Vision and Mission of Automobile Engineering

The vision of the Department of Automobile engineering is

“To be a premier department in Automobile engineering and reach the highest academic level in the field of Automobile Engineering by imparting knowledge, continuously enhancing Research & Development activities, supporting industries through consultancy programme and providing the nation with high quality engineers”

The mission of the Department of Automobile engineering is

1. To prepare students excel in their chosen professions by offering high quality education in automobile engineering with fundamental knowledge, interdisciplinary problem solving skills and confidence required.
2. To provide supportive and diverse environment that encourage students to achieve the best of their abilities to be innovators or job providers.
3. To maintain constant and active partnership with industries for technology development and transfer through consultancy projects.

PROGRAMME EDUCATIONAL OBJECTIVES (PEOs) :

Students will

PEO 1: Excel in their professional career in automobile industry.

PEO 2: Exhibit research with highest professional and ethical standards.

PEO 3: Acquire knowledge in basics of automobile engineering to apply in growth of the industry.

PEO 4: Showcase professionalism, team work in their chosen profession

PEO 5: Update themselves to recent trends, technologies and industrial scenarios by pursuing lifelong learning.
PROGRAMME OUTCOMES (POs):

Engineering Graduates will be able to:

1. **Engineering knowledge**: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.

2. **Problem analysis**: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.

3. **Design/development of solutions**: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.

4. **Conduct investigations of complex problems**: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.

5. **Modern tool usage**: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modelling to complex engineering activities with an understanding of the limitations.

6. **The engineer and society**: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.

7. **Environment and sustainability**: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.

8. **Ethics**: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.

9. **Individual and team work**: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

10. **Communication**: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
11. **Project management and finance**: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one’s own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.

12. **Life-long learning**: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

**CORRELATION BETWEEN POs AND PEOs**

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<th>Sl. No.</th>
<th>Programme Outcomes (POs)</th>
<th>Programme Educational Objectives</th>
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Program Specific Outcomes (PSOs):

PSO 1: The graduate will be able to apply mathematical, scientific, engineering concepts to deliver environmentally friendly and workable products in the automotive engineering domain as a part of a multidisciplinary team using modern tools.

PSO 2: The graduate will be able to undertake a successful engineering career, higher studies, research, entrepreneur through lifelong learning and maintaining professional ethics.
# Mapping of Course Outcomes with Programme Outcomes (POs) and Program Specific Outcomes (PSOs)

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ANNA UNIVERSITY, CHENNAI
UNIVERSITY DEPARTMENTS
B.E. AUTOMOBILE ENGINEERING
REGULATIONS – 2015
CHOICE BASED CREDIT SYSTEM
CURRICULA AND SYLLABI I - VIII SEMESTERS

SEMESTER I

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8. Non Credit / Mandatory
COURSE DESCRIPTION:
- This course aims at developing the language skills necessary for the first year students of Engineering and Technology.

OBJECTIVES:
- To develop the four language skills – Listening, Speaking, Reading and Writing.
- To improve the students’ communicative competence in English.
- To teach students the various aspects of English language usage.

CONTENTS

UNIT I  GREETING AND INTRODUCING ONESELF  12
Listening – Types of listening – Listening to short talks, conversations; Speaking – Speaking about one’s place, important festivals etc. – Introducing oneself, one’s family/friend; Reading – Skimming a passage – Scanning for specific information; Writing – Guided writing – Free writing on any given topic (My favourite place/Hobbies/School life, writing about one’s leisure time activities, hometown, etc.); Grammar – Tenses (present and present continuous) – Question types – Regular and irregular verbs; Vocabulary – Synonyms and Antonyms.

UNIT II  GIVING INSTRUCTIONS AND DIRECTIONS  12
Listening – Listening and responding to instructions; Speaking – Telephone etiquette – Giving oral instructions – Describing a process – Asking and answering questions; Reading – Reading and finding key information in a given text – Critical reading; Writing – Process description (non-technical); Grammar – Tense (simple past & past continuous) – Use of imperatives – Subject – verb agreement – Active and passive voice; Vocabulary – Compound words – Word formation – Word expansion (root words).

UNIT III  READING AND UNDERSTANDING VISUAL MATERIAL  12
Listening – Listening to lectures/talks and completing a task; Speaking – Role play/ Simulation – Group interaction; Reading – Reading and interpreting visual material; Writing – Jumbled sentences – Discourse markers and Cohesive devices – Essay writing (cause & effect/narrative); Grammar – Tenses (perfect), Conditional clauses – Modal verbs; Vocabulary – Cause and effect words; Phrasal verbs in context.

UNIT IV  CRITICAL READING AND WRITING  12
Listening – Watching videos/documentaries and responding to questions based on them; Speaking – Informal and formal conversation; Reading – Critical reading (prediction & inference); Writing – Essay writing (compare & contrast/analytical) – Interpretation of visual materials; Grammar – Tenses (future time reference); Vocabulary – One word substitutes (with meanings) – Use of abbreviations & acronyms – Idioms in sentences.

UNIT V  LETTER WRITING AND SENDING E-MAILS  12
Listening – Listening to programmes/broadcast/telecast/podcast; Speaking – Giving impromptu talks, Making presentations on given topics – Discussion on the presentation; Reading – Extensive reading; Writing – Poster making – Letter writing (Formal and E-mail); Grammar – Direct and Indirect speech – Combining sentences using connectives; Vocabulary – Collocation;

TEACHING METHODS:
Interactive sessions for the speaking module.
Use of audio – visual aids for the various listening activities.
Contextual Grammar Teaching.
EVALUATION PATTERN:
Internals – 50%
End Semester – 50%
TOTAL: 60 PERIODS

OUTCOMES:
- Students will improve their reading and writing skills
- Students will become fluent and proficient in communicative English
- Students will be able to improve their interpersonal communication

TEXT BOOK:

REFERENCES:

MA7151 MATHEMATICS – I
(Common to all branches of B.E. / B.Tech. Programmes in I Semester)

OBJECTIVES:
- The goal of this course is for students to gain proficiency in calculus computations. In calculus, we use three main tools for analyzing and describing the behavior of functions: limits, derivatives, and integrals. Students will use these tools to solve application problems in a variety of settings ranging from physics and biology to business and economics.
- To make the student acquire sound knowledge of techniques in solving ordinary differential equations that model engineering problems.
- To familiarize the student with functions of several variables. This is needed in many branches of engineering.
- To acquaint the student with mathematical tools needed in evaluating multiple integrals and their usage.

UNIT I DIFFERENTIAL CALCULUS
Representation of functions - New functions from old functions - Limit of a function - Limits at infinity - Continuity - Derivatives - Differentiation rules - Polar coordinate system - Differentiation in polar coordinates - Maxima and Minima of functions of one variable.
UNIT II FUNCTIONS OF SEVERAL VARIABLES

UNIT III INTEGRAL CALCULUS
Definite and Indefinite integrals - Substitution rule - Techniques of Integration - Integration by parts, Trigonometric integrals, Trigonometric substitutions, Integration of rational functions by partial fraction, Integration of irrational functions - Improper integrals.

UNIT IV MULTIPLE INTEGRALS

UNIT V DIFFERENTIAL EQUATIONS
Method of variation of parameters – Method of undetermined coefficients – Homogenous equation of Euler’s and Legendre’s type – System of simultaneous linear differential equations with constant coefficients.

TOTAL: 60 PERIODS

OUTCOMES:
- Understanding of the ideas of limits and continuity and an ability to calculate with them and apply them.
- Improved facility in algebraic manipulation.
- Fluency in differentiation.
- Fluency in integration using standard methods, including the ability to find an appropriate method for a given integral.
- Understanding the ideas of differential equations and facility in solving simple standard examples.

TEXT BOOKS:

REFERENCES:
OBJECTIVE:
- To introduce the concept and different ways to determine moduli of elasticity and applications.
- To instill the concept of sound, reverberation, noise cancellation, and ultrasonic generation, detection and applications
- To inculcate an idea of thermal properties of materials, heat flow through materials and quantum physics
- To promote the basic understanding of interferometers, principles and applications of lasers, optical fibers and sensors
- To establish a sound grasp of knowledge on the basics, significance and growth of single crystals

UNIT I  PROPERTIES OF MATTER  9

UNIT II  ACOUSTICS AND ULTRASONICS  9

UNIT III  THERMAL AND MODERN PHYSICS  9

UNIT IV  APPLIED OPTICS  9

UNIT V  CRYSTAL PHYSICS  9
Single crystalline, polycrystalline and amorphous materials – Single crystals: unit cell, crystal systems, Bravais lattices, ditctions and planes in a crystal, Miller indices - interplanar distance for a cubic crystal - coordination number and packing factor for SC, BCC, FCC, HCP and diamond structures - structure and significance of NaCl, CsCl, ZnS and graphite - crystal imperfections: point defects, line defects – Burger vectors, dislocations and stacking faults – Growth of single crystals: Bridgman and Czochralski methods.

TOTAL: 45 PERIODS
OUTCOME:
- The students will understand different moduli of elasticity, their determination and applications.
- The students will gain knowledge on the properties of sound, noise cancellation, and production, detection and applications of ultrasonics.
- The students will acquire sound knowledge on thermal expansion and thermal conductivity of materials. Further they will gain an idea of quantum physics.
- The students will gain knowledge on interferometers, lasers and fiber optics.
- The students will secure knowledge on the basics of crystal structures and their significance. Further they gain basic ideas of growing single crystals.

TEXT BOOKS:

REFERENCES:

CY7151 ENGINEERING CHEMISTRY L T P C 3 0 0 3

OBJECTIVES
- To develop an understanding about fundamentals of polymer chemistry.
- Brief elucidation on surface chemistry and catalysis.
- To develop sound knowledge photochemistry and spectroscopy.
- To impart basic knowledge on chemical thermodynamics.
- To understand the basic concepts of nano chemistry.

UNIT I POLYMER CHEMISTRY
Introduction: Functionality-degree of polymerization. Classification of polymers- natural and synthetic, thermoplastic and thermosetting. Types and mechanism of polymerization: addition (free radical, cationic, anionic and living); condensation and copolymerization. Properties of polymers: Tg, tacticity, molecular weight-weight average, number average and polydispersity index. Techniques of polymerization: Bulk, emulsion, solution and suspension.

UNIT II SURFACE CHEMISTRY AND CATALYSIS
UNIT III PHOTOCHEMISTRY AND SPECTROSCOPY

UNIT IV CHEMICAL THERMODYNAMICS
Second law: Entropy-entropy change for an ideal gas, reversible and irreversible processes; entropy of phase transitions; Free energy and work function: Helmholtz and Gibbs free energy functions; Criteria of spontaneity; Gibbs-Helmholtz equation; Clausius Clapeyron equation; Maxwell relations-Van’t Hoff isotherm and isochore. Chemical potential; Gibbs-Duhem equation- variation of chemical potential with temperature and pressure.

UNIT V NANOCHEMISTRY

TOTAL: 45 PERIODS

OUTCOMES
• Will be familiar with polymer chemistry, surface chemistry and catalysis.
• Will know the photochemistry, spectroscopy and chemical thermodynamics.
• Will know the fundamentals of nano chemistry.

TEXT BOOKS

REFERENCES

GE7152 ENGINEERING GRAPHICS L T P C 3 2 0 4
OBJECTIVES
• To develop in students, graphic skills for communication of concepts, ideas and design of engineering products and expose them to existing national standards related to technical drawings.
CONCEPTS AND CONVENTIONS (NOT FOR EXAMINATION)

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

UNIT I PLANE CURVES AND FREE HANDSKETCHING

Basic Geometrical constructions, Curves used in engineering practices-Conics – Construction of ellipse, parabola and hyperbola by eccentricity method – Construction of cycloid – construction of involutes of square and circle – Drawing of tangents and normals to the above curves. Visualization concepts and Free Hand sketching: Visualization principles – Representation of Three Dimensional objects – Layout of views- Free hand sketching of multiple views from pictorial views of objects

UNIT II PROJECTION OF POINTS, LINES AND PLANE SURFACES

Orthographic projection- principles-Principal planes-First angle projection-Projection of points. Projection of straight lines (only First angle projections) inclined to both the principal planes- Determination of true lengths and true inclinations by rotating line method and trapezoidal method and traces Projection of planes (polygonal and circular surfaces) inclined to both the principal planes by rotating object method.

UNIT III PROJECTION OF SOLIDS

Projection of simple solids like prisms, pyramids, cylinder, cone and truncated solids when the axis is inclined to both the principal planes by rotating object method and auxiliary plane method.

UNIT IV PROJECTION OF SECTIONED SOLIDS AND DEVELOPMENT OF SURFACES

Sectioning of solids in simple vertical position when the cutting plane is inclined to the one of the principal planes and perpendicular to the other – obtaining true shape of section. Development of lateral surfaces of simple and sectioned solids – Prisms, pyramids cylinders and cones. Development of lateral surfaces of solids with cut-outs and holes.

UNIT V ISOMETRIC AND PERSPECTIVE PROJECTIONS

Principles of isometric projection – isometric scale – Isometric projections of simple solids and truncated solids - Prisms, pyramids, cylinders, cones- combination of two solid objects in simple vertical positions and miscellaneous problems. Perspective projection of simple solids-Prisms, pyramids and cylinders by visual ray method and vanishing point method.

COMPUTER AIDED DRAFTING (DEMONSTRATION ONLY)

Introduction to drafting packages and demonstration of their use.

L=45+T=30, TOTAL: 75 PERIODS

OUTCOMES:

On Completion of the course the student will be able to

- Perform free hand sketching of basic geometrical shapes and multiple views of objects.
- Draw orthographic projections of lines, planes and solids
- Obtain development of surfaces.
- Prepare isometric and perspective views of simple solids.

TEXT BOOK:

REFERENCES:

Publication of Bureau of Indian Standards:

Special points applicable to University Examinations on Engineering Graphics:
1. There will be five questions, each of either or type covering all units of the syllabus.
2. All questions will carry equal marks of 20 each making a total of 100.
3. The answer paper shall consist of drawing sheets of A3 size only. The students will be permitted to use appropriate scale to fit solution within A3 size.
4. The examination will be conducted in appropriate sessions on the same day.

BS7161 BASIC SCIENCES LABORATORY L T P C
(Common to all branches of B.E. / B.Tech Programmes) 0 0 4 2

PHYSICS LABORATORY: (Any Seven Experiments)

OBJECTIVE:
- To inculcate experimental skills to test basic understanding of physics of materials including properties of matter, thermal and optical properties.
- To induce the students to familiarize with experimental determination of velocity of ultrasonic waves, band gap determination and viscosity of liquids.

1. Torsional pendulum - Determination of rigidity modulus of wire and moment of inertia of disc
2. Non-uniform bending - Determination of young’s modulus
3. Uniform bending – Determination of young’s modulus
4. Lee’s disc Determination of thermal conductivity of a bad conductor
5. Potentiometer-Determination of thermo e.m.f of a thermocouple
6. Laser- Determination of the wave length of the laser using grating
7. Air wedge - Determination of thickness of a thin sheet/wire
8. a) Optical fibre -Determination of Numerical Aperture and acceptance angle
b) Compact disc- Determination of width of the groove using laser.
10. Ultrasonic interferometer – determination of the velocity of sound and compressibility of liquids
11. Post office box -Determination of Band gap of a semiconductor.
13. Viscosity of liquids - Determination of co-efficient of viscosity of a liquid by Poiseuille’s flow

OUTCOME:
- To determine various moduli of elasticity and also various thermal and optical properties of materials.
- To determine the velocity of ultrasonic waves, band gap determination and viscosity of liquids.

CHEMISTRY LABORATORY:
(Minimum of 8 experiments to be conducted)
1. Estimation of HCl using Na₂CO₃ as primary standard and Determination of alkalinity in water sample.
2. Determination of total, temporary & permanent hardness of water by EDTA method.
3. Determination of DO content of water sample by Winkler’s method.
4. Determination of chloride content of water sample by argentometric method.
5. Estimation of copper content of the given solution by Iodometry.
6. Determination of strength of given hydrochloric acid using pH meter.
7. Determination of strength of acids in a mixture of acids using conductivity meter.
8. Estimation of iron content of the given solution using potentiometer.
9. Estimation of iron content of the water sample using spectrophotometer (1, 10-Phenanthroline/thiocyanate method).
10. Estimation of sodium and potassium present in water using flame photometer.
12. Pseudo first order kinetics-ester hydrolysis.
14. Determination of CMC.
15. Phase change in a solid.

TOTAL: 60 PERIODS

TEXT BOOKS

GE7162 ENGINEERING PRACTICES LABORATORY (Common to all Branches of B.E / B.Tech. Programmes) L T P C 0 0 4 2

OBJECTIVES
To provide exposure to the students with hands-on experience on various Basic Engineering Practices in Civil, Mechanical, Electrical and Electronics Engineering.

GROUP – A (CIVIL & ELECTRICAL)
1. CIVIL ENGINEERING PRACTICES

PLUMBING
Basic pipe connections involving the fittings like valves, taps, coupling, unions, reducers, elbows and other components used in household fittings. Preparation of plumbing line sketches.
- Laying pipe connection to the suction side of a pump.
- Laying pipe connection to the delivery side of a pump.
- Practice in connecting pipes of different materials: Metal, plastic and flexible pipes used in household appliances.

WOOD WORK
Sawing, planing and making joints like T-Joint, Mortise and Tenon joint and Dovetail joint.

STUDY
- Study of joints in door panels and wooden furniture
- Study of common industrial trusses using models.

2. ELECTRICAL ENGINEERING PRACTICES

- Basic household wiring using Switches, Fuse, Indicator and Lamp etc.,
- Stair case light wiring
- Tube – light wiring
- Preparation of wiring diagrams for a given situation.
- Study of Iron-Box, Fan Regulator and Emergency Lamp

GROUP – B (MECHANICAL AND ELECTRONICS)

3. MECHANICAL ENGINEERING PRACTICES

WELDING
- Arc welding of Butt Joints, Lap Joints, and Tee Joints
- Gas welding Practice.
- Basic Machining - Simple turning, drilling and tapping operations.
- Study and assembling of the following:
  - Centrifugal pump
    - Mixie
    - Air Conditioner.
  - DEMONSTRATION ON FOUNDRY OPERATIONS.

4. ELECTRONIC ENGINEERING PRACTICES

- Soldering simple electronic circuits and checking continuity.
- Assembling electronic components on a small PCB and Testing.
- Study of Telephone, FM radio and Low Voltage Power supplies.

TOTAL: 60 PERIODS

OUTCOMES
- Ability to fabricate carpentry components and to lay pipe connections including plumbing works.
- Ability to use welding equipments to join the structures
- Ability to do wiring for electrical connections and to fabricate electronics circuits.
OBJECTIVES

- To enable students acquire proficiency in technical communication.
- To enhance their reading and writing skills in a technical context.
- To teach various language learning strategies needed in a professional environment.

CONTENTS

UNIT I  ANALYTICAL READING
Listening- Listening to informal and formal conversations; Speaking – Conversation Skills (opening, turn taking, closing)- explaining how something works-describing technical functions and applications; Reading –Analytical reading, Deductive and inductive reasoning; Writing- vision statement-structuring paragraphs.

UNIT II  SUMMARISING
Listening- Listening to lectures/ talks on Science & Technology; Speaking –Summarizing/ Oral Reporting, Reading – Reading Scientific and Technical articles; Writing- Extended definition –Lab Reports – Summary writing.

UNIT III  DESCRIBING VISUAL MATERIAL
Listening- Listening to a panel discussion; Speaking – Speaking at formal situations; Reading – Reading journal articles - Speed reading; Writing-data commentary-describing visual material-writing problem-process- solution-the structure of problem-solution texts- writing critiques

UNIT IV  WRITING/ E-MAILING THE JOB APPLICATION
Listening- Listening to/ Viewing model interviews; Speaking –Speaking at different types of interviews – Role play practice (mock interview); Reading – Reading job advertisements and profile of the company concerned; Writing- job application – cover letter –Résumé preparation.

UNIT V  REPORT WRITING
Listening- Viewing a model group discussion; Speaking –Participating in a discussion - Presentation; Reading – Case study - analyse -evaluate – arrive at a solution; Writing– Recommendations- Types of reports (feasibility report)- designing and reporting surveys- – Report format.- writing discursive essays.

TEACHING METHODS:
Practice writing
Conduct model and mock interview and group discussion.
Use of audio – visual aids to facilitate understanding of various forms of technical communication.
Interactive sessions.

EVALUATION PATTERN:
Internals – 50%
End Semester – 50%

TOTAL: 60 PERIODS

OUTCOMES

- Students will learn the structure and organization of various forms of technical communication.
- Students will be able to listen and respond to technical content.
- Students will be able to use different forms of communication in their respective fields.
MA7251 MATHEMATICS - II
(Common to all branches of B.E./B.Tech. Programmes in II Semester)

OBJECTIVES:

- To develop the use of matrix algebra techniques that is needed by engineers for practical applications.
- To acquaint the student with the concepts of vector calculus, needed for problems in all engineering disciplines.
- To develop an understanding of the standard techniques of complex variable theory so as to enable the student to apply them with confidence, in application areas such as heat conduction, elasticity, fluid dynamics and flow of the electric current.
- To make the student appreciate the purpose of using transforms to create a new domain in which it is easier to handle the problem that is being investigated.

UNIT I MATRICES


UNIT II VECTOR CALCULUS

Gradient and directional derivative – Divergence and Curl – Irrotational and Solenoidal vector fields – Line integral over a plane curve – Surface integral - Area of a curved surface - Volume integral - Green’s, Gauss divergence and Stoke’s theorems – Verification and application in evaluating line, surface and volume integrals.
UNIT III  ANALYTIC FUNCTION  12
Analytic functions – Necessary and sufficient conditions for analyticity – Properties – Harmonic conjugates – Construction of analytic function – Conformal mapping – Mapping by functions \( w = z + c, \frac{1}{z}, z^2 \) - Bilinear transformation.

UNIT IV  COMPLEX INTEGRATION  12

UNIT V  LAPLACE TRANSFORMS  12

TOTAL: 60 PERIODS

OUTCOMES:
- Upon successful completion of the course, students should be able to:
  - Evaluate real and complex integrals using the Cauchy integral formula and the residue theorem
  - Appreciate how complex methods can be used to prove some important theoretical results.
  - Evaluate line, surface and volume integrals in simple coordinate systems
  - Calculate grad, div and curl in Cartesian and other simple coordinate systems, and establish identities connecting these quantities
  - Use Gauss, Stokes and Greens theorems to simplify calculations of integrals and prove simple results.

TEXT BOOKS:

REFERENCES:
OBJECTIVE

• To learn programming using a structured programming language.
• To provide C programming exposure.
• To introduce foundational concepts of computer programming to students of different branches of Engineering and Technology.

UNIT I INTRODUCTION

Introduction to Computers – Computer Software – Computer Networks and Internet - Need for logical thinking – Problem formulation and development of simple programs - Pseudo code - Flow Chart and Algorithms.

UNIT II C PROGRAMMING BASICS


UNIT III ARRAYS AND STRINGS


UNIT IV POINTERS

Macros - Storage classes –Basic concepts of Pointers– Pointer arithmetic - Example Problems - Basic file operations

UNIT V FUNCTIONS AND USER DEFINED DATA TYPES


TOTAL : 45 PERIODS

OUTCOMES

At the end of the course, the student should be able to:

• Write C program for simple applications
• Formulate algorithm for simple problems
• Analyze different data types and arrays
• Perform simple search and sort.
• Use programming language to solve problems.

TEXT BOOKS:


REFERENCES:

OBJECTIVE:
- To impart knowledge on the basics of binary phase diagrams and their applications
- To learn the phase diagram, effect of alloying elements and various transformations in the Fe-C system, and also the heat treatment of steels.
- To introduce various strengthening methods of materials, and also various mechanical properties and their measurement
- To instill the types, properties and applications of magnetic, dielectric and superconducting materials.
- To introduce the preparation, properties and applications of various new materials.

UNIT I PHASE DIAGRAMS
Solid solutions - Hume Rothery's rules - The phase rule - single component system - one-component system of iron - binary phase diagrams - isomorphous systems - the tie-line rule - the lever rule - application to isomorphous system - eutectic phase diagram - peritectic phase diagram - other invariant reactions – free energy composition curves for binary systems - microstructural change during cooling.

UNIT II FERROUS ALLOYS AND HEAT TREATMENT

UNIT III MECHANICAL PROPERTIES

UNIT IV MAGNETIC, DIELECTRIC AND SUPERCONDUCTING MATERIALS

UNIT V NEW MATERIALS

TOTAL: 45 PERIODS
OUTCOME:
Upon completion of this course, the students will
- gain knowledge on the basics of binary phase diagrams and the use of lever rule
- learn about the Fe-C phase diagram, effect of alloying elements, TTT in the Fe-C system, and also the heat treatment of steels.
- understand the significance of dislocations, strengthening mechanisms, and tensile, creep, hardness and fracture behavior of materials
- acquire knowledge on the types, properties and applications of magnetic, dielectric and superconducting materials.
- get adequate understanding on the preparation, properties and applications of ceramics, composites, metallic glasses, shape-memory alloys and nanomaterials.

TEXT BOOKS:

REFERENCES:

GE7153 ENGINEERING MECHANICS

OBJECTIVE:
The objective of this course is to inculcate in the student the ability to analyze any problem in a simple and logical manner and to predict the physical phenomena and thus lay the foundation for engineering applications.

UNIT I STATICS OF PARTICLES

UNIT II EQUILIBRIUM OF RIGID BODIES
UNIT III DISTRIBUTED FORCES

Centroids of lines and areas – symmetrical and unsymmetrical shapes. Determination of Centroids by Integration , Theorems of Pappus-Guldinus, Distributed Loads on Beams, Center of Gravity of a Three-Dimensional Body, Centroid of a Volume, Composite Bodies , Determination of Centroids of Volumes by Integration.

Moments of Inertia of Areas and Mass - Determination of the Moment of Inertia of an Area by Integration , Polar Moment of Inertia , Radius of Gyration of an Area , Parallel-Axis Theorem , Moments of Inertia of Composite Areas, Moments of Inertia of a Mass - Moments of Inertia of Thin Plates , Determination of the Moment of Inertia of a Three-Dimensional Body by Integration.

UNIT IV FRICTION


UNIT V DYNAMICS OF PARTICLES


L – 45 + T – 15 TOTAL: 60 PERIODS

OUTCOME:
- Upon completion of this course, students will be able to construct meaningful mathematical models of physical problems and solve them.

TEXT BOOK

REFERENCES

PR7251 PRODUCTION PROCESSES L T P C
(Common to Aero/Auto/Rubber and Plastics) 3 0 0 3

OBJECTIVES:
- To impart the knowledge about the various production processes available
- To expose the student on the principle and applications of the processes
- To make a decision on a relevant process based on the merits and demerits.
UNIT I CASTING PROCESSES

UNIT II METAL FORMING PROCESSES

UNIT III MACHINING PROCESSES
Machine and machine tool – construction, types operations in the following machines with block diagrams – Lathe, Milling, Drilling and Grinding – Concept of NC/CNC machines – Comparison of CNC with conventional machines – sample manual part programming for CNC Lathe and milling.

UNIT IV WELDING PROCESSES

UNIT V UNCONVENTIONAL MACHINING PROCESSES
Need for unconventional – Construction, working principle merits, demerits and applications with block diagram only for AJM, AWJM, USM, CHM, ECM, EDM, EBM, LBM, PAM and IBM.

TOTAL: 45 PERIODS

OUTCOMES:
- Has enough knowledge on the various process available to make a part.
- Confident to select the process to based on cost of time and quantities.
- Can determine processes for new materials.

TEXT BOOKS
1. Serope Kalpakjian, Steven R. Schmid, Manufacturing Engineering and Technology - Anna University, 4/e, Pearson Education, 2014

REFERENCES:
OBJECTIVES

- To understand the basic programming constructs and articulate how they are used to develop a program with a desired runtime execution flow.
- To articulate where computer programs fit in the provision of computer-based solutions to real world problems.
- To learn to use user defined data structures.

LIST OF EXPERIMENTS

1. Search, generate, manipulate data using MS office/Open Office
2. Presentation and Visualization – graphs, charts, 2D, 3D
3. Problem formulation, Problem Solving and Flowcharts
4. C Programming using Simple statements and expressions
5. Scientific problem solving using decision making and looping.
6. Simple programming for one dimensional and two dimensional arrays.
7. Solving problems using String functions
8. Programs with user defined functions
9. Program using Recursive Function
10. Program using structures and unions.

TOTAL: 60 PERIODS

OUTCOMES

At the end of the course, the student should be able to:

- Write and compile programs using C programs.
- Write program with the concept of Structured Programming
- Identify suitable data structure for solving a problem
- Demonstrate the use of conditional statement.

LABORATORY REQUIREMENTS FOR BATCH OF 30 STUDENTS

30 Systems with C compiler

OBJECTIVES:

- To get hands on experience in the machines for production
- To prepare the process planning sheets for all the operations and then follow the sequence during the machining processes.

LIST OF EXPERIMENTS:

1. Study of all the machining tools- identification of parts/mechanisms and position of tool and work piece.
2. Facing, plain turning/step turning operations in Lathe.
3. Taper Turning/Threading and knurling operations in Lathe.
5. Machining to make a cube using shaper
6. Machining to make a V-block using shaper.
7. Counter sinking, counter Boring and Tapping operations in a drilling machine.
8. Surfacing/pocket milling in a vertical milling machine.
9. Polygonal shape milling in a horizontal milling machine
10. Flat surface grinding and cylindrical grinding operations
11. Machining an internal spline in slotting machine.
12. To machine the given part drawing using Lathe and milling machines.

**TOTAL: 60 PERIODS**

**OUTCOME:**
- Enough experience to operate machines and processes commonly used in production of components.
- Enable interpretation of process plan sheets to be followed for machining of products.

**AE7352 MECHANICS OF SOLIDS**

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**OBJECTIVES**
- The objective of this course is to make the students understand the concepts of stress and strain and their relationships by analysis of solids and structures, to analyze determinate and indeterminate axial members, torsional members, and beams, in order to determine axial forces, torque, shear forces, bending moments, stresses, and deflections.

**UNIT I STRESS-STRAIN – AXIAL LOADING**
- Definition of stress and strain - Stress-Strain relation - Relation between material constants - Bar under axial loading - Statically determinate and indeterminate cases - Thermal stress - Impact Loading

**UNIT II STRESSES IN BEAMS**
- Types of beams and loadings - Relation between shear force and bending moment - Shear force and bending moment diagrams - Euler beam theory - Bending stress in beams - Shear stress in beam - Composite beam.

**UNIT III DEFLECTION OF BEAM**

**UNIT IV TORSION AND SPRINGS**
- Shear stress and twist relation for circular section - Comparison of hollow shaft and solid shaft - Compound shaft - Power transmission by circular shafts - Springs - Deflection expression for close coiled helical spring - Stress in springs.

**UNIT V BIAXIAL STRESS**
- Thin walled cylinder under internal pressure - Principal stresses for general biaxial stress field - Mohr’s circle - Stresses in combined loading

**OUTCOMES**
At the end of the course, the students are expected to
- Know about how a solid (materials, structures) behaves when it is exposed to forces and deformations.
- Apply the fundamental concepts of principle of superposition, equilibrium, compatibility, force-deformation, and stress-strain relationships to the solid and structural mechanics problems
- Analyze determinate and indeterminate bars, beams, to determine axial forces, torques, shear forces, and bending moments
- Have physical insight into distribution of stresses and strains in structural members
- Identify the biaxial stresses in acting in a body or an element.
TEXT BOOKS:

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OBJECTIVE
- To impart basic knowledge on IC engines and its types and to develop the knowledge on various additional systems which are helps to improve the engine characteristics. Also to give through knowledge on complete construction and working details of petrol engine and its different accessories.

UNIT I ENGINE CONSTRUCTION AND WORKING

UNIT II FUEL AND IGNITION SYSTEM
- Carburetor – requirements, working principle, types, different circuits – Compensation & Maximum power devices – Petrol injection in SI engines, Magneto coil and battery coil spark ignition system. Advance mechanism. Electronic ignition System – CDI.

UNIT III COOLING AND LUBRICATION SYSTEM

UNIT IV COMBUSTION AND COMBUSTION CHAMBERS
UNIT V   TWO STROKE ENGINES

Two stroke engine – types, terminologies, definitions, construction and operation. Comparison of four stroke and two stroke engine operation. Theoretical scavenging processes. Merits and demerits, scavenging efficiency, Scavenging pumps, Rotary valve engine.

TOTAL : 45 PERIODS

OUTCOMES

Student can able to,

CO1: Understand various components of petrol engines and its sub systems.
CO2: Understand and analyse actual engine working principle and its related components
CO3: Design critical systems like ignition and injection systems
CO4: Design other systems like cooling and lubrication systems
CO5: Understand advanced knowledge on petrol combustion and its related parameters

TEXT BOOKS


REFERENCES


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AU7302      THERMODYNAMICS AND THERMAL ENGINEERING      L T P C

OBJECTIVE:

- The objective of this course is to introduce the basic principles of thermodynamics and thermal engineering via real world engineering examples, to show students how thermodynamics is applied in engineering practice.
UNIT I   BASIC THERMODYNAMICS

UNIT II  AIR STANDARD CYCLES AND COMPRESSORS
Otto, Diesel, Dual combustion and Brayton cycles. Air standard efficiency. Mean effective pressure. Compressors, Classifications of compressors, Single stage and multi stage, Effect of intercooler in multi stage compressor, Perfect and imperfect intercooler, work done by the compressor, Reciprocating, Rotary, Axial, Vane compressors.

UNIT III STEAM AND JET PROPULSION
Properties of steam, Dryness fraction, Quality of steam by steam tables and Mollier chart – Rankine cycle, Work done, Steam rate – Steam Nozzles, Types of nozzles, Friction in nozzles - Simple jet propulsion system – Thrust rocket motor – Specific impulse.

UNIT IV  REFRIGERATION AND AIR-CONDITIONING
Principles of refrigeration, Vapor compression – Vapor absorption types, comparison - Co-efficient of performance (COP), Properties of refrigerants – Basic Principle, Summer, winter and Year round Air conditioning.

UNIT V  HEAT AND MASS TRANSFER

TOTAL: 60 PERIODS
(Use of standard Steam tables with mollier chart and Refrigerant tables are permitted)

OUTCOMES:
CO1: Demonstrate a basic understanding of the nature of the thermodynamics process for pure substances
CO2: Interpret First law of Thermodynamics and its application to systems and control volumes.
CO3: Solve any problem in an engineering approach based on basic concepts and logic sequences
CO4: compare and contrast refrigeration cycles and the air conditioning systems
CO5: evaluate basics of heat transfer and its necessary applications

TEXT BOOKS:

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EI7306 ELECTRICAL AND ELECTRONICS ENGINEERING  
L T P C  
3 0 0 3

OBJECTIVES
- Gain knowledge on network theorems.
- Understand the basics of AC circuits and the terms related to AC circuits.
- Gain knowledge on construction and working principle of AC and DC machines.
- Get exposed to basic electronic devices and their applications.
- Gain knowledge on logic gates and their applications in digital electronics.

UNIT I BASIC CONCEPTS AND D.C. CIRCUIT ANALYSIS

UNIT II A.C. CIRCUITS
Sinusoidal voltage and current-RMS and average value of periodic waves - Form factor - Phase and Phase difference – Simple RC,RL and RLC circuits - series and parallel resonance - power and power factor – introduction to three phase systems – power measurement in 3 phase system.

UNIT III ELECTRICAL MACHINES

UNIT IV ANALOG ELECTRONICS

UNIT V DIGITAL ELECTRONICS
Number systems – binary codes - logic gates - Boolean algebra, laws & theorems - simplification of Boolean expression - implementation of Boolean expressions using logic gates - standard forms
of Boolean expression-Combinational circuits- Design of adder, subtractor, encoders, decoders, multiplexers and demultiplexers-Flip flops.

TOTAL : 45 PERIODS

OUTCOMES

- Able to analyze and solve problems for all types of electrical networks by applying various theorems.
- Able to understand and solve problems for basic AC circuits.
- Will be in a position to suggest suitable AC/DC machines for a given application.
- Able to analyze the characteristics of electronic devices such as PN junction and other diodes.

REFERENCES


GE7251 ENVIRONMENTAL SCIENCE AND ENGINEERING

OBJECTIVES:
To the study of nature and the facts about environment.

- To finding and implementing scientific, technological, economic and political solutions to environmental problems.
- To study the interrelationship between living organism and environment.
- To appreciate the importance of environment by assessing its impact on the human world; envision the surrounding environment, its functions and its value.
- To study the dynamic processes and understand the features of the earth’s interior and surface.
- To study the integrated themes and biodiversity, natural resources, pollution control and waste management.

UNIT I ENVIRONMENT, ECOSYSTEMS AND BIODIVERSITY

Definition, scope and importance of environment – need for public awareness - concept of an ecosystem – structure and function of an ecosystem – producers, consumers and decomposers – energy flow in the ecosystem – ecological succession – food chains, food webs and ecological pyramids – Introduction, types, characteristic features, structure and function of the (a) forest ecosystem (b) grassland ecosystem (c) desert ecosystem (d) aquatic ecosystems (ponds, streams, lakes, rivers, oceans, estuaries) – Introduction to biodiversity definition: genetic, species and ecosystem diversity – bio geographical classification of India – value of biodiversity: consumptive use, productive use, social, ethical, aesthetic and option values – Biodiversity at global, national and local levels – India as a mega-diversity nation – hot-spots of biodiversity – threats to biodiversity: habitat loss, poaching of wildlife, man-wildlife conflicts – endangered and endemic species of India – conservation of biodiversity: In-situ and ex-situ conservation of biodiversity.
Field study of common plants, insects, birds
Field study of simple ecosystems – pond, river, hill slopes, etc.
UNIT II  ENVIRONMENTAL POLLUTION 8
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 – soil waste management: causes, effects and control measures of municipal solid wastes – role of an individual in prevention of pollution – pollution case studies – disaster management: floods, earthquake, cyclone and landslides.
Field study of local polluted site – Urban / Rural / Industrial / Agricultural.

UNIT III  NATURAL RESOURCES 10
Forest resources: Use and over-exploitation, deforestation, case studies- timber extraction, mining, dams and their effects on forests and tribal people – Water resources: Use and over-utilization of surface and ground water, floods, drought, conflicts over water, dams-benefits and problems – Mineral resources: Use and exploitation, environmental effects of extracting and using mineral resources, case studies – Food resources: World food problems, changes caused by agriculture and overgrazing, effects of modern agriculture, fertilizer-pesticide problems, water logging, salinity, case studies – Energy resources: Growing energy needs, renewable and non renewable energy sources, use of alternate energy sources. case studies – Land resources: Land as a resource, land degradation, man induced landslides, soil erosion and desertification – role of an individual in conservation of natural resources – Equitable use of resources for sustainable lifestyles.
Field study of local area to document environmental assets – river / forest / grassland / hill / mountain.

UNIT IV  SOCIAL ISSUES AND THE ENVIRONMENT 7

UNIT V  HUMAN POPULATION AND THE ENVIRONMENT 6
TOTAL: 45 PERIODS

OUTCOMES:
Environmental Pollution or problems cannot be solved by mere laws. Public participation is an important aspect which serves the environmental Protection. One will obtain knowledge on the following after completing the course.
• Public awareness of environmental is at infant stage.
• Ignorance and incomplete knowledge has lead to misconceptions
• Development and improvement in std. of living has lead to serious environmental disasters

TEXT BOOKS

REFERENCES

**MA7354** **NUMERICAL METHODS**

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**OBJECTIVES:**

- To provide the mathematical foundations of numerical techniques for solving linear system, eigen value problems, interpolation, numerical differentiation and integration and the errors associated with them;
- To demonstrate the utility of numerical techniques of ordinary and partial differential equations in solving engineering problems where analytical solutions are not readily available.

**UNIT I** **SOLUTION OF EQUATIONS AND EIGENVALUE PROBLEMS**


**UNIT II** **INTERPOLATION AND APPROXIMATION**

- Interpolation with unequal intervals - Lagrange interpolation – Newton's divided difference interpolation – Cubic Splines - Interpolation with equal intervals - Newton's forward and backward difference formulae – Least square method - Linear curve fitting.

**UNIT III** **NUMERICAL DIFFERENTIATION AND INTEGRATION**


**UNIT IV** **INITIAL VALUE PROBLEMS FOR ORDINARY DIFFERENTIAL EQUATIONS**


**UNIT V** **BOUNDARY VALUE PROBLEMS IN ORDINARY AND PARTIAL DIFFERENTIAL EQUATIONS**

- Finite difference methods for solving two-point linear boundary value problems - Finite difference techniques for the solution of two dimensional Laplace’s and Poisson’s equations on rectangular domain – One dimensional heat-flow equation by explicit and implicit (Crank-Nicholson) methods - One dimensional wave equation by explicit method.

**TOTAL: 60 PERIODS**

**OUTCOMES:**

- Demonstrate understanding of common numerical methods and how they are used to obtain approximate solutions.
- Apply numerical methods to obtain approximate solutions to mathematical problems.
• Derive numerical methods for various mathematical operations and tasks, such as interpolation, differentiation, integration, the solution of linear and nonlinear equations, and the solution of differential equations.
• Analyze and evaluate the accuracy of common numerical methods.

TEXT BOOKS:

REFERENCES:

AU7311 MECHANICAL TESTING AND IC ENGINES LABORATORY

OBJECTIVE:
To give on hand training to the students in testing and quantifying the various mechanical properties of Engineering Materials and to find various performance characteristics of Internal combustion engine.

LIST OF EXPERIMENTS
• Tension Test
• Torsion Test
• Testing of springs
• Impact test i) Izod, ii) Charpy
• Hardness test i) Vickers, ii) Brinell, iii) Rockwell, iv) Shore
• Deflection of Beams
• Dye Penetrant Test
• Tensile testing of polymers.
• Relaxation Fatigue test for Elastomers.
• Injection molding machine operation.
• Performance test on a 4 stroke diesel engine
• Performance test on a 4 stroke petrol engine
• Moment of inertia of connecting rod
• Determination of Effectiveness of a parallel and counter flow heat exchangers.
• Valve timing of a 4 stroke engine
• Port timing of a 2 stroke engine.

TOTAL : 60 PERIODS
OUTCOMES:

Student can able to
- Understand various physical characterization and mechanical properties of materials
- Examine various testing methods of mechanical properties
- Evaluate the basics of internal combustion engine and its performance characteristics
- Evaluate fuel properties and related emission in engines.
- Know the type of materials used for automotive application.

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EE7261 ELECTRICAL AND ELECTRONICS ENGINEERING LABORATORY

OBJECTIVE:
- To train the students in performing various tests on electrical drives, sensors and circuits.

LIST OF EXPERIMENTS:
1. Load test on separately excited DC shunt generator
2. Load test on DC shunt motor
3. Load test on S Transformer
4. Load test on Induction motor
5. Regulation of 3 Alternator
6. Study of CRO
7. Logic gates
8. Operational amplifiers
9. Time constant of RC circuit
10. Characteristics of LVDT
11. Calibration of Rotometer
12. RTD and Thermistor
13. Flapper Nozzle system

TOTAL: 60 PERIODS

OUTCOMES:
- Ability to perform speed characteristic of different electrical machine
- Ability to use of diodes, transistors for rectifiers
- Ability to use of operational amplifiers
OBJECTIVE:
- The student is introduced to the mechanics of fluids through a thorough understanding of the properties of the fluids. The dynamics of fluids is introduced through the control volume approach which gives an integrated understanding of the transport of mass, momentum and energy. The applications of the conservation laws to flow through pipes and hydraulics machines are studied.

UNIT I INTRODUCTION
Units and dimensions- Properties of fluids- mass density, specific weight, specific volume, specific gravity, viscosity, compressibility, vapor pressure, surface tension and capillarity. Flow characteristics – concept of control volume - application of continuity equation, energy equation and momentum equation.

UNIT II FLOW THROUGH CIRCULAR CONDUITS

UNIT III DIMENSIONAL ANALYSIS
Need for dimensional analysis – methods of dimensional analysis – Similitude – types of similitude - Dimensionless parameters- application of dimensionless parameters – Model analysis.

UNIT IV TURBINES

UNIT V PUMPS

TOTAL: 45 PERIODS

OUTCOME:
- CO1: Students will be familiar with all basic concepts of fluids statics
- CO2: Summarize the concepts of flow governing equations
- CO3: Generate solutions to complex pipe flow problems
- CO4: Interpret the results of dimensional analysis
- CO5: Expose to the applications of fluid machinery in vehicles

TEXTBOOKS:

REFERENCES:
OBJECTIVES:

- The student shall gain appreciation and understanding function of front axle, types of stub axle, types of steering gear box, Shall be able to understand need of suspension and its types, types of tyre, tyre specification, tyre rotation, Student shall gain knowledge of design consideration braking system, suspension system and for chassis.

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

UNIT II DRIVE LINE, FINAL DRIVE AND DIFFERENTIAL  9

UNIT III REAR AXLES, WHEELS, RIMS AND TYRES  9
Construction of rear axles, Types of Loads acting on rear axles, Full –Floating, Three–Quarter Floating and Semi–Floating Axles, Twist beam rear axle, Types, Multi axles vehicles. Wheels and Rims, Types of Tyres and their constructional details. tubeless, cross ply radial type, tyre sizes and designation.

UNIT IV SUSPENSION SYSTEM  9
UNIT V  
BRAKE SYSTEMS


TOTAL : 45 PERIODS

OUTCOMES
CO1: Identify the different types of frame and chassis used in Automotive
CO2: Relate different types of drive lines and drives used in Automotive
CO3: Acquire knowledge about different types of front axle and rear axles used in motor vehicles
CO4: Examine the working principle of conventional and independent suspension systems
CO5: Apply knowledge on working principles of brake and its subsystems

TEXT BOOKS

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AU7402  
AUTOMOTIVE DIESEL ENGINES

OBJECTIVES
- To impart knowledge on basic concepts of automotive diesel engines, combustion process involved in diesel engines and the various subsystems used along with their functions in detail.
UNIT I BASIC OF DIESEL ENGINES 9

UNIT II FUEL INJECTION IN DIESEL ENGINES 9

UNIT III AIR MOTION, COMBUSTION AND COMBUSTION CHAMBERS 9

UNIT IV SUPERCHARGING AND TURBOCHARGING 9

UNIT V ENGINE TESTING AND RECENT DEVELOPMENTS 9

TOTAL : 45 PERIODS

OUTCOMES
CO1: Understand engine glossaries, identify various components of diesel engines and its sub-systems.
CO2: Design fuel injection systems
CO3: Attain the advanced knowledge on air motion and CI engine combustion and its related parameters
CO4: Design and analyse intake air boosting systems
CO5: Attain knowledge on recent Developments of engine developments.

TEXT BOOKS

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AU7403 METROLOGY AND MEASUREMENT SYSTEM

OBJECTIVE:
- To understand the different degree of accuracy obtained from different types of instruments and the process of reducing uncertainties in measurements

UNIT I SCIENCE OF MEASUREMENT

UNIT II LINEAR AND ANGULAR MEASUREMENT
Linear measuring instruments: Vernier, micrometer, interval measurement, Slip gauges and classification, interferometer, optical flats, limit gauges – Comparators: Mechanical, pneumatic and electrical types, applications.
Angular measurements:- Sine bar, optical bevel protractor, angle Decker – Taper measurements, coordinate measuring machine (CMM)

UNIT III FORM MEASUREMENT

UNIT IV PRESSURE, FORCE AND TORQUE MEASUREMENT
Bourdon tube, diaphragm, bellows and pressure capsules: Transducers used in pressure measurement – potentiometer, strain gauges, LVDT, capacitive and variable reluctance type transducers. Dynamic pressure measurement piezo electric and piezo resistive transducers. Farnboro engine indicator. Low pressure measurement – Mc leod gage, Pirani gauge, thermal conductivity type pressure measurement.
Force measuring devices – Balances, platform scales, weigh bridges, load cells, proving ring. Torque measurement – prony brake, rope brake and fan type brakes. Dynamometers – hydraulic, electric cradle and eddy current dynamometers.

UNIT V MEASUREMENT OF TEMPERATURE AND FLOW

TOTAL: 45 PERIODS

OUTCOMES:
The Students will
CO1: Be able to demonstrate their knowledge about different measurement method and devices used in industries.
CO2: Have the ability to handle and interpret measurement data, to estimate measurement uncertainties.
CO3: Design measuring equipment’s for the measurement of Pressure Force, temperature and flow.
CO4: To understand about pressure, force and torque measurement equipment’s
CO5: To understand about measurement of temperature and flow

TEXT BOOKS:

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AU7404 THEORY OF FUELS AND LUBRICANTS L T P C
3 0 0 3

OBJECTIVE
- To understand the basic of manufacturing of fuels and lubricants along with properties of fuels and lubricants for the design and operation of the I.C engines.

UNIT I MANUFACTURE OF FUELS AND LUBRICANTS 9
Introduction to Structure of petroleum, refining process-Distillation, cracking processes, Catalytic reforming, alkylation, isomerisation and polymerization, finishing process- blending, products of refining process. Manufacture of lubricating oil base stocks, manufacture of finished automotive lubricants.
UNIT II THEORY OF LUBRICATION
Engine friction: introduction, total engine friction, effect of engine variables on friction, hydrodynamic lubrication, elasto hydrodynamic lubrication, boundary lubrication, bearing lubrication, functions of the lubrication system, introduction to design of a lubricating system.

UNIT III LUBRICANTS
Specific requirements for automotive lubricants, oxidation deterioration and degradation of lubricants, additives and additive mechanism, synthetic lubricants, classification of lubricating oils, properties of lubricating oils, tests on lubricants. Grease, classification, properties, test used in grease.

UNIT IV PROPERTIES AND TESTING OF FUELS
Properties and testing of fuels - density, calorific value, flash point, fire point, distillation, vapour pressure, spontaneous ignition temperature, viscosity, pour point, flammability, ignitability, diesel index, API gravity, aniline point, carbon residue, copper strip corrosion.

UNIT V FUEL RATING

TOTAL : 45 PERIODS

OUTCOMES
Student would have basic understanding of
CO1: Can able to compare Various refinery processes
CO2: Can able to explain Theory of lubricants
CO3: Can infer the different types of Properties and testing of fuels
CO4: Can discuss about Fuel ratings
CO5: Can analysis the Additive mechanisms

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PR7451  KINEMATICS AND DYNAMICS OF MACHINES  L T P C

4 0 0 4

OBJECTIVE:
- To understand the basic concepts of mechanisms and machinery.

UNIT I  MECHANISMS 12

UNIT II  FRICTION 12
Types of friction – friction in screw and nut – screw jack – pivot, collar and thrust bearings – plate and cone clutch – belt (Flat and V) and rope drives – creep in belts – open and crossed belt drives – Ratio of tensions – Effect of centrifugal and initial tensions – condition for maximum power transmission.

UNIT III  GEARs AND CAMS 12

UNIT IV  VIBRATION 12

UNIT V  BALANCING 12
Static and dynamic balancing – single and several masses in different planes – primary and secondary balancing of reciprocating masses – Balancing of single and multi cylinder engines – Governors and Gyroscopic effects.

TOTAL:60 PERIODS
OUTCOME:

CO1: Apply the kinematics and dynamics of machinery in design and analysis of engineering problems.

CO2: Demonstrate the ability to synthesize and analysis mechanisms

CO3: Design and analyze cam and their motion.

CO4: Select the gears and gear trains for their applications.

CO5: Examine the concept of free, forced and damped vibrations.

TEXT BOOKS:

REFERENCES:

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AU7411 AUTOMOTIVE ENGINE AND CHASSIS COMPONENTS LABORATORY L T P C 0 0 4 2

OBJECTIVES:
- To familiarize and train the students on the constructional arrangements of different engine system.
- Study of the following engines and its components by dismantling, comparing with recent engine components and assembling various parts.
- To familiarize and train the students on the constructional arrangements of different engine system.

LIST OF EXPERIMENT FOR AUTOMOTIVE ENGINE
1. Study the layout of chassis system
2. Study the layout of steering systems with different Steering gearboxes
3. Dismantling, study and Assembling of Transfer case
4. Dismantling, study and Assembling of Constant Velocity Joint (Front Axles )
5. Dismantling, study and Assembling of Clutch.
6. Dismantling, study and Assembling of sliding mesh gear box
7. Dismantling, study and Assembling of Constant mesh gear box
8. Dismantling, study and Assembling of Syncro mesh gear box
10. Study the Layout of Rear Axle.
11. Study the Layout of Braking system.
12. Study of different types of suspension system.
13. Study the Automatic transmission system.

**STUDY OF THE FOLLOWING ENGINES AND ITS COMPONENTS:**
1. Single Cylinder Four Stroke Diesel Engine
2. Two wheeler Two stroke Petrol engines
3. Two wheeler Four Stroke Petrol Engine
4. Three wheeler Engine
5. Multi cylinder inline diesel engine
6. Multi cylinder inline Petrol engine
7. Multi cylinder V type diesel Engine
8. MPFI engine
9. CRDI engine

**OUTCOMES**
- Dismantle and Assemble the automobile chassis and Engine components
- Identify & differentiate components of SI & CI engines
- Understand working of braking, steering, clutch, transmission, Suspension systems.
- Differentiate various subsystems of two, three & Four wheeler vehicles

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**OBJECTIVE**
- To impart basic knowledge on properties testing procedure for fuels and Lubricants.

**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. Cloud and pour point of fuels.
6. ASME distillation test of fuels (gasoline / diesel).
7. Carbon residue test of lubrication oil.
10. Penetration test on grease.
11. Copper strip corrosion test
12. Density test on different fuels

TOTAL : 60 PERIODS

OUTCOMES

CO1: Student would have basic understanding of various testing methods adopted to assess quality of fuels and lubricants like viscosity

CO2: Student would have basic understanding of various testing methods adopted to assess quality of fuels and lubricants like flash, fire point

CO3: Student would have basic understanding of various testing methods adopted to assess quality of fuels and lubricants like Cloud and pour point

CO4: Student would have basic understanding of various testing methods adopted to assess quality of fuels and lubricants like Calorific value

CO5: Student would have basic understanding of various testing methods adopted to assess quality of fuels and lubricants like Density

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AU7501 AUTOMOTIVE COMPONENTS DESIGN

OBJECTIVE:
To familiarize the various steps involved in the design process and understand the principles involved in design.

UNIT I INTRODUCTION
UNIT II  DESIGN OF SHAFTS AND SPRINGS  9

UNIT III  DESIGN OF FLYWHEELS  9

UNIT IV  DESIGN OF BEARINGS  9
Types of bearings – Sliding contact bearings –Rolling contact bearings .Bearing life –Static load capacity – Dynamic load capacity – Bearing material – Boundary lubrication – Oil flow and temperature rise. Design of journal bearings - Ball and Roller bearings

UNIT V  GEAR DESIGN  9

TOTAL :45 PERIODS

OUTCOMES:
The students will be able
CO1:  To identify the design requirements for any specific components.
CO2:  Acquire knowledge on design of shafts and springs.
CO3:  To design the flywheel based upon input parameters.
CO4:  To design bearings for specified automotive applications.
CO5:  To design and select the gear based on the load perspective.

TEXT BOOK

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OBJECTIVES

- Knowledge in vehicle electrical and electronics components for engine operation.
- Enhancing the knowledge of revesor and microprocessor applications in vehicle control systems.
- Gaining information's on modern safety system in vehicle braking.

UNIT I  BATTERIES AND STARTING SYSTEM  10
Different types of Batteries – principle, rating, testing and charging. Starter motors characteristics, capacity requirements. Drive mechanisms. Starter switches.

UNIT I  CHARGING SYSTEM LIGHTING AND ACCESSORIES  9

UNIT III  ELECTRONIC IGNITION AND INJECTION SYSTEM  9
Spark plugs. Advance mechanisms. Different types of ignition systems. Electronic fuel injection systems.

UNIT IV  SENSORS AND MICROPROCESSORS IN AUTOMOBILES  9
Basic sensor arrangements. Types of sensors – oxygen sensor, hot wire anemometer sensor, vehicle speed sensor, detonation sensor, accelerometer sensor, crank position sensor. Microprocessor and microcomputer controlled devices in automobiles such voice warning system, travel information system, keyless entry system, automatic transmission system, electronic steering system.

UNIT V  SAFETY SYSTEMS  8
Antilock braking system, air bag restraint system, voice warning system, seat belt system, road navigation system, anti theft system.

TOTAL : 45 PERIODS

COURSE OUTCOMES:

CO1: Define the glossary related to vehicle electrical and electronic system -
CO2: Understand the need for starter batteries, starter motor and alternator in the vehicle.
CO3: Differentiate the conventional and modern vehicle architecture and the data transfer among the different electronic control unit using different communication protocols
CO4: List common types of sensor and actuators used in vehicles.
CO5: Understand networking in vehicles.

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**AU7503 AUTOMOTIVE TRANSMISSION**

**OBJECTIVES:**

- The main objective of this course is to impart knowledge in detailed concept, construction and principle of operation of various types of mechanical transmission components, hydrodynamic devices, hydrostatic devices, automatic transmission system and electric drive used in road vehicles. At the end of course the students will have command over both mechanical transmission system, automatic transmission systems and their applications.

**UNIT I**

**CLUTCH**

Requirement of transmission system, Types of transmission system, Clutches – Functions-Types of clutches, construction and operation of Single plate, multi plate and Diaphragm spring clutches.

**UNIT II**

**GEAR BOX**

Purpose of gear box. Construction and working principle of sliding, constant and synchromesh gear boxes. Problems on performance of automobile such as Resistance to motion, Ttractive effort, Engine speed & power and acceleration. Determination of gear box ratios for different vehicle applications.

**UNIT III**

**HYDRODYNAMIC TRANSMISSION**


**UNIT IV**

**AUTOMATIC TRANSMISSION**


**UNIT V**

**HYDROSTATIC DRIVE AND ELECTRIC DRIVE**


**TOTAL :45 PERIODS**
OUTCOMES:
Upon completion of the course, students will

CO1: Acquire knowledge in the construction and working principle of different types of mechanical transmission system,
CO2: Design the mechanical transmission system (Gearboxes)
CO3: Identify the function of hydrodynamic Transmission.
CO4: compare the working of various transmission systems in modern vehicles
CO5: Justify the need of in Electric drive

TEXT BOOKS:

REFERENCES:
1. SAE Transactions 900550 & 930910.

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AU7504 ELECTRONIC ENGINE MANAGEMENT SYSTEMS

OBJECTIVE
- The objective of the course is to make the student to understand the need, role, components, control strategies used in an engine management system. The student will be familiarized in the fundamentals, operation, function of various sensors and actuators in an engine. The student will gain knowledge on various systems related to ignition and injection system, and various engine control algorithm used during engine operation.

UNIT I FUNDAMENTALS OF AUTOMOTIVE ELECTRONICS
Components for electronic engine management system, open and closed loop control strategies, PID control, Look up tables, introduction to modern control strategies like Fuzzy logic and adaptive control. Switches, active resistors, Transistors, Current mirrors/amplifiers, Voltage and current references, Comparator, Multiplier. Amplifier, filters, A/D and D/A converters.
UNIT II  SENSORS AND ACTUATORS  9
Working principles, construction and location of sensors to measure speed, load, air flow, temperature, pressure, lambda, throttle position, knock, etc. Working principles, construction and location of actuators viz. Solenoid, relay, stepper motor etc. Design constraints.

UNIT III  SI ENGINE MANAGEMENT  9

UNIT IV  CI ENGINE MANAGEMENT  9

UNIT V  DIGITAL ENGINE CONTROL SYSTEM  9

TOTAL : 45 PERIODS

OUTCOMES
At the end of the course, the student should able to
CO1: Define the function, construction and operation of various sensors and actuators.
CO2: Describe basic electronic engine management theory
CO3: Demonstrate the principles and application of computerized engine control devices and electronic fuel and ignition management systems in the modern automobile.
CO4: Ability to recognize which electronic system best for vehicle and also for safety consideration.
CO5: Control algorithm for different operating modes of engine.

TEXT BOOKS:

REFERENCES:
OBJECTIVE:
The main objective of this course is to impart practical knowledge in various automobile electrical and electronic components by testing, checking and programming.

LIST OF EXPERIMENTS:
1. Testing and checking of battery
2. Testing and checking of starting systems
3. Testing and checking of charging systems
4. Testing and checking of ignition systems
5. Study of automotive lighting system
6. Adjustment of head lights beam
7. Testing and checking of body controller systems
8. Logic gates, Adders, Flip flops
9. SCR and IC Timers
10. Interface circuit like amplifier, filter, Multiplexer and De Multiplexer
11. Interfacing seven segment displays
12. Basic microprocessor and microcontroller programming like arithmetic and Logic operation, code conversion, waveform generation, look up table etc
13. Interfacing ADC and DAC for Data Acquisition and Control Application
14. Interfacing Sensors for Measurements of position, displacement, velocity, force, temperature, proximity/range etc
15. Display, Keyboard, Stepper Motor and DC Motor interface using microcontroller.
16. EPROM Programming
17. Study of Virtual Instrumentation

TOTAL : 60 PERIODS

OUTCOMES:
CO1: Understand the working principle of Electrical circuits in automobile.
CO2: Evaluate the working principle of Battery, and starter motor.
CO3: Understand the working principle of auxiliary systems used in automobiles.
CO4: Understand the use of sensors in an automobile.
CO5: Develop a programming knowledge on Microprocessor
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AU7512 SIMULATION OF ENGINE AND CHASSIS COMPONENTS LABORATORY

OBJECTIVE:
- To import the knowledge in the area of design and analysis of automotive engine components and Chassis Components.

LIST OF EXPERIMENTS:
Design, model and analysis of the following components
1. Engine Cylinder
2. Piston
3. Connecting rod Assembly
4. Valve train
5. Crank shaft
6. Cam shaft
7. Clutch components
8. Gear Box
9. Front Axle
10. Propeller Shaft
11. Rear Axle
12. Final Drive

TOTAL: 60 PERIODS

OUTCOME:
CO1: Visualize The Automotive Components With The Help Of Modelling Software.
CO2: Make The Modifications Instantly If Required At The Initial Stage Itself.
CO3: Demonstrate The Knowledge On Designing Components To Withstand The Loads And Deformations.
CO4: Synthesize, Analyze And Document The Design Of The Various Components.
CO5: Demonstrate The Ability To Use Engineering Techniques For Developing Vehicle Components With Industry Standards.

REFERENCES:
CO - PO and PSO Mapping

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AU7601 AUTOMOTIVE POLLUTION AND CONTROL

OBJECTIVES:
- The main objective of this course is to impart knowledge in automotive pollution control.
- The detailed concept of formation and control techniques of pollutants like UBHC, CO, NOx, particulate matter and smoke for both SI and CI engine will be taught to the students. The instruments for measurement of pollutants and emission standards will also be introduced to the students. At the end of the course the students will have command over automotive pollution and control.

UNIT I INTRODUCTION

UNIT II EMISSION FROM SPARK IGNITION ENGINE AND ITS CONTROL
Emission formation in SI Engines- Carbon monoxide- Unburned hydrocarbon, NOx, Smoke - Effects of design and operating variables on emission formation – controlling of pollutants - Catalytic converters — Charcoal Canister — Positive Crank case ventilation system, Secondary air injection, thermal reactor, Laser Assisted Combustion.

UNIT III EMISSION FROM COMPRESSION IGNITION ENGINE AND ITS CONTROL
Formation of White, Blue, and Black Smokes, NOx, soot, sulphur particulate and Intermediate Compounds – Physical and Chemical delay — Significance Effect of Operating variables on Emission formation — Fumigation, EGR, HCCI, Particulate Traps, SCR — Cetane number Effect.

UNIT IV NOISE POLLUTION FROM AUTOMOBILES

UNIT V TEST PROCEDURES AND EMISSION MEASUREMENTS
Constant Volume Sampling I and 3 (CVSI &CVS3) Systems- Sampling Procedures — Chassis dyno - Seven mode and thirteen mode cycles for Emission Sampling — Sampling problems -
Emission analyzers — NDIR, FID, Chemiluminescent, Smoke meters, Dilution Tunnel, SHED Test, Sound level meters.

**OUTCOMES:**
By the end of this course, students will be able to
- **CO1:** Differentiate the various emissions formed in IC engines
- **CO2:** Analyze the effects of pollution on human health and environment
- **CO3:** Design the control techniques for minimizing emissions
- **CO4:** Categorize the emission norms
- **CO5:** Identify suitable methods to reduce the noise emissions.

**TEXT BOOKS:**

**REFERENCES:**
3. SAE Transactions, Vehicle emission, 1982 (3 volumes).

**CO - PO and PSO Mapping**

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**AU7602 HYBRID AND ELECTRIC VEHICLES**

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**OBJECTIVE:**
- To understand the basic concept of Hybrid, Electric Vehicles, energy Storage devices and controls.

**UNIT I **
**INTRODUCTION TO NEED FOR ALTERNATIVE SYSTEM**
UNIT II ENERGY STORAGE DEVICES AND FUELL CELLS 9
Electromechanical batteries- types of batteries –lead acid batteries, nickel based batteries, lithium based batteries, electrochemical reactions, thermodynamic voltage, specific energy, specific power, energy efficiency and ultra-capacitors.
Fuel Cell- Fuel cell characteristics- Fuel cell types-Hydrogen fuel cell- Connecting cell in series-water management in the PEM fuel cell

UNIT III ELECTRIC VEHICLES 9
Electric vehicle layout, performance of electric vehicles – traction motor characteristics, tractive effort, transmission requirements, vehicle performance, energy consumption, advantage and limitations, specifications, system components, electronic control system, safety and challenges in electric vehicles.

UNIT IV HYBRID VEHICLES 9
Concepts of hybrid electric drive train, types, architecture of series and parallel hybrid electric drive train, merits and demerits, hybrid electric drive train design, mild and full hybrids, plug-in hybrid electric vehicles and range extended hybrid electric vehicles.

UNIT V PROPULSION MOTORS AND CONTROLLERS 9
Types of electric motors – working principle of AC and DC motors. Characteristic of shunt, series and compound type of DC motors- permanent magnet and separately exited DC motors. AC single phase and 3-phase motor – inverters – DC and AC motor speed controllers.

TOTAL : 45 PERIODS

OUTCOMES
End of the course student would have deep knowledge on

CO1: Understand the need for Electric and hybrid vehicles
CO2: Evaluate different Energy requirement for vehicles
CO3: Distinguish different operating modes and performance parameters of the Electric vehicles.
CO4: Design the hybrid and electric vehicles subsystems
CO5: Know about different electric propulsion motors.

TEXT BOOKS:

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70
OBJECTIVES:
- The main objective of this course is to impart knowledge in the construction of vehicle, aerodynamics, paneling of passenger car and commercial vehicle body design. At the end of the course the student will be well versed in the design and construction of external body of all types of vehicles such as car, light commercial vehicles and heavy commercial vehicles.

UNIT I CAR BODY DETAILS 10
Types of Car body - Saloon, convertibles, Limousine, Estate Van, Racing and Sports car – Visibility- regulations, driver’s visibility, improvement in visibility and tests for visibility. Driver seat design -Car body construction-Various panels in car bodies. Safety: Safety design, safety equipment for cars.

UNIT II BUS BODY DETAILS 9
Types of bus body: based on capacity, distance travelled and based on construction. – Bus body lay out, floor height, engine location, entrance and exit location. Types of metal sections used – Regulations – Constructional details: Conventional and integral.

UNIT III COMMERCIAL VEHICLE DETAILS 8
Types of commercial vehicle bodies - Light commercial vehicle body. Construction details of Flat platform body, Tipper body and Tanker body – Dimensions of driver’s seat in relation to controls – Drivers cab design.

UNIT IV VEHICLE AERODYNAMICS 9
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 tunnels – Principle of operation, Types. Wind tunnel testing such as: Flow visualization techniques, Airflow management test – measurement of various forces and moments by using wind tunnel.

UNIT V BODY MATERIALS, TRIM, MECHANISMS AND BODY REPAIR 9
Types and properties of materials used in body construction-Such as steel sheet, timber, plastics and GRP. Body trim items-body mechanisms. Hand tools-power tools for body repair. Vehicle corrosion-Anticorrosion methods-Modern painting process procedure.

TOTAL : 45 PERIODS

OUTCOMES:
Upon completion of the course, students will
- CO1: Different aspects of car body
- CO2: Bus body and commercial vehicle bodies.
- CO3: Role of various aerodynamic forces and moments, measuring instruments in vehicle body design.
- CO4: Material used in body building,
- CO5: Tools used in body repairs and command over vehicle body engineering applications.

TEXT BOOKS:
REFERENCES:

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AU7604 VEHICLE CONTROL SYSTEM

OBJECTIVE:
- The main objective of this course is to impart knowledge in the selection of various control related variables in automobile sub systems, review of various control schemes, control oriented modeling and dynamic response of automotive system.

UNIT I INTRODUCTION TO VEHICLE CONTROL SYSTEM
Trends, overview and examples of vehicle control system- Sensors , actuators and controller modules- Vehicle communication Network- System Engineering V- diagram- Algorithm Development Steps in vehicle control system design- Degree of freedom for vehicle control- selection of controlled, manipulated, measured disturbance variables- classification of the variables in various automotive systems like engines, suspension, braking, air conditioning – General types of vehicle controller configurations- Feedback, Inferential, Feed-Forward, Ratio control

UNIT II CONTROL SCHEMES , CRUISE AND HEADWAY CONTROL
Feed-Forward control-Cascade control- Design considerations for cascade control, Time delay compensation, Inferential control- Nonlinear control- Adaptive control etc.

UNIT III DRIVER MODELING AND POWERTRAIN CONTROL SYSTEMS
Driving simulators- percentage of road departure- Driver modeling- Transfer function models- Preview/ Predictive models- longitudinal driver models Control oriented engine modeling- Air intake model- Fuel dynamics model- Air Fuel ratio dynamics- Engine Control Loops- Air Fuel Ratio
control- EGR Control- Spark Timing control- Idle speed control- Knock control- Adaptive knock control- Combustion torque estimation- Transmission control

UNIT IV  CONTROL OF HYBRID AND FUEL CELL VEHICLES

Series-Parallel- Split Hybrid Configurations- Hybrid Vehicle Control Hierarchy- Control Concepts Of Series Hybrids- Equivalent Consumption minimization strategy- control concepts for split hybrid- modeling of fuel cell systems- fuel stack model- control of fuel cell system

UNIT V  HUMAN FACTORS AND INTELLIGENT TRANSPORT SYSTEM

Human factors in vehicle automation- cross over model principle- Risk- Homeostatic Theory- Driving simulators- percentage of road departure Advanced traffic management system- Advanced traveler information system- commercial vehicle operation- Advanced vehicle control system- Preventing collisions- Longitudinal motion control and platoons- Site specific information- comparison of longitudinal control approaches- String stability- Automated steering and lateral control – Lane sensing- automated lane change and follow control

COURSE OUTCOMES:
Students will gain understanding on automotive-control problem considering the physics and

CO1: Understand the basics of control system used in automobiles

CO2: Recognize the electronically controlled system used in driving mechanics

CO3: Understand the working principle of driver modelling and power train control systems

CO4: Identify the control system used in hybrid and electrical vehicles.

CO5: Illustrate the need of automated transport systems.

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TOTAL : 45 PERIODS
The goal of this course is to help students to identify innovative projects that promotes and inhibit creativity to explore the variables that affect creativity and innovation. By the end of the period, students should be familiar with current thinking in their field, and able to apply the concepts to relevant research problems or practical applications.

The goal of this course is to drive them to learn concepts, models, frameworks, and tools that engineering graduates’ need in a world where creativity and innovation is fast becoming a precondition for competitive advantage.

Each student will choose a nagging workplace problem or socially relevant problems that have been difficult for them to "solve." At the end of the semester, each or group of students have to submit a report for evaluation.

TOTAL : 60 PERIODS

Course Outcome
CO1: Think creatively and innovatively towards potential research areas in the field of Engineering.
CO2: Formulate a methodology to identify the various solutions for the identified problems.
CO3: Compare and contrast the several existing solutions for the Societal identified problems.
CO4: Develop the solution as a team and interpret the results.
CO5: Report and present the findings of the work conducted.

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AU7612 ENGINE TESTING AND EMISSION MEASUREMENT LABORATORY

OBJECTIVE:
- The main objective of this course is to impart knowledge in automotive Emission measurement and methods of testing engines. The detailed measuring techniques of pollutants like UBHC, CO, NOx, CO₂ and smoke for both SI and CI engines will be taught and compared with the emission standards. The knowledge about the instruments used for measurement of pollutants, engine performance and combustion parameters are to be explained with live example. At the end of the course the students will have knowledge about methods to test the engine and emission.
LIST OF EXPERIMENTS:
1. Study and use of IC engine testing Dynamometers.
2. Study and use of Pressure pickups, charge amplifier, storage oscilloscope and signal analyzers used for IC engine testing.
3. Performance study on petrol engine.
4. Performance study on diesel engine.
5. Determine the Frictional power on petrol engines.
7. Study of NDIR Gas Analyzer and FID.
8. Study of Chemiluminescent NO\textsubscript{x} analyser.
9. Measurement of HC, CO, CO\textsubscript{2}, O\textsubscript{2} and NO\textsubscript{x} using exhaust gas analyzer.
10. Diesel smoke measurement.

TOTAL : 60 PERIODS

OUTCOMES:
By the end of this course, students will be able to
- Understand the various emission measuring instruments
- Understand the various engine testing instruments
- Understand the procedure to measure the emission
- Understand the procedure for measuring the engine performance and combustion parameters
- Understand the emission norms

TEXT BOOK:

REFERENCES:

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OBJECTIVE:
- To understand the hydraulic and pneumatic principles, involved and their components as well as its selection.
UNIT I  INTRODUCTION TO FLUID POWER  9
Introduction to fluid power control- Hydraulic and pneumatics- Selection criteria, application of fluid
power, application of pascal's law, equation, Transmission and multiplication of force pressure
losses- fluids, selection and properties- ISO symbols

UNIT II  FLUID POWER DRIVES  9
Fluid power drives- Pumps- working principle and construction details of gear, vane and piston
pumps, hydraulic motor, Hydrostatic transmission drives and characteristics - Hydraulic supply
Components- Pneumatic power supply- Compressor, air distribution, air motors. Case study
related to automotive application.

UNIT III  FLUID POWER ELEMENTS  9
Control valves- pressure, flow direction- working principles and construction- Special type valves-
cartridge, modular, proportional and servo- Selection and actuation methods. Actuators- Selection
and specification, cylinders- mounting, cushioning, pipe fittings- Fluid conditioning elements-
Accumulators. Case study related to automotive application.

UNIT IV  HYDRAULIC AND PNEUMATIC CIRCUITS DESIGN  9
Design of Hydraulic and Pneumatic circuits for automation, Selection and specification of circuit
components, sequencing circuits, cascade and Karnaugh- Veitch map method- Regenerative,
speed control, Synchronizing circuits. Case study related to automotive application.

UNIT V  ELECTRO PNEUMATICS AND PLC CIRCUITS  9
Use of electrical timers, switches, solenoid, relay, proximity sensors etc. Electro pneumatic
sequencing Ladder diagram- PLC: – elements, function and selection- PLC programming- Ladder
and different programming methods- Sequencing circuits. Case study related to automotive
application.

TOTAL: 45 PERIODS

OUTCOMES:

CO1:  Understand the basics of hydraulic and pneumatic systems
CO2:  Examine the working of hydraulic power drives
CO3:  Apply knowledge on fluid power elements
CO4:  Design hydraulic and pneumatic systems.
CO5:  Evaluate the concept of programming in PLC circuits.

TEXT BOOKS:

REFERENCES:

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OBJECTIVE:
- The objective of this course is to provide fundamental knowledge of the dynamics of ground vehicles, knowledge of suspension design and function, basic concepts on concerning stability and control and to study about basic analysis of vehicle dynamics in performance, handling and ride modes.

UNIT I  CONCEPT OF VIBRATION

UNIT II  TYRES

UNIT III  VERTICAL DYNAMICS

UNIT IV  LONGITUDINAL DYNAMICS AND CONTROL

UNIT V  LATERAL DYNAMICS
Steady state handling characteristics. Steady state response to steering input – Yaw velocity gain, Lateral acceleration gain, curvature response gain. Testing of handling characteristics. Transient response characteristics, Direction control of vehicles. Roll center, Roll axis, Vehicle under side forces. Stability of vehicle on banked road, during turn. Effect of suspension on cornering. Minuro Plot for Lateral Transient Response,

OUTCOMES:
At the end of the courses, the students can able to
CO1: Develop physical and mathematical models to predict the dynamic response of vehicles
CO2: Demonstrate the importance of tyre and the forces and moments acting on it
CO3: Illustrate the various parameters that influence vehicle suspension system
CO4: Explain the importance of various subsystem that are used to control longitudinal motion of the vehicle
CO5: Illustrate the handling characteristics of a vehicle
TEXT BOOKS:

REFERENCES:

**CO - PO and PSO Mapping**

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**GE7351 ENGINEERING ETHICS AND HUMAN VALUES**

OBJECTIVES
- To emphasise into awareness on Engineering Ethics and Human Values.
- To understand social responsibility of an engineer.
- To appreciate ethical dilemma while discharging duties in professional life.

UNIT I HUMAN VALUES

UNIT II ENGINEERING ETHICS

UNIT III ENGINEERING AS SOCIAL EXPERIMENTATION
Engineering as experimentation - engineers as responsible experimenters - codes of ethics – Importance of Industrial Standards - a balanced outlook on law – anticorruption- occupational crime -the challenger case study.
UNIT IV ENGINEER’S RIGHTS AND RESPONSIBILITIES ON SAFETY


UNIT V GLOBAL ISSUES

Multinational corporations - Environmental ethics - computer ethics - weapons development - engineers as managers-consulting engineers-engineers as expert witnesses and advisors -moral leadership-Sample code of conduct.

TOTAL : 45 PERIODS

OUTCOMES

CO1: Emphasise into awareness on Engineering Ethics and Human Values.
CO2: Understand social responsibility of an engineer.
CO3: Appreciate ethical dilemma while discharging duties in professional life.
CO4: Students will have the ability to perform with professionalism, understand their rights, legal, ethical issues and their responsibilities as it pertains to engineering profession with engaging in life-long learning with knowledge of contemporary issues.
CO5: Study, evaluate and Overcome the Global Issues.

TEXT BOOKS


REFERENCES


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OBJECTIVES:
- To impart the knowledge on testing of vehicle and subsystems.

LIST OF EXPERIMENTS:
1. Minor and major tune up of gasoline and diesel engines
2. Calibration of Fuel pump
3. Engine fault diagnosis using scan tool
4. Fault diagnosis and service of transmission system
5. Fault diagnosis and service of braking system
6. Fault diagnosis and service of suspension system
7. Fault diagnosis and service of steering system
8. Fault diagnosis and service of Electrical system like battery, starting system, charging system, lighting system etc
9. Vehicle testing on chassis dynamometer
10. Practice the following:
   i. Adjustment of pedal play in clutch, brake, hand brake lever and steering wheel play.
   ii. Air bleeding from hydraulic brakes, air bleeding of diesel fuel system.
   iii. Wheel bearings tightening and adjustment.
   iv. Adjustment of head lights beam.
   v. Removal and fitting of tire and tube.

TOTAL : 60 PERIODS

OUTCOMES
CO1: Apply various vehicle testing methods
CO2: Operate various testing machines
CO3: Verify the procedure to test the vehicle.
CO4: Calibrate various vehicle components.
CO5: Test the vehicle after the maintenance

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TOTAL: 60 PERIODS
OBJECTIVE:

- To give students a first-hand experience on industrial environment and to implement the theoretical knowledge in solving existing problems at industry. This course will also give students a thirst on entrepreneurship.

1. The students have to undergo practical industrial training for four weeks in recognized industrial establishments during their vacation periods.

2. At the end of the training they have to submit a report with following information:
   a. Profile of the industry
   b. Product specification
   c. Organizational chart
   d. Plant layout
   e. Processes/Machines/Equipment/Devices
   f. Personnel & social welfare schemes
   g. Details of the training undergone
   h. Projects undertaken during the training, if any
   i. Inference from training

3. The assessments will be based equally on the report in the prescribed format and viva-voce examination by a committee nominated by the Head of the Department

TOTAL: 60 PERIODS

OUTCOMES:

CO1: Aware of an industrial structure
CO2: Expose to the sequence of developing a product
CO3: Aware of the Safety standards in industries.
CO4: Understand the process layout

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TOTAL: 60 PERIODS
The project work may be assigned to a single student or to a group of students not exceeding 4 per group, on a project involving some design and fabrication work or theoretical and experimental studies related to the respective engineering discipline.

Every project work shall have a Guide who is a member of the faculty of the University. Twenty periods per week shall be allotted in the Time table for this important activity and this time shall be utilized by the students to receive 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 or viva to review the progress made in the project.

Each student shall finally produce a comprehensive report covering background information, literature survey, problem statement, project work details, estimation of cost and conclusions. This final report shall be in typewritten form as specified in the guidelines.

The continuous assessment and semester evaluation may be carried out as specified in the guidelines to be issued from time to time.

TOTAL: 300 PERIODS

OUTCOMES:
CO1: Manage the selection and initiation of individual projects and of portfolios of projects in the enterprise.
CO2: Demonstrate a strong working knowledge of ethics and professional responsibility.
CO3: Conduct project planning activities that accurately forecast project costs, timelines, and quality.
CO4: Implement processes for successful resource, communication, and risk and change management.
CO5: Demonstrate effective organizational leadership and change management skills for projects and project teams.

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OBJECTIVES

- To impart knowledge in modern trends and developments in internal combustion engines.
- To develop knowledge in non conventional engines and their operation in detail and to acquire complete knowledge in engine modeling and combustion analysis of internal combustion engines.

UNIT I  COMBUSTION OF FUELS


UNIT II  ENGINE CYCLE ANALYSIS

Ideal air, fuel air cycle and actual cycle analysis. Progressive combustion analysis in SI engines. Parametric studies on work output, efficiency and other engine performance.

UNIT III  COMBUSTION MODELLING


UNIT IV  NON CONVENTIONAL IC ENGINES


UNIT V  COMBUSTION ANALYSIS IN IC ENGINES

Photographic studies of combustion processes – Analysis of Pressure crank angle diagrams in SI and CI engines. Knock study for Pressure crank angle histories. Apparent heat release rate and Wiebe’s law analysis for combustion. Calculation of Ignition delay and combustion duration. – Hot wire and laser Doppler anemometry and velocimetry for flow and combustion analysis in IC engines.

TOTAL : 45 PERIODS

OUTCOMES:

- Students will understand the recent developments and trends in internal combustion engines. They will be able to apply their knowledge in making changes in engine design for better engine performance.
- Students will become familiar with the non conventional engines and their importance, difficulties involved in using them for power generation
- They will also get familiarized with the equipment used for flow and combustion analysis.

TEXT BOOKS


REFERENCES

AU7002 ADVANCED VEHICLE TECHNOLOGY  

OBJECTIVES
- The course should enable the students to know about the basics about the vehicle and to understand the safety aspects in the vehicle. It also enables to acquire knowledge in sensors provided in the vehicle to avoid the crash and to detect the defects in the vehicle and to know about the comfort and convenience system.

UNIT I MODERN POWER PLANT AND POWER TRAIN 9
Modern Engine Technology like DTS-i, DTS-Fi, DTS-Si, VVT, Camless Engine, GDi, CRDI, Hybrid/Electric and Future Cars, Fuel Cell.

UNIT II PASSIVE SAFETY EQUIPMENTS AND CONVENIENCE SYSTEM 9
Seat belt, Seat belt tightener system and importance, collapsible steering column. Air bags and its activation. Designing aspects of automotive bumpers and materials for bumpers. Steering And mirror adjustment, central locking system, Tire pressure control system, rain sensor system, automated wiper system.

UNIT III ACTIVE SAFETY 9
Antilock braking system, Stability Control. Adaptive cruise control, Lane Keep Assist System, Collision warning, avoidance system, Blind Spot Detection system, Driver alertness detection system.

UNIT IV VEHICLE INTEGRATION 9
Vision enhancement, road recognition system, Looking out sensors and Looking in sensors, intelligent vision system, Vehicle Integration system. Anti theft technologies, smart card system, number plate coding. Locking system- Central locking system- acoustic signaling devices.

UNIT V VEHICLE NAVIGATION SYSTEM 9

TOTAL: 45 PERIODS

OUTCOMES:
The students should be able to:
- CO1: Know about the recent innovation in vehicle technology
- CO2: Expose to the various types of passive safety components such as air bags, seat belts, design of the bumper.
- CO3: Acquainted with the various types of active safety components such as ABS, ESC, etc. and also about Driver Distraction.
- CO4: Appraise about various object detection system
- CO5: Recognize about various comfort, convenience system and environment information system.
TEXT BOOKS:

REFERENCES:
4. ARAI Safety standards

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AU7003 ALTERNATIVE FUELS AND ENERGY SYSTEMS

OBJECTIVES
- To acquire complete knowledge on availability of possible alternate fuels and their properties to use as fuel in CI and SI engines. To develop knowledge in changing the engine system, modifying the fuel for efficient use in the internal combustion engines and to understand the challenges and difficulties in using alternative fuels in internal combustion engines

UNIT I INTRODUCTION TO ALTERNATIVE FUELS
Need for alternative fuels. World and Indian energy scenario on alternative fuels. Availability of different alternative fuels for SI and CI engines. Production technologies for biofuels for internal combustion engines- Pyrolysis, gasification, digestion.

UNIT II ALCOHOLS AS FUELS
UNIT III  VEGETABLE OILS AS FUELS

Various vegetable oils and their important properties. Different methods of using vegetable oils – Blending, preheating Transesterification and emulsification of Vegetable oils - Performance in engines – Performance, Emission and Combustion Characteristics in diesel engines. Role of Nano fluids, additives and cetane improvers for performance improvement of vegetable oils as fuel.

UNIT IV  HYDROGEN AS ENGINE FUEL


UNIT V  BIOGAS, LPG AND NATURAL GAS AS FUELS

Production methods of Biogas, Natural gas and LPG. Properties studies. CO₂ and H₂S scrubbing in Biogas., Modification required to use in SI and CI Engines- Performance and emission characteristics of Biogas, NG and LPG in SI and CI engines.

TOTAL : 45 PERIODS

OUTCOMES

CO1: Acquire complete knowledge on availability of possible alternate fuels and their properties to use as fuel in CI and SI engines.

CO2: Develop knowledge in all the possible ways of using alcohols as a fuel in IC engines.

CO3: Understand the challenges and difficulties in using vegetable oil as an alternative fuel in internal combustion engines.

CO4: Identify the uses of hydrogen as fuel in IC engines as an alternative for fossil fuels.

CO5: Understand the usefulness of natural acquiring gases towards IC engines.

TEXT BOOKS


REFERENCES


3. Technical papers of SAE on Biofuels (Alcohols, vegetable oils, CNG, LPG, Hydrogen, Biogas etc.).


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OBJECTIVE

- To learn the basics of fluid mechanics on vehicle motion and expose to the optimization techniques followed in automotive industry in reducing aerodynamics drag, fuel consumption and improving vehicle stability. This course will also expose the students to testing techniques practiced in industry.

UNIT I  BASICS OF FLUID DYNAMICS ON VEHICLE MOTION  9
Importance of study - timeline developments -basics of fluid mechanics -flow phenomenon related to vehicles - external flow problem -various resistances to vehicle motion - performance, fuel consumption and traction force diagram of a passenger car.

UNIT II  DRAG FRACTIONS AND LOCAL ORIGINS IN A PASSENGER CAR  9
Car as a bluff body - generation & transportation of vortices around car -types of aerodynamic drag forces& its contribution to total drag - analysis of aerodynamic drag at local origins - shape and detail optimization techniques with case studies.

UNIT III  VEHICLE HANDLING  9
The origin of forces and moments on a vehicle - lateral stability problems - methods to calculate forces and moments – vehicle dynamics under side winds - the effects of forces and moments, dirt accumulation on the vehicle, wind noise. Add-ons to improve stability of road vehicles.

UNIT IV  COMMERCIAL VEHICLE AERODYNAMICS  9
Tractive resistance & fuel consumption – Drag coefficients of various commercial Vehicles – Scope for reducing drag on commercial vehicles (Trucks with trailers and buses), Advantages of commercial vehicles aerodynamics & its effects – Vehicle soiling & its effects on driving.

UNIT V  WIND TUNNELS FOR ROAD VEHICLES AERODYNAMICS  9
Need of a wind tunnel, principle of wind tunnel technology, problems with reduced scale models, full scale wind tunnels examples and case studies, instrumentation& measurement techniques, Introduction to numerical analysis (CFD).

OUTCOMES :

- Know the forces & moments influencing drag
- Solve simple numericals related to fuel economy & drag
- Learn the techniques of optimization practiced in industry
- Learn the relation between drag, stability & fuel economy
- Expose to fundamentals of numerical & experimental testing

TEXT BOOKS:

1. R.H.Barnard - “Road vehicle aerodynamic design, An Introduction” , Mechaero publications, Third edition

REFERENCES :

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AU7005 AUTOMOTIVE AUTOMATION

OBJECTIVE:
- To understand the various automated Automobile manufacturing activities and study the application of computer technology in the Automobile manufacturing activities.

UNIT I AUTOMATION IN AUTOMOBILE MANUFACTURING

UNIT II AUTOMATED MATERIAL HANDLING SYSTEMS
Automated assembly systems- Design principles and types – part feeding devices, automated material handling devices – conveyor systems- types and applications, AGVs – types and control applications ,rail guided vehicles-automated storage/retrieval systems-industrial robots- basic components-special features-applications.

UNIT III GROUP TECHNOLOGY AND FMS
Part families-visual-part classification and coding-production flow analysis, benefits of GT-FMS-workstations-FMS layouts configurations-computer control systems- planning the FMS- machine cell design-FMS application and benefits – automated work flow-automated flexible assembly systems.

UNIT IV AUTOMATED ASSEMBLY AND INSPECTION
Automated chassis assembly-car body assembly-engine assembly-transfer lines-visual inspection-machine visions application-CMM-types-principle and applications, industrial robots for assembly of automobile components-applications.

UNIT V SHOP FLOOR AND COMPUTER AIDED QUALITY CONTROL
Automated chassis assembly-car body assembly-engine assembly-transfer lines-visual inspection-machine visions application-CMM-types-principle and applications, industrial robots for assembly of automobile components-applications.

TOTAL: 45 PERIODS

OUTCOMES:
- Students will have a sound knowledge in the various automated manufacturing process.
- Students will be familiar in modern engineering manufacturing process and will have an update in recent scenario.
TEXT BOOKS:
1. Mikel P. Groover “Automation production systems and computer integrated manufacturing”

REFERENCES:
1. N. Viswanathan and Y. Navahari “performance modelling of automated manufacturing systems”

AU7006 AUTOMOTIVE MATERIALS

OBJECTIVES
- Knowledge on properties of engineering materials
- To select suitable materials for design
- Materials selection criteria for engine and transmission systems
- Different materials used for automotive structures.
- Different electronic materials for automotive applications

UNIT I ENGINEERING MATERIALS AND THEIR PROPERTIES
Classes of engineering materials - the evolution of engineering materials, Definition of materials
properties, Displaying material properties using materials selection charts, Forces for change in
materials selection and design, Materials and the environment-selection of materials for
automotive, aerospace, marine and defence applications.

UNIT II BASIS OF MATERIAL SELECTION
Selection strategy, Attribute limits and Material indices, structural index Selection procedure:
Design process - types of design, design requirements, Function, Material attributes, Shape
and Manufacturing processes - Materials processing and design processes and their influence
on design, Process attributes, Systematic process selection, Process selection diagrams,
Process cost, Energy consumption for production, Material costs, Availability, Recyclability,
Environmental consideration. Computer aided selection.

UNIT III MATERIALS FOR ENGINES AND TRANSMISSION SYSTEMS
Materials selection for IC engines: Piston, piston rings, cylinder, Engine block, Connecting rod,
Crank shaft, Fly wheels, Gear box, Gears, Splines, Clutches.

UNIT IV MATERIALS FOR AUTOMOTIVE STRUCTURES
Materials selection for bearings, leaf springs, chasis & frames, Bumper, shock absorbers, wind
screens, panels, brake shoes, Disc, wheels, differentials , damping and antifriction fluids, Tyres
and tubes.

UNIT V ELECTRONIC MATERIALS FOR AUTOMOTIVE APPLICATIONS
Materials for electronic devices meant for engine control, ABS, Steering, Suspension, Sensors,
anti-collision, Anti-fog, Head lamps.

TOTAL: 45 PERIODS
OUTCOMES
CO1: knowledge on properties of engineering materials
CO2: Select suitable materials for design
CO3: Select Materials for engine and transmission systems
CO4: Select materials used for automotive structures.
CO5: Select electronic materials for automotive applications

TEXT BOOKS

REFERENCES

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AU7007 AUTOMOTIVE TEST INSTRUMENTATION L T P C 3 0 0 3

OBJECTIVES
- To develop complete knowledge in using sensors, actuators and instruments in automobiles. To understand their necessities, working principles and performance characteristics in detail and to impart knowledge in modern laboratory experimental techniques for testing automobiles

UNIT I MEASUREMENT SYSTEMS 9
Introduction to Measurement systems-static and dynamic measurement –closed and open loop system - Requirements and characteristics – Analysis of experimental detail. Error analysis

UNIT II TRASDUCERS, MODIFIERS AND TERMINATING DEVICES 9
Transducers for Automotive Applications – Amplifiers- filters –data Acquisition- Indicators, Printers and displays –Signal Analyzing.
UNIT III   MECHANICAL MEASUREMENT 9
Instrumentation for measuring Weight, Force, torque, pressure power, temperature, fluid flow, vibration, rotational speed, velocity, acceleration and angular motion.

UNIT IV  ENGINE EXPERIMENTAL TECHNIQUES 9

UNIT V  VEHICLE EXPERIMENTAL TECHNIQUES 9
Laboratory tests- Study of chassis dynamometer- test tracks - Endurance Tests- crash tests- Vehicle performance test – Brake tests.

TOTAL: 45 PERIODS

OUTCOMES
CO1: Understand the working principle of various sensors and actuators.
CO2: Develop an instrument for automobile using sensor and actuators.
CO3: Acquire knowledge about performance characteristics of a test instruments.
CO4: Analyse automobile parts using modern laboratory experimental techniques.
CO5: Apply control strategy in the various operation of automobile.

TEXT BOOKS

REFERENCES
2. T.G. Beckwith and Buck, Mechanical Measurements, Oxford and IBH Publishing House, New Delhi, 1995

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OBJECTIVES

- To make the students understand the principle of general and engine combustion.
- To understand engine heat release rate and various heat transfer models and to study the experimental methods for combustion and heat transfer in engines.

UNIT I  THERMODYNAMICS OF COMBUSTION  9
Premixed and diffusion combustion process in IC engines. First and Second Law of Thermodynamics applied to combustion- combustion Stoichiometry- chemical equilibrium, spray formation and droplet combustion.

UNIT II  CHEMICAL KINETICS OF COMBUSTION  9

UNIT III  FLAMES  9
Laminar premixed – flame speed correlations- quenching, flammability, and ignition, flame stabilization, laminar diffusion flames, turbulent premixed flames-Reynolds and Damkovler numbers and their significance.

UNIT IV  HEAT TRANSFER IN IC ENGINES  9

UNIT V  EXPERIMENTS IN IC ENGINES  9
Cylinder pressure measurement. Rate of heat release calculation – hot wire and laser Doppler anemometry and velocimetry for flow and combustion analysis in IC engines.

TOTAL : 45 PERIODS

OUTCOMES

- Upon completion the students will understand the principle of engine combustion and the various heat transfer models and measuring methods of engine heat transfer in detail.
- They will understand thermodynamics of combustion, grasp the basics of normal, abnormal combustion and heat transfer in engines.
- They also understand experimental techniques in investigating the combustion and heat transfer processes in IC engines.

TEXT BOOK


REFERENCES

OBJECTIVE:
• To develop finite difference and finite volume discretized forms of the CFD equations and formulate explicit & implicit algorithms for solving the Euler Equations & Navier Strokes Equations.

UNIT I GOVERNING DIFFERENTIAL EQUATIONS AND FINITE DIFFERENCE METHOD
Classification, Initial and Boundary conditions – Initial and Boundary Value problems – Finite difference method, Central, Forward, Backward difference, Uniform and non-uniform Grids, Numerical Errors, Grid Independence Test.

UNIT II CONDUCTION HEAT TRANSFER BY FINITE DIFFERENCE METHOD AND FINITE VOLUME METHOD
Steady one-dimensional conduction, Two and three dimensional steady state problems, Transient one-dimensional problem, Two-dimensional Transient Problems.

UNIT III CONVECTION HEAT TRANSFER BY FINITE DIFFERENCE METHOD AND FINITE VOLUME METHOD

UNIT IV INCOMPRESSIBLE FLUID FLOW BY FINITE DIFFERENCE METHOD AND FINITE VOLUME METHOD
Governing Equations, Stream Function – Vorticity method, Determination of pressure for viscous flow, SIMPLE, Computation of Boundary layer flow - Finite difference approach.

UNIT V FINITE ELEMENT METHOD AND TURBULENCE MODELS

OUTCOMES:
The student will
• Demonstrate an ability to recognize the type of fluid flow that is occurring in a particular physical system and to use the appropriate model equations to investigate the flow.
• Gain the confidence to simplify a real fluid-flow system into a simplified model problem, and select the proper governing equations involved in the system
• Analyze and interpret data obtained from the numerical solution of fluid flow problems.
• Expose to the concept of finite volume.
• Know about various turbulence models.

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AU7010  FINITE ELEMENT TECHNIQUES  L T P C
3 0 0 3

OBJECTIVE:
- The objective of the course is to make the students to understand the general steps of finite element methods, FEM formulation, be able to derive equations in finite element methods for 1D, 2D and 3D problems and its application solid mechanics and heat transfer.

UNIT I  INTRODUCTION  9
Review of various approximate methods – Raleigh Ritz’s, Galerkin and finite difference methods – Steps in FEM Analysis – Governing equation and convergence criteria of finite element method.

UNIT II  DISCRETE ELEMENTS  9

UNIT III  CONTINUUM ELEMENTS  9
Plane stress, Plane strain and axisymmetric problems, constant and linear strain, triangular elements, stiffness matrix, axisymmetric load vector. Computer codes for CST and LST elements.

UNIT IV  ISOPARAMETRIC ELEMENTS  9
Definitions, Shape function for 4, 8 and 9 nodal quadrilateral elements, Stiffness matrix and consistent load vector, Gaussian integration

94
UNIT V  FIELD PROBLEM

OUTCOMES:
At the end of the course, the students can able to
CO1: Understand and perform engineering analysis of structural members using FEM.
CO2: Demonstrate the ability to evaluate and interpret FEA analysis results for design and evaluation purposes
CO3: Develop computer codes for FEM Elements.
CO4: Derive the characteristics equation of Iso parametric elements.
CO5: Apply knowledge towards Modal analysis in a vibrating element analytically.

TEXT BOOKS:

REFERENCES:

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OBJECTIVE:
- To study in detail about the modern casting, forging, molding and machining processes followed in automotive components. To enhance the knowledge of the students in the field of non-ferrous materials, emerging metallic and non-metallic materials like polymers, fiber reinforced plastics (FRP), engineering ceramics, metal matrix composites (MMCs) and its manufacturing methods, selection criteria, properties and applications for automotive components.

UNIT I  ENGINE COMPONENTS

UNIT II  TRANSMISSION COMPONENTS

UNIT III  BODY COMPONENTS

UNIT IV  CHASSIS COMPONENTS

UNIT V  TYRES AND ADVANCED MATERIALS MANUFACTURING
Tire and tube manufacturing, spray painting, powder coating, Prototype Manufacturing - RPT, 3-D Printing, chemical vapour deposition, physical vapour deposition, cryogenic grinding of powders, sealants, sound proof materials, structural adhesives, MMC liners –Selection of materials for Auto components.

TOTAL: 45 PERIODS
OUTCOMES:
At the end of this course the student should

CO1: Identify the methods to manufacture the vehicle components
CO2: Analyze the requirements of each component and material
CO3: Differentiate between the casting and forming process
CO4: Design the process for manufacturing vehicle components
CO5: Understand the advanced techniques used for manufacturing Automobile components

TEXT BOOKS:

REFERENCES:

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AU7012 NOISE, VIBRATION AND HARSHNESS L T P C
3 0 0 3

OBJECTIVE:
- To provide introduction to students the fundamentals of noise and vibration related to generation, transmission, control techniques and the effect of human sensitivity. To enable the students acquaint with principles and fundamentals in NVH instrumentation and signal analysis techniques

UNIT I FUNDAMENTALS OF NOISE, VIBRATION AND HARSHNESS 9
UNIT II  EFFECTS OF NOISE, BLAST, VIBRATION AND SHOCK ON HUMANS 9

UNIT III  TRANSPORTATION NOISE AND VIBRATION – SOURCES, PREDICTION AND CONTROL 9

UNIT IV  ACOUSTICAL DESIGN OF MUFFLERS AND SILENCERS 9

UNIT V  NOISE AND VIBRATION TRANSDUCERS ANALYSIS EQUIPMENT, SIGNAL PROCESSING, AND MEASURING TECHNIQUES. 9

TOTAL : 45 PERIODS

OUTCOMES:
At the end of this course the student will be able to
• Interpret the principle of noise, shock and vibration.
• Demonstrate the knowledge of physiological effect of noise and vibration on humans.
• Identify source of noise and vibration from an automobile.
• To design select the appropriate muffler for the control of tail pipe noise.
• Select different acoustic instrumentation noise control technique depending on the noise level.

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AU7013 OFF HIGHWAY VEHICLES L T P C
3 0 0 3

OBJECTIVE:
- The main objective of this course is to introduce the concept and principle of operation of special vehicles such as Bulldozers, Ditchers, Bucket excavators, farm equipments, military vehicles etc. At the end of the course, the students can have a better understanding of the application of the Off Highway Vehicle in the excavation of earth.

UNIT I EARTH MOVING EQUIPMENTS 9
Construction layout, capacity and applications of earthmovers like dumpers, front-end loaders, bulldozers, backhoe loaders, scrapers, hydraulic shovels, Bucket conveyors etc. Selection criteria of prime mover for dumpers and front end loaders based on vehicle performance characteristics. Surface Miners – Highwall Miners, Off-Highway Mining Trucks.

UNIT II CONSTRUCTIONAL EQUIPMENTS 9
UNIT III FARM EQUIPMENTS 9

UNIT IV INDUSTRIAL APPLICATIONS 9

UNIT V MILITARY AND COMBAT VEHICLES 9
Ride and stability characteristics, power take off, special implementations. Special features and constructional details of Main Battle tankers, gun carriers and transport vehicles, bridge builders, communication vehicles.

OUTCOMES:
At the end of this course the student will be able to

- Interpret the working principle of various special vehicles like bulldozer, scraper and backhoe load.
- Acquire knowledge on the working of constructional equipments
- Categorize different form equipment based on the construction and working.
- Demonstrate the knowledge on the industrial equipment like forklift, loader, scissor lift etc.
- Understand the basic working principle of military and compact vehicle.

TEXT BOOKS:
2. SAE Handbook Volume III

REFERENCES:
1. B. Geleman and M. Moskovin, Farm tractors, MIR publishers, Moscow.
CO - PO and PSO Mapping

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AU7014 POLYMER COMPONENTS IN AUTOMOTIVE APPLICATIONS  
L T P C  
3 0 0 3

OBJECTIVE:
- To make the students to understand the requirements related to polymers used in various automotive parts and to make the students to identify polymers for specific parts based on the usage.

UNIT I INTRODUCTION  

UNIT II STRUCTURE PROPERTY RELATIONSHIPS IN RUBBERS  
Resilience, creep, hysteresis and damping, stability, set and stress relaxation, behavior in dynamic applications.

UNIT III VIBRATION AND RUBBER SPRING  

UNIT IV FLUID SEALINGS, FLEXIBLE COUPLINGS AND HOSES  

UNIT V COMPOUND AND MANUFACTURE  
Types of couplings – specification and selection – torque vs. deflection relationship – brake fluid / hydraulic hoses, materials and manufacture.

TOTAL : 45 PERIODS

OUTCOMES:
- **CO1**: Apply the knowledge about the various polymers used in automotive application.
- **CO2**: Analyze the structure and properties of polymers.
- **CO3**: Design various mountings and parts based on vibration and damping.
- **CO4**: Design and analyze various seals used in automotive application.
- **CO5**: Design /identify the process used to manufacture the components.
REFERENCES
2. Hobel, E.F., Rubber Springs Design

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AU7015 PRINCIPLES OF CONTROL SYSTEMS L T P C

OBJECTIVES:
The student should be able to state, explain and illustrate a set of key concepts related to Control Systems qualitatively in the context of an engineering application.

UNIT I SYSTEM AND THEIR REPRESENTATION 9
Basic elements in control systems-Open loop and Closed loop system-Feedback characteristics-Effects of feedback-mathematical modeling of physical systems:- mechanical, Thermal, hydraulic and Pneumatic systems-Transfer function- AC and DC servomotor- Block diagram reduction techniques-signal flow graph- control system components – computer simulation.

UNIT II TIME RESPONSE ANALYSIS 9
Time response- Types of test inputs- First and Second order responses- Error coefficient-Generalized error series- Steady state error- Time domain specifications- Problems related to automotive domain- Computer simulation.

UNIT III FREQUENCY RESPONSE ANALYSIS 12
Frequency response- Frequency domain specifications-Bode plot-Polar plot- Determination of phase margin and gain margin- Constant M and N circles-Nichols chart- Determination of closed loop responses from open loop response- Problems related to automotive domain Computer simulation.

UNIT IV STABILITY OF CONTROL SYSTEM 6

UNIT V CONTROL SYSTEM DESIGN 9
OUTCOMES:
- To understand the methods of representation of system and their transfer function models
- To provide adequate knowledge in the time response of systems and steady state error analysis
- To give basic knowledge in obtaining the open loop and closed loop frequency responses of systems
- To understand the concept of stability of control systems and methods of stability analysis
- To study the three ways of designing compensators for a control system

TEXT BOOKS:

REFERENCES:
2. Dorf Bishop, “Modern Control System”, Prentice Hall, 2004

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<th>AU7016</th>
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OBJECTIVE:
- Teach the essentiality of Quality Control, sampling and reliability engineering. Study on various types of control charts, six sigma and process capability to help the students understand various quality control techniques. Reliability engineering focuses on the dependability, failure mode analysis, reliability prediction and management of a system.

UNIT I STATISTICAL PROCESS CONTROL

UNIT II ACCEPTANCE SAMPLING

UNIT III EXPERIMENTAL DESIGN AND TAGUCHI METHOD

UNIT IV RELIABILITY AND ITS PREDICTION

UNIT V FAILURE DATA ANALYSIS
Real time distribution, exponential, normal, log normal, gamma and weibull – reliability data
requirements – Graphical evaluation.

TOTAL : 45 PERIODS

OUTCOMES:
At the end of this course the student should
- Will be able to select an appropriate SPC and Sampling process for the Quality Control in particularly for manufacturing Automotive Components.
- Have in-depth knowledge of the Reliability and Failure Data Analysis.
- Will be able to design the experiment based on Taguchi methods

TEXT BOOKS:

REFERENCES:

AU7017 SIMULATION OF IC ENGINES

OBJECTIVES
- To impart knowledge in simulating IC engine processes. The detailed concept of air standard, fuel air cycle, progressive and actual cycle simulation of SI engine will be taught to the students. At the end of the course the students will have command over simulation of IC engine process.

UNIT I INTRODUCTION TO SIMULATION

UNIT II STOICHIOMETRY AND ADIABATIC FLAME TEMPERATURE
Reactive processes, Heat of reaction, measurement of URP, measurement of HRP. Introduction -combustion equation for hydrocarbon fuels. Calculation of minimum air, excess air and stoichiometric air required for combustion. Introduction, complete combustion in C-H-N-O systems, constant volume adiabatic combustion, constant pressure adiabatic combustion, calculation of adiabatic flame temperature, isentropic changes of state.

UNIT III SI ENGINE SIMULATION
SI Engine simulation with air as working medium, deviation between actual and ideal cycle. Fuel air cycle analysis - Temperature drop due to fuel vaporization, full throttle operation, work output and efficiency calculation, part-throttle operation, engine performance at part throttle, super charged operation. SI Engines simulation with progressive combustion. Models for mass burnt fraction.

UNIT IV SI ENGINE SIMULATION WITH GAS EXCHANGE PROCESS
Introduction, gas exchange process, Heat transfer process, friction calculations, compression of
simulated values, validation of the computer code, engine performance simulation, pressure crank angle diagram, brake power, brake thermal efficiency, effect of speed on performance.

UNIT V  
CI ENGINE SIMULATION  
9

OUTCOMES
- Students will understand the classifications and applications of engine cycle simulation model and grasp the major modeling and simulation methods and the influence of model parameters on engine performance.
- Students will become familiar with the modeling of progressive combustion and gas exchange processes and ability to build up control-oriented simulation model of internal combustion engines.
- They will get familiarized with the essential models of engine cycle simulation and theoretical knowledge to control the calculation accuracy and calculation efficiency of engine performance, combustion and emission.

TEXT BOOK

REFERENCES

AU7018  
TWO AND THREE WHEELER TECHNOLOGY  
L T P C  
3 0 0 3

OBJECTIVE:
- To develop the basic knowledge of the students in constructional details of two and Three Wheelers. Dissect the skills of the students in the operating principles.

UNIT I  
POWER UNIT  
9

UNIT II  
FUEL AND IGNITION SYSTEM  
9
Fuel system – Different circuits in two wheeler fuel systems, fuel injection system. Lubrication system, Ignition systems - Magneto coil and battery coil spark ignition system, Electronic ignition System, and starting system - Kick starter system – Self starter system. Recent technologies.

UNIT III  
CHASSIS AND SUB – SYSTEMS  
9
Main frame for two and three wheelers, its types, Chassis and different drive systems for two wheelers, Single, multiple plates and centrifugal clutches, Gear box and its and various gear
controls in two wheelers. Front and rear suspension systems. Shock absorbers. Panel meters and controls on handle bar, Freewheeling devices

UNIT IV  BRAKES AND WHEELS  9

UNIT V  TWO & THREE WHEELER CASE STUDY  9

TOTAL: 45 PERIODS

OUTCOMES
On successful completion of this course students will be able to:

- Explain the working of two and four stroke engines.
- Illustrate the functioning of clutch and gear box.
- Demonstrate the wheels, tyres, suspensions and braking systems.
- Identify the latest models of two wheelers.
- Define the operations of three wheelers and latest models of three wheelers

TEXT BOOK:

REFERENCES:
2. K. K. Ramalingam, Two Wheelers, Scitech publications, Chennai,

CO - PO and PSO Mapping

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106
OBJECTIVES:

- The objective of the course is to impart knowledge in the area of pychrometry, refrigerant and to understand the various components of vehicle air conditioning. Also the Servicing and repairing aspects of vehicle air conditioning will be covered.

UNIT I  AUTOMOTIVE AIRCONDITIONING FUNDAMENTALS  9
Purposes of Heating, Ventilation and Air Conditioning- Environmental Concerns- Ozone layer depletion- Location of air conditioning components in a car – Schematic layout of a vehicle refrigeration system. Psychrometry – Basic terminology and Psychrometric mixtures- Psychrometric Chart- Related problems

UNIT II  AUTOMOTIVE COOLING AND HEATING SYSTEM  9
Vehicle Refrigeration System and related problems- Fixed thermostatic and Orifice tube system- Variable displacement thermostatic and Orifice tube system- Vehicle air conditioning operation Types of compressor- Compressor Clutches- Compressor Clutch electrical circuit- Compressor lubrication- Condensers- Evaporators- Expansion devices- Evaporator temperature and pressure controls- receiver-drier- Accumulators- refrigerant hoses, Connections and other assemblies- Heating system

UNIT III  AIR-CONDITIONING CONTROLS, DELIVERY SYSTEM AND REFRIGERANTS  9
Types of Control devices- Preventing Compressor damage- Preventing damage to other systems- Maintaining drive ability- Preventing Overheating Ram air ventilation- Air delivery Components- Control devices- Vacuum Controls Containers – Handling refrigerants – Discharging, Charging & Leak detection – Refrigeration system diagnosis – Diagnostic procedure – Ambient conditions affecting system pressures.

UNIT IV  AUTOMATIC TEMPERATURE CONTROL  9
Different types of sensors and actuators used in automatic temperature control- Fixed and variable displacement temperature control- Semi Automatic- Controller design for Fixed and variable displacement type air conditioning system

UNIT V  SYSTEM SERVICING AND TESTING  9
Special tools for servicing vehicle air conditioning – Diagnosing components and air conditioning systems- Diagnosing cooling system- Air delivery system- Automatic temperature Control system diagnosis and service

TOTAL : 45 PERIODS

OUTCOMES:

- Student will understand the fundamental principles and operation of the heating, cooling, ventilation and air-conditioning system.
- Student will able to solve the simple problems related to pychrometry and refrigerant
- Enable the student to understand the operation of the individual components of the A/C
- System, sensors, actuators and electronic control
- Enable the reader to understand the range of techniques that can be used in diagnosing faults which affect system performance
- To provide adequate knowledge in safe working practice. understanding the correct procedures for A/C service and repair

TEXT BOOKS:
REFERENCES:

AU7020 VEHICLE MAINTENANCE
L T P C
3 0 0 3

OBJECTIVE:
- To impart the knowledge on basics of vehicle maintenance and maintenance of engine subsystems and drive line components.

UNIT I MAINTENANCE, WORKSHOP PRACTICES, SAFETY AND TOOLS 9

UNIT II ENGINE AND ENGINE SUBSYSTEM MAINTENANCE 9
General Engine service- Dismantling of Engine components- Engine repair- Service of basic engine sub systems- cooling and lubricating system, fuel system, Intake and Exhaust system, electrical system - Electronic fuel injection and engine management service - fault diagnosis-servicing emission controls

UNIT III TRANSMISSION AND DRIVELINE MAINTENANCE 9
Clutch- general checks, adjustment and service- Dismantling, identifying, checking and reassembling transmission, transaxle- road testing- Removing and replacing propeller shaft, servicing of cross and yoke joint and constant velocity joints- Rear axle service points- removing axle shaft and bearings- servicing differential assemblies- fault diagnosis.

UNIT IV STEERING, BRAKE, SUSPENSION, WHEEL MAINTENANCE 9

UNIT V AUTO ELECTRICAL AND AIR CONDITIONING MAINTENANCE 9
Maintenance of batteries, starting system, charging system and body electrical -Fault diagnosis using Scan tools. Maintenance of air conditioning parts like compressor, condenser, expansion valve, evaporator - Replacement of hoses- Leak detection- AC Charging- Fault diagnosis Vehicle body repair like panel beating, tinkering, soldering, polishing, painting.

TOTAL : 45 PERIODS

OUTCOMES
End of the course student would have deep knowledge on
CO1: Upon the completion of the course student can able to understand the importance of maintenance
CO2: Various sub systems of vehicle and its maintenance Understand Transmission
CO3: Functions of transmission and its maintenance
CO4: The importance of vehicle body structure
CO5: Basic functional principle of electrical and electronic gadgets in automobile and its maintenance
TEXT BOOKS

REFERENCES
2. Vehicle Service Manuals of manufacturers

CO - PO and PSO Mapping

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AU7021 VEHICLE MULTIPLEXING

OBJECTIVE: The objective of the course is to impart knowledge in the areas of vehicle networking, various vehicle networking standards and multiplexing buses

UNIT I INTRODUCTION TO VEHICLE NETWORKING CONCEPTS
Historical Perspective- Multiplexing Paradox- Vehicle multiplexing comparison to industry- Why multiplexing – Popularity of multiplexing- SAE Classification- Intra Module Versus Intermodule communication- Examples of Vehicle Nodes – Terminology like : open architecture , Broad cast, Peer to peer, Baud rate versus Bit rate, protocol Synchronous and asynchronous protocol- On board Diagnostics- Encoding- Error Handling- Media Characteristics etc.

UNIT II VARIOUS MULTIPLEXING LEVEL

UNIT III MULTIPLEXING STANDARDS

UNIT IV CAN: FROM CONCEPT TO REALITY
The CAN bus: general-CAN: its protocol, its properties, its novel features-The CAN physical layer-Medium, and physical layers in CAN-Components, applications and tools for CAN-Event-triggered and time-triggered aspects-TTCAN – Time-triggered communication on CAN-Towards high-speed, X-by-Wire and redundant systems
UNIT V  NEW MULTIPLEXED BUS CONCEPTS  9
LIN – Local Interconnect Network-Think ‘Bus’, think ‘Fail-safe SBC’, ‘Gateways’ -Safe-by-Wire-
Audio-video buses

OUTCOMES :
• Students will acquire knowledge in multiplexing terminology and Standards relevant to vehicle
• Student can able to understand the current state of the CAN protocol, all the possible subdivisions of the physical layers and everything relating to conformity problems.
• Student can able to know the importance of various new multiplexed bus concepts

TEXT BOOKS:

AU7022  VIRTUAL INSTRUMENTATION IN AUTOMOBILE ENGINEERING  L T P C
3 0 0 3

OBJECTIVE :
• To learn and understand the programming, data acquisition hardware and implementing small automotive related projects in virtual instrumentation.

UNIT I  INTRODUCTION  9
Virtual Instrumentation-Definition and flexibility-Block diagram and Architecture of Virtual Instrumentation- Virtual instruments versus Traditional Instruments- Review of software in virtual Instrumentation- VI programming techniques- VI, sub VI, Loops and charts, Arrays, Clusters and Graphs, Case and Sequence Structures, Formula nodes, string and File Input / Output.

UNIT II  DATA ACQUISITION IN VI  9
A/D and D/A Converters, plug-in Analog input / Output cards- Digital Input and Output cards, Organization of the DAQ VI system- Opto Isolation- Performing analog input and analog output- Scanning multiple analog channels- issues involved in selection of data acquisition cards- Data acquisition modules with serial communication- Design of digital voltmeter with transducer input- Timers and Counters.

UNIT III  COMMUNICATION NETWORKED MODULES  9

UNIT IV  REAL TIME CONTROL IN VI  9
Design of ON/OFF controller and proportional controller for a mathematically described processes using VI software- Modeling and basic control of level and Reactor Processes- Case Studies on development of HMI, SCADA in VI.

UNIT V  AUTOMOTIVE APPLICATIONS  9
PC based digital storage oscilloscope- Sensor technology and signal processing- virtual laboratory- spectrum analyzer- wave form generator- Data visualization and multiple locations:- Distributed monitoring and control-Vision and motion control. Case study related to automotive applications

TOTAL : 45 PERIODS
TEXT BOOKS:

REFERENCES:

GE7071 DISASTER MANAGEMENT L T P C 3 0 0 3

OBJECTIVES:
- To provide students an exposure to disasters, their significance and types.
- To ensure that students begin to understand the relationship between vulnerability, disasters, disaster prevention and risk reduction
- To gain a preliminary understanding of approaches of Disaster Risk Reduction (DRR)
- To enhance awareness of institutional processes in the country and
- To develop rudimentary ability to respond to their surroundings with potential disaster response in areas where they live, with due sensitivity

UNIT I INTRODUCTION TO DISASTERS
Definition: Disaster, Hazard, Vulnerability, Resilience, Risks – Disasters: Types of disasters – Earthquake, Landslide, Flood, Drought, Fire etc - Classification, Causes, Impacts including social, economic, political, environmental, health, psychosocial, etc.- Differential impacts- in terms of caste, class, gender, age, location, disability - Global trends in disasters: urban disasters, pandemics, complex emergencies, Climate change- Dos and Don’ts during various types of Disasters.

UNIT II APPROACHES TO DISASTER RISK REDUCTION (DRR)
Disaster cycle - Phases, Culture of safety, prevention, mitigation and preparedness community based DRR, Structural- nonstructural measures, Roles and responsibilities of- community, Panchayati Raj Institutions/Urban Local Bodies (PRIs/ULBs), States, Centre, and other stakeholders- Institutional Processess and Framework at State and Central Level- State Disaster Management Authority(SDMA) – Early Warning System – Advisories from Appropriate Agencies

UNIT III INTER-RELATIONSHIP BETWEEN DISASTERS AND DEVELOPMENT
Factors affecting Vulnerabilities, differential impacts, impact of Development projects such as dams, embankments, changes in Land-use etc.- Climate Change Adaptation- IPCC Scenario and Scenarios in the context of India - Relevance of indigenous knowledge, appropriate technology and local resources

UNIT IV DISASTER RISK MANAGEMENT IN INDIA
Hazard and Vulnerability profile of India, Components of Disaster Relief: Water, Food, Sanitation, Shelter, Health, Waste Management, Institutional arrangements (Mitigation, Response and Preparedness, Disaster Management Act and Policy - Other related policies, plans, programmes and legislation – Role of GIS and Information Technology Components in Preparedness, Risk Assessment, Response and Recovery Phases of Disaster – Disaster Damage Assessment.
UNIT V DISASTER MANAGEMENT: APPLICATIONS AND CASE STUDIES AND FIELD WORKS

Landslide Hazard Zonation: Case Studies, Earthquake Vulnerability Assessment of Buildings and Infrastructure: Case Studies, Drought Assessment: Case Studies, Coastal Flooding: Storm Surge Assessment, Floods: Fluvial and Pluvial Flooding: Case Studies; Forest Fire: Case Studies, Man Made disasters: Case Studies, Space Based Inputs for Disaster Mitigation and Management and field works related to disaster management.

TOTAL: 45 PERIODS

OUTCOMES:
The students will be able to

- Differentiate the types of disasters, causes and their impact on environment and society
- Assess vulnerability and various methods of risk reduction measures as well as mitigation.
- Draw the hazard and vulnerability profile of India, Scenarios in the Indian context,
- Disaster damage assessment and management.

TEXT BOOKS:


REFERENCES

1. Govt. of India: Disaster Management Act , Government of India, New Delhi, 2005
UNIT III  NANOMATERIALS
Nanoforms of Carbon - Buckminster fullerene- graphene and carbon nanotube, 92 Single wall carbon Nanotubes (SWCNT) and Multi wall carbon nanotubes (MWCNT)- methods of synthesis(arc-growth, laser ablation, CVD routes, Plasma CVD), structure-property Relationships applications- Nanometal oxides-ZnO, TiO$_2$, MgO, ZrO$_2$, NiO, nanoalumina, CaO, AgTiO$_2$, Ferrites, Nanoclays-functionalization and applications-Quantum wires, Quantum dotspreparation, properties and applications

UNIT IV  CHARACTERIZATION TECHNIQUES
X-ray diffraction technique, Scanning Electron Microscopy - environmental techniques, Transmission Electron Microscopy including high-resolution imaging, Surface Analysis techniques- AFM, SPM, STM, SNOM, ESCA, SIMS-Nanoindentation

UNIT V  APPLICATIONS

OUTCOMES:
CO1:  Able familiarize about the science of nanomaterials
CO2:  Able demonstrate the preparation of nanomaterials
CO3:  Able develop knowledge in characteristic nanomaterial
CO4:  Able to define the characteristics of Nano materials
CO5:  Apply the concepts of Nano materials in the field of automobile applications

TOTAL : 45 PERIODS

PERIODS

TEXT BOOKS

REFERENCES

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OBJECTIVES:
- To sensitize the Engineering students to various aspects of Human Rights.

UNIT I

UNIT II

UNIT III
Theories and perspectives of UN Laws – UN Agencies to monitor and compliance.

UNIT IV
Human Rights in India – Constitutional Provisions / Guarantees.

UNIT V

TOTAL : 45 PERIODS

OUTCOME:
CO1: Gain and apply the knowledge using computers for various manufacturing activities
CO2: Employ the most suitable material handling equipment to accomplish the given task
CO3: Employ the principles of cellular manufacturing
CO4: Gain and apply the knowledge using flexible manufacturing system
CO5: Evaluate the functions of shop floor control and associated systems.

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- To provide comprehensive knowledge about the principles, practices, tools and techniques of Total quality management.

OBJECTIVES

- To understand the need for quality, its evolution, basic concepts, contribution of quality gurus, TQM framework, Barriers and Benefits of TQM.
- To understand the TQM Principles.
- To learn and apply the various tools and techniques of TQM.
- To understand and apply QMS and EMS in any organization.

UNIT I  INTRODUCTION

Introduction - Need for quality - Evolution of quality - Definition of quality - Dimensions of product and service quality – Definition of TQM - Basic concepts of TQM – Gurus of TQM (Brief introduction) -- TQM Framework - Barriers to TQM – Benefits of TQM.

UNIT II  TQM PRINCIPLES


UNIT III  TQM TOOLS & TECHNIQUES I


UNIT IV  TQM TOOLS & TECHNIQUES II


UNIT V  QUALITY MANAGEMENT SYSTEM


TOTAL: 45 PERIODS

OUTCOMES:

- Ability to apply TQM concepts in a selected enterprise.
- Ability to apply TQM principles in a selected enterprise.
- Ability to apply the various tools and techniques of TQM.
- Ability to apply QMS and EMS in any organization.

TEXT BOOK:

REFERENCES:

PR7452 QUANTITATIVE TECHNIQUES IN MANAGEMENT

OBJECTIVE:
- To introduce the various quantitative techniques and optimization techniques and to make the students apply these techniques for modeling and solving many engineering situations in general and manufacturing situations in particular.

UNIT I LINEAR PROGRAMMING 12

UNIT II REPLACEMENT MODELS AND GAME THEORY 12

UNIT III QUEUING MODELS AND SIMULATION 12

UNIT IV FORECASTING, SEQUENCING AND LINE BALANCING 12

UNIT V PROJECT NETWORK ANALYSIS AND DECISION TREE ANALYSIS 12
Network – CPM/PERT – Project time estimation – critical path – crashing of network, Decision tree analysis – applications

TOTAL: 60 PERIODS

OUTCOME:
- The students shall able to select and apply techniques for typical engineering and industrial situations.

TEXT BOOKS:
REFERENCES:
GE7072  FOUNDATION SKILLS IN INTEGRATED PRODUCT DEVELOPMENT  

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OBJECTIVES:
- To understand the global trends and development methodologies of various types of products and services
- To conceptualize, prototype and develop product management plan for a new product based on the type of the new product and development methodology integrating the hardware, software, controls, electronics and mechanical systems
- To understand requirement engineering and know how to collect, analyze and arrive at requirements for new product development and convert them into design specification
- To understand system modeling for system, sub-system and their interfaces and arrive at the optimum system specification and characteristics
- To develop documentation, test specifications and coordinate with various teams to validate and sustain up to the EoL (End of Life) support activities for engineering customer

UNIT I  FUNDAMENTALS OF PRODUCT DEVELOPMENT  
9

UNIT II  REQUIREMENTS AND SYSTEM DESIGN  
9

UNIT III  DESIGN AND TESTING  
9

UNIT IV  SUSTENANCE ENGINEERING AND END-OF-LIFE (EOL) SUPPORT  
9

UNIT V  BUSINESS DYNAMICS – ENGINEERING SERVICES INDUSTRY  
9

TOTAL: 45 PERIODS
OUTCOMES:
Upon completion of the course, the students will be able to:
- Define, formulate and analyze a problem
- Solve specific problems independently or as part of a team
- Gain knowledge of the Innovation & Product Development process in the Business Context
- Work independently as well as in teams
- Manage a project from start to finish

TEXTBOOKS:
1. Book specially prepared by NASSCOM as per the MoU.

REFERENCES: