIODIVERSITY** 14

Concept of and ecosystem –structure and function of an ecosystem-producers, consumers and decomposers-energy flow in the ecosystem-ecological succession-food chains, food webs and ecological pyramids-introduction, types, characteristic features, structure and function of the (a)forest ecosystem (b). grassland ecosystem (c) desert ecosystem (d) aquatic ecosystems (ponds, streams, lakes, rivers, oceans, estuaries)-introduction to biodiversity- definition: genetic, species and ecosystem diversity-biogeographical classification of India-value of biodiversity: consumptive use, productive use, social, ethical, aesthetic and option values-biodiversity at global, national and local levels-India as a mega-diversity nation-hot spots of biodiversity-endangered and endemic species of India –conservation of biodiversity: in-situ and ex-situ conservation of biodiversity.

Field study of common plants, insects, birds Field study of simple ecosystems – pond, river, hill slopes, etc.
UNIT - III ENVIRONMENTAL POLLUTION
Definition-causes, effects and control measures of: (a) air pollution (b) water pollution (c) soil pollution (d) marine pollution (e) noise pollution (f) thermal pollution (g) nuclear hazards – solid waste management: caused, effects and control measures of urban and industrial wastes-role of an individual in prevention of pollution-pollution case studies – disaster management: floods, earthquake, cyclone and landslides. Field study of local polluted site-urban / rural / industrial / agriculture

UNIT - IV SOCIAL ISSUES AND THEIR ENVIRONMENT

UNIT – V HUMAN POPULATION AND THE ENVIRONMENT

Total Hours : 45

TEXT BOOK:
1. Raman Sivakumar, Environmental Science and Engineering, Vijay Nicole imprints Pvt.Ltd.

REFERENCE BOOKS :
1. Bharucha Erach, The Biodiversity of India, publishing Pvt. Ahmedabad, India,
ENGINEERING PHYSICS
(Common to all branches of B.E.)

Objective
To familiarize students with the basic concepts of Physics and their application in Engineering & Technology.

Outcome
Students will be enabled in applying their knowledge of Physics concepts in Engineering & Technology.

UNIT – I  Lasers

UNIT – II  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 (block diagram only) – fibre optic sensors (displacement sensor and pressure sensor).

UNIT – III  Crystal Physics

UNIT – IV  Acoustics

UNIT – V  Non – Destructive Testing

TEXT BOOK


REFERENCE BOOKS

Objective: It is the branch of Engineering Mechanics, which deals with the forces and their effects, while acting upon the bodies at rest.

Outcome: The students would have learned the fundamental of Mechanics systems of forces which are very essential for engineering students to further build up his studies in the mechanical engineering branch.

Unit – I

Element of Vector Algebra: Introduction, Magnitude and Multiplication of a Vector by a Scalar, Addition and Subtraction of Vectors, Resolution of Vectors: Scalar Components, Unit Vectors, Useful Ways of Representing Vectors, Scalar or Dot Product of Two Vectors, Cross Product of Two Vectors, Scalar triple Product, Note on Vector Notation.

Unit – II


Unit – III

Unit-IV

Unit-V
Properties of Surfaces: Introduction, First Moment of an Area and the Centroid and Other Centers, Theorem of Pappus-Guldinus, Second Moments and the Product of an Area of a Plane Area, Transfer Theorems, Computations Involving Second Moments and Products of Area, Relation Between Second Moments and Products of Area, Polar Moment of Area, Principal Axes.


Total: 45 Hours
DEPARTMENT OF AUTOMOBILE ENGINEERING

Text Book:

Reference:
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
WORKSHOP PRACTICE LAB
(Common to all departments - Except Bio-Tech & Bio info)

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. Vee Joint
2. Square Joint
3. Dove Tail Joint

CARPENTRY
1. Planning
2. Half lab
3. Dove Tail Joint

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

DEMONSTRATION
1. Sheet Metal – Fabrication of tray and cone
2. Black Smithy – Round to square rod.
3. Foundry – Mould Preparation using single piece and split pattern

Reference:
1. “Basic Workshop Practice “, Department of Mechanical Engineering, VMKV Engineering College, 2008
DEPARTMENT OF AUTOMOBILE ENGINEERING

COMPUTER FOUNDATION PROGRAM LAB
(COMMON TO ALL BRANCHES)

I. OFFICE AUTOMATION
   1. Create a document with all formatting effects.
   2. Create a document to send mails using mail merge option.
   3. Create an Excel File to analyze the student’s performance. Create a chart for the
      above data to depict it diagrammatically.
   4. Create Excel sheet to maintain employee information and use this data to send
      mails using mail merge.
   5. Create a Power Point presentation for your personal profile with varying
      animation effects with timer.

II. SQL QUERIES
   1. Write SQL Commands for Data Definition, Table Creation with constraints.
   2. Write SQL Commands for Insert, Select, Update and Delete operations.
   3. Write SQL Commands for aggregate functions.

III. HTML
   1. Write HTML code to develop a web page having the background in red and title
      “My First Page” in any other color.
   2. Design a page having background color given text color red and using all the
      attributes of font tab.
   3. Create a web page, when user clicks on the link it should go to the bottom of the
      page.
   4. Create a web page, showing an ordered & unordered list of name of your five
      friends.
   5. Create a web page with appropriate content and insert an image towards the left
      hand side of the page when user clicks on the image. It should open another web
      page.
   6. Create a web page which should contain a table having two rows and two
      columns.

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BUSINESS ENGLISH

(For I year B.E., all branches)
Syllabus 2012-2013 Regulations – Second Semester

UNIT – I

UNIT – II

UNIT – III
Understanding Ideas and Making Inferences- Interview Questions (Direct, Open-ended and Closed Questions) - E-mail Netiquette, Sample E-mails- Group Discussion and Mock interview.

UNIT – IV
Instruction - Check-list - Minutes of the Meeting and Writing Agenda - Note making. Rearranging the jumbled sentences- Technical Articles- Project Proposals.

UNIT – V

TEXT BOOK

REFERENCE BOOKS
DEPARTMENT OF AUTOMOBILE ENGINEERING

ENGINEERING MATHEMATICS-II
(COMMON TO THE BRANCHES MECH,ECE,CSE,
CSSE,EEE,EIE,CIVIL,IT,MECHTRONICS,AERONAUTICAL
,ETC,AUTOMOBILE)

The syllabus for Engineering Mathematics- II common to all branches except Bio
info and Bio tech approved by Board of studies held on 28th and 29th July 2012 at
VMKV Engineering College,Salem

Objectives: The syllabus for the Engineering Mathematics II have been framed
catering to the needs of the Engineering students. It is purely applications oriented. To
mention a few (i) Differential equation plays a vital role in finding the solutions of
problems related to oscillations of Mechanical and Electrical systems, bending of beam,
conduction of heat, velocity of chemical reaction etc.,and as such play an very important
role in all modern scientific and engineering studies.(ii) The complex functions are
useful in the study of Fluid mechanics, Thermodynamics and electric fields

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
ORDINARY DIFFERENTIAL EQUATIONS 09
Solutions of third and higher order linear ordinary differential equation with constant
coefficients – Method of variation of parameters – Cauchy’s and Legendre’s linear
equations – Simultaneous first order linear equations with constant coefficients.

UNIT II
MULTIPLE INTEGRALS 09
Double integration –change of order of integration- Cartesian and polar coordinates –
Area as a double integral – Triple integration – volume as a triple integral.

UNIT III
VECTOR CALCULUS 09
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).

UNIT IV
ANALYTIC FUNCTIONS 09
Function of a complex variable – Analytic function – Necessary conditions - Cauchy
Riemann equations – Sufficient conditions (excluding proof) – Harmonic conjugate–
Constructions of analytic functions-conformal mapping(w=z+c,w=z^2,w=1/z)-bilinear
transformation

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UNIT V

COMPLEX ANALYSIS

Statement and application of Cauchy’s integral theorem and integral formula –
Taylor’s and Laurent’s expansions – Residues – Cauchy’s residue theorem - contour integration over unit circle.

TEXT BOOKS

1. “Engineering Mathematics” by Department of Mathematics, VMU
   NewDelhi, 2006.
3. Dr. A. Singaravelu, Engineering Mathematics Volume I & Volume II by
   Meenakshi Publications.

REFERENCE BOOKS

ENGINEERING CHEMISTRY
Credit: 3
(Common to all Branches)

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: WATER TECHNOLOGY & CORROSION


UNIT II: ELECTROCHEMISTRY, BATTERIES AND FUEL CELLS


UNIT III: CHEMISTRY OF ADVANCED MATERIALS

Portland cement –setting and hardening – RCC – Special cements. Organic electronic material, solid oxide materials, shape memory alloys, nanomaterials, polymers, fullerenes, ceramics, fibers, lubricants, refractories & composites (definition, classification and applications)

UNIT IV: PHASE EQUILIBRIA & NUCLEAR CHEMISTRY


UNIT V: CHROMATOGRAPHY AND SPECTROSCOPY


Total: 45 hours

REFERENCES:
2. Engineering Chemistry by Jain & Jain.
PROGRAMMING IN C

OBJECTIVES: To enable the student to learn programming knowledge in C.

OUTCOME: Do develop the skill of the student to develop the programming in C language.

UNIT I

Introduction: Algorithms & flowcharts-Overview of C-Features of C-IDE of C Structure of C program-Compilation & execution of C program-Identifiers, variables, expression, keywords, data types, constants, scope and life of variables, local and global variables. Operators: arithmetic, logical, relational, conditional and bitwise operators-Special operators: size of () & - comma (,) operator Precedence and associativity of operators & Type conversion in expressions.

Basic input/output and library functions: Single character input/output i.e. getch(), getchar(), getche() & putchar()-Formatted input/output: printf() and scanf()-Library Functions: concepts, mathematical and character functions.

UNIT II


UNIT III

Arrays: Single and multidimensional arrays-Array declaration and initialization of arrays-Array as function arguments. Strings: Declaration-Initialization and string handling functions. Structure and Union: Defining structure-Declaration of structure variable-Accessing structure members-Nested structures-Array of structures-Structure assignment-Structure as function argument-Function that returns structure- Union.

UNIT IV

Pointers: The ‘&’ and * operators-Pointers expressions-Pointers vs arrays-Pointer to functions-Function returning pointers-Static and dynamic memory allocation in C. DMA functions: malloc(), calloc(), sizeof(), free() and realloc()-Preprocessor directives.
UNIT V

**File management:** Defining, opening & closing a file, text file and binary file- Functions for file handling: fopen, fclose, gets, puts, fprintf, fscanf, getw, putw, fputs, fgets, fread, fwrite-Random access to files: fseek, ftell, rewind-File name as Command Line Argument.

**TEXT BOOKS:**


**REFERENCE BOOKS:**

MATERIAL SCIENCE
(Common to Mechanical, Auto, Aero & Civil of B. E.)

Objective: To familiarize students with the classical and quantum aspects of materials and their application in Engineering & Technology

Outcome: Students will be enabled in applying their knowledge of materials in Engineering & Technology

UNIT- I Conducting Materials

UNIT- II Semiconducting Materials

UNIT – III Magnetic and Dielectric Materials

UNIT – IV Dielectric Materials
Electrical susceptibility – dielectric constant – electronic, ionic, orientational and space charge polarization – frequency and temperature dependence of polarisation – internal field – Claussius – Mosotti relation (derivation) – dielectric loss - uses of Dielectric materials

UNIT- V Nano Materials
Synthesis of nanostructured materials – Top-down and Bottom-up methods - Lithography - sol-gel method - carbon nanotubes - synthesis of carbon nanotubes - applications

TEXT BOOKS:

Dr.K.G.MUTHURAJAN  Prof.K.V.KRISHNASASTRY  Prof.T.RAJA  Prof.S.LOGANATHAN
REFERENCES:

Objective: It is the branch of Engineering Mechanics, which deals with the forces and their effects, while acting upon the bodies in motion.

Outcome: The students would have learned the fundamental of Mechanics systems of forces Kinematics of particle, Impulse–Momentum Methods for Rigid bodies which are very essential for engineering students to further build up his studies in the mechanical engineering branch.

Unit-I
Kinematics of a Particle – Simple Relative Motion
Introduction, General Notions, Velocity and Acceleration Calculations, Simple, Kinematical Relations and Applications

Particle Dynamics
Introduction, Rectangular Coordinates, Rectilinear Translation, Cylindrical Coordinates, central Force Motion, System of Particles

Unit – II
Energy Method for Particles
System of particles: Work-Energy Equations, Kinetic Energy Expression Based on Center of Mass, Work-Kinetic Energy Expression Based on Center of Mass

Unit – III
Kinematics of Rigid Bodies: Relative Motion
Introduction, Translation and Rotation of Rigid Bodies, Chasles’ Theorem, Applications of the Fixed-Vector Concept, General Relationships between Time Derivatives of a Vector for Different References, General Relationships between Velocities of a Particle for Different References, Acceleration of a Particle for Different References.

Unit – IV
Kinetics of Plane Motion of Rigid Bodies
Introduction, Moment-of-Momentum Equations, Pure Rotation of a body of Revolution About its Axis of Revolution, Pure Rotation of a body with Two Orthogonal Planes of Symmetry, Pure Rotation of Slab Like Bodies, Rolling Slab Like Bodies, General Plane Motion of a Slab Like Bodies, Pure Rotation of an Arbitrary Rigid Body.

Unit – V
Energy and Impulse–Momentum Methods for Rigid Bodies

Total: 45 PERIODS

Dr.K.G.MUTHURAJAN  Prof.K.V.KRISHNASASTRY  Prof.T.RAJA  Prof.S.LOGANATHAN
Text Book:

Reference:
1. Implementation of Sine and cosine series.
2. Generation of Fibonacci series.
3. To find the  
   i) Factorial number.  
   ii) Sum of n natural numbers.
4. Reversing the digits of an integer
5. Conversion of decimal number to octal number
6. Conversion of character integer to decimal number
7. Finding the square root of a given number by applying algorithm
8. (a) Find GCD of two numbers  
   (b) Generate Prime numbers between 1 and n.
9. Greatest of three numbers using if statement and conditional operator.
10. Read two numbers and swap those two numbers using temporary variable and without using  
    temporary variable.
11. Quadratic equation for different sets of inputs.
12. Use of switch….Case statements.
13. Matrix operations  
    a) Addition  
    b) Transpose  
    c) Multiplication
14. Ascending and Descending order.
15. Given a set of n numbers, find the length of the longest monotone increasing subsequence.
16. Sort by exchange, selection and partitioning method
17. Use of pointers and array of pointers
18. Linear search.
20. Files operations.
ENGINEERING GRAPHICS
(Common to MECH, AUTO, AERO, CIVIL, ECE, EIE, EEE, ETC & MECT)

2 0 3 2

Objectives: To develop in student’s graphic skill for communication of concepts, ideas and design of engineering products and expose them to existing national standards related to technical drawings.

Outcome: The students would have learned the engineering graphics which is the basic language for an engineer to communicate is idea in manufacturing the various items.

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.

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 I PLANE CURVES AND FREE HAND SKETCHING

Curves used in engineering practices:
Conics – Construction of ellipse, Parabola and hyperbola by eccentricity method – Construction of cycloid – construction of involutes of squad and circle – Drawing of tangents and normal to the above curves.

UNIT II PROJECTION OF POINTS, LINES AND PLANE SURFACES

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

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 – Development of lateral surfaces of solids with cylindrical cutouts, perpendicular to the axis.
UNIT V ISOMETRIC AND PERSPECTIVE PROJECTIONS


Total: 45 PERIODS

TEXT BOOKS:

REFERENCES:

Note:
1. Mini drafter is to be used for unit-I & II
2. Free hands sketch and drafting software is to be used for Unit-III, IV & V
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. Determination of alkalinity by indicator method.
3. Estimation of ferrous ion by Potentiometry.
4. Titration of strong acid with strong base 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.
OBJECTIVES:
The syllabus for the Advanced Engineering Mathematics has been framed catering to the needs of the Engineering students. It is purely application oriented. To mention a few (i) Partial differential equations arises in most of the Engineering discipline when the number of independent variables in the given problem under discussion is two or more. (ii) Fourier series has the wide application in the field of heat propagation and diffusion, wave propagation and in signal and systems analysis. (iii) Transform techniques are very useful in the field of signal and system analysis. Z-transform plays an important role in analysis of Discrete signals. This is a prelude to learn higher semester courses.

1. 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.

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

3. 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.

4. FOURIER TRANSFORMS

5. Z - TRANSFORM
TEXT BOOK:
1. A. Singaravelu, "Transforms and Partial Differential Equations", Meenakshi Agencies, Chennai

REFERENCES:
OBJECTIVES:
The aim of the subject is to provide a fundamental knowledge of automotive petrol engines.
1. To understand the fundamentals of engines 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.
To understand the types of combustion and combustion chamber.

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
Carburettor working principle, requirements of an automotive carburettor, 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: 45 HOURS
TEXT BOOKS

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

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

UNIT –I BASIC CONCEPTS AND FIRST LAW OF THERMODYNAMICS
First law of thermodynamics – Applications to closed and open systems, Internal energy, Specific heats, Enthalpy, Steady and unsteady flow conditions. Problems

UNIT –II SECOND LAW OF THERMODYNAMICS

UNIT –III WORKING FLUIDS
Definition of working fluid, Thermodynamic properties of pure substances, property diagram, PVT surface of water and other substances, calculation of properties. First law and second law analysis using tables and charts.

UNIT –IV POWER CYCLES
UNIT – V  THERMODYNAMIC RELATIONS AND COMBUSTION OF FUELS

Exact differentials, T-Ds relations, Maxwell relations, clausius clapeyron equations, Joule- Thomson coefficient. Heat value of fuels, Combustion equations, Theoretical and excess air, Air fuel ratio, exhaust gas analysis, Problems.

TUTORIAL : 15 HOURS
TOTAL HOURS: 60 HOURS

TEXT BOOKS

REFERENCES
1. Spalding & Cole., Engineering Thermodynamics, ELBS.
3. Rogers & Mayhew, Engineering Thermodynamics – Addision Wesley.
DEPARTMENT OF AUTOMOBILE ENGINEERING

<table>
<thead>
<tr>
<th>SEMESTER</th>
<th>SUBJECT</th>
<th>L</th>
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<th>C</th>
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<tbody>
<tr>
<td>III</td>
<td>MECHANICS OF MACHINES</td>
<td>3</td>
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<td>4</td>
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Common to (AUTO & AERO)

OBJECTIVES:

To provide knowledge and understanding on mechanics of machines

1. To understand the types of mechanisms.
2. To impart the knowledge of frictions.
3. To understand the various types of gears and cams.
4. To impart the knowledge of static and dynamics balancing.
5. To impart the knowledge of vibrations.

UNIT- I MECHANISMS


UNIT- II FRICTION

Friction in screw and nut – Pivot and collar – Thrust bearing – Plate and disc clutches – Belt (flat and V) and rope drives. Ratio of tensions – Effect of centrifugal and initial tension – Condition for maximum power transmission – Open and crossed belt drive.

UNIT- III GEARING AND CAMS

Gear profile and geometry – Nomenclature of spur and helical gears – Gear trains: Simple, compound gear trains and epicyclic gear trains - Determination of speed and torque- Cams – Types of cams – Design of profiles – Knife edged, flat faced and roller ended followers with and without offsets for various types of follower motions.

UNIT- IV BALANCING

Static and dynamic balancing – Single and several masses in different planes – Balancing of reciprocating masses- primary balancing and concepts of secondary balancing – Single and multi cylinder engines (Inline) – Balancing of radial V engine – direct and reverse crank method.

UNIT- V VIBRATION


TOTAL: 45 HOURS

Dr. K.G. MUTHURAJAN  Prof. K.V. KRISHNASASTRY  Prof. T. RAJA  Prof. S. LOGANATHAN
TEXT BOOKS

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

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

Dr.K.G.MUTHURAJAN  Prof.K.V.KRISHNASASTRY  Prof.T.RAJA  Prof.S.LOGANATHAN
UNIT- V BRAKING SYSTEM


TOTAL: 45 HOURS

TEXT BOOKS

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

REFERENCES

DEPARTMENT OF AUTOMOBILE ENGINEERING

<table>
<thead>
<tr>
<th>SEMESTER</th>
<th>SUBJECT</th>
<th>L</th>
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<tr>
<td>III</td>
<td>AUTOMOTIVE ELECTRICAL SYSTEMS</td>
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**OBJECTIVES:**
To provide knowledge and understanding on various types of automotive electrical systems
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 systems.
4. To impart the knowledge of ignition systems.
5. To impart the knowledge of vehicle lighting and its accessories.

**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**
Function, Components of DC and AC Charging System for Automobile, construction, operating principle, characteristics, charging circuit controls – cut out, relays, voltage and current regulators, troubleshooting

**UNIT- IV IGNITION SYSTEMS**
Types, construction & working of battery coil and magneto ignition systems. Relative merits, centrifugal and vacuum advance mechanisms. Types and construction of spark plugs, Electronic Ignition system. Digital ignition system.

**UNIT- V LIGHTING SYSTEM & ACCESSORIES**
Insulated & earth return systems. Positive & negative earth systems. Details of head light & side light. Head light dazzling & preventive methods. Electrical fuel-pump, Speedometer, Fuel, oil & temperature gauges, Horn, Wiper system, Trafficator, wiring system

**TEXT BOOKS**

Dr.K.G.MUTHURAJAN  Prof.K.V.KRISHNASASTRY  Prof.T.RAJA  Prof.S.LOGANATHAN
REFERENCES

OBJECTIVES:

To impart training in drafting of automobile components using Auto-Cad software.

To impart knowledge in the assembly drawing of different types of auto parts of vehicles.

1. INTRODUCTION TO COMPUTER AIDED DRAFTING AND SOFTWARE


2. PREPARATION OF 2-D DRAWINGS


3. ASSEMBLY DRAWING

Preparation of assembled views of automotive components blocks: piston, connecting rod, valve assembly, manifold, crankshaft, bearing, Universal Joint, engine assembly.

TOTAL: 45 HOURS
OBJECTIVES:

The main objective of this course is to impart knowledge in the assembling and dismantling and study of different types of an engine and its various systems like steering system, transmission system, electrical system, ignition system, injection system, Braking system. 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

- Tata
- Leyland
- Ambassador
- Premier Padmini
- 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: 45 HOURS
OBJECTIVES:
To familiarize and train the students on the constructional arrangements of different electrical system of different vehicles.
To learn the function of Automotive Electronics components of testing and measurements

AUTOMOTIVE ELECTRICAL SYSTEM
1. Testing, charging and discharging of lead acid battery used in automobiles,
2. Testing and troubleshooting of starting system in automobiles
3. Starter motor component test
4. Testing and troubleshooting of charging system in automobiles
5. Alternator component test
6. Testing and troubleshooting of lighting system in automobiles
7. Testing of lighting conventional analog instrumentation, indicator light, warning devices
8. Testing of electrical accessories in automobiles
9. Study & testing of conventional ignition system

AUTOMOTIVE ELECTRONICS SYSTEM
1. Temperature Measurement
2. Speed Measurement
3. Torque Measurement
4. Optical Sensor Performance study
5. Efficiency of photovoltaic cell panels

TOTAL: 45 HOURS
OBJECTIVES:

In reality all equations cannot be solved in complete form. Hence the next best solution is only Numerical Methods. Therefore Numerical Methods plays a pivotal role in the field of Engineering.

UNIT- I SOLUTION OF EQUATIONS AND EIGEN VALUE PROBLEMS 9

UNIT- II INTERPOLATION AND APPROXIMATION 9
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 9

UNIT- IV INITIAL VALUE PROBLEMS FOR ORDINARY DIFFERENTIAL EQUATIONS 9

UNIT- V BOUNDARY VALUE PROBLEMS FOR ORDINARY AND PARTIAL DIFFERENTIAL EQUATIONS 9
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.

TUTORIAL : 15 HOURS
TOTAL HOURS: 60 HOURS

Dr.K.G.MUTHURAJAN  Prof.K.V.KRISHNASASTRY  Prof.T.RAJA  Prof.S.LOGANATHAN
TEXT BOOKS


REFERENCES

4. N. Subramanian, Numerical Methods, SCM Publishers, Erode
OBJECTIVES:
To provide knowledge and understanding on various types of manufacturing processes
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.

UNIT- I INTRODUCTION AND CASTING 9

UNIT- II METAL FORMING AND POWDER METALLURGY 9
Basic concepts and classification of forming processes- principles- Application of the following processes- Forging, rolling, extrusion, wire drawing, spinning, sheet metal forming- powder metallurgy- steps involved, applications.

UNIT- III COVENTIONAL MACHINING 9
General principles(with schematic diagrams only) of working, types and commonly performed operations in the following machines- Lathe, shaper, planer, milling machining, drilling machines- basic of CNC machines.

UNIT- IV WELDING 9
Classification of welding processes- principles and equipment used in the following processes- gas welding- Arc welding- Resistance welding- Thermit welding- soldering, brazing.

UNIT- V UNCONVENTIONAL MACHINING PROCESSES 9
Need for unconventional machining processes- principles and applications of the following processes- Abrasive jet machining, Ultrasonic machining, Electro discharge machining, Electrochemical machining, Chemical machining, LASER beam machining, Electro beam machining, plasma arc machining

TOTAL: 45 HOURS

Dr.K.G.MUTHURAJAN  Prof.K.V.KRISHNASASTRY  Prof.T.RAJA  Prof.S.LOGANATHAN
TEXT BOOKS

REFERENCES
OBJECTIVES:
To study and understand the substitute for conventional automobile fuels and energy sources.
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 various unconventional machining processes.

UNIT- I  INTRODUCTION  9

UNIT- II  ALCOHOLS  9
Properties as engine fuel, alcohols and gasolene blends, performance in SI engine. Methanol and gasoline blends Combustion characteristics in engines - emission characteristics.

UNIT- III  NATURAL GAS, LPG, HYDROGEN AND BIOGAS  9
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  9
Various vegetable oils for engines - Esterification - Performance in engines - Performance and emission Characteristics

UNIT- V  ELECTRIC AND SOLAR POWERED VEHICLES  9
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.
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 analyze the torsional effects on circular bars, shafts, helical springs.
4. To form deflection equations of beams and columns for different end conditions.
5. To analyze the two dimensional stresses and deformation of cylinders and spherical shells.

UNIT- I STRESS- STRAIN AND DEFORMATION OF SOLIDS

UNIT- II BEAMS - LOADS AND STRESSES
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 TORSION

UNIT- IV DEFLECTION OF BEAMS
UNIT- V  ANALYSIS OF STRESSES IN TWO DIMENSIONS

Biaxial state of stresses – Thin cylindrical and spherical shells – Deformation in thin cylindrical and spherical shells – Biaxial stresses at a point – Stresses on inclined plane – Principal planes and stresses – Mohr’s circle for biaxial stresses – Maximum shear stress - Strain energy in bending and torsion

TUTORIAL : 15 HOURS
TOTAL HOURS: 60 HOURS

TEXT BOOKS
Third Edition- 2008

REFERENCES
, McGraw-Hill Book Co- New York- 2005
3. Ray Hulse- Keith Sherwin & Jack Cain- “Solid Mechanics”- Palgrave ANE Books-
2006.
SEMESTER | SUBJECT | L | T | P | C
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IV | AUTOMOTIVE DIESEL ENGINES | 3 | 0 | 0 | 3

OBJECTIVES:
To study and understand the substitute for automotive diesel engines.
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.

UNIT- I BASIC THEORY

UNIT- II FUEL INJECTION SYSTEM

UNIT-III AIR MOTION, COMBUSTION AND COMBUSTION CHAMBERS

UNIT- IV SUPERCHARGING AND TURBOCHARGING

UNIT-V ENGINE PERFORMANCE AND EVALUATION

TOTAL: 45 HOURS

Dr.K.G.MUTHURAJAN  Prof.K.V.KRISHNASASTRY  Prof.T.RAJA  Prof.S.LOGANATHAN
DEPARTMENT OF AUTOMOBILE ENGINEERING

TEXT BOOKS

REFERENCES
OBJECTIVES:
To study and purpose is to understand the Electronics system and components.
1. To impart the knowledge of digital electronics.
2. To understand the engine control systems.
3. To understand the various type of electronic fuel injection systems.
4. To impart the knowledge of automotive electronics.
5. To impart the knowledge of various sensors and actuators.

UNIT- I DIGITAL ELECTRONICS INTRODUCTION
Binary number system- Basic logic gates- Boolean algebra- Half adder- Full adder- Flip flops- Registers- Encounters- A/D and D/A C conversions, EMG

UNIT- II DIGITAL ENGINE CONTROL SYSTEM
Open loop & closed loop system- Engine cracking and warm up control Acceleration and deceleration system, idle speed control, Integrated engine system, Exhaust emission control system

UNIT-III ELECTRONIC FUEL INJECTION SYSTEM
Introduction, Feedback carburetor system(FBC), Throttle body injection and MPFI, Injection system control, CRDI, Distributorless ignition system.

UNIT- IV AUTOMOTIVE ELECTRONICS
Current trends in automotive electronic engine management system, electro Magnetic interference suppression, electromagnetic compatibility, electronic Dashboard instruments, on board diagnostic system, security and warning system.

UNIT- V SENSORS AND ACTUATORS
Types of sensors: sensor for speed, throttle position, exhausts 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
1. Electronic devices and circuits- S.salivahanan, N.sureshkumar, A.vallavaraj.
2. R.S.Govankar."Microprocessor architecture, programming and application with 8085/8080A.
3. Introduction to microprocessor by Mathur.
REFERENCES

OBJECTIVES:

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

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
9. Ovality and taper measurement of cylinder bore and comparison with standard specifications
10. Ovality and taper measurement of engine crank shaft and comparison with standard specification

TOTAL: 45 HOURS
OBJECTIVES:

To impart training in turning, milling and grinding operations in different types of machine.

List Of Experiments

1. Plain Turning and Step Turning on a Lathe.
2. Taper Turning on a lathe
3. Thread Cutting on a lathe
4. Drilling, reaming and tapping in a drilling machine
5. Plain Milling
6. Undercut Step Milling
7. Hexagonal Milling
8. Cutting Keyways in a Slotting Machine

TOTAL: 45 HOURS
OBJECTIVES:
To provide a hands on experience to conduct testing of materials.

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

TOTAL: 45 HOURS
OBJECTIVES:

To study and purpose is to understand the modern vehicle technology.

1. To impart the knowledge of trends in power plants.
2. To understand the suspension brakes and safety.
3. To understand the various type of noise and pollution.
4. To impart the knowledge of vehicle operation and control.
5. To impart the knowledge of vehicle automated tracks.

UNIT- I  TRENDS IN POWER PLANTS


UNIT- II SUSPENSION BRAKES AND SAFETY

Air suspension - Closed loop suspension - antiskid braking system, Retarders, Regenerattive braking safety cage- air bags - crash resistance - passenger comfort.

UNIT-III NOISE & POLLUTION

Reduction of noise - Internal & external pollution control through alternate fuels/power plants – Catalytic converters and filters for particulate emission.

UNIT- IV  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- V 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.

TOTAL: 45 HOURS

TEXT BOOKS

1. Electronic devices and circuits- S.salivahanan, N.sureshkumar, A.vallavaraj.
2. R.S.Govankar.”Microprocessor architecture, programming and application with 8085/8080A.
3. Introduction to microprocessor by Mathur.

REFERENCES


Dr.K.G.MUTHURAJAN  Prof.K.V.KRISHNASASTRY  Prof.T.RAJA  Prof.S.LOGANATHAN
OBJECTIVES:
To study and purpose is to understand the automotive transmissions.

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

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
DEPARTMENT OF AUTOMOBILE ENGINEERING

TEXT BOOKS

REFERENCES
2. SAE Transactions 900550 & 930910.
OBJECTIVES:
To study and purpose is to understand the combustion thermodynamics and heat transfer.
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.

UNIT- I INTRODUCTION TO COMBUSTION PROCESSES

UNIT- II THERMODYNAMICS OF COMBUSTION

UNIT-III NORMAL, ABNORMAL COMBUSTION IN SI ENGINES
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

UNIT- V EXPERIMENTAL INVESTIGATION OF COMBUSTION AND HEAT TRANSFER IN IC ENGINES
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

Dr.K.G.MUTHURAJAN  Prof.K.V.KRISHNASASTRY  Prof.T.RAJA  Prof.S.LOGANATHAN
TEXT BOOKS

REFERENCES
**OBJECTIVES:**

To study and purpose is to understand the emerging automotive materials

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 composites, fabrication methods, types and applications.
4. To impart the knowledge of smart materials
5. To understand the various types of nonmaterial’s,

**UNIT- I ENGINEERING MATERIALS CLASSIFICATION, PROPERTIES & APPLICATIONS**


**UNIT- II POWDER METALLURGY**


**UNIT-III 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- IV SMART MATERIALS**

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

**UNIT- V 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
DEPARTMENT OF AUTOMOBILE ENGINEERING


TOTAL: 45 HOURS

TEXT BOOKS
2. M.V.Gandhi., Thomson - Smart Materials and Structures- Chapman and Hall
3. A.K.Bandhopadyay-Nanomaterials-New Age

REFERENCES
OBJECTIVES:
To study and purpose is to understand fuels and lubricants.
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 properties and testing of fuels
5. To understand the combustion & fuel ratings.

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- 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
DEPARTMENT OF AUTOMOBILE ENGINEERING

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OBJECTIVES:
To impart knowledge on fuel and lubricant properties and its measurements techniques.

List of experiments:

1. Temperature dependence of viscosity of lubrication oil by Redwood Viscometer.
2. Viscosity Index of lubricating oil by Saybolt Viscometer
3. Flash and Fire points of fuels.
4. Flash and Fire points of lubricants.
5. ASME distillation test of gasoline
6. Drop point of grease and mechanical penetration in grease.
7. Aniline distillation test of gasoline
10. Reid vapour pressure test.

TOTAL: 45 HOURS
**OBJECTIVES:**

*To impart knowledge on heat transfer by convection.*

**List of Experiments:**

1. Thermal conductivity of insulating material.
2. Thermal conductivity by Guarded hot plate method.
3. Heat transfer through composite walls.
4. Heat transfer by free and forced convection.
6. Emissivity measurement apparatus.
7. Heat transfer from fins - natural and forced convection
8. Stefan- Boltzmann apparatus.

**TOTAL: 45 HOURS**
OBJECTIVES:
To impart knowledge on vehicle design and data characteristics

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: 45 HOURS
AIM: To develop graduates with good Presentation and Writing skills (Professional & Technical)

OBJECTIVES: To improve Aptitude Skills, train to improve self-learning/researching abilities, Presentation Skills & Technical Writing (Reports, Brochures, Manuscripts/Articles)

METHODOLOGY: Modular Evaluation will be done based on Continuous Internal Assessment as Assignments, Short Communications, Proposals, Briefs, Reports, etc. Final Evaluation will be based on a Real-time research article based on current research carried out in the Institution or by any Faculty of the Institution (Good articles can be submitted to Journals co-authored by the Student and Faculty, with affiliation to the Institution)

UNIT I – COMMUNICATION AND SELF DEVELOPMENT: Basic Concepts of Communication; Process of Communication; Types of Formal Communication; The Media of Communication; Channels of Communication; Barriers in Communication; How to Overcome Barriers to Communication.

UNIT II - GRAMMAR & SYNTAX: Synonyms; Antonyms; Words used as different parts of speech; Spotting errors; Concord; Principle of proximity between subject and verb. Sentence Structure; Combination and Transformation of sentences; Verb Patterns in English.

UNIT III - READING AND WRITING SKILLS: Purpose and Process of Reading; Reading Tactics; Reading Strategies; Reading Comprehension; Paraphrase; Preparing outlines of paragraph/text. Elements of Effective Writing; Job Application, Bio-data, Personal Resume and Curriculum Vitae; Preparing Agenda and Minutes of a Meeting; Back office job for organizing a conference/seminar; Writing Styles; Scientific and Technical Writing; Summary Writing; Writing paragraphs; Writing Essays.

UNIT IV – LISTENING AND SPEAKING SKILLS: Process of listening; Hard and Soft Skills; Feedback Skills; Essentials of Good Communications; Types of Listening; Barriers to Listening; Note taking and Note making. Skills of Effective Speaking; Component of an Effective Talk; Tone of Voice; Accent, Body Language; Timing and Duration of Speech; Audio-Visual Aids in Speech.

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UNIT V – TECHNICAL REPORT, RESEARCH CASE STUDY & REPORTING:
Main considerations in writing a good report; Types and Structure of Reports; Collecting Data; Technical Proposals; Visual Aids; General Tips for Writing Reports. Research Case Study and Reporting

Text Book


Reference Books

1  Business Communication, Sinha K. K, S. Chand, New Delhi.


4  A New Approach to English Grammar for High Schools, Madan Sabina, Spectrum Books, New Delhi
OBJECTIVES:

To study and purpose is to understand vehicle body engineering

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

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-IV 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.

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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

OBJECTIVES:
To study and purpose is to understand two and three wheeler technology.
1. To understand the power units.
2. To understand the chassis and sub systems.
3. To understand the brakes and wheels
4. To impart the various types of two wheeler
5. To understand the various types of three wheeler.

UNIT- I  THE POWER UNIT  9

UNIT- II  CHASSIS AND SUB-SYSTEM 9

UNIT-III BRAKES AND WHEELS 9
Drum brakes, disc brakes, front and rear brake links layouts. spoke wheel, cast wheel. Disc wheel. Disc types. Tyres and Tubes.

UNIT- IV  TWO WHEELERS 9
Case study of motor cycles, scooters and mopeds. servicing and maintenance.

UNIT- V  THREE WHEELERS 9
Case study of Auto rickshaws, pickup van, delivery van and trailer. servicing and maintenance.

TOTAL: 45 HOURS

TEXT BOOKS

REFERENCES
OBJECTIVES:

To study and purpose is to understand automotive engine design.
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 of connecting rod and crankshafts.
5. To understand the design of valves and flywheels.

UNIT- I INTRODUCTION

Engineering materials and their physical properties applied to design, selection of materials, factor of safety, endurance limit, notch sensitivity, principles of design optimization, future trends, computer aided drafting.

UNIT- II LIMITS, FITS, TOLERANCES, SURFACE FINISH, SHAFTS AND SPRINGS

Definitions, types of tolerances and fits, design considerations for interference fits, surface finish, surface roughness, design of power transmission shafts, design of helical 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


Dr.K.G.MUTHURAJAN Prof.K.V.KRISHNASASTRY Prof.T.RAJA Prof.S.LOGANATHAN

REFERENCES
OBJECTIVES:
To study and purpose is to understand automotive pollution control.
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 and CI engines.
5. To understand the measurement technique and emission standards.

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: 45 HOURS
DEPARTMENT OF AUTOMOBILE ENGINEERING

TEXT BOOKS

REFERENCES

Dr.K.G.MUTHURAJAN  Prof.K.V.KRISHNASASTRY  Prof.T.RAJA  Prof.S.LOGANATHAN
OBJECTIVES:
To study and purpose is to design of chassis.
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.

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.

TUTORIAL : 15 HOURS
TOTAL HOURS: 60 HOURS
TEXT BOOKS

REFERENCES
OBJECTIVES:
To impart knowledge on clutch, gear box and performance on two and three wheeler.

List of Experiments

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

TOTAL: 45 HOURS
OBJECTIVES:
To impart knowledge on performance and emission characteristics on petrol and diesel engine.

List of Experiments:

2. Performance Test on 4-stroke Diesel Engine.
3. Performance Test on a 4 - stroke Petrol Engine.
5. Morse Test on Multicylinder Petrol Engine.
6. Retardation Test to find Frictional Power of a Diesel Engine.
7. Study of NDIR gas Analyser and FID.
8. Study of Chemiluminescent NOx Analyser.

TOTAL: 45 HOURS
OBJECTIVES:
To impart knowledge on types of vehicles drafting using solid works.

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: 45 HOURS
OBJECTIVES:
To study and purpose is to understand total quality management.
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.

UNIT- INTRODUCTION
- Definition of Quality- Dimensions of Quality- Quality Planning- Quality costs

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: 45 HOURS
TEXT BOOKS


REFERENCES

OBJECTIVES:
To study and purpose is to understand various vehicle maintenance.
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.

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 9
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
OBJECTIVES:
To study and purpose is to understand combustion theory of IC engines.
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

UNIT- I CYCLE ANALYSIS
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

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

UNIT- IV ADVANCES IN IC ENGINES
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 OPERATION AND PERFORMANCE
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

Dr.K.G.MUTHURAJAN  Prof.K.V.KRISHNASASTRY  Prof.T.RAJA  Prof.S.LOGANATHAN
DEPARTMENT OF AUTOMOBILE ENGINEERING

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**OBJECTIVES:**

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

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.

**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
### OBJECTIVES:
To provide in house training in vehicle servicing and maintenance.

### List of Experiments
1. Clutch assembly and servicing
2. Gearbox assembly and servicing
3. Differential unit assembly and servicing
4. Transaxle assembly and servicing
5. Different types of rear axle assembly and servicing
6. Brake system trouble shooting
7. Wheel alignment testing
8. Ackermann Steering geometry verification
9. Electrical signal and circuits
10. Servicing of accessories such as wiper motor, A/C system

**TOTAL: 45 HOURS**
# DEPARTMENT OF AUTOMOBILE ENGINEERING

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## OBJECTIVES:

*To provide training in modeling and simulation of IC engine processes*

## List of Experiments:

1. SI and CI engine Adiabatic Flame Temperature simulation.
2. SI and CI engine Ideal cycle simulation.
3. SI engine Fuel-Air cycle simulation.
4. SI engine simulation with adiabatic combustion.
5. SI Engine simulation with progressive combustion.
6. Two zone model for CI engine combustion.
7. Simulation of engine CI engine performance.
8. Study of different heat release and heat transfer models.
9. Study of multi zone CFD models for SI & CI engine combustion simulation.

**TOTAL: 45 HOURS**
OBJECTIVES:
To familiarize the students with repair and maintenance techniques with emphasis on practical application

List of Experiments

LIST OF EXPERIMENTS
1. Engine Reboring
2. Crank shaft grinding
4. Silencer Decarbonising
5. Fuel Nozzle reconditioning
7. Clutch plate grinding.
8. Flywheel grinding.
9. Wheel drum grinding

TOTAL: 45 HOURS
### OBJECTIVE

- The objective of the project work is to enable the students to form the groups of not more than 3 members on a project involving theoretical and experimental studies related to the branch of study.

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

  Group A Student will have a choice to take 2 students from Group B&C

- 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
LIST OF ELECTIVES FOR AUTOMOBILE ENGINEERING

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<td>ELECTIVE</td>
<td>MODERN AUTOMOBILE ACCESSORIES</td>
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**Aim**
To introduce the modern developments in vehicle technology.

**Objective**
1. To study electronically controlled systems in SI and CI Engine.
2. To learn about active suspension system.
3. To understand vehicle heating and air conditioning.
4. To know about adaptive control systems.
5. To impart knowledge on modern safety systems like airbag.

**UNIT – I ENGINE MANAGEMENT SYSTEMS**
9
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**
9
Active suspension control, Pneumatic suspensions

**UNIT – III HEATING AND AIR CONDITIONING**
9
Principles of vehicle air conditioning and heating.

**UNIT – IV COMFORT AND CONVENIENCE**
9
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**
9
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 provide knowledge about off road vehicles

Objective:
1. To understand classification and requirements of off road vehicles
2. To study earth moving machines.
3. To study about scrappers, graders, shovels and ditchers
4. To understand farm equipments, military and combat vehicles
5. To understand vehicle braking and suspension systems.

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

Dr.K.G.MUTHURAJAN  Prof.K.V.KRISHNASASTRY  Prof.T.RAJA  Prof.S.LOGANATHAN
REFERENCE

Aim: To make the students to understand the instruments involved in measurement of various automotive parameters.

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

UNIT I LINEAR AND ANGULAR MEASUREMENTS
Errors in measurement & calibraiion - 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
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
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

UNIT V LOAD AND TORQUE MEASUREMENT

TOTAL : 45
DEPARTMENT OF AUTOMOBILE ENGINEERING

TEXT BOOKS


REFERENCE


Dr.K.G.MUTHURAJAN Prof.K.V.KRISHNASASTRY Prof.T.RAJA Prof.S.LOGANATHAN
# DEPARTMENT OF AUTOMOBILE ENGINEERING

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**Aim**: To familiarize the students in stability and vehicle dynamics.

**Objective**:
1. To know the concepts of mechanical vibrating systems.
2. To know about multi degree freedom systems.
3. To understand stability of vehicles.
4. To know suspension and tyre related vibrations.
5. To study approximate methods for determining fundamental frequency.

## UNIT I INTRODUCTION

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

Closed and coupled far system, orthogonality of mode shapes, modal analysis.

## UNIT III STABILITY OF VEHICLES

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

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

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 familiarize the students with the fundamentals of automobile air conditioning, heating systems, refrigerants, trouble shooting and service.

Objective : 1. To know the concepts of Air conditioning and heating.
2. To understand air-conditioner heating system.
3. To know about conventional and modern refrigerants for automobiles.
4. To understand air routing and temperature control.
5. To know about air control, handling, trouble shooting and servicing.

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 AIRCONDITIONER – 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

Dr.K.G.MUTHURAJAN Prof.K.V.KRISHNASASTRY Prof.T.RAJA Prof.S.LOGANATHAN
TEXT BOOKS


REFERENCE

### Aim:
To provide knowledge about tractors and farm equipments.

### Objective:
1. To understand the general design of tractors.
2. To know control of the tractors and fundamentals of engine operation.
3. To study engine frame work and valve mechanism of tractor.
4. To study cooling system, lubrication system and fuel system of tractors.
5. To know about farm equipments.

### UNIT I: GENERAL DESIGN OF TRACTORS
- Classification of tractors
- Main components of tractor
- Safety rules

### UNIT II: CONTROL 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

### UNIT V: FARM EQUIPMENTS
- Working attachment of tractors
- Farm equipments
- Classification
- Auxiliary equipment
- Trailers and body tipping mechanism

### TOTAL: 45

### TEXT BOOKS

### REFERENCE BOOKS
1. Kolchin A., an dV.Demidov, Design of Automotive Engines for Tractor
2. MIR publisher, 1972.
**DEPARTMENT OF AUTOMOBILE ENGINEERING**

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**Aim**: To provide knowledge about tractors and farm equipments.

**Objective**:  
1. To understand the general design of tractors.  
2. To know control of the tractors and fundamentals of engine operation.  
3. To study engine frame work and valve mechanism of tractor.  
4. To study cooling system, lubrication system and fuel system of tractors.  
5. To know about farm equipments.

**UNIT I   INTRODUCTION**

**UNIT II     AERODYNAMIC DRAG OF CABS**

**UNIT III     SHAPE OPTIMIZATION OF CABS**
Front and modification – front and rear 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**

*Dr.K.G.MUTHURAJAN  Prof.K.V.KRISHNASASTRY  Prof.T.RAJA  Prof.S.LOGANATHAN*
TEXT BOOKS

REFERENCE
3. Vehicle Aerodynamics, SP -1145, SAE, 1996
Aim: To study combustion of fuels, thermodynamics and kinetics.

Objective:
1. To study air-fuel combustion.
2. To understand thermo-chemistry of fuel combustion
3. To understand kinetics of fuel combustion
4. To study fuel combustion in SI and CI engines
5. To study laminar and turbulent flame combustion

UNIT I COMBUSTION OF FUELS
Combustion equations, Theoretical air, excess air, air fuel 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 complex reactions, chain reactions, Arrhenius rate equation, Collection theory, activated complex theory, Explosive and general oxidative characteristics of fueled.

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

Dr.K.G.MUTHURAJAN  Prof.K.V.KRISHNASASTRY  Prof.T.RAJA  Prof.S.LOGANATHAN
TEXT BOOKS


REFERENCE

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

**Aim**: To introduce the technology of fuel cells and to familiarize with the developmental challenges in fuel cell technology.

**Objective**: 1. To understand the basic principles involved fuel cell operation.  
2. To have knowledge of electrode kinetics.  
3. To design simple fuel cell systems like alkaline fuel cell.  
4. To get exposed to solid oxide fuel cell.  
5. To understand methanol and proton exchange fuel cell.

**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**


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

*Proton Exchange Membrane Fuel Cells*: Operating principle – Technology

Dr.K.G.MUTHURAJAN Prof.K.V.KRISHNASASTRY Prof.T.RAJA Prof.S.LOGANATHAN
development – Fuel processing – Modeling studies – Technology development and applications.

TOTAL : 45

TEXT BOOKS

REFERENCE

Aim: To develop the ability to understand the advanced manufacturing techniques evolved in manufacturing automobiles.

Objective:
1. To study advanced techniques in casting in powder metallurgy.
2. To understand recent developments in forming process.
3. To understand manufacturing of gears.
4. To know about Programming of CNC machines.
5. To study the recent trends in manufacturing of auto 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 study about the rubber and plastic components of automobiles.

Objective:
1. To understand selection of rubber materials for automobiles.
2. To study the properties of rubber.
3. To study the role of rubber in vibration isolation.
4. To study the role of rubber in fluid sealing and flexible coupling.
5. To understand rubber compounding and manufacture.

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, stabilility, 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 provide knowledge about computer simulation of IC Engines Process.

Objective:
1. To study fundamental of combustion of C/H/O/N system.
2. To simulate SI engine combustion with air as working medium.
3. To simulate progressive combustion with fuel-air as medium.
4. To simulate two stroke and four stroke engine combustion.
5. To simulate CI engine combustion.

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 understand modern engine control and safety in transportation

Objective:
1. To study speed control and role of sensors
2. To understand ignition control and knock control
3. To study vehicle handling and ride characteristics of road vehicles
4. To understand intelligent transportation system
5. To study vision enhancement and anti-lock braking system

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 - Lambda 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 provide knowledge and good exposure to Automotive safety aspects including safety equipments.

Objective : 1. To study safety of body and passenger.
2. To understand safety concepts.
3. To understand safety equipments.
4. To know about collision warning and avoidance system.
5. To study about comfort and convenience system.

UNIT I TRENDS IN POWER PLANTS

UNIT II SUSPENSION BRAKES AND SAFETY

UNIT III NOISE & POLLUTION
Reduction of noise – internal & external pollution control through alternate fuels / power plants – Catalytic converters and filters for particulate emission.

UNIT IV 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 fo the vehicle like optimum speed and direction.

UNIT V 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.

TOTAL : 45

TEXT BOOKS
2. ARAI safety Standards

REFERENCE BOOKS
Objectives:

1. To find maximum or minimum of an expression subjected to given constraints
2. To minimize the cost of transporting items from various sources to different destinations
3. To carry out most economical way with less time consumption for a project
4. To learn different types of inventory models
5. To select the best among several decisions through a proper evaluation of the parameters of each decision environment

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

TUTORIAL HOURS : 15
TOTAL HOURS : 60

TEXT BOOK

REFERENCES:
Objectives:

1. To understand the basics of governing equations and boundary conditions
2. To gain knowledge about finite difference method
3. To enable student to learn about FVM – Diffusion.
4. To gain knowledge about FVM-Convection diffusion.

UNIT I GOVERNING EQUATIONS AND BOUNDARY CONDITIONS 12

UNIT II FINITE DIFFERENCE METHOD 12

UNIT III FINITE VOLUME METHOD (FVM) FOR DIFFUSION 12
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
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
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-с) 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.
At the end of this elective, student shall be able to:
1. Get an exposure to the Aerospace Industry.
2. 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 an Aeroplane 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
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At the end of this elective, student shall be able to:
1. Industry Practices on Design of Aircraft Structures.
2. Understand the applicability of Design aspects in Aircraft Design.
3. Relate the theoretical knowledge with the design of Aircraft Structures.

**Chapter-1-Overview of the Aircraft Design Process, Duration- 2hrs**


**Chapter 2-Fundamentals of Structural Analysis, Duration 2 hrs**

Review of Hooke’s Law, Principal stresses, Equilibrium and Compatibility, Determinate Structures, St Venant’s Principle, Conservation of Energy, Stress Transformation, Stress Strain Relations

**Chapter 3-Introduction to Aircraft Structures, Duration 3 hrs**

Types of Structural members of Fuselage and wing section Ribs, Spars, Frames, Stringers, Longeron, Splices, Sectional Properties of structural members and their loads, Types of structural joints, Type of Loads on structural joints

**Chapter-4 Aircraft Loads, Duration- 4 hrs**

Aerodynamic Loads, Inertial Loads, Loads due to engine, Actuator Loads, Maneuver Loads, VN diagrams, Gust Loads, Ground Loads, Ground conditions, Miscellaneous Loads

**Chapter-5-Aircraft Materials and Manufacturing processes Duration- 4 hrs**


**Chapter-6-Structural Analysis of Aircraft Structures Duration-20**

Theory of Plates- Analysis of plates for bending, stresses due to bending, Plate deflection under different end conditions, Strain energy due to bending of circular, rectangular plates, Plate buckling, Compression buckling, shear buckling, Buckling due to in plane bending moments, Analysis of stiffened panels in buckling, Rectangular plate buckling, Analysis of Stiffened panels in Post buckling, Post buckling under shear.

**Sample Exercises.**

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**DEPARTMENT OF AUTOMOBILE ENGINEERING**

Theory of Shells-Analysis of Shell Panels for Buckling, Compression loading, Shear Loading / Shell Shear Factor, Circumferential Buckling Stress, **sample exercises**

Theory of Beams-Symmetric Beams in Pure Bending, Deflection of beams, Unsymmetrical Beams in Bending, Plastic Bending of beams,Shear Stresses due to Bending in Thin Walled Beams, Bending of Open Section Beams, Bending of Closed Section Beams, Shear Stresses due to Torsion in Thin Walled Beams. **Sample Exercises.**

Theory of Torsion - Shafts of Non-Circular Sections, Torsion in Closed Section Beams, Torsion in Open Section Beams, Multi Cell Sections, **Sample Exercises.**

**Chapter-7 Airworthiness and Aircraft Certification, Duration- 4 hrs**
Definition, Airworthiness Regulations, Regulatory Bodies, Type certification, General Requirements, Requirements Related to Aircraft Design Covers, Performance and Flight Requirements, Airframe Requirements, Landing Requirements, Fatigue and Failsafe requirements, Emergency Provisions, Emergency Landing requirements

**Chapter-8 Aircraft Structural Repair, Duration- 3 hrs**
Types of Structural damage, Nonconformance, Rework, Repair, Allowable damage Limit, Repairable Damage Limit, Overview of ADL Analysis, Types of Repair, Repair Considerations and best practices

**REFERENCE BOOKS:**

Dr.K.G.MUTHURAJAN  Prof.K.V.KRISHNASASTRY  Prof.T.RAJA  Prof.S.LOGANATHAN
Objective:

1. To understand the various deformation mechanisms, failure modes and phase diagram.
2. To learn heat treatment methodologies and mechanical treatment methodologies.
3. To understand the classification, properties and application of various engineering materials.
4. To understand the various forms of corrosion, protection methods.
5. To understand the basic concepts in powder metallurgy, composite materials and working of SEM.

UNIT I BEHAVIOR OF MATERIALS

Introduction to plastic deformation - Slip and twinning – Types of fracture-brittle, ductile, creep & fatigue. Phase diagrams- Iron – Iron carbide equilibrium diagram-TTT & CCT curve

UNIT II MATERIAL TREATMENT

Heat treatment- annealing, Normalizing- hardening and Tempering, Case hardening, Hardenability - Jominy end quench test
Mechanical Treatment-strengthening mechanisms-strain hardening, solid solution hardening, grain size reduction

UNIT III METALLIC & NON-METALLIC MATERIALS


UNIT IV CORROSION

Introduction- forms of corrosion-pitting, intergranular, stress corrosion, corrosion fatigue, dezincification, erosion-corrosion, Crevice Corrosion, Fretting-Protection methods-PVD, CVD.

UNIT V ADVANCED MATERIALS & CHARACTERIZATION

Powder metallurgy -Manufacturing-compaction-sintering-applications
Composites-MMC, PMC, CMC-properties & applications
SEM-working principle, set-up, sample preparation method-evaluation mode-EDAX

TOTAL HOURS :45

Dr.K.G.MUTHURAJAN  Prof.K.V.KRISHNASASTRY  Prof.T.RAJA  Prof.S.LOGANATHAN
TEXT BOOKS

REFERENCE BOOKS
2. George E.Dieter, “Mechanical Metallurgy”
Aim: To provide knowledge and good exposure to work study and process planning.

Objective:
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.

1. WORK STUDY AND ERGONOMICS

2. PROCESS PLANNING
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

4. ELEMENTS OF COST

5. PRODUCTION COST ESTIMATION

TOTAL HOURS: 45

TEXT BOOKS
REFERENCES

Objectives:
1. To gain knowledge about surfaces and to study the different types of friction in materials.
2. To gain knowledge in wear mechanisms, types of wear for different environment and materials.
3. To study the properties of fluid film for bearing applications.
4. To have a theoretical understanding of the film lubrication theory.
5. To learn the various ways of modifying the surface of the materials for bearing.

UNIT I SURFACES AND FRICTION

UNIT II WEAR

UNIT III LUBRICANTS AND LUBRICATION TYPES

UNIT IV FILM LUBRICATION THEORY
Fluid film in simple shear - Viscous flow between very close parallel plates - Shear stress variation Reynolds Equation for film Lubrication - High speed unloaded journal bearings - Loaded journal bearings – Reaction torque on the bearings - Virtual Co-efficient of friction - The Sommerfield diagram/.

UNIT V SURFACE ENGINEERING AND MATERIALS FOR BEARINGS

TOTALHOURS : 45

Dr.K.G.MUTHURAJAN Prof.K.V.KRISHNASASTRY Prof.T.RAJA Prof.S.LOGANATHAN
TEXT BOOK:

REFERENCES:
Objectives:
1. To learn the basics about Robotics and Robot anatomy
2. To study the drives and end effectors used in robotics
3. To learn the Sensors and machine vision for robotic applications
4. To learn about Robot kinematics and programming
5. To understand about Robot cell designss, applications and economics

UNIT I  FUNDAMENTALS OF ROBOT 7


UNIT II  ROBOT DRIVE SYSTEMS AND END EFFECTORS 10


UNIT III  ROBOT SENSORS AND MACHINE VISION 9


UNIT IV  ROBOT KINEMATICS AND ROBOT PROGRAMMING 10

Forward Kinematics, Inverse Kinematics and Differences; Forward Kinematics and Reverse Kinematics of Manipulators with Two, Three Degrees of Freedom (In 2 Dimensional), Four Degrees of Freedom (In 3 Dimensional) – Derivations and Problems. Teach Pendant Programming, Lead through programming, Robot programming Languages – VAL Programming – Motion Commands, Sensor Commands, End Effectors commands and simple programs.

UNIT V  CELL DESIGN APPLICATIONS AND ECONOMICS OF ROBOTICS 9

**TOTAL HOURS**: 45

**Text Books:**

**Reference Books:**
Objective:
1. To understand the basics of Finite element techniques and 1D element equation formulation
2. To gain knowledge about 2D problems in structural and Thermal
3. To enable student to learn about Natural coordinates and Iso-Parametric Elements
4. To understand about Elasticity concepts and Virtual work
5. To study about dynamic analysis

UNIT I 1D FINITE ELEMENT ANALYSIS

UNIT II FEA OF 2D PROBLEMS

UNIT III ISO PARAMETRIC FORMULATION

UNIT IV SOLUTION TO PLANE ELASTICITY PROBLEMS
Introduction to Theory of Elasticity – Plane Stress – Plane Strain and Axisymmetric Formulation – Principle of virtual work – Element matrices using energy approach

UNIT V: DYNAMIC ANALYSIS

Tutorial Hours: 15
Total Hours: 60
TEXT BOOKS:

REFERENCE BOOKS:
Objectives:
1. To understand the importance of entrepreneurship for engineering students.
2. To inculcate entrepreneurship skills for engineering students.
3. To train in preparing the project report and IPR
4. To understand the importance of finance and its transactions.
5. To develop the skills to take corrective measures of consequences of business sickness and plan for growth

UNIT I ENTREPRENEURSHIP


UNIT 2 MOTIVATION


UNIT 3 BUSINESS AND ENTERPRISE MANAGEMENT


UNIT 4 FINANCIAL MANAGEMENT

Need and objectives of financial management for engineers-Sources of Finance- Term Loans- Capital structure- Financial Institutions- Management of working capital- Costing - Break Even Analysis- Managerial uses of Breakeven analysis-Network analysis Techniques –Problems on PERT &CPM – Taxation

UNIT 5 BUSINESS SICKNESS AND GROWTH STRATEGIES


TOTAL HOURS : 45
TEXT BOOKS:

REFERENCES:
1. EDII - “A manual for Entrepreneurs”- Entrepreneurship Development Institute of India, Ahmedabad- Tata McGrawHill-2006...
AIM
To study the critical need for ensuring Information Security in Organizations

OBJECTIVES
1. To understand the basics of Information Security
2. To know the legal, ethical and professional issues in Information Security
3. To know the aspects of risk management
4. To become aware of various standards in this area
5. To know the technological aspects of Information Security

UNIT 1 INTRODUCTION

UNIT II SECURITY INVESTIGATION
Need for Security, Business Needs, Threats, Attacks, Legal, Ethical and Professional Issues

UNIT III SECURITY ANALYSIS
Risk Management: Identifying and Assessing Risk, Assessing and Controlling Risk

UNIT IV LOGICAL DESIGN

UNIT V PHYSICAL DESIGN

TOTAL : 45

TEXT BOOK

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REFERENCES