B.E. AUTOMOBILE ENGINEERING

[ Full Time ]
### SEMESTER I

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OBJECTIVES:

- To enable all students of engineering and technology develop their basic communication skills in English.
- To give special emphasis to the development of speaking skills amongst the students of engineering and technology students.
- To ensure that students use the electronic media such as internet and supplement the learning materials used in the classroom.
- To inculcate the habit of reading for pleasure.

UNIT I

Listening - Introducing learners to GIE - Types of listening - Listening to audio (verbal & sounds); Speaking - Speaking about one’s place, important festivals etc. – Introducing oneself, one’s family / friend; Reading - Skimming a reading passage – Scanning for specific information - Note-making; Writing - Free writing on any given topic (My favourite place / Hobbies / School life, etc.) - Sentence completion - Autobiographical writing (writing about one’s leisure time activities, hometown, etc.); Grammar - Prepositions - Reference words - Wh-questions - Tenses (Simple); Vocabulary - Word formation - Word expansion (root words / etymology); E-materials - Interactive exercises for Grammar & Vocabulary - Reading comprehension exercises - Listening to audio files and answering questions.

UNIT II

Listening - Listening and responding to video lectures / talks; Speaking - Describing a simple process (filling a form, etc.) - Asking & answering questions - Telephone skills – Telephone etiquette; Reading – Critical reading - Finding key information in a given text - Sifting facts from opinions; Writing - Biographical writing (place, people) - Lab descriptions (general/specific description of laboratory experiments) - Definitions - Recommendations; Grammar - Use of imperatives - Subject-verb agreement; Vocabulary - Compound words - Word Association; E-materials - Interactive exercises for Grammar and Vocabulary - Listening exercises with sample telephone conversations / lectures – Picture-based activities.

UNIT III

Listening - Listening to specific task - focused audio tracks; Speaking - Role-play – Simulation - Group interaction - Speaking in formal situations (teachers, officials, foreigners); Reading - Reading and interpreting visual material; Writing - Jumbled sentences - Coherence and cohesion in writing - Channel conversion (flowchart into process) - Types of paragraph (cause & effect / compare & contrast / narrative / analytical) - Informal writing (letter/e-mail/blogs) - Paraphrasing; Grammar - Tenses (Past) - Use of sequence words - Adjectives; Vocabulary - Different forms and uses of words, Cause and effect words; E-materials - Interactive exercises for Grammar and Vocabulary - Excerpts from films related to the theme and follow up exercises - Pictures of flow charts and tables for interpretations.

UNIT IV

Listening - Watching videos / documentaries and responding to questions based on them; Speaking - Responding to questions - Different forms of interviews - Speaking at different types of interviews; Reading - Making inference from the reading passage - Predicting the content of a reading passage; Writing - Interpreting visual materials (line graphs, pie charts etc.) - Essay writing – Different types of essays; Grammar - Adverbs – Tenses – future time reference; Vocabulary - Single word substitutes - Use of abbreviations & acronyms; E-
materials - Interactive exercises for Grammar and Vocabulary - Sample interviews - film scenes - dialogue writing.

UNIT V
Listening - Listening to different accents, Listening to Speeches / Presentations, Listening to broadcast & telecast from Radio & TV; Speaking - Giving impromptu talks, Making presentations on given topics; Reading - Email communication - Reading the attachment files having a poem/joke/proverb - Sending their responses through email Writing - Creative writing, Poster making; Grammar - Direct and indirect speech; Vocabulary - Lexical items (fixed / semi fixed expressions); E-materials - Interactive exercises for Grammar & Vocabulary - Sending emails with attachment – Audio / video excerpts of different accents, - Interpreting posters

TOTAL : 60 PERIODS

TEXT BOOKS:

REFERENCES:

EXTENSIVE READERS

WEBSITE RESOURCES
1. www.uefap.com
2. www.eslcafe.com
3. www.listen-to-english.com
4. www.owl.english.purdue.edu
5. www.chompchomp.com
OBJECTIVES:
- To develop the use of matrix algebra techniques this is needed by engineers for practical applications.
- To make the student knowledgeable in the area of infinite series and their convergence so that he/she will be familiar with limitations of using infinite series approximations for solutions arising in mathematical modeling.
- To familiarize the student with functions of several variables. This is needed in many branches of engineering.
- To introduce the concepts of improper integrals, Gamma, Beta and Error functions which are needed in engineering applications.
- To acquaint the student with mathematical tools needed in evaluating multiple integrals and their usage.

UNIT I MATRICES

UNIT II INFINITE SERIES

UNIT III FUNCTIONS OF SEVERAL VARIABLES

UNIT IV IMPROPER INTEGRALS

UNIT V MULTIPLE INTEGRALS

TOTAL : 60 PERIODS

TEXT BOOKS:
REFERENCES:

PH8151  ENGINEERING PHYSICS  L T P C
3 0 0 3
(Common to all branches of B.E. / B.Tech. Programmes in I Semester)

OBJECTIVE:
- To introduce the basic physics concepts relevant to different branches of Engineering and Technology.

UNIT I  PROPERTIES OF MATTER  9

UNIT II  ACOUSTICS AND ULTRASONICS  9

UNIT III  THERMAL PHYSICS  9

UNIT IV  APPLIED OPTICS  9
UNIT V  SOLID STATE PHYSICS
Nature of bonding - growth of single crystals (qualitative) - crystal systems - crystal planes and directions - expressions for interplanar distance - coordination number and packing factor for simple structures: SC, BCC, FCC and HCP - structure and significance of NaCl, ZnS, diamond and graphite - crystal imperfections: point defects, dislocations and stacking faults - unit cell, Bravais space lattices - miller indices.

TOTAL : 45 PERIODS

TEXT BOOKS:

REFERENCES:

CY8151  ENGINEERING CHEMISTRY  L T P C
3  0  0  3
(Common to all branches of B.E. / B.Tech. Programmes in I Semester)

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

UNIT II  POLYMER CHEMISTRY
Introduction: Classification of polymers – Natural and Synthetic; Thermoplastic and Thermosetting. Functionality – Degree of polymerisation. Types and mechanism of polymerisation: Addition (Free Radical, cationic, anionic and living); condensation and copolymerisation. Properties of polymers: Tg, Tacticity, Molecular weight – weight average, number average and polydispersity index. Techniques of polymerisation: Bulk, emulsion, solution and suspension.

UNIT III  KINETICS AND CATALYSIS
UNIT IV  PHOTOCHEMISTRY AND SPECTROSCOPY  9

UNIT V  NANOCHEMISTRY  9

TEXT BOOKS

REFERENCE BOOKS

GE8151  COMPUTING TECHNIQUES  L T P C
3 0 0 3

UNIT I  INTRODUCTION  8

UNIT II  C PROGRAMMING BASICS  10
UNIT III ARRAYS AND STRINGS

UNIT IV FUNCTIONS AND POINTERS

UNIT V STRUCTURES AND UNIONS
Introduction – need for structure data type – structure definition – Structure declaration – Structure within a structure - Union - Programs using structures and Unions – Storage classes, Pre-processor directives.

TOTAL : 45 PERIODS

TEXTBOOKS

REFERENCES

GE8152 ENGINEERING GRAPHICS

L T P C 2 0 3 4
(Common to all branches of B.E. / B.Tech. Programmes in I Semester)

OBJECTIVES:
• To develop in students, graphic skills for communication of concepts, ideas and design of engineering products and expose them to existing national standards related to technical drawings.

CONCEPTS AND CONVENTIONS (NOT FOR EXAMINATION)
Importance of graphics in engineering applications – Use of drafting instruments – BIS conventions and specifications – Size, layout and folding of drawing sheets – Lettering and dimensioning.

UNIT I PLANE CURVES AND FREE HAND SKETCHING

Visualization concepts and Free Hand sketching: Visualization principles – Representation of Three Dimensional objects – Layout of views- Free hand sketching of multiple views from pictorial views of objects
UNIT II  PROJECTION OF POINTS, LINES AND PLANE SURFACES
Orthographic projection- principles-Principal planes-First angle projection-Projection of points. Projection of straight lines (only First angle projections) inclined to both the principal planes - Determination of true lengths and true inclinations by rotating line method and trapezoidal method and traces

Projection of planes (polygonal and circular surfaces) inclined to both the principal planes by rotating object method.

UNIT III  PROJECTION OF SOLIDS
Projection of simple solids like prisms, pyramids, cylinder, cone and truncated solids when the axis is inclined to one of the principal planes by rotating object method and auxiliary plane method.

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

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

COMPUTER AIDED DRAFTING (DEMONSTRATION ONLY)
Introduction to drafting packages and demonstration of their use.

TOTAL: 75 PERIODS

TEXT BOOK:

REFERENCES:
PH8161  PHYSICS LABORATORY  L T P C

0 0 2 1

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

LIST OF EXPERIMENTS:

1. Torsional pendulum  Determination of rigidity modulus of wire and moment of inertia of disc
2. Non – uniform bending  Determination of young’s modulus
3. Lee’s disc  Determination of thermal conductivity of a bad conductor
4. Potentiometer  Determination of thermo EMF of thermocouple
5. Air wedge  Determination of thickness of a thin sheet of paper
6. i. Optical fibre  Determination of Numerical Aperture and acceptance angle
   ii. Compact disc  Determination of width of the groove using laser
7. Acoustic grating  Determination of velocity of ultrasonic waves in liquids
8. Post office box  Determination of Band gap of a semiconductor
9. Spectrometer  Determination of wavelength using grating
10. Viscosity of liquids  Determination of co-efficient of viscosity of a liquid by Poiseuille’s flow

TOTAL : 30 PERIODS
LIST OF EXPERIMENTS:
1. Estimation of HCl using Na₂CO₃ as primary standard and Determination of alkalinity in water sample.
2. Determination of total, temporary & permanent hardness of water by EDTA method.
3. Determination of DO content of water sample by Winkler's method.
4. Determination of chloride content of water sample by argentometric method.
5. Estimation of copper content of the given solution by Iodometry.
6. Determination of strength of given hydrochloric acid using pH meter.
7. Determination of strength of acids in a mixture of acids using conductivity meter.
8. Estimation of iron content of the given solution using potentiometer.
9. Estimation of iron content of the water sample using spectrophotometer (1,10-phenanthroline / thiocyanate method).
10. Estimation of sodium and potassium present in water using flame photometer.
14. Determination of CMC.
15. Phase change in a solid.

TOTAL: 30 PERIODS

REFERENCE BOOKS

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

TOTAL: 45 PERIODS
OBJECTIVE
To provide exposure to the students with hands-on experience on various basic engineering practices in Civil, Mechanical, Electrical and Electronics Engineering.

GROUP – A (CIVIL & ELECTRICAL)

1. CIVIL ENGINEERING PRACTICE

   **Plumbing**
   Basic pipe connections involving the fittings like valves, taps, coupling, unions, reducers, elbows and other components used in household fittings. Preparation of plumbing line sketches.
   Laying pipe connection to the suction side of a pump – inlet.
   Laying pipe connection to the delivery side of a pump – outlet.
   Practice in mixed pipe connections: Metal, plastic and flexible pipes used in household appliances.

   **Wood Work**
   Sawing, planning and making common joints: T-Joint, Mortise and Tennon joint, Dovetail joint.

   **Study**
   Study of joints in door panels, wooden furniture
   Study of common industrial trusses using models.

2. ELECTRICAL ENGINEERING PRACTICE

   Basic household wiring using switches, fuse, indicator – lamp etc.,
   Preparation of wiring diagrams
   Stair case light wiring
   Tube – light wiring
   Study of iron-box, fan with regulator, emergency lamp

GROUP – B (MECHANICAL AND ELECTRONICS)

3. MECHANICAL ENGINEERING PRACTICE

   **Welding**
   Arc welding of butt joints, lap joints, tee joints
   Gas welding Practice.
   Basic Machining
   Simple turning, drilling and tapping operations.
   Machine assembly Practice.
   Study and assembling the following:
   Centrifugal pump, mixies and air conditioners.
   Demonstration on
   (a) Smithy operations like the production of hexagonal bolt.
   (b) Foundry operation like mould preparation for grooved pulley.
4. ELECTRONIC ENGINEERING PRACTICE

Soldering simple electronic circuits and checking continuity.
Assembling electronic components on a small PCB and testing.
Study of Telephone, FM radio, low-voltage power supplies.

TOTAL: 45 PERIODS

HS8251 TECHNICAL ENGLISH II

(LCommon to all branches of B.E. / B.Tech. Programmes in II Semester)

OBJECTIVES:
- To make the students acquire listening and speaking skills meant for both formal and informal contexts
- To help them develop their reading skills by exposing them to different types of reading strategies
- To equip them with writing skills needed for academic as well as workplace situations
- To make them acquire language skills at their own pace by using e-materials and language lab component

UNIT I
Listening - Listening to informal conversations and participating; Speaking - Opening a conversation (greetings, comments on something, weather) - Turn taking - Closing a conversation (excuses, general wish, positive comment, thanks); Reading - Developing analytical skills, Deductive and inductive reasoning - Extensive reading; Writing - Effective use of SMS for sending short notes and messages - Using 'emoticons' as symbols in email messages; Grammar - Regular & irregular verbs - Active and passive voice; Vocabulary - Homonyms (e.g. 'can') - Homophones (e.g. 'some', 'sum'); E-materials - Interactive exercise on Grammar and vocabulary – blogging; Language Lab - Listening to different types of conversation and answering questions.

UNIT II
Listening - Listening to situation based dialogues; Speaking - Conversation practice in real life situations, asking for directions (using polite expressions), giving directions (using imperative sentences), Purchasing goods from a shop, Discussing various aspects of a film (they have already seen) or a book (they have already read); Reading - Reading a short story or an article from newspaper, Critical reading, Comprehension skills; Writing - Writing a review / summary of a story / article, Personal letter (Inviting your friend to a function, congratulating someone for his success, thanking one’s friend / relatives); Grammar - modal verbs, Purpose expressions; Vocabulary - Phrasal verbs and their meanings, Using phrasal verbs in sentences; E-materials - Interactive exercise on Grammar and vocabulary, Extensive reading activity (reading stories / novels from links), Posting reviews in blogs - Language Lab - Dialogues (Fill up exercises), Recording students’ dialogues.

UNIT III
Listening - Listening to the conversation - Understanding the structure of conversations; Speaking - Conversation skills with a sense of stress, intonation, pronunciation and meaning - Seeking information – expressing feelings (affection, anger, regret etc.); Reading - Speed reading – reading passages with the time limit - Skimming; Writing - Minutes of meeting –
format and practice in the preparation of minutes - Writing summary after reading the articles from the journals - Format for the journal articles – elements of technical articles (abstract, introduction, methodology, results, discussion, conclusion, appendices, references) - Writing strategies; Grammar - Conditional clauses - Cause and effect expressions; Vocabulary - Words used as nouns and verbs without any change in the spelling (e.g. ‘rock’, ‘train’, ‘ring’); E-materials - Interactive exercise on Grammar & vocabulary - Speed Reading practice exercises; Language Lab - Intonation practice using EFLU materials – Attending a meeting and writing minutes.

UNIT IV
Listening - Listening to a telephone conversation, Viewing a model interview (face-to-face, telephonic and video conferencing) and observing the practices; Speaking - Role play practice in telephone skills - listening and responding, -asking questions, -note taking – passing on messages, Role play and mock interview for grasping the interview skills; Reading - Reading the job advertisements and the profile of the company concerned – scanning; Writing - Applying for a job – cover letter - résumé preparation – vision, mission and goals of the candidate; Grammar - Numerical expressions - Connectives (discourse markers); Vocabulary - Idioms and their meanings – using idioms in sentences; E-materials - Interactive exercises on Grammar & Vocabulary - Different forms of résumés- Filling up a résumé / cover letter; Language Lab - Telephonic interview – recording the responses - e-résumé writing.

UNIT V
Listening - Viewing a model group discussion and reviewing the performance of each participant - Identifying the characteristics of a good listener; Speaking - Group discussion skills – initiating the discussion – exchanging suggestions and proposals – expressing dissent/agreement – assertiveness in expressing opinions – mind mapping technique; Reading - Note making skills – making notes from books, or any form of written materials - Intensive reading Writing - Types of reports – Feasibility / Project report – report format – recommendations / suggestions – interpretation of data (using charts for effective presentation); Grammar - Use of clauses; Vocabulary – Collocation; E-materials - Interactive grammar and vocabulary exercises - Sample GD - Pictures for discussion, Interactive grammar and vocabulary exercises - Pictures for discussion; Language Lab - Different models of group discussion

TOTAL: 60 PERIODS

TEXT BOOKS:

REFERENCE BOOKS:

EXTENSIVE READERS

WEB RESOURCES
1. www.esl-lab.com
2. www.englishgrammar.org
3. www.englishclub.com
4. www.mindtools.com
5. www.esl.about.com

MA8251 MATHEMATICS – II
(Common to all branches of B.E. / B.Tech. Programmes in II Semester) L T P C
3 1 0 4

OBJECTIVES:
- To make the student acquire sound knowledge of techniques in solving ordinary differential equations that model engineering problems.
- To acquaint the student with the concepts of vector calculus, needed for problems in all engineering disciplines.
- To develop an understanding of the standard techniques of complex variable theory so as to enable the student to apply them with confidence, in application areas such as heat conduction, elasticity, fluid dynamics and flow through electric current.
- To make the student appreciate the purpose of using transforms to create a new domain in which it is easier to handle the problem that is being investigated.

UNIT I DIFFERENTIAL EQUATIONS 9+3
Method of variation of parameters – Method of undetermined coefficients – Homogenous equation of Euler’s and Legendre’s type – System of simultaneous linear differential equations with constant coefficients.

UNIT II VECTOR CALCULUS 9+3
Gradient and directional derivative – Divergence and Curl – Irrotational and Solenoidal vector fields – Line integral over a plane curve – Surface integral and volume integral - Green’s, Gauss divergence and Stoke’s theorems – Verification and application in evaluating line, surface and volume integrals.

UNIT III ANALYTIC FUNCTION 9+3
Analytic functions – Necessary and sufficient conditions for analyticity - Properties – Harmonic conjugates – Construction of analytic function - Conformal mapping – Mapping by functions $w = z + c, az, \frac{1}{z}, z^2$ - Bilinear transformation.

UNIT IV COMPLEX INTEGRATION 9+3

UNIT V LAPLACE TRANSFORMS 9+3

**TOTAL : 60 PERIODS**

**TEXT BOOKS:**

**REFERENCES:**

**PH8251 MATERIALS SCIENCE**
(Common to Manufacturing, Industrial, Mining, Mechanical, Aeronautical, Automobile and Production Engineering)

**OBJECTIVE:**
To introduce the essential principles of materials science for mechanical and related engineering applications.

**UNIT I MECHANICAL PROPERTIES**

**UNIT II PHASE DIAGRAMS**
Solid solutions - Hume Rothery’s rules - free energy of solid solution - intermediate phases - The phase rule - single component system - one-component system of iron - binary phase diagrams - isomorphous systems - the tie-line rule - the level rule - application to isomorphous system - eutectic phase diagram - peritectic phase diagram - other invariant reactions - microstructural change during cooling.

**UNIT III FERROUS ALLOYS AND HEAT TREATMENT**
The iron-carbon equilibrium diagram - phases, invariant reactions - microstructure of slowly cooled steels - eutectoid steel, hypo and hypereutectoid steels - effect of alloying elements on the Fe-C system - diffusion in solids - Fick’s law - phase transformations - pearlitic transformations - T-T-T-diagram for eutectoid steel - bainitic and martensitic transformations -
tempering of martensite - heat treatment of steels - annealing - normalizing - quenching and tempering - case hardening - induction, flame and laser hardening - carburizing, cyaniding, carbonitriding and nitriding.

UNIT IV ELECTRONIC MATERIALS
Classification of solids - energy bands - concept of Fermi level - conductor, semiconductor, insulator - Semiconductors: intrinsic, extrinsic - carrier concentration expression (qualitative) - compound semiconductors (qualitative) - dielectric materials - polarization mechanisms - dielectric breakdown - magnetic materials - ferromagnetic materials & hysteresis - ferrites - superconducting materials, properties, types and applications.

UNIT V NEW MATERIALS AND APPLICATIONS

TOTAL : 45 PERIODS

TEXT BOOK:

REFERENCE BOOKS:

GE8251 ENGINEERING MECHANICS

OBJECTIVE:
- To develop capacity to predict the effect of force and motion in the course of carrying out the design functions of engineering

UNIT I BASICS AND STATICS OF PARTICLES

UNIT II EQUILIBRIUM OF RIGID BODIES
Free body diagram – Types of supports –Action and reaction forces –stable equilibrium – Moments and Couples – Moment of a force about a point and about an axis – Vectorial representation of moments and couples – Scalar components of a moment – Varignon’s theorem – Single equivalent force -Equilibrium of Rigid bodies in two dimensions – Equilibrium of Rigid bodies in three dimensions
UNIT III  PROPERTIES OF SURFACES AND SOLIDS  9 + 3

UNIT IV  DYNAMICS OF PARTICLES  9 + 3

UNIT V  FRICTION AND ELEMENTS OF RIGID BODY DYNAMICS  9 + 3
Friction force – Laws of sliding friction – equilibrium analysis of simple systems with sliding friction –wedge friction- Rolling resistance -Translation and Rotation of Rigid Bodies – Velocity and acceleration – General Plane motion of simple rigid bodies such as cylinder, disc/wheel and sphere.

TOTAL: 60 PERIODS

TEXT BOOKS:

REFERENCES:
OBJECTIVES
To understand the properties of fuels and lubricants for the design and operation of the I.C engines.

UNIT I  MANUFACTURE OF FUELS AND LUBRICANTS  9
Structure of petroleum, refining process, fuels, thermal cracking, catalytic cracking, polymerization, alkylation, isomerisation, blending, products of refining process. Manufacture of lubricating oil base stocks, manufacture of finished automotive lubricants.

UNIT II  THEORY OF LUBRICATION  9
Engine friction: introduction, total engine friction, effect of engine variables on friction, hydrodynamic lubrication, elasto hydrodynamic lubrication, boundary lubrication, bearing lubrication, functions of the lubrication system, introduction to design of a lubricating system.

UNIT III  LUBRICANTS  9
Specific requirements for automotive lubricants, oxidation deterioration and degradation of lubricants, additives and additive mechanism, synthetic lubricants, classification of lubricating oils, properties of lubricating oils, tests on lubricants. Grease, classification, properties, test used in grease.

UNIT IV  PROPERTIES AND TESTING OF FUELS  9
Thermo-chemistry of fuels, properties and testing of fuels, relative density, calorific value, flash point, fire point, distillation, vapour pressure, spontaneous ignition temperature, viscosity, pour point, flammability, ignitability, diesel index, API gravity, aniline point, carbon residue, copper strip corrosion etc.

UNIT V  COMBUSTION & FUEL RATING  9

TOTAL: 45 PERIODS

TEXT BOOKS:

REFERENCES
OBJECTIVE:
To learn the basic processes available to make a part/product. Will help the students to select the best manufacturing process based on quality/time/cost/mechanical properties.

UNIT I CASTING PROCESSES

UNIT II WELDING PROCESSES

UNIT III METAL FORMING PROCESSES

UNIT IV MACHINING PROCESSES

UNIT V PLASTIC MATERIAL PROCESSES

TOTAL : 45 PERIODS

TEXT BOOKS:

REFERENCE BOOKS:
**OBJECTIVE:**
- To get hands on experience in the conventional machines.
- To prepare the process planning sheets for all the operations and then follow the sequences during the machining processes.

**LIST OF EXPERIMENTS:**
1. Study of all the conventions machines – identification of parts / Mechanisms and Position of tool and work piece.
2. Facing, plain turning /Step Turning operations in Lathe.
3. Taper Turning/ Threading, Knurling operations in Lathe.
5. Machining to make a cube using shaper.
6. Machining to make a V-Block in shaper.
7. Counter sinking, Counter Boring, Tapping operation in a drilling machine.
8. Surfacing/Pocket Milling in a vertical milling machine.
10. Flat surface grinding and cylindrical grinding operations.
11. Machining an internal spline in a slotting machine.
12. To machine the given part drawing using Lathe and milling machines.

TOTAL : 45 PERIODS

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**OBJECTIVE:**
- To impart practical knowledge in modeling.
- To get hands on experience in drafting of automotive / typical industrial components, etc.

**LIST OF EXPERIMENTS:**
1. Practice on Drafting software using Measuring Commands; Basic Draw Commands; Display Commands GRID, SNAP, CIRCLE, LINE, ARC, LIMITS, ZOOM, PAN
2. Practice on using Editing Commands; Creating Layers; CHANGE, ERASE, EXTEND, TRIM, GRIDS, LAYER. Construction Commands ARRAY, COPY, MIRROR, MOVE, OFFSET, FILLET, CHAMFER, OSNAP
3. Placing lettering on a drawing; Crosshatching a drawing TEXT, BHATCH
4. 2D drafting of automobile components like engine crank shaft, connecting rod etc.
5. 2D drafting of machine components.
6. 2D drafting of machine shop drawing.
7. 2D drafting of pin joints, cotter joints and bearings.

TOTAL : 45 PERIODS
OBJECTIVES:
- To provide the mathematical foundations of numerical techniques for solving linear system, eigen value problems, interpolation, numerical differentiation and integration and the errors associated with them;
- To demonstrate the utility of numerical techniques of ordinary and partial differential equations in solving engineering problems where analytical solutions are not readily available.

UNIT I  SOLUTION OF EQUATIONS AND EIGENVALUE PROBLEMS  9+3

UNIT II  INTERPOLATION AND APPROXIMATION  9+3
Interpolation with unequal intervals - Lagrange interpolation – Newton’s divided difference interpolation – Cubic Splines - Interpolation with equal intervals - Newton’s forward and backward difference formulae – Least square method - Linear curve fitting.

UNIT III  NUMERICAL DIFFERENTIATION AND INTEGRATION  9+3

UNIT IV  INITIAL VALUE PROBLEMS FOR ORDINARY DIFFERENTIAL EQUATIONS  9+3

UNIT V  BOUNDARY VALUE PROBLEMS IN ORDINARY AND PARTIAL DIFFERENTIAL EQUATIONS  9+3
Finite difference methods for solving two-point linear boundary value problems. Finite difference techniques for the solution of two dimensional Laplace’s and Poisson’s equations on rectangular domain – One dimensional heat-flow equation by explicit and implicit (Crank-Nicholson) methods - One dimensional wave equation by explicit method.

TOTAL: 60 PERIODS

TEXT BOOKS:

REFERENCES:
OBJECTIVE:

- To introduce various behavior of structural components under various loading conditions.

UNIT I  INTRODUCTION  8

UNIT II  STRESSES IN BEAMS  10
Shear force & bending moment diagrams: Bending and shear stress variation in beams of symmetric sections, a typical spar section: Beams of uniform strength - beams of two materials.

UNIT III  DEFLECTION OF BEAMS  10

UNIT IV  TORSION – SPRINGS – COLUMNS  10

UNIT V  BIAXIAL STRESSES  7
Stresses in thin-walled pressure vessels – combined loading of circular shaft with bending, torsion and axial loadings – Mohr’s circle and its construction – determination of principal stresses.

TOTAL: 45 PERIODS

TEXT BOOKS:
2. Timoshenko and Young “Strength of Materials” Vol. I & II

REFERENCES:
OBJECTIVE:
To impart the knowledge on basic concepts on Automotive SI Engines and its various sub components along with its functions.

UNIT I ENGINE CONSTRUCTION AND OPERATION 10

UNIT II FUEL AND IGNITION SYSTEM 10
Carburetor – requirements, working principle, types, different circuits – Compensation – Maximum power devices – Petrol injection in SI engines, Magneto coil and battery coil spark ignition system. Advance mechanism. Electronic ignition System – CDI.

UNIT III COOLING AND LUBRICATION SYSTEM 8

UNIT IV COMBUSTION AND COMBUSTION CHAMBERS 9

UNIT V TWO STROKE ENGINES 8
Two stroke engine – types, terminologies, definitions, construction and operation. Comparison of four stroke and two stroke engine operation. Theoretical scavenging processes. Merits and demerits, scavenging efficiency, Scavenging pumps, Rotary valve engine.

TOTAL : 45 PERIODS

TEXT BOOKS:

REFERENCES:
UNIT I INTRODUCTION TO MEASUREMENTS AND SENSORS
Sensors: Functions- Classifications- Main technical requirement and trends
Units and standards- Calibration methods- Classification of errors- Error analysis- Limiting error- Probable error- Propagation of error- Odds and uncertainty- principle of transduction-Classification.
Static characteristics- mathematical model of transducers- Zero, First and Second order transducers- Dynamic characteristics of first and second order transducers for standard test inputs.

UNIT II VARIABLE RESISTANCE AND INDUCTANCE SENSORS
Principle of operation- Construction details- Characteristics and applications of resistive potentiometer- Strain gauges- Resistive thermometers- Thermistors- Piezoresistive sensors Inductive potentiometer- Variable reluctance transducers- EI pick up and LVDT

UNIT III VARIABLE AND OTHER SPECIAL SENSORS
Variable air gap type, variable area type and variable permittivity type- capacitor microphone

UNIT IV AUTOMOTIVE PRESSURE AND FORCE/TORQUE SENSOR
Pressure Sensor:
Typical automotive applications- Thick film pressure sensor- Semiconductor pressure sensor- Integrated silicon intake-manifold pressure sensor-Integrated silicon combustion-pressure sensor- Piezo electric sensor-High pressure sensor with metal diaphragm.
Force/Torque Sensor:
Typical automotive applications- Magneto elastic bearing-pin sensor- Magneto elastic tension/compressive-force sensor according to the cross-ductor principle – Basic principle of torque measurement –Stress and Angle measuring torque sensor

UNIT V AUTOMOTIVE POSITION AND RPM/VELOCITY SENSORS
Temperature Sensors:- Typical automotive applications -Sintered-Ceramic resistors-Thin film resistors-Thick film resistors- Monocrystalline silicon semiconductor resistor- Thermopile sensors
Introduction to MEMs

TOTAL: 45 PERIODS
TEXT BOOKS:

REFERENCES:

AU8351 THERMODYNAMICS AND THERMAL ENGINEERING L T P C
3 1 0 4

OBJECTIVE:
To introduce fundamental concepts in thermodynamics, heat transfer, propulsion and refrigeration and air conditioning.

UNIT I BASIC THERMODYNAMICS

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

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

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

UNIT V HEAT AND MASS TRANSFER

TOTAL : 60 PERIODS

(Use of standard Steam tables with mollier chart and Refrigerant tables are permitted)
TEXT BOOKS:

REFERENCES:

EI8305  ELECTRICAL AND ELECTRONICS ENGINEERING  L T P C
3 0 0 3

OBJECTIVE:
• To impart the knowledge on basic concepts of electrical circuits and electrical machines.
• To impart the knowledge on basic concepts of electronic components, devices and circuits

UNIT I  BASIC CONCEPTS AND DC CIRCUITS  9
Ohm's law - Electrical resistance - Series /Parallel resistive circuits - Star/Delta transformations - Kirchoff's law - Node and Mesh analysis - Thevenin's and Norton's theorem.

UNIT II  A.C.CIRCUITS  9
RMS and average value of periodic waves - Form factor - Phase and Phase difference - Simple RC,RL and RLC circuits - series and parallel resonance - power and power factor - introduction to three phase systems – power measurement in 3 phase system.

UNIT III  D.C. MACHINES  10

UNIT IV  ELECTRONIC COMPONENTS AND DEVICES  9
Operating principle and characteristics of Simple PN Junction Diodes, Zener diode, Bipolar Junction transistor - Field Effect Transistors – UJT – SCR.

UNIT V  ANALOG CIRCUITS  8
Rectifier and Power Supply Circuits, clipper, clamper using diodes, Operational Amplifiers (Ideal) - properties and typical circuits like differentiator, integrator, summer, comparator.

TOTAL : 45 PERIODS
REFERENCES:

AU8311 MECHANICAL SCIENCE LABORATORY

OBJECTIVE:
To train the students in testing and quantifying the mechanical properties of Engineering Materials, Engines.

LIST OF EXPERIMENTS:

Material Testing Lab

- Tension Test
- Torsion Test
- Testing of springs
- Impact test i) Izod, ii) Charpy
- Hardness test i) Vickers, ii) Brinell, iii) Rockwell, iv) Shore
- Deflection of Beams
- Dye Penetrant Test
- Tensile testing of polymers.
- Flex Fatigue test for Elastomers.
- Injection moulding machine operation.

IC Engines Lab

- Performance test on a 4 stroke engine
- Viscosity determination of the given fluid
- Moment of inertia of connecting rod
- Determination of Effectiveness of a parallel and counter flow heat exchangers.
- Valve timing of a 4 stroke engine and port timing of a 2 stroke engine.
- Determination of Flash point and Fire point of the given oil.

TOTAL : 45 PERIODS
EI8361 ELECTRICAL AND ELECTRONIC ENGINEERING LABORATORY

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

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

TOTAL: 45 PERIODS

GE8351 ENVIRONMENTAL SCIENCE AND ENGINEERING

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 INTRODUCTION TO ENVIRONMENTAL STUDIES AND NATURAL RESOURCES
Definition, scope and importance of environment – need for public awareness - 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 II  ENVIRONMENT, ECOSYSTEMS AND BIODIVERSITY
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 III  ENVIRONMENTAL POLLUTION
Definition – causes, effects and control measures of: (a) Air pollution (b) Water pollution (c) Soil pollution (d) Marine pollution (e) Noise pollution (f) Thermal pollution (g) Nuclear hazards – soil waste management: causes, effects and control measures of municipal solid wastes – role of an individual in prevention of pollution – pollution case studies – disaster management: floods, earthquake, cyclone and landslides.
Field study of local polluted site – Urban / Rural / Industrial / Agricultural.

UNIT IV  SOCIAL ISSUES AND THE ENVIRONMENT

UNIT V  HUMAN POPULATION AND THE ENVIRONMENT

TOTAL: 45 PERIODS

TEXT BOOKS
3. Anubha Kaushik and Kaushik C.P., “ Perspectives in Environmental Studies” New age International (P) Ltd., New Delhi, 2005
REFERENCES

AE8451 ENGINEERING FLUID MECHANICS

OBJECTIVE:
- To introduce the basic concepts of fluid statics.
- To make the student understand the basic laws governing fluid motion and its application.
- To give an introduction on fluid machines and aerodynamics.

UNIT I BASIC CONCEPTS
Classification of fluids and their properties – Measurement of pressure and viscosity - Fluid statics and force on submerged bodies – Stability of floating bodies.

UNIT II EQUATIONS OF FLUID FLOW
Kinematics – Motion of a fluid particle – Fluid deformation – Navier Stokes equation and Euler’s equation – Basic laws of fluid motion in integral form and differential form - Linear momentum equation

UNIT III INCOMPRESSIBLE INVISCID FLOW
Bernoulli’s equations – Applications — Flow measurement – Orifice plate – Venturi meter – Stream function and velocity potential – Laplace equation

UNIT IV INCOMPRESSIBLE VISCOUS FLOW
Fully developed laminar flow between parallel plates – Laminar and turbulent flow through pipes – Velocity profiles – Energy considerations in pipe flow – Calculation of head loss Pipe flow problems – Hydraulic and energy grade lines – Moody’s diagram

UNIT V DIMENSIONAL ANALYSIS AND FLUID MACHINERY

TOTAL: 45 PERIODS

TEXT BOOKS:
1. White.F.M., Fluid Mechanics

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   LAYOUT, FRAME, FRONT AXLE AND STEERING SYSTEM 9

UNIT II   DRIVE LINE, FINAL DRIVE AND DIFFERENTIAL 9

UNIT III   REAR AXLES, WHEELS, RIMS AND TYRES 9

UNIT IV   SUSPENSION SYSTEM 9

UNIT V   BRAKING SYSTEM 9

TOTAL : 45 PERIODS

TEXT BOOKS

REFERENCES
OBJECTIVES:
To impart knowledge on basic concepts of automotive diesel engines, combustion process involved in diesel engines and the various subsystems used along with their functions in detail.

UNIT I  DIESEL ENGINE BASIC THEORY  9

UNIT II  FUEL INJECTION SYSTEM  9

UNIT III  AIR MOTION, COMBUSTION AND COMBUSTION CHAMBERS  10

UNIT IV  SUPERCHARGING AND TURBOCHARGING  8

UNIT V  DIESEL ENGINE TESTING AND PERFORMANCE  9

TOTAL: 45 PERIODS

TEXT BOOKS:

REFERENCES:
5. Heinz advanced engine tech
OBJECTIVES:
To understand the basic concepts of mechanisms and machinery

UNIT I MECHANISMS

UNIT II FRICTION

UNIT III GEARING AND CAMS

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

UNIT V VIBRATION

TOTAL : 60 PERIODS

TEXT BOOK

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

TOTAL : 45 PERIODS

OBJECTIVE:
- To familiarize and train the students on the constructional arrangements of different engine system.

Study of the following engines and its components:
1. Single Cylinder Four Stroke Diesel Engine  
2. Two wheeler Two stroke Petrol engines  
3. Two wheeler Four Stroke Petrol Engine  
4. Three wheeler Engine  
5. Multi cylinder inline diesel engine  
6. Multi cylinder inline Petrol engine  
7. Multi cylinder V type diesel Engine  
8. MPFI engine  
9. CRDI engine

TOTAL : 45 PERIODS
LIST OF EXPERIMENTS:
1. Temperature dependence of viscosity of lubrication oil by Redwood Viscometer.
2. Viscosity Index of lubricating oil by Saybolt Viscometer
3. Flash and Fire points of fuels.
4. Flash and Fire points of lubricants.
5. Cloud and pour point of fuels.
6. ASME distillation test of fuels (gasoline / diesel).
7. Carbon residue test of lubrication oil.
10. Ash content test of fuel.
11. Penetration test of grease.
12. Finding the Cetane index
13. Copper strip corrosion
14. Density test

TOTAL : 45 PERIODS

LIST OF EQUIPMENTS
1. Redwood Viscometer - 1 No.
2. Saybolt Viscometer - 1 No.
3. Flash and Fire point apparatus - 1 No.
4. Cloud and pour point apparatus - 1 No.
5. Distillation test apparatus - 1 No.
7. Bomb Calorimeter - 1 No.
8. Ash content test apparatus - 1 No.

AU8501 AUTOMOTIVE COMPONENTS DESIGN

OBJECTIVE:
- To familiarize 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 INTRODUCTION
UNIT II DESIGN OF SHAFTS AND SPRINGS

UNIT III GEAR DESIGN

UNIT IV FLYWHEELS
Determination of the mass of a flywheel for a given co-efficient of speed fluctuation. Engine flywheels stresses of rim of flywheels. Design of hubs and arms of flywheel – Turning moment diagram.

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

TEXTBOOKS:

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

REFERENCES:

UNIT I CLUTCH AND GEAR BOX
Requirement of transmission system, Different types of clutches, principle & Construction of Single plate coil spring and Diaphragm spring clutches., Need and Objectives of Gear box. Construction and operation of Sliding mesh, Constant mesh and Synchronmesh gearboxes. – Determination of gear ratios for vehicles. Performance characteristics in different speeds. Problems on performance of automobile such as Resistance to motion, Ttractive effort, Engine speed & Power and acceleration.

UNIT II HYDRO_DYNAMIC TRANSMISSION

UNIT III EPICYCLIC GEARBOXES USED IN AUTOMATIC TRANSMISSION

UNIT IV AUTOMATIC TRANSMISSION APPLICATIONS
Need for automatic transmission, Four speed longitudinally mounted automatic transmission - Chevrolet “Turboglide” Transmission, Continuously Variable Transmission (CVT) – Types – Operations of a typical CVT.

UNIT V HYDROSTATIC AND ELECTRIC DRIVE

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 THE POWER UNIT 9
Two stroke and four stroke SI & CI engine Construction and Working, merits and demerits, Symmetrical and unsymmetrical valve & port timing diagrams. Scavenging process.

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

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

UNIT IV BRAKES AND WHEELS 8

UNIT V TWO & THREE WHEELERS – CASE STUDY 10
Case study of Sports bike, Motor cycles, Scooters and Mopeds - Auto rickshaws, Pick up van, Delivery van and Trailer. Servicing and maintenance. Recent developments.

TOTAL: 45 PERIODS

TEXT BOOK:

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

TOTAL : 45 PERIODS

OBJECTIVE
To make the students understand the design concept and principles of various engine components, their materials and manufacturing techniques. These concepts and principles and familiarized for design of components
1. Design of piston, piston pin, piston rings and drawing of these components.
2. Designing of connecting rod small end and big end, shank design, design of big and cap bolts and drawing of the connecting rod assembly.
3. Design of crankshaft, balancing weight calculations, development of short long crankarms, front end and rear end details, drawing of the crankshaft assembly.
4. Design and drawing of flywheel, ring gear design, drawing of the flywheel including the development of ring gear teeth.
5. Design and drawing of the inlet and exhaust valves
7. Design of combustion chamber.
8. Design and drawing of engine complete assembly involved with cylinder block, cylinder head, crankcase, valve ports, water jackets.

Computer aided design of the above components
(use of these packages are recommended - Pro E, CATIA and other CAD packages)

TOTAL : 15 L + 30 P
TEXT BOOK:

REFERENCES:

UNIT I INTRODUCTION

UNIT II EMISSIONS IN SI ENGINE
Chemistry of SI engine combustion – HC and CO formation in SI engines – NO formation in SI engines – Smoke emissions from SI engines – Effect of operating variables on emission formation.

UNIT III EMISSIONS IN CI ENGINE
Basics of diesel combustion – Smoke emission and its types in diesel engines – NOx emission and its types from diesel engines – Particulate emission in diesel engines. Odor, sulfur and Aldehyde emissions from diesel engines – effect of operating variables on emission formation.

UNIT IV CONTROL TECHNIQUES FOR REDUCTION OF EMISSION

UNIT V TEST PROCEDURE, INSTRUMENTATION & EMISSION MEASUREMENT

TOTAL : 45 PERIODS

TEXT BOOKS:

REFERENCES:
3. SAE Transactions, Vehicle emission, 1982 (3 volumes).
UNIT I CAR BODY DETAILS

UNIT II BUS BODY DETAILS
Types of bus body: based on capacity, distance traveled and based on construction.– Bus body lay out for various types, Types of metal sections used – Regulations – Constructional details: Conventional and integral. driver seat design - Safety aspect of bus body.

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

UNIT IV VEHICLE AERODYNAMICS
Objectives, Vehicle drag and types. Various types of forces and moments. Effects of forces and moments. Side wind effects on forces and moments. Various body optimization techniques for minimum drag. Wind tunnels – Principle of operation, Types. Wind tunnel testing such as: Flow visualization techniques, Airflow management test – measurement of various forces and moments by using wind tunnel.

UNIT V BODY MATERIALS, TRIM, MECHANISMS AND BODY REPAIR

TOTAL : 45 PERIODS

TEXTBOOKS:

REFERENCES:
UNIT I  INTRODUCTION TO VEHICLE CONTROL SYSTEM
Steps in vehicle control system design- Influence of vehicle system design on vehicle control-
examples w.r.to vehicle sub system - Degree of freedom for vehicle control- Calculation of the
Control degree of freedom- Effect of feedback on Control degree of freedom- selection of
controlled, manipulated, measured disturbance variables- classification of the variables in
various automotive systems like engines, suspension, braking, air conditioning – General types
of vehicle controller configurations- Feedback, Inferential, Feed-Forward, Ratio control

UNIT II  DYNAMIC BEHAVIOUR AND HARDWARE OF VEHICLE CONTROL
SYSTEMS
Transfer function and state-space models- Dynamic behavior of first order and second order
vehicle system- Standard vehicle system inputs- Dynamic responses characteristics of more
complicated vehicle system- Development of empirical models from vehicle system data
Hardware elements like vehicle plant, measuring instruments, transducers, transmission lines,
controller, final control elements, recording elements- Use of digital computers in vehicle
control

UNIT III  FEEDBACK AND ADVANCED CONTROLLERS FOR VEHICLE
CONTROL SYSTEM
Introduction- Basic Control modes- Proportional Control- Integral Control- Reset windup-
Derivative Control- various forms of PID control- Enhancements of PID controllers- On-off
controllers- Typical responses of feedback control systems- Digital Version of PID controllers
Feed-Forward control-Cascade control- Design considerations for cascade control, Time delay
compensation, Inferential control- Nonlinear control- Adaptive control

UNIT IV  ENGINE CONTROL SYSTEM
Fuel control- Ignition control- Lambda control- Idle speed control- Knock control-Adaptive knock
control- Combustion torque estimation

UNIT V  VEHICLE DRIVELINE, BRAKING AND SUSPENSION CONTROL
SYSTEM
Driveline modeling- Modeling for neutral Gear- driveline Control- Driveline Speed Control-
Driveline control for gear shifting- Active suspension control
Antilock braking control - Traction Control - Electronic stability Program control

TEXT BOOKS:

REFERENCES:
2. Benjamin C.Kuo and Farid Golnaraghi, Automatic Control System, John Wiley & Sons,
UNIT I  MARKETING AND PERSONNEL MANAGEMENT  7
Functions of Marketing – Sales Promotion Methods – Advertising – Product Packaging –
Marketing Variables – Distribution Channels – Organization – Market research – Market
Research Techniques.

Communication – Conflict - Industrial Relations – Trade union – Management functions

UNIT II  INVENTORY MANAGEMENT  10
Purpose of Inventory – Cost Related to inventory – Basic EOQ Model – Variations in EOQ
Model – Finite Production – Quantity Discounts – ABC Analysis – MRP – Lot size under
constraints.

UNIT III  OPERATIONS MANAGEMENT  9
Aggregate Planning – Value Analysis.

UNIT IV  FINANCIAL MANAGEMENT  8
Capital – Types – Sources – Break Even Analysis – Financial Statements – Income Statement

UNIT V  OPERATIONS RESEARCH TECHNIQUES  11
Replacement theory – Linear Programming - Transportation and assignment problems –
Sequencing - Network Techniques - CPM and PERT.

TOTAL: 45 PERIODS

TEXT BOOKS:
   Eswar Press, 2005

REFERENCES:
7. R. Kesavan, C. Elanchezian and B. Vijayaramnath – Production Planning and Control,
OB jectives

- To enhance the employability skills of students with a special focus on Presentation skills, Group discussion skills and Interview skills
- To help them improve their soft skills, including report writing, necessary for the workplace situations

1. Making presentations – introducing oneself – introducing a topic – answering questions individual presentation practice
2. Creating effective PPTs – presenting the visuals effectively
3. Using appropriate body language in professional contexts – gestures, facial expressions, etc.
4. Preparing job applications - writing covering letter and résumé
5. Applying for jobs online - email etiquette
6. Participating in group discussions – understanding group dynamics - brainstorming the topic
7. Training in soft skills - persuasive skills – People skills - questioning and clarifying skills – mock GD
8. Writing Project proposals – collecting, analyzing and interpreting data / drafting the final report
9. Attending job interviews – answering questions confidently
10. Interview etiquette – dress code – body language – mock interview

Total: 30 periods

Requirements for a class of 30 students

1. A PC or a lap top with one or two speakers
2. A Collar mike and a speaker
3. An LCD projector and a screen
4. CD's and DVD's on relevant topics

Reference Books:


Extensive Readers


Web Resources

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

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

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

**TOTAL : 45 PERIODS**

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**AU8612 ENGINE TESTING AND EMISSION MEASUREMENT LABORATORY**

**LIST OF EXPERIMENTS:**
1. Study and use of IC engine testing Dynamometers.
2. Study of 2 and 4 wheeler chassis Dynamometers.
3. Study and use of Pressure pickups, charge amplifier, storage oscilloscope and signal analyzers used for IC engine testing.
5. Performance study of diesel engine.
6. Calculation of frictional power on petrol engines.
8. Testing of 2 and 4 wheelers using chassis dynamometers.
9. Study of NDIR Gas Analyzer and FID.
10. Study of Chemiluminescent NOx analyser.
12. Diesel smoke measurement.

**TOTAL : 45 PERIODS**

**TEXT BOOK:**

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

UNIT I  INTRODUCTION  9

UNIT II  COMBUSTION AND STOICHIOMETRY  9
Reactive processes, Heat of reaction, measurement of URP, measurement of HRP. Introduction - combustion equation for hydrocarbon fuels. Calculation of minimum air required for combustion, excess air supplied and stoichiometric air required for complete combustion. Conversion of volumetric analysis to mass analysis.

UNIT III  ADIABATIC FLAME TEMPERATURE  9
Introduction, complete combustion in C-H-N-O systems, constant volume adiabatic combustion, constant pressure adiabatic combustion, calculation of adiabatic flame temperature, isentropic changes of state. SI Engine simulation with air as working medium, deviation between actual and ideal cycle.

UNIT IV  SI ENGINE SIMULATION WITH ADIABATIC COMBUSTION  9
Introduction, Engine details, temperature drop due to fuel vaporization, full throttle operation, work output and efficiency calculation, part-throttle operation, engine performance at part throttle, super charged operation, SI Engines simulation with progressive combustion. Wiebe’s law combustion analysis.

UNIT V  SI ENGINE SIMULATION WITH GAS EXCHANGE PROCESS  9
Introduction, gas exchange process, Heat transfer process, friction calculations, compression of simulated values, validation of the computer code, engine performance simulation, pressure crank angle diagram, brake power, brake thermal efficiency, effect of speed on performance.

TOTAL : 45 PERIODS

TEXTBOOK:

REFERENCES:
UNIT I  CONCEPT OF VIBRATION

UNIT II  TIRES

UNIT III  VERTICAL DYNAMICS

UNIT IV  LONGITUDINAL DYNAMICS AND CONTROL

UNIT V  LATERAL DYNAMICS

TOTAL : 45 PERIODS

TEXT BOOKS:

REFERENCES:
1. Dean Karnopp, Vehicle Stability, 1st edition, Marcel Dekker, 2004
UNIT I  MAINTENANCE, WORKSHOP PRACTICES, SAFETY AND TOOLS  10

UNIT II  ENGINE AND ENGINE SUBSYSTEM MAINTENANCE  8
General Engine service- Dismantling of Engine components- Engine repair- working on the underside, front, top, ancillaries- Service of basic engine parts, cooling and lubricating system, fuel system, Intake and Exhaust system, electrical system - Electronic fuel injection and engine management service - fault diagnosis- servicing emission controls

UNIT III  TRANSMISSION AND DRIVELINE MAINTENANCE  8
Clutch- general checks, adjustment and service- Dismantling, identifying, checking and reassembling transmission, transaxle- road testing- Removing and replacing propeller shaft, servicing of cross and yoke joint and constant velocity joints- Rear axle service points-removing axle shaft and bearings- servicing differential assemblies- fault diagnosis.

UNIT IV  STEERING, BRAKE, SUSPENSION, WHEEL MAINTENANCE  11
Inspection, Maintenance and Service of Hydraulic brake, Drum brake, Disc brake, Parking brake. Bleeding of brakes.
Inspection, Maintenance and Service of Mc person strut, coil spring, leaf spring, shock absorbers. Dismantling and assembly procedures.
Wheel alignment and balance, removing and fitting of tyres, tyre wear and tyre rotation.
Inspection, Maintenance and Service of steering linkage, steering column, Rack and pinion steering, Recirculating ball steering service- Worm type steering, power steering system

UNIT V  AUTO ELECTRICAL AND AIR CONDITIONING MAINTENANCE  10
Maintenance of batteries, starting system, charging system and body electrical -Fault diagnosis using Scan tools. Maintenance of air conditioning parts like compressor, condenser, expansion valve, evaporator - Replacement of hoses- Leak detection- AC Charging- Fault diagnosis
Vehicle body repair like panel beating, tinkering, soldering, polishing, painting.

TOTAL : 45 PERIODS

TEXT BOOKS:
3. Vehicle Service Manuals of reputed manufacturers

REFERENCE:
OBJECTIVE:
Designing of the clutch, gear box, front axle and drive line systems of Automobiles.
Drafting and Modeling of

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

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

- **FRONT AXLE**
  1. Design of front axle system for various cross section like circular, 'I' section

- **DRIVE LINE AND REAR AXLE**
  1. Design of propeller shaft.
  2. Design details of final drive gearing.
  3. Design details of full floating, semi-floating and three quarter floating rear shafts and rear axle housings

**TOTAL : 45 PERIODS**

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AU8712  INDUSTRIAL TRAINING  

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

2. At the end of the training they have to submit a report with following information:
   a. Profile of the industry
   b. Product range
   c. Organization structure
   d. Plant layout
   e. Processes/Machines/Equipments/Devices
   f. Personnel welfare schemes
   g. Details of the training undergone
   h. Projects undertaken during the training, if any
   i. Learning points

The assessments will be based equally on the report in the prescribed format and viva-voce examination by a committee nominated by the Head of the Department
STUDY EXPERIMENTS:
1. Tools and instruments required for maintenance
2. Safety aspects with respect to man, machine and tools
3. General procedures for servicing and maintenance schedule
4. Wheel Alignment procedure

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

TOTAL : 45 PERIODS

REFERENCES:
1. Service manuals of reputed vehicles.

AU8811   PROJECT WORK   L T P C
0 0 12 6

The objective of project work is to enable the students, to work in convenient groups of not more than four members in a group, on a project involving some design and fabrication work or theoretical and experimental studies related to the respective engineering discipline.

Every project work shall have a Guide who is a member of the faculty of the University. Twelve periods per week shall be allotted in the Time table for this important activity and this time shall be utilized by the students to receive directions from the Guide, on library reading, laboratory work, computer analysis, or field work as assigned by the Guide and also to present in periodical seminars or viva to review the progress made in the project.

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

The continuous assessment and semester evaluation may be carried out as specified in the guidelines to be issued from time to time.
UNIT I  COMBUSTION OF FUELS  9

UNIT II  ENGINE CYCLE ANALYSIS  8
Ideal air, fuel air cycle and actual cycle analysis. Progressive combustion analysis in SI engines. Parametric studies on work output, efficiency and other engine performance.

UNIT III  COMBUSTION MODELLING  10

UNIT IV  NON-CONVENTIONAL IC ENGINES  9

UNIT V  COMBUSTION ANALYSIS IN IC ENGINES  9
Photographic studies of combustion processes – Analysis of Pressure crank angle diagrams in SI and CI engines. Knock study for Pressure crank angle histories. Apparent heat release rate and Wiebe’s law analysis for combustion. Calculation of Ignition delay and combustion duration. – Hot wire and laser Doppler anemometry and velocimetry for flow and combustion analysis in IC engines.

TOTAL : 45 PERIODS

TEXTBOOKS:

REFERENCES:
OBJECTIVES:
- To learn and understand the programming, data acquisition hardware and implementing small automotive related projects in virtual instrumentation

UNIT I  POWERTRAIN  9
Modern Engine Technology like DTS- i, DTS – Fi, DTS – Si, VVT, Camless Engine, GDi, CRDI.

UNIT II  VEHICLE SAFETY  9
Anti lock braking systems- Traction Control system- Electro-hydraulic brakes- Occupant safety systems- Airbags, seat belt tightening system, collision warning systems, child Lock – Power windows- Power Sunroof- Seat and steering Column- Biometric systems- Driver-assistance systems- Adaptive cruise control

UNIT III  VEHICLE SECURITY AND COMFORT SYSTEM  9
Vision enhancement, road recognition system, Anti theft technologies, smart card system, number plate coding. Locking system- Central locking system- acoustic signaling devices Active suspension systems, requirement and characteristics, different types, Vehicle Handling and Ride characteristics of road vehicle, pitch, yaw, bounce control, Climate control management system

UNIT IV  VEHICLE INFORMATION AND COMMUNICATION  9

UNIT V  INTELLIGENT TRANSPORTATION SYSTEM  9
Traffic routing system - Automated highway systems - Lane warning system – Driver Information System, driver assistance systems - Driver conditioning warning - Route Guidance and Navigation Systems- Hybrid / Electric and Future Cars

TOTAL : 45 PERIODS

TEXT BOOKS:

REFERENCE:
UNIT I ALCOHOLS AS FUELS

UNIT II VEGETABLE OILS AS FUELS

UNIT III HYDROGEN AS ENGINE FUEL

UNIT IV BIOGAS, NATURAL GAS AND LPG AS FUELS
Production methods of Biogas, Natural gas and LPG. Properties studies. CO₂ and H₂S scrubbing in Biogas., Modification required to use in SI and CI Engines- Performance and emission characteristics of Biogas, NG and LPG in SI and CI engines.

UNIT V ELECTRIC, HYBRID AND FUEL CELL VEHICLES

TOTAL : 45 PERIODS

REFERENCES:
4. Transactions of SAE on Biofuels (Alcohols, vegetable oils, CNG, LPG, Hydrogen, Biogas etc.).
OBJECTIVE
At the end of the course, the students will be able to apply basic principles of aerodynamics for
the design of vehicle body.

UNIT I    INTRODUCTION
Scope, historical developments, fundamental of fluid mechanics, flow phenomenon related to
vehicles, external and internal flow problem, resistance to vehicle motion, performance, fuel
consumption and performance potential of vehicle aerodynamics.

UNIT II    AERODYNAMIC DRAG OF CARS
Cars as a bluff body, flow field around car, drag force, types of drag force, analysis of
aerodynamic drag, drag coefficient of cars, strategies for aerodynamic development, low drag
profiles.

UNIT III    SHAPE OPTIMIZATION OF CARS
Front end modification, front and rear wind shield angle, boat tailing, hatch back, fast back and
square back, dust flow patterns at the rear, effects of gap configuration, effect of fasteners.
Case studies on modern vehicles.

UNIT IV    VEHICLE HANDLING
The origin of forces and moments on a vehicle, lateral stability problems, methods to calculate
forces and moments – vehicle dynamics under side winds, the effects of forces and moments,
characteristics of forces and moments, dirt accumulation on the vehicle, wind noise, drag
reduction in commercial vehicles and racing cars.

UNIT V    WIND TUNNELS FOR AUTOMOTIVE AERODYNAMICS
Introduction, principle of wind tunnel technology, limitation of simulation, stress with scale
models, full scale wind tunnels, measurement techniques, equipment and transducers, road
testing methods, numerical methods. CFD analysis.

TOTAL : 45 PERIODS

TEXT BOOK :

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

UNIT II TRANSDUCTORS, MODIFIERS AND TERMINATING DEVICES
Transducers for Automotive Applications – Amplifiers- filters –data Acquisition- Indicators, Printers and displays –Signal Analyzing.

UNIT III MECHANICAL MEASUREMENT
Instrumentation for measuring Weight, Force, torque, pressure power, temperature, fluid flow, vibration, rotational speed, velocity, acceleration and angular motion.

UNIT IV ENGINE EXPERIMENTAL TECHNIQUES

UNIT V VEHICLE EXPERIMENTAL TECHNIQUES
Laboratory tests- test tracks - Endurance Tests- crash tests- Vehicle performance test - Brake tests.

REFERENCES:
1. A.W. JUDGE, Engineering Precision Measurement, Chapman and Hall Ltd, Essex Street W.C.,1951,
2. T.G. Beckwith and Buck, Mechanical Measurements, Oxford and IBH Publishing House, New Delhi, 1995

TOTAL : 45 PERIODS

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

UNIT III FLAMES
Laminar premixed – flame speed correlations- quenching, flammability, and ignition, flame stabilization, laminar diffusion flames, turbulent premixed flames-Damkohler number.

UNIT IV HEAT TRANSFER IN IC ENGINES

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

REFERENCES:

TOTAL : 45 PERIODS

AU8007 COMPUTATIONAL FLUID MECHANICS L T P C
3 0 0 3

AIM
This course aims to introduce numerical modeling and its role in the field of heat and fluid flow, it will enable the students to understand the various discretisation methods and solving methodologies and to create confidence to solve complex problems in the field of heat transfer and fluid dynamics.

OBJECTIVES :
• To develop finite difference and finite volume discretized forms of the CFD equations.
• To formulate explicit & implicit algorithms for solving the Euler Eqns & Navier Stokes Eqns.
UNIT I  GOVERNING DIFFERENTIAL EQUATION AND FINITE DIFFERENCE METHOD
Classification, Initial and Boundary conditions – Initial and Boundary Value problems – Finite difference method, Central, Forward, Backward difference, Uniform and non-uniform Grids, Numerical Errors, Grid Independence Test.

UNIT II  CONDUCTION HEAT TRANSFER
Steady one-dimensional conduction, Two and three dimensional steady state problems, Transient one-dimensional problem, Two-dimensional Transient Problems.

UNIT III  CONVECTION HEAT TRANSFER AND FEM

UNIT IV  INCOMPRESSIBLE FLUID FLOW

UNIT V  TURBULENCE MODELS

TOTAL : 45 PERIODS

TEXT BOOKS:

REFERENCES
UNIT I  MANAGEMENT TRAINING AND OPERATION  

UNIT II  VEHICLE MAINTENANCE  

UNIT III  VEHICLE PARTS, SUPPLY MANAGEMENT AND BUDGET  

UNIT IV  SCHEDULING AND FARE STRUCTURE  

UNIT V  MOTOR VEHICLE ACT  
Schedules and sections – Registration of motor vehicles – EURO Norms - Licensing of drivers – Control of permits – Limits of speed – traffic signs – Constructional regulations – Description of goods carrier, delivery van, tanker, tipper, Municipal, fire fighting and break down service vehicle.

TOTAL : 45 PERIODS

TEXT BOOK:

REFERENCES:
OBJECTIVES:

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

UNIT I NEED FOR ALTERNATIVE SYSTEM
Need of electric vehicles hybrid vehicles – comparative study of diesel, petrol, pure electric and hybrid vehicles. Limitations of electric vehicles. Specification of some electric and hybrid vehicles

UNIT II ENERGY SOURCES: BATTERIES AND FUELL CELLS
Battery Parameters-Power requirement of electric vehicles- Different types of batteries - Lead acid-Nickel based-Sodium based-Lithium based- Metal Air based. Battery charging- Charger design- Quick charging devices- Battery Modeling.

Fuel Cell- Fuel cell characteristics- Fuel cell types-Hydrogen fuel cell- Connecting cell in series-water management in the PEM fuel cell- Thermal Management of the PEM fuel cell

UNIT III PROPULSION MOTORS AND CONTROLLERS
A characteristic of permanent magnet and separately exited DC motors. AC single phase and 3-phase motor – inverters – DC and AC motor speed controllers.

UNIT IV VEHICLE DESIGN CONSIDERATIONS FOR ELECTRIC VEHICLES
Aerodynamic-Rolling resistance- Transmission efficiency- Vehicle mass- Electric vehicle chassis and Body design considerations- Heating and cooling systems- Controllers- Power steering- Tyre choice- Wing Mirror, Aerials and Luggage racks

UNIT V HYBRID VEHICLES

TOTAL: 45 PERIODS

TEXT BOOKS:

REFERENCES:
OBJECTIVES:

- To understand the hydraulic and pneumatic principles, components and its selection
- To design the hydraulic circuit and control for automotive applications
- To design the Pneumatic circuit and control for automotive applications

UNIT I  INTRODUCTION TO FLUID POWER & PRINCIPLE  
Introduction to fluid power control- Hydraulic and pneumatics- Selection criteria, application of fluid power, application of pascal’s law, equation, Transmission and multiplication of force-pressure losses- fluids, selection and properties- ISO symbols

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

UNIT III  FLUID POWER ELEMENTS  

UNIT IV  HYDRAULIC AND PNEUMATIC CIRCUITS DESIGN  

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

TOTAL : 45 PERIODS

TEXT BOOKS:

REFERENCES:
UNIT I  FUNDAMENTALS OF ACOUSTICS AND NOISE, VIBRATION  8

UNIT II  EFFECTS OF NOISE, BLAST, VIBRATION, AND SHOCK ON PEOPLE  7

UNIT III  TRANSPORTATION NOISE AND VIBRATION—SOURCES, PREDICTION, AND CONTROL.  10

UNIT IV  INTERIOR TRANSPORTATION NOISE AND VIBRATION SOURCES — PREDICTION AND CONTROL.  10

UNIT V  NOISE AND VIBRATION TRANSDUCERS, ANALYSIS EQUIPMENT, SIGNAL PROCESSING, AND MEASURING TECHNIQUES  10

REFERENCES:

TOTAL : 45 PERIODS

Resilience, creep, hysteresis and damping, stability, set and stress relaxation, behavior in dynamic applications.


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

Basic elements in control systems-Open loop and Closed loop system-Feedback characteristics- Effects of feedback-mathematical modeling of physical systems:- mechanical, Thermal, hydraulic and Pneumatic systems-Transfer function- AC and DC servomotor- Block diagram reduction techniques-signal flow graph- control system components – computer simulation.
UNIT II    TIME RESPONSE ANALYSIS
Time response- Types of test inputs- First and Second order responses- Error coefficient-
Generalized error series- Steady state error- Time domain specifications- Problems related to
automotive domain- Computer simulation

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

UNIT IV    STABILITY OF CONTROL SYSTEM
Concepts of stability- Location of roots in S-plane for stability- Routh Hurwitz criterion- Root
locus techniques- Construction-Nyquist stability criterion- Problems related to automotive
domain -Computer simulation

UNIT V     CONTROL SYSTEM DESIGN
PID controllers –Performance criteria- Selection of controller modes-lag, Lead, and lag-Lead
networks-Compensator design for desired response using root locus and Bode diagrams-
Problems related to automotive domain -Computer simulation

TEXT BOOKS:

REFERENCES:
   Delhi, 2006
2. Dorf Bishop, “Modern Control System”, Prentice Hall, 2004

AU8014    RENEWABLE SOURCES OF ENERGY
L T P C
3 0 0 3

OBJECTIVES:
• To understand the energy conversion, utilization and storage for renewable technologies
  such as wind, solar, biomass, and other renewable energy sources such as geothermal
  and ocean.
• To study the potential of using renewable energy technologies as a complement to the
  extent possible, replacement for conventional technologies, and the possibility of combining
  renewable and non-renewable energy technologies in hybrid systems.
• To understand the environmental consequences of energy conversion and how renewable
  energy can reduce air pollution and global climate change and present the strategies for
  enhancing the future use of renewable energy resources.
UNIT I  INTRODUCTION TO RENEWABLE ENERGY SOURCES

UNIT II  SOLAR ENERGY

UNIT III  BIOMASS AND BIOENERGY

UNIT IV  WIND ENERGY

UNIT V  OTHER RENEWABLE ENERGIES

TOTAL: 45 PERIODS

REFERENCE BOOKS :
4. Donald L. Klass Biomass for renewable energy fuels and chemicals
UNIT I  EARTH MOVING EQUIPMENTS  10
Construction layout, capacity and applications of earthmovers like dumpers, front-end loaders, bulldozers, backhoe loaders, scrappers, Bucket conveyors etc. Selection criteria of prime mover for dumpers and front end loaders based on vehicle performance characteristics.

UNIT II  CONSTRUCTIONAL EQUIPMENTS  9
Layout of Constructional equipments, excavators, Jip Cranes, hoist, motor graders, Mixing machine, concrete ready mixers, drillers, ramming machines for construction of bridges and working principles, Power generators

UNIT III  FARM EQUIPMENTS  9
Classification of tractors – Main components of tractor. Working attachment of tractors – Auxiliary equipment – Trailers and body tipping mechanism - plowing - paddy plantation machine harvesting machines. Sugarcane harvesting, power trailers

UNIT IV  INDUSTRIAL APPLICATIONS  9

UNIT V  MILITARY AND COMBAT VEHICLES  8
Ride and stability characteristics, power take off, special implementations. Special features and constructional details of tankers, gun carriers and transport vehicles, bridge builders, communication vehicles.

TOTAL : 45 PERIODS

TEXT BOOKS:
2. SAE Handbook Volume III

REFERENCES:
1. B. Geleman and M. Moskovin, Farm tractors, MIR publishers, Moscow.
UNIT I  AUTOMOTIVE AIRCONDITIONING FUNDAMENTALS  
Purposes of Heating, Ventilation and Air Conditioning- Environmental Concerns- Ozone layer depletion- Location of air conditioning components in a car – Schematic layout of a vehicle refrigeration system.

Psychrometry – Basic terminology and Psychrometric mixtures- Psychrometric Chart- Related problems

UNIT II  AUTOMOTIVE COOLING AND HEATING SYSTEM  
Vehicle Refrigeration System and related problems- Fixed thermostatic and Orifice tube system- Variable displacement thermostatic and Orifice tube system- Vehicle air conditioning operation

Types of compressor- Compressor Clutches- Compressor Clutch electrical circuit- Compressor lubrication- Condensers- Evaporators- Expansion devices- Evaporator temperature and pressure controls- receiver-drier- Accumulators- refrigerant hoses, Connections and other assemblies- Heating system

UNIT III  AIR-CONDITIONING CONTROLS, DELIVERY SYSTEM AND REFRIGERANTS  
Types of Control devices- Preventing Compressor damage- Preventing damage to other systems- Maintaining driveability- Preventing Overheating

Ram air ventilation- Air delivery Components- Control devices- Vacuum Controls  
Containers – Handling refrigerants – Discharging, Charging & Leak detection – Refrigeration system diagnosis – Diagnostic procedure – Ambient conditions affecting system pressures.

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

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

TEXT BOOKS:

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

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

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

UNIT III COMMUNICATION NETWORKED MODULES

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

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

TEXT BOOKS:

REFERENCES:

TOTAL : 45 PERIODS
UNIT I  INTRODUCTION

UNIT II  STATIC ANALYSIS

UNIT III  DYNAMICS ANALYSIS

UNIT IV  HEAT TRANSFER AND FLUID FLOW ANALYSIS

UNIT V  AUTOMOTIVE APPLICATION
Force distribution on different parts of automotive structure, design of the parts, static, dynamic and thermal analysis of the parts using finite element method. Material redistribution to minimize stresses and deflection. Optimization of location of ribs to maximize rigidity.

TOTAL: 45 PERIODS

TEXT BOOKS:

REFERENCES:
OBJECTIVE:
To impart knowledge on basic principle and production methods of automotive components.

UNIT I      CASTED ENGINE COMPONENTS  9
Material selection and Manufacturing methods for Piston, Piston rings, Cylinder block, wet and dry liners, Engine head, Oil pan, Carburetors. Thermal barrier coating of Engine head and valves.

UNIT II     FORGED ENGINE COMPONENTS  8
Material selection and Manufacturing methods for Crank shaft, Connecting rod, Cam shaft, valve, Piston pin, Push rod, Rocker arm, tappets, spark plug.

UNIT III    TRANSMISSION SYSTEM  10


UNIT IV     VEHICLE CHASSIS  8

UNIT V      RECENT DEVELOPMENTS  10

TOTAL : 45 PERIODS

TEXT BOOK:

REFERENCES:
2. Newton and steels, the motor vehicle, ELBS, 1990
UNIT I INTRODUCTION
Nanoscale Science and Technology- Implications for Physics, Chemistry, Biology and Engineering-Classifications of nanostructured materials- nano particles- quantum dots, nanowires-ultra-thinfilms-multilayered materials. Length Scales involved and effect on properties: Mechanical, Electronic, Optical, Magnetic and Thermal properties. Introduction to properties and motivation for study (qualitative only).

UNIT II PREPARATION METHODS
Bottom-up Synthesis-Top-down Approach: Precipitation, Mechanical Milling, Colloidal routes, Self-assembly, Vapour phase deposition, MOCVD, Sputtering, Evaporation, Molecular Beam Epitaxy, Atomic Layer Epitaxy, MOMBE.

UNIT III PATTERNING AND LITHOGRAPHY FOR NANOSCALE DEVICES
Introduction to optical/UV electron beam and X-ray Lithography systems and processes, Wet etching, dry (Plasma /reactive ion) etching, Etch resists-dip pen lithography

UNIT IV PREPARATION ENVIRONMENTS
Clean rooms: specifications and design, air and water purity, requirements for particular processes, Vibration free environments: Services and facilities required. Working practices, sample cleaning, chemical purification, chemical and biological contamination, Safety issues, flammable and toxic hazards, biohazards.

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

TOTAL: 45 PERIODS

TEXT BOOKS

REFERENCES
GE8751        ENGINEERING ETHICS AND HUMAN VALUES         L T P C
                  3 0 0 3

UNIT I       HUMAN VALUES
Morals, values and Ethics – Integrity – Work ethic – Service learning – Civic virtue – Respect
for others – Living peacefully – Caring – Sharing – Honesty – Courage – Valuing time –
Cooperation – Commitment – Empathy – Self confidence – Character – Spirituality.

UNIT II       ENGINEERING ETHICS
Senses of ‘Engineering Ethics’ – Variety of moral issues – Types of inquiry – Moral dilemmas –
Moral Autonomy – Kohlberg’s theory – Gilligan’s theory – Consensus and Controversy –
Models of professional roles - Theories about right action – Self-interest – Customs and
Religion – Uses of Ethical Theories

UNIT III       ENGINEERING AS SOCIAL EXPERIMENTATION
Engineering as Experimentation – Engineers as responsible Experimenters – Codes of Ethics
– A Balanced Outlook on Law – The Challenger Case Study

UNIT IV       SAFETY, RESPONSIBILITIES AND RIGHTS
Safety and Risk – Assessment of Safety and Risk – Risk Benefit Analysis and Reducing Risk
– The Three Mile Island and Chernobyl Case Studies
Collegiality and Loyalty – Respect for Authority – Collective Bargaining – Confidentiality –
Conflicts of Interest – Occupational Crime – Professional Rights – Employee Rights –
Intellectual Property Rights (IPR) – Discrimination

UNIT V       GLOBAL ISSUES
Multinational Corporations – Environmental Ethics – Computer Ethics – Weapons Development
– Engineers as Managers – Consulting Engineers – Engineers as Expert Witnesses and
Advisors – Moral Leadership – Sample Code of Conduct

TOTAL: 45 PERIODS

TEXT BOOK
Delhi, 2003.

REFERENCES:
2. Charles E. Harris, Michael S. Pritchard and Michael J. Rabins, “Engineering Ethics –
Concepts and Cases”, Thompson Wadsworth, A Division of Thomson Learning Inc., United
States, 2000
3. John R Boatright, “Ethics and the Conduct of Business”, Pearson Education, New Delhi,
2003
4. Edmund G Seebauer and Robert L Barry, “Fundamentals of Ethics for Scientists and
Engineers”, Oxford University Press, Oxford, 2001

WEB SOURCES:
1. www.onlineethics.org
2. www.nspe.org
3. www.globalethics.org
4. www.ethics.org
AIM
To provide comprehensive knowledge about the principles, practices, tools and techniques of Total quality management.

OBJECTIVES
- To understand the various principles, practices of TQM to achieve quality.
- To learn the various statistical approaches for Quality control.
- To understand the TQM tools for continuous process improvement.
- To learn the importance of ISO and Quality systems

UNIT I INTRODUCTION

UNIT II TQM PRINCIPLES
Quality statements - Customer focus –Customer orientation, Customer satisfaction, Customer complaints, Customer retention - Continuous process improvement – PDCA cycle, 5s, Kaizen - Supplier partnership – Partnering, Supplier selection, Supplier Rating.

UNIT III TQM TOOLS & TECHNIQUES I

UNIT IV TQM TOOLS & TECHNIQUES II

UNIT V QUALITY SYSTEMS

TOTAL : 45 PERIODS

TEXT BOOK:

REFERENCE BOOKS:
UNIT I  ENGINEERING MATERIALS AND THEIR PROPERTIES
Classes of engineering materials - the evolution of engineering materials, Definition of materials properties, Displaying material properties using materials selection charts, Forces for change in materials selection and design, Materials and the environment

UNIT II  BASIS OF MATERIAL SELECTION

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

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

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

TOTAL : 45 PERIODS

TEXTBOOKS:

REFERENCES:
AIM:
To instruct the importance of energy conservation in both thermal and electrical energy and its
management for the better utilization of resources.

OBJECTIVE:
At the end of the course, the student expected to do
i. Understand and analyze the plant energy data
ii. Energy audit and suggest methodologies for energy savings
iii. Energy accounting and balance and
iv. Able to utilize the available resources in optimal way

UNIT I  IMPORTANCE OF ENERGY CONSERVATION AND MANAGEMENT  8
World, national Energy consumption – environmental aspects – Energy prices, policies –
Energy auditing: methodology, analysis, energy accounting – Measurements – Thermal and
Electrical.

UNIT II  ELECTRICAL SYSTEMS  12
AC / DC current systems, Demand control, power factor correction, load management, Motor
drives : motor efficiency testing, energy efficient motors, motor speed control – Lighting :
lighting levels, efficient options, daylighting, timers, Energy efficient windows – electrical

UNIT III  THERMAL SYSTEMS  10
Boiler – efficiency testing, excess air control, Steam distribution & use – steam traps,
condensate recovery, flash steam utilization, Thermal Insulation. Heat exchanger networking –
concept of pinch, target settling, problem table approach.

UNIT IV  ENERGY CONSERVATION  8
Energy conservation in Pumps, Fans (flow control) and blowers, Compressed Air Systems,
Refrigeration and air conditioning systems – Waste heat recovery recuperators, heat sheets,
heat pipes, heat pumps.

UNIT V  ENERGY MANAGEMENT, ECONOMICS  7
Energy resource management – Energy Management information systems – Computerized
energy management – Energy economics – discount rate, payback period, internal rate of
Return, life cycle costing – Financing energy conservation Projects.

TOTAL : 45 PERIODS

TEXT BOOKS:

REFERENCES:
UNIT I    FUNDAMENTALS OF ROBOT

UNIT II    ROBOT DRIVE SYSTEMS AND END EFFECTORS

End Effectors – Grippers – Mechanical Grippers, Pneumatic and Hydraulic Grippers, Magnetic grippers, vacuum grippers, two fingered and three fingered grippers, internal grippers and external grippers, selection and design considerations of a gripper - gripper force calculation and analysis.

UNIT III    SENSORS IN ROBOTICS
Force sensing, touch and tactile sensors, proximity sensors, non contact sensors, safety considerations in robotic cell, proximity sensors, fail safe hazard sensor systems, and compliance mechanism

Machine vision system - camera, frame grabber, sensing and digitizing image data – signal conversion, image storage, lighting techniques, image processing and analysis – data reduction, segmentation, feature extraction, object recognition, other algorithms, applications – Inspection, identification, visual servoing and navigation.

UNIT IV    ROBOT KINEMATICS AND PROGRAMMING
Forward kinematics, inverse kinematics and the difference: forward kinematics and Reverse Kinematics of Manipulators with two, three degrees of freedom (in 2 dimensional), four degrees of freedom (in 3 dimensional) – derivations and problems. Homogeneous transformation matrices, translation and rotation matrices.

Teach pendant programming, lead through programming, robot programming languages – VAL programming – Motion Commands, Sensors commands, End-Effector Commands, and simple programes.

UNIT V    APPLICATIONS OF ROBOT
Role of robots in inspection, assembly, material handling, underwater, space and medical fields.

TOTAL : 45 PERIODS

TEXT BOOK:

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

UNIT I  LINEAR PROGRAMMING  10

UNIT II  REPLACEMENT MODELS AND GAME THEORY  8
Basic replacement model – individual and group replacement problems – applications – game theory – terminology – decision criteria – solution to a $2 \times 2$ and $2 \times n$ games – applications of LP in game theory – applications.

UNIT III  QUEUING MODELS AND SIMULATION  9

UNIT IV  FORECASTING AND SEQUENCING  9

UNIT V  PROJECT NETWORK ANALYSIS, LINE BALANCING AND DECISION TREE ANALYSIS  9
Network – CPM/PERT – Project time estimation – critical path – crashing of network; line balancing – applications; Decision tree analysis – applications

TOTAL: 45 PERIODS

TEXT BOOK:

REFERENCES:
UNIT I  STATISTICAL PROCESS CONTROL

UNIT II  ACCEPTANCE SAMPLING
Lot by lot sampling types – probability of acceptance in single, double, multiple sampling plans – OC curves – Producer’s risk and consumer’s risk. AQL, LTPD, AOQL, Concepts Design of single sampling plan – standard sampling plans for AQL and LTPD – Use of standard sampling plans – Sequential sampling plan.

UNIT III  EXPERIMENTAL DESIGN AND TAGUCHI METHOD

UNIT IV  RELIABILITY AND ITS PREDICTION

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

TOTAL : 45 PERIODS

TEXT BOOKS:

REFERENCES: