VINAYAKA MISSIONS UNIVERSITY, SALEM

VINAYAKA MISSIONS KIRUPANANDA VARIYAR ENGINEERING COLLEGE
SALEM – 636 308.
AND
AARUPADAI VEEDU INSTITUTE OF TECHNOLOGY, CHENNAI

SCHOOL OF MECHANICAL SCIENCES

BOARD : MECHANICAL ENGINEERING
REGULATION : 2012
PROGRAM : B.E – AUTOMOBILE ENGIEERING - FULL TIME

CURRICULUM & SYLLABUS

SEMESTER I

SL.NO	COURSE CODE	COURSE TITLE	DEPT	L	T	P	C
THEORY							
1		ENGLISH FOR EFFECTIVE COMMUNICATION	ENG	3	0	0	**3**
2		ENGINEERING MATHEMATICS-I	MATHS	3	1	0	**4**
3		COMPUTER FOUNDATION PROGRAM	CSE	3	0	0	**3**
4		ENVIRONMENTAL SCIENCE AND ENGINEERING	CHEM	3	0	0	**3**
5		ENGINEERING PHYSICS	PHY	3	0	0	**3**
6		ENGINEERING MECHANICS - STATICS	MECH	3	0	0	**3**
PRACTICAL							
7		ENGINEERING PHYSICS LAB	PHY	0	0	3	**2**
8		WORKSHOP PRACTICE LAB	MECH	0	0	3	**2**
9		COMPUTER FOUNDATION PROGRAM LAB	CSE	0	0	3	**2**
TOTAL				**18**	**1**	**9**	**25**

SEMESTER II

SL.NO	COURSE CODE	COURSE TITLE	DEPT	L	T	P	C
THEORY							
1		BUSINESS ENGLISH	ENG	3	0	0	**3**
2		ENGINEERING MATHEMATICS-II	MATHS	3	1	0	**4**
3		ENGINEERING CHEMISTRY	CHEM	3	0	0	**3**
4		PROGRAMMING IN C	CSE	3	0	0	**3**
5		MATERIAL SCIENCE	PHY	3	0	0	**3**
6		ENGINEERING MECHANICS-DYNAMICS	MECH	3	1	0	**4**
PRACTICAL							
7		PROGRAMMING IN C	CSE	0	0	3	**2**
8		ENGINEERING GRAPHICS LAB	MECH	2	0	3	**2**
9		ENGINEERING CHEMISTRY LAB	CHEM	0	0	3	**2**
TOTAL				**20**	**2**	**9**	**26**

DEPARTMENT OF AUTOMOBILE ENGINEERING

SEMESTER III

SL.NO	COURSE CODE	COURSE TITLE	DEPT	L	T	P	C
THEORY							
1		ADVANCED ENGINEERING MATHEMATICS	MATHS	3	1	0	**4**
2		AUTOMOTIVE PETROL ENGINES	AUTO	3	0	0	**3**
3		ENGINEERING THERMODYNAMICS	MECH	3	1	0	**4**
4		MECHANICS OF MACHINES	AUTO	3	1	0	**4**
5		AUTOMOTIVE CHASSIS	AUTO	3	0	0	**3**
6		AUTOMOTIVE ELECTRICAL SYSTEMS	AUTO	3	0	0	**3**
PRACTICAL							
7		COMPUTER AIDED AUTOPARTS DRAFTING LAB	AUTO	0	0	4	**2**
8		AUTOMOTIVE CHASSIS LAB	AUTO	0	0	4	**2**
9		AUTOMOTIVE ELECTRICAL AND ELECTRONICS LAB	AUTO	0	0	4	**2**
TOTAL				**18**	**3**	**12**	**27**

DEPARTMENT OF AUTOMOBILE ENGINEERING

SEMESTER IV

SL.NO	COURSE CODE	COURSE TITLE	DEPT	L	T	P	C
THEORY							
1		NUMERICAL METHODS	MATHS	3	0	2	**4**
2		MANUFACTURING ENGINEERING	MECH	3	0	0	**3**
3		ALTERNATIVE ENERGY SOURCES FOR AUTOMOBILES	AUTO	3	0	0	**3**
4		STRENGTH OF MATERIALS	MECH	3	1	0	4
5		AUTOMOTIVE DIESEL ENGINES	AUTO	3	0	0	**3**
6		AUTOMOTIVE ELECTRONICS SYSTEMS	AUTO	3	0	0	**3**
PRACTICAL							
7		AUTOMOTIVE ENGINE COMPONENTS LAB	AUTO	0	0	4	**2**
8		MANUFACTURING ENGINEERING LAB	MECH	0	0	4	**2**
9		STRENGTH OF MATERIALS LAB	MECH	0	0	4	**2**
TOTAL				**18**	**1**	**14**	**26**

DEPARTMENT OF AUTOMOBILE ENGINEERING

SEMESTER V

SL.NO	COURSE CODE	COURSE TITLE	DEPT	L	T	P	C
THEORY							
1		MODERN VEHICLE TECHNOLOGY	AUTO	3	0	0	3
2		AUTOMOTIVE TRANSMISSION	AUTO	3	1	0	4
3		COMBUSTION THERMODYNAMICS AND HEAT TRANSFER	AUTO	3	1	0	4
4		EMERGING AUTOMOTIVE MATERIALS	AUTO	3	0	0	3
5		FUELS AND LUBRICANTS	AUTO	3	0	0	3
6		ELECTIVE -I	AUTO	3	0	0	3
PRACTICAL							
7		FUELS AND LUBRICANTS LAB	AUTO	0	0	4	2
8		HEAT TRANSFER LAB	MECH	0	0	4	2
9		VEHICLE DESIGN AND DATA CHARACTERISTICS LAB	AUTO	0	0	4	2
10		PROFESSIONAL COMMUNICATION AND PERSONALITY DEVEIOPMENT	MGT	0	0	2	1
TOTAL				18	2	14	**27**

DEPARTMENT OF AUTOMOBILE ENGINEERING

SEMESTER VI

SL.NO	COURSE CODE	COURSE TITLE	DEPT	L	T	P	C
THEORY							
1		VEHICLE BODY ENGINEERING	AUTO	3	0	0	3
2		TWO AND THREE WHEELER TECHNOLOGY	AUTO	3	0	0	3
3		AUTOMOTIVE ENGINE DESIGN	AUTO	3	1	0	4
4		AUTOMOTIVE POLLUTION CONTROL	AUTO	3	0	0	3
5		AUTOMOTIVE CHASSIS DESIGN	AUTO	3	1	0	4
6		ELECTIVE - II	AUTO	3	0	0	3
PRACTICAL							
7		TWO AND THREE WHEELER LAB	AUTO	0	0	4	2
8		ENGINE TESTING AND EMISSION MEASUREMENT LAB	AUTO	0	0	4	2
9		VEHICLE MODELING LAB	AUTO	0	0	4	2
TOTAL				**18**	**2**	**12**	**26**

SEMESTER VII

SL.NO	COURSE CODE	COURSE TITLE	DEPT	L	T	P	C
THEORY							
1		TOTAL QUALITY MANAGEMENT	MECH	3	0	0	3
2		VEHICLE MAINTENANCE	AUTO	3	0	0	3
3		COMBUSTION THEORY OF IC ENGINES	AUTO	3	1	0	4
4		EMBEDDED ENGINE MANAGEMENT SYSTEMS	AUTO	3	0	0	3
5		ELECTIVE – III	AUTO	3	0	0	3
6		ELECTIVE – IV	AUTO	3	0	0	3
PRACTICAL							
7		VEHICLE SERVICE AND MAINTENANCE LAB	AUTO	0	0	4	2
8		AUTOMOTIVE ENGINE SIMULATION LAB	AUTO	0	0	4	2
9		ENGINE RECONDITIONING LAB	AUTO	0	0	4	2
TOTAL				**18**	**1**	**12**	**25**

SEMESTER VIII

SL.NO	COURSE CODE	COURSE TITLE	DEPT	L	T	P	C
THEORY							
1		ELECTIVE – V	AUTO	3	0	0	3
2		ELECTIVE – VI	AUTO	3	0	0	3
3		ELECTIVE – VII	AUTO	3	0	0	3
PRACTICAL							
4		PROJECT WORK	AUTO	0	0	12	6
TOTAL				**9**	**0**	**12**	**15**
						TOTAL CREDIT -	**197**

DEPARTMENT OF AUTOMOBILE ENGINEERING

LIST OF ELECTIVES FOR AUTOMOBILE ENGINEERING

SL.NO	COURSE CODE	COURSE TITLE	DEPT	L	T	P	C
THEORY							
1		MODERN AUTOMOBILE ACCESSORIES	AUTO	3	0	0	3
2		OFF ROAD VEHICLES	AUTO	3	0	0	3
3		AUTOMOTIVE INSTRUMENTATION	AUTO	3	0	0	3
4		VEHICLE DYNAMICS	AUTO	3	0	0	3
5		VEHICLE AIR-CONDITIONING	AUTO	3	0	0	3
6		TRACTOR AND FARM EQUIPMENTS	AUTO	3	0	0	3
7		AUTOMOTIVE AERODYNAMICS	AUTO	3	0	0	3
8		COMBUSTION ENGINEERING	AUTO	3	0	0	3
9		FUEL CELL TECHNOLOGY	AUTO	3	0	0	3
10		ADVANCED PRODUCTION PROCESSES FOR AUTOMOTIVE COMPONENTS	AUTO	3	0	0	3
11		RUBBER TECHNOLOGY FOR AUTOMOBILES	AUTO	3	0	0	3
12		COMPUTER SIMULATION OF IC ENGINE PROCESSES	AUTO	3	0	0	3
13		COMPUTER CONTROLED VEHICLE SYSTEMS	AUTO	3	0	0	3
14		AUTOMOTIVE SAFETY	AUTO	3	0	0	3
15		OPERATION RESEARCH	MATHS	3	0	0	**3**
16		COMPUTATIONAL FLUID DYNAMICS	MECH	3	0	0	**3**
17		INTRODUCTION TO AIRCRAFT INDUSTRY AND AIRCRAFT SYSTEMS	AERO	3	0	0	**3**
18		DESIGN OF AIRCRAFT STRUCTURES	AERO	3	0	0	**3**
19		PHYSICAL METALLURGY	AUTO	3	0	0	**3**
20		PROCESS PLANNING AND COST ESTIMATION	MECH	3	0	0	**3**
21		INDUSTRIAL TRIBOLOGY	MECH	3	0	0	**3**
22		INDUSTRIAL ROBOTICS	MECH	3	0	0	**3**
23		FINITE ELEMENT ANALYSIS	MECH	3	0	0	**3**

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

24		ENTREPRENEURIAL SKILLS DEVELOPMENT FOR ENGINEERES	MECH	3	0	0	**3**
25		INFORMATION SECURITY	CSE	3	0	0	**3**

ENGLISH FOR EFFECTIVE COMMUNICATION

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

UNIT – I

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

UNIT – II

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

UNIT – III

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

UNIT – IV

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

UNIT – V

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

TEXT BOOK

1. **English for Effective Communication,**
Departments of English, VMKV & AVIT.
Erode: SCM Publishers, 2009.

REFERENCE BOOKS

1. M.Ashraf Rizvi, **Effective Technical Communication.**
New Delhi: Tata McGraw Hill Publications, 2007.
2. Pickett and Laster. **Technical English: Writing, Reading and Speaking.**
New York: Harper and Row Publications, 2002.
3. Cutts, Martin. **The Plain English Guide – How to Write Clearly and Communicate Better.** New Delhi: Oxford University Press, 1995.
4. Narayanaswami.V.R. **Strengthen Your Writing.** Chennai: Orient Longman Ltd., 1996.
5. Prof.K.R.Lakshmi Narayanan & Dr.T.Murugavel, **Communication Skills for Engineers,** Chennai: SCI Publications, 2002.

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

Objectives: The syllabus for the Engineering Mathematics I have been framed catering to the needs of the Engineering students. It is purely applications oriented. To mention a few i) To utilize the powerful features of MATLAB one has to be an expert in Matrix theory (ii) The matrix theory plays an vital role in simplifying large arrays of equation and in determining their solution.(iii) Partial differential equation frequently occured in the theory of elasticity and Hydraulics.(iv) In circuit branches the current flow can be calculated by using Laplace transform when EMF,resistance and inductions are known.

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

UNIT I

MATRICES **09**

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

UNIT II

DIFFERENTIAL CALCULUS **09**

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

UNIT III

FUNCTIONS OF SEVERAL VARIABLES **09**

Partial Derivatives – Total Differential - Maxima and Minima – constrained Maxima and Minima by Lagrangian Multiplier Method.

UNIT IV

LAPLACE TRANSFORMS **09**

Laplace transform – transform of elementary functions – basic properties – derivatives and integrals of transforms – transforms of derivatives and integrals – initial and final value theorems – Transform of periodic functions.

UNIT V

APPLICATIONS OF LAPLACE TRANSFORMS 09

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

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

TEXT BOOKS

1**. "**Engineering Mathematics**"** by Department of Mathematics, VMU
2.Veerarajan, T., "Engineering Mathematics", Tata McGraw Hill Publishing Co., NewDelhi, 2006.
3. Dr.A .Singaravelu , Engineering Mathematics Volume I & Volume II by Meenakshi Publications.

REFERENCE BOOKS

1. Grewal, B.S., "Higher Engineering Mathematics" (36th Edition), Khanna Publishers, Delhi 2001.
2. Kreyszig, E., "Advanced Engineering Mathematics" (8th Edition), John Wiley and Sons (Asia) Pvt Ltd., Singapore, 2001.
3. Kandasamy .P., Thilagavathy. K., and Gunavathy. K., "Engineering Mathematics", Volumes I & II (4th edition), S.Chand & Co., New Delhi., 2001.

COMPUTER FOUNDATION PROGRAM
(COMMON TO ALL BRANCHES)

OBJECTIVE:

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

OUTCOMES:

At the end of this course, student shall be able to:

Do Problem Solving using Programming and algorithms, Describe working of Internet based applications, Document artifacts using common quality standards, Design simple data store using DBMS concepts and implement, Develop a working website with all above learning.

UNIT I **9**

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

UNIT II **9**

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

UNIT III **9**

Basics of Computer Architecture and System Software : Fundamentals of Computer Architecture-Introduction-Organization of a small computer Central Processing Unit-Execution cycle-Instruction categories – measure of CPU performance Memory-Input/output devices-BUS-addressing modes. System Software-Assemblers-Loaders and linkers-Compilers and interpreters.

UNIT IV **9**

Basics of Operating System and DBMS : Introduction-Basics of memory management schemes-Scheduling-threads. Introduction to File and Database systems- SQL-DDL statements-DML statements-DCL statements.

UNIT V **9**

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

TOTAL HOURS : 45

TEXT BOOK:

1. Faculties, School of Computer Science, VMKVEC, "An Introduction to Computer Foundation Program".

REFERENCES

1. Ashok N.Kamthane, programming with ANSI and TURBO C, Pearson Education (India) 2005.
2. V.Ramesh babu, fundamental of computing, VRB publisher, 2004.
3. Carl Hamacher, Zvonko Varnesie and Safwat Zaky, 5th Edition "Computer Organization", McGraw-Hill, 2002.
4. Leland L.Beck, "System Software- An Introduction to Systems Programming", 3rd Edition, Pearson Education Asia, 2000.
5. Abraham Silberschatz, Peter Baer Galvin and Greg Gange, "Operating System Concepts", Sixth Edition, John Wiley & Sons Pvt. Ltd,2003.
6. Abraham Silberschatz, Henry F.Korth and S.Sudarshan – "Database Systems Concepts", Fourth Edition, McGraw-Hill, 2002.

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

OBJECTIVE: It is the branch of science which deals with the effects of human activities &modern technology on environment. It creates awareness among the engineering students about environmental pollution and the role of the engineers in conservation of environment.
OUT COME: The students will get the knowledge about environment and they will work their corresponding field with eco friendly. It will protect our environment from pollution

UNIT – I INTRODUCTION TO ENVIRONMENTAL STUDIES AND NATURAL RESOURCES 10

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

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

UNIT – II ECOSYSTEMS AND BIODIVERSITY 14

Concept of and ecosystem –structure and function of an ecosystem-producers, consumers and decomposers-energy flow in the ecosystem-ecological succession-food chains, food webs and ecological pyramids-introduction, types, characteristic features, structure and function of the (a)forest ecosystem (b). grassland ecosystem (c) desert ecosystem (d) aquatic ecosystems (ponds, streams, lakes, rivers, oceans, estuaries)-introduction to biodiversity- definition: genetic, species and ecosystem diversity-biogeographical classification of India-value of biodiversity: consumptive use, productive use, social, ethical, aesthetic and option values-biodiversity at global, national and local levels-India as a mega-diversity nation-hot-spots of biodiversity-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 8

Definition-causes, effects and control measures of: (a) air pollution (b) water pollution (c) soil pollution (d) marine pollution (e) noise pollution (f) thermal pollution (g) nuclear hazards – solid waste management: caused, effects and control measures of urban and industrial wastes-role of an individual in prevention of pollution-pollution case studies – disaster management: floods, earthquake, cyclone and landslides. Field study of local polluted site-urban / rural / industrial / agriculture

UNIT - IV SOCIAL ISSUES AND THEIR ENVIRONMENT 7

From unsustainable to sustainable development-urban problems related to energy- water conservation, rain water harvesting, watershed management –resettlement and rehabilitation of people, its problems and concerns, case studies – environmental ethics: issues and possible solutions – climate change, global warming, acid rain, ozone layer depletion, nuclear accidents and holocaust, case studies – wasteland reclamation-consumerism and waste products-environment protection act-air (prevention and control of pollution) act-water (prevention and control of pollution) act- wildlife protection act-forest conservation act-issues involved in enforcement of environmental legislation-public awareness.

UNIT – V HUMAN POPULATION AND THE ENVRONMENT 6

Population growth, variation among nations – population explosion – family welfare programme- environment and human health – human rights- value education-HIV/ AIDS – women and child welfare –role of information technology in environment and human health –case studies.

Total Hours : 45

TEXT BOOK:

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

REFERENCE BOOKS :

1. Bharucha Erach, The Biodiversity of India, publishing Pvt. Ahmedabad, India,
2. Trivedi R.K. Hand book of Environmental laws, Rules, Guidelines, Compliances and Standards, Vol. and II, Enviro Media.
3. Cunningham, W.P.Cooper, T.H.Gorhani, Environmental Encyclopedia, jaicao., House, Mumbai, 2001.
4. Weger K.D., Environmental Management, W.B. Saunders, Co., Philadelphia, USA., 1998.
5. Gilbert M.Masters, Introduction to Environmental Engineering and science, pearson Education Pvt., Ltd., Second Edition, 2004
6. Miller `T.G. Jr., Environmental Science, Wadsworth Publishing Co.
7. Townsend C., Harper J and Michael Begon, Essentials of Ecology, Blackwell Science
8. Trivedi R.K And P.K. Goel, Introduction to air pollution, Techno-Science publications.

ENGINEERING PHYSICS

(Common to all branches of B.E)

Objective

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

Outcome

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

UNIT – I Lasers

Einstein coefficients (A&B), Nd – YAG laser, CO_2 laser, semiconductor laser (homojunction) – uses of lasers – Holography – construction and reconstruction of a hologram.

UNIT – II Fibre Optics

Principle and propagation of light in optical fibres – numerical aperture and acceptance angle – types of optical fibres (material, refractive index, mode) – Applications: Fibre optic communication system (block diagram only) – fibre optic sensors (displacement sensor and pressure sensor).

UNIT – III Crystal Physics

Lattice – unit cell – Bravais lattice – Lattice planes – Miller indices – 'd' spacing in cubic lattice – calculation of number of atoms per unit cell – atomic radius – coordination number – packing factor for SC, BCC, FCC, HCP structures.

UNIT – IV Acoustics

Classification of sound – characteristics of musical sound – loudness – Weber-Fechner law – decibel – absorption coefficient – experimental determination – reverberation – reverberation time – Sabine's formula (no derivation) – factors affecting acoustics of buildings (reverberation time, loudness, focusing, echo, echolen effect, resonance and noise) and their remedies.

UNIT- V Non – Destructive Testing

Liquid penetrant method – ultrasonic flaw detection – ultrasonic flaw detector (block diagram) – X-ray Radiography: displacement method – X-ray Fluoroscopy – merits and demerits of each method.

TEXT BOOK

1. Gaur R. K. and Gupta S. L., "Engineering Physics", Dhanpat Rai publishers, New Delhi, 2001.
2. Rajendran. V, "Engineering Physics", Tata Mc Graw Hill Publication and Co New Delhi, 2009.

REFERENCE BOOKS

1. Pillai S.O "Solid Sate Physics", New Age International Publication, New Delhi, (2003).
2. Palanisamy P.K. "Physics for Engineers", Scitech publications (India) Pvt. Ltd., Chennai (2005).
3. Rajendran V and Marikani "Physics for Engineers", Tata McGraw Hill Publising Company Ltd, New Delhi (2004).
4. Arumugam M, "Engineering Physics", Anuradha Agencies, Kumbakonam, Second Edition (2005).

ENGINEERING MECHANICS – STATICS 3 0 0 3
(Common to Mech, Auto, Aero & Civil)

Objective: It is the branch of Engineering Mechanics, which deals with the forces and their effects, while acting upon the bodies at rest.
Outcome: The students would have learned the fundamental of Mechanics systems of forces which are very essential for engineering students to further build up his studies in the mechanical engineering branch.

Unit – I **9**
Fundamentals of Mechanics: Introduction, Basic Dimensions and units of mechanics, Secondary Dimensional Quantities, Law of Dimensional Homogeneity, Dimensional Relation Between Force and Mass, Unit of Mass, Idealizations of Mechanics, Vector and Scalar Quantities, Equality and Equivalence of Vectors, Law of Mechanics.
Element of Vector Algebra: Introduction, Magnitude and Multiplication of a Vector by a Scalar, Addition and Subtraction of Vectors, Resolution of Vectors: Scalar Components, Unit Vectors, Useful Ways of Representing Vectors, Scalar or Dot Product of Two Vectors, Cross product of Two Vectors, Scalar triple Product, Note on Vector Notation.

Unit – II **9**
System of Forces: Position Vector, Moment of a Force About a Point and Axis, Couple and Couple moment, Couple Moment as a Free Vector, Addition and Subtraction of Couples, Moment of a Couple about a Line.
Equivalent Force System: Introduction - Translation of a Force to a Parallel position, Resultant of Special Force Systems, Distributed Force Systems.

Unit – III **9**
Equations of Equilibrium: Introduction, Free Body Diagram, Free Bodies Involving Interior Sections, General Equations of Equilibrium, Problems in Equilibrium I and II, Two Point Equivalent Loading, Problems Arising From Structures, Static Indeterminacy.

Unit-IV **9**
Friction Forces: Introduction, Laws of Coulomb Friction, Simple and Complex Contact Friction Problems, Transmission of Power Through - Belts, Screw Jack, Wedge, Belt Friction, Square Screw Thread.

Unit-V **9**
Properties of Surfaces: Introduction, First Moment of an Area and the Centroid and Other Centers, Theorem of Pappus-Guldinus, Second Moments and the Product of an Area of a Plane Area, Transfer Theorems, Computations Involving Second Moments and Products of Area, Relation Between Second Moments and Products of Area, Polar Moment of Area, Principal Axes.
Moments and Product of Inertia: Introduction, Definition of Inertia Quantities, Relation Between Mass-Inertia Terms and Area-inertia Terms, Translation of Coordinates Axes.

Total: 45 Hours

Text Book:

1. Engineering Mechanics: Statics and Dynamics, Shames Irving H and G.Krishna Mohana Rao., Pearson Education, 2006
2. Engineering Mechanics: Statics and Dynamics, S.Rajasekaran and G.Sankara Subramaniam, Vikas Publishing House Pvt Ltd.,

Reference:

3. Engineering Mechanics, Dr. R.K.Bansal, Lakshmi Publications.
4. Engineering Mechanics, R.S.Khurmi, S.Chand Company Ltd.,

ENGINEERING PHYSICS LAB
(Common to all branches of B. E.)

List of Experiments

1. Young's modulus of a bar - Non-uniform bending
2. Rigidity modulus of a wire - Torsional Pendulum
3. Viscosity of a liquid - Poiseuille's method
4. Velocity of ultrasonic waves in liquids - Ultrasonic Interferometer
5. Particle size determination using Laser
6. Wavelength of spectral lines – grating - Spectrometer
7. Thickness of a wire - Air wedge Method
8. Thermal conductivity of a bad conductor - Lee's disc
9. Band gap determination of a thermistor - Post Office Box
10. Specific resistance of a wire – Potentiometer

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

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

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

FITTING

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

CARPENTRY

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

WELDING

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

DEMONSTRATION

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

Reference:

1. "Basic Workshop Practice ", Department of Mechanical Engineering,
VMKV Engineering College, 2008

COMPUTER FOUNDATION PROGRAM LAB
(COMMON TO ALL BRANCHES)

I. OFFICE AUTOMATION

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

II. SQL QUERIES

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

III. HTML

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

BUSINESS ENGLISH

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

UNIT – I

Subject and Verb Agreement (Concord) - Impersonal Passive Voice – Preposition - Cause and Effect - Phrasal Verbs - Idioms and Phrases - Question Tags – Vocabulary. Sentence Pattern (SVOCA) - Auxiliary and Modal verbs- Simple, Complex and Compound Sentences.

UNIT – II

Stress (Word Stress and Sentence Stress) – Intonation - Differences Between British and American English – Indianism.

UNIT – III

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

UNIT – IV

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

UNIT – V

Skimming - Scanning -Reading Comprehension - Interpreting Tables - Business Letters (Calling for Quotation, Placing Orders and Complaint Letters) - Essay Writing and Developing Hints – Expansion of an Idea.

TEXT BOOK

1. **English for Effective Communication,**
Departments of English, VMKV & AVIT.
Erode: SCM Publishers, 2009.

REFERENCE BOOKS

1. M.Ashraf Rizvi, **Effective Technical Communication.**
New Delhi: Tata McGraw Hill Publications, 2007.
2. Pickett and Laster. **Technical English: Writing, Reading and Speaking.**
New York: Harper and Row Publications, 2002.
3. Cutts, Martin. **The Plain English Guide – How to Write Clearly and Communicate Better.** New Delhi: Oxford University Press, 1995.
4. Narayanaswami.V.R. **Strengthen Your Writing.** Chennai: Orient Longman Ltd., 1996.
5. Prof.K.R.Lakshmi Narayanan & Dr.T.Murugavel, **Communication Skills for Engineers,** Chennai: SCI Publications, 2002.

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

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

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

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

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

UNIT II

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

UNIT III

VECTOR CALCULUS 09
Directional derivatives – Gradient, Divergence and Curl – Irrotational and solenoidal-vector fields – vector integration – Green's theorem, Gauss divergence theorem and Stoke's theorem (excluding proof).

UNIT IV

ANALYTIC FUNCTIONS 09

Function of a complex variable – Analytic function – Necessary conditions - Cauchy Riemann equations – Sufficient conditions (excluding proof) – Harmonic conjugate– Constructions of analytic functions-conformal mapping(w=z+c,w=z2,w=1/z)-bilinear transformation

UNIT V

COMPLEX ANALYSIS **09**

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

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

TEXT BOOKS

1. **"**Engineering Mathematics**"** by Department of Mathematics, VMU
2. Veerarajan, T., "Engineering Mathematics", Tata McGraw Hill Publishing Co., NewDelhi, 2006.
3. Dr.A .Singaravelu , Engineering Mathematics Volume I & Volume II by Meenakshi Publications.

REFERENCE BOOKS

1. Grewal, B.S., "Higher Engineering Mathematics" (36th Edition), Khanna Publishers,Delhi 2001.
2. Kreyszig, E., "Advanced Engineering Mathematics" (8th Edition), John Wiley and Sons (Asia) Pvt Ltd., Singapore, 2001.
3. Kandasamy .P., Thilagavathy. K., and Gunavathy. K., "Engineering Mathematics",Volumes I & II (4th edition), S.Chand & Co., New Delhi., 2001

ENGINEERING CHEMISTRY **Credit: 3**

(Common to all Branches)

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

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

UNIT I : WATER TECHNOLOGY & CORROSION **9**

Sources of water – impurities – Hardness and its determination (problems to be avoided) – boiler troubles – water softening (zeolite & Demineralisation) – Domestic water treatment – Desalination (Electrodialysis & Reverse Osmosis). Corrosion – Types – principles – corrosion control methods (Sacrificial and Impressed current method).

UNIT II : ELECTROCHEMISTRY, BATTERIES AND FUEL CELLS **9**

Ostwald Law and Debye Huckle's law - Cells – Electrode (SHE, Calomel and Glass) - Electrode potential – Nernst equation – EMF series. Primary cells – secondary batteries – charging and discharging.

UNIT III : CHEMISTRY OF ADVANCED MATERIALS **9**

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

UNIT IV : PHASE EQUILIBRIA & NUCLEAR CHEMISTRY **9**

Phase rule: statement and explanation of terms involved – One component system – Condensed phase rule – Two component system. Nuclear Chemistry – Fission – Fusion – working of nuclear reactor – Radiations and harmful effects.

UNIT V : CHROMATOGRAPHY AND SPECTROSCOPY **9**

Chromatography — classification & principles (Paper, column, thin layer, gas, HPLC). Spectroscopy – Electromagnetic radiation – Beer Lambert's law – UV – Visible – IR (Principle and Instrumentation, block diagram) – Atomic absorption spectroscopy.

Total: 45 hours

REFERENCES:

1. Engineering Chemistry by S.S. Dara.
2. Engineering Chemistry by Jain & Jain.

PROGRAMMING IN C

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

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

UNIT I

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

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

UNIT II

Control structures: Conditional control-Loop control and Unconditional control structures.
Functions: The Need of a function-User defined and library function- Prototype of a function-Calling of a function-Function argument-Passing arguments to function- Return values-Nesting of function- main()-Command line arguments and recursion. Storage class specifier – auto, extern, static, & register.

UNIT III

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

UNIT IV

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

UNIT V

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

TEXT BOOKS:

1. Balaguruswami.E, 'Programming in C', TMH Publications,1997

REFERENCE BOOKS:

1. Behrouz A. Forouzan & Richard F. Gilberg, "Computer Science A Structured Programming
using C", Cengage Learning, 3rd Edition, 2007
2. Gottfried , 'Programming with C', schaums outline series, TMH publications,1997
3. Mahapatra , 'Thinking in C', PHI publications, 2nd Edition, 1998.
4. Stevens , 'Graphics programming in C', BPB publication, 2006
5. Subbura.R , 'Programming in C', Vikas publishing, 1st Edition, 2000

MATERIAL SCIENCE

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

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

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

UNIT- I Conducting Materials

Classical free electron theory of metals – Electrical and thermal conductivity – Wiedemann – Franz law – Draw backs of classical theory – Quantum theory – Fermi distribution function – Effect of temperature on Fermi Function

UNIT- II Semiconducting Materials

Intrinsic semiconductor – carrier concentration derivation – Fermi level – Variation of Fermi level with temperature – electrical conductivity – band gap determination – extrinsic semiconductors – carrier concentration derivation in n-type and p-type semiconductor Hall effect –Experimental arrangement and Applications.

UNIT – III Magnetic and Dielectric Materials

Origin of magnetic moment – Bohr magneton – Dia and para magnetism – Ferro magnetism – Domain theory – Hysteresis – soft and hard magnetic materials – anti – ferromagnetic materials – Ferrites – applications

UNIT – IV Dielectric Materials

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

UNIT- V Nano Materials

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

TEXT BOOKS:

1. Charles Kittel ‘Introduction to Solid State Physics’, John Wiley & sons, Singapore (2007).
2. Pillai S.O ‘Solid Sate Physics’, New Age International Publication, New Delhi, (2003).
3. A.S. Edelstein and R.C. Cammearata, eds., “Nanomaterials: Synthesis, Properties and Applications”, Institute of Physics Publishing, Bristol and Philadelphia, 1996.

REFERENCES:

1. Rajendran, V, and Marikani A, 'Materials science' TMH publications, New delhi (2004).
2. Jayakumar, S. 'Materials science', R.K. Publishers, Coimbatore, (2008).
3. Palanisamy P.K, 'Materials science', Scitech publications(India) Pvt. LTd., Chennai, second Edition (2007).
4. Arumugam. M, 'Materials Science' Anuradha publications, Kumbakonam, (2006).
5. Rajendran. V, "Engineering Physics", Tata Mc Graw Hill Publication and Co New Delhi, (2009).

ENGINEERING MECHANICS – DYNAMICS 3 1 0 4
(Common to Mech, Auto & Aero)

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

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

Unit-I **9**

Kinematics of a Particle – Simple Relative Motion

Introduction, General Notions, Velocity and Acceleration Calculations, Simple, Kinematical Relations and Applications

Particle Dynamics

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

Unit – II **9**

Energy Method for Particles

Analysis for a Single Particle: Introduction, Conservative Force Field, Conservation of Mechanical Energy, Alternative form of Work-Energy Equation.

System of particles: Work-Energy Equations, Kinetic Energy Expression Based on Center of Mass, Work-Kinetic Energy Expression Based on Center of Mass

Linear Momentum: Impulse and Momentum Relations for a Particle, Linear-Momentum Considerations for a System of Particles, Impulsive Forces, Impact Forces.

Moment of Momentum: Moment of Momentum Equation for a Single and a system of particles.

Unit – III **9**

Kinematics of Rigid Bodies: Relative Motion

Introduction, Translation and Rotation of Rigid Bodies, Chasles' Theorem, Applications of the Fixed-Vector Concept, General Relationships between Time Derivatives of a Vector for Different References, General Relationships between Velocities of a Particle for Different References, Acceleration of a Particle for Different References.

Unit – IV **9**

Kinetics of Plane Motion of Rigid Bodies

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

Unit – V **9**

Energy and Impulse–Momentum Methods for Rigid Bodies

Introduction, Energy Method: Kinetic Energy of a Rigid Body, Work – Energy Relations, Impulse–Momentum Methods: Angular Momentum of a Rigid Body about any Point in the Body, Impulse–Momentum Equations, Impulsive Forces and torques, Eccentric-Impact.

Total: 45 PERIODS

Text Book:

1. Engineering Mechanics: Statics and Dynamics, Shames Irving H and G.Krishna Mohana Rao., Pearson Education, 2006
2. Engineering Mechanics: Statics and Dynamics, S.Rajasekaran and G.Sankara Subramaniam, Vikas Publishing House Pvt Ltd.,

Reference:

3. Engineering Mechanics, Dr. R.K.Bansal, Lakshmi Publications.
4. Engineering Mechanics, R.S.Khurmi, S.Chand Company Ltd.,

PROGRAMMING IN C LAB
(COMMON TO CSE, IT, CSSE, M.Sc, MECH, AUTO, AERO, CIVIL, BIO-TECH, BIO-INFO)

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

ENGINEERING GRAPHICS
(Common to MECH, AUTO, AERO, CIVIL, ECE, EIE, EEE, ETC& MECT)
2 0 3 2

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

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

Concepts and conventions (Not for Examination)

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

Free hand sketching:

Representation of Three Dimensional objects – General principles of orthographic projection – Need for importance of multiple views and their placement – First angle projection – layout views – Developing visualization skills through free hand sketching of multiple views from pictorial views of objects.

UNIT I PLANE CURVES AND FREE HAND SKETCHING 9

Curves used in engineering practices:

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

UNIT II PROJECTION OF POINTS, LINES AND PLANE SURFACES 9

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

UNIT III PROJECTION OF SOLIDS 9

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

UNIT IV SECTION OF SOLIDS AND DEVELOPMENT OF SURFACES 9

Sectioning of above solids in simple vertical position by cutting planes inclined to one reference plane and perpendicular to the other – Obtaining true shape of section. Development of lateral surfaces of simple and truncated solids – Prisms, pyramids, cylinders and cones – Development of lateral surfaces of solids with cylindrical cutouts, perpendicular to the axis.

UNIT V ISOMETRIC AND PERSPECTIVE PROJECTIONS 9

Principles of isometric projection – isometric scale – isometric projections of simple solids, truncated prisms, pyramids, cylinders and cones. Perspective projection of prisms, pyramids and cylinders by visual ray method.

Total: 45 PERIODS

TEXT BOOKS:

1. N.D. Bhatt, "Engineering Drawing" Charotar Publishing House, 46th Edition, (2003).
2. K. V. Natrajan, "A text book of Engineering Graphics", Dhanalakshmi Publishers, Chennai (2006).

REFERENCES:

1. M.S. Kumar, "Engineering Graphics", D.D. Publications, (2007).
2. K. Venugopal & V. Prabhu Raja, "Engineering Graphics", New Age International (P) Limited (2008).
3. M.B. Shah and B.C. Rana, "Engineering Drawing", Pearson Education (2005).
4. K. R. Gopalakrishnana, "Engineering Drawing" (Vol.I&II), Subhas Publications (1998).
5. Dhananjay A.Jolhe, "Engineering Drawing with an introduction to AutoCAD"Tata McGraw Hill Publishing Company Limited (2008).
6. Basant Agarwal and Agarwal C.M., "Engineering Drawing", Tata McGraw Hill Publishing Company Limited, New Delhi, (2008).

Note:

1. Mini drafter is to be used for unit-I & II
2. Free hands sketch and drafting software is to be used for Unit-III, IV & V

ENGINEERING CHEMISTRY LAB
Credit: 2
(Common to all Branches)

OBJECTIVE

To learn the relevant experience using laboratory experiments

OUTCOME

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

1. Estimation of total hardness of water sample by EDTA method.
2. Determination of alkalinity by indicator method.
3. Estimation of ferrous ion by Potentiometry.
4. Titration of strong acid with strong base by Conductometry.
5. Acid base reaction by pH metry.
6. Estimation of copper from its ore.
7. Estimation of iron by spectrophotometer.
8. Estimation of sodium by flame photometer.

SEMESTER	SUBJECT	L	T	P	C
III	**ADVANCED ENGINEERING MATHEMATICS.** (Common to CIVIL, MECH, MECHAT,AUTO, AERO, ECE, EEE, CSE,EIE, IT)	**3**	**1**	**0**	**4**

OBJECTIVES:

The syllabus for the Advanced Engineering Mathematics has been framed catering to the needs of the Engineering students. It is purely application oriented. To mention a few (i) Partial differential equations arises in most of the Engineering discipline when the number of independent variables in the given problem under discussion is two or more. (ii) Fourier series has the wide application in the field of heat propagation and diffusion, wave propagation and in signal and systems analysis. (iii) Transform techniques are very useful in the field of signal and system analysis. Z - transform plays an important role in analysis of Discrete signals. This is a prelude to learn higher semester courses.

1. PARTIAL DIFFERENTIAL EQUATIONS **9**

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

2. FOURIER SERIES **9**

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

3. BOUNDARY VALUE PROBLEMS **9**

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

4. FOURIER TRANSFORMS **9**

Statement of Fourier integral theorem - Fourier transform pairs - Fourier Sine and Cosine transforms – Properties - Transforms of simple functions - Convolution theorem - Parseval's identity.

5. Z - TRANSFORM **9**

Z-Transform – Elementary Properties – Inverse Z-Transform – Convolution Theorem – Formation of Difference Equations – Solution of Difference Equations using Z-Transform.

TUTORIAL : 15 PERIODS
TOTAL HOURS: 60 PERIODS

TEXT BOOK:

1. A.Singaravelu,"Transforms and Partial Differential Equations", Meenakshi Agencies,Chennai

REFERENCES:

1. T. Veerarajan, "Engineering Mathematics" (for semester III), Third Edition Tata McGraw- Hill Publishing Company limited.
2. Grewal, B.S., "Higher Engineering Mathematics" (35th Edition), Khanna Publishers,Delhi 2000.
3 .Kreyszig, E., "Advanced Engineering Mathematics" (8th Edition), John Wiley and Sons,(Asia) Pte Ltd.,Singapore, 2000.

SEMESTER	SUBJECT	L	T	P	C
III	AUTOMOTIVE PETROL ENGINES	3	0	0	3

OBJECTIVES:

The aim of the subject is to provide a fundamental knowledge of automotive petrol engines.

1. *To understanding of fundamentals of engines construction and operations.*
2. *To provide an in-depth study of SI engine fuel supply systems.*
3. *To understand the concept of ignition system and types.*
4. *To provide in-depth study of cooling systems and lubrication systems.*

To understand the types of combustion and combustion chamber.

UNIT- I ENGINE CONSTRUCTION AND OPERATION 9

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

UNIT- II SI ENGINE FUEL SYSTEM 9

Carburettor working principle, requirements of an automotive carburettor, starting, idling, acceleration and normal circuits of carburettors. Compensation, maximum power devices, constant choke and constant vacuum carburettors, fuel feed systems; mechanical and electrical fuel feed pumps. Petrol injection, MPFI.

UNIT- III IGNITION SYSTEM 9

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

UNIT- IV COOLING AND LUBRICATION SYSTEM 9

Need for cooling system, Types of cooling system: air cooling system, liquid cooling system, forced circulation system, pressure cooling system. Lubrication system; mist, wet sump lubrication system, properties of lubricants.

UNIT- V COMBUSTION AND COMBUSTION CHAMBERS 9

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

TOTAL: 45 HOURS

TEXT BOOKS

1. Ganesan.V., "Internal Combustion Engines", Tata McGraw-Hill Publishing Co., New Delhi, 2003.
2. M.L.Mathur and R.P.Sharma, "A course in Internal combustion engines", Dhanpat Rai & Sons Publications, New Delhi, 2001.

REFERENCES

1. William H.Crouse, "Automotive Engines", McGraw-Hill Publishers, 1985.
2. John B.Heywood, "Internal Combustion Engine Fundamental", McGraw-Hill, 1988.
3. Pulkrabek "Engineering Fundamentals of the Internal Combustion Engines", Practice Hall of India, 2003.

SEMESTER	SUBJECT	L	T	P	C
III	**ENGINEERING THERMODYNAMICS** (Common to MECH,AUTO and AERO)	3	1	0	4

OBJECTIVES:

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

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

UNIT –I BASIC CONCEPTS AND FIRST LAW OF THERMODYNAMICS 9

Thermodynamic systems, Concepts of continuum, Thermodynamic properties, Equilibrium, Process cycle, Work, temperature, Zeroth law of Thermodynamics.

First law of thermodynamics – Applications to closed and open systems, Internal energy, Specific heats, Enthalpy, Steady and unsteady flow conditions. Problens

.

UNIT –II SECOND LAW OF THERMODYNAMICS 9

Statements, Reversibility, Causes of irreversibility, Carnot cycle, Reversed Carnot cycle, Heat engines, refrigerators, Heat pumps. Clausius inequality, Entropy, Principles of increase in entropy, Carnot theorem, Available energy, Availability. Problems.

UNIT –III WORKING FLUIDS 9

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

Properties of ideal and Real gases, Equation of state, Gas laws, Vanderwaal's equation of state, Compressibility, Compressibility charts, Dalton's law of partial pressures, Internal energy, enthalpy, Heat and molecular weight of gas mixtures. .

UNIT –IV POWER CYCLES 9

Gas Power Cycles – Carnot, Otto, Diesel, Dual, Brayton, Ericsson, Stirling, Lenoir, and Atkinson cycles. Problems on Otto , Diesel , Dual and Brayton Cycles.
Vapour Power Cycles – Rankine, modified rankine, Reheat, Regeneration Cycles, Binary vapour power cycles. Problems.

UNIT –V THERMODYNAMIC RELATIONS AND COMBUSTION OF FUELS **9**

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

TUTORIAL : 15 HOURS
TOTAL HOURS: 60 HOURS

TEXT BOOKS

1. Yunus.A.Cengel, Michael A.Boles, Thermodynamics: An Engineering Approach, McGh, 2011.
2. Nag.P.K. - "Engineering Thermodynamics", IV Edition, Tata McGraw-Hill-New Delhi- 2008.
3. Rajput. R.K.,"A Textbook of Engineering Thermodynamics", Third Edition, Laxmi Publications, New Delhi, 2005.

REFERENCES

1. Spalding & Cole., Engineering Thermodynamics, ELBS.
2. Van Wylen & Sonntag., fundamentals of classical thermodynamics – Tata Mc Graw Hill.
3. Rogers & Mayhew, Engineering Thermodynamics – Addision Wesley.

SEMESTER	SUBJECT	L	T	P	C
III	MECHANICS OF MACHINES Common to (AUTO & AERO)	3	1	0	4

OBJECTIVES:

To provide knowledge and understanding on mechanics of machines

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

UNIT- I MECHANISMS **9**

Machine Structure – Kinematic link, pair and chain – Grueblers criteria – Constrained motion – Degrees of freedom - Slider crank and crank rocker mechanisms – Inversions – Applications – Kinematic analysis of simple mechanisms – Determination of velocity and acceleration.

UNIT- II FRICTION **9**

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

UNIT- III GEARING AND CAMS **9**

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

UNIT- IV BALANCING **9**

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

UNIT- V VIBRATION **9**

Free, forced and damped vibrations of single degree of freedom systems – Force transmitted to supports – Vibration isolation – Vibration absorption – Torsional vibration of shaft – Single and multi rotor systems – Geared shafts – Critical speed of shaft.

TOTAL: 45 HOURS

TEXT BOOKS

1. Rattan.S.S, "Theory of Machines", Tata McGraw–Hill Publishing Co., New Delhi,2004
2. Ballaney.P.L, "Theory of Machines", Khanna Publishers, New Delhi, 2002.
3. Khurmi.R.S. and Gupta ., Theory of Machines , S.Chand @ Co., 2005.

REFERENCES

1. 1.Rao,J.S and Dukkipati, R.V, "Mechanism and Machine Theory", Second Edition, Wiley Eastern Ltd., 2002.
2. Malhotra, D.R and Gupta, H.C., "The Theory of Machines", Satya Prakasam, Tech. India Publications, 2005.
3. Gosh, A. and Mallick, A.K., "Theory of Machines and Mechanisms", Affiliated East West Press, 2006.

SEMESTER	SUBJECT	L	T	P	C
III	AUTOMOTIVE CHASSIS	3	0	0	3

OBJECTIVES:

To provide knowledge and understanding on various types of automotive chassis

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

UNIT- I INTRODUCTION, FRAME, STEERING SYSTEM 9

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

UNIT- II PROPELLER SHAFT AND FINAL DRIVE 9

Effect of Driving Thrust, torque reactions and side thrust, Hotchkiss drive, torque tube drive, radius rods and stabilizers, Propeller Shaft, Universal Joints, Constant Velocity Universal Joints, Front Wheel drive, Final drive, different types, Double reduction and twin speed final drives, Multi–axled vehicles, Differential principle and types, Differential housings, Non–Slip differential, Differential locks, Final drive of Crawler Tractors.

UNIT- III AXLES AND TYRES 9

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

UNIT- IV SUSPENSION SYSTEM 9

Need for Suspension System, Types of Suspension Springs, Constructional details and characteristics of Single Leaf, Multi–Leaf, Coil, Torsion bar, Rubber, Pneumatic and Hydro – elastic Suspension Spring Systems, Independent Suspension System, Shock Absorbers, Types and Constructional details, Design of Leaf and Coil Springs.

UNIT- V BRAKING SYSTEM **9**

Theory of Automobile Braking, Stopping Distance Time and Braking Efficiency, Effect of Weight Transfer during Braking, Theory of Drum Brakes, Leading and Trailing Shoes, Braking Torque, Constructional Details of Drum Brake and its Activators, Disc Brake Theory, Hydraulic, Mechanical, Pneumatic and Power–Assisted Braking System, Servo Brakes, Retarders, Anti–Lock Braking System.

TOTAL: 45 HOURS

TEXT BOOKS

1. 1 Kripal Singh, Automobile Engineering, Standard Publisher, New Delhi, 2006
2. R.K. Rajput, A Text–Book of Automobile Engineering, Laxmi Publications Private Limited, 2007
3. N.K. Giri, Automotive Mechanics, Kanna Publishers, 2007

REFERENCES

1. Heldt P.M., Automotive Chassis, Chilton Co., New York, 1990
2. Newton Steeds and Garret, Motor Vehicles, 13th Edition, Butterworth, London, 2005.
3. Heinz Hezler, Modern Vehicle Technology, Butterworth, London, 2005.

SEMESTER	SUBJECT	L	T	P	C
III	AUTOMOTIVE ELECTRICAL SYSTEMS	3	0	0	3

OBJECTIVES:

To provide knowledge and understanding on various types of automotive electrical systems

1. *To understand the types of batter and its constructions.*
2. *To impart the knowledge of starting systems of the vehicle.*
3. *To understand the various types of charging systems.*
4. *To impart the knowledge of ignition systems.*
5. *To impart the knowledge of vehicle lighting and its accessories.*

UNIT- I BATTERIES **9**

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

UNIT- II STARTING SYSTEM **9**

Condition of starting Behavior of starter during starting. Series motor and its characteristics. Principle & construction of starter motor. Working of different starter drive units. Care & maintenance of starter motor, Starter switches.

UNIT- III CHARGING SYSTEM **9**

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

UNIT- IV IGNITION SYSTEMS **9**

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

UNIT- V LIGHTING SYSTEM & ACCESSORIES **9**

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

TOTAL: 45 HOURS

TEXT BOOKS

1. Kholi,P.L., Automotive Electrical Equipment, Tata McGraw-Hill Co. Ltd., New Delhi, 1975.
2. Judge,A.W., Modern Electrical Equipment of Automobiles, Chapman & Hall, London, 1992.
3. Kripal Singh, Automobile Engineering, Standard Publisher, New Delhi, 2006.

REFERENCES

1. Young,A.P. & Griffiths,L., Automobile Electrical Equipment, English Language Book Society & New Press, 1990.
2. Vinal,G.W., Storage Batteries, John Wiley & Sons Inc., New York, 1985.
3. Crouse,W.H., Automobile Electrical Equipment, McGraw Hill Book Co. Inc., New York, 1980.
4. Spreadbury,F.G., Electrical Ignition Equipment, Constable & Co. Ltd., London, 1962.
5. Automotive Hand Book, fifth edition, Robert Bosch, Bently Publishers, 2003.

SEMESTER	SUBJECT	L	T	P	C
III	COMPUTER AIDED AUTOPARTS DRAFTING LAB	0	0	4	2

OBJECTIVES:

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

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

1. INTRODUCTION TO COMPUTER AIDED DRAFTING AND SOFTWARE

Introduction to CAD – Geometric modeling - Drawing- Editing- Dimensioning- Plotting Commands- Layering concepts- Limits- Fits and Tolerances. Dimensioning, annotations, symbols- welding , surface finish, threads. Text, Bill of materials, Title Block.

2. PREPARATION OF 2-D DRAWINGS

Orthographic views , Isometric Views, 2D sectional views, part drawing of standard mechanical components : Screw Jack – Gib and Cotter Joint – Knuckle Joint - Brackets- V Blocks- Stop Block- Screw threads and Threaded fasteners.

3.ASSEMBLY DRAWING

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

TOTAL: 45 HOURS

DEPARTMENT OF AUTOMOBILE ENGINEERING

SEMESTER	SUBJECT	L	T	P	C
III	AUTOMOTIVE CHASSIS LAB	0	0	4	2

OBJECTIVES:

The main objective of this course is to impart knowledge in the assembling and dismantling and study of different types of an engine and its various systems like steering system, transmission system, electrical system, ignition system, injection system, Braking system. At the end of the course the student will be well versed in the assembling and dismantling of any vehicles.

STUDY AND MEASUREMENT OF THE FOLLOWING CHASSIS

- Tata
- Leyland
- Ambassador
- Premier Padmini
- Maruthi car (Front engine, front wheel drive & constant velocity joint)

.

STUDY, DISMANTLING & ASSEMBLING

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

TOTAL: 45 HOURS

SEMESTER	SUBJECT	L	T	P	C
III	AUTOMOTIVE ELECTRICAL AND ELECTRONICS LAB	0	0	4	2

OBJECTIVES:

To familiarize and train the students on the constructional arrangements of different electrical system of different vehicles.

To learn the function of Automotive Electronics components of testing and measurements

AUTOMOTIVE ELECTRICAL SYSTEM

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

AUTOMOTIVE ELECTONICS SYSTEM

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

TOTAL: 45 HOURS

SEMESTER	SUBJECT	L	T	P	C
IV	**NUMERICAL METHODS** **(COMMON TO(MECH,AERO,AUTO,MECT, CIVIL,EIE & EEE)**	**3**	**0**	**2**	**4**

OBJECTIVES:

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

UNIT- I SOLUTION OF EQUATIONS AND EIGEN VALUE PROBLEMS 9

Method of false position, Newton-Raphson method for single variable, Solutions of a linear system by Gaussian, Gauss-Jordan, Jacobian and Gauss- Seidel methods. Inverse of a matrix by Gauss-Jordan method. Eigen value of a matrix by Power Method.

UNIT- II INTERPOLATION AND APPROXIMATION 9

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

UNIT- III . NUMERICAL DIFFERENTIATION AND INTEGRATION 9

Numerical differentiation with interpolation polynomials, Numerical integration by Trapezoidal and Simpson's (both $1/3^{rd}$ and $3/8^{th}$) rules. Rombergs rule, Two and Three point Gaussian quadrature formula. Double integrals using Trapezoidal and Simpson's rule.

UNIT- IV INITIAL VALUE PROBLEMS FOR ORDINARY DIFFERENTIAL EQUATIONS 9

Single Step Methods - Taylor Series, Euler and Modified Euler, Runge-Kutta method of fourth order first and second order differential equations. Multistep Methods - Milne and Adam's-Bash forth predictor and corrector methods.

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

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

TUTORIAL : 15 HOURS
TOTAL HOURS: 60 HOURS

TEXT BOOKS

1. A.Singaravelu ,"Numerical Methods" , Meenakshi Agency, Chennai

REFERENCES

1. Sastry, S.S., " Introductory Methods of Numerical Analysis (Third Edition) ", Printice Hall of India, New Delhi, 1998.
2. T.Veerarajan, T.Ramachandran, " Numerical Methods with Programs in C and C++", Tata McGraw-Hill (2004).
3. Grewal, B.S. and Grewal, J.S., Numerical Methods in Engineering and Science Khanna Publishers, New Delhi, 1999.
4. N.Subramanian,Numerical Methods,SCM Publishers,Erode

SEMESTER	SUBJECT	L	T	P	C
IV	MANUFACTURING ENGINEERING (Common to AUTO and MECT)	3	0	0	3

OBJECTIVES:

To provide knowledge and understanding on various types of manufacturing processes

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

UNIT- I INTRODUCTION AND CASTING 9

Classification and comparison of manufacturing processes- criteria for selection of a process. Casting- sand casting- Types – procedure to make sand moulds- Cores-Principle of die casting – centrifugal casting, Investment casting- shell moulding- Continuous casting.

UNIT- II METAL FORMING AND POWDER METALLURGY 9

Basic concepts and classification of forming processes- principles- Application of the following processes- Forging, rolling, extrusion, wire drawing, spinning, sheet metal forming- powder metallurgy- steps involved, applications.

UNIT- III COVENTIONAL MACHINING 9

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

UNIT- IV WELDING 9

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

UNIT- V UNCONVENTIONAL MACHINING PROCESSES 9

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

TOTAL: 45 HOURS

TEXT BOOKS

1. Nagpal, " Machine Tool Engineering" Tata McGraw Hill, 2002.
2. Rao .P.N. " Manufacturing Technology" Tata McGraw Hill, 2002.

REFERENCES

1. Hajra Choudhury, Elements of Workshop Technology, Vol. I and Vol.II Asia Publising House, 1996.
2. R.K. Jain and S.C. Gupta, Production Technology – Khanna Publishers, 1997
3. H.M.T Production Technology– Hand book, Tata McGraw Hill,

SEMESTER	SUBJECT	L	T	P	C
IV	ALTERNATIVE ENERGY SOURCES FOR AUTOMOBILES	3	0	0	3

OBJECTIVES:

To study and understand the substitute for conventional automobile fuels and energy sources .

1. *To impart the knowledge of various alternate fuels in vehicles.*
2. *To understand the entire properties of alcohols.*
3. *To understand the various fuels like natural gas, lpg, hydrogen and biogas.*
4. *To impart the knowledge of vegetable oils.*
5. *To impart the knowledge of various unconventional machining processes.*

UNIT- I INTRODUCTION 9

Estimation of petroleum reserve - Need for alternate fuel - Availability and properties of alternate fuels – general use of alcohols - LPG - Hydrogen - Ammonia, CNG, and LNG - Vegetable oils and Biogas - Merits and demerits of various alternate fuels.

UNIT- II ALCOHOLS 9

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

UNIT- III NATURAL GAS, LPG, HYDROGEN AND BIOGAS 9

Availability of CNG, properties, modification required to use in engines - performance and emission characteristics of CNG using LPG in SI & CI engines. Performance and emission for LPG - Hydrogen – Storage and handling, perforamance and safety aspects.

UNIT- IV VEGETABLE OILS 9

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

UNIT- V ELECTRIC AND SOLAR POWERED VEHICLES 9

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

TOTAL: 45 HOURS

TEXT BOOKS

1. Maheswar Dayal, " Energy today & tomorrow ", I & B Horishr India, 1982.
2. Nagpal, " Power Plant Engineering ", Khanna Publishers, 1991.

REFERENCES

1. " Alcohols and motor fuels progess in technology ", Series No.19, SAE Publication USA 1980.
2. SAE Paper Nos. 840367, 841156, 841333, 841334.
3. " The properties and performance of modern alternate fuels " - SAE Paper No.841210.
4. Bechtold. R.L., " Alternative Fuels Guide Book ", SAE, 1997.

SEMESTER	SUBJECT	L	T	P	C
IV	**STRENGTH OF MATERIALS** (Common To MECH,MECT & AUTO)	3	1	0	4

OBJECTIVES:

1. *To understand basic mechanical forces acting on rigid and deformable bodies.*
2. *To draw shear force and bending moment diagram for various types of beams.*
3. *To analyze the torsional effects on circular bars ,shafts , helical springs.*
4. *To form deflection equations of beams and columns for different end conditions.*
5. *To analyze the two dimensional stresses and deformation of cylinders and spherical shells.*

UNIT- I STRESS- STRAIN AND DEFORMATION OF SOLIDS 9

Properties of material, Concept of Stress and Strain, Hook's Law, Stress Strain Diagram for structural steel and Non-ferrous materials. Poisson's Ratio & principles of superposition, Total elongation of tapering bars of circular and rectangular cross-sections. Elongation due to self-weight, Volumetric strain. Expression for Volumetric strain, Elastic constants, relationship among elastic constants, compound bars Rigid and Deformable bodies – Strength- Stiffness and Stability – Stresses; Tensile-Compressive and Shear – Elastic constants – Strain energy and unit strain energy – Strain energy in uniaxial loads.

UNIT- II BEAMS - LOADS AND STRESSES 9

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

UNIT- III TORSION 9

Analysis of torsion of circular bars – Shear stress distribution – Bars of Solid and hollow circular section – Stepped shaft – Twist and torsion stiffness – Compound shafts – Fixed and simply supported shafts – Application to close-coiled helical springs – Maximum shear stress in spring section including Wahl Factor – Deflection of helical coil springs under axial loads – Design of helical coil springs.

UNIT- IV DEFLECTION OF BEAMS 9

Elastic curve of Neutral axis of the beam under normal loads – Evaluation of beam deflection and slope : Double integration method- Macaulay Method- and Moment-area Method –Columns – End conditions – Equivalent length of a column – Euler equation – Slenderness ratio – Rankine formula for columns – Introduction to curved beams.

UNIT- V ANALYSIS OF STRESSES IN TWO DIMENSIONS 9

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

TUTORIAL : 15 HOURS
TOTAL HOURS: 60 HOURS

TEXT BOOKS

1. 1. Ramamutham.S- Strength of Materials- S.Chand &B Co.- New Delhi-2007.
2. Beer F. P. and Johnston R- "Mechanics of Materials"- McGraw-Hill Book Co- Third Edition- 2008

REFERENCES

1.Nash W.A- "Theory and problems in Strength of Materials"- Schaum Outline Series- , McGraw-Hill Book Co- New York- 2005
2. Ryder G.H- "Strength of Materials"- Macmillan India Ltd.- Third Edition- 2007
3. Ray Hulse- Keith Sherwin & Jack Cain- "Solid Mechanics"- Palgrave ANE Books- 2006.
4. Singh D.K "Mechanics of Solids" Pearson Education 2009.

SEMESTER	SUBJECT	L	T	P	C
IV	AUTOMOTIVE DIESEL ENGINES	3	0	0	3

OBJECTIVES:

To study and understand the substitute for automotive diesel engines.

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

UNIT- I BASIC THEORY 9

Diesel engine construction and operation. Two stroke and four stroke diesel engines. Diesel cycle – Fuel-air and actual cycle analysis. Diesel fuel. Ignition quality. Cetane number. Laboratory tests for diesel fuel. Standards and specifications.

UNIT- II FUEL INJECTION SYSTEM 9

Requirements – solid injection. Function of components –common rail direct injection - Jerk and distributor type pumps. Pressure waves, Injection lag. Unit injector. Mechanical and pneumatic governors. Fuel injector, Types of injection nozzle, Nozzle tests. Spray characteristics. Injection timing. Pump calibration. Pilot injection.

UNIT-III AIR MOTION,COMBUSTION AND COMBUSTION CHAMBERS 10

Importance of air motion – Swirl, squish and turbulence, Swirl ratio. Fuel air mixing. Stages of combustion. Delay period – factors affecting delay period. Knock in CI engines. Comparison of knock in CI & SI engines. Direct and indirect injection combustion chambers. Air cell chamber. Combustion chamber design – objectives – Different types of combustion chamber. M.Combustion chamber. Combustion chambers for Homogeneous charge compression ignition systems – Dual and alternate fueled engine systems.

UNIT- IV SUPERCHARGING AND TURBOCHARGING 8

Necessity and limitation – Charge cooling. Types of supercharging and turbocharging – Relative merits. Matching of turbocharger.

UNIT-V ENGINE PERFORMANCE AND EVALUATION 9

Automotive and stationary diesel engine testing and related standards – Engine power and efficiencies - performance characteristics. Variables affecting engine performance – Methods to improve engine performance – Heat balance – Performance maps.

TOTAL: 45 HOURS

TEXT BOOKS

1. 1 K. K. Ramalingm, internal Combustion Engines, Scitech publications, Chennai, 2003.
2. Ganesan,V., Internal Combustion Engines, Tata-McGraw Hill Publishing Co., New Delhi, 1994.

REFERENCES

1. Heldt,P.M., High Speed Combustion Engines, Oxford IBH Publishing Co., Calcutta, 1985.
2. Obert,E.F., Internal Combustion Engine analysis and Practice, International Text Book Co., Scranton, Pennsylvania, 1988.
3. Maleev,V.M., Diesel Engine Operation and Maintenance, McGraw Hill, 1974.
4. Dicksee,C.B., Diesel Engines, Blackie & Son Ltd., London, 1964.

SEMESTER	SUBJECT	L	T	P	C
IV	AUTOMOTIVE ELECTRONICS SYSTEMS	3	0	0	3

OBJECTIVES:

To study and purpose is to understand the Electronics system and components.

1. *To impart the knowledge of digital electronics.*
2. *To understand the engine control systems.*
3. *To understand the various type of electronic fuel injection systems.*
4. *To impart the knowledge of automotive electronics.*
5. *To impart the knowledge of various sensors and actuators.*

UNIT- I DIGITAL ELECTRONICS INTRODUCTION 9

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

UNIT- II DIGITAL ENGINE CONTROL SYSTEM 9

Open loop & closed loop system- Engine cracking and warm up control Acceleration and deceleration system, idle speed control, Integrated engine system, Exhaust emission control system

UNIT-III ELECTRONIC FUEL INJECTION SYSTEM 9

Introduction, Feedback carburetor system(FBC), Throttle body injection and MPFI, Injection system control, CRDI, Distributorless ignition system.

UNIT- IV AUTOMOTIVE ELECTRONICS 9

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

UNIT- V SENSORS AND ACTUATORS 9

Types of sensors: sensor for speed, throttle position, exhausts oxygen level, manifold Pressure, crankshaft position, coolant temperature, exhaust temperature, air mass Flow for engine application. Solenoids, stepper motors, relay.

TOTAL: 45 HOURS

TEXT BOOKS

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

REFERENCES

1. Crouse, W.H-Automobile Electrical Equipment – McGraw Hill Book Co., Inc, N York
2. Kholi.P.L- Automotive Electrical Equipment- Tata McGraw Hill Co Ltd.,New Delhi,1975
3. Ganesan.V- "Internal Combustion Engines" - Tata McGraw Hill Publishing Co, Delhi 2003.

SEMESTER	SUBJECT	L	T	P	C
IV	AUTOMOTIVE ENGINE COMPONENTS LAB	0	0	4	2

OBJECTIVES:

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

1. Dismantling of 4 cylinder petrol engine.
2. Assembling of 4 cylinder petrol engine.
3. Dismantling of 6 cylinder diesel engine.
4. Assembling of 6 cylinder diesel engine.
5. Study of oil filter, fuel filter, fuel injection system, carburetor, MPFI
6. Study of ignition system components – coil, magneto and electronic ignition systems.
7. Study of engine cooling system components
8. Study of engine lubrication system components
9. Ovality and taper measurement of cylinder bore and comparison with standard specifications
10. Ovality and taper measurement of engine crank shaft and comparison with standard specification

TOTAL: 45 HOURS

SEMESTER	SUBJECT	L	T	P	C
IV	MANUFACTURING ENGINEERING LAB	0	0	4	2

OBJECTIVES:

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

List Of Experiments

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

TOTAL: 45 HOURS

SEMESTER	SUBJECT	L	T	P	C
IV	STRENGTH OF MATERIALS LAB	0	0	4	2

OBJECTIVES:

To provide a hands on experience to conduct testing of materials.

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

TOTAL: 45 HOURS

SEMESTER	SUBJECT	L	T	P	C
V	MODERN VEHICLE TECHNOLOGY	3	0	0	3

OBJECTIVES:

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

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

UNIT- I TRENDS IN POWER PLANTS 9

Hybrid vehicles - Stratified charged / learn burn engines - Hydrogen engines - battery vehicles – Electric propulsion with cables - Magnetic track vehicles.

UNIT- II SUSPENSION BRAKES AND SAFETY 9

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

UNIT-III NOISE & POLLUTION 9

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

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UNIT- IV VEHICLE OPERATION AND CONTROL 9

Computer Control for pollution and noise control and for fuel economy - Transducers and actuators - Information technology for receiving proper information and operation of the vehicle like optimum speed and direction.

UNIT- V VEHICLE AUTOMATED TRACKS 9

Preparation and maintenance of proper road network - National highway network with automated roads and vehicles - Satellite control of vehicle operation for safe and fast travel.

TOTAL: 45 HOURS

TEXT BOOKS

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

REFERENCES

1. Crouse, W.H-Automobile Electrical Equipment – McGraw Hill Book Co., In New York

2. Kholi.P.L- Automotive Electrical Equipment- Tata McGraw Hill Co Ltd.,Ne
Delhi,1975
3. Ganesan.V- "Internal Combustion Engines" - Tata McGraw Hill Publis
Co,New Delhi 2003.

SEMESTER	SUBJECT	L	T	P	C
V	AUTOMOTIVE TRANSMISSION	3	1	0	4

OBJECTIVES:

To study and purpose is to understand the automotive transmissions.

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

UNIT- I CLUTCH AND GEAR BOX 9

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

UNIT- II HYDRODYNAMIC DRIVE 9

Fluid coupling - Principle of operation, Constructional details, Torque capacity, Performance characteristics and Reduction of drag torque. Hydrodynamic Torque converter - Principle of operation, Constructional details and Performance characteristics. Multistage torque converters. Polyphase torque converters. Converter coupling

UNIT-III PLANETARY GEAR BOXES 9

Construction and operation of Ford – T-model gearbox, Wilson Gear box and Cotal electromagnetic transmission.

.

UNIT- IV AUTOMATIC TRANSMISSION APPLICATIONS 9

Need for automatic transmission, Principle of operation. Hydraulic control system for automatic transmission. Chevrolet "Turboglide" Transmission, Continuously Variable Transmission (CVT) – Types – Operations.

UNIT- V HYDROSTATIC AND ELECTRIC DRIVE 9

Hydrostatic drive - Various types of hydrostatic systems, Principles of Hydrostatic drive system. Advantages and limitations. Comparison of hydrostatic drive with hydrodynamic drive, Construction and Working of typical Janny hydrostatic drive. Electric drive - Principle of operation of Early and Modified Ward Leonard Control system, Advantages & limitations.

TUTORIAL : 15 HOURS
TOTAL HOURS: 60 HOURS

TEXT BOOKS

1. Newton and Steeds, Motor vehicles, Illiffe Publishers, 2000.
2. Judge, A.W., Modern Transmission systems, Chapman and Hall Ltd., 1990.

REFERENCES

1. Heldt, P.M., Torque converters, Chilton Book Co., 1992.
2. SAE Transactions 900550 & 930910.
3. Hydrostatic transmissions for vehicle applications, I Mech E Conference, 1981-88.
4. Crouse, W.H., Anglin, D.L., Automotive Transmission and Power Trains construction, McGraw Hill, 1992.

SEMESTER	SUBJECT	L	T	P	C
V	COMBUSTION THERMODYNAMICS AND HEAT TRANSFER	3	1	0	4

OBJECTIVES:

To study and purpose is to understand the combustion thermodynamics and heat transfer.

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

UNIT- I INTRODUCTION TO COMBUSTION PROCESSES 10

Definition for Fuel and Oxidizer – types – Various combustion modes- Combustion in premixed laminar and premixed turbulent combustion - Flame Speed – Burning Velocity - diffusion flames – Combustion process in IC engines.

UNIT- II THERMODYNAMICS OF COMBUSTION 11

Thermodynamics of combustion – Thermodynamic Properties – Ideal gas law – Gas mixture combustion – Stoichiometric combustion – Thermochemistry – Hess's law- Adiabatic flame temperature – Physics of combustion – Fick's law of species diffusion – Conservation equations – Boundary layer concept

UNIT-III NORMAL, ABNORMAL COMBUSTION IN SI ENGINES 7

Stages of combustion – Flame propagation — Flame Limits –Flame Extinction -Rate of pressure rise – Cycle to cycle variation – Abnormal combustion – Theories of detonation – Effect of engine operating variables on combustion –Example problems.

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UNIT- IV COMBUSTION AND HEAT TRANSFER IN IC ENGINES 11

Droplet and spray combustion theory – delay period – Peak pressure – Heat release – Gas temperature – Diesel knock. Basic definitions – Convective heat transfer – Radiative heat transfer – Heat transfer, temperature distribution and thermal stresses in piston – Cylinder liner – Cylinder head – fins and valves.

UNIT- V EXPERIMENTAL INVESTIGATION OF COMBUSTION AND HEAT TRANSFER IN IC ENGINES 6

Photographic studies of combustion processes – P-θ diagrams in SI and CI engines, Assembly – Temperature measurement in piston – cylinder liner – Cylinder head and engine valves.

TUTORIAL : 15 HOURS
TOTAL HOURS: 60 HOURS

TEXT BOOKS

1. Ganesan,V., Internal Combustion Engines, Tata McGraw Hill Co., 1994.
2. SPALDING.D.B., Some fundamentals of Combustion, Butterworth Science Publications, London, 1985.
3. John B.Heywood, "Internal Combustion Engine Fundamental", McGraw-Hill, 1988.

REFERENCES

1. Lewis,B., Pease,R.N. and Taylor,H.S., Combustion Process, High Speed Gas dynamics and Jet Propulsion Series, Princeton University Press, Princeton, New Jersey, 1976.
2. Taylor,E.F., The Internal Combustion Engines, International Text Book Co., Pennsylvania, 1982.
3. D.P.Mishra.,Fundamentals of Combustion, PHI .,2008

SEMESTER	SUBJECT	L	T	P	C
V	EMERGING AUTOMOTIVE MATERIALS	3	0	0	3

OBJECTIVES:

To study and purpose is to understand the emerging automotive materials

1. *To understand the classification of Engineering Materials and their relevant applications.*
2. *To understand the powder metallurgy concepts, process t techniques, applications.*
3. *To understand the composites, fabrication methods, types and applications.*
4. *To impart the knowledge of smart materials*
5. *To understand the various types of nonmaterial's,*

UNIT- I ENGINEERING MATERIALS CLASSIFICATION, PROPERTIES & APPLICATIONS 9

Classification of engineering materials- Metallic materials-ferrous materials-steel & cast iron and non ferrous materials –aluminium and copper. Non-Metallic materials – glasses , ceramics ,Polymer and plastics – their characteristics and unique properties- Material for structural applications - Light weight structural materials for automobiles and aero plane applications – Structural materials for high temperature applications

UNIT- II POWDER METALLURGY 9

Thermodynamics of combustion – Thermodynamic Properties – Ideal gas law – Gas mixture combustion – Stoichiometric combustion – Thermochemistry – Hess's law- Adiabatic flame temperature – Physics of combustion – Fick's law of species diffusion – Conservation equations – Boundary layer concept

UNIT-III COMPOSITES 9

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

UNIT- IV SMART MATERIALS 9

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

UNIT- V NANO MATERIALS 9

Nanomaterials-Definition, Classification of Nanostructured materials, causes of interest in nanomaterials, some present and future applications of nanomaterials. Processes for producing ultrafine powders-mechanical grinding, wet chemical

synthesis of nanomaterials. Gas phase synthesis of nano materials, gas condensation processes, chemical vapour condensation, laser ablation. Carbon nanotubes, nano composites.

TOTAL: 45 HOURS

TEXT BOOKS

1. Budinski, Kenneth G, Budinski, Michael K, Engineering Materials: Properties and Selection, 9th Edition, PHI.
2. M.V.Gandhi., Thomson - Smart Materials and Structures- Chapman and Hall
3. A.K.Bandhopadyay-Nanomaterials-New Age

REFERENCES

1. Srinivasan.K, Composite Materials, Narosa Publishing House, 2009.
2. Ramesh, Nanomaterials: Mechanics and Mechanisms, Springer Verlag, EPZ, Paperback edition.
3. Angelo P.C., Subramanian R., Powder Metallurgy,Science, Technology and Applications,Prentice Hall of India, 2012.

SEMESTER	SUBJECT	L	T	P	C
V	FUELS AND LUBRICANTS	3	0	0	3

OBJECTIVES:

To study and purpose is to understand fuels and lubricants.

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

UNIT- I MANUFACTURE OF FUELS AND LUBRICANTS 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- 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, distillation, vapour pressure, flash point, spontaneous ignition temperature, viscosity, pour point, flammability, ignitability, diesel index, API gravity, aniline point etc.

UNIT- V COMBUSTION & FUEL RATING 9

SI Engines – flame propagation and mechanism of combustion, normal combustion, knocking, octane rating, fuel requirements. CI Engine, mechanism of combustion, diesel knock, cetane rating, fuel requirements. Additive - mechanism, requirements of an additive, petrol fuel additives and diesel fuel additives – specifications of fuels.composites.

TOTAL: 45 HOURS

TEXT BOOKS

1. Gupta.O.B., "Elements of Fuels, Furnaces and Refractories",Khanna Publishers, 2007.
2. Ganesan.V., "Internal Combustion Engineering", Tata McGraw-Hill Publishing Co., New Delhi, 2003.

REFERENCES

1. Dr.Ram Prasad., "Petroleum Refining Technology", Khanna Publishers, 2008.
2. Brame, J.S.S. and King, J.G. – Fuels – Solids, Liquids, Gaseous.
3. Francis, W – Fuels and Fuel Technology, Vol. I & II.

SEMESTER	SUBJECT	L	T	P	C
V	FUELS AND LUBRICANTS LAB	0	0	4	2

OBJECTIVES:

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

List of experiments :

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

TOTAL: 45 HOURS

SEMESTER	SUBJECT	L	T	P	C
V	HEAT TRANSFER LAB	0	0	4	2

OBJECTIVES:

To impart knowledge on heat transfer by convection .

List of Experiments :

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

TOTAL: 45 HOURS

SEMESTER	SUBJECT	L	T	P	C
V	VEHICLE DESIGN AND DATA CHARACTERISTICS LAB	0	0	4	2

OBJECTIVES:

To impart knowledge on vehicle design and data characteristics

List of Experiments

1. Performance Curve

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

2. Expectancy curves

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

TOTAL: 45 HOURS

SEMESTER	SUBJECT	L	T	P	C
V	**PROFESSIONAL COMMUNICATION AND PERSONALITY DEVEIOPMENT (Common to All Branches)**	**0**	**0**	**2**	**1**

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

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

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

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

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

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

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

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

Text Book

I The Functional Aspects of Communication Skills, Prajapati Prasad and Rajendra K. Sharma, S. K Kataria & Sons, New Deihl, Rep"nt 2007.

Reference Books

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

2. Business Communication, Asha Kaul, Prentice Hall of India.

3 Business Correspondence and Report Writing' A Practical Approach to Business and

Technical Communication, Sharma, R.C. and Krishna Mohan, Tata McGraw-HilI.

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

SEMESTER	SUBJECT	L	T	P	C
VI	VEHICLE BODY ENGINEERING	3	0	0	3

OBJECTIVES:

To study and purpose is to understand *vehicle body engineering*

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

UNIT- I CAR BODY DETAILS 9

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

UNIT- II VEHICLE AERODYNAMICS 9

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

UNIT-III BUS BODY DETAILS 9

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

UNIT-IV COMMERCIAL VEHICLE DETAILS 9

Types of body; flat platform, drop side, fixed side, tipper body, tanker body, Light commercial vehicle body types. Dimensions of driver's seat relation to controls. Drivers cab design.

UNIT- V BODY MATERIALS, TRIM AND MECHANISMS 9

Steel sheet, timber, plastic, GRP, properties of materials; Corrosion, anticorrosion methods. Selection of paint and painting process, spray painting and components. Body trim items. Body mechanisms.

TOTAL: 45 HOURS

TEXT BOOKS

1. J.Powloski - "Vehicle Body Engineering" - Business Books Ltd, London -1989

REFERENCES

1. Giles.J.C. - "Body construction and design" - Liiffe Books Butterworth & Co. - 1971.
2. John Fenton - "Vehicle Body layout and analysis" - Mechanical Engg. Publication Ltd., London – 1982.
3. Braithwaite.J.B. - "Vehicle Body building and drawing" - Heinemann Educational Books Ltd., London – 1977.

SEMESTER	SUBJECT	L	T	P	C
VI	TWO AND THREE WHEELER TECHNOLOGY	3	0	0	3

OBJECTIVES:

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

1. *To understand the power units.*
2. *To understand the chassis and sub systems.*
3. *To understand the brakes and wheels*
4. *To impart the various types of two wheeler*
5. *To understand the various types of three wheeler.*

UNIT- I THE POWER UNIT **9**

Two stroke and four stroke SI engine, merits and demerits, symmetrical and unsymmetrical port timing diagrams. Types of scavenging processes, merits and demerits, scavenging efficiency. scavenging pumps. rotary valve engine. Fuel system. Lubrication system. Magneto coil and battery coil spark ignition system. Electro ignition system. Starting system. Kick starter system.

UNIT- II CHASSIS AND SUB-SYSTEM **9**

Main frame, its types. Chassis and shaft drive. Single, multiple plates and centrifugal clutches. Gear box and gear controls. Front and rear suspension systems. Shack absorbers. Panel meters and controls on handle bar.

UNIT-III BRAKES AND WHEELS **9**

Drum brakes, disc brakes, front and rear brake links layouts. spoked wheel, cast wheel. Disc wheel. Disc types. Tyres and Tubes.

UNIT- IV TWO WHEELERS **9**

Case study of motor cycles, scooters and mopeds. servicing and maintenance.

UNIT- V THREE WHEELERS **9**

Case study of Auto rickshaws, pickup van, delivery van and trailer. servicing and maintenance.

TOTAL: 45 HOURS

TEXT BOOKS

1. Irving, P.E., Motor cycle Engineering, Temple press Book, Loondon,1992

REFERENCES

1. The cycle motor manual, Temple press Ltd , London, 1990.
2. Encyclopedia of Motor cycling, 20 volumes, Marshall Cavensih, New York and London, 1989.
3. Bryaut, R.V., Vespa Maintenance and repair series.
4. RAYMOND Broad, Lambretta- A practical guide to maintenance and repair, 1987.

SEMESTER	SUBJECT	L	T	P	C
VI	AUTOMOTIVE ENGINE DESIGN	3	1	0	4

OBJECTIVES:

To study and purpose is to understand automotive engine design.

1. *To understand the introduction of materials.*
2. *To understand the limits fits and tolerances*
3. *To understand the design of piston and cylinder*
4. *To impart the design of connecting rod and crankshafts.*
5. *To understand the design of valves and flywheels.*

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UNIT- I INTRODUCTION 9

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

UNIT- II LIMITS, FITS, TOLERANCES, SURFACE FINISH, SHAFTS AND SPRINGS 9

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

UNIT-III DESIGN OF CYLINDER AND PISTON 9

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

UNIT- IV DESIGN OF CONNECTING ROD AND CRANKSHAFT 9

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

UNIT- V DESIGN OF VALVES AND FLYWHEEL 9

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

TUTORIAL : 15 HOURS
TOTAL HOURS: 60 HOURS

TEXT BOOKS

1. A.Kolchin and V.Demidov, “Design of Automotive Engines”, MIR Publishers, Moscow, 1984.
2. Gupta.R.B. “Auto Design”, Satya Prakashan, New Delhi.

3. Jain.R.K. , "Machine Design", Khanna Publishers, New Delhi, 1997.
4. "Design Data Book", PSG College of Technology, Coimbatore, 2000.

REFERENCES

1. Dr.Ram Prasad., "Petroleum Refining Technology", Khanna Publishers, 2008.
2. Brame, J.S.S. and King, J.G. – Fuels – Solids, Liquids, Gaseous.
3. Francis, W – Fuels and Fuel Technology, Vol. I & II.

SEMESTER	SUBJECT	L	T	P	C
VI	AUTOMOTIVE POLLUTION CONTROL	3	0	0	3

OBJECTIVES:

To study and purpose is to understand *automotive pollution control.*

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

UNIT- I INTRODUCTION 9

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

UNIT- II POLLUTANT FORMATION IN SI ENGINES 9

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

UNIT-III POLLUTANT FORMATION IN CI ENGINES 9

Pollutant formation in CI engines, smoke and particulate emissions in CI engines, effects of design and operating variables on CI engine emissions. Nox and Sox formation and control. Noise pollution from automobiles, measurement and standards.

UNIT- IV CONTROL OF EMISSIONS FROM SI AND CI ENGINES 9

Design of engine, optimum selection of operating variables for control of emissions, EGR, Thermal reactors, secondary air injection, catalytic converters, catalysts, fuel modifications, fuel cells, Two stroke engine pollution control.

UNIT- V MEASUREMENT TECHNIQUES - EMISSION STANDARDS 9

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

TOTAL: 45 HOURS

TEXT BOOKS

1. Paul Degobert – Automobiles and Pollution – SAE International ISBN-1-56091-563-3, 1991.
2. Ganesan, V- "Internal Combustion Engines"- Tata McGraw-Hill Co.- 2003.

REFERENCES

1. SAE Transactions- "Vehicle Emission"- 1982 (3 volumes).
2. Obert.E.F.- "Internal Combustion Engines"- 1988
3. Marco Nute- " Emissions from two stroke engines, SAE Publication – 1998

SEMESTER	SUBJECT	L	T	P	C
VI	AUTOMOTIVE CHASSIS DESIGN	3	1	0	4

OBJECTIVES:

To study and purpose is to design of chassis.

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

UNIT- I CLUTCH DESIGN CALCULATION 9

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

UNIT- II GEAR BOX 9

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

UNIT-III VEHICLE FRAME AND SUSPENSION 9

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

UNIT- IV FRONT AXLE AND STEERING SYSTEMS 9

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

UNIT- V FINAL DRIVE AND REAR AXLE 9

Design of propeller shaft, design details of final drive gearing, design details of full floating, semi-floating and three quarter floating rear shafts and rear axle housings.

TUTORIAL : 15 HOURS
TOTAL HOURS: 60 HOURS

TEXT BOOKS

1. Giri.N.K- "Automobile Mechanics"- Khanna Publisher, New Delhi- 2002
2. Heldt.P.M - "Automotive Chassis"- Chilton Co., New York- 1992
3. "Design Data Book", PSG College of Technology, Coimbatore, 2000.

REFERENCES

1. Steeds. W -"Mechanics of Road Vehicles"- Illiffe Books Ltd., London- 1990
2. Giles.K.G - Steering, Suspension and tyres"- Illiffe Books Ltd., London - 1988
3. Newton Steeds & Garret- "Motor Vehicle"- Illiffe Books Ltd., London – 2000
4. Heldt.P.M- "Torque converter" - Chilton Book Co., New York - 1982
5. Dean Averns - "Automobile Chassis Design"- Illiffe Books Ltd – 1992

SEMESTER	SUBJECT	L	T	P	C
VI	TWO AND THREE WHEELER LAB	0	0	4	2

OBJECTIVES:

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

List of Experiments

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

TOTAL: 45 HOURS

SEMESTER	SUBJECT	L	T	P	C
VI	ENGINE TESTING AND EMISSION MEASUREMENT LAB	0	0	4	2

OBJECTIVES:

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

List of Experiments:

1. Valve Timing and Port Timing Diagrams.
2. Performance Test on 4-stroke Diesel Engine.
3. Performance Test on a 4 – stroke Petrol Engine.
4. Heat Balance Test on 4 - stroke Diesel Engine.
5. Morse Test on Multicylinder Petrol Engine.
6. Retardation Test to find Frictional Power of a Diesel Engine.
7. Study of NDIR gas Analyser and FID.
8. Study of Chemiluminescent NOx Analyser.
9. Measurement of HC, CO , CO_2, O_2 using exhaust gas analyzer.
10. Diesel Engine Smoke Measurement.

TOTAL: 45 HOURS

SEMESTER	SUBJECT	L	T	P	C
VI	VEHICLE MODELING LAB	0	0	4	2

OBJECTIVES:

To impart knowledge on types of vehicles drafting using solid works.

List of Experiments

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

TOTAL: 45 HOURS

SEMESTER	SUBJECT	L	T	P	C
VII	**TOTAL QUALITY MANAGEMENT (Common to MECH, AUTO, MECT, ECE, EEE, EIE, BIO-TECH, CSE & CIVIL)**	**3**	**0**	**0**	**3**

OBJECTIVES:

To study and purpose *is to understand total quality management.*

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

UNIT- INTRODUCTION **9**

Definition of Quality- Dimensions of Quality- Quality Planning- Quality costs – Analysis Techniques for Quality Costs- Basic concepts of Total Quality Management- Historical Review- Principles of TQM- Leadership – Concepts- Role of Senior Management- Quality Council- Quality Statements- Strategic Planning- Deming Philosophy- Barriers to TQM Implementation.

UNIT- II TQM PRINCIPLES **9**

Customer satisfaction – Customer Perception of Quality- Customer Complaints- Service Quality- Customer Retention- Employee Involvement – Motivation- Empowerment- Teams- Recognition and Reward- Performance Appraisal- Benefits- Continuous Process Improvement – Juran Trilogy- PDSA Cycle- 5S- Kaizen-Basic Concepts- Strategy- Performance Measure.

UNIT- III STATISTICAL PROCESS CONTROL (SPC) **9**

The seven tools of quality- Statistical Fundamentals – Measures of central Tendency and Dispersion- Population and Sample- Normal Curve- Control Charts for variables and attributes- Process capability- Concept of six sigma- New seven Management tools.

UNIT- IV TQM TOOLS **9**

Benchmarking – Reasons to Benchmark- Benchmarking Process- Quality Function Deployment (QFD) – House of Quality- QFD Process- Benefits- Taguchi Quality Loss Function- Total Productive Maintenance (TPM) – Concept- Improvement Needs- FMEA – Stages of FMEA.

UNIT- V QUALITY SYSTEMS **9**

Need for ISO 9000 and Other Quality Systems- ISO 9000:2000 Quality System – Elements- Implementation of Quality System- Documentation- Quality Auditing- QS 9000- ISO 14000 – Concept- Requirements and Benefits.

TOTAL: 45 HOURS

TEXT BOOKS

1. Dale H.Besterfiled- et at. - Total Quality Management- PHI-1999. (Indian reprint 2002).
2. Feigenbaum.A.V. "Total Quality Management- McGraw-Hill- 1991.

REFERENCES

1. James R.Evans & William M.Lidsay- The Management and Control of Quality- (5^{th} Edition)- South-Western (Thomson Learning)- 2002 (ISBN 0-324-06680-5).
2. Oakland.J.S. "Total Quality Management Butterworth – Hcinemann Ltd.- Oxford. 1989.
3. Narayana V. and Sreenivasan- N.S. Quality Management – Concepts and Tasks- New Age International 1996.

SEMESTER	SUBJECT	L	T	P	C
VII	VEHICLE MAINTENANCE	3	0	0	3

OBJECTIVES:

To study and purpose is to understand various vehicle maintenance.

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

UNIT- I MAINTENANCE OF RECORDS AND SCHEDULES 9

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

UNIT- II ENGINE MAINTENANCE – REPAIR AND OVERHAULING 9

Dismantling of engine components and cleaning, cleaning methods, visual and dimensional inspections, minor and major reconditioning of various components, reconditioning methods, engine assembly, special tools used for maintenance overhauling, engine tune up.

UNIT-III CHASSIS MAINTENANCE - REPAIR AND OVERHAULING 9

Mechanical and automobile clutch and gear box, servicing and maintenance, maintenance servicing of propeller shaft and differential system. Maintenance servicing of suspension systems. Brake systems, types and servicing techniques. Steering systems, overhauling and maintenance. Wheel alignment, computerized alignment and wheel balancing.

UNIT- IV ELECTRICAL SYSTEM MAINTENANCE - SERVICING AND REPAIRS 9

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

UNIT- V MAINTENANCE OF FUEL SYSTEM, COOLING SYSTEMS, LUBRICATION SYSTEM AND VECHICLE BODY 9

Servicing and maintenance of fuel system of different types of vehicles, calibration and tuning of engine for optimum fuel supply. Cooling systems, water pump, radiator, thermostat, anticorrosion and antifreeze additives. Lubrication maintenance, lubricating oil changing, greasing of parts. Vehicle body maintenance, minor and major repairs. Door locks and window glass actuating system maintenance.

TOTAL: 45 HOURS

TEXT BOOKS

1. John Doke “Fleet Management”, McGraw-Hill Co. 1984.
2. Venk Spicer, “Automotive Maintenance and Trouble Shooting”.

REFERENCES

1. James D Halderman - Advanced Engine Performance Diagnosis – PHI - 1998.
2. Judge.A.W., “Maintenance of high speed diesel engines”,Chapman Hall Ltd., London.
3. Service Manuals from Different Vehicle Manufacturers.

SEMESTER	SUBJECT	L	T	P	C
VII	COMBUSTION THEORY OF IC ENGINES	3	1	0	4

OBJECTIVES:

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

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

UNIT- I CYCLE ANALYSIS 9

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

UNIT- II COMBUSTION OF FUELS 9

Combustion stoichiometry of petrol, diesel, alcohol and hydrogen fuels - chemical energy and heating values – Chemical equilibrium and maximum temperature – SI engine combustion – flame velocity and area of flame front – CI engine combustion. Fuel spray characteristics – droplet size, penetration and atomization.

UNIT-III COMBUSTION MODELLING 9

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

UNIT- IV ADVANCES IN IC ENGINES 9

Adiabatic and LHR engines – MAN combustion chamber and multi fuel engines - stratified charge and lean burn engines - surface ignition concept – Locomotive and Marine engines.

UNIT- V OPERATION AND PERFORMANCE 9

Computer control of engine parameters for pollution control and better efficiency-closed loop control of engine parameters – hybrid operating- performance maps.

TOTAL: 45 HOURS

TEXT BOOKS

1. Ganesan .V - "InternalCombustion Engines" - Tata McGraw-Hill, 2003.

REFERENCES

1. Ramalingam.K.K., Internal Combustion Engine, scitech publications,Chennai, 2003.
2. Ganesan.V. – Computer Simulation of compression ignition engines – Orcent Longman – 2000.
3. John B. Haywodd, "Internal Combustion Engine Fundamentals", McGraw-Hill Automotive Technology Series ISBN 0-07-1000499-8, 1988

SEMESTER	SUBJECT	L	T	P	C
VII	EMBEDDED ENGINE MANAGEMENT SYSTEMS	3	0	0	3

OBJECTIVES:

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

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

UNIT- I ELECTRONICS 5

Semiconducters , Transistors, Amplifiers – Integrated circuits – Analog and Digital,Logic Gastes, Microcontrollers –Analog Digital / Digital Analog Converters.

UNIT- SENSORS 8

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

UNIT-III GASOLINE INJECTION SYSTEM 12

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

UNIT- IV DIESEL INJECTION SYSTEM 10

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

UNIT- V IGNITION SYSTEMS 10

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

TOTAL: 45 HOURS

TEXT BOOKS

1. Robert N.Brady, Automotive Computers and Digital Instrumentation, Prentice Hall, 1988.
2. Bosch Technical Instruction Booklets.
3. Tom Denton, Automotive Electrical and Electronic Systems, Edward Amold, 1995.

REFERENCES

1. Duffy Smith, Auto Fuel Systems,The Good Heart Willcox Company Inc., Publishers, 1987.
2. Gasoline Engine Management, Second Edition, Robert Bosch GmbH, 2004. Engine Management, Second Edition, Robert Bosch GmbH, 1999.
3. Eric Chowaniety, Automobile Electronics, SAE Publications 1995.
4. William B. Ribbews, Understanding Automotive Electronics, Fifth Edition, SAE Publications 1998.

SEMESTER	SUBJECT	L	T	P	C
VII	VEHICLE SERVICE AND MAINTENANCE LAB	0	0	4	2

OBJECTIVES:

To provide in house training in vehicle servicing and maintenance.

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List of Experiments

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

.

TOTAL: 45 HOURS

SEMESTER	SUBJECT	L	T	P	C
VII	AUTOMOTIVE ENGINE SIMULATION LAB	0	0	4	2

OBJECTIVES:

To provide training in modeling and simulation of IC engine processes

List of Experiments:

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

TOTAL: 45 HOURS

SEMESTER	SUBJECT	L	T	P	C
VII	ENGINE RECONDITIONING LAB	0	0	4	2

OBJECTIVES:

To familiarize the students with repair and maintenance techniques with emphasis on practical application

List of Experiments

LIST OF EXPERIMENTS

1. Engine Reboring
2. Crank shaft grinding
3. Valve Seat grinding and Valve Lapping.
4. Silencer Decarbonising
5. Fuel Nozzle reconditioning
6. Fuel Injection Pump Calibration.
7. Clutch plate grinding.
8. Flywheel grinding.
9. Wheel drum grinding

TOTAL: 45 HOURS

SEMESTER	SUBJECT	L	T	P	C
VIII	PROJECT WORK & VIVA VOCE	0	0	12	6

OBJECTIVE

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

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

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

- Every project work shall have a guide who is the member of the faculty of the institution. Six periods per week shall be allotted in the time table and this time shall be utilized by the students to receive the directions from the guide, on library reading, laboratory work, computer analysis or field work as assigned by the guide and also to present in periodical seminars on the progress made in the project.

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

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

- Each student shall finally produce a comprehensive report covering background information, literature survey, problem statement, project work details and conclusion.

- This final report shall be typewritten form as specified in the guidelines.

- The continuous assessment shall be made as prescribed in the regulations

LIST OF ELECTIVES FOR AUTOMOBILE ENGINEERING

SEMESTER	SUBJECT	L	T	P	C
ELECTIVE	MODERN AUTOMOBILE ACCESSORIES	3	0	0	3

Aim : To introduce the modern developments in vehicle technology.

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

UNIT –I ENGINE MANAGEMENT SYSTEMS 9

Electronically controlled SI and CI engine fuel injection systems, related hardware and software. Closed loop ignition system. Catalytic converters and particulate traps.

UNIT –II CHASSIS 9

Active suspension control, Pneumatic suspensions

UNIT – III HEATING AND AIR CONDITIONING 9

Principles of vehicle air conditioning and heating.

UNIT – IV COMFORT AND CONVENIENCE 9

Adaptive cruise control, car entertainment, power windows, navigation system, adaptive noise control, electric seats, driver information system. Power windows, power steering.

UNIT – V SAFETY AND SECURITY SYSTEMS 9

Airbags, seat belt tightening system, collapsible and tilt able steering column, Anti theft system, anti lock braking system, electronic stability control system/traction control system, roll over protection system.

TOTAL : 45

TEXT BOOKS

1. Bosch Automotive Hand Book - 5th Edition - SAE Publication, USA - 2000

REFERENCE BOOKS

1. Tom Denton - “Automobile Electrical and Electronic Systems” - Edward Arnold, London - 1995.
2. Eric Chowanietz - „Automotive Electronics" - SAE International USA - 1995.

SEMESTER	SUBJECT	L	T	P	C
ELECTIVE	OFF ROAD VEHICLES	3	0	0	3

Aim : To provide knowledge about off road vehicles

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

UNIT-I CLASSIFICATION AND REQUIREMENTS OF OFF ROAD VEHICLES 9

Construction layout, capacity and applications. Power Plants, Chassis and Transmission, Multivalve vehicles.

UNIT –II EARTH MOVING MACHINES 9

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

UNIT – III SCRAPPERS, GRADERS, SHOVELS AND DITCHERS 9

Scrappers, elevating graders, motor graders, self powered scrappers and graders, Power shovel, revolving and stripper shovels – drag lines – ditchers – capacity of shovels.

UNIT– IV FARM EQUIPMENTS, MILITARY AND COMBAT VEHICLES 9

Power take off, special implements. Special features and constructional details of tankers, gun carriers and transport vehicles.

UNIT –V VEHICLE SYSTEMS, FEATURES 9

Brake system and actuation – OCDB and dry disc caliper brakes. Body hoist and bucket operational hydraulics. Hydro-pneumatic suspension cylinders. Power steering system. Kinematics for loader and bulldozer operational linkages. Safety features, safe warning system for dumper. Design aspects on dumper body, loader bucket and water tank of sprinkler.

TOTAL : 45

TEXT BOOKS

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

REFERENCE

1. Abrosimov.K. Branberg.A and Katayer.K, Road making machinery, MIR Publishers, Moscow, 1971.
2. Bart H Vanderveen, Tanks and Transport vehicles, Frederic Warne and Co Ltd.,London.
3. Nakra C.P., "Farm machines and equipments" Dhanparai Publishing company Pvt. Ltd.
4. Robert L Peurifoy, "Construction, planning, equipment and methods" Tata McGraw Hill Publishing company Ltd.

SEMESTER	SUBJECT	L	T	P	C
ELECTIVE	AUTOMOTIVE INSTRUMENTATION	3	0	0	3

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

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

UNIT I LINEAR AND ANGULAR MEASUREMENTS 9

Errors in measurement & calibraiion - Length standards - Length measuring instruments -Vernier, micrometers,dial guages, comparators, Limits, fits, tolerances. Gauges and their types - Angular measuring instruments -bevel protractor, spirit level, sine bar - measurement of straightness and flatness - Measurement of surface finish

UNIT II MEASUREMENT OF SCREW THREAD AND GEAR 9

Various elements of thread - Two wire & three wire method – Thread gauge - Various elements of gears – Various gear tooth measurement methods, composite error measurement.

UNIT III PRESSURE & FLOW MEASUREMENT 9

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

UNIT IV TEMPERATURE MEASUREMENT 9

Temperature scales- Mechanical temperature sensors - liquid in glass, vapour pressure bimetal- resistance type temperature sensors and their measuring circuits – Thermistors, Thermocouples, laws, types- Construction, circuits - Radiation methods- Optical pyrometer.

UNIT V LOAD AND TORQUE MEASUREMENT 9

Force measuring devices, balances, platform scale, weigh bridges, load cells. Torque measurement, prony brake, rope brake. Dynamometrs.Electric cradle dynamometer, Eddy current dynamometer. Hydraulic dynamometer –Transmission and chassis dynamometer.

TOTAL : 45

TEXT BOOKS

1. Jain.R.K. " Engineering Metrology", Khanna Publishers, New Delhi, 1994.
2. Rangan.C.S., Sarma G.E .and Mani V.S.V., "Instrumentation Devices and Systems", Tata McGraw Hill Publishing Co.,New Delhi 1990.

REFERENCE

1. Patranabisj.D., "Principles of Industrial Instrumentation", .Tata McGraw Hill Publishing Co..New Delhi, 1996.
2 Beckwith.tG. & Buck.N L., "Mechanical Measurements",. Oxford and IBH Publishing House. New Delhi, 1990.
3. Jain.R.K.," Mechanical & industrial Measurements". Khanna Publishers, New Delhi. 1990
4. Gaylnr.RW. and Shotbolt.C.R.. "Metrology for Engineers", ELBS Edition, 1990.
5. Khare and Vajpayee, "Dimensional Metrology". Oxford IBH Publishing Co, New Delhi, 1990.

SEMESTER	SUBJECT	L	T	P	C
ELECTIVE	VEHICLE DYNAMICS	3	0	0	3

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

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

UNIT I INTRODUCTION **9**

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

UNIT II MULTI DEGREE FREEDOM SYSTEMS **9**

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

UNIT III STABILITY OF VEHICLES **9**

Load distribution, stability on a curved track slope and a banked road, calculation of tractive effort and reactions for different drives, cornering force behavior

UNIT IV SUSPENSION TYRES AND VEHICLES HANDLING **9**

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

UNIT V NUMERICAL METHODS **9**

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

TOTAL : 45

TEXT BOOKS

1. Giri N.K – Automotive Mechanics, Khanna Publishers, 2002.
2. Rao J.S and Gupta. K “Theory and Practice of Mechanical Vibrations”, Wiley Eastern Ltd., New Delhi -2, 2002.

REFERENCE

1. Heldt.P.M -"Automotive Chassis"- Chilton Co., New York- 1992
2. Ellis.J.R - "Vehicle Dynamics"- Business Books Ltd., London- 1991
3. Giles.J.G.Steering - "Suspension and Tyres", Illiffe Books Ltd., London- 1998
4. Ham B, Pacejka - Tyre and Vehicle Dynamics - SAE Publication - 2002.
5. Gillespie T.D, "Fundamentals of Vehicle Dynamics", SAE USA 1992.

SEMESTER	SUBJECT	L	T	P	C
ELECTIVE	VEHICLE AIR-CONDITIONING	3	0	0	3

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

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

UNIT I AUTOMOTIVE AIR-CONDITIONING FUNDAMENTALS 9

Basic Air conditioning system- Location of Air conditioning components in a car – schematic layout of a Refrigeration system. Compressor components- condenser and high pressure service ports. Thermostatic expansion valve and Orific tube – expansion valve calibration – evaporator temperature controls for TXV and CCOT systems.

UNIT II AIRCONDITIONER – HEATING SYSTEM 9

Manually controlled air conditioner- Heater system- ford automatically controlled air conditioner- Heater systems- Chrysler automatically controlled air conditioner- heater system, general motors automatically controlled Air conditioner-heater system- Flushing and evacuating.

UNIT III REFRIGERANT 9

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

UNIT IV AIR ROUTING AND TEMPERATURE CONTROL 9

Objectives – Evaporators case air flow through the Dash recalculating unit – Automatic Temperature control – Duct system- Controlling flow – vacuum reserve – testing the air control and handling systems.

UNIT V HEATER- AIR CONDITIONER TROUBLE SHOOTING & SERVICE 9

Air conditioner maintenance and service- servicing heater system. removing and replacing components. trouble shooting of air conditioner- heating system-compressor service.

TOTAL : 45

TEXT BOOKS

1. William H Crouse and Donald L Anglin, Automotive Air Conditioning McGraw Hill inc; 1990.

REFERENCE

1 Mitchell information services, Inc., Mitchell Automotive Heating and Air conditioning systems, prentice Hall Inc, 1989.
2. Paul Weisler, Automotive Air conditioning, Reston Publishing Co. Inc., 1990.
3. McDonald K.L., Automotive Air conditioning., Theodore Audel series., 1978.
4. Goings.L.F., Automotive Air conditioning., American Technical services, 1974

SEMESTER	SUBJECT	L	T	P	C
ELECTIVE	TRACTOR AND FARM EQUIPMENTS	3	0	0	3

Aim : To provide knowledge about tractors and farm equipments.

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

UNIT I GENERAL DESIGN OF TRACTORS 9

Classification of tractors –Main components of tractor – safety rules

UNIT II CONTROAL DESIGN OF THE TRACTOR AND FUNDAMENTALS OF ENGINE OPERATION 9

Tractor controls and the starting of the tractor engines – basic notions and definition – Engine cycles – operation of multi cylinder engines - General engine design – Basic engine performance characteristics.

UNIT III ENGINE FRAME WORK AND VALVE MECHANISM OF TRACTOR 9

Cylinder and pistons –Connecting rods and crankshafts – Engine balancing – Construction and operations of the valve mechanism – Valve mechanism troubles

UNIT IV COOLING SYSTEM, LUBRICATION SYSTEM AND FUEL SYSTEMS OF A TRACTOR 9

Cooling system – Classification – Liquid cooling systems – Components, Lubricating system servicing and troubles – Air cleaner and turbo charger – Fuel tanks and filters – Fuel pumps

UNITV FARM EQUIPMENTS 9

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

TOTAL : 45

TEXT BOOKS

1. Rodichev and G.Rodicheva, Tractor and Automobiles, MIR Publishers, 1987

REFERENCE BOOKS

1. Kolchin A., an dV.Demidov, Design of Automotive Engines for Tractor
2. MIR publisher, 1972.

SEMESTER	SUBJECT	L	T	P	C
ELECTIVE	AUTOMOTIVE AERODYNAMICS	3	0	0	3

Aim : To provide knowledge about tractors and farm equipments.

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

UNIT I INTRODUCTION 9

Scope – historical development trends – Fundamentals of fluid mechanics – Flow phenomenon related to vehicles – External & Internal flow problems – Resistance to vehicle motion – Performance – Fuel consumption and Performance – Fuel consumption and performance – Potential of vehicle aerodynamics

UNIT II AERODYNAMIC DRAG OF CABS 9

Car as a bluff body – Flow field around car – drag force – types of drag force – analysis of aerodynamics drag – drag coefficient of cars – strategies for aerodynamic development – low drag profiles.

UNIT III SHAPE OPTIMIZATION OF CABS 9

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

UNIT IV VEHICLE HANDLING 9

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

UNIT V WIND TUNNELS FOR AUTOMOTIVE AERODYNAMICS 9

Introduction – Principles of wind tunnel technology – Limitation of simulation – Stress with scale models – full scale wind tunnels - measurements techniques – Equipment and transducers – road testing methods – Numerical methods.

TOTAL : 45

TEXT BOOKS

1. Hucho, W,H., Aerodynamics of Road vehicles, Butterworths Co. Ltd., 1987

REFERENCE

1. Pope, A., Wind Tunnel Testing, John Wiley & Sons, 2nd Edition., New York, 1974.
2. Automotive Aerodynamics: Update SP – 1145, SAE, 1996.
3. Vehicle Aerodynamics, SP -1145, SAE, 1996

SEMESTER	SUBJECT	L	T	P	C
ELECTIVE	COMBUSTION ENGINEERING	3	0	0	3

Aim : To study combustion of fuels, thermodynamics and kinetics.

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

UNIT I COMBUSTION OF FUELS **9**

Combustion equations, Theoretical air, excess air, air fuel ratio, equivalence ratio, exhaust gas composition, Airfuel ratio from exhaust gas composition, heating value of fuels.

UNIT II THERMODYNAMICS OF COMBUSTION **9**

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

UNIT III KINETICS OF COMBUSTION **9**

Rates of reaction, Reaction order and molecularity complex reactions, chain reactions, Arrhenius rate equation, Collection theory, activated complex theory, Explosive and general oxidative characteristics of fueled.

UNIT IV ENGINE COMBUSTION **9**

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

UNIT V FLAMES **9**

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

TOTAL : 45

TEXT BOOKS

1. Heywood. J. B, Internal Combustion Engine Fundamentals, McGraw Hill Book Co., 1988.
2. Ganesan.V., Internal Combustion Engines, 5th edition, Tata McGraw Hill Co, 2012.

REFERENCE

1. Stephen R.Turns, An Introduction to Combustion, McGraw Hill Book Company, 1996.
2. Irwin Glassman, Combustion, Third Edition, Academic Press, 1996.
3. Sharma. S. P and Chandramohan, Fuels and Combustion, Tata McGraw Hill Book Co., 1984.
4. Samir Sarkar, Fuels and Combustion, Orient Longman, 1984.
5. Kuo. K. K, Principles of Combustion, John Wiley & Sons, 1984.

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

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

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

UNIT I INTRODUCTION AND THERMODYNAMICS 9

Introduction: Basic operating principles – Historical highlights – Classification. **Thermodynamics:** Electrochemical energy conversion – Theoretical efficiency – Electrochemical energy conversion – Factors affecting electrochemical energy conversion

UNIT II ELECTRODE KINETICS 9

Electrode double layer – Electrolyte double layer – Double layer models – Solid metallic electrode – Semiconductor electrode – Specific adsorption – Zero potential.

UNIT III ALKALINE FUEL CELLS & PHOSPHORIC ACID FUEL CELLS 9

Alkaline Fuel Cells: Working principle–Components– Modules and stacks – Performance characteristics– Limitations and R&D challenges– System issues– Ammonia as fuel.

Phosphoric Acid Fuel Cells: Cell reactions – Electrodes – Stacks and systems.

UNIT IV SOLID OXIDE FUEL CELLS & MOLTEN CARBONATE FUEL CELLS 9

Solid Oxide Fuel Cell: Principle of operation - Benefits and limitations – Cell components – Cathode materials – Anode materials – Interconnects – Fuel reactions –Configurations and performance – Environmental impact – Applications.

Molten Carbonate Fuel Cell: General principle – Components – Electrode reactions – Life time

UNIT V DIRECT METHANOL FUEL CELLS & PROTON EXCHANGE MEMBRANE FUEL CELLS 9

Direct Methanol Fuel Cells: Operating principle – Noble metal issue – Electro-oxidation of methanol - Methanol crossover – Catalyst optimization – Vapor feed versus liquid feed cells.

Proton Exchange Membrane Fuel Cells: Operating principle – Technology

development – Fuel processing – Modeling studies – Technology development and applications.

TOTAL : 45

TEXT BOOKS

1.Viswanathan, B. and Aulice Scibioh, M., Fuel Cells Principles and Applications, Universities Press (India) Pvt. Ltd., Hyderabad, 2006.
2.Hoogers, G., Edr., Fuel Cell Technology Handbook, CRC Press, Washington D.C., 2003.

REFERENCE

1. Larminie, J. and Dicks, A., Fuel Cell Systems Explained, John Wiley & Sons, Ltd., New York, 2001.

SEMESTER	SUBJECT	L	T	P	C
ELECTIVE	ADVANCED PRODUCTION PROCESSES FOR AUTOMOTIVE COMPONENTS	3	0	0	3

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

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

UNIT I POWDER METALLURGY 9

Process flow chart – production of metal powers and their raw materials – Manufacture of friction lining materials for clutches and brakes – testing and inspection of PM parts.

UNIT II FORMING PROCESS 9

Forging – process flow chart, forging of valves – connecting rod, crank shaft, cam shaft, propeller shaft, transmission gear blanks, foot brake linkage, steering knuckles. Extrusion: Basic process steps, extrusion of transmission shaft, steering worm blanks, brake anchor pins, rear axle drive shaft, axle housing spindles, piston pin and valve tappets. Hydro forming: Process, hydro forming of manifold and comparison with conventional methods – Hydro forming of tail lamp housing stretch forming – process, stretch forming of auto body panels – super plastic alloys for auto body panels.

UNIT III GEAR MANUFACTURING 9

Different methods of gear manufacture – Gear hobbig and gear shaping machines specifications – gear generation – different methods – gear finishing and shaving – Grinding and lapping of hobs and shaping cutters – gear honing – gear broaching.

UNIT IV CONCEPT & PROGRAMMING OF CNC MACHINES 9

NC, CNC & DNC – types of CNC – constructional features – drives and control systems – feed back devices – manual part programming – steps involved – sample program in lathe & milling.

UNIT V RECENT TRENDS IN MANUFACTURING OF AUTO COMPONENTS 9

Power injection moulding – Shotpeen hardening of gears – production of aluminum MMC liners for engine blocks – Plasma spray coated engine blacks and valves – Recent developments in auto body panel forming – Squeeze casting of pistons – aluminum composite brake rotors.

TOTAL : 45

TEXT BOOKS

1. Heldt, P.M., High Speed Combustion Engines, Oxford Publishing Co., New York, 1990
2. Groover. M.P. Automatic production systems and computer integrated manufacturing prentice – hall, 1990.

REFERENCE

1. Haslehurst, S.E., Manufacturing Technology, ELBS, London, 1990
2. Rusinoff, Forging and Forming of metals, D.B. Taraporevala Sons & Co., Pvt. Ltd., Mumbai, 1995.
3. Subroff, A.M. & Other, Forging Materials & Processes, Reinhold Book Corporation, New York, 1998.
4. High Velocity Forming of Metals, ASTME, Prentice Hall of India (P) Ltd., New Delhi, 1990

SEMESTER	SUBJECT	L	T	P	C
ELECTIVE	RUBBER TECHNOLOGY FOR AUTOMOBILES	3	0	0	3

Aim : To study about the rubber and plastic components of automobiles.

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

UNIT I INTRODUCTION 9

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

UNIT II STRUCTURE-PROPERTY RELATIONSHIP OF RUBBER 9

Resilience, creep, hysteresis and damping, stabilily, set and stress relaxation, behaviour in dynamic applications.

UNIT III VIBRATION AND RUBBER SPRING 9

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

UNIT IV FLUID SEALINGS AND FLEXIBLE COUPLING AND HOSES 9

Seals for static and dynamic applications - effect of heat/ oil ageing - frictional behaviour - fundamental of sealability.

UNIT V COMPOUNDING AND MANUFACTURE 9

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

TOTAL : 45

TEXTBOOKS

1. Freakley.P.K., and Payne A.R., Theory and Practice of Engineering with Rubber., Applied Science Publishers Ltd.

REFERENCE BOOKS

1. Hobel,E.F., Rubber Springs Design.
2. Blow,C.M. and Hepburn.C, Rubber Technology and Manufacture

SEMESTER	SUBJECT	L	T	P	C
ELECTIVE	COMPUTER SIMULATION OF IC ENGINE PROCESSES	3	0	0	3

Aim : To provide knowledge about computer simulation of IC Engines Process.

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

UNIT I INTRODUCTION 9

Introduction – Heat of reaction – Measurement of URP – Measurement of HRR – Adiabatic flame temperature: Complete combustion in C/H/O/N Systems, Constant volume adiabatic combustion, constant pressure adiabatic combustion. Calculation of adiabatic flame temperature – Isentropic changes of state.

UNIT II SI ENGINE SIMULATION WITH AIR AS WORKING MEDIUM 9

Deviation between actual and ideal cycle – problems, SI engine simulation with adiabatic combustion, temperature drop due to fuel vaporization, full throttle operation – efficiency calculation, part – throttle operation, super charged operation.

UNIT III PROGRESSIVE COMBUSTION 9

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

UNIT IV SIMULATION OF SI ENGINE 9

Intake – Exhaust - Charging and Combustion Simulation for two stroke and four stroke spark ignition engines.

UNIT V DIESEL ENGINE SIMULATION 9

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

TOTAL : 45

TEXT BOOKS

1. Genesan.V., Computer Simulation of spark ignition engine process, Universities press (I) Ltd., Hyderabad, 1996.

REFERENCE BOOKS

1. Ramoss A.L. Modeling of Internal Combustion Engines process, McGraw Hill Publishing Co., 1992
2. Ashley Cambel, Thermodynamics analysis of combustion engines, John Wiley & Son, New York, 1986.
3. Benson, R.S., Whitehouse, N.D., Internal Combustion Engines, Pergamon Press, Oxford,
   1979.

SEMESTER	SUBJECT	L	T	P	C
ELECTIVE	COMPUTER CONTROLED VEHICLE SYSTEMS	3	0	0	3

Aim : To understand modern engine control and safety in transportation

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

UNIT I INTRODUCTION **9**

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

UNIT II ENGINE CONTROL SYSTEM **9**

Fuel control-Ignition control in SI engines- Lamda control- idle speed control- Knock control- cylinder balancing.

UNIT III DRIVE LINE CONTROL SYSTEM **9**

Speed control – gear shifting control – traction /braking- steering- suspension – vehicle handling and ride characteristics of road vehicles- adaptive cruise control.

UNIT IV INTELLIGENT TRANSPORTATION SYSTEM **9**

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

UNIT V SAFETY IMPACTING DEVICES **9**

Vision enhancement- driver conditioning warming- anti-lock braking systems – route guidance and navigation systems – in-vehicle computing – commercial vehicle diagnostic/ prognostics – hybrid/ electric and future cars- case study.

TOTAL : 45

TEXT BOOKS

1. Automotive control systems, U.Kienckeand L. Nielson, SAE and springer-Verlag, 2000

REFERENCE BOOKS

1. Crouse,W.H. & Anglin,D.L., Automotive Mechanics, Intl. Student edition,TMH, New Delhi.
2. Artamonov,M.D.,Harionov,V.A. & Morin,M.m. Motor Vehicle,Mir Publishers,Moscow 1978.
3. Heitner, J., Automotive Mechanics,CBS Publishers,New Delhi 1987.
4. Stockel Martin W and Stocker Martin T., Auto Mechanics Fundamentals,Goodheart Wilcox,South Holland,Illinois,1982.

SEMESTER	SUBJECT	L	T	P	C
ELECTIVE	AUTOMOTIVE SAFETY	3	0	0	3

Aim : To provide knowledge and good exposure to Automotive safety aspects including safety equipments.

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

UNIT I TRENDS IN POWER PLANTS 9

Hybrid vehicles – stratified charged / learn burn engines - Hydrogen engines – battery vehicles – Electric propulsion with cables – magnetic track vehicles.

UNIT II SUSPENSION BRAKES AND SAFETY 9

Air suspension – closed loop suspension – antiskid braking system, Retarders, Regenerative braking safety cage – air bags crash resistance passenger comfort.

UNIT III NOISE & POLLUTION 9

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

UNIT IV VEHICLE OPERATION AND CONTROL 9

Computer Control for pollution and noise control and for fuel economy - transducers and actuators – information technology for receiving proper information and operation fo the vehicle like optimum speed and direction.

UNIT V VEHICLE AUTOMATED TRACKS 9

Preparation and maintenance of proper road network – national highway network with automated roads and vehicles – Satellite control of vehicle operation for safe and fast travel.

TOTAL : 45

TEXT BOOKS

1. "Bosch Hand book", 3rd Edition, SAE, 1993
2. ARAI safety Standards

REFERENCE BOOKS

1. Beranek L.L. "Noise Reduction", McGraw – Hill books Co., Inc, New York, 1993

SEMESTER	SUBJECT	L	T	P	C
ELECTIVE	OPERATIONS RESEARCH	3	0	0	3

Objectives:

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

1. Linear programming **9**

Linear programming problem – Graphical method - Simplex method – Big M method – Duality principle.

2. Transportation model **9**

Transportations problem – Assignment problem – Under Assignment -Traveling salesman problem

3. Network model **9**

Project Network – CPM and PERT Networks – Critical path scheduling – Sequencing Models.

4. Inventory Models **9**

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

5. Decision Model **9**

Decision Model – Game theory – Two Person Zero sum game – Algebraic solutions Graphical solutions – Replacement model – Model based on Service life – Economic life single / multivariable search technique.

TUTORIAL HOURS :15

TOTAL HOURS :60

TEXT BOOK

1.Sundarasen.V, Ganapathy subramaniyam . K.S. Ganesan.K. "Operations Research" ,A.R. Publications.

RFERENCES:

1. Premkumar Gupta, Hira, "Operations Research" Chand & company New Delhi.
2. H.A.Taha, "Operations Research",Prentice Hall of India , 1999, Six Edition.
3. Kanti Swarup,P.K.Gupta,Man Mohan, SultanChand& Sons, New Delhi(2010)

SEMESTER	SUBJECT	L	T	P	C
ELECTIVE	COMPUTATIONAL FLUID DYNAMICS	3	0	0	3

Objectives:

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

To elaborate about FVM flow field calculation

UNIT I GOVERNING EQUATIONS AND BOUNDARY CONDITIONS 12

Basics of computational fluid dynamics – Governing equations of fluid dynamics – continuity, Momentum and Energy equations – Chemical species transport – Physical boundary conditions – Time-averaged equations for Turbulent Flow – Turbulent–Kinetic Energy Equations – Mathematical behavior of PDEs on CFD - Elliptic, Parabolic and Hyperbolic equations.

UNIT II FINITE DIFFERENCE METHOD 12

Derivation of finite difference equations – Simple Methods – General Methods for first and second order accuracy – solution methods for finite difference equations – Elliptic equations – Iterative solution Methods – Parabolic equations – Explicit and Implicit schemes – Example problems on elliptic and parabolic equations.

UNIT III FINITE VOLUME METHOD (FVM) FOR DIFFUSION 12

Finite volume formulation for steady state One, Two and Three -dimensional diffusion problems. One dimensional unsteady heat conduction through Explicit, Crank – Nicolson and fully implicit schemes.

UNIT IV FINITE VOLUME METHOD FOR CONVECTION DIFFUSION 12

Steady one-dimensional convection and diffusion – Central, upwind differencing schemes-properties of discretization schemes – Conservativeness, Boundedness, Trasnportiveness, Hybrid, Power-law, QUICK Schemes.

UNIT V CALCULATION FLOW FIELD BY FVM 12

Representation of the pressure gradient term and continuity equation – Staggered grid – Momentum equations – Pressure and Velocity corrections – Pressure Correction equation, simple algorithm and its variants. Turbulence models, mixing length model, two equation (k-Є) models – High and low Reynolds number models

TOTAL CONTACT HOURS: 60

TEXT BOOKS:

1. T.J. Chung, Computational Fluid Dynamics, Cambridge University, Press, 2002.
2. Versteeg, H.K., and Malalasekera, W., An Introduction to Computational Fluid Dynamics: The finite volume Method, Longman, 1998.
3. Ghoshdastidar , P.S., Computer Simulation of flow and heat transfer, Tata McGraw

REFERENCES:

1. Patankar, S.V. Numerical Heat Transfer and Fluid Flow, Hemisphere Publishing Corporation, 2004.
2. Muralidhar, K., and Sundararajan, T., computationsl Fluid Flow and Heat Transfer,
   Narosa Publishing House, NewDelhi, 1995.
3. Ghoshdastidar P.S., Heat Transfer, Oxford Unversity Press, 2005.
4. Prodip Niyogi, Chakrabarty .S.K., Laha .M.K. Introduction to Computational Fluid Dynamics, Pearson Education, 2005.
5. Introduction to Computational Fluid Dynamics Anil W. Date Cambridge University Press, 2005.

SEMESTER	SUBJECT	L	T	P	C
ELECTIVE	INTRODUCTION TO AIRCRAFT INDUSTRY AND AIRCRAFT SYSTEMS	3	0	0	3

At the end of this elective, student shall be able to:

1. Get an exposure to the Aerospace Industry.
2. Understand the Basics of Aircraft Systems and Aircraft Structures.

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

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

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

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

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

Types of Aircraft Systems.Mechanical Systems.Electrical and Electronic Systems.Auxiliary systems. Mechanical Systems: Environmental control systems (ECS), Pneumatic systems, Hydraulic systems, Fuel systems, Landing gear systems, Engine Control Systems, Ice and rain protection systems, Cabin Pressurization and Air Conditioning Systems, Steering and Brakes Systems Auxiliary Power Unit, Electrical systems: Avionics, Flight controls, Autopilot and Flight Management Systems, Navigation Systems, Communication, Information systems, Radar System

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

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

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

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

Stability and Control

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

Aircraft Performance and Maneuvers

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

REFERENCE BOOKS:

1. Flight without Formulae by A.C Kermode, Pearson Education,10th Edition
2. Mechanics of Flight by A.C Kermode, Pearson Education,5th Edition
3. Fundamentals Of Flight, Shevell, Pearson Education, 2nd Edition
4. Introduction to Flight by Dave Anderson
5. Aircraft Systems: Mechanical, Electrical and Avionics Subsystems Integration by Ian moir, Allan Seabridge
6. An Introduction to Aircraft Certification; A Guide to Understanding Jaa, Easa and FAA by Filippo De Florio, Butterworth-Heinemann

DEPARTMENT OF AUTOMOBILE ENGINEERING

SEMESTER	SUBJECT	L	T	P	C
ELECTIVE	DESIGN OF AIRCRAFT STRUCTURES	3	0	0	3

At the end of this elective, student shall be able to:

1. Industry Practices on Design of Aircraft Structures.
2. Understand the applicability of Design aspects in Aircraft Design.
3. Relate the theoretical knowledge with the design of Aircraft Structures.

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

Introduction, Phases of Aircraft Design, Aircraft Conceptual Design Process, Conceptual Stage, Preliminary Design, Detailed Design, Design Methodologies

Chapter 2-Fundamentals of Structural Analysis, Duration 2 hrs

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

Chapter 3-Introduction to Aircraft Structures, Duration 3 hrs

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

Chapter-4 Aircraft Loads, Duration- 4 hrs

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

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

Material selection criteria, Aluminum Alloys, Titanium Alloys, Steel Alloys, Magnesium Alloys, copper Alloys, Nimonic Alloys, Non Metallic Materials, Composite Materials, Use of Advanced materials Smart materials, Manufacturing of A/C structural members, Overview of Types of manufacturing processes for Composites, Sheet metal Fabrication ,Machining, Welding, Super-plastic Forming And Diffusion Bonding

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

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

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

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

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

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

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

REFERENCE BOOKS:

1. Aircraft Design-A Conceptual Approach by Daniel P.Raymer, AIAA education series,6th Edition
2. Airframe Structural Design by Michael Niu, Conmilit Press, 1988,2nd Edition
3. Airframe Stress Analysis and Sizing by Michael Niu, Conmilit Press, 1999,3rd Edition
4. The Elements of Aircraft Preliminary Design – Roger D. Schaufele, Aries Publications, 2000
5. Aircraft Structural Maintenance by Dale Hurst, Avotek publishers, 2nd Edition, 2006
6. Aircraft Maintenance & Repair by Frank Delp, Michael J. Kroes& William A. Watkins, Glencoe &McGraw-Hill,6th Edition, 1993

DEPARTMENT OF AUTOMOBILE ENGINEERING

SEMESTER	SUBJECT	L	T	P	C
ELECTIVE	PHYSICAL METALLURGY	3	0	0	3

Objective:

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

UNIT I BEHAVIOR OF MATERIALS 9

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

UNIT II MATERIAL TREATMENT 9

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

UNIT III METALLIC & NON-METALLIC MATERIALS 9

Classification-Metallic Materials-Ferrous-steel, types, effects of alloying elements in steel, cast iron-types; Non-Ferrous-aluminium, copper and alloys. Non-Metallic Materials-polymers, ceramics; Properties and applications.

UNIT IV CORROSION 9

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

UNIT V ADVANCED MATERIALS & CHARACTERIZATION 9

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

TOTAL HOURS :45

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

TEXT BOOKS

1. William D Callister "Material Science and Engineering", John Wiley and Sons 2005.
2. Sydney H.Avner "Introduction to Physical Metallurgy" McGraw Hill Book Company.

REFERENCE BOOKS

1. Kenneth G.Budinski and Michael K.Budinski "Engineering Materials" Prentice-Hall of India Private Limited- 4th Indian Reprint 2002.
2. George E.Dieter, "Mechanical Metallurgy"

SEMESTER	SUBJECT	L	T	P	C
ELECTIVE	PROCESS PLANNING AND COST ESTIMATION	3	0	0	3

Aim : To provide knowledge and good exposure to work study and process planning.

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

1. WORK STUDY AND ERGONOMICS 9

Method study – Definition – Objectives-Motion economy- Principles – Tools and Techniques-Applications – Work measurements- purpose – use – procedure – tools and techniques- Standard time –Ergonomics – principles – applications.

2. PROCESS PLANNING 9

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

3. INTRODUCTION TO COST ESTIMATION 9

Importance and aims of cost estimation – functions of estimation – costing – importance and aims of costing – difference between costing and estimation – importance of realistic estimates – estimation procedure. Types of estimates – methods of estimates – data requirements and sources- collection of cost- allowances in estimation.

4. ELEMENTS OF COST 9

Introduction – Material Cost – determination of material cost , Labour cost – Analysis of Overhead Expenses – Factory Expenses – Depreciation – Methods – Administrative Expenses – Marketing Expenses - Ladder of Cost.

5. PRODUCTION COST ESTIMATION 9

Estimation for forging - estimation for welding and gas cutting – estimation in foundry shop – estimation for machining – estimation for drilling and other metal removal operations - Illustrative Examples.

TOTAL HOURS :45

TEXT BOOKS

1. Sinha.B.P., “Mechanical Estimating and Costing”, Tata McGraw-Hill, Publishing Co., 1995

2.Banga.T.R., Sharma.S.C., Mehanical Estimating and Costing, Khanna Publishers, 2006.

REFERENCES

1. Phillip.F Ostwalal and Jairo Munez, “Manufacturing Processes and systems”, John Wiley, 9th Edition, 1998
2. Russell.R.S and Tailor, B.W, “Operations Management”, PHI, 4th Edition, 2003.
3. Chitale.A.V. and Gupta.R.C., “Product Design and Manufacturing”, PHI , 2nd Edition, 2002.

DEPARTMENT OF AUTOMOBILE ENGINEERING

SEMESTER	SUBJECT	L	T	P	C
ELECTIVE	**INDUSTRIAL TRIBOLOGY** (Common to Mech, Auto & Mect)	3	0	0	3

Objectives:

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

UNIT I SURFACES AND FRICTION 9

Topography of Engineering surfaces- Contact between surfaces - Sources of sliding friction – Adhesion-Ploughing- Energy dissipation mechanisms Friction Characteristics of metals - Friction of non metals. Friction of lamellar solids - friction of Ceramic materials and polymers - Rolling Friction - Source of Rolling Friction – Stick slip motion - Measurement of Friction.

UNIT II WEAR 9

Types of wear - Simple theory of Sliding Wear Mechanism of sliding wear of metals - Abrasive wear – Materials for Adhesive and Abrasive wear situations - Corrosive wear - Surface Fatigue wear situations - Brittle Fracture - wear - Wear of Ceramics and Polymers - Wear Measurements.

UNIT III LUBRICANTS AND LUBRICATION TYPES 9

Types and properties of Lubricants - Testing methods - Hydrodynamic Lubrication – Elasto-hydrodynamic lubrication- Boundary Lubrication - Solid Lubrication - Hydrostatic Lubrication.

UNIT IV FILM LUBRICATION THEORY 9

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

UNIT V SURFACE ENGINEERING AND MATERIALS FOR BEARINGS 9

Surface modifications - Transformation Hardening, surface fusion - Thermo chemical processes – Surface coatings - Plating and anodizing - Fusion Processes – Vapour Phase processes - Materials for rolling Element bearings - Materials for fluid film bearings - Materials for marginally lubricated and dry bearings.

TOTALHOURS : 45

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

TEXT BOOK:

1. A.Harnoy “Bearing Design in Machinery “Marcel Dekker Inc, New York, 2003

REFERENCES:

1. M.M.Khonsari & E.R.Booser, “Applied Tribology”, John Willey &Sons, New York, 2001
2. E.P.Bowden and D.Tabor. "Friction and Lubrication ", Heinemann Educational Books Ltd., 1974.
3. A.Cameron, “Basic Lubrication theory ", Longman, U.K.., 1981.
4. M.J.Neale (Editor), “Tribology Handbook ", Newnes. Butter worth, Heinemann, U.K.,

SEMESTER	SUBJECT	L	T	P	C
ELECTIVE	**INDUSTRIAL ROBOTICS** (Common to Mech, Auto & Mect)	**3**	**0**	**0**	**3**

Objectives:

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

UNIT I FUNDAMENTALS OF ROBOT 7

Robot – Definition – Robot Anatomy – Co-ordinate Systems, Work Envelope, types and classification – Specifications – Pitch, Yaw, Roll, Joint Notations, Speed of Motion, Pay Load – Robot Parts and Functions – Need for Robots – Different Applications.

UNIT II ROBOT DRIVE SYSTEMS AND END EFFECTORS 10

Pneumatic Drives – Hydraulic Drives – Mechanical Drives – Electrical Drives – D.C.Servo Motors, Stepper Motor, A.C. Servo Motors – Salient Features, Applications and Comparison of Drives. 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.

UNIT III ROBOT SENSORS AND MACHINE VISION 9

Transducers and sensors – Sensors in robot – Tactile sensor – Proximity and range sensors – Sensing joint forces – Robotic vision system – Image processing and analysis – Image segmentation – Pattern recognition – Training of vision system

UNIT IV ROBOT KINEMATICS AND ROBOT PROGRAMMING 10

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

UNIT VCELL DESIGN APPLICATIONS AND ECONOMICS OF OBOTICS 9

Robot work cell design and control – Safety in Robotics – Robot cell layouts – Multiple robots and machine interference – Robot cycle time analysis – Industrial applications of robots. Economic Analysis of Robots – Pay back Method, EUAC Method, and Rate of Return Method. **TOTAL HOURS : 45**

Text Books:

1. Mikell, P. Groover, Mitchell Weis, Roger, N. Nagel, Nicholas G. Odrey "Industrial Robotics Technology, Programming and Applications", Mc Graw Hill, Int., 1986.
2. Fu. K.S., Cgonzalez R. and Lee C.S.G., "Robotics Control, Sensing, Vision and Intelligence" Mc Graw hill , 1987

Reference Books:

1. Richar. D., Klafter, Thomas, A, Chmielewski, "Machine Negin Robotics Engineering – An Integrated Approach", Prentice Hall of India Pvt., Ltd., 1984.
2. Kozyrey, Yu. "Industrial Robotics" MIR Publishers Moscow, 1985.
3. Deb, S.R. "Robotics Technology and Flexible Automation", Tata McGraw Hill, 1994.
4. Timothy Jordonides etal, "Expert Systems and Robotics", Springer – Verlag, New York, May 1991.

SEMESTER	SUBJECT	L	T	P	C
ELECTIVE	FINITE ELEMENT ANALYSIS	3	0	0	3

Objective:

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

UNIT I 1D FINITE ELEMENT ANALYSIS 12

Historical Background – Weighted Residual Methods – Basic Concepts of FEM – Variational Formulation of B.V.P – Ritz Method – Finite Element Modeling – Element Equations – Linear and Quadratic Shape functions -Bar, Beam Elements – Applications to Heat Transfer.

UNIT II FEA OF 2D PROBLEMS 12

Basic Boundary Value Problems in 2 Dimensions – Triangular, quadrilateral, higher order elements – Poissons and Laplace Equations – Weak Formulation – Elements Matrices and Vectors – Application to Solid mechanics, Heat transfer, Fluid Mechanics.

UNIT III ISO PARAMETRIC FORMULATION 12

Natural Co-ordinate System – Lagrangian Interpolation Polynomials – Iso-parametric Elements – Formulation – Numerical Integration – 1D -2D Triangular elements – rectangular elements – Illustrative Examples.

UNIT IV SOLUTION TO PLANE ELASTICITY PROBLEMS 12

Introduction to Theory of Elasticity – Plane Stress – Plane Strain and Axisymmetric Formulation – Principle of virtual work – Element matrices using energy approach

UNIT V: DYNAMIC ANALYSIS 12

Dynamic Analysis – Equation of Motion – Mass Matrices – Free Vibration analysis – Natural frequencies of Longitudinal – Transverse and torsional vibration – Introduction to transient field problems. Non linear analysis. Use of software – h & p elements – special element formulation.

TUTORIAL HOURS :15

TOTAL HOURS :60

TEXT BOOKS:

1. Chandrupatla & Belagundu, "Finite Elements in Engineering", Prentice Hall of India Private Ltd., 1997.
2. Rao S.S., "Finite Element Method in Engineering" , Pergamon Press, 1989

REFERENCE BOOKS:

1. Reddy J.N. "An Introduction to the Finite Element Method", Mc Graw Hill, International Edition, 1993.
2. Segerlind L.J., "Applied Finite Element Analysis", John Wiley, 1984.

DEPARTMENT OF AUTOMOBILE ENGINEERING

SEMESTER	SUBJECT	L	T	P	C
ELECTIVE	**ENTREPRENEURIAL SKILLS DEVELOPMENT FOR ENGINEERS** (Common to MECH, AUTO, ECE, CSE, IT & BIO-MEDICAL)	**3**	**0**	**0**	**3**

Objectives:

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

UNIT I ENTREPRENEURSHIP 9

Entrepreneur –Definition-Evolution and importance of entrepreneurship-Views and Theories of Entrepreneurship-Traits of Entrepreneurs- Types of Entrepreneurs – Risks and Rewards-Entrepreneur -Technocrat –Manager -Comparison–Role of Entrepreneurship in Economic Development- Factors affecting Entrepreneurial Growth-Engineers as Entrepreneurs-Ten commandments for the beginning entrepreneur.

UNIT 2 MOTIVATION 9

Motivation-Definition and objectives-Types of motivation-Theories of Motivation-Achievement Motivation Training- Self Rating- Business games- Thematic Apperception Test - Stress Management. Entrepreneurship Development Programmes - Need- objectives.

UNIT 3 BUSINESS AND ENTERPRISE MANAGEMENT 9

Business-definition- Classification –Small Enterprises- Characteristics- ownership structure-Various types of ownership-Project Formulation – Steps involved in setting up a Business - Market survey and Research- Techno economic Feasibility Report - Preliminary Project Report-Importance of Project Appraisal-Sources of information-Classification of needs and Agencies – Intellectual Property Rights.

UNIT 4 FINANCIAL MANAGEMENT 9

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

UNIT 5 BUSINESS SICKNESS AND GROWTH STRATEGIES 9

Sickness in small Business –Definition of sick unit- Symptoms of Sickness- Magnitude-Causes and Consequences-Preventive and Corrective measures - Institutional Support to Entrepreneurs- Government Policy for small Enterprises - Growth strategies in small Industry - Expansion- Diversification- Joint venture- Merger- sub-contracting.

TOTAL HOURS :45

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

TEXT BOOKS:

1. S.S. Khanka- Entrepreneurial Development- Chand & Co. Ltd- Ram Nagar - New Delhi- 2005.
2. BhramarbarBadhai-"Entrepreneurship for Engineers"-Dhanpat Rai&co (P) ltd, Delhi-2001.

REFERENCES:

1. EDII - "A manual for Entrepreneurs"- Entrepreneurship Development Institute of India, Ahmedabad- Tata McGrawHill-2006...
2. MSME-'A guide book for new entrepreneurs'-2nd edition-2010.
3. Lawrence R.Jauch, Rajiv Gupta,William F.Glueck-"Business Policy & Strategic Management"- 7th edition-Frank Bros&co.(publishers) ltd,.2007
4. Robert DHisrich, Michael P Peters &Dean A Shepherd-"Entrepreneurship"-TataMcGrawHill, 2008.
5. Mary K Coulter, "Entrepreneurship in Action", Prentice Hall-2006.

SEMESTER	SUBJECT	L	T	P	C
ELECTIVE	**INFORMATION SECURITY** (Common to All Branches)	**3**	**0**	**0**	**3**

AIM

To study the critical need for ensuring Information Security in Organizations

OBJECTIVES

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

UNIT 1 INTRODUCTION 9

History, What is Information Security?, Critical Characteristics of Information, NSTISSC Security Model, Components of an Information System, Securing the Components, Balancing Security and Access, The SDLC, The Security SDLC

UNIT II SECURITY INVESTIGATION 9

Need for Security, Business Needs, Threats, Attacks, Legal, Ethical and Professional Issues

UNIT III SECURITY ANALYSIS 9

Risk Management: Identifying and Assessing Risk, Assessing and Controlling Risk

UNIT IV LOGICAL DESIGN 9

Blueprint for Security, Information Security Poicy, Standards and Practices, ISO 17799/BS 7799, NIST Models, VISA International Security Model, Design of Security Architecture, Planning for Continuity

UNIT V PHYSICAL DESIGN 9

Security Technology, IDS, Scanning and Analysis Tools, Cryptography, Access Control Devices, Physical Security, Security and Personnel

TOTAL : 45

TEXT BOOK

1. Michael E Whitman and Herbert J Mattord, “Principles of Information Security”, Vikas Publishing House, New Delhi, 2003

REFERENCES

1. Micki Krause, Harold F. Tipton, " Handbook of Information Security Management", Vol 1-3 CRC Press LLC, 2004.
2. Stuart Mc Clure, Joel Scrambray, George Kurtz, "Hacking Exposed", Tata McGraw-Hill, 2003
3. Matt Bishop, " Computer Security Art and Science", Pearson/PHI, 2002.