ANNA UNIVERSITY, CHENNAI  
AFFILIATED INSTITUTIONS  
R - 2008  
B.E. AUTOMOBILE ENGINEERING  
II TO VIII SEMESTERS CURRICULUM AND SYLLABI  
SEMESTER II  

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(For branches under Electrical Faculty)  
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9. c  EC2155  Circuits and Devices Laboratory  
(For branches under I & C Faculty)  
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**TOTAL : 28 CREDITS**

10.  -  English Language Laboratory *  
0  0  2  -

* Common to all B.E. / B.Tech. Programmes

+ Offering English Language Laboratory as an additional subject (with no marks) during 2nd semester may be decided by the respective Colleges affiliated to Anna University Chennai.

**A. CIRCUIT BRANCHES**

**I  Faculty of Electrical Engineering**

1. B.E. Electrical and Electronics Engineering  
2. B.E. Electronics and Instrumentation Engineering  
3. B.E. Instrumentation and Control Engineering

**II  Faculty of Information and Communication Engineering**

1. B.E. Computer Science and Engineering  
2. B.E. Electronics and Communication Engineering  
3. B.E. Bio Medical Engineering  
4. B.Tech. Information Technology

**B. NON – CIRCUIT BRANCHES**

**I  Faculty of Civil Engineering**

1. B.E. Civil Engineering

**II  Faculty of Mechanical Engineering**

1. B.E. Aeronautical Engineering  
2. B.E. Automobile Engineering
III Faculty of Technology

1. B.Tech. Chemical Engineering
2. B.Tech. Biotechnology
3. B.Tech. Polymer Technology
4. B.Tech. Textile Technology
5. B.Tech. Textile Technology (Fashion Technology)
7. B.Tech. Plastics Technology

**SEMESTER – III**
(Applicable to the students admitted from the Academic year 2008 – 2009 onwards)

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### SEMESTER - VI

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### SEMESTER - VIII

#### ELECTIVE IV

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#### ELECTIVE V

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AIM:
To encourage students to actively involve in participative learning of English and to help them acquire Communication Skills.

OBJECTIVES:
- To help students develop listening skills for academic and professional purposes.
- To help students acquire the ability to speak effectively in English in real-life situations.
- To inculcate reading habit and to develop effective reading skills.
- To help students improve their active and passive vocabulary.
- To familiarize students with different rhetorical functions of scientific English.
- To enable students write letters and reports effectively in formal and business situations.

UNIT I
12
Technical Vocabulary - meanings in context, sequencing words, Articles- Prepositions, intensive reading& predicting content, Reading and interpretation, extended definitions, Process description

Suggested activities:
1. Exercises on word formation using the prefix 'self' - Gap filling with preposition.
2. Exercises - Using sequence words.
3. Reading comprehension exercise with questions based on inference – Reading headings
4. and predicting the content – Reading advertisements and interpretation.
5. Writing extended definitions – Writing descriptions of processes – Writing paragraphs based on discussions – Writing paragraphs describing the future.

UNIT II
12

Suggested activities:
1. Reading comprehension exercises with questions on overall content – Discussions analyzing stylistic features (creative and factual description) - Reading comprehension exercises with texts including graphic communication - Exercises in interpreting non-verbal communication.
2. Listening comprehension exercises to categorise data in tables.
3. Writing formal letters, quotations, clarification, complaint – Letter seeking permission for Industrial visits– Writing analytical paragraphs on different debatable issues.

UNIT III
12
Cause and effect expressions – Different grammatical forms of the same word - Speaking – stress and intonation, Group Discussions - Reading – Critical reading - Listening, - Writing – using connectives, report writing – types, structure, data collection, content, form, recommendations.
Suggested activities:
1. Exercises combining sentences using cause and effect expressions – Gap filling exercises using the appropriate tense forms – Making sentences using different grammatical forms of the same word. (Eg: object – verb / object – noun)
2. Speaking exercises involving the use of stress and intonation – Group discussions – analysis of problems and offering solutions.
3. Reading comprehension exercises with critical questions, Multiple choice question.

UNIT IV

Numerical adjectives – Oral instructions – Descriptive writing – Argumentative paragraphs – Letter of application - content, format (CV / Bio-data) - Instructions, imperative forms - Checklists, Yes/No question form – E-mail communication.

Suggested Activities:
1. Rewriting exercises using numerical adjectives.
2. Reading comprehension exercises with analytical questions on content – Evaluation of content.
3. Listening comprehension – entering information in tabular form, intensive listening exercise and completing the steps of a process.
4. Speaking - Role play – group discussions – Activities giving oral instructions.

UNIT V

Speaking - Discussion of Problems and solutions - Creative and critical thinking – Writing an essay, Writing a proposal.

Suggested Activities:
1. Case Studies on problems and solutions
2. Brain storming and discussion
3. Writing Critical essays
4. Writing short proposals of 2 pages for starting a project, solving problems, etc.
5. Writing advertisements.

TEXT BOOK:

REFERENCES:

EXTENSIVE READING:

NOTE:
The book listed under Extensive Reading is meant for inculcating the reading habit of the students. They need not be used for testing purposes.

MA2161 MATHEMATICS – II

UNIT I ORDINARY DIFFERENTIAL EQUATIONS
Higher order linear differential equations with constant coefficients – Method of variation of parameters – Cauchy’s and Legendre’s linear equations – Simultaneous first order linear equations with constant coefficients.

UNIT II VECTOR CALCULUS

UNIT III ANALYTIC FUNCTIONS
Functions of a complex variable – Analytic functions – Necessary conditions, Cauchy – Riemann equation and Sufficient conditions (excluding proofs) – Harmonic and orthogonal properties of analytic function – Harmonic conjugate – Construction of analytic functions – Conformal mapping : w= z+c, cz, 1/z, and bilinear transformation.

UNIT IV COMPLEX INTEGRATION

UNIT V LAPLACE TRANSFORM

TOTAL: 60 PERIODS
PH2161 ENGINEERING PHYSICS – II

UNIT I CONDUCTING MATERIALS

UNIT II SEMICONDUCTING MATERIALS

UNIT III MAGNETIC AND SUPERCONDUCTING MATERIALS
Superconductivity : properties - Types of super conductors – BCS theory of superconductivity(Qualitative) - High Tc superconductors – Applications of superconductors – SQUID, cryotron, magnetic levitation.
UNIT IV  DIELECTRIC MATERIALS


UNIT V  MODERN ENGINEERING MATERIALS


TOTAL: 45 PERIODS

TEXT BOOKS:
2. Charles P. Poole and Frank J.Owen, ‘Introduction to Nanotechnology’, Wiley India (2007) (for Unit V)

REFERENCES:

CY2161  ENGINEERING CHEMISTRY – II  L T P C  3 0 0 3

AIM
To impart a sound knowledge on the principles of chemistry involving the different application oriented topics required for all engineering branches.

OBJECTIVES
• The student should be conversant with the principles electrochemistry, electrochemical cells, emf and applications of emf measurements.
• Principles of corrosion control
• Chemistry of Fuels and combustion
• Industrial importance of Phase rule and alloys
• Analytical techniques and their importance.
UNIT I  ELECTROCHEMISTRY
Electrochemical cells – reversible and irreversible cells – EMF – measurement of emf – Single electrode potential – Nernst equation (problem) – reference electrodes – Standard Hydrogen electrode - Calomel electrode – Ion selective electrode – glass electrode and measurement of pH – electrochemical series – significance – potentiometer titrations (redox - Fe²⁺ vs dichromate and precipitation – Ag⁺ vs Cl⁻ titrations) and conduct metric titrations (acid-base – HCl vs, NaOH) titrations,

UNIT II  CORROSION AND CORROSION CONTROL

UNIT III  FUELS AND COMBUSTION

UNIT IV  PHASE RULE AND ALLOYS

UNIT V  ANALYTICAL TECHNIQUES

TEXT BOOKS:

REFERENCES:
ME2151  ENGINEERING MECHANICS  L T P C  3 1 0 4

OBJECTIVE
At the end of this course the student should be able to understand the vectorial and scalar representation of forces and moments, static equilibrium of particles and rigid bodies both in two dimensions and also in three dimensions. Further, he should understand the principle of work and energy. He should be able to comprehend the effect of friction on equilibrium. He should be able to understand the laws of motion, the kinematics of motion and the interrelationship. He should also be able to write the dynamic equilibrium equation. All these should be achieved both conceptually and through solved examples.

UNIT I  BASICS & STATICS OF PARTICLES  12

UNIT II  EQUILIBRIUM OF RIGID BODIES  12

UNIT III  PROPERTIES OF SURFACES AND SOLIDS  12

UNIT IV  DYNAMICS OF PARTICLES  12

UNIT V  FRICTION AND ELEMENTS OF RIGID BODY DYNAMICS  12
Translation and Rotation of Rigid Bodies – Velocity and acceleration – General Plane motion.

TOTAL: 60 PERIODS
TEXT BOOK:

REFERENCES:

EE2151 CIRCUIT THEORY L T P C
(Common to EEE, EIE and ICE Branches) 3 1 0 4

UNIT I BASIC CIRCUITS ANALYSIS 12

UNIT II NETWORK REDUCTION AND NETWORK THEOREMS FOR DC AND AC CIRCUITS 12
Network reduction: voltage and current division, source transformation – star delta conversion.
Thevenins and Novton & Theorem – Superposition Theorem – Maximum power transfer theorem – Reciprocity Theorem.

UNIT III RESONANCE AND COUPLED CIRCUITS 12

UNIT IV TRANSIENT RESPONSE FOR DC CIRCUITS 12
Transient response of RL, RC and RLC Circuits using Laplace transform for DC input and A.C. with sinusoidal input.

UNIT V ANALYSING THREE PHASE CIRCUITS 12
Three phase balanced / unbalanced voltage sources – analysis of three phase 3-wire and 4-wire circuits with star and delta connected loads, balanced & un balanced – phasor diagram of voltages and currents – power and power factor measurements in three phase circuits.

TOTAL: 60 PERIODS
TEXT BOOKS:

REFERENCES:

EC2151 ELECTRIC CIRCUITS AND ELECTRON DEVICES L T P C
(For ECE, CSE, IT and Biomedical Engg. Branches) 3 1 0 4

UNIT I CIRCUIT ANALYSIS TECHNIQUES 12

UNIT II TRANSIENT RESONANCE IN RLC CIRCUITS 12

UNIT III SEMICONDUCTOR DIODES 12

UNIT IV TRANSISTORS 12
Principle of operation of PNP and NPN transistors – study of CE, CB and CC configurations and comparison of their characteristics – Breakdown in transistors – operation and comparison of N-Channel and P-Channel JFET – drain current equation – MOSFET – Enhancement and depletion types – structure and operation – comparison of BJT with MOSFET – thermal effect on MOSFET.

UNIT V SPECIAL SEMICONDUCTOR DEVICES (Qualitative Treatment only) 12
TEXT BOOKS:

REFERENCES:

GE2151 BASIC ELECTRICAL AND ELECTRONICS ENGINEERING
(Common to branches under Civil, Mechanical and Technology faculty)
4 0 0 4

UNIT I ELECTRICAL CIRCUITS & MEASURMENTS 12

Operating Principles of Moving Coil and Moving Iron Instruments (Ammeters and Voltmeters), Dynamometer type Watt meters and Energy meters.

UNIT II ELECTRICAL MECHANICS 12

UNIT III SEMICONDUCTOR DEVICES AND APPLICATIONS 12


UNIT IV DIGITAL ELECTRONICS 12
Binary Number System – Logic Gates – Boolean Algebra – Half and Full Adders – Flip-Flops – Registers and Counters – A/D and D/A Conversion (single concepts)

UNIT V FUNDAMENTALS OF COMMUNICATION ENGINEERING 12
Communication Systems: Radio, TV, Fax, Microwave, Satellite and Optical Fibre (Block Diagram Approach only).

**TOTAL: 60 PERIODS**

**TEXT BOOKS:**

**REFERENCES:**

**GE2152 **

**BASIC CIVIL & MECHANICAL ENGINEERING**

(General course covering the material required across all branches.)

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**UNIT I  **

**SURVEYING AND CIVIL ENGINEERING MATERIALS**


**UNIT II  **

**BUILDING COMPONENTS AND STRUCTURES**

**Foundations:** Types, Bearing capacity – Requirement of good foundations.


**TOTAL: 30 PERIODS**

**UNIT III  **

**POWER PLANT ENGINEERING**

UNIT IV  IC ENGINES
Internal combustion engines as automobile power plant – Working principle of Petrol and Diesel Engines – Four stroke and two stroke cycles – Comparison of four stroke and two stroke engines – Boiler as a power plant.

UNIT V  REFRIGERATION AND AIR CONDITIONING SYSTEM

REFERENCES:

GE2155  COMPUTER PRACTICE LABORATORY – II
L T P C
0 1 2 2

LIST OF EXPERIMENTS

1. UNIX COMMANDS
   Study of Unix OS - Basic Shell Commands - Unix Editor

2. SHELL PROGRAMMING
   Simple Shell program - Conditional Statements - Testing and Loops

3. C PROGRAMMING ON UNIX
   Dynamic Storage Allocation-Pointers-Functions-File Handling

TOTAL: 45 PERIODS

HARDWARE / SOFTWARE REQUIREMENTS FOR A BATCH OF 30 STUDENTS

Hardware
- 1 UNIX Clone Server
- 33 Nodes (thin client or PCs)
- Printer – 3 Nos.

Software
- OS – UNIX Clone (33 user license or License free Linux)
- Compiler - C
LIST OF EXPERIMENTS

1. Determination of Young’s modulus of the material – non uniform bending.
2. Determination of Band Gap of a semiconductor material.
3. Determination of specific resistance of a given coil of wire – Carey Foster Bridge.
5. Spectrometer dispersive power of a prism.
6. Determination of Young’s modulus of the material – uniform bending.

• A minimum of FIVE experiments shall be offered.
• Laboratory classes on alternate weeks for Physics and Chemistry.
• The lab examinations will be held only in the second semester.

LIST OF EXPERIMENTS

1. Conduct metric titration (Simple acid base)
2. Conduct metric titration (Mixture of weak and strong acids)
3. Conduct metric titration using BaCl\textsubscript{2} vs Na\textsubscript{2} SO\textsubscript{4}
4. Potentiometric Titration (Fe\textsuperscript{2+} / KMnO\textsubscript{4} or K\textsubscript{2} Cr\textsubscript{2} O\textsubscript{7})
5. PH titration (acid & base)
6. Determination of water of crystallization of a crystalline salt (Copper sulphate)
7. Estimation of Ferric iron by spectrophotometry.

• A minimum of FIVE experiments shall be offered.
• Laboratory classes on alternate weeks for Physics and Chemistry.
• The lab examinations will be held only in the second semester.
List of Exercises using software capable of Drafting and Modeling

1. Study of capabilities of software for Drafting and Modeling – Coordinate systems (absolute, relative, polar, etc.) – Creation of simple figures like polygon and general multi-line figures.

2. Drawing of a Title Block with necessary text and projection symbol.

3. Drawing of curves like parabola, spiral, involute using Bspline or cubic spline.

4. Drawing of front view and top view of simple solids like prism, pyramid, cylinder, cone, etc, and dimensioning.

5. Drawing front view, top view and side view of objects from the given pictorial views (eg. V-block, Base of a mixie, Simple stool, Objects with hole and curves).

6. Drawing of a plan of residential building ( Two bed rooms, kitchen, hall, etc.)

7. Drawing of a simple steel truss.

8. Drawing sectional views of prism, pyramid, cylinder, cone, etc,


10. Creation of 3-D models of simple objects and obtaining 2-D multi-view drawings from 3-D model.

Note: Plotting of drawings must be made for each exercise and attached to the records written by students.

List of Equipments for a batch of 30 students:

1. Pentium IV computer or better hardware, with suitable graphics facility -30 No.
2. Licensed software for Drafting and Modeling. – 30 Licenses
3. Laser Printer or Plotter to print / plot drawings – 2 No.

TOTAL: 45 PERIODS
EE2155  ELECTRICAL CIRCUIT LABORATORY  
(Common to EEE, EIE and ICE)  
LIST OF EXPERIMENTS  
1. Verification of ohm’s laws and kirchoff’s laws.  
2. Verification of Thevemin’s and Norton’s Theorem  
3. Verification of superposition Theorem  
4. Verification of maximum power transfer theorem.  
5. Verification of reciprocity theorem  
6. Measurement of self inductance of a coil  
7. Verification of mesh and nodal analysis.  
8. Transient response of RL and RC circuits for DC input.  
10. Frequency response of single tuned coupled circuits.  

TOTAL: 45 PERIODS

EC2155  CIRCUITS AND DEVICES LABORATORY  
LIST OF EXPERIMENTS  
1. Verification of KVL and KCL  
2. Verification of Thevenin and Norton Theorems.  
3. Verification of superposition Theorem.  
4. Verification of Maximum power transfer and reciprocity theorems.  
5. Frequency response of series and parallel resonance circuits.  
6. Characteristics of PN and Zener diode  
7. Characteristics of CE configuration  
8. Characteristics of CB configuration  
9. Characteristics of UJT and SCR  
10. Characteristics of JFET and MOSFET  

TOTAL: 45 PERIODS
1. **Listening:**
   - Listening & answering questions – gap filling – Listening and Note taking – Listening to telephone conversations
   - **L T P C:** 0 0 2 - 

2. **Speaking:**
   - Pronouncing words & sentences correctly – word stress – Conversation practice.
   - **L T P C:** 5

**Classroom Session**
- **L T P C:** 20
  1. Speaking: Introducing oneself, Introducing others, Role play, Debate
  2. Presentations: Body language, gestures, postures
     - Group Discussions etc

**Evaluation**

1. **Lab Session – 40 marks**
   - Listening – 10 marks
   - Speaking – 10 marks
   - Reading – 10 marks
   - Writing – 10 marks

2. **Classroom Session – 60 marks**
   - Role play activities giving real life context – 30 marks
   - Presentation – 30 marks

**Note on Evaluation**

1. Examples for role play situations:
   - Marketing engineer convincing a customer to buy his product.
   - Telephone conversation – Fixing an official appointment / Enquiry on availability of flight or train tickets / placing an order. etc.

2. Presentations could be just a Minute (JAM activity) or an Extempore on simple topics or visuals could be provided and students could be asked to talk about it.

**REFERENCES:**


**LAB REQUIREMENTS**

1. Teacher – Console and systems for students
2. English Language Lab Software
3. Tape Recorders.
OBJECTIVE
The course objective is to develop the skills of the students in the areas of Transforms and Partial Differential Equations. This will be necessary for their effective studies in a large number of engineering subjects like heat conduction, communication systems, electro-optics and electromagnetic theory. The course will also serve as a prerequisite for post graduate and specialized studies and research.

UNIT I  FOURIER SERIES  9 + 3

UNIT II  FOURIER TRANSFORMS  9 + 3

UNIT III  PARTIAL DIFFERENTIAL EQUATIONS  9 + 3
Formation of partial differential equations – Lagrange’s linear equation – Solutions of standard types of first order partial differential equations - Linear partial differential equations of second and higher order with constant coefficients.

UNIT IV  APPLICATIONS OF PARTIAL DIFFERENTIAL EQUATIONS  9 + 3
Solutions of one dimensional wave equation – One dimensional equation of heat conduction – Steady state solution of two-dimensional equation of heat conduction (Insulated edges excluded) – Fourier series solutions in cartesian coordinates.

UNIT V  Z-TRANSFORMS AND DIFFERENCE EQUATIONS  9 + 3

LECTURES: 45  TUTORIALS: 15  TOTAL: 60 PERIODS

TEXT BOOKS

REFERENCES
OBJECTIVE

- To achieve an understanding of principles of thermodynamics and to be able to use it in accounting for the bulk behaviour of the simple physical systems.
- To provide in-depth study of thermodynamic principles, thermodynamics of state, basic thermodynamic relations, Principle of Psychrometry & Properties of pure substances
- To enlighten the basic concepts of vapour power cycles.

UNIT I  BASIC CONCEPT AND FIRST LAW  9+3
Basic concepts - concept of continuum, macroscopic approach, thermodynamic systems - closed, open and isolated. Property, state, path and process, quasi-static process, work, modes of work, Zeroth law of thermodynamics – concept of temperature and heat. Concept of ideal and real gases. First law of thermodynamics – application to closed and open systems, internal energy, specific heat capacities, enthalpy, steady flow process with reference to various thermal equipments.

UNIT II  SECOND LAW, ENTROPY AND AVAILABILITY  9+3
Second law of thermodynamics – Kelvin’s and Clausius statements of second law. Reversibility and irreversibility. Carnot cycle, reversed carnot cycle, efficiency, COP. Thermodynamic temperature scale, Clausius inequality, concept of entropy, entropy of ideal gas, principle of increase of entropy – Carnot theorem, absolute entropy, availability.

UNIT III  PROPERTIES OF PURE SUBSTANCE AND STEAM POWER CYCLE  9+3

UNIT IV  IDEAL & REAL GASES AND THERMODYNAMIC RELATIONS  9+3
Gas mixtures – Properties of ideal and real gases, equation of state, Avagadro’s law, Vander Waal’s equation of states, compressibility, compressibility chart. Dalton’s law of partial pressure, Exact differentials, T-D, relations, Maxwell relations, Clausius Clapeyron equations, Joule Thomson Coefficient.

UNIT V  PSYCHROMETRY  9+3

TUTORIALS 15 TOTAL: 60 PERIODS

(Use of standard thermodynamic tables, Mollier diagram, Psychrometric chart and Refrigerant are permitted)
TEXT BOOKS

REFERENCES

ME2204 FLUID MECHANICS AND MACHINERY L T P C
(Common to Aeronautical, Mechanical, Automobile & Production) 3 1 0 4

OBJECTIVES:
• 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 12
Units & Dimensions. Properties of fluids – Specific gravity, specific weight, viscosity, compressibility, vapour pressure and gas laws – capillarity and surface tension. Flow characteristics: concepts of system and control volume. Application of control volume to continuity equation, energy equation, momentum equation and moment of momentum equation.

UNIT II FLOW THROUGH CIRCULAR CONDUITS 12

UNIT III DIMENSIONAL ANALYSIS 9
Dimension and units: Buckingham’s Π theorem. Discussion on dimensionless parameters. Models and similitude. Applications of dimensionless parameters.
UNIT IV  ROTO DYNAMIC MACHINES  16

UNIT V  POSITIVE DISPLACEMENT MACHINES  11

TOTAL: 60 PERIODS

TEXT BOOKS:

REFERENCES:

AT2201  AUTOMOTIVE ENGINES  L T P C
3 0 0 3

OBJECTIVE
To understand the basic principles of engines used for automobiles and different systems.

UNIT I  CONSTRUCTION AND OPERATION  9

UNIT II  FUEL SYSTEMS  9
UNIT III  COMBUSTION AND COMBUSTION CHAMBERS  9

UNIT IV  SUPERCHARGING , TURBOCHARGING AND ENGINE TESTING  9
Supercharging and Turbocharging, Different methods of turbocharging, Intercooling, Turbocharger controls including, waster gate, variable geometry, variable nozzle types. Dynamometers, Indicated thermal, brake thermal and volumetric efficiencies. Measurement of friction, Cylinder pressure measurement. Engine performance maps, Engine testing standards.

UNIT V  COOLING AND LUBRICATION SYSTEMS  9
Need for cooling, types of cooling systems- air and liquid cooling systems. Thermo syphon and forced circulation and pressurized cooling systems. Properties of coolants. Requirements of lubrication systems. Types-mist, pressure feed, dry and wet sump systems. Properties of lubricants.

TOTAL: 45 PERIODS

TEXT BOOKS:
1. Internal Combustion Engines by V. Ganesan, 2007, Tata Mc Graw Hill

REFERENCES
1. Advanced Engine Technology by Heisler, SAE Publication
2. Edward F. Obert Internal Combustion Engines
3. H.N. Gupta Fundamentals of Internal Combustion Engines by, PHI
4. Mathur and Sharma Intendemntal Combustion Engines Dhanpat Rai and Sons 2002

AE2201   MECHANICS OF MACHINES   L T P C
(Common to Production, Automobile and Aero)  3 1 0 4

OBJECTIVE
To expose the students the different mechanisms, their method of working, Forces involved and consequent vibration during working

UNIT I  MECHANISMS  9+3
UNIT II   FRICTION  9+3
Friction in screw and nut – Pivot and collar – Thrust bearing – Plate and disc clutches –
Belt (flat and V) and rope drives.  Ratio of tensions – Effect of centrifugal and initial
tension – Condition for maximum power transmission – Open and crossed belt drive.

UNIT III   GEARING AND CAMS  9+3
Gear profile and geometry – Nomenclature of spur and helical gears – Gear trains:
Simple, compound gear trains and epicyclic gear trains - Determination of speed and
torque- Cams – Types of cams – Design of profiles – Knife edged, flat faced and roller
ended followers with and without offsets for various types of follower motions

UNIT IV   BALANCING  9+3
Static and dynamic balancing – Single and several masses in different planes –
Balancing of reciprocating masses- primary balancing and concepts of secondary
balancing – Single and multi cylinder engines (Inline) – Balancing of radial V engine –
direct and reverse crank method

UNIT V   VIBRATION  9+3
Free, forced and damped vibrations of single degree of freedom systems – Force
transmitted to supports – Vibration isolation – Vibration absorption – Torsional vibration

TOTAL: 60 PERIODS

TEXT BOOKS

REFERENCES
India Publications, 2005.

AE2253 PRODUCTION TECHNOLOGY
(Common to Aeronautical & Automobile)  L T P C
3 0 0 3

OBJECTIVE
The automobile components such as piston, connecting rod, crankshaft, engine block,
front axle, frame, body etc., are manufactured by various types of production processes
involving casting, welding, machining, metal forming, power metallurgy etc. Hence B.E.
Automobile Engineering students must study this course Production Technology.

UNIT I   CASTING  8
Casting types, procedure to make sand mould, types of core making, moulding tolls,
machine moulding, special moulding processes – CO₂ moulding; shell moulding,
investment moulding, permanent mould casting, pressure die casting, centrifugal casting, continuous casting, casting defects.

UNIT II  WELDING  8

UNIT III  MACHINING  13
General principles (with schematic diagrams only) of working and commonly performed operations in the following machines: Lathe, Shaper, Planer, Horizontal milling machine, Universal drilling machine, Cylindrical grinding machine, Capstan and Turret lathe. Basics of CNC machines.
General principles and applications of the following processes: Abrasive jet machining, Ultrasonic machining, Electric discharge machining, Electro chemical machining, Plasma arc machining, Electron beam machining and Laser beam machining.

UNIT IV  FORMING AND SHAPING OF PLASTICS  7

UNIT V  METAL FORMING AND POWDER METALLURGY  9
Principles and applications of the following processes: Forging, Rolling, Extrusion, Wire drawing and Spinning, Powder metallurgy – Principal steps involved advantages, disadvantages and limitations of powder metallurgy.

TOTAL: 45 PERIODS

TEXT BOOKS

REFERENCES
1. Dismantling and study of Multi-cylinder Petrol Engine
2. Assembling of Multi-cylinder Petrol Engine
3. Dismantling and study of Multi-cylinder Diesel Engine
4. Assembling of Multi-cylinder Diesel Engine
5. Study of petrol engine fuel system
6. Study of diesel engine fuel system
7. Study and measurement of light and heavy commercial Vehicle Frame
8. Study, dismantling and assembling of front and rear Axles
9. Study, dismantling and assembling of differential
10. Study, dismantling and assembling of Clutch
11. Study, dismantling and assembling of Gear Box
12. Study of steering system

TOTAL: 45 PERIODS

LIST OF EQUIPMENTS
(for a batch of 30 students)

1. Multi Cylinder Petrol Engine 2 No.
3. Petrol and Diesel fuel systems 2No Each
4. Heavy duty vehicle chassis frame 1 No.
5. Light duty vehicle chassis frame 1 No.
6. Front axle 2 No.
7. Rear axle 2 No.
9. Clutch and Gear box 2 No. each (light duty, heavy duty)
10. Steering systems with different gearboxes 4 No.
LIST OF EXPERIMENTS

1. Determination of the Coefficient of discharge of given Orifice and Venturi meter.
2. Calculation of the rate of flow using Rota meter.
3. Determination of friction factor of given set of pipes.
4. Conducting experiments and drawing the characteristic curves of centrifugal pump/submergible pump.
5. Conducting experiments and drawing the characteristic curves of reciprocating pump.
6. Conducting experiments and drawing the characteristic curves of Gear pump.
7. Conducting experiments and drawing the characteristic curves of Pelton wheel.
8. Conducting experiments and drawing the characteristics curves of Francis turbine.
9. Conducting experiments and drawing the characteristic curves of Kaplan turbine.
10. Flow visualization experiment on the effects of sharp corner and rounded corner and add-on devices in automobiles.
11. Drag estimation on models of automobiles of different shapes.

TOTAL: 45 PERIODS

LIST OF EQUIPMENTS

(for the batch of 30 students)

1. Orifice meter setup
2. Venturi meter setup
3. Rotameter setup
4. Pipe Flow analysis setup
5. Centrifugal pump/submergible pump setup
6. Reciprocating pump setup
7. Gear pump setup
8. Pelton wheel setup
9. Francis turbine setup Kaplan turbine setup
10. Wind tunnel with pressure measuring devices
LIST OF EXPERIMENTS

1. LATHE
   1.1. Facing, plain turning and step turning
   1.2. Taper turning using compound rest.
   1.3. Taper turning using taper turning attachment
   1.4. Single start V thread, cutting and knurling
   1.5. Boring and internal thread cutting.

2. SHAPER AND SLOTTER
   2.1. Machining a V-block (in a Shaper)
   2.2. Machining hexagonal shape (in a Shaper)
   2.3. Machining internal key-way (in a slotter)

3. DRILLING
   3.1 Drilling 4 or 6 holes at a given pitch circle on a plate
   3.2 Drilling, reaming and tapping

4. MILLING
   4.1 Plain Milling Exercise
   4.2 Gear Milling Exercise

5. GRINDING
   Cylindrical Grinding Exercise

TOTAL: 45 PERIODS

LIST OF EQUIPMENTS (For A Batch Of 30 Students)

<table>
<thead>
<tr>
<th>No.</th>
<th>Equipment</th>
<th>Quantity</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Centre Lathe with accessories</td>
<td>5No.</td>
</tr>
</tbody>
</table>
### MA2266  STATISTICS AND NUMERICAL METHODS  
(Common to Mechanical, Automobile & Production)  
*L T P C*  
3 1 0 4

#### UNIT I  TESTING OF HYPOTHESIS  
**9 + 3**  

#### UNIT II  DESIGN OF EXPERIMENTS  
**9 + 3**  
Completely randomized design – Randomized block design – Latin square design – $2^2$-factorial design.

#### UNIT III  SOLUTION OF EQUATIONS AND EIGENVALUE PROBLEMS  
**9 + 3**  

#### UNIT IV  INTERPOLATION, NUMERICAL DIFFERENTIATION AND NUMERICAL INTEGRATION  
**9 + 3**  
Lagrange’s and Newton’s divided difference interpolation – Newton’s forward and backward difference interpolation - Approximation of derivatives using interpolation polynomials - Numerical integration using Trapezoidal and Simpson’s 1/3 rules.

#### UNIT V  NUMERICAL SOLUTION OF ORDINARY DIFFERENTIAL EQUATIONS  
**9+ 3**  

**L = 45  T = 15 TOTAL = 60 PERIODS**

### TEXT BOOKS

### REFERENCES:
UNIT I  GAS POWER CYCLES  

Air standard cycles-Otto-Diesel-Dual-Work output, Efficiency and MEP calculations – comparison of the cycles for same compression ratio and heat addition, same compression ratio and heat rejection, same peak pressure, peak temperature and heat rejection, same peak pressure and heat input, same peak pressure and work output, Brayton cycle with intercooling, reheating and regeneration.

UNIT II  RECIPROCATING AIRCOMPRESSORS & REFRIGERATION CYCLES 10+3

Single acting and double acting air compressors, work required, effect of clearance volume, volumetric efficiency, isothermal efficiency, free air delivery, multistage compression, condition for minimum work. Fundamentals of refrigeration, C.O.P., reversed cannot cycle, simple vapour compression refrigeration system, T-S, P-H diagrams, simple vapour absorption refrigeration system, desirable properties of an ideal refrigerant.

UNIT III  CONDUCTION  10+2


UNIT IV  CONVECTION  10+2


UNIT V  RADIATION  8+2


TOTAL: 60 PERIODS

TEXT BOOKS

REFERENCES
ME 2253 ENGINEERING MATERIALS AND METALLURGY

(Common to Mechanical, Mechanical and Automation and Automobile)

OBJECTIVE
To impart knowledge on the structure, properties, treatment, testing and applications of metals and non-metallic materials so as to identify and select suitable materials for various engineering applications.

REVIEW (NOT FOR EXAM):
Crystal structure – BCC, FCC and HCP structure – unit cell – crystallographic planes and directions, miller indices – crystal imperfections, point, line, planar and volume defects – Grain size, ASTM grain size number.

UNIT I CONSTITUTION OF ALLOYS AND PHASE DIAGRAMS

UNIT II HEAT TREATMENT

UNIT III MECHANICAL PROPERTIES AND TESTING
Mechanism of plastic deformation, slip and twinning – Types of fracture – Testing of materials under tension, compression and shear loads – Hardness tests (Brinell, Vickers and Rockwell), Impact test - Izod and Charpy, Fatigue and creep tests, fracture toughness tests.

UNIT IV FERROUS AND NON FERROUS METALS
UNIT V  NON-METALLIC MATERIALS

TOTAL: 45 PERIODS

TEXT BOOKS

REFERENCES

ME2254  STRENGTH OF MATERIALS  L  T  P  C
(Common to Mechanical, Automobile & Production)  3  1  0  4

OBJECTIVES
• To gain knowledge of simple stresses, strains and deformation in components due to external loads.
• To assess stresses and deformations through mathematical models of beams, twisting bars or combinations of both.
• Effect of component dimensions and shape on stresses and deformations are to be understood.
• The study would provide knowledge for use in the design courses

UNIT I  STRESS STRAIN DEFORMATION OF SOLIDS
Rigid and Deformable bodies – Strength, Stiffness and Stability – Stresses; Tensile, Compressive and Shear – Deformation of simple and compound bars under axial load – Thermal stress – Elastic constants – Strain energy and unit strain energy – Strain energy in uniaxial loads.

UNIT II  BEAMS - LOADS AND STRESSES
Types of beams: Supports and Loads – Shear force and Bending Moment in beams – Cantilever, Simply supported and Overhanging beams – Stresses in beams – Theory of simple bending – Stress variation along the length and in the beam section – Effect of shape of beam section on stress induced – Shear stresses in beams – Shear flow
UNIT III  TORSION
Analysis of torsion of circular bars – Shear stress distribution – Bars of Solid and hollow circular section – Stepped shaft – Twist and torsion stiffness – Compound shafts – Fixed and simply supported shafts – Application to close-coiled helical springs – Maximum shear stress in spring section including Wahl Factor – Deflection of helical coil springs under axial loads – Design of helical coil springs – stresses in helical coil springs under torsion loads

UNIT IV  BEAMDEFLECTION

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

TUTORIALS 15 TOTAL: 60 PERIODS

TEXT BOOKS

REFERENCES
OBJECTIVE
To enable the students to understand the fundamental concepts of Semi Conductors, Transistors, Rectifiers, Digital Electronics and 8085 Microprocessors

UNIT I SEMICONDUCTORS AND RECTIFIERS 9
Classification of solids based on energy band theory-Intrinsic semiconductors-Extrinsic semiconductors-P type and N type-PN junction-Zenor effect-Zenor diode characteristics-Half wave and full wave rectifiers -Voltage regulation

UNIT II TRANSISTORS AND AMPLIFIERS 12
Bipolar junction transistor- CB, CE, CC configuration and characteristics-Biasing circuits-Class A, B and C amplifiers- Field effect transistor-Configuration and characteristic of FET amplifier-SCR, Diac, Triac, UJT-Characteristics and simple applications-Switching transistors-Concept of feedback-Negative feedback-Application in temperature and motor speed control.

UNIT III DIGITAL ELECTRONICS 9
Binary number system - AND, OR, NOT, NAND, NOR circuits-Boolean algebra-Exclusive OR gate - Flip flops-Half and full adders-Registers-Counters-A/D and D/A conversion.

UNIT IV 8085 MICROPROCESSOR 9
Block diagram of microcomputer-Architecture of 8085-Pin configuration-Instruction set-Addressing modes-Simple programs using arithmetic and logical operations.

UNIT V INTERFACING AND APPLICATIONS OF MICROPROCESSOR 6
Basic interfacing concepts - Interfacing of Input and Output devices-Applications of microprocessor Temperature control, Stepper motor control, traffic light control.

TOTAL: 45 PERIODS

TEXT BOOKS

REFERENCES
OBJECTIVE:
Study of the constructional details and theory of important drive line, structural, steering, braking and suspension systems of automobiles.
Problem-solving in steering mechanism, propeller shaft, braking and suspension systems are to be done.

UNIT I  INTRODUCTION
9
Types of chassis layout, with reference to power plant location and drive, various types of frames, loads acting on vehicle frame, constructional details and materials for frames, testing of frames, types of front axles and stub axles, front wheel geometry, namely, castor, camber, king pin inclination and toe-in, condition for true rolling motion of wheels during steering, ackerman’s and daut’s steering mechanisms, steering error curve, steering linkages, different types of steering gears, slip angle, over-steer and under-steer, reversible and irreversible steering, power-assisted steering.

UNIT II  DRIVE LINE
9
Effect of driving thrust, torque reactions and side thrust, hotchkiss drive, torque tube drive, radius rods and stabilizers, propeller shaft, universal joints, constant velocity universal joints, front wheel drive, final drive, different types, double reduction and twin speed final drives, multi-axled vehicles, differential principle and types, differential housings, non-slip differential, differential locks, final drive of crawler tractors.

UNIT III  AXLES
9
Construction and design of drive axles, types of loads acting on drive axles, full-floating, three-quarter floating and semi-floating axles, axle housings and types, types and constructional details of different types of wheels and rims, different types of tyres and their constructional details.

UNIT IV  SUSPENSION SYSTEM
9
Need for suspension system, types of suspension springs, constructional details and characteristics of single leaf, multi-leaf, coil, torsion bar, rubber, pneumatic and hydro-elastic suspension spring systems, independent suspension system, shock absorbers, types and constructional details, design of leaf and coil springs.

UNIT V  BRAKING SYSTEM
9
Theory of automobile braking, stopping distance time and braking efficiency, effect of weight transfer during braking, theory of drum brakes, loading and trailing shoes, braking torque, constructional details of drum brake and its activators, disc brake theory, types and construction, hydraulic braking system, mechanical braking system, pneumatic braking system, power-assisted braking system, servo brakes, retarders, types and construction, anti-lock braking system, constructional details.

TOTAL: 45 PERIODS

TEXT BOOKS

REFERENCES

AT2255 ENGINE PERFORMANCE AND EMISSION TESTING LAB

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LIST OF EXPERIMENTS

1. Study of hydraulic, electrical and eddy current dynamometers
2. Valve timing and port timing diagram
3. Performance and emission test on two wheeler SI engine
4. Performance and emission test on automotive multi-cylinder SI engine
5. Performance and emission test on automotive multi-cylinder CI engine
7. Heat balance test on automotive multi-cylinder SI engine
8. Heat balance test on automotive multi-cylinder CI engine
9. Morse test on multi-cylinder SI engine
10. P-θ and P-V diagrams for IC engine with piezo-electric pick up, charge amplifier, angle encoder and PC

LIST OF EQUIPMENTS
(for a batch of 30 students)

1. Hydraulic dynamometer - 1 No.
2. Eddy current dynamometer - 1 No.
3. Electrical dynamometer - 1 No.
4. Single cylinder two stroke cut section engine - 1 No.
5. Single cylinder four stroke cut section engine - 1 No.
6. Two-wheeler engine test rig - 1 No.
7. Automotive multicylinder SI engine test rig with heat balance arrangement - 1 No.
8. Automotive multicylinder CI engine test rig with heat balance arrangement - 1 No.
9. Emission Measuring Instruments for Petrol & Diesel Engines - 1 No each
10. Piezo-electric pick up, Charge Amplifier, Angle Encoder and PC - 1 set

TOTAL: 45 PERIODS
AT2256 COMPUTER AIDED MACHINE DRAWING LAB (Common to Automobile & Production) 0 0 3 2

1. Drawing of automobile components such as piston, connecting rod, valves, manifold and crank shaft.
2. Assembly drawing of screw jack, piston – connecting rod assembly, valve assembly, clutch assembly and gear box assembly.

TOTAL: 45 PERIODS

LIST OF EQUIPMENTS (For a batch of 30 students)

2. Software
   i) Auto CAD - 15 licenses
   ii) Pro-E - 5 Nos.

AT 2257 ELECTRONICS AND MICROPROCESSORS LAB 0 0 3 2

OBJECTIVE

To supplement the theoretical knowledge with practical use of electronic components and programming and control using micro-processors.

LIST OF EXPERIMENTS

ELECTRONICS 30
VI Characteristics of PN Junction Diode
VI Characteristics of Zener Diode
Characteristics of CE Transistor
Characteristics of JFET
Characteristics of Uni Junction Transistor
RC or Wein Bridge Oscillator
Study of Logic Gates (Basic Gates)
Half Adder and Full Adder
Shift Registers and Counters
Operational Amplifier (Adder, Subtractor, Differentiator, Integrator, Inverting and Non - Inverting)
MICROPROCESSORS
Block Transfer
8 bit Addition, Subtraction
Multiplication and Division
Maximum and Minimum of block of data
Sorting
Stepper Motor Interfacing

LIST OF EQUIPMENT
(for a batch of 30 students)

Voltmeters 5 No.
Ammeters 5 No.
PN Diode, BJT, JFET, Logic Gates, Shift Registers and Counters 1 set.
Digital Logic Trainer Kits 1 No.
Breadboards 1 No.
Microprocessor Kits – 8085 5 No.
D/A Converter Interface 1 No.
Stepper Motor Interface 1 No.
CRO 1 No.
Waveform Generator 1 No.
Multimeter 1 No.

TOTAL : 45 PERIODS

ME 2256  STRENGTH OF MATERIALS LAB  L T P C
(Common to Auto, Mechanical & Production)  0 0 3 2

OBJECTIVE
To supplement the theoretical knowledge gained in Mechanics of Solids with practical testing for determining the strength of materials under externally applied loads. This would enable the student to have a clear understanding of the design for strength and stiffness

LIST OF EXPERIMENTS
1. Tension test on a mild steel rod
2. Double shear test on Mild steel and Aluminium rods
3. Torsion test on mild steel rod
4. Impact test on metal specimen
5. Hardness test on metals - Brinnell and Rockwell Hardness Number
6. Deflection test on beams
7. Compression test on helical springs
8. Strain Measurement using Rosette strain gauge
10. Tempering- Improvement Mechanical properties Comparison
(i) Unhardened specimen
(ii) Quenched Specimen and
(iii) Quenched and tempered specimen.

11. Microscopic Examination of
    Hardened samples and
    (ii) Hardened and tempered samples.

**LIST OF EQUIPMENT**
(for a batch of 30 students)

- Universal Tensile Testing machine with double shear attachment – 40 Ton Capacity
- Torsion Testing Machine (60 NM Capacity)
- Impact Testing Machine (300 J Capacity)
- Brinell Hardness Testing Machine
- Rockwell Hardness Testing Machine
- Spring Testing Machine for tensile and compressive loads (2500 N)
- Metallurgical Microscopes
- Muffle Furnace (800 °C)

**TOTAL : 45 PERIODS**

**GE 2021**
**ENVIRONMENTAL SCIENCE AND ENGINEERING**

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**AIM**
- The aim of this course is to create awareness in every engineering graduate about the importance of environment, the effect of technology on the environment and ecological balance and make them sensitive to the environment problems in every professional Endeavour that they participates.

**OBJECTIVE**
- At the end of this course the student is expected to understand what constitutes the environment, what are precious resources in the environment, how to conserve these resources, what is the role of a human being in maintaining a clean environment and useful environment for the future generations and how to maintain ecological balance and preserve bio-diversity. The role of government and non-government organization in environment managements.

**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 –
biogeographical classification of India – value of biodiversity: consumptive use, productive use, social, ethical, aesthetic and option values – Biodiversity at global, national and local levels – India as a mega-diversity nation – hot-spots of biodiversity – 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 – solid waste management: causes, effects and control measures of municipal solid wastes – role of an individual in prevention of pollution – pollution case studies – disaster management: floods, earthquake, cyclone and landslides.
Field study of local polluted site – Urban / Rural / Industrial / Agricultural.

UNIT III NATURAL RESOURCES 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
TEXT BOOKS:

REFERENCES BOOKS:

ME2303 DESIGN OF MACHINE ELEMENTS

OBJECTIVES
• To familiarise the various steps involved in the Design Process
• To understand the principles involved in evaluating the shape and dimensions of a component to satisfy functional and strength requirements.
• To learn to use standard practices and standard data
• To learn to use catalogues and standard machine components

UNIT I STEADY STRESSES AND VARIABLE STRESSES IN MACHINE MEMBERS

UNIT II DESIGN OF SHAFTS AND COUPLINGS
Design of solid and hollow shafts based on strength, rigidity and critical speed – Design of keys, key ways and splines - Design of crankshafts -- Design of rigid and flexible couplings.

UNIT III DESIGN OF TEMPORARY AND PERMANENT JOINTS
UNIT IV  DESIGN OF ENERGY STORING ELEMENTS

Design of various types of springs, optimization of helical springs -- rubber springs -- Design of flywheels considering stresses in rims and arms, for engines and punching machines.

UNIT V  DESIGN OF BEARINGS AND MISCELLANEOUS ELEMENTS

Sliding contact and rolling contact bearings -- Design of hydrodynamic journal bearings, McKee's Eqn. Sommerfield Number, Raimondi & Boyd graphs, -- Selection of Rolling Contact bearings -- Design of Seals and Gaskets -- Design of Connecting Rod.

LECTURE: 45 TUTORIAL: 15 TOTAL: 60 PERIODS

Note: (Use of P S G Design Data Book is permitted in the University examination)

TEXT BOOKS


REFERENCES


STANDARDS

OBJECTIVE

- To impart basic knowledge to students with respect to transmission system of automobiles and impart knowledge that will enable the students to understand the latest developments in the field.

UNIT I  CLUTCH

UNIT II  GEAR BOX
Problems on performance of automobile such as resistance to motion, tractive effort, engine speed & power and acceleration. Determination of gear ratio for passenger car, heavy vehicle and tractors. Objectives and need of gear box in a vehicle. Construction and operation of Sliding mesh gear box, constant mesh gear box, Synchronizers –need, principle of operation and types such as Early Warner and Later Warner gear synchronizers.

UNIT III  HYDROMATIC DRIVE

UNIT IV  EPICYCLIC GEAR BOXES

UNIT V  HYDROSTATIC AND ELECTRIC DRIVE

LECTURES: 45 TUTORIALS: 15 TOTAL = 60 PERIODS

TEXT BOOKS

REFERENCES
OBJECTIVE

- To impart knowledge to the students in the principles of operation and constructional details of various Automotive Electrical and Electronic Systems like Batteries, Starting System, Charging System, Ignition System, Lighting System and Dash – Board Instruments.

UNIT I  TYPES OF BATTERIES

Principle and construction of Lead Acid Battery, Nickel – Cadmium Battery, Nickel Metal, Hybrid Battery, Sodium Sulphur Battery and Aluminium Air Battery, Characteristics of Battery, Battery Rating, Capacity and Efficiency, Various Tests on Battery, Battery – Charging Techniques, Maintenance of batteries.

UNIT II  ELECTRICAL COMPONENTS


UNIT III  IGNITION SYSTEMS


UNIT IV  ELECTRICAL AND ELECTRONIC IGNITION SYSTEMS


UNIT V  WIRING, LIGHTING AND OTHER INSTRUMENTS AND SENSORS


TOTAL: 45 PERIODS

TEXT BOOKS


REFERENCES

OBJECTIVE
Students have to collect important technical specifications of an automobile from Automobile Journals and keeping this, as a guide, they have to calculate and tabulate various vehicle performance parameters and design parameters and to draw curves using these data.

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

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

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

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

UNIT V
GEAR RATIOS
Determination of Gear Ratios, Acceleration and Gradability, Typical Problems on Vehicle performance

TOTAL: 60 PERIODS

TEXT BOOKS

REFERENCE
1. R.B.Gupta, Automobile Engineering.
OBJECTIVE
To understand the source of automotive fuels and lubricants, their basic properties, determination of air requirement for the combustion of fuels and basic theory of lubrication.

UNIT I MANUFACTURE OF FUELS AND LUBRICANTS
Fuels, Structure of petroleum, refining process, thermal and catalytic cracking, products of refining process, manufacture of lubricating oil base stocks and finished automotive lubricants.

UNIT II FUELS FOR I.C. ENGINES
Types of Fuels, Liquid and gaseous fuels, heating value of fuels, higher and lower heating values, chemical structure of hydro-carbons SI Engine fuels, Volatility characteristics, desirable characteristics of SI Engine fuels, knock rating and additives, alternate fuels for SI engines. CI engine fuels, desirable characteristics, cetane rating, alternate fuels for CI engines, biodiesels.

UNIT III COMBUSTION OF FUELS
Stoichiometry - calculation of theoretically correct air required for combustion of liquid and gaseous fuels, volumetric and gravimetric analysis of the dry products of combustion, mass of dry gas per kg of fuel burnt, mass of carbon in the exhaust gas, mass of carbon burnt to carbon-monoxide per kg of fuel, heat loss due to incomplete combustion, exhaust gas analysis by Orsat apparatus.

UNIT IV THEORY OF LUBRICATION
Engine friction: introduction, total engine friction, effect of engine variables on friction, hydrodynamic lubrication, elasto hydrodynamic lubrication, boundary lubrication, Hydrostatic lubrication bearing lubrication, functions of the lubrication system.

UNIT V 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, testing of grease.

TOTAL: 45 PERIODS

TEXT BOOKS

REFERENCES
Globalisation has brought in numerous opportunities for the teeming millions, with more focus on the students’ overall capability apart from academic competence. Many students, particularly those from non-English medium schools, find that they are not preferred due to their inadequacy of communication skills and soft skills, despite possessing sound knowledge in their subject area along with technical capability. Keeping in view their pre-employment needs and career requirements, this course on Communication Skills Laboratory will prepare students to adapt themselves with ease to the industry environment, thus rendering them as prospective assets to industries. The course will equip the students with the necessary communication skills that would go a long way in helping them in their profession.

OBJECTIVES:

- To equip students of engineering and technology with effective speaking and listening skills in English.
- To help them develop their soft skills and interpersonal skills, which will make the transition from college to workplace smoother and help them excel in their job.
- To enhance the performance of students at Placement Interviews, Group Discussions and other recruitment exercises.

<table>
<thead>
<tr>
<th>I. PC based session</th>
<th>(Weightage 40%)</th>
<th>24 periods</th>
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A. ENGLISH LANGUAGE LAB (18 Periods)

1. LISTENING COMPREHENSION:
   - Listening and typing – Listening and sequencing of sentences – Filling in the blanks - Listening and answering questions.

2. READING COMPREHENSION:
   - Filling in the blanks - Close exercises – Vocabulary building - Reading and answering questions.

3. SPEAKING:

   Conversations: Face to Face Conversation – Telephone conversation – Role play activities (Students take on roles and engage in conversation)

B. DISCUSSION OF AUDIO-VISUAL MATERIALS (6 PERIODS)

   (Samples are available to learn and practice)
1. **RESUME / REPORT PREPARATION / LETTER WRITING**  
   Structuring the resume / report - Letter writing / Email Communication - Samples.

2. **PRESENTATION SKILLS:**  
   Elements of effective presentation – Structure of presentation - Presentation tools – Voice Modulation – Audience analysis - Body language – Video samples

3. **SOFT SKILLS:**  
   Time management – Articulateness – Assertiveness – Psychometrics – Innovation and Creativity - Stress Management & Poise - Video Samples

4. **GROUP DISCUSSION:**  
   Why is GD part of selection process ? - Structure of GD – Moderator – led and other GDs - Strategies in GD – Team work - Body Language - Mock GD -Video samples

5. **INTERVIEW SKILLS:**  
   Kinds of interviews – Required Key Skills – Corporate culture – Mock interviews-Video samples.

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<thead>
<tr>
<th>II. Practice Session</th>
<th>(Weightage – 60%)</th>
<th>24 periods</th>
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<tbody>
<tr>
<td>1. <strong>Resume / Report Preparation / Letter writing:</strong> Students prepare their own resume and report.</td>
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<td>2. <strong>Presentation Skills:</strong> Students make presentations on given topics.</td>
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<tr>
<td>3. <strong>Group Discussion:</strong> Students participate in group discussions.</td>
<td>(6)</td>
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<tr>
<td>4. <strong>Interview Skills:</strong> Students participate in Mock Interviews</td>
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**REFERENCES**

LAB REQUIREMENT

1. Teacher console and systems for students.
2. English Language Lab Software
3. Career Lab Software

Requirement for a batch of 60 students

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<tr>
<th>Sl.No.</th>
<th>Description of Equipment</th>
<th>Quantity required</th>
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<td>Server</td>
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<td></td>
<td>o PIV system</td>
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<td></td>
<td>o 1 GB RAM / 40 GB HDD</td>
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<td></td>
<td>o OS: Win 2000 server</td>
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<tr>
<td></td>
<td>o Audio card with headphones (with mike)</td>
<td>1 No.</td>
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<tr>
<td></td>
<td>o JRE 1.3</td>
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<td>2.</td>
<td>Client Systems</td>
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<td>o PIII or above</td>
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<td>o 256 or 512 MB RAM / 40 GB HDD</td>
<td></td>
</tr>
<tr>
<td></td>
<td>o OS: Win 2000</td>
<td></td>
</tr>
<tr>
<td></td>
<td>o Audio card with headphones (with mike)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>o JRE 1.3</td>
<td></td>
</tr>
<tr>
<td>3.</td>
<td>Handicam Video Camera (with video lights and mic input)</td>
<td>1 No.</td>
</tr>
<tr>
<td>4.</td>
<td>Television - 29&quot;</td>
<td>1 No.</td>
</tr>
<tr>
<td>5.</td>
<td>Collar mike</td>
<td>1 No.</td>
</tr>
<tr>
<td>6.</td>
<td>Cordless mikes</td>
<td>1 No.</td>
</tr>
<tr>
<td>7.</td>
<td>Audio Mixer</td>
<td>1 No.</td>
</tr>
<tr>
<td>8.</td>
<td>DVD Recorder / Player</td>
<td>1 No.</td>
</tr>
</tbody>
</table>
LIST OF EXPERIMENTS

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

b. Electronics Laboratory
6. Study of rectifiers and filters
7. Study of logic gates, adder and flip-flops
8. Study of SCR and IC timer
9. Interfacing Sensors like RTD, LVDT, Load Cell etc.
10. Interfacing ADC for Data Acquisition
11. Interfacing DAC for Control Application
12. Interfacing A/D converter and simple data acquisition
13. Micro controller programming and interfacing
14. Interfacing Actuators
15. EPROM Programming
16. Fault Diagnosis of various sensors

TOTAL: 45 PERIODS

LIST OF EQUIPMENT
(for a batch of 30 students)

<table>
<thead>
<tr>
<th>Equipment</th>
<th>Quantity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Battery, hydrometer, voltage tester</td>
<td>1 No. each</td>
</tr>
<tr>
<td>Starter motor, regulator, cut-out</td>
<td>1 No. each</td>
</tr>
<tr>
<td>Distributor, ignition coil, spark plug</td>
<td>1 No. each</td>
</tr>
<tr>
<td>Auto electrical wiring system</td>
<td>1 No.</td>
</tr>
<tr>
<td>Rectifiers, filters</td>
<td>1 No. each</td>
</tr>
<tr>
<td>Amplifier</td>
<td>1 No.</td>
</tr>
<tr>
<td>IC timer</td>
<td>1 No.</td>
</tr>
<tr>
<td>Data logger</td>
<td>1 No.</td>
</tr>
<tr>
<td>8085 trainer kit</td>
<td>10 Nos</td>
</tr>
<tr>
<td>ADC interface board</td>
<td>2 Nos</td>
</tr>
<tr>
<td>DAC interface board</td>
<td>2 Nos</td>
</tr>
<tr>
<td>Sensors like RTD, Load cell, LVDT</td>
<td>2 Nos</td>
</tr>
<tr>
<td>Actuators like stepper motor</td>
<td>2 Nos</td>
</tr>
</tbody>
</table>
LIST OF EXPERIMENTS

2. Study of Octane and Cetane Number of fuels.
3. Testing of fuels - Ultimate analysis, proximate analysis
4. ASTM distillation test of liquid fuels
5. Aniline Point test of diesel
7. Calorific value of gaseous fuel.
8. Reid vapour pressure test.
10. Copper strip Corrosion Test
11. Cloud & Pour point Test.
13. Viscosity Index of lubricants & Fuels by Saybolt Viscometer
14. Ash content and Carbon Residue Test
15. Drop point of grease and mechanical penetration in grease.

TOTAL: 45 PERIODS

LIST OF EQUIPMENT
(for a batch of 30 students)

1. Fuel Analysis Test Apparatus
   (for Ultimate and proximate analysis) - 1 No. each
2. Abels flash and fire point apparatus (for petrol) - 1 No.
3. Aniline point Apparatus - 1 No.
4. Reid vapor pressure test Apparatus - 1 No.
5. Bomb and Gas Calorimeters - 1 No. each
6. Carbon Residue Test Apparatus - 1 No.
7. Copper Strip Corrosion Test Apparatus - 1 No.
8. Cloud and Pour point Apparatus - 1 No.
9. Redwood Viscometer - 1 No.
10. Saybolt Viscometer - 1 No.
11. ASTM distillation test Apparatus - 1 No.
12. Ash content Test Apparatus - 1 No.
13. Drop point and penetration Apparatus for grease - 1 No.
OBJECTIVE:
Knowledge on the principles of management is essential for all kinds of people in all kinds of organizations. After studying this course, students will be able to have a clear understanding of the managerial functions like planning, organizing, staffing, leading and controlling. Students will also gain some basic knowledge on international aspect of management.

UNIT I  OVERVIEW OF MANAGEMENT  9

UNIT II  PLANNING  9

UNIT III  ORGANIZING  9

UNIT IV  DIRECTING  9
Creativity and Innovation - Motivation and Satisfaction - Motivation Theories Leadership - Leadership theories - Communication - Hurdles to effective communication - Organization Culture - Elements and types of culture - Managing cultural diversity.

UNIT V  CONTROLLING  9
Process of controlling - Types of control - Budgetary and non-budgetary control techniques - Managing Productivity - Cost Control - Purchase Control - Maintenance Control - Quality Control - Planning operations.

TOTAL : 45 PERIODS

TEXT BOOKS:

REFERENCES:
OBJECTIVE
To make the students understand the design concept and principles of various engine components. These concepts and principles are familiarized for design of components.

UNIT I INTRODUCTION 12
Engineering materials - Introduction endurance limit, notch sensitivity. Tolerances, types of tolerances and fits, design considerations for interference fits, surface finish, surface roughness, Rankine’s formula - Tetmajer’s formula - Johnson formula - design of push-rods.

UNIT II DESIGN OF CYLINDER, PISTON AND CONNECTING ROD 12
Choice of material for cylinder and piston, design of cylinder, piston, piston pin, piston rings, piston failures, lubrication of piston assembly. Material for connecting rod, determining minimum length of connecting rod, small end design, shank design, design of big end cap bolts.

UNIT III DESIGN OF CRANKSHAFT 12
Balancing of I.C. engines, significance of firing order. Material for crankshaft, design of crankshaft under bending and twisting, balancing weight calculations, development of short and long crankarms. Front and rear-end details.

UNIT IV DESIGN OF FLYWHEELS 12
Determination of the mass of a flywheel for a given co-efficient of speed fluctuation. Engine flywheel - stresses on the rim of the flywheels. Design of hubs and arms of the flywheel, turning moment diagram.

UNIT V DESIGN OF VALVES AND VALVE TRAIN 12

TOTAL: 60 PERIODS

Note: (Use of P S G Design Data Book is permitted in the University examination)

TEXT BOOK:

REFERENCES:
OBJECTIVE:
• At the end of the course the student will be able to understand the fundamental principles involved in design of components of automotive chassis, the complete design exercise and arrive at important dimensions of chassis components.

UNIT I  VEHICLE FRAME AND SUSPENSION  12
Study of loads-moments and stresses on frame members. Design Of frame for passenger and commercial vehicle - Design of leaf Springs-Coil springs and torsion bar springs.

UNIT II  FRONT AXLE AND STEERING SYSTEMS  12

UNIT III  CLUTCH  12
Design of single plate clutch, multiplate clutch and cone clutch. Torque capacity of clutch. Design of clutch components, Design details of roller and sprag type of clutches.

UNIT IV  GEAR BOX  12
Gear train calculations, layout of gearboxes. Calculation of bearing loads and selection of bearings. Design of three speed and four speed gearboxes.

UNIT V  DRIVE LINE AND REAR AXLE  12
Design of propeller shaft. Design details of final drive gearing. Design details of full floating, semi-floating and three quarter floating rear shafts and rear axle housings and design aspects of final drive.

TOTAL: 60 PERIODS

TEXT BOOKS:

REFERENCES:
OBJECTIVE:
The aim of this course is to make the students to know and understand the constructional details operating characteristics and vehicle design aspects.

UNIT I POWER UNIT

UNIT II CHASSIS AND SUB-SYSTEMS

UNIT III BRAKES, WHEELS AND TYRES
Drum brakes, disc brakes, front and rear brake links, layouts. Spoked wheel, cast wheel, disc wheel, disc types. Tyres and tubes.

UNIT IV TWO WHEELERS
Case study of major Indian models of motorcycles, scooters and mopeds. TVS mopeds and motorcycles, HeroHonda motorcycles, Bajaj scooters and motorcycles, Yamaha, Enfield motorcycles. Servicing and maintenance.

UNIT V THREE WHEELERS

TOTAL: 45 PERIODS

TEXT BOOKS:

REFERENCES:
INTRODUCTION (Not for examination)

UNIT I  FINITE ELEMENT FORMULATION OF BOUNDARY VALUE PROBLEMS  5+3

UNIT II  ONE DIMENSIONAL FINITE ELEMENT ANALYSIS  8+3

UNIT III  TWO DIMENSIONAL FINITE ELEMENT ANALYSIS  10+3

UNIT IV  DYNAMIC ANALYSIS USING FINITE ELEMENT METHOD  9+3

UNIT V  APPLICATIONS IN HEAT TRANSFER & FLUID MECHANICS  8+3
One dimensional heat transfer element – application to one-dimensional heat transfer problems – scalar variable problems in 2-Dimensions – Applications to heat transfer in 2-Dimension – Application to problems in fluid mechanics in 2-D

TOTAL L=45, T=15=60 PERIODS
TEXT BOOKS:

REFERENCES:

Note: L- no. of lectures/week, T- no. of tutorials per week

AT2354 COMPUTER AIDED ENGINE DESIGN LAB

L T P C
0 0 3 2

LIST OF EXPERIMENTS

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

TOTAL: 45 PERIODS

LIST OF EQUIPMENTS
(For a batch of 30 students)

2. Software like AutoCAD or Pro-E - 15 licenses
**AT 2355  COMPUTER AIDED CHASSIS DESIGN LAB**  
**LIST OF EXPERIMENTS**  

**CLUTCH**  
1. Complete design of clutch components.  
2. Assembly drawing of clutch using drafting software.  

**GEAR BOX**  
3. Gear train calculations.  
4. Layout of gear box.  
5. Calculation of bearing loads  
6. Selection of bearings.  
7. Assembly drawing of gear box using drafting software.  

**DRIVE LINE AND REAR AXLE**  
8. Design of propeller shaft.  
10. Design details of full floating, semi-floating and three quarter floating rear shafts and rear axle housings  
11. Design aspects of final drive.  

**TOTAL: 45 PERIODS**  

**LIST OF EQUIPMENTS**  
*(for a batch of 30 students)*  
2. Software like AutoCAD or Pro-E - 15 licenses

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**AT2356  TWO AND THREE WHEELERS LAB**  
**LIST OF EXPERIMENTS**  

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

**TOTAL: 45 PERIODS**
LIST OF EQUIPMENTS  
(for a batch of 30 students)

1. Two wheeler chassis dynamometer - 1 No.
2. Coil spring test rig - 1 No.
3. Chain tension test rig - 1 No.
4. Shock absorber test rig - 1 No.
5. Two-wheeler gearbox - 2 Nos.
8. Three-wheeler steering assembly - 2 Nos.

AT2401 ENGINE AND VEHICLE MANAGEMENT SYSTEM  L T P C  
4 0 0 4

OBJECTIVE:
To explain the principle of engines and vehicle electronic management system and different sensors used in the systems.

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

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

UNIT III SI ENGINE MANAGEMENT  

UNIT IV CI ENGINE MANAGEMENT  
Fuel injection system parameters affecting combustion, noise and emissions in CI engines. Pilot, main, advanced post injection and retarded post injection. Electronically controlled Unit Injection system. Layout of the common rail fuel injection system. Working of components like fuel injector, fuel pump, rail pressure limiter, flow limiter, EGR valves,
UNIT V  VEHICLE MANAGEMENT SYSTEMS  12

TEXT BOOKS:
2. Automobile Electronics by Eric Chowaniets SAE

REFERENCES:
1. Diesel Engine Management by Robert Bosch, SAE Publications
2. Gasoline Engine Management by Robert Bosch, SAE Publications

TOTAL: 60 PERIODS

AT 2402  VEHICLE DYNAMICS  L T P C  3 1 0 4

OBJECTIVE
When the vehicle is at dynamic condition more vibration will be produced. It is essential to study about vibrations and how to reduce the vibration under different loads, speed and road conditions in order to improve the comfort for the passengers and life of the various components of the vehicle. In this subject these aspects have been given.

UNIT I  INTRODUCTION  12
Fundamentals of vibration, single degree of freedom, two degree of freedom, multidegree freedom, free, forced and damped vibrations, modeling and simulation studies, model of an automobile, magnification factor, transmissibility, vibration absorber.

UNIT II  STABILITY OF VEHICLES  12
Load distribution, calculation of acceleration, tractive effort and reactions for different drives, stability of a vehicle on a curved track, slope and a banked road.

UNIT III  MULTI DEGREE FREEDOM SYSTEMS  12
Closed and far coupled system, eigen value problems, orthogonality of mode shapes, modal analysis, forced vibration by matrix inversion.

UNIT IV  SUSPENSION, TYRES AND VEHICLE HANDLING  12
Requirements, sprung mass frequency, wheel hop, wheel wobble, wheel shimmy, choice of suspension spring rate, calculation of effective spring rate, vehicle suspension in fore and aft, roll axis and vehicle under the action of side forces, tyre, dynamics, ride characteristics power consumed by a tyre. Oversteer, under steer, steady state cornering, effect of braking, driving torques on steering, effect of camber, transient effects in cornering.
UNIT V  NUMERICAL METHODS

Approximate methods for determining fundamental frequency, Dunkerley’s lower bound, Rayleigh’s upper bound, Holzer method for closed coupled system and branched systems.

TOTAL: 60 PERIODS

TEXT BOOKS

REFERENCES

AT2403  VEHICLE MAINTENANCE

OBJECTIVE:
At the end of the course, the students will be able to have a complete knowledge of the vehicle maintenance procedures and acquire skills in handling situations where the vehicle is likely to fail.

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

UNIT II  ENGINE MAINTENANCE – REPAIR AND OVERHAULING
Dismantling of engine components and cleaning, cleaning methods, visual and dimensional inspections, minor and major reconditioning of various components, reconditioning methods, engine assembly, special tools used for maintenance overhauling, engine tune up, including modern engines.

UNIT III  CHASSIS MAINTENANCE - REPAIR AND OVERHAULING
UNIT IV  ELECTRICAL AND ELECTRONIC SYSTEM MAINTENANCE - SERVICING AND REPAIRS
Testing methods for checking electrical and electronic components, checking battery, starter motor, charging systems, DC generator and alternator, ignitions system, lighting systems. Fault diagnosis and maintenance of modern electronic controls, checking and servicing of dash board instruments.

UNIT V  MAINTENANCE OF FUEL SYSTEM, COOLING SYSTEMS, LUBRICATION SYSTEM AND VEHICLE BODY
Servicing and maintenance of fuel system of different types of vehicles, calibration and tuning of engine for optimum fuel supply. Cooling systems, water pump, radiator, thermostat, anticorrosion and antifreeze additives. Lubrication maintenance, lubricating oil changing, greasing of parts. Vehicle body maintenance, minor and major repairs. Door locks and window glass actuating system maintenance.

TOTAL: 45 PERIODS

TEXT BOOKS
2. Automotive Mechanics W.H. crouse

REFERENCES
2. Service Manuals from Different Vehicle Manufacturers.
3. Automobile Engineering by Kribal Singh

AT2404           AUTOMOTIVE POLLUTION AND CONTROL
L T P C
3 0 0 3

OBJECTIVES:
To make the students to realize the impact of automobile emissions on the environment and expose student to factors affecting the formation and control of automobile pollutants.

UNIT I  INTRODUCTION
Vehicle population assessment in metropolitan cities and contribution to pollution, effects on human health and environment, global warming, types of emission, transient operational effects on pollution, noise vibration and harshness (NVH).

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

UNIT III  CONTROL OF EMISSIONS FROM ENGINES
Design strategies to control emission from engines, optimum selection of operating variables for control of emissions, EGR, Thermal reactors, secondary air injection,
catalytic converters, catalysts, fuel modifications, fuel cells, Two stroke engine pollution control.

UNIT IV NOISE POLLUTION FROM AUTOMOBILES

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

TOTAL: 45 PERIODS

TEXT BOOKS:

REFERENCES:

AT2405 VEHICLE MAINTENANCE AND RECONDITIONING LAB L T P C
0 0 3 2

LIST OF EXPERIMENTS
1. Study and layout of an automobile repair, service and maintenance shop.
2. Study and preparation of different statements/records required for the repair and maintenance works.
3. Cylinder reboring – checking the cylinder bore, Setting the tool and reboring.
4. Valve grinding, valve lapping - Setting the valve angle, grinding and lapping and checking for valve leakage
5. Calibration of fuel injection pump
6. Minor and major tune up of gasoline and diesel engines.
7. Study and checking of wheel alignment - testing of camber, caster.
8. Testing kingpin inclination, toe-in and toe-out
9. Brake adjustment and Brake bleeding.
10. Simple tinkering, soldering works of body panels, study of door lock and window glass rising mechanisms.
11. Battery testing and maintenance.
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 tyre and tube

TOTAL: 45 PERIODS

LIST OF EQUIPMENTS
(for a batch of 30 students)

1. Engine Analyzer - 1 No.
2. Cylinder compression pressure gauge - 1 No.
3. Vacuum gauge - 1 No.
4. Spark plug cleaner and tester - 1 No.
5. Cam angle and rpm tester - 1 No.
6. Tachometer - 1 No.
7. Wheel alignment apparatus - 1 No.
8. Gas welding equipment - 1 No.
9. Tyre remover - 1 No.
11. Head light alignment gauge - 1 No.
12. Service manuals of petrol, diesel engines - 1 No: each
15. Valve lapping machine - 1 No.
16. Fuel injection calibration test bench with nozzle tester - 1 No.
17. HRD tester, Clamp on meter, Hydrometer - 1 No: each

ME2309 CAD/CAM LAB

OBJECTIVES:

- To be able to understand and handle design problems in a systematic manner.
- To gain practical experience in handling 2D drafting and 3D modeling software systems.
- To be able to apply CAD in real life applications.
- To understand the concepts G and M codes and manual part programming.
- To expose students to modern control systems (Fanuc, Siemens etc)
- To know the application of various CNC machines
- To expose students to modern CNC application machines EDM, EDM wire cut and Rapid Prototyping
3D Geometric Modeling

STL File Generation – Reverse Engineering

Manual CNC Part Programming

Computer Aided Part Programming
CL Data Generation by Using CAM Software– Post Process Generation for Different Control System – Machining of Computer Generated Part Program by Using Machining Center and Turning Center.

Study of Experiments
Multi-axial Machining in CNC Machining Center – EDM – EDM Wire Cut - Rapid Prototyping

TOTAL: 45 PERIODS

LIST OF EQUIPMENTS
(for a batch of 30 students)

I. HARDWARES
1. Computer server 1 No.
2. Computer nodes or systems (Pentium IV with 256MB Ram) networked to the server 15 Nos.
3. A3 size plotter 2 Nos.
4. Laser Printer 2 Nos.
5. Trainer CNC lathe 2 Nos.
6. Trainer CNC milling 2 Nos.

II. SOFTWARES
1. CAD/CAM Software – 15 licenses
   (Pro –E or IDEAS or Unigraphics or CATIA)
2. CAM Software – 15 licenses
   (CNC programming and tool path simulation for FANUC, Sinumeric and Heiden controller)
OBJECTIVE
At the end of the course, the students will be able to have a sound knowledge for the design of the vehicles body to give maximum comfort for the passengers and exposed to the methods of stream lining the vehicles bodt to minimize drag.

UNIT I  CAR BODY DETAILS

UNIT II  VEHICLE AERODYNAMICS
To make the students understand the design concept and principles of various engine omponents. These concepts and principles are familiarized for design of components.

UNIT III  BUS BODY DETAILS
Types: Mini bus, single decker, double decker, two level, split level and articulated bus – Bus body lay out – Constructional details: Types of metal sections used – Regulations – Conventional and integral type construction.

UNIT IV  COMMERCIAL VEHICLE DETAILS
Different types of commercial vehicle bodies – Light commercial vehicle body types – Construction details of flat platform body, Tipper body & Tanker body – Dimensions of driver’s seat in relation to controls – Drivers cab design.

UNIT V  BODY MATERIALS, TRIM AND MECHANISMS

TOTAL: 45 PERIODS

TEXT BOOKS

REFERENCES:
AT2452  COMPREHENSION  L T P C
(Common to all branches)  0 0 2 1

OBJECTIVE
The objective of comprehension is to provide opportunity for the student to apply the
knowledge acquired during the earlier semesters to real life problems which he/she may
have to face in future as an engineer. While learning as how to solve the real life
problems, student will receive guidance from the faculty and also review various courses
learnt earlier.

AT 2453  PROJECT WORK  L T P C
(Common to all Branches)  0 0 12 6

OBJECTIVES
- The objective of the project work is to enable the students in convenient groups of
  not more than 4 members on a project involving theoretical and experimental studies
  related to the branch of study. Every project work shall have a guide who is the
  member of the faculty of the institution. Six periods per week shall be allotted in the
time table and this time shall be utilized by the students to receive the directions from
the guide, on library reading, laboratory work, computer analysis or field work as
assigned by the guide and also to present in periodical seminars on the progress
made in the project.

- Each student shall finally produce a comprehensive report covering back round
  information, literature survey, problem statement, project work details and
  conclusion. This final report shall be typewritten form as specified in the guidelines.

- The continuous assessment shall be made as prescribed by the Anna University
  regulations

GE 2025  PROFESSIONAL ETHICS IN ENGINEERING  L T P C
3 0 0 3

UNIT I  ENGINEERING ETHICS  9
Senses of ‘Engineering Ethics’ – Variety of moral issues – Types of inquiry – Moral
dilemmas – Moral Autonomy – Kohlberg’s theory – Gilligan’s theory – Consensus and
Controversy – Professions and Professionalism – Professional Ideals and Virtues –
Uses of Ethical Theories

UNIT II  ENGINEERING AS SOCIAL EXPERIMENTATION  9
Engineering as Experimentation – Engineers as responsible Experimenters – Research
Ethics - Codes of Ethics – Industrial Standards - A Balanced Outlook on Law – The
Challenger Case Study
UNIT III  ENGINEER’S RESPONSIBILITY FOR SAFETY  9

UNIT IV  RESPONSIBILITIES AND RIGHTS  9

UNIT V  GLOBAL ISSUES  9

TOTAL: 45 PERIODS

TEXT BOOKS :

REFERENCES :

AT 2021  AUTOMOTIVE AIR-CONDITIONING  L T P C
3 0 0 3

OBJECTIVE:
At the end of the course, the students will be able to understand the components of the automotive air-conditioning and their functions and the latest developments in this field.

UNIT I  AIR CONDITIONING FUNDAMENTALS  9
Basic air conditioning system - location of air conditioning components in a car, schematic layout of a refrigeration system, compressor components, condenser and high pressure service ports, thermostatic expansion valve, expansion valve calibration, controlling evaporator temperature, evaporator pressure regulator, evaporator temperature regulator.
UNIT II AIR CONDITIONER – HEATING SYSTEM
Automotive heaters, manually controlled air conditioner, heater system, automatically controlled air conditioner and heater systems, automatic temperature control, air conditioning protection, engine protection.

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

UNIT IV AIR ROUTING AND TEMPERATURE CONTROL
Objectives, evaporator airflow through the recirculating unit, automatic temperature control, duct system, controlling flow, vacuum reserve, testing the air control and handling systems.

UNIT V AIR CONDITIONING SERVICE
Air conditioner maintenance and service, servicing heater system removing and replacing components, trouble shooting of air controlling system, compressor service.

TOTAL: 45 PERIODS

TEXT BOOKS

REFERENCES

AT2022 ALTERNATE FUELS AND ENERGY SYSTEMS

OBJECTIVES
At the end of the course, the student will be able to acquire knowledge of alternate fuels and the changes in the engine design for handling them and understand various energy systems for use in the automobiles.

UNIT I INTRODUCTION
Need for alternate fuel, availability and properties of alternate fuels, general use of alcohols, LPG, hydrogen, ammonia, CNG and LNG, vegetable oils and biogas, merits and demerits of various alternate fuels, introduction to alternate energy sources. Like EV, hybrid, fuel cell and solar cars.
UNIT II  ALCOHOLS  
Properties as engine fuel, alcohols and gasoline blends, performance in SI engine, methanol and gasoline blends, combustion characteristics in CI engines, emission characteristics, DME, DEE properties performance analysis, performance in SI & CI Engines.

UNIT III  NATURAL GAS, LPG, HYDROGEN AND BIOGAS  
Availability of CNG, properties, modification required to use in engines, performance and emission characteristics of CNG using LPG in SI & CI engines, performance and emission of LPG. Hydrogen; storage and handling, performance and safety aspects.

UNIT IV  VEGETABLE OILS  
Various vegetable oils for engines, esterification, performance in engines, performance and emission characteristics, bio diesel and its characteristics

UNIT V  ELECTRIC, HYBRID, FUEL CELL AND SOLAR CARS  
Layout of an electric vehicle, advantage and limitations, specifications, system components, electronic control system, high energy and power density batteries, hybrid vehicle, fuel cell vehicles, solar powered vehicles.

TOTAL: 45 PERIODS

TEXT BOOK

REFERENCES
3. SAE paper nos. 840367, 841333, 841334, 841156, Transactions, SAE, USA.
OBJECTIVES

The students will be able to understand the sources of vibration, noise and harshness in automobiles and make design modifications to reduce them and improve the life of the components and the comfort of the passengers.

UNIT I  BASICS OF VIBRATION  10
Introduction, classification of vibration: free and forced vibration, undamped and damped vibration, linear and non linear vibration, response of damped and undamped systems under harmonic force, analysis of single degree and two degree of freedom systems, torsional vibration, determination of natural frequencies.

UNIT II  VIBRATION CONTROL TECHNIQUES  10
Vibration isolation, tuned absorbers, untuned viscous dampers, damping treatments, application dynamic forces generated by IC engines, engine isolation, crank shaft damping, modal analysis of the mass elastic model shock absorbers.

UNIT III  BASICS OF NOISE AND SOURCES  10
Introduction, noise dose level, legislation, measurement and analysis of noise in engines, Noise characteristics, overall noise levels, assessment of combustion noise, assessment of mechanical noise, engine radiated noise, intake and exhaust noise, engine accessory contributed noise, transmission noise, aerodynamic noise, tyre noise, brake noise.

UNIT IV  NOISE CONTROL  9
Methods for control of engine noise, combustion noise, mechanical noise, predictive analysis, palliative treatments and enclosures, automotive noise control principles, sound in enclosures, sound energy absorption, sound transmission through barriers.

UNIT V  HARSHNESS AND ITS CONTROL  6
Harshness, sources, its effects, measurement and control.

TOTAL: 45 PERIODS

TEXT BOOKS


REFERENCES

OBJECTIVE:
- To explain the theory of combustion processes in SI and CI Engines and the gas exchange processes and the various possible alternate fuels and the developments in the recent years in this area.

UNIT I  COMBUSTION IN SI ENGINES  9

UNIT II  GAS EXCHANGE PROCESSES  9
Gas exchange processes in two and four stroke engines, factors affecting volumetric efficiency, flow through valves and ports, multi valve concept. Charge motion within the cylinder. Turbocharging and Turbocharger control. Different methods of charging and scavenging two stroke engines.

UNIT III  COMBUSTION ANALYSIS  9
Introduction to HWA, LDA and PIV systems to analyse engine flows. Engine heat transfer and energy balance, correlations for heat transfer coefficient, variables affecting heat transfer in engines. Cylinder pressure data acquisition and thermodynamic analysis of engine pressure data to yield heat release rates.

UNIT IV  ALTERNATIVE FUELS  9
Alternative gaseous and liquid fuels for SI and CI engines, Alcohols, Biogas, LPG, CNG, Hydrogen, Biodiesel and Straight Vegetable oils, their properties and characteristics when used as engine fuels. Production, storage and distribution of different alternative fuels.

UNIT V  RECENT DEVELOPMENTS  9
Homogeneous charge compression ignition, Stratified charge and gasoline direct injection, Dual fuel, lean burn and Hot surface Ignition engine concepts. Hybrid Electric Drives.

TOTAL: 45 PERIODS

TEXT BOOKS:
1. Internal Combustion Engines by V. Ganesan, 2007, Tata Mc Graw Hill
3. Advanced Engine Technology by Heisler, SAE Publication

REFERENCES:
1. Internal Combustion Engines by Richard Stone, Macmillan Book Company also SAE Publications
2. Internal Combustion Engines by Colin R Ferguson, John Wiley and Sons
3. Design and Simulation of Two Stroke Engines, GP Blair SAE Publications
OBJECTIVES

- To introduce the concept of SQC
- To understand process control and acceptance sampling procedure and their application.
- To learn the concept of reliability.

UNIT I  INTRODUCTION AND PROCESS CONTROL FOR VARIABLES  10
Introduction, definition of quality, basic concept of quality, definition of SQC, benefits and limitation of SQC, Quality assurance, Quality control: Quality cost-Variation in process-causesof variation –Theory of control chart- uses of control chart – Control chart for variables – X chart, R chart and σ chart -process capability – process capability studies and simple problems. Six sigma concepts.

UNIT II  PROCESS CONTROL FOR ATTRIBUTES  8
Control chart for attributes –control chart for non conformings– p chart and np chart – control chart for nonconformities– C and U charts, State of control and process out of control identification in charts, pattern study.

UNIT III  ACCEPTANCE SAMPLING  9

UNIT IV  LIFE TESTING - RELIABILITY  9

UNIT V  QUALITY AND RELIABILITY  9

TOTAL: 45 PERIODS

Note : Use of approved statistical table permitted in the examination.

TEXT BOOKS

REFERENCES
AT2037 METROLOGY AND INSTRUMENTATION

OBJECTIVE
Study of the theory, construction and operation of different measurement technology, instruments transducers and their application

UNIT I LINEAR MEASUREMENT
Units and standards, precision, accuracy and measurement errors. Linear measuring instruments, dail gauges, comparators and linear measuring machines. Angular measuring instruments- measurement of straightness flatness and surface finish. Profilographs.

UNIT II PRESSURE MEASUREMENT
Bourden 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 gauge, Pirani gauge,, thermal conductivity type pressure measurement.

UNIT III FLOW MEASUREMENT

UNIT IV TEMPERATURE MEASUREMENT:

UNIT V FORCE AND TORQUE MEASUREMENT:

TOTAL: 45 PERIODS

TEXT BOOKS
1. Jain R.K., Engineering metrology, Khanna publishers, New Delhi

REFERENCES
1. Patranabis D, Principles of industrial instrumentation, TMH Publishing Co. New Delhi
2. Jain R.K., Mechanical & Industrial measurements , Khanna publishers, New Delhi
4. Gaylor F.W and Shotbolt C.R Metrology for engineers, ELBS

AT 2026 SUPERCHARGING AND SCAVENGING L T P C
3 0 0 3

OBJECTIVES
- To make the students understand the need for supercharging and the various types of superchargers used and their performance characteristics and the scavenging methods for two stroke engines. These concepts and principles are familiarized for design of components.

UNIT I SUPERCHARGING 8

UNIT II SUPERCHARGERS 10

UNIT III SCAVENGING OF TWO STROKE ENGINES 12

UNIT IV PORTS AND MUFFLER DESIGN 8

UNIT V EXPERIMENTAL METHODS 7
Experimental techniques for evaluating scavenging – Firing engine tests – Non firing engine tests – Port flow characteristics – Kadenacy system – Orbital engine combustion system.

TOTAL: 45 PERIODS
TEXT BOOKS

REFERENCES

AT2027 AUTOMOTIVE AERODYNAMICS L T P C
3 0 0 3

OBJECTIVE
- To make the students understand the design concept of automobile bodies and to determine their drag coefficients and optimize their shapes. The use of wind tunnel for the same will be illustrated.

UNIT I INTRODUCTION

UNIT II AERODYNAMIC DRAG OF CABS

UNIT III SHAPE OPTIMIZATION OF CABS

UNIT IV VEHICLE HANDLING

UNIT V WIND TUNNELS FOR AUTOMOTIVE AERODYNAMICS
TEXT BOOK:

REFERENCES:

ME2030  COMPOSITE MATERIALS

OBJECTIVES:
- To understand the fundamentals of composite material strength and its mechanical behavior
- Understanding the analysis of fiber reinforced Laminate design for different combinations of plies with different orientations of the fiber.
- Thermo-mechanical behavior and study of residual stresses in Laminates during processing.
- Implementation of Classical Laminate Theory (CLT) to study and analysis for residual stresses in an isotropic layered structure such as electronic chips.

UNIT I  INTRODUCTION, LAMINA CONSTITUTIVE EQUATIONS & MANUFACTURING

UNIT II  FLAT PLATE LAMINATE CONSTITUTE EQUATIONS
UNIT III  LAMINA STRENGTH ANALYSIS

UNIT IV  THERMAL ANALYSIS

UNIT V  ANALYSIS OF LAMINATED FLAT PLATES

TOTAL: 45 PERIODS

TEXT BOOK:

REFERENCES:
OBJECTIVES:
- To understand the functions and design principles of Jigs, fixtures and press tools
- To gain proficiency in the development of required views of the final design.

UNIT I  LOCATING AND CLAMPING PRINCIPLES:  8

UNIT II  JIGS AND FIXTURES  10
Design and development of jigs and fixtures for given component- Types of Jigs – Post, Turnover, Channel, latch, box, pot, angular post jigs – Indexing jigs – General principles of milling, Lathe, boring, broaching and grinding fixtures – Assembly, Inspection and Welding fixtures – Modular fixtureing systems- Quick change fixtures.

UNIT III  PRESS WORKING TERMINOLOGIES AND ELEMENTS OF CUTTING DIES  10

UNIT IV  BENDING FORMING AND DRAWING DIES  10

UNIT V  MISCELLANEOUS TOPICS  7
Bulging, Swaging, Embossing, coining, curling, hole flanging, shaving and sizing, assembly, fine Blanking dies – recent trends in tool design- computer Aids for sheet metal forming Analysis – basic introduction - tooling for numerically controlled machines- setup reduction for work holding – Single minute exchange of dies – Poka Yoke - Course should be supplemented with visits to industries.

(Use of Approved design Data Book permitted).

TEXT BOOKS
REFERENCES:
4. ASTM Fundamentals of Tool Design Prentice Hall of India.

AT2028 COMPUTER SIMULATION OF I.C. ENGINES

OBJECTIVE
- To make the students understand the basic principles of simulation of the combustion processes in engines used for automobiles and the heat transfer mechanism and friction losses of the different systems.

UNIT I COMBUSTION CALCULATIONS
Heat of reaction at constant volume and constant pressure, Calculation of properties of the working medium in an engine, Constant volume and constant pressure adiabatic combustion, Calculation of Adiabatic flame temperature.

UNIT II SIMULATION OF SI ENGINE COMBUSTION
Engine kinematics, Ideal Otto cycle, SI engine simulation with adiabatic combustion with air as the working substance under full and part throttle conditions. Actual SI engine heat release rate curves. SI engine combustion models including Wiebe’s function.

UNIT III SIMULATION OF CI ENGINE COMBUSTION
CI engine simulation with adiabatic combustion with air as the working substance under naturally aspirated, supercharged and turbocharged conditions. Actual heat release rates of diesel engines, Hardenberg and Hase and other ignition delay models for diesel enignes, Zero dimensional combustion models for CI engines – Watsons and White House and Way models.

UNIT IV GAS EXCHANGE PROCESSES
Flow through valves their characteristics, compressible and incompressible flow through valves, Volumetric efficiency and Mach index, Effect of valve timing on volumetric efficiency, Swirl and squish, SI engine simulation with gas exchange, influence of valve timing and area. CI engine simulation with gas exchange.

UNIT V HEAT TRANSFER AND FRICTION IN ENGINES

TOTAL: 45 PERIODS
TEXT BOOKS:
3. Introduction to Internal Combustion Engines by Richard Stone:

REFERENCES:
1. Internal Combustion Engines – Applied Thermo Sciences, Colin R Ferguson, John Wiley and Sons.

ME2028 ROBOTICS (Common to Mechanical, Automobile and Production - core) L T P C
3 0 0 3

OBJECTIVES
To understand the basic concepts associated with the design and functioning and applications of Robots
To study about the drives and sensors used in Robots
To learn about analyzing robot kinematics and robot programming

UNIT I FUNDAMENTALS OF ROBOT

UNIT II ROBOT DRIVE SYSTEMS AND END EFFECTORS

UNIT III SENSORS AND MACHINE VISION
UNIT IV  ROBOT KINEMATICS AND ROBOT PROGRAMMING  10
Forward Kinematics, Inverse Kinematics and Differences; Forward Kinematics and Reverse Kinematics of Manipulators with Two, Three Degrees of Freedom (In 2 Dimensional), Four Degrees of Freedom (In 3 Dimensional) – Deviations and Problems. Teach Pendant Programming, Lead through programming, Robot programming Languages – VAL Programming – Motion Commands, Sensor Commands, End effector commands, and Simple programs

UNIT V  IMPLEMENTATION AND ROBOT ECONOMICS  8
RGV, AGV; Implementation of Robots in Industries – Various Steps; Safety Considerations for Robot Operations; Economic Analysis of Robots – Pay back Method, EUAC Method, Rate of Return Method.

TOTAL: 45 PERIODS

TEXT BOOK

REFERENCES

AT2029  NEW GENERATION AND HYBRID VEHICLES  L T P C
3 0 0 3

OBJECTIVE
• To illustrate the new generation vehicles and their operation and controls

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

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

UNIT III  VEHICLE OPERATION AND CONTROL  9
Computer Control for pollution and noise control and for fuel economy - Transducers and actuators - Information technology for receiving proper information and operation of the vehicle like optimum speed and direction.
UNIT IV   VEHICLE AUTOMATED TRACKS 9
Preparation and maintenance of proper road network - National highway network with automated roads and vehicles - Satellite control of vehicle operation for safe and fast travel, GPS.

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

TEXT BOOKS
1. Modern Vehicle Technology by Heinz.

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

AT2030   OFF ROAD VEHICLES 3 0 0 3

OBJECTIVE
• At the end of the course, the students will be able to understand the various Off road vehiclea and their systems and featuresa

UNIT I   CLASSIFICATION AND REQUIREMENTS OF OFF ROAD VEHICLES 6
Construction layout, capacity and applications. Power Plants, Chassis and Transmission, Multiaxle vehicles.

UNIT II   EARTH MOVING MACHINES 10
Earthmovers like dumpers, loaders - single bucket, Multi bucket and rotary types - bulldozers, excavators, backhoe loaders, scrapers, drag and self powered types, Bush cutters, stompers, tree dozer, rippers etc. – Power and capacity of earth moving machines.

UNITY III   SCRAPERS ,GRADERS, SHOVELS AND DITCHERS 10

UNIT IV   FARM EQUIPMENTS, MILITARY AND COMBAT VEHICLES 8
Power take off, special implements. Special features and constructional details of tankers, gun carriers and transport vehicles.
UNIT V  VEHICLE SYSTEMS, FEATURES

TOTAL: 45 PERIODS

TEXT BOOKS

REFERENCES:

AT2031 PROJECT AND MATERIALS MANAGEMENT L T P C
3 0 0 3

OBJECTIVE

• To enable the students understand the concept of project and materials management and illustrate the various systems and procedures involved

UNIT I  PROJECT MANAGEMENT
Concept of project-Categories of projects-Project life cycle - Concept of project management -Tools and techniques for project management-The project manager-Roles and responsibilities of project manager- Project formulation- Formulation of stages-Bottlenecks-Feasibility Report-Financing arrangements- Finalization of project-Implementation of project..

UNIT II  PROJECT EXECUTION AND CONTRACT
Administrative agencies for project approval- Ministry of finance- Bureau of public enterprises –Planning commission- Public Investment Board.
Organizing human resources and contracting—Delegation of project manager’s authority—Project organization—Accountability in project execution—Contracts—‘R’ of contracting—Tendering and selection of contractors—Team building

UNIT III  SYSTEMS AND PROCEDURES:  9
Organizing and working of systems—Design of systems—Project work system design—work breakdown structure—project execution plan—project procedure—manual project control system—planning, scheduling, monitoring and controlling—monitoring contracts and project diary. Project implementation—stages of project direction—communication in a project—coordination guidelines for effective implementation—Reporting in project management—project evaluation and its objectives, types, and methods.

UNIT IV  MATERIAL MANAGEMENT  9
Concept and importance of Material Management—organization of Material management—purchase methods—Dynamic purchasing—Purchasing decisions (quality, quantity, suppliers, time, price)—Purchasing function—Selection of Materials and vendors—purchasing organization—concept of value analysis—import substitution—vendor rating—vendor development.

UNIT V  INVENTORY MANAGEMENT  9
Material requirement planning, forecasting and Inventory management—inventory control—factors affecting inventory control policy—Inventory costs, Basic EOQ model—Re-order level—ABC analysis—statistical methods in inventory control—inventory classification methods.


TOTAL: 45 PERIODS

TEXT BOOKS:
5. M.V.Varma—Material Management

REFERENCES:
OBJECTIVE

- To make the students understand the various auxiliary systems used in automobiles and their functions

UNIT I CARBURETION

Properties of air-petrol mixtures, Mixture requirements for steady state and transient operation, Mixture formation studies of volatile fuels, design of elementary carburetor, Chokes, Effects of altitude on carburetion, Carburetor for 2-stroke and 4-stroke engines, carburetor systems for emission control.

UNIT II GASOLINE INJECTION AND IGNITION SYSTEMS


UNIT III DIESEL FUEL INJECTION

Factors influencing fuel spray atomization, penetration and dispersion of diesel and heavy oils and their properties, rate and duration of injection, fuel line hydraulics, fuel pump, injectors, CRDI systems and its merits and demerits.

UNIT IV MANIFOLDS AND MIXTURE DISTRIBUTION

Intake system components, Discharge coefficient, Pressure drop, Air filter, Intake manifold, Connecting pipe, Exhaust system components, Exhaust manifold and exhaust pipe, Spark arresters, Waste heat recovery, Exhaust mufflers, Type of mufflers, exhaust manifold expansion.

UNIT V LUBRICATION AND COOLING SYSTEMS

Lubricants, lubricating systems, Lubrication of piston rings, bearings, oil consumption, Oil cooling. Heat transfer coefficients, liquid and air cooled engines, coolants, additives and lubricity improvers, concept of adiabatic engines.

TOTAL: 45 PERIODS

TEXT BOOKS:
1. Ramalingam, K.K, Internal Combustion Engine, Scitech Publication (India)

REFERENCES
OBJECTIVE

- To understand the various processes involved in Marketing and its Philosophy.
- To learn the Psychology of consumers.
- To formulate strategies for advertising, pricing and selling

UNIT I  MARKETING PROCESS
Definition, Marketing process, dynamics, needs, wants and demands, marketing concepts, environment, mix, types. Philosophies, selling versus marketing, organizations, industrial versus consumer marketing, consumer goods, industrial goods, product hierarchy

UNIT II  BUYING BEHAVIOUR AND MARKET SEGMENTATION
Cultural, demographic factors, motives, types, buying decisions, segmentation factors - demographic -Psycho graphic and geographic segmentation, process, patterns.

UNIT III  PRODUCT PRICING AND MARKETING RESEARCH
Objectives, pricing, decisions and pricing methods, pricing management. Introduction, uses, process of marketing research.

UNIT IV  MARKETING PLANNING AND STRATEGY FORMULATION
Components of marketing plan-strategy formulations and the marketing process, implementations, portfolio analysis, BCG, GEC grids.

UNIT V  ADVERTISING, SALES PROMOTION AND DISTRIBUTION
Characteristics, impact, goals, types, and sales promotions- point of purchase- unique selling proposition. Characteristics, wholesaling, retailing, channel design, logistics, and modern trends in retailing.

TOTAL: 45 PERIODS

TEXT BOOKS

REFERENCES

91
OBJECTIVE
- Study of this subject provides an understanding of the scope of an entrepreneur, key areas of development, financial assistance by the institutions, methods of taxation and tax benefits, etc.

UNIT I ENTREPRENEURSHIP

UNIT II MOTIVATION
Major Motives Influencing an Entrepreneur – Achievement Motivation Training, self Rating, Business Game, Thematic Apperception Test – Stress management, Entrepreneurship Development Programs – Need, Objectives.

UNIT III BUSINESS

UNIT IV FINANCING AND ACCOUNTING

UNIT V SUPPORT TO ENTREPRENEURS

TOTAL: 45 PERIODS

TEXT BOOKS

REFERENCES
4. EDII “Faulty and External Experts – A Hand Book for New Entrepreneurs

AT2033 AUTOMOTIVE SAFETY

OBJECTIVE:
- At the end, the students will have good exposure to automotive safety aspects
  including the understanding of the various safety equipments.

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

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

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

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

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

TOTAL: 45 PERIODS

TEXT BOOK

REFERENCE
OBJECTIVE

- To introduce the concept of fuel cells for use in automobiles, analyse the performance characteristics of the various components and compare them with the other powering devices.

UNIT I  INTRODUCTION TO FUEL CELLS
Introduction – working and types of fuel cell – low, medium and high temperature fuel cell, liquid and methanol types, proton exchange membrane fuel cell solid oxide, hydrogen fuel cells – thermodynamics and electrochemical kinetics of fuel cells.

UNIT II  FUEL CELLS FOR AUTOMOTIVE APPLICATIONS

UNIT III  FUEL CELL COMPONENTS AND THEIR IMPACT ON PERFORMANCE
Fuel cell performance characteristics – current/voltage, voltage efficiency and power density, ohmic resistance, kinetic performance, mass transfer effects – membrane electrode assembly components, fuel cell stack, bi-polar plate, humidifiers and cooling plates.

UNIT IV  FUELING

UNIT V  FUEL CYCLE ANALYSIS
Introduction to fuel cycle analysis – application to fuel cell and other competing technologies like battery powered vehicles, SI engine fueled by natural gas and hydrogen and hybrid electric vehicle.

TOTAL: 45 PERIODS

TEXTBOOKS
OBJECTIVE
To create awareness about optimization in utilization of resources.
To understand and apply operations research techniques to industrial operations.

UNIT I  LINEAR MODEL  10
The phases of OR study – formation of an L.P model- graphical solution – simplex
algorithm – artificial variables technique– Big M method, two phase method, Duality in
LPP. Transportation problems- VAM – MODI technique, Assignment problems.

UNIT II  NETWORK MODELS  8
Shortest route – minimal spanning tree - maximum flow models – project network- CPM
and PERT network-critical path scheduling.

UNIT III  INVENTORY MODEL  9
Types of Inventory- EOQ –ERL- Deterministic inventory problems – Price breaks -
Stochastic inventory problems- selective inventory control techniques.

UNIT IV  REPLACEMENT MODELS  9
Replacement of items that deteriorate with time – value of money changing with time –
not charging with time – optimum replacement policy – individual and group
replacement. Sequencing problem: models with n jobs with 2 machines – problem with n
jobs with m machines.

UNIT V  QUEUING THEORY  9
Queuing models – queuing systems and structures – notation –parameter – single
server and multiserver models – Poisson input – exponential service – constant rate
service – infinite population.

TOTAL: 45 PERIODS

TEXT BOOK
1. Wayne.L.Winston, Operations research applications and algorithms, Thomson

REFERENCES
1. Frederick.S.Hiller and Gerald.J.Lieberman, “Operations research concepts and
cases”, TMH (SIE) 8th edition.
2. J.K.Sharma, “Operations research theory and applications”, Macmillan India .3rd
edition 2007,
OBJECTIVE
• After completion of this course the students are able to manage a transport fleet and their related activities for minimizing operational cost.

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

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

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

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

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

TOTAL: 45 PERIODS

TEXTBOOK

REFERENCES
1. Government Motor Vehicle Act –Publication on latest act to be used as on date
UNIT I  INTRODUCTION  9
Introduction - Need for quality - Evolution of quality - Definition of quality - Dimensions of
manufacturing and service quality - Basic concepts of TQM - Definition of TQM – TQM
Framework - Contributions of Deming, Juran and Crosby – Barriers to TQM.

UNIT II  TQM PRINCIPLES  9
Leadership – Strategic quality planning, Quality statements - Customer focus –
Customer orientation, Customer satisfaction, Customer complaints, Customer retention -
Employee involvement – Motivation, Empowerment, Team and Teamwork, Recognition
and Reward, Performance appraisal - Continuous process improvement – PDSA cycle,
5s, Kaizen - Supplier partnership – Partnering, Supplier selection, Supplier Rating.

UNIT III  TQM TOOLS & TECHNIQUES I  9
The seven traditional tools of quality – New management tools – Six-sigma: Concepts,
methodology, applications to manufacturing, service sector including IT – Bench marking
– Reason to bench mark, Bench marking process – FMEA – Stages, Types.

UNIT IV  TQM TOOLS & TECHNIQUES II  9
Quality circles – Quality Function Deployment (QFD) – Taguchi quality loss function –
TPM – Concepts, improvement needs – Cost of Quality – Performance measures.

UNIT V  QUALITY SYSTEMS  9
Need for ISO 9000- ISO 9000-2000 Quality System – Elements, Documentation, Quality
auditing: QS 9000 – ISO 14000 – Concepts, Requirements and Benefits – Case studies
of TQM implementation in manufacturing and service sectors including IT.

TOTAL: 45 PERIODS

TEXT BOOK

REFERENCES
   Prentice Hall (India) Pvt. L