FACULTY OF ENGINEERING, TECHNOLOGY AND MANAGEMENT SCIENCES

VINAYAKA MISSION'S RESEARCH FOUNDATION (Deemed to be University) SALEM (TAMILNADU)

REGULATION - 2016

B.E AUTOMOBILE ENGINEERING (REGULAR) – CBCS

AARUPADAI VEEDU INSTITUTE OF TECHNOLOGY, PAIYANOOR, CHENNAI

VINAYAKA MISSIONS RESEARCH FOUNDATION, SALEM

VINAYAKA MISSSION'S KIRUPANANDA VARIYAR ENGINEERNG COLLEGE
SALEM
AND
AARUPADAI VEEDU INSTITUTE OF TECHNOLOGY, PAIYANOOR, CHENNAI

DEPARTMENT OF MECHANICAL ENGINEERING

BOARD : MECHANICAL ENGINEERING
REGULATION : 2016
PROGRAM : B.E – AUTOMOBILE ENGINEERING - FULL TIME

CURRICULUM & SYLLABUS

SEMESTER I

SL.NO.	COURSE CODE	COURSE TITLE	DEPT	L	T	P	C
THEORY							
1		CALCULUS FOR ENGINEERS	MATHS	3	1	0	4
2		ENGLISH FOR ENGINEERS	ENG	3	0	0	3
3		PHYSICS FOR ENGINEERS	PHY	3	0	0	3
4		ESSENTIALS OF COMPUTER SCIENCE AND ENGINEERING	CSE	3	0	0	3
5		ESSENTIALS OF ELECTRICAL AND ELECTRONICS ENGINEERING	EEE/ECE	3	0	0	3
PRACTICAL							
7		ENGINEERING PHYSICS LAB	PHY	0	0	4	2
8		WORKSHOP PRACTICES	MECH	0	0	4	2
9		COMPUTER LAB	CSE	0	0	4	2
10		ELECTRICAL AND ELECTRONICS ENGINEERING LAB	EEE/ECE	0	0	4	2
TOTAL				15	1	16	24

SEMESTER II

SL.NO.	COURSE CODE	COURSE TITLE	DEPT	L	T	P	C
THEORY							
1		TRANSFORMS AND MATRICES	MATHS	3	1	0	4
2		BUSINESS ENGLISH	ENG	3	0	0	3
3		CHEMISTRY FOR ENGINEERS	CHEM	3	0	0	3
4		‘C’ PROGRAMMING	CSE	3	0	0	3
5		ENGINEERING MECHANICS	MECH	3	1	0	4
PRACTICAL							
7		YOGA AND MEDITATION		0	0	2	2
8		ENGINEERING CHEMISTRY LAB	CHEM	0	0	4	2
9		‘C’ PROGRAMMING LAB	CSE	0	0	4	2
10		ENGINEERING GRAPHICS LAB	MECH	0	0	4	2
TOTAL				15	2	14	25

SEMESTER III

SL.NO	COURSE CODE	COURSE TITLE	DEPT	L	T	P	C
THEORY							
1		**MATHEMATICS FOR MECHANICAL SCIENCES**	**MATHS**	**3**	**1**	**0**	**4**
2		**AUTOMOTIVE PETROL ENGINES**	**AUTO**	**3**	**0**	**0**	**3**
3		**ENGINEERING THERMODYNAMICS**	**MECH**	**3**	**1**	**0**	**4**
4		**FLUID MECHANICS AND STRENGTH OF MATERIALS**	**MECH**	**3**	**1**	**0**	**4**
5		**AUTOMOTIVE DIESEL ENGINES**	**AUTO**	**3**	**1**	**0**	**4**
6		**AUTOMOTIVE ELECTRICAL AND ELECTRONICS SYSTEMS**	**AUTO**	**3**	**0**	**0**	**3**
PRACTICAL							
7		**AUTOMOTIVE ENGINE COMPONENTS LAB**	**AUTO**	**0**	**0**	**3**	**2**
8		**FLUID MECHANICS AND STRENGTH OF MATERIALS LAB**	**MECH**	**0**	**0**	**3**	**2**
9		**AUTOMOTIVE ELECTRICAL AND ELECTRONICS LAB**	**AUTO**	**0**	**0**	**3**	**2**
10		**VALUE ADDED COURSE - I**	**AUTO**	**0**	**0**	**2**	**1**
TOTAL				**18**	**4**	**11**	**29**

SEMESTER IV

SL.NO	COURSE CODE	COURSE TITLE	DEPT	L	T	P	C
THEORY							
1		NUMERICAL METHODS	MATHS	3	1	0	4
2		MANUFACTURING ENGINEERING	MECH	3	0	0	3
3		ENVIRONMENTAL SCIENCE AND ENGINEERING	MECH	3	0	0	3
4		MECHANICS OF MACHINES	MECH	3	1	0	4
5		AUTOMOTIVE CHASSIS	AUTO	3	1	0	4
6		DISASTER MITIGATION AND MANAGEMENT	CIVIL	3	0	0	3
PRACTICAL							
7		AUTOMOTIVE CHASSIS LAB	AUTO	0	0	3	2
8		MANUFACTURING ENGINEERING LAB	MECH	0	0	3	2
9		COMPUTER AIDED DRAFTING LAB	MECH	0	0	3	2
10		VALUE ADDED COURSE - II	AUTO	0	0	2	1
TOTAL				18	3	11	28

SEMESTER V

SL.NO	COURSE CODE	COURSE TITLE	DEPT	L	T	P	C
THEORY							
1		AUTOMOTIVE ENGINE COMPONENTS DESIGN	AUTO	3	1	0	4
2		AUTOMOTIVE TRANSMISSION	AUTO	3	1	0	4
3		COMBUSTION THERMODYNAMICS AND HEAT TRANSFER	MECH	3	1	0	4
4		AUTOMOTIVE FUELS AND LUBRICANTS	AUTO	3	0	0	3
5		MODERN VEHICLE TECHNOLOGY	AUTO	3	0	0	3
6		ELECTIVE -I	AUTO	3	0	0	3
PRACTICAL							
7		AUTOMOTIVE 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		VALUE ADDED COURSE - III	AUTO	0	0	2	1
TOTAL				18	3	14	28

SEMESTER VI

SL.NO	COURSE CODE	COURSE TITLE	DEPT	L	T	P	C
THEORY							
1		VEHICLE BODY ENGINEERING	AUTO	3	0	0	3
2		AUTOMOTIVE CHASSIS COMPONENTS DESIGN	AUTO	3	1	0	4
3		PROFESSIONAL ETHICS AND HUMAN VALUES	MGT	3	0	0	3
4		AUTOMOTIVE POLLUTION CONTROL	AUTO	3	1	0	4
5		ENGINE AND VEHICLE MANAGEMENT SYSTEM	AUTO	3	0	0	3
6		ELECTIVE – II	AUTO	3	0	0	3
PRACTICAL							
7		VEHICLE MODELING LAB	AUTO	0	0	4	2
8		ENGINE TESTING AND EMISSION MEASUREMENT LAB	AUTO	0	0	4	2
9		COMPUTER AIDED MANUFACTURING LAB	AUTO	0	0	4	2
10		VALUE ADDED COURSE - IV	AUTO	0	0	2	1
TOTAL				18	2	14	27

SEMESTER VII

SL.NO	COURSE CODE	COURSE TITLE	DEPT	L	T	P	C
THEORY							
1		VEHICLE TRANSPORT MANAGEMENT	AUTO	3	0	0	3
2		ALTERNATIVE ENERGY SOURCES FOR AUTOMOBILES	AUTO	3	0	0	3
3		VEHICLE MAINTENANCE	AUTO	3	0	0	3
4		TWO AND THREE WHEELER TECHNOLOGY	AUTO	3	0	0	3
5		EMBEDDED ENGINE MANAGEMENT SYSTEMS	AUTO	3	0	0	3
6		ELECTIVE – III	AUTO	3	0	0	3
PRACTICAL							
7		VEHICLE MAINTENANCE AND ENGINE RECONDITIONING LAB	AUTO	0	0	4	2
8		TWO AND THREE WHEELER LAB	AUTO	0	0	4	2
9		MINI PROJECT	AUTO	0	0	4	2
TOTAL				18	0	12	24

SEMESTER VIII

SL.NO	COURSE CODE	COURSE TITLE	DEPT	L	T	P	C
THEORY							
1		ELECTIVE – IV	AUTO	3	0	0	3
2		ELECTIVE – V	AUTO	3	0	0	3
3		ELECTIVE – VI	AUTO	3	0	0	3
PRACTICAL							
4		PROJECT WORK	AUTO	0	0	12	6
TOTAL				9	0	12	15
TOTAL CREDITS			200				

LIST OF ELECTIVES

SL.NO	COURSE CODE	COURSE TITLE	DEPT	L	T	P	C
THEORY							
1		**MODERN AUTOMOBILE ACCESSORIES**	AUTO	3	0	0	3
2		**AUTOMOTIVE SAFETY**	AUTO	3	0	0	3
3		**COMBUSTION THEORY OF IC ENGINES**	AUTO	3	0	0	3
4		**OFF ROAD VEHICLES**	AUTO	3	0	0	3
5		**AUTOMOTIVE INSTRUMENTATION**	AUTO	3	0	0	3
6		**VEHICLE DYNAMICS**	AUTO	3	0	0	3
7		**VEHICLE AIR-CONDITIONING**	AUTO	3	0	0	3
8		**TRACTOR AND FARM EQUIPMENTS**	AUTO	3	0	0	3
9		**AUTOMOTIVE AERODYNAMICS**	AUTO	3	0	0	3
10		**COMBUSTION ENGINEERING**	AUTO	3	0	0	3
11		**FUEL CELL TECHNOLOGY**	AUTO	3	0	0	3
12		**ADVANCED PRODUCTION PROCESSES FOR AUTOMOTIVE COMPONENTS**	AUTO	3	0	0	3
13		**RUBBER TECHNOLOGY FOR AUTOMOBILES**	AUTO	3	0	0	3
14		**COMPUTER SIMULATION OF IC ENGINE PROCESSES**	AUTO	3	0	0	3
15		**COMPUTER CONTROLLED VEHICLE SYSTEMS**	AUTO	3	0	0	3
16		**CRYOGENIC ENGINEERING**	MECH	3	0	0	3
17		**COMPUTATIONAL FLUID DYNAMICS**	MECH	3	0	0	3
18		**EMERGING AUTOMOTIVE MATERIALS**	AUTO	3	0	0	3
19		**METROLOGY AND INSTRUMENTATION**	MECH	3	0	0	3

20		**NEW GENERATION AND HYBRID VEHICLES**	AUTO	3	0	0	3
21		**OPERATION RESEARCH**	MATHS	3	1	0	4
22		**TOTAL QUALITY MANAGEMENT**	MECH	3	0	0	3
23		**ENTERPRENEURSHIP DEVELOPMENT**	MECH	3	0	0	3
24		**INTRODUCTION TO AIRCRAFT INDUSTRY AND AIRCRAFT SYSTEMS**	AERO	3	0	0	3
25		**PROCESS PLANNING AND COST ESTIMATION**	MECH	3	0	0	3

I	**CALCULUS FOR ENGINEERS** **(COMMON TO THE BRANCHES MECH, ECE, CSE, CSSE, EEE, EIE,CIVIL,IT,MECHTRONICS, AERONAUCTICAL ,ETC, AUTOMOBILE)**	**3**	**1**	**0**	**4**

Aim: To impart analytical ability in solving mathematical problems as applied to the respective branches of Engineering.

Objectives:

To provide students with mathematical knowledge and skills needed to support their concurrent and subsequent engineering and science studies

- To improve their ability in solving geometrical applications of differential calculus problems
- To equip themselves familiar with the functions of several variables.
- To have knowledge in multiple calculus
- To improve their ability in Vector calculus

Outcome:

To impart analytical ability in solving Mathematical problems as applied as the respective branches of Engineering.

UNIT I APPLICATION OF DIFFERENTIAL CALCULUS

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

UNIT II FUNCTIONS OF SEVERAL VARIABLES

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

UNIT III INTEGRATION

Concept of integration-Integration of Rational andTrigonometric functions – Using Partial Fractions – Integration by parts.

UNIT IV MULTIPLE INTEGRAL

Double integration –change of order of integration- Cartesian and polar coordinates –Area as a double integral – Triple integration.

UNIT V VECTOR CALCULUS

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).

TEXT BOOK:

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.

REFERENCES:

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.
4. T. Veerarajan, “Engineering Mathematics” (for semester III), Third Edition Tata McGraw- Hill Publishing Company limited.

SEMESTER	SUBJECT	L	T	P	C
I	**ENGLISH FOR ENGINEERS** **(Common for all branches)**	3	0	0	3

Aim: To Strengthens the basic LSRW (Listening, Speaking, Reading and Writing) skills.

Objectives:

1. To enable students to develop LSRW skills in English.
2. To become effective communicators in English.
3. To ensure that learners use Electronic media materials for developing language skills.

Outcome:

Out come of the revised English for Engineers syllabus for the first semester UG engineering students for the academic year 2015- 2016.

1. By teaching this syllabus, our UG Engineering graduates will enable to enhance wide range vocabulary to use at right place in right time.
2. Students who undergo this syllabus will fulfill practice in professional writing and comprehension skill and meet the industry requirements.

Unit – I

Self introduction - Simulations using E Materials - Whatsapp, Face book, Hiker, Twitter- Effective Communication with Minimum Words - Interpretation of Images and Films - Identify the different parts of speech– Common Errors in English – Scientific Vocabulary, (definition and meaning) - Listening Skills- passive and active listening, Listening to native speakers, , guided note taking - Characteristics of a good listener– Telephonic conversation with dialogue.

Unit – II

Articles - Phonetics (Vowels, Consonants and Diphthongs) – Pronunciation Guidelines – Listening to Indian speakers from different regions, intrusion of mother tongue – Homophones – Homonyms, Note taking and Note making - Difference between Spoken and Written English- Use of appropriate language - Listening and Responding to Video Lectures (Green India, environment, social talks) - Extempore.

Unit – III

Tense forms- Verbal &Non verbal communication – Describing objects – Process Description- Speaking Practice – Paragraph Writing on any given topic (My favourite place, games / Hobbies / School life, etc.) –Types of paragraphs- Telephone Etiquettes.

Unit – IV

Impersonal Passive Voice- Conditional Sentences – Technical &Non technical Report Writing (Attend a technical seminar & submit a report) – News Letters & Editing –Skimming & Scanning - How to Improve Reading Speed – Designing Invitations & Poster Preparation.

Unit – V

Sentence Pattern (SVOCA) - Statement of Comparison - Transcoding – Informal letters - SWOT analysis– Resume Writing- Difference –Bio – data, Resume and CV.

References:

1. Practical English Usage- Michael Swan (III edition), Oxford University Press
2. Grammar Builder- I, II, III, and Cambridge University Press.

SEMESTER	SUBJECT	L	T	P	C
I	**PHYSICS FOR ENGINEERS (COMMON TO ALL BRANCHES)**	3	0	0	3

Aim: To Strengthens the fundamental knowledge in physics will improve the scientific thinking of students.

Objective: The fundamental knowledge in physics will improve the scientific thinking of students.

Outcome: To understatnd the elastic properties of materials.

To understatnd the properties of crystals.

To understatnd the significance of laser and its applications in technology.

To understatnd the basic principles of optical fibres and their applications.

To understatnd the Non-Destructive Testing techniques.

UNIT I –Properties of matter **9**

Elasticity – Hooke's law – Stress-strain diagram - Relationship between three moduli of elasticity (qualitative) - Poisson's ratio – Young's modulus by uniform bending and non-uniform bending – Experimental determination of rigidity modulus – I-shaped girders.

UNIT II – Crystal Physics **9**

Unit cell – Bravais lattice – Miller indices – Calculation of number of atoms per unit cell – atomic radius – coordination number – packing factor for SC, BCC, FCC, HCP structures – Crystal imperfections – point, line, surface and volume defects.

UNIT III – Lasers **9**

Laser characteristics - Stimulated Emission – Population Inversion - Einstein coefficients – Lasing action – Types of Laser – Nd:YAG laser, CO_2 laser, GaAs laser – Applications of Laser – Holography – construction and reconstruction of a hologram

UNIT IV – Fibre Optics **9**

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 – fibre optic displacement sensor and pressure sensor.

UNIT V - Non – Destructive Testing **9**

Introduction – Types of NDT - Liquid penetrant method – characteristics of penetrant and developer - ultrasonic flaw detector – Ultrasonic scanning methods - X-ray Radiography: displacement method – X-ray Fluoroscopy.

Total hours 45

TEXT BOOK

"Engineering Physics", compiled by Department of Physics, Vinayaka Missions University, Salem.

REFERENCE BOOKS

1. Beiser, Arthur, "Concepts of Modern Physics", 5th Ed., McGraw-Hill, 2009.

2. Halliday.D, Resnick.R, Walker.J, Fundamentals of Physics, Wiley & sons, 2013.

3.Gaur R. K. and Gupta S. L., “Engineering Physics”, DhanpatRai publishers, New Delhi, 2001.

4. Avanadhanulu.M.N., ArunMurthy.T.V.S, Engineering Physics Vol. I, S.Chand, 2014.

5. Rajendran. V, “Engineering Physics”, Tata McGraw Hill Publication and Co., New Delhi, 2009.

SEMESTER	SUBJECT	L	T	P	C
I	**ESSENTIALS OF COMPUTER SCIENCE AND ENGINEERING (COMMON TO ALL BRANCHES)**	3	0	0	3

AIM: To study the basics of Computer, Hardware, Software Applications, Algorithms and Problem solving
methodologies.

OBJECTIVES:

- To provide basic knowledge on hardware and software components of computers.
- To introduce and demonstrate various software applications
- To introduce Problem solving methodologies
- To learn about Implementation of Algorithms
- To learn about HTML

OUTCOME

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 - Basics of Computer and Information Technology **10**

Computer – Generations, Types of Computers, Block diagram of a computer- Components of a computer system - Hardware and software definitions - Categories of software – Booting - Installing and Uninstalling a Software - Software piracy - Software terminologies - Applications of Computer - Role of Information Technology - History of Internet - Internet Services.

UNIT II - Software Applications (Practical Learning) **7**

Office Automation: Application Packages - Word processing (MS Word) - Spread sheet (MS Excel) – Presentation (MS PowerPoint).

UNIT III - Problem Solving Methodologies **10**

Problems Solving Techniques - Program Development Cycle – Algorithm Development - Flow chart generation – Programming Constructs (Sequential, Decision-Making, Iteration) - Types and generation of programming languages

UNIT IV Implementation of Algorithms **9**

Implementation of Algorithms-program verification-The efficiency of algorithms-The analysis of algorithms-Fundamental Algorithms

UNIT V HTML **9**

Basics of HTML – Applications of HTML – HTML Fonts – anchor tag and its attributes – Using images in HTML programs – list tag - Table tag – HTML forms

TOTAL HOURS: 45

TEXT BOOKS

1. *Essentials of Computer Science and Engineering – by VMU*

SEMESTER	SUBJECT	L	T	P	C
I	**ESSENTIALS OF ELECTRICAL AND ELECTRONICS ENGINEERING (COMMON TO AERO, AUTO, CIVIL, MECH)**	3	0	0	3

OBJECTIVE: To provide the basic knowledge about EEE

To provide an understanding of fundamentals of Electrical and Electronics Engineering.

OUTCOME:

The student will be able to identify and understand the operation of electrical and electronic components and design circuits.

A) ELECTRICAL ENGINEERING

UNIT I Electrical Circuits & Meters 9

Definition of electromotive force, current, power and energy-InternationalSystem of units-Ohm's law and Kirchhoff's laws-solution of series and parallel Circuits.

Generation of alternating voltage-average and RMS values-solution of simple R,RL,RC and RLC circuits- Calculation of power and power factor in ACcircuits.

Construction and principles of operation of moving coil,moving iron anddynamometer instruments.

UNIT II DC Machines (Qualitative Treatment Only) 8

Dc machines –parts-DC generator-EMF equation-Different types of DCgenerators and their applications-DC motors and their applications-different types-speed control-Starters.

UNIT III AC Machines (Qualitative Treatment Only) 6

Construction & principle of operation of transformers-Single phase & Three phasetransformers-Construction and operation of AC motors-Single phase and three phase Induction motors-applications-construction, principles of operation and application of synchronous motors.

B) BASIC ELECTRONICS ENGINEERING

UNIT I: SEMICONDUCTOR DEVICES 8

Passive and Active Components - Resistors, Inductors, Capacitors, Characteristics of PN Junction Diode - Zener Diode and its Characteristics - Half wave and Full waveRectifiers - Voltage Regulation. Bipolar Junction Transistor, FET, MOSFET & UJT.

UNIT II: DIGITAL FUNDAMENTALS 8

Number Systems – Binary, Octal, Decimal and Hexa-Decimal – Conversion from one to another – Logic Gates – AND, OR, NOT, XOR, Universal Gates – Adders, Multiplexer, De Multiplexer, Encoder, Decoder – Memories – PAL, PLA.

UNIT III: COMMUNICATION AND ADVANCED GADGETS 8

Modulation andDemodulation – AM, FM, PM – RADAR – Satellite Communication – Optical Fibre Communication, Mobile Communication, Digital TV, HD Video Camera, Smart Phones – Block diagrams Only.

TEXT BOOKS

1. "Basic Electrical and Electronics Engineering", compiled by Department of EEE&ECE faculty of Engineering & technology, VMRFDU, Anuradha Agencies,2006.
2. Edward Hughes, "Electrical and Electronics Technology", Pearson Education Limited, Ninth edition,2005.
3. "Basic Electrical and Electronics Engineering", Compiled by Department of EEE & ECE, Faculty of Engineering and Technology, VMRFDU, Anuradha agencies,2006.

4. Edward Hughes, "Electrical and Electronics Technology",Pearson Education Limited, Ninth edition, 2005.
5. "Basic Electrical and Electronics Engineering", Compiled byDepartment of EEE & ECE, Faculty of Engineering and Technology, VMRFDU, Anuradha agencies,2006

REFERENCES

1. B.R. Guptha, “Principles of Electrical Engineering “ ,S.Chand& Co,2002.
2. I.J.Nagrath, “Elements of Electrical Engineering”, Tata McGraw Hill Publishing Co.,2002.
3. H.Cotton.” Advanced Electrical Technology”, Wheeler,1983.
4. Principles of Communication Engineering, S.Chand& Co, 1994.
5. John Kennedy "Electronics Communication System" TataMcGraw Hill, 2003
6. Millman and Halkias, "Electronic Devices and Circuits", TataMcGraw hill.

SEMESTER	SUBJECT	L	T	P	C
I	**PHYSICS LAB (REAL AND VIRTUAL) (COMMON TO ALL BRANCHES)**	**0**	**0**	**3**	**2**

Aim: To provide the knowledge about basics of physics

Objective: Students will have the knowledge of taking measurements precisely.

Outcome: To understand the experiments through online virtual demonstration followed by real hands-on experience.

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

SEMESTER	SUBJECT	L	T	P	C
I	**ELECTRICAL AND ELECTRONICS ENGINEERING LAB (COMMON TO CIVIL, AUTO , AERO, MECH)**	**3**	**0**	**0**	**2**

AIM: To provide the basic skills of EEE

OBJECTIVE:

To provide exposure to the students with hands on experience on various basic Engineering practices in Electrical and Electronics Engineering.

OUTCOME:

Development of skills in electrical and electronic devices.

LIST OF EXPERIMENTS

A) ELECTRICAL ENGINEERING LAB

1. Residential house wiring using switches, fuse, indicator, lamp and energymeter.
2. Fluorescent lamp wiring.
3. Stair case wiring
4. Measurement of electrical quantities – voltage, current, power & power factor in RLC circuit.
5. Measurement of energy using single phase energy meter.
6. Measurement of resistance to earth of an electrical equipment.

B) ELECTRONICS ENGINEERING LAB

1. Characteristics of PN junction Diode.
2. Characteristics of Zener diode.
3. Input, Output characteristics of BJT.
4. Transfer characteristics of JFET.
5. Amplitude Modulation
6. Frequency Modulation.

SEMESTER	SUBJECT	L	T	P	C
I	**COMPUTER SCIENCE LAB (COMMON TO ALL BRANCHES)**	0	0	3	2

AIM

To practice the basics of office automation application, SQL and basic HTML coding

OBJECTIVE

To familiarize students with the basic tools of computer and their application in engineering & technology

OUTCOME

At the end of the course, the students would have develop their skills for Office automation, SQL queries and Html

1. Implement Mail Merge in MS-Word and send letters to parents regarding the semester fee structure of the student.
2. Using MS-Word, create a leave letter addressed to your faculty advisor
3. A) Using MS-Word, create a table for a list of students with different font sizes and colours

   B) Using MS-Word, create a flow-chart using the basic shapes available. Use page border, a watermark, header and footer
4. Using MS-PowerPoint, create a presentation about the university
5. Using MS-PowerPoint, create a story line with various animations and transition effects.
6. Using MS-Excel, Analyze Students performance using MS-Excel and prepare a chart type report.
7. Using MS-Excel, create a pivot table
8. Using MS-Excel, create look-up tables
9. Using MS-Excel, create graphs for the weather condition in various cities of India
10. Create an HTML page Create an HTML page to
    a) Click on a link and go to the bottom of the page using <a href>
    b) Display an image.
11. Create an HTML page to
    a) Display ordered and unordered lists of your friends names and sports persons
    b) Display a table with 3 columns and 4 rows.

SEMESTER	SUBJECT	L	T	P	C
I	**WORKSHOP PRACTICES LAB (COMMON TO ALL BRANCHESEXCEPT BIO-TECH)**	**0**	**0**	**3**	**2**

AIM

The aim of the lab to learn Business fitting, Carpentry and welding technics.

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. Square Joint
2. Dove Tail Joint

CARPENTRY

1. Half Lap Joint
2. Dove Tail Joint

WELDING

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

CASTING

1. Foundry – Mould Preparation using single piece pattern

DEMONSTRATION

1. Sheet Metal – Fabrication of cone
2. Black Smithy – Round to square rod

Reference:

1. "Basic Workshop Practice", Department of Mechanical Engineering, Vinayaka Missions University

SEMESTER	SUBJECT	L	T	P	C
II	**TRANSFORMS AND MATRICES** **(COMMON TO THE BRANCHES MECH, ECE, CSE, CSSE, EEE, EIE,CIVIL,IT,MECHTRONICS, AERONAUCTICAL ,ETC, AUTOMOBILE)**	3	1	0	4

Aim: To provide students with mathematical knowledge and skills needed to support their concurrent and subsequent engineering and science studies

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

- To utilize the powerful features of MATLAB one has to be an expert in Matrix theory
- The matrix theory plays a vital role in simplifying large arrays of equation and in determining their solution.
- Partial differential equation frequently occurred in the theory of elasticity and Hydraulics.
- In circuit branches the current flow can be calculated by using Laplace transform when EMF, resistance and inductions are known.

Outcome:

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

UNIT I
MATRICES

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

UNIT II
LAPLACE TRANSFORMS

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 III
INVERSE LAPLACE TRANSFORMS & APPLICATIONS

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.

UNIT IV
FOURIER TRANSFORMS

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

UNIT V

RANSFORMS

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

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.
4. A.Singaravelu,"Transforms and Partial Differential Equations", MeenakshiAgencies,Chennai

REFERENCE BOOKS

1. Grewal, B.S., "Higher Engineering Mathematics" (36th Edition), KhannaPublishers,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 & III (4th edition), S.Chand& Co., New Delhi., 2001

SEMESTER	SUBJECT	L	T	P	C
II	**BUSINESS ENGLISH** **(Common for all branches)**	3	0	0	3

Aim: To provide the basic knowledge of business english

Objectives:

1. To impart and enhance corporate communication.
2. To enable learners to develop presentation skills.
3. To build confidence in learners to use English in Business contexts.

Outcome:

Out come of the revised Business English syllabus for the second semester UG engineering students for the academic year 2015-2016.

1. It is hoped that this syllabus will able to communicate with a range of formal and informal context.
2. This syllabus will enable the students to undergo in activities, demonstrating interaction skills and consider how own communication is adjusted in different scenario.

Unit – I

Subject and verb agreement (Concord) – Preposition and Relative Pronoun – Cause and effect- Phrasal Verbs – Idioms and Phrases – Listening comprehension - Listening to Audio Files and Answering Questions – Framing Questions – Negotiation skills, Persuasion Skills and Debating skills.

Unit – II

Stress (Word stress and Sentence stress) – Intonation – Difference between British and American English– Vocabulary – Indianism - Compound Words(including technical terminology).

Unit – III

Reading Skills – Understanding ideas and making inferences – Group Discussion – Types of Interviews, FAQs – e- mail Netiquette, Sample e-mails – Watching Documentary Films and responding to questions.

Unit – IV

Corporate communication – Recommendation - Instruction – Check List- circulars- Inter office memo – Minutes of meeting and Writing agenda – Discourse Markers- Rearranging the jumbled sentences – Technical Articles – Project Proposals, Making Presentations on given topics – Preparing Power Point Presentations.

Unit – V

Critical Reading – Book Review - Finding Key Information and Sifting Facts from Opinions – Business letters (Calling for Quotation, Placing orders and Complaint letters) – Expansion of an Idea. – Creative Writing.

References:

1. Grammar Builder- I, II, III -Cambridge University Press.
2. Technical English-Writing, Reading and Speaking- Pickett and Lester, Harper and Row publication

SEMESTER	SUBJECT	L	T	P	C
II	**CHEMISTRY FOR ENGINEERS** **(COMMON TO ALL BRANCHES)**	3	0	0	3

AIM

To impart in basic knowledge in chemistry so that the student will understand the engineering concept and they can face the competitive examinations effectively.

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: ELECTROCHEMISTRY, BATTERIES AND FUEL CELLS 9 Hrs

Ostwald Law and Debye Huckle's law - Electrode potential - Nernst equation – Electrodes (SHE, Calomel and Glass)- cells - EMF measurement-emf and galvanic series.

Primary battery (Daniel and dry cell) – secondary battery (lead Acid storage battery and Nickel-Cadmium battery) – Fuel cell (H_2-O_2 fuel cell)

UNIT II : WATER TECHNOLOGY & CORROSION 9 Hrs

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 (Electroplating,Electroless plating, Sacrificial anode and Impressed current method).

UNIT III: CHEMISTRY OF ADVANCED MATERIALS 9 Hrs

Refractories – properties and uses, Portland cement –manufacturing, setting and hardening – Special cement, ceramics.

Organic electronic material, shape memory alloys, smart materials,polymers(PVC,Teflon, Bakelite)- fibers(optical fibre) & composites (FRP,MMC & PMC)

UNIT IV : PHASE EQUILIBRIA & NUCLEAR CHEMISTRY 9 Hrs

Phase rule: statement and explanation of terms involved – One component system (water) – Condensed phase rule – Two component system (Lead-silver) .

Nuclear Chemistry – Fission – Fusion – working of nuclear reactor – Radiations and harmful effects.

UNIT V : CHROMATOGRAPHY AND SPECTROSCOPY 9 Hrs

Chromatography — classification (Paper, Column, Thin Layer, Gas, HPLC). Principle and applications.

Spectroscopy – Electromagnetic radiation – Beer Lambert's law – UV – Visible – IR – Atomic absorption & flame emission spectroscopy (Principle,Instrumentation, block diagram).

TEXT BOOK: Engineering Chemistry by VMU.

References:

1. A text book of Engineering Chemistry by S.S. Dara, S.Chand& company Ltd., New Delhi
2. Engineering Chemistry by Jain & Jain, 15th edition Dhanpatrai Publishing Company (P) Ltd., New Delhi
3. A text book of Engineering Chemistry by ShashiChawla,Edition 2012 Dhanpatrai& Co., New Delhi.
4. Engineering Chemistry by Dr.A.Ravikrishnan,Sri Krishna Publications, Chennai.

SEMESTER	SUBJECT	L	T	P	C
II	**C - PROGRAMMING (COMMON TO ALL BRANCHES)**	3	0	0	3

AIM:

The aim is to introduce C programming to the students.

OBJECTIVES:

- To introduce Basics of C
- To understand Control Structures & Arrays
- To learn about String concept, Structure and Union in C
- To introduce the concepts of Functions and Pointers
- To introduce Memory and File management concepts in C

OUTCOME

At the end of this course, student shall be able to know the concepts of C programming techniques.

UNIT I - Basics of C **9**

Identifiers, variables, expression, keywords, data types, constants, scope of variables. Operators: arithmetic, logical, relational, conditional and bitwise operators - Special operators: size of () & comma (,) operator - Precedence and associatively of operators - Type conversion in expressions.

UNIT II - Control Structures & Arrays **9**

Basic input/output and library functions: Single character input/output i.e. getch(), getchar(), getche(), putchar() - Formatted input/output: printf() and scanf() – Library functions (mathematical and character functions). Decision Making and Branching – Looping statements. Arrays – Initialization – Declaration – One dimensional and two dimensional arrays.

UNIT III String, Structure & Union **9**

Strings: Declaration-Initialization and string handling functions. Structure and Union: structure declaration and definition – Accessing a Structure variable – Structure within a structure – Union.

UNIT IV Functions and Pointers **9**

Function –Function Declaration–function definition- Pass by value – Pass by reference – Recursive function – Pointers - Definition – Initialization – & and * operators - Pointer to functions-Function returning pointers – Pointers and arrays

UNIT V Memory and File management **9**

Static and dynamic memory allocation - Storage class specifier - Preprocessor directives. File handling concepts – File read – write- Functions for file manipulation: 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.

TOTAL HOURS: 45

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.

SEMESTER	SUBJECT	L	T	P	C
II	ENGINEERING MECHANICS (COMMON TO AERO, AUTO, CIVIL, MECH)	3	0	0	3

AIM:

The aim is to introduce basics of solid mechanics to the students.

OBJECTIVES:

To create and understanding of statics and dynamics of bodies in rest or in motion.

OUTCOME

At the end of this course, student will be in a position to design mechanical systems independently.

UNIT 1. BASICS & STATICS OF PARTICLES 9

Introduction - Units and Dimensions - Laws of Mechanics - Lame's theorem. Parallelogram and triangular law of forces - Coplanar Forces - Resolution and Composition of forces - Equilibrium of a particle - Forces in space - Equilibrium of a particle in space - Equivalent systems of forces - Principle of transmissibility - Single equivalent force.

UNIT 2. EQUILIBRIUM OF RIGID BODIES 9

Free body diagram - Types of supports and their reactions - requirements of stable equilibrium - Moments and Couples - Moment of a force about a point and about an axis - Vectorialrepresentaion of moments and couples - Scalar components of a moment - Varignon's theorem - Equilibrium of Rigid bodies in two dimension - Equilibrium of Rigid bodies in three dimensions.

UNIT 3. PROPERTIES OF SURFACES AND SOLIDS 9

Determination of Areas and Volumes - First moment of area the Centroid of sections - Rectangle, circle, triangle from integration - T section, I section, Angle section, Hollow section by using standard formula - second and product moments of plane area - Rectangle, triangle, circle from integration - T section, I section, Angle section, Hollow section by using standard formula - Parallel axis theorem and perpendicular axis theorem - Polar moment of inertia - Principle moments of inertia of plane areas - Principle axes of inertia - Mass moment of inertia.

UNIT 4. FRICTION AND ELEMENTS OF RIGID BODY DYNAMICS 9

Frictional force - Laws of Coloumb friction - simple contact friction - Rolling resistance - Belt friction. Translation and Rotation of Rigid Bodies - Velocity and acceleration - General Plane motion.

UNIT 5. DYNAMICS OF PARTICLES 9

Displacement, Velocity and acceleration, their relationship - Relative motion - Curvilinear motion - Newton's law - Work Energy equation of particles - Impulse and Momentum - Impact of elastic bodies.

TOTAL: 45 PERIODS

TEXT BOOKS :

1. Beer & Johnson, Vector Mechanics for Engineers. Vol.I Statics and Vol. II Dynamics, McGraw Hill International Edition, 1995.

2. KottiswaranN,Engineering Mechanics-Statics &Dynamics,SriBalaji Publications,2014.
3. Meriam, Engineering Mechanics, Vol. I Statics & Vol. II Dynamics 2/e, Wiley Intl., 1998.

REFERENCE BOOKS :

1. Rajasekaran.S, and Sankara Subramanian G, “Engineering Mechanics”, Vikas Publishing Co. New Delhi.
2. Irving H. Sharma, Engineering Mechanics - Statics & Dynamics, III Edition, Prentice Hall of India Pvt. Ltd., 1993.
3. K.L.Kumar, Engineering Mechanics III Edition, Tata McGraw Hill Publishing Co. Ltd., 1998

SEMESTER	SUBJECT	L	T	P	C
II	**C – PROGRAMMING LAB (COMMON TO ALL BRANCHES)**	0	0	3	2

AIM

To practice and develop applications using C Programming languages.

OBJECTIVE

To make the students to develop program in C languages.

OUTCOME

At the end of the course, the students will be able to develop applications using C Programming languages.

1. Write a C Program to Implementation of Sine and cosine series
2. Write a C Program to calculate Simple Interest
3. Write a C Program to generate Fibonacci Series using for loop
4. Write a C program to calculate factorial using while loop
5. Write a C Program to
   a) Find the greatest of three numbers using if condition.
   b) Find the greatest of three numbers using conditional operator.
6. Write a C program for finding the roots of a given quadratic equation using conditional control statements
7. Write a C program to
   a) Compute matrix multiplication using the concept of arrays.
   b) Illustrate the concept of string handling functions.
8. Write a C program to
   a) Find the largest element in an array using pointers.
   b) Convert a binary number to decimal or decimal to binary using functions.
9. Write a C program to read data from keyboard, write it to a file named student again read the same data from student file and write it into data file.
10. Write a C program to store employee details using the concept of structures.

SEMESTER	SUBJECT	L	T	P	C
II	**ENGINEERING GRAPHICS LAB (COMMON TO ALL BRANCHES EXCEPT BIO-TECH))**	3	0	0	2

AIM:

AN INTRODUCTION OF CAD SOFTWARE AND ITS UTILITIES IN ENGINEERING FIELDS.

OBJECTIVES:

1. To improve imagination skills.
2. Increase ability to communicate with people.
3. Learn to sketch and take field dimensions.
4. Learn to take data and transform it into graphic drawings.
5. Learn basic engineering drawing formats.
6. Prepare the student for future Engineering positions.

COURSE OUTCOMES:

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

1. Get acquainted with the knowledge of various lines, geometrical constructions and construction of various kinds of scales, and Ellipse.
2. Improve their imagination skills by gaining knowledge about points, lines and planes.
3. Become proficient in drawing the projections of various solids. 4. Gain knowledge about orthographic and isometric projections.

Concepts and conventions (Not for Examination)

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

UNIT I PLANE CURVES AND FREE HAND SKETCHING 9

Conics – Construction of ellipse-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 II PROJECTION OF POINTS, LINES 9

Projection of points, Projection of straight lines located in the first quadrant: inclined to both planes – Determination of true lengths and true inclinations – rotating line method only.

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

UNIT V ISOMETRIC VIEW AND PERSPECTIVE PROJECTION 9

Principles of isometric View – isometric scale – isometric view of simple solids- Introduction to Perspective projection

TEXT BOOKS:

1. N.D. Bhatt, "Engineering Drawing" Charotar Publishing House, 46th Edition, (2003).
2. K. V. Natarajan, "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.
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).

SEMESTER	SUBJECT	L	T	P	C
II	**ENGINEERING CHEMISTRY LAB (REAL & VIRTUAL) (COMMON TO ALL BRANCHES EXCEPT BIO-TECH)**	0	0	3	2

AIM

To impart in basic knowledge in chemistry so that the student will understand the engineering concept.

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. Estimation of dissolved oxygen by Winkler's method.
3. Estimation of ferrous ion by Potentiometry.
4. Precipitation reaction 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.
9. Separation of mixture of components using thin layer chromatography.
10. Corrosion experiment by weight loss methods.

SEMESTER	SUBJECT	L	T	P	C
III	**MATHEMATICS FOR MECHANICAL SCIENCES** **(**Common to MECH,AUTO and AERO**)**	**3**	**1**	**0**	**4**

Aim: *The aim of the subject is to provide a fundamental knowledge of Partial differential equation andFourier series.*

Objectives:

1. *Partial differential equation arises in most of the Engineering discipline when the number of independent variables in the given problem under discussion is two or more.*
2. *Fourier series is used to express even aperiodic functions in terms of periodic functions making them amenable for further processing.*

Outcome:

1. *The student will understand the usage of Fourier series application in the field of heat diffusion, wave propagation and in signal and systems analysis.*

UNIT-I PARTIAL DIFFERENTIAL EQUATIONS 12

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.

UNIT-II FOURIER SERIES 12

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

UNIT-III BOUNDARY VALUE PROBLEMS 12

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.

UNIT-IV STANDARD DISTRIBUTIONS 12

Binomial – Poisson- Geometric –Uniform – Exponential - Gamma and Normal Distributions and their MGF and Properties (Mean Variance and Problems).

UNIT-V STATISTICS 12

Measures of central tendency, Curve fitting - Straight line and Parabola by least square method, Correlation, Rank correlation and Regression.

TUTORIAL : 15 HOURS
TOTAL HOURS: 60 HOURS

TEXT BOOKS:

1. A.Singaravelu, “Transforms and Partial Differential Equations”, Meenakshi Agencies,Chennai.
2. A.Singaravelu, “Probability and Statistics”, Meenakshi Agencies,Chennai.
3. S.C.Gupta,V.K.Kapoor, “Fundamentals of mathematical statistics”,Sultan Chand&Sons.

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.
4. T.Veerarajan, “Probability, Statistics and Random processes” (Second Edition), Tata McGraw-Hill Publishing Company Ltd., New Delhi(2006).
5. Johnson. R.A., “Miller & Freund’s Probability and Statistics for Engineers”, Sixth Edition, Pearson education, Delhi, 2000. (Chapters 7,8,9,12).

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

Aim: *The aim of the subject is to provide fundamental knowledge of automotive petrol engines.*

Objectives:
1.To understand fundamentals of SI engine 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.
5.To understand the types of combustion and combustion chamber.

Outcome:
1.The student will undergo a sequential understanding of the concept, construction and required components of automotive petrol engine to provide environmental friendliness.

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

Carburetor working principle, requirements of an automotive carburetor, 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: 45HOURS

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**

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

Objectives:

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

Outcome:

2. *The student will understand concept of heat and work to implement the efficient conversion between them in the applications like IC engine, steam power plant,domestic refrigerators and air conditioners.*

UNIT –I BASIC CONCEPTS AND FIRST LAW OF THERMODYNAMICS 9

Definition of Thermodynamics, macroscopic and microscopic approach, thermodynamic systems and surroundings, thermodynamic properties, thermodynamic equilibrium, state, path, process and cycle, reversible and irreversible processes, work, energy, and heat, state postulate and Zeroth- law of thermodynamics, thermometer and thermometric property, temperature Scales.

Internal energy, First law of thermodynamics, perpetual motion machine of the first kind PMM I, application of first law to non-flow processes or closed system and related problems, application of first law to steady flow process, steady flow energy equation. Problems

UNIT –II SECOND LAW OF THERMODYNAMICS 9

Limitations of First law of thermodynamics, thermal reservoir, heat engine, refrigerator, and heat pump, statements of Second law of thermodynamics, perpetual motion machine of II Kind - PMM II, Carnot cycle, , Carnot theorem, corollary of Carnot's theroem, Clausius inequality. Problems on heat engine ,refrigerator and heat pump. Entropy, Temperature – entropy diagram, entropy changes for a closed system. Problems on entropy change calculations in different processes. Availability and irreversibility , available and unavailable energy, availability in non-flow and steady flow systems. Problems on irreversibility and avaialbility.

UNIT –III PURE SUBSTANCES AND THERMODYNAMIC RELATIONS 9

Definition of pure substance, phase change of a pure substance, p-T diagram, p-V-T Surface, phase change terminology, property diagram in common use. Formation of steam, sensible heat, latent heat, dryness fraction, enthalpy, superheated steam, thermodynamic properties of steam and steam table, work, internal energy, entropy calculation, Mollier diagram, calorimeters for determination of dryness fraction.

Problems determining thermodynamic properties of steam.

Thermodynamic relations : Thermodynamic potentials, thermodynamic gradients, general thermodynamics relations, entropy (Tds) equations, equations for internal energy and enthalpy, equation of state, coefficient of expansion and compressibility, specific heats, Joule Thomson coefficient, Clausius –Claperyon equation, Maxwell's relations.

UNIT –IV GASES AND VAPOUR MIXTURES 9

Ideal gas, equation of state for a perfect gas, Joules law, internal energy, enthalpy & specific heat capacities of an ideal gas, real gases, Van der waals equation – Amagats experiment , the cooling effect. Law of corresponding states, reduced properties, compressibility chart. Problem on calculation of properties ideal and real gases. Daltons law, Gibbs – Daltons law, volumetric analysis of a gas mixture, apparent molecular weight and gas constant, specific heats of a gas mixture, adiabatic mixing of perfect gases. Problems on gas mixture property values.

UNIT –V FUELS AND COMBUSTION 9

Characteristics of an ideal fuel, properties of fuel , flash point , fire point, cloud point, pour point, viscosity, combustion reaction and combustion analysis, theoretical air and excess air, stoichiometric air fuel ratio, analysis of combustion products, internal energy and enthalpy of formation, calorific value, determination of calorific value of fuels, Junkers gas calorimeter, Orsat apparatus, exhaust gas analyser, problem on calculation of air fuel ratio.

TUTORIAL : 15 HOURS
TOTAL HOURS: 60 HOURS

TEXT BOOKS

1. Nag.P.K. - "Engineering Thermodynamics", IV Edition, Tata McGraw-Hill-New Delhi- 2008.
2. Rajput. R.K.,"A Textbook of Engineering Thermodynamics", Third Edition, Laxmi Publications, New Delhi, 2005.

REFERENCES

1. Yunus.A.Cengel, Michael A.Boles, Thermodynamics: An Engineering Approach, McGraw-Hill, 2011.
2. Spalding & Cole., Engineering Thermodynamics, ELBS.
3. Van Wylen & Sonntag., Fundamentals of Classical Thermodynamics – Tata Mc Graw Hill.
4. Rogers & Mayhew, Engineering Thermodynamics – Addision Wesley.

SEMESTER	SUBJECT	L	T	P	C
III	**FLUID MECHANICS AND STRENGTH OF MATERIALS** (Common to MECT and AUTO)	3	1	0	4

Aim: *The aim of the subject is to provide fundamental concepts of fluid mechanics and strength of materials.*

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 form deflection equations of beams and columns for different end conditions.*
4. *To understand fluid property and flow characteristics.*
5. *To understand flow dynamics and measurement.*

Outcome: *3. The student will understand fundamental concepts of mechanics of materials and fluids.The knowledge acquisition will enhance the selection, design and application of materials and fluids in the desired fields of functioning.*

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 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-IV FLUID PROPERTY AND FLOW CHARACTERISTICS 9

Surface tension – Capillarity – Viscosity – Newton's law – Fluid pressure and pressure head - Fluid velocity – Uniform and steady flow – Reynolds number - Classification as laminar and turbulent flow – Continuity equation.

UNIT-V FLOW DYNAMICS AND MEASUREMENT IN PIPE NETWORKS 9

Euler's and Bernoulli's Equations – Manometer, Venturi meter and orifice meter - Pressure losses along the flow – Categorisation into minor losses - Flow through circular pipes – Statement of Darcy – Weisbach equation – Friction factor – Pipes in series and parallel - Hydraulic gradient

TUTORIAL : 15 HOURS
TOTAL HOURS: 60 HOURS

TEXT BOOKS

1. R. K. Rajput, 'Strength of Materials (Mechanics of Solids)', S. Chand & Company Ltd., 2003.
2. R.K., Bansal, A text book on Fluid Mechanics & Hydraulic Mechanics,- M/s. Lakshmi Publications (P) Ltd, 2004.

REFERENCES

1. Ryder G.H- "Strength of Materials"- Macmillan India Ltd.- Third Edition- 2007
2. K. L. Kumar, 'Engineering Fluid Mechanics', S. Chand & Company Ltd., 2002.

SEMESTER	SUBJECT	L	T	P	C
III	AUTOMOTIVE DIESEL ENGINES	3	1	0	4

Aim: *The aim of the subject is to study and understand the automotive diesel engines.*

Objectives:

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*

Outcome: *1.The student will undergo a sequential understanding of the concept, construction and required components of automotive diesel engine to provide environmental friendliness.*

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 specification

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.

UNIT-IIIAIR 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.

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.

TUTORIAL : 15 HOURS
TOTAL HOURS: 60 HOURS

TEXT BOOKS

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
III	AUTOMOTIVE ELECTRICAL AND ELECTRONICS SYSTEMS	3	0	0	3

Aim: *The aim of the subject is to provide knowledge and understanding on various types of automotive electrical and electronics systems*

Objectives:

1. *To understand the types of battery and its constructions.*
2. *To impart the knowledge of starting systems of the vehicle.*
3. *To understand the various types of charging system & lighting system.*
4. *To impart the knowledge of fundamental of automotive electronics.*
5. *To impart the knowledge of sensors and actuators.*

Outcome: *1.The student will understand construction and required components of automotive electrical and electronics systems to provide efficient and environmental friendly operation of automobiles.*

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&LIGHTING SYSTEM 9

Generation of direct current, shunt generator characteristics, armature reaction,third brush regulation, cutout. Voltage and current regulators, compensatedvoltage regulator, alternators principle and constructional aspects and bridgerectifiers, new developments.Lighting system: insulated and earth return system, details of head light and sidelight, LED lighting system, head light dazzling and preventive methods – Horn,wiper system and trafficator.

UNIT- IV FUNDAMENTALS OF AUTOMOTIVE ELECTRONICS9

Current trends in automotive electronic engine management system, electromagnetic interference suppression, electromagnetic compatibility, electronic dashboard instruments, onboard diagnostic system, security and warning system.

UNIT- V SENSORS AND ACTUATORS 9

Types of sensors: sensor for speed, throttle position, exhaust 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. 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. Younng A.P & Griffiths L, "Automobile Electrical and Electronic Equipments", English Languages Book Society & New Press, 1990
4. Tom Weather Jr and Cland C.Hunter, "Automotive Computers and Control system", Prentice Hall Inc., New Jersey.

REFERENCES

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

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

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

Objectives:

1. *To understand the dismantling of 4 and 6 cylinder engines.*
2. *To understand the assembly of 4 and 6 cylinder engines.*
3. *To study the engine accessories and their functions.*

Outcome:

4. *The student will undergo training in the dismantling and assembly of engine components and acquire knowledge to modify them according to the need.*

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.

TOTAL: 30 HOURS

SEMESTER	SUBJECT	L	T	P	C
III	**FLUID MECHANICS AND STRENGTH OF MATERIALS LAB** **(**Common to MECT and AUTO**)**	**0**	**0**	**4**	**2**

Aim: *The main objective of this lab is to practice the mechanisms behind fluid flow and understand the property measurement and strength of materials.*

Objectives:
1. *To get practice in fluid flow measurement and losses.*
2. *To understand the operation of pumps.*
3. *To get practice in material property measurement.*

Outcome: *1. The student will undergo training in the fluids and materials mechanisms and properties.*

LIST OF EXPERIMENTS:

1. A comparative analysis of Coefficient of discharge using Orifice meter & venturimeter.
2. Determination of pipe loses-major & minor.
3. Demonstration of centrifugal pump/submersible pump/jet pump/reciprocating pump.
4. Determination of Tensile strength and Compression strength on a given specimen.
5. Determination of shear strength of Mild steel and Aluminium rods
6. Determination of Torsional strength of mild steel rod
7. Determination of Impact strength
8. Conduct of Hardness test on metals - Brinell and Rockwell Hardness.
9. Conduct of Deflection test on beams

.

TOTAL: 30 HOURS

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

Aim: *To familiarize and train the students on the constructional arrangements of different electrical system of automobiles and study the automobile electronics components.*

Objectives:

1. *To get practice in battery tests and starting system trouble shouting.*
2. *To understand the operation of alternator.*
3. *To study temperature and speed measurement.*

Outcome: *1. The student will undergo training in the electrical systems and automotive electronics.*

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. Study of Temperature measurement using thermocouple.
9. Study of Speed & Torque measurement using thermocouple.
10. Study of optical sensor

TOTAL: 30 HOURS

SEMESTER	SUBJECT	L	T	P	C
IV	NUMERICAL METHODS (COMMON TOMECH,AERO,AUTO,MECT, CIVIL & EEE)	3	1	0	4

Aim: *To impart knowledge on numerical methods for engineers.*

Objectives:

1. *Computing the trajectory of a spacecraft requires the accurate numerical solution of a system of ordinary differential equations.*
2. *It is used in Kinematics Simulation, Complex System Optimization*
3. *Car companies can improve the crash safety of their vehicles by using computer simulations of car crashes. Such simulations essentially consist of solving partial differential equations numerically.*
4. *Numerical linear algebra is important for data analysis.*
5. *Airlines use sophisticated optimization algorithms to decide ticket prices, airplane and crew assignments and fuel needs. Historically, such algorithms were developed within the overlapping field of operations research.*

Outcome: *The student will understand the usage of numerical methods application in the field of engineering.*

UNIT- I SOLUTION OF EQUATIONS AND EIGEN VALUE PROBLEMS 12

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 12

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 12

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 12

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 12

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.

LECTURE : 45 HOURS

TUTORIAL : 15 HOURS
TOTAL HOURS: 60 HOURS

TEXT BOOKS

1. N.Subramanian, "Numerical Methods" ,SCM Publishers,Erode.
2. B.S.Grewal, "Higher Engineering Mathematics", Khanna Publishers, New Delhi.

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

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

Aim: *To provide knowledge and understanding on various types of manufacturing processes*

Objectives:

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.*

Outcome: *4. The student will acquaint with various types of manufacturing processes.*

UNIT- I INTRODUCTION AND CASTING 9

Casting types, procedure to make sand mould, types of core making, moulding tools, machine moulding, special moulding processes – CO_2 moulding; shell moulding, investment moulding, permanent mould casting, pressure die casting, centrifugal casting, continuous casting, casting defects.

UNIT- II WELDING 9

Classification of welding processes. Principles of Oxy-acetylene gas welding. A.C metal arc welding, resistance welding, submerged arc welding, tungsten inert gas welding, metal inert gas welding, plasma arc welding, thermit welding, electron beam welding, laser beam welding, defects in welding, soldering and brazing.

UNIT III MACHINING 13

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

UNIT- IV FORMING AND SHAPING OF PLASTICS 7

Types of plastics - Characteristics of the forming and shaping processes – Moulding of Thermoplastics – Working principles and typical applications of - Injection moulding – Plunger and screw machines – Blow moulding – Rotational moulding – Film blowing – Extrusion - Typical industrial applications – Thermoforming – Processing

of Thermosets – Working principles and typical applications - Compression moulding – Transfer moulding – Bonding of Thermoplastics – Fusion and solvent methods – Induction and Ultrasonic methods.

UNIT- V METAL FORMING AND POWDER METALLURGY 9

Principles and applications of the following processes: Forging, Rolling, Extrusion, Wire drawing and Spinning, Powder metallurgy – Principal steps involved advantages, disadvantages and limitations of powder metallurgy.

TOTAL: 45 HOURS

TEXT BOOKS

1. Hajra Choudhury, "Elements of Workshop Technology", Vol. I and II, Media Promoters and Publishers Pvt., Ltd., Mumbai, 2005.
2. Nagendra Parashar B.S. and Mittal R.K., "Elements of Manufacturing Processes", Prentice- Hall of India Private Limited, 2007.

REFERENCES

1. Serope Kalpajian, Steven R.Schmid, "Manufacturing Processes for Engineering Materials", 4/e, Pearson Education, Inc. 2007.
2. Jain. R.K., and S.C. Gupta, "Production Technology", 16th Edition, Khanna Publishers, 2001.
3. "H.M.T. "Production Technology – Handbook", Tata McGraw-Hill, 2000.

SEMESTER	SUBJECT	L	T	P	C
IV	**ENVIRONMENTAL SCIENCE AND ENGINEERING (COMMON TO ALL BRANCHES OF B.E./B.Tech./BBA/BCA- CBCS Regulations 2015)**	**3**	**0**	**0**	**3**

Aim: *To provide knowledge and understanding on various types environmental pollutions and social issues.*

Objectives:
1. *To create awareness on the various pollutions and their impact.*
2. *To provide comprehensive insight in natural resources.*
3. *To educate the ways and means to protect natural resources.*
4. *To impart fundamental knowledge on human welfare measures.*

Outcome:
5. *The student will acquaint with various measures to counter environmental pollutions.*

UNIT - I - ENVIRONMENT AND NATURAL RESOURCES 9 hrs

Environment - Definition, scope & importance - Public awareness- Forest resources, mineral resources , water resources, food resources , energy resources (uses, over -exploitation & adverse effects in each case) - Scope & role of environmental engineers in conservation of natural resources - Sustainability development.

UNIT-II-ECOSYSTEMS AND BIO – DIVERSITY 9 hrs

Ecosystem - Definition, structure and function - Energy flow -Ecological succession - food chain, food web, ecological pyramids- Introduction, types, characteristics, structure and function of forest, grassland, desert and Aquatic ecosystems - Bio - Diversity :values and uses, hotspots, threats and conservation.

UNIT - III -ENVIRONMENTAL POLLUTION 9hrs

Pollution - Definition , manmade impacts and control measures of air, water and land pollution - Water quality standards & characterization - Importance of sanitation - Nuclear hazards – Hazardous waste management : Solid waste, waste water and biomedical waste - Prevention of pollution and role of individual – Disasters management : Floods, earthquake, cyclone and landslides - Clean technology options.

UNIT-IV-SOCIAL ISSUES AND ENVIRONMENT 9 hrs

Urban problems related to energy - Water conservation – Resettlement and rehabilitation of people - Environmental ethics - Climate change - Global warming - Acid rain - Ozone depletion- Waste land reclamation, Environment Protection Act for air, water, wild life and forests - Pollution Control Board.

UNIT -V-HUMAN POPULATION AND ENVIRONMENT 9 hrs

Population growth - Population explosion - Family welfare programme -

Environment & human health - Human rights – Value education - Women and child welfare, Role of information technology in environment and human health.

TOTAL: 45 HOURS

TEXT BOOKS :

1. Environmental Science and Engineering by Dr.A. Ravikrishnan, Sri Krishna Publications, Chennai.

REFERENCES :

1. Wager K.D. "Environmental Management", W.B. Saunders Co. Philadelphia, USA, 1998.
2. Bharucha Erach "The Biodiversity of India" Mapin Publishing Pvt Ltd, Ahmedabad, India
3. Trivedi R.K. " Handbook of Environmental Laws", Rules, Guidelines,Compliances and Standards Vol I & II, Enviro media.
4. Environmental Science and Engineering by Dr. J. Meenambal ,MJP Publication , Chennai Gilbert M. Masters : Introduction to Environmental Engineering and Science , Pearson Education PvtLtd., II Edition, ISBN 81-297-0277-0, 2004
5. Miller T.G. Jr Environmental Science Wadsworth Publishing Co.
6. Townsend C. Harper J. and Michael Begon, Essentials of Ecology,Blackwell Science.

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

Aim: *To provide knowledge and understanding on mechanics of machines*

Objectives:

1. *To understand the types of kinematics of mechanisms.*
2. *To impart knowledge on the various types of gears and gear trains.*
3. *To understand the effect of friction.*
4. *To impart the knowledge of static force analysis.*
5. *To impart the knowledge of balancing and vibrations.*

Outcome: *The student will understand concept of kinematics and kinetics to apply in the field of engineering.*

UNIT- I KINEMATIC OF MECHANICS 10

Mechanisms – Terminology and definitions – kinematics inversions of 4 bar and slide crank chain – kinematics analysis in simple mechanisms – velocity and acceleration polygons – Analytical methods – computer approach – cams – classifications – displacement diagrams - layout of plate cam profiles – derivatives of followers motion – circular arc and tangent cams.

UNIT- II GEARS AND GEAR TRAINS 9

Spur gear – law of toothed gearing – involute gearing – Interchangeable gears – Gear tooth action interference and undercutting – nonstandard teeth – gear trains – parallel axis gears trains – epicyclic gear trains – automotive transmission gear trains

UNIT- III FRICTION 8

Sliding and Rolling Friction angle – friction in threads – Friction Drives – Friction clutches – Belt and rope drives – brakes – Tractive resistance.

UNIT- IV FORCE ANALYSIS 9

Applied and Constrained Forces – Free body diagrams – static Equilibrium conditions – Two, Three and four members – Static Force analysis in simple machine members – Dynamic Force Analysis – Inertia Forces and Inertia Torque – D'Alembert's principle – superposition principle – dynamic Force Analysis in simple machine members.

UNIT- V BALANCING AND VIBRATION 9

Static and Dynamic balancing – Balancing of revolving and reciprocating masses – Balancing machines – free vibrations – Equations of motion – natural Frequency – Damped Vibration – bending critical speed of simple shaft – Torsional vibration – Forced vibration – harmonic Forcing – Vibration solution.

TUTORIAL : 15 HOURS
TOTAL HOURS: 60 HOURS

TEXT BOOKS

1. Ambekar A.G., ―Mechanism and Machine Theory‖ Prentice Hall of India, New Delhi, 2007
2. Shigley J.E., Pennock G.R and Uicker J.J., ―Theory of Machines and Mechanisms‖, Oxford University Press, 2003.
3. Khurmi.R.S. and Gupta ., Theory of Machines , S.Chand @ Co., 2005.

REFERENCES

1. Thomas Bevan, ―Theory of Machines‖, CBS Publishers and Distributors, 1984.
2. Ghosh.A, and A.K.Mallick, ―Theory and Machine‖, Affiliated East-West Pvt. Ltd., New Delhi, 1988.
3. Rao.J.S. and Dukkipatti R.V. ―Mechanisms and Machines‖, Wiley-Eastern Ltd., New Delhi, 1992.
4. Ramamurthi. V., "Mechanisms of Machine", Narosa Publishing House, 2002.
5. Robert L.Norton, "Design of Machinery", McGraw-Hill, 2004.

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

Aim: *To provide knowledge and understanding on various types of automotive chassis*

Objectives:

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.*

Outcome: *1. The student will acquaint with chassis components of automobiles.*

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: 60 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
IV	DISASTER MITIGATION AND MANAGEMENT	3	0	0	3

Aim: *To impart awareness on disasters and preparedness during disasters.*

Objectives:

1. *To Understand basic concepts in Disaster Management*
2. *To Understand Definitions and Terminologies used in Disaster Management*
3. *To Understand the Challenges posed by Disasters*
4. *To understand Impacts of Disasters*

Outcome: *The student will acquaint awareness on disasters and preparedness during disasters.*

UNIT 1 INTRODUCTION **9**

Concept of disaster; Different approaches; Concept of Risk; Levels of disasters; Disaster phenomena and events *(Global, national and regional)*; Natural and man-made hazards

UNIT 2 RISK ASSESSMENT AND VULNERABILITY ANALYSIS **9**

Response time, frequency and forewarning levels of different hazards; Characteristics and damage potential of natural hazards; hazard assessment ;Dimensions of vulnerability factors; vulnerability assessment; Vulnerability and disaster risk; Vulnerabilities to flood and earthquake hazards

UNIT 3 DISASTER MANAGEMENT MECHANISM **9**

Concepts of risk management and crisis management -Disaster management cycle ;Response and Recovery ; Development, Prevention, Mitigation and Preparedness-Planning for relief

UNIT 4 DISASTER RESPONSE **9**

Mass media and disaster management-Disaster Response Plan; Communication, Participation, and Activation of Emergency Preparedness Plan-Logistics Management-Psychological Response-Trauma and Stress Management-Rumour and Panic Management-Minimum Standards of Relief-Managing Relief-Funding

UNIT 5 DISASTER MANAGEMENT IN INDIA **9**

Strategies for disaster management planning; Steps for formulating a disaster risk reduction plan; Disaster management Act and Policy in India; Organisational structure for disaster management in India; Preparation of state and district disaster management plans

Text books

1. Alexander, D. *Natural Disasters,* ULC press Ltd, London, 1993.

2. Carter, W. N. *Disaster Management: A Disaster Management Handbook,* Asian Development Bank, Bangkok, 1991.
3. Chakrabarty, U. K. *Industrial Disaster Management and Emergency Response,* Asian Books Pvt. Ltd., New Delhi 2007.

References

1. Abarquez I. & Murshed Z. *Community Based Disaster Risk Management: Field Practitioner's Handbook,* ADPC, Bangkok, 2004.
2. Goudie, A. *Geomorphological Techniques,* Unwin Hyman, London 1990.
3. Goswami, S. C. *Remote Sensing Application in North East India,* Purbanchal Prakesh, Guwahati, 1997.
4. *Manual on Natural Disaster Management in India,* NCDM, New Delhi, 2001.
5. *Disaster Management in India,* Ministry of Home Affairs, Government of India, New Delhi, 2011.
6. *National Policy on Disaster Management,* NDMA, New Delhi, 2009.
7. *Disaster Management Act. (2005),* Ministry of Home Affairs, Government of India, New Delhi, 2005.

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

Aim: *The main objective of this course is to impart knowledge in the assembling and dismantling of different types of systems like steering system, transmission system, electrical system, ignition system, injection system, and braking system.*

Objectives:

1. *To impart the knowledge of Vehicle chassis.*
2. *To understand the steering system.*
3. *To Understand the injection and brake system..*

Outcome:

1. *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

- Leyland
- Hyundai i20
- 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: 30 HOURS

SEMESTER	SUBJECT	L	T	P	C
IV	**MANUFACTURING ENGINEERING LAB** (Common to MECT, AUTO and AERO)	0	0	4	2

Aim: *To impart training in turning, milling and grinding operations in different types of machines*

Objectives:
1. *To impart training in turning.*
2. *To understand the drilling machine operations.*
3. *To Understand the shaping and grinding machines.*

Outcome: *1. At the end of the course the student will be well versed in the turning, milling and grinding operations.*

OBJECTIVES:

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

1. Plain turning and step turning on lathe.
2. Taper turning on lathe.
3. Thread cutting on lathe.
4. Drilling, reaming and tapping in a drilling machine.
5. Plain milling.
6. Making square shape job in shaping machine.
7. Making Cutting key ways in a slotting machine.
8. To Perform Grinding process using a grinding machine.

TOTAL: 30 HOURS

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

Aim: *To study about 2D and 3D modeling techniques of automobile components.*

Objectives:
1. *To impart the knowledge of Knuckle Joint, Gib and Cotter Joint.*
2. *To impart the knowledge of engine components modelling in 3D.*

Outcome:
1. *Students will skillfully assemble simple machine components, measure and create assembly drawings using Computer Aided drafting software.*

INTRODUCTION TO 2D MODELING

1. 2D Drawing by using CAD software - Knuckle Joint
2. 2D Drawing by using CAD software – Gib and Cotter Joint
3. 2D Drawing by using CAD software - Screw Jack

INTRODUCTION TO 3D MODELING

Creation of 3D Models - Wire Frame, Surface, Solid modeling Techniques Using CAD Packages – CSG, B-Rep Approaches in Solid Modeling - Feature Based Modeling Technique – Assembly – Detailing - Exposure to Industrial Components – Application of GD&T

4. 3D Modeling by using CAD software –Valve Assembly
5. 3D Modeling by using CAD software – Bushed Bearing
6. 3D Modeling by using CAD software – Crank shaft
7. 3D Modeling by using CAD software – Piston and Connecting Rod

TOTAL HOURS: 30

3 TEXT BOOKS

1. Bhatt-N.D.-"Machine Drawing"-Published by R.C.Patel-Chartstar Book Stall-Anand- India- 2003.
2. P.S.G. Design Data Book.

REFERENCES

1.Sidheswar- N. - Kanniah- P. and Sastry- V.V.S. - “Machine Drawing ". TMH., connecting rod, valve assembly, manifold, crankshaft, bearing, Universal Joint, engine assembly.

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

Aim: *To study and purpose is to understand automotive engine design.*

Objectives:
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 knowledge of connecting rod and crankshaft.*
5. *To understand the design of valves and flywheel*

Outcome: *The student will acquaint with chassis components design.*

UNIT- I INTRODUCTION 9

Classification of design – Engineering materials and their physical properties as applied to design – Selection of materials – Factors of safety in design – Endurance limit of materials – Determination of endurance limit for ductile materials – Notch sensitivity – Principle of design optimization – Future trends – CAD Euler's formula – – Rankine's formula – Tetmajer's formula – Johnson formula – Design of push rods and eccentricity loaded columns – Reduction of stress concentration.

UNIT- II DESIGN OF SHAFTS AND SPRINGS 9

Introduction – Material and design stresses – Design of axles – Design of shafts on the basis of strength – Design of shaft on the basis of rigidity – Design of hollow shafts – Design of close coiled helical spring subjected to axial loading – Torsion 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
V	AUTOMOTIVE TRANSMISSION	3	1	0	4

Aim: *To provide knowledge and understanding on various types gear drives and transmission in automobiles.*

Objectives:
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.*

Outcome: *1. The student will acquaint with transmission gear boxes and drives.*

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

Aim: *To provide knowledge and understanding on combustion and heat transfer in engineering applications.*

Objectives:

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

Outcome: *1. The student will acquaint with the concept and application of fuel combustion and heat transfer in engineering components.*

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	AUTOMOTIVE FUELS AND LUBRICANTS	3	0	0	3

Aim: *To provide knowledge and understanding on the use of fuels and lubricants in various types of automobiles.*

Objectives:

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 knowledge on properties and testing of fuels*
5. *To understand the combustion & fuel ratings.*

Outcome: *1. The student will acquaint with the use of fuels and lubricants.*

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.

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	MODERN VEHICLE TECHNOLOGY	3	0	0	3

Aim: *To study and* understand the modern vehicle's technology.

Objectives:

1. *To impart the knowledge of Modern Vehicles.*
2. *To understand the Power System and New Generation Vehicles.*
3. *To Understand the Vehicle Operation and Control.*
4. *To Impart The Knowledge of Vehicle Automated Tracks.*
5. *To Impart The Knowledge of Suspension, Brakes, Aerodynamics and Safety.*

Outcome: *1. The student will understand concept of modern vehicles like maglev, HCCI, FFV and fuel cell.*

UNITIINTRODUCTION 7

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

UNIT II POWER SYSTEM AND NEW GENERATION VEHICLES 12

Hybrid Vehicle engines, Stratified charge engines, learn burn engines, low heat rejection engines, hydrogen engines, HCCI engine, VCR engine, surface ignition engines, VVTI engines. High energy and power density batteries, fuel cells, solar panels, flexible fuel systems.

UNIT III VEHICLE OPERATION AND CONTROL 9

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

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UNIT IV VEHICLE AUTOMATED TRACKS 9

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

UNIT V SUSPENSION, BRAKES, AERODYNAMICS AND SAFETY 8

Air suspension – Closed loop suspension, compensated suspension, anti skid braking system, retarders, regenerative braking, safety gauge air backs- crash resistance. Aerodynamics for modern vehicles, safety systems, materials and standards

TOTAL: 45 HOURS

TEXT BOOKS:

1. Heinz, "Modern Vehicle Technology" Second Edition, Bu
2. Bosch Hand Book, SAE Publication, 2000

REFERENCES

1. Light weight electric for hybrid vehicle design.
2. Advance hybrid vehicle power transmission, SAE.
3. Noise reduction, Branek L.L., McGraw Hill Book company, New York, 1993.

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

Aim: *To impart knowledge on fuel and lubricant properties and its measurement techniques.*

Objectives: *1. To impart the knowledge of fuel property testing..*

2. To understand the Temperature dependence of viscosity of lubricants & Fuels.

3. To understand the properties of grease.

Outcome: *4. The student will understand the methods of measurement of fuel and lubricant properties.*

List of experiments :

1. Study of International and National standards for fuels and lubricants.
2. Study of Octane and Cetane Number of fuels.
3. ASTM distillation test of gasoline.
4. Aniline Point test.
5. Calorific value of liquid fuel.
6. Calorific value of gaseous fuel.
7. Flash and Fire points of petrol , diesel and lubricants.
8. Temperature dependence of viscosity of lubricants & Fuels by Redwood Viscometer.
9. Viscosity Index of lubricants & Fuels by Saybolt Viscometer
10. Drop point of grease and mechanical penetration in grease.

TOTAL: 30 HOURS

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

Aim: *To impart knowledge on heat transfer*

Objectives: *1. To impart the knowledge of conductive, radiative and onvective heat transferrin engineering applications.*

Outcome: *1. The student will understand the methods of heat transfer in engineering components.*

List of Experiments :

1. To determine the thermal conductivity of a lagged pipe.
2. To determine the thermal conductivity of a solid by the guarded hot plate method.
3. To determine the heat transfer through composite wall apparatus.
4. To find the effectiveness of a pin fin in a rectangular duct under natural convective & forced convective condition and plot temperature distribution along its length.
5. To determine the surface heat transfer coefficient for a heated vertical tube under natural convection and plot the variation of local heat transfer coefficient along the length of the tube. Also compare the results with those of the correlation.
6. To determine average heat transfer coefficient for an externally heated horizontal pipe under forced convection & plot Reynolds and Nusselt numbers along the length of pipe. Also compare the results with those of the correlations.
7. To measure the emissivity of the gray body (plate) at different temperature and plot the variation of emissivity with surface temperature.
8. To find overall heat transfer coefficient and effectiveness of a heat exchange under parallel & counter flow conditions. Also plot the temperature distribution in both the cases along the length of heat of heat exchanger.
9. To verify the Stefan-Boltzmann constant for thermal radiation.
10. Study and demonstration of boiler.

TOTAL: 30 HOURS

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

Aim: *To impart knowledge on vehicle design and data characteristics.*

Objectives: *1. To impart the knowledge of resistances and performance of automobile.*

Outcome: *1. The student will design a vehicle countering various resistances to provide the desired performance.*

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: 30 HOURS

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

Aim: *The aim of the subject is to study and understand the automotive body building technology.*

Objectives:

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*

Outcome: *1.The student will undergo a sequential understanding of the different types of car, tanker,bus and commercial vehicle bodies.*

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-VI 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	AUTOMOTIVE CHASSIS COMPONENTS DESIGN	3	1	0	4

Aim: *To study and purpose is to design of chassis.*

Objectives:
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.*

Outcome: *The student will understand to design chassis of automobiles.*

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	AUTOMOTIVE POLLUTION CONTROL	3	1	0	4

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

Objectives:

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* CI engines.
5. *To understand the measurement technique and emission standards.*

Outcome: *The student will understand concept of pollutant formation and control techniques.*

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: 60 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	ENGINE AND VEHICLE MANAGEMENT SYSTEM	3	0	0	3

Aim: *To study and purpose is to understand engine management system*

Objectives:

1. *To understand the types sensors.*
2. *To impart knowledge on SI and CI engine management system.*
3. *To understand the vehicle management systems.*

Outcome: *The student will understand concept of electronic management of engine and vehicle.*

UNIT I FUNDAMENTALS OF AUTOMOTIVE ELECTRONICS 10

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

UNIT II SENSORS 12

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

UNIT III SI ENGINE MANAGEMENT 13

Three way catalytic converter, conversion effciency versus lambda. Layout and working of SI engine management systems like Bosch L-Jetronic and LH-Jetronic. Group and sequential injection techniques. Working of the fuel system components. Cold start and warm up phases, idle speed control, acceleration and full load enrichment, deceleration fuel cutoff. Fuel control maps, open loop control of fuel injection and closed loop lambda control. Electronic ignition systems and spark timing control. Closed loop control of knock.

UNIT IV CI ENGINE MANAGEMENT 13

Fuel injection system parameters affecting combustion, noise and emissions in CI engines. Pilot, main, advanced post injection and retarded post injection. Electronically controlled Unit Injection system. Layout of the common rail fuel injection system. Working of components like fuel injector, fuel pump, rail pressure limiter, flow limiter, EGR valve

UNIT V VEHICLE MANAGEMENT SYSTEMS 12

ABS system, its need, layout and working. Electronic control of suspension – Damping control, Electric power steering, Supplementary Restraint System of air bag system – crash sensor, seat belt tightening. Cruise control. Vehicle security systems- alarms, vehicle tracking system. On board diagnostics. Collision avoidance Radar warning system.

TOTAL: 45 HOURS

TEXT BOOKS:

1. William B Ribbens "Understanding Automotive Electronics", SAE Publications, 1998
2. Eric Chowanietz "Automobile Electronics" SAE Publications, 1994

REFERENCES:

1. Robert Bosch "Diesel Engine Management" SAE Publications, 2006.
2. Robert Bosch, "Gasoline Engine Management" SAE Publications, 2006.

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

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

Objectives:

1. *To understand SI engine testing procedures.*
2. *To impart knowledge on the various types pollution measuring instruments and methods.*

Outcome: *The student will understand concept of measurement of emissions by various methods.*

List of Experiments:

1. Valve Timing and Port Timing Diagrams.
2. Performance Test on 4-stroke Diesel Engine.
3. 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. Demonstration of HC, CO, CO_2, O_2 using exhaust gas analyzer.
10. Demonstration of diesel engine smoke Measurement.

TOTAL: 30 HOURS

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

Aim: *To impart knowledge on types of vehicles drafting using CAD sofware.*

Objectives:

1. *To understand the drafting of various types of car models.*
2. *To understand the tanker and tractor body model.*
3. *To impart the knowledge of Aerodynamic car models.*

Outcome: *The student will understand to model different types of automobile models by using CAD software.*

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: 30 HOURS

SEMESTER	SUBJECT	L	T	P	C
VI	COMPUTER AIDED MANUFACTURING LAB	0	0	4	2

Aim: *1. To gain knowledge about CNC programming*
Objectives: *1. To get the hands on training in CNC trainer machines*

Outcome: *The student will simulate various CNC maching and generate codes using CAM software.*

Introduction:

1. Study of G and M codes
2. Manual Part Programming for CNC Machines using Stand G and M Code.
3. Machining practice on Trainer Type CNC Machines-
4. Simulation of tool path using any CAM Software

Part programming in CNC Milling:

1. Point to point motions
2. Linear motions
3. Circular interpolations
4. Contour motions
5. Rectangular pocketing
6. Mirroring
7. Circular Pocketing
8. Fixed /canned cycles
9. Subroutines

Part programming for CNC Turning :

1. Turning and facing
2. Step turning, Taper Turning
3. Grooving
4. Fixed/Canned Cycles :
5. Thread cutting Cycles
6. Peek Drilling Cycles

SEMESTER	SUBJECT	L	T	P	C
VII	VEHICLE TRANSPORT MANAGEMENT	3	0	0	3

Aim: *The aim of the subject is to study and understand the transport systems*

Objectives:
1. *To understand the transport systems.*
2. *To understand the scheduling and fare structure.*
3. *To understand the motor vehicle act*
4. *To impart the various types of maintenance*
5. *To understand the fare structure.*

Outcome: *1. The student will undergo a sequential understanding of the vehicle transport systems and management.*

UNIT- I INTRODUCTION **9**

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

UNIT- II TRANSPORT SYSTEMS **9**

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

UNIT-III SCHEDULING AND FARE STRUCTURE **9**

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

UNIT- IV MOTOR VEHICLE ACT **9**

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

UNIT- V MAINTENANCE **9**

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

TOTAL: 45 HOURS

TEXT BOOKS

1. John Duke, "Fleet Management", McGraw-Hill Co, USA, 1984.
2. Kitchin.L.D., "Bus Operation", III edition, Illiffee and Sons Co., London, 1992

REFERENCES

1. Government Motor Vehicle Act, Publication on latest act to be used as on date

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

Aim: *To study and understand the substitute for conventional automobile fuels and energy source.*

Objectives:

1. *To impart the knowledge of various alternate fuels invehicles.*
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 electric and solar vehicles.*

Outcome:

6. *The student will select the alternate fuels according to the need and apply in the engineering applications of automobile power plants.*

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 gasoline blends, performance in SI engine. Methanol and gasoline blends Combustion characteristics in engines - emission characteristics.

UNIT- III CNG, 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. K. K. Ramalingm, internal Combustion Engines, Scitech publications, Chennai, 2003.
2. Maheswar Dayal, " Energy today & tomorrow ", I & B Horishr India, 1982.
3. 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
VII	VEHICLE MAINTANANCE	3	0	0	3

Aim: *To study and purpose is to understand various vehicle maintance.*

Objectives:

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.*

Outcome: *1. The student will able to attend the maintenance of automobiles.*

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	TWO AND THREE WHEELER TECHNOLOGY	3	0	0	3

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

Objectives:

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

Outcome: *1. The student will able to attend the maintenance of two and 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.

UNIT- II FUEL AND IGNITION SYSTEMS **9**

Fuel system, Fuel injection system, Lubrication system. Magneto coil and battery coil spark ignition system. Electro ignition system. Starting system. Kick starter system.

UNIT- III 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-IV 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- V TWO AND THREE WHEELERS CASE STUDY **9**

Case study of Sports bike, Motor cycles, Scooters and Mopeds - Auto rickshaws, Pick up van, Delivery van and Trailer. Servicing and maintenance. Recent developments.

TOTAL: 45 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
VII	EMBEDDED ENGINE MANAGEMENT SYSTEMS	3	0	0	3

Aim: *To teach the students about the various sensors and engine management systemsused in petrol and diesel engines*

Objectives:

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.*

Outcome: *1. The student will able to attend the maintenance of engine and trouble suiting.*

UNIT- I ELECTRONICS **5**

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

UNIT- II 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 MAINTANANCE AND ENGINE RECONDITIONING LAB	0	0	4	2

Aim: *To provide in house training in vehicle servicing, maintenance and engine reconditioning.*

Objectives:

1. *To understand the clutch and gear box servicing.*
2. *To understand the Differential unit.*
3. *To understand the Ackermann Steering geometry.*

Outcome: *1. The student will able to attend the maintenance of vehicle and engine reconditioning.*

List of Experiments

1. Clutch assembly and servicing
2. Gearbox assembly and servicing
3. Differential unit assembly and servicing
4. Different types of rear axle assembly and servicing
6. Brake system trouble shooting
7. Ackermann Steering geometry verification
8. Engine Reboring
9. Fuel Injection Pump Calibration.
10. Wheel drum grinding

.

TOTAL: 30 HOURS

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

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

Objectives:

1. *To understand the performance shock absorber and coil spring.*
2. *To understand the two wheeler chain tension.*
3. *To study three wheeler chassis frame.*

Outcome: *The student will able to attend the maintenance of two and three wheeler.*

List of Experiments

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

TOTAL: 30 HOURS

SEMESTER	SUBJECT	L	T	P	C
VII	MINI PROJECT	0	0	4	2

OBJECTIVE

- The objective of the mini project work is to enable the students to form the groups of not more than 4 members on a project involving the activity based learning concept and to design a model / mechanism related to the branch of study.

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

  A group will be formed with atleast one student from each category.

- Every mini project work shall have a guide who is the member of the faculty of the institution. Three 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 mini project.

SEMESTER	SUBJECT	L	T	P	C
VIII	PROJECT WORK AND VIVA VOCE	0	0	8	6

OBJECTIVE

- The objective of the project work is to enable the students to form the groups of not more than 4 members on a project involving theoretical and experimental studies related to the branch of study.

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

  A group will be formed with atleast one student from each category.

- 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

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

Aim: *To teach the students about the various Automobile accessories in Modern Vehicles*

Objectives:

1. *To understand the.Engine Management Systems*
2. *To understand the Chassis.*
3. *To understand the Heating and Air Conditioning*
4. *To impart the various Comfort and Convenience*
5. *To understand the various Safety And Security Systems*

Outcome: *1. The student will able to attend the various Automobile accessories in Modern Vehicles*

UNIT –I ENGINE MANAGEMENT SYSTEMS 9

Electronically controlled SI and CI engine fuel injection systems, relatedhardware 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	AUTOMOTIVE SAFETY	3	0	0	3

Aim: *To study and purpose is to understand Automotive Safety*

Objectives:

1. *To understand the.SafetySystems*
2. *To understand the Safety Concepts.*
3. *To understand the Safety Equipments*
4. *To understand the Collision Warning And Avoidance*
5. *To understand the Comfort And Convenience System*
   1. *standards.*

Outcome: *The student will understand concept of Automotive Safetytechniques.*

UNIT I INTRODUCTION 9

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

UNIT II SAFETY CONCEPTS 9

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

UNIT III SAFETY EQUIPMENTS 9

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

UNIT IV COLLISION WARNING AND AVOIDANCE 9

Collision warning system, causes of rear end collision, frontal object detection, rear vehicle object detection system, object detection system with braking system interactions.

UNIT V COMFORT AND CONVENIENCE SYSTEM 9

Steering and mirror adjustment, central locking system , Garage door opening system, tyre pressure control system, rain sensor system, environment information system

TOTAL : 45

TEXT BOOKS

1. Bosch, “Automotive Handbook”, 8th Edition, SAE publication, 2011.
2. Powloski. J., “Vehicle Body Engineering”, Business books limited, London, 1969.

REFERENCES:

1. Ronald.K.Jurgen, “Automotive Electronics Handbook”, Second Edition, McGraw-Hill Inc., 1999.

SEMESTER	SUBJECT	L	T	P	C
ELECTIVE	COMBUSTION THEORY OF IC ENGINES	3	0	0	3

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

Objectives:

1. *To understand thecycle analysis.*
2. *To understand the combustionof fuels.*
3. *To understand the combustionmodeling*
4. *To impart the various advances in IC engines*
5. *To understand the various performance and operations*

Outcome: *The student will understand concept of combustion theory of IC engines.*

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-IIICOMBUSTION 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- VOPERATIOBN 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
ELECTIVE	OFF ROAD VEHICLES	3	0	0	3

Aim: *To study and purpose is to understand about the various Off Road Vehicles.*

Objectives:

1. *To understand the classification and requirements of off road vehicles*
2. *To understand the earth moving machines.*
3. *To understand the scrappers, graders, shovels and ditchers.*
4. *To impart the various types farm equipments, military and combat vehicles*
5. *To understand the various vehicle systems, features.*

Outcome: *The student will understand about the various Off Road Vehicles.*

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 teach the students about the various automotive instrumentation.*

Objectives:

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

Outcome: *The student will understand the various automotive instrumentation.*

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 teach the students about the vehicle dynamics*

Objectives:

1. *To understand the degree of freedom.*
2. *To understand the multi degree freedom systems.*
3. *\To understands the stability of vehicles.*
4. *To study about suspension tyres and vehicles handling*
5. *To study numerical methods.*

Outcome: *The student will understand the vehicle dynamics.*

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 teach the students about thevehicle air-conditioning*

Objectives:

1. *To understand the automotive air-conditioning fundamentals.*
2. *To understand the air conditioner – heating system.*
3. *\To understands the refrigerant.*
4. *To study about air routing and temperature control*
1. *To study heater- air conditioner trouble shooting &service*

Outcome: *The student will understand thevehicle air-conditioning.*

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 teach the students about thetractor and farm equipments*

Objectives:

1. *To understand the general design of tractors.*
2. *To understand the fundamentals of engine operation .*
3. *To understands the engine frame work and valve mechanism o tractor*
4. *To study about cooling system*
5. *To study farm equipments.*

Outcome: *The student will understand thetractor and 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

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

Aim: *To teach the students about theautomotive aerodynamics*

Objectives:

1. *To understand the general aerodynamics.*
2. *To understand the fundamentals of aerodynamic drag of cabs.*
3. *To understands the engine shape optimization of cabs*
4. *To study about vehicle handling*
5. *To study wind tunnels for automotive aerodynamics.*

Outcome: *The student will understand theautomotive aerodynamics*

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

TEXTBOOKS

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 teach the students about thecombustion engineering*

Objectives:

1. *To understand the combustion of fuels.*
2. *To understand the thermodynamics of combustion.*
3. *\to understands the kinetics of combustion.*
4. *To study about engine combustion*
1. *To study flames*

Outcome: *The student will understand thecombustion engineering*

UNIT I COMBUSTION OFFUELS **9**

Combustion equations, Theoretical air,excess air,airfuel ratio, equivalence ratio, exhaust gascomposition, Airfuelratiofromexhaustgascomposition,heatingvalueoffuels.

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, Evaluationofequilibriumcomposition,chemicalavailability.

UNIT III KINETICSOFCOMBUSTION **9**

Ratesof reaction,Reactionorderandmolecularitycomplexreactions,chainreactions,Arrheniusrateequation, Collectiontheory,activatedcomplextheory,Explosiveandgeneraloxidativecharacteristics offueled.

UNIT IV ENGINECOMBUSTION **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 teach the students about thefuel cell technology*

Objectives:

1. To understand the thermodynamics.
2. To understand the electrode kinetics.
3. To understands the alkaline fuel cells
4. To study about phosphoric acid fuel cells.
2. To study proton exchange membrane fuel cells

Outcome: *The student will understand thefuel cell technology*

UNIT I INTRODUCTION ANDTHERMODYNAMICS 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 ALKALINEFUELCELLS&PHOSPHORIC ACIDFUEL 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 SOLIDOXIDEFUELCELLS&MOLTENCARBONATE 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– Lifetime

UNIT V DIRECTMETHANOL FUELCELLS&PROTONEXCHANGE MEMBRANE FUELCELLS 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

TEXTBOOKS

1. Viswanathan, B.andAulice Scibioh, M.,FuelCellsPrinciples andApplications, Universities Press (India)Pvt.Ltd.,Hyderabad,2006.
2. Hoogers,G.,Edr.,FuelCellTechnologyHandbook,CRCPress,WashingtonD.C.,2003.

REFERENCE

1. Larminie,J.andDicks,A.,FuelCellSystemsExplained,JohnWiley&Sons,Ltd.,NewYork ,2001.

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

Aim: *To teach the students about theadvanced production processes for automotive components*

Objectives:

1. *To understand the powder metallurgy.*
2. *To understand the forming process.*
3. *To understands the gear manufacturing.*
4. *To study about programming of CNC machines*
3. *To study manufacturing of auto components*

Outcome: *The student will understand theadvanced production processes for automotive 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 teach the students about therubber technology for Automobiles*

Objectives:

1. *To understand the plastics.*
2. *To understand the structure-property relationship ofrubber.*
3. *To understands the vibration and rubber spring.*
4. *To study about fluid sealing's.*
5. *To study compounding and manufacture.*
4.

Outcome: *The student will understand therubber technology for Automobiles*

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 teach the students about thesimulation of IC engine processes*

Objectives:

1. *To understand the measurement of URP.*
2. *To understand the SI engine simulation.*
3. *To understands the progressive combustion.*
4. *To study about simulation of SI engine*
5. *To study diesel engine simulation.*

Outcome: *The student will understand thesimulation of IC engine processes*

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 CONTROLLED VEHICLE SYSTEMS	3	0	0	3

Aim: *To teach the students about thecomputer controlled vehicle systems*

Objectives:

1. *To understand the autonomy cruise control and abs.*
2. *To understand the engine control system .*
3. *To understands the drive line control system.*
4. *To study about intelligent transportation system*
5. *To study safety impacting devices.*

Outcome: *The student will understand thecomputer controlled vehicle systems*

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	CRYOGENIC ENGINEERING	3	0	0	3

Aim: *To teach the students about thecryogenic engineering*

Objectives:

1. *To understand the construction details and heat transfer.*
2. *To understand the liquefaction and low temperature refrigeration.*
3. *To understands the separation and purification systems.*
4. *To study about insulation and vacuum technology*
5. *To study storage and instrumentation.*

Outcome: *The student will understand thecryogenic engineering*

UNIT 1 CONSTRUCTION DETAILS AND HEAT TRANSFER 9

Introduction to Cryogenic Systems Low Temperature properties of Engineering Materials. Cryogenic fluids and their properties. Applications in space- Food Processing- super Conductivity- Electrical Power- Biologyedicine- Electronics and Cutting Tool Industry.

UNIT II LIQUEFACTION AND LOW TEMPERATURE REFRIGERATION 9

Liquefaction systems ideal system- Joule Thomson expansion- Adiabatic expansion- Linde Hampson A Cycle- Claude & Cascaded System- Magnetic Cooling- Stirling Cycle Cryo Coolers.

UNIT 1II SEPARATION AND PURIFICATION SYSTEMS 9

General charateristics of mixtures-composition diagrams. Gas separation-principles of rectification-flash calculations - Rectification column analysis- Flash calculations.

UNIT IV INSULATION AND VACUUM TECHNOLOGY 9

Thermal insulation and their performance at cryogenic temperatures- Super Insulations- Vacuum insulation- Powder insulation- Cryo pumping Applications.

UNIT V STORAGE AND INSTRUMENTATION 9

Cryogenic Storage vessels and Transportation- Transfer devices. Pressure flow-level and temperature measurements.

TOTAL HOURS 45

TEXT BOOK:

1. Klaus D.Timmerhaus and Thomas M.Flynn- " Cryogenic Process Engineering " Plenum Press-New York- 1989.

REFERENCES:

1. Randal F.Barron- " Cryogenic Systems "- McGrawHill-1986.
2. R.B.Scoott- " Cryogenic engineering "- Van Nostrand Company Inc.-1985.
3. J.H.Bell- " Cryogenic Engineering "- Prentice Hall Inc.-1963.

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

Aim: *To teach the students about thecomputational fluid dynamics*

Objectives:

1. *To understand the governing equations and boundary condition.*
2. *To understand the finite difference method.*
3. *To understands the finite volume method.*
4. *To study about finite volume method for convection diffusion*
5. *To study calculation flow field by FVM.*

Outcome: *The student will understand thecomputational fluid dynamics*

UNIT I GOVERNING EQUATIONS AND BOUNDARY CONDITIONS 12

Objective :To understand the basics of governing equations and boundary conditions

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

Objective : To gain knowledge about finite difference method

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

Objective :To enable student to learn about FVM - Diffusion

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

Objective: To inherit knowledge about FVM-Convection diffusion

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

Objective :To elaborate about FVM flow field calculation

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, CambridgeUniversity, 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. DateCambridgeUniversity Press, 2005.

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

Aim: *To teach the students about theEmerging Automotive Materials*

Objectives:

1. *To understand the classification of Engineering Materials and their relevant applications.*
2. *To understand the powder metallurgy concepts, process techniques, applications.*
3. *To understand the basics in composites, fabrication methods, types and applications.*
4. *To understand the various forms of Smart Materials, applications.*
5. *To understand the various types of Nano-material's, production & applications.*

1.

Outcome: *The student will understand theEmerging Automotive Materials*

UNIT 1: 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 2: POWDER METALLURGY 9

Powder Metallurgy – Near net shaping process methods and principles - chemical methods – electro-chemical methods - atomization – mechanical alloying – rapid solidification – processing – Nano size powders. Powder physical and chemical characterization – process characteristics - Applications – Tools – Contact materials – Structural parts and others.

UNIT 3: 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 4: SMART MATERIALS 9

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

UNIT 5: 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.

TEXTBOOKS:

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
ELECTIVE	METROLOGY AND INSTRUMENTATION	3	0	0	3

Aim: *To teach the students about theMetrology and Instrumentation*

Objectives:

1. *To understand the measurements and sensors.*
2. *To understand the variable resistance and inductance sensors.*
3. *To understands the other special sensors.*
4. *To study aboutautomotive pressure and force/torque sensor*
5. *To study automotive position and rpm/velocity sensors.*

Outcome: *The student will understand theMetrology and Instrumentation*

UNIT I INTRODUCTION TO MEASUREMENTS AND SENSORS 9

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

UNIT II VARIABLE RESISTANCE AND INDUCTANCE SENSORS 9

Principle of operation- Construction details- Characteristics and applications of resistive potentiometer- Strain gauges- Resistive thermometers- Thermistors- Piezoresistive sensors Inductive potentiometer- Variable reluctance transducers:- EI pick up and LVDT

UNIT III VARIABLE AND OTHER SPECIAL SENSORS 9

Variable air gap type, variable area type and variable permittivity type- capacitor microphone Piezoelectric, Magnetostrictive, Hall Effect, semiconductor sensor- digital transducers- Humidity Sensor. Rain sensor, climatic condition sensor, solar, light sensor, antiglare sensor.

UNIT IV AUTOMOTIVE PRESSURE AND FORCE/TORQUE SENSOR 9

Pressure Sensor:

Typical automotive applications- Thick film pressure sensor- Semiconductor pressure sensor- Integrated silicon intake-manifold pressure sensor-Integrated silicon combustion-pressure sensor- Piezo electric sensor-High pressure sensor with metal diaphragm.

Force/Torque Sensor:

Typical automotive applications- Magneto elastic bearing-pin sensor- Magneto elastic tension/compressive-force sensor according to the cross-ductor principle – Basic principle of torque measurement –Stress and Angle measuring torque sensor

UNIT V AUTOMOTIVE POSITION AND RPM/VELOCITY SENSORS 9

Position Sensors:- Typical automotive applications- Wiper potentiometers- Short-circuiting ring sensor- Half-differential sensor- Eddy-current pedal-travel sensor- Integrated Hall IC's – Hall acceleration sensor- Knock sensors-RPM and Velocity Sensors: - Inductive rotational speed sensor- Hall effect sensor

Temperature Sensors:- Typical automotive applications -Sintered-Ceramic resistors-Thin film resistors-Thick film resistors- Monocrystalline silicon semiconductor resistor-Thermopile sensors

Flow Sensors:- Ultrasonic flow sensors-Pitot tube air-flow sensor- Hot wire air-mass flow meter- Micro mechanical hot-film air-mass flow meter- Lambda sensor -Imaging sensor-Rain Sensor Introduction to MEMs

TOTAL CONTACT HOURS: 45

TEXT BOOKS:

1. Doeblin E.O, "Measurement Systems : Applications and Design", 5th Edition, Tat McGraw-Hill
Publishing Co,2007
2. Robert Brandy, " Automotive Electronics and Computer System", Prentice Hall, 2001
3. William Kimberley," Bosch Automotive Handbook", 6th Edition, Robert Bosch GmbH, 2004

REFERENCES:

1. Bentley J.P ," Principles of Measurement Systems", 4th Edition, Addision Wesley Longman
Ltd., U.K, 2004
2. Patranabis.D, " Sensors and Transducers", 2nd Edition, Prentice Hall India Ltd, 2003
3. Murthy D.V.S, "Transducers and Instrumentation", Prentice Hall of India, 2007
4. Neubert H.K.P.," Instrument Transducers- An Introduction to their Performance and Design" ,
Oxford University Press, Cambridge, 2003

SEMESTER	SUBJECT	L	T	P	C
ELECTIVE	NEW GENERATION AND HYBRID VEHICLES	3	0	0	3

Aim: *To teach the students about thenew generation and hybrid vehicles*

Objectives:

1. *To understand the hybrid vehicles.*
2. *To understand the power system and new generation vehicles.*
3. *To understands the vehicle operation and control.*
4. *To study about vehicle automated tracks*
5. *To study automotive suspension, brakes, aerodynamics and safety..*

Outcome: *The student will understand thenew generation and hybrid vehicles*

UNIT I INTRODUCTION 7

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

UNIT II POWER SYSTRM AND NEW GENERATION VEHICLES 12

Hybrid Vehicle engines, Stratified charge engines, learn burn engines, low heat rejection engines, hydrogen engines, HCCI engine, VCR engine, surface ignition engines, VVTI engines. High energy and power density batteries, fuel cells, solar panels, flexible fuel systems.

UNIT III VEHICLE OPERATION AND CONTROL 9

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

UNIT IV VEHICLE AUTOMATED TRACKS 9

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

UNIT V SUSPENSION, BRAKES, AERODYNAMICS AND SAFETY 8

Air suspension – Closed loop suspension, compensated suspension, anti skid braking system, retarders, regenerative braking, safety gauge air backs- crash resistance. Aerodynamics for modern vehicles, safety systems, materials and standards.

TOTAL CONTACT HOURS: 45

TEXT BOOKS:

1. Heinz, "Modern Vehicle Technology" Second Edition, Bu
2. Bosch Hand Book, SAE Publication, 2000

REFERENCES

1. Light weight electric for hybrid vehicle design.
2. Advance hybrid vehicle power transmission, SAE.
3. Noise reduction, Branek L.L., McGraw Hill Book company, New York, 1993.

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

Aim: *To teach the students about theoperations research*

Objectives:

1. *Linear Programming is useful in finding either maximum or minimum of an expression subject to given constraints*
2. *To minimize the cost of transporting items from various sources to different destinations*
3. *When number of activities are to be carried out most economical way with less time consumptions can be found*
4. *Inventory is essential to provide flexibility in operating a system or organization.*
5. *Decision making is an integral part of any business organization. It uses to select the best among several decisions through a proper evaluation of the parameters of each decision environment*

Outcome: *The student will understand theoperations research*

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 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	TOTAL QUALITY MANAGEMENT	3	0	0	3

Aim: *To teach the students about thetotal quality management*

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

Outcome: *The student will understand thetotal quality management*

UNIT –I 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 Hours **45**

TEXT BOOK:

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- (5th 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
ELECTIVE	ENTREPRENEURIAL SKILLS DEVELOPMENT FOR ENGINEERS	3	0	0	3

Aim: *To teach the students about theentrepreneurship for engineering students*

Objectives:

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

Outcome: *The student will understand theentrepreneurship for engineering students*

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

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	INTRODUCTION TO AIRCRAFT INDUSTRY AND AIRCRAFT SYSTEMS	3	0	0	3

Aim: *To teach the students about the Basics of Aircraft Systems and Aircraft Structures*

Objectives:

1. *To understand the Aircraft Overview.*
2. *To understand the Aircraft.*
3. *To understands the system.*
4. *To study about Principles of Flight*
5. *To study Basics of Flight Mechanics*

Outcome: *The student will understand theBasics 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

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

Aim: *To teach the students about the process planning and cost estimation*

Objectives:

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.

Outcome: *The student will understand theprocess planning and 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.