

**NOOURL ISLAM CENTRE FOR HIGHER EDUCATION**

**NOORUL ISLAM UNIVERSITY, KUMARACOIL**

**B.E. AUTOMOBILE ENGINEERING**

**CURRICULUM & SYLLABUS**

**SEMESTER I**

*(Common for All B.E/B.Tech. Programmes Except Marine Engineering)*

<b>Sl. No</b>	<b>Course Code</b>	<b>Course Title</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>THEORY</b>						
1.	EG1101	Technical English – I	3	1	0	4
2.	MA1101	Engineering Mathematics – I	3	1	0	4
3.	PH1101	Engineering Physics – I	3	0	0	3
4.	CH1101	Engineering Chemistry - I	3	0	0	3
5.	ME1101	Engineering Graphics	3	0	0	3
6.	CS1101	Fundamentals of Computing and Programming	3	0	0	3
<b>PRACTICAL</b>						
7.	CS1171	Computer Practice Lab - I	0	1	2	2
8.	ME1171	Computer Aided Drafting and Modeling Lab	0	1	2	2
9.	PH1171	Physics Lab – I	0	0	2	1
10.	CH1171	Chemistry Lab - I	0	0	2	1
<b>TOTAL</b>			<b>18</b>	<b>4</b>	<b>8</b>	<b>26</b>

**\* Those who have admitted from the Academic Year 2013-2014 onwards**

**EG1101**

**TECHNICAL ENGLISH – I**

**3 1 0 4**

**UNIT-I**

**9**

Verb-Tenses -12 Tenses-8 Passive Forms- Word formation with prefixes and suffixes

**UNIT-II**

**9**

Expansion of Compound Nouns – Punctuation - Definitions of Technical Terms - Changing words from one form to another - Imperatives and Instructions - Conditional clauses.

**UNIT-III**

**9**

Interrogatives and Question Tags - Asking Questions - Comprehension – Discourse Markers

**UNIT –IV**

**9**

Concord - Identifying Common Errors - Cause and Effect Expressions – Paragraph Writing – Copy Writing: Slogans and Captions - Writing Instructions - Letter Writing (Formal Letters)

**UNIT –V**

**9**

Creative Writing – Transcoding: Bar Chart, Flow Chart - Pie Chart - Tree Diagram - Tabular Column

**L: 45 + T: 15, TOTAL: 60 PERIODS**

**TEXT BOOK:**

Department of Humanities and Social Sciences, Anna University, English for Engineers and Technologists, Combined Edition (Volumes 1 @ 2), Chennai: Orient Black Swan Pvt.Ltd.,2006 Themes 1-4 (Resources, Energy, Computer, Transport)

**EXTENSIVE READING:**

A.P.J.Abdul Kalam with Arun Tiwari, Wings of Fire: An Autobiography, University Press (India) Pvt.Ltd, 1999, 30 Impression 2007

**NOTE:**

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

**MA1101**

**ENGINEERING MATHEMATICS - I**

**3 1 0 4**

**AIM:**

To impart the fundamental knowledge of Engineering Mathematics to the students in order to achieve a well founded knowledge about the principles of Mathematics.

**OBJECTIVE:**

The course objective is to develop the required skill of the students in the area of

Engineering Mathematics with special emphasis on the characteristic equation of matrices, differential calculus, Beta and Gamma functions and to develop basic knowledge to the students in double and triple integration.

**UNIT I MATRICES**

**9**

Characteristic equation – Eigen values and Eigen vectors of a real matrix – Properties of eigen values and eigen vectors(without proof)– Cayley Hamilton theorem (statement only), verification and its applications – Orthogonal and Symmetric matrices and their properties(excluding proof)- Orthogonal transformation of a symmetric matrix to diagonal form.

**UNIT II DIFFERENTIAL CALCULUS**

**9**

Curvature – Cartesian co-ordinates and parametric form -Centre and radius of curvature, Circle of curvature – Evolutes.

**UNIT III FUNCTIONS OF SEVERAL VARIABLES**

**9**

Partial derivatives – Total derivatives – Jacobians – Properties – Maxima and minima for functions of two variables–Lagrange Multiplier method- Taylor’s expansion.

**UNIT IV BETA AND GAMMA INTEGRALS**

**9**

Evaluation of improper integrals- Beta and Gamma functions – Properties – Relation between Beta and Gamma functions - Evaluation of integrals using Beta and Gamma functions.

**UNIT V MULTIPLE INTEGRALS**

**9**

Evaluation of double and triple integrals – Area as double integral in cartesian and polar co-ordinates– Change of order of integration- Transformation of Cartesian coordinates into polar coordinates.

**L: 45 + T: 15, TOTAL: 60 PERIODS**

**TEXT BOOK:**

Grewal B.S., “Higher Engineering Mathematics”- 40<sup>th</sup> Edition , Khanna Publishers, Delhi 2007.

**REFERENCES:**

- 1 Veerarajan T, “ Engineering Mathematics (for first year)”, Tata McGraw- Hill Publishing Company Ltd.,New Delhi , 2007
- 2 Erwin Kreyszig, “ Advanced Engineering Mathematics”, 7<sup>th</sup> Edition, Wiley India, 2007.
- 3 P.Kandasamy , K.Thilagavathy , K.Gunavathy” Engineering Mathematics” Vol,1 S.Chand & Company Ltd.2002
4. B.V. Ramana,”Higher Engineering Mathematics” Tata McGraw- Hill, Publishing Company Ltd.,New Delhi, 2006

**AIM:**

To provide a sound knowledge on the principles of Physics and its practical applications in various areas of Engineering and Technology.

**OBJECTIVE:**

At the end of the course students would be exposed to

- The mechanical properties of matter and its engineering applications
- Application of ultrasonics in Industry and Medical field
- The important properties of light and their application
- Application of laser and fiber optics in communication and technology
- The fundamentals of heat- energy conversion and its application.

**UNIT I Properties of matter****9**

Elasticity – Poisson’s ratio – Stress-strain diagram – factors affecting elasticity – bending of beams – cantilever – bending moment – theory and experiment of Young’s modulus determination – Uniform and non-uniform bending – I shaped girders – twisting couple – hollow cylinder – shaft – torsion pendulum – determination of rigidity modulus

**UNIT - II Ultrasonics****9**

Introduction-production of ultrasonic waves- magnetostriction effect- magnetostriction generator-piezoelectric effect-piezoelectric generator-detection of ultrasonic waves-properties - velocity measurement - acoustic grating-industrial applications-drilling, welding, soldering and cleaning- SONAR- non destructive testing pulse echo system-medical applications-sonograms.

**UNIT –II Optics****9**

Interference: air wedge- theory and experiment-testing of flat surfaces- Michelson’s Interferometer-types of fringes- applications (determination of wavelength and thickness of thin transparent medium).

Polarization: Introduction- double refraction, quarter and half wave plates- production of plane, circularly and elliptically polarized light-detection of plane, circularly & elliptically polarized light.

Photoelasticity- Stress-optic law- photoelastic bench

**UNIT- IV Lasers & Fiber Optics****9**

Introduction- principle of spontaneous emission and stimulated emission, Einsteins A and B coefficients-derivation- population inversion, pumping, types of lasers- Nd-YAG, CO<sub>2</sub>- applications.

Principle and propagation of light in optical fibre- numerical aperture and acceptance angle- types of optical fibres (material, refractive index, mode)- double crucible technique of fibre drawing, fibre optic communication system (Block diagram)-fibreoptic sensors.

**UNIT – V Heat and Thermodynamics****9**

Thermal conductivity- Forbe's and Lee's disc methods-radial flow of heat- thermal conductivity of rubber and glass-thermal insulation in buildings - Laws of thermodynamics- Carnot's cycle as heat engine – efficiency, Otto engine & Diesel engine (qualitative).

**TOTAL: 45 PERIODS****TEXT BOOKS:**

1. R.K. Gaur and S.L.Gupta, 'Engineering Physics' Dhanpat Rai publications, New Delhi.
2. Marikani A, 'Engineering Physics' PHI learning pvt ltd, III Edition, New Delhi.
3. Palanisamy.P.K., 'Engineering Physics' Scitech publications, Chennai.
4. M.N. Avadhanulu and PG Kshirsagar. ' A Text book of Engineering Physics', S.Chand and company, Ltd., New Delhi.

**REFERENCES:**

1. Serway and Jewett, 'Physics for Scientists and Engineers with Modern Physics', 6th Edition, Thomson Brooks/Cole, Indian reprint.
2. Brijlal and Subrahmanyam 'Heat and Thermodynamics' S. Chand , Limited.
3. Ajoy Ghatak, ' Optics' Tata McGraw Hill Publications, New Delhi.
4. Brijlal and Subrahmanyam 'Properties of Matter' S. Chand , Limited.

**CH1101****ENGINEERING CHEMISTRY-I****3 0 0 3****AIM**

To have a thorough knowledge of the basics of chemistry particularly engineering oriented topics to engineering students.

**OBJECTIVES**

To make the students conversant with the principles of the following topics: (i) Water Technology, (ii) Engineering Materials and Polymers,(iii) Surface Chemistry and Nanomaterials,(iv) Analytical Techniques and (v) Chemical Kinetics

**UNIT I****WATER TECHNOLOGY****9**

Water as a universal solvent – hard and soft water – reasons for hardness – disadvantages of hard water in washing and industrial purposes - estimation of hardness by EDTA method, problems; boiler feed water – characteristics- softening methods - external conditioning – demineralization (ion exchange) process, desalination by reverse osmosis method- internal conditioning (phosphate, calgon and carbonate conditioning methods); stages in domestic water treatment – disinfection by chlorination, ozone and UV treatments.

**UNIT-II ENGINEERING MATERIALS AND POLYMERS 9**

Abrasives – Natural & synthetic – Moh’s scale, diamond, carborundum – Refractories – classification and properties – Cement – Manufacture. Lubricants- Types – properties of lubricants – oiliness, fire & flash points, pour & cloud point (definition only) – solid lubricants – Graphite and  $\text{MoS}_2$ .

Polymer and polymerization (definition only)- examples for natural & synthetic polymers, Preparation, properties and uses of Kevlar, Nomex, Rubber – natural and synthetic – neoprene, butyl rubber- vulcanization of rubber, Introduction to Conducting polymers and Liquid crystal polymers.

**UNIT III SURFACE CHEMISTRY AND NANOMATERIALS 9**

Adsorption – classification- adsorption of gases on solids- adsorption isotherms- Freundlich and Langmuir adsorption isotherms- adsorption of solutes from solution- application of adsorption-catalysis and pollution control- Nanomaterials – introduction – carbon nanotubes (CNT) and their applications.

**UNIT IV ANALYTICAL TECHNIQUES 9**

Importance of spectroscopic techniques- Beer-Lambert’s law (problem) – UV-visible spectroscopy and IR spectroscopy – principles – instrumentation (block diagram only) – flame photometry – principle – instrumentation (block diagram only) – estimation of sodium by flame photometry – atomic absorption spectroscopy – principles – instrumentation (block diagram only) – estimation of nickel by atomic absorption spectroscopy. Thermal Analysis- TGA and DTA- principles- thermogram of calcium oxalate monohydrate.

**UNIT-V CHEMICAL KINETICS 9**

Introduction – rate, rate constant, order & molecularity of reactions –First order reaction – Derivation of rate constant – Second order reactions – rate constant (no derivation, equation and problem only) - activation energy – concept-Arrhenius equation-derivation- steady state approximation.

**TOTAL: 45 PERIODS**

**TEXT BOOKS:**

1. P.C. Jain and Monica Jain, Engineering Chemistry Dhanpat Rai Pub, Co., New Delhi (2002)
2. S.S. Dara, A text book of engineering chemistry S. Chand & C. Ltd., New Delhi (2006)
3. B. Sivasankar Engineering Chemistry Tate McGraw- Hill Pub. Co. Ltd, New Delhi (2008)

**REFERENCES:**

1. B. K. Sharma Engineering Chemistry Krishna Prakasan Media (P) Ltd., Meerut (2001)
2. R. Gopalan, D. Venkappayya, Sulochana Nagarajan, Engineering Chemistry Vikas Pub, Co., New Delhi (2006)
3. Principles of physical chemistry by Samuel Glasstone, Van Nostrand pub.comp, Newyork.
4. Principles of physical chemistry by Puri & Sharma, Vikas pub.comp, 2008

**OBJECTIVE**

- To know the fundamental principles of geometrical drawing
- To visualize the various machine components

**Unit I - Introduction****9**

Introduction to Engineering Drawing, Drawing Standard, ISI code of practice, Drawing covering, Principles of Engineering Graphics and their significance, usage of Drawing instruments, lettering, Conic sections including the Rectangular Hyperbola (General method only); Cycloid, Epicycloid, Hypocycloid and Involute; Scales – Plain, Diagonal and Vernier Scales;

**Unit II - Orthographic Projection (Points, Lines & Planes)****9**

Principles of orthographic projection-projection of points, straight lines, traces and projection of planes inclined to both planes Orthographic projection of simple engineering components-missing view exercises.

**Unit III - Orthographic Projection (Solids)****9**

Projection of solids – Inclined to one plane - Sections and Sectional Views of Right Angular Solids covering - Prism, Cylinder, Pyramid, Cone – Auxiliary Views

**Unit IV - Pictorial Projections****9**

Principles of pictorial views, isometric view of simple solids. Free hand sketching of orthographic views from pictorial views. Free hand sketching of isometric views from given two or three views.

**Unit V - Development Of Surfaces & Perspective Projection****9**

Development of surfaces of Right Regular Solids - Prism, Pyramid, Cylinder and Cone; Perspective Projection of Planes and Solids

**L: 45 + T: 15, TOTAL: 60 PERIODS****TEXT BOOKS:**

1. Venugopal K and Prabhu Raja V, “Engineering Graphics”, New Age International Publishers, 2007.
2. . Luzadder W J, “Fundamentals of Engineering Drawing”, Prentice Hall Book Co., New York, 1998
3. Bhat, N.D.& M. Panchal , *Engineering Drawing*, Charotar Publishing House,2008

**REFERENCES:**

1. Kumar M S, “Engineering Graphics”, Ninth Edition, DD Publications, Chennai, 2007.
2. Bureau of Indian Standards, “Engineering Drawing Practices for Schools and Colleges SP 46-2003”, BIS, New Delhi, 2003.
3. Shah, M.B. & B.C. Rana , *Engineering Drawing and Computer Graphics*, Pearson Education,2008

**CS1101      FUNDAMENTALS OF COMPUTING AND PROGRAMMING      3 0 0 3**

**AIM:**

To provide an awareness to Computing and Programming

**OBJECTIVES:**

- To enable the student to learn the major components of a computer system
- To know the correct and efficient ways of solving problems
- To learn to use office automation tools
- To learn to program in C

**UNIT - I Introduction to Computers 9**

Introduction – Characteristics of Computers – Evolution of Computers - Computer Generations – Classification of Computers – Basic Computer organization – Number Systems

**UNIT -II Computer Software 9**

Computer Software –Types of Software – Software Development Steps – Internet Evolution - Basic Internet Terminology – Getting connected to Internet Applications.

**UNIT – III Problem Solving and Office Application Software 9**

Planning the Computer Program – Purpose – Algorithm – Flow Charts – Pseudocode - Application Software Packages- Introduction to Office Packages (not detailed commands for examination).

**UNIT – IV Introduction to C 9**

Overview of C – Constants, Variables and Data Types – Operators and Expressions – Managing Input and Output operators – Decision Making - Branching and Looping.

**UNIT – V Functions and Pointers 9**

Handling of Character Strings – User-defined Functions – Definitions – Declarations - Call by reference – Call by value – Structures and Unions – Pointers – Arrays – The Preprocessor – Developing a C Program : Some Guidelines

**TOTAL: 45 PERIODS**

**TEXT BOOKS:**

1. Ashok.N.Kamthane, “ Computer Programming”, Pearson Education (India) (2008).
2. Behrouz A.Forouzan and Richard.F.Gilberg, “A Structured Programming Approach Using C”, II Edition, Brooks-Cole Thomson Learning Publications, (2007).

**REFERENCES:**

1. Pradip Dey, Manas Ghosh, “Programming in C”, Oxford University Press. (2007).
2. Byron Gottfried, “Programming with C”, 2<sup>nd</sup> Edition, (Indian Adapted Edition), TMH publications, (2006).
3. Stephen G.Kochan, “Programming in C”, Third Edition, Pearson Education



- India, (2005).
4. Brian W.Kernighan and Dennis M.Ritchie, “The C Programming Language”, Pearson Education Inc., (2005).
  5. E.Balagurusamy, “Computing fundamentals and C Programming”, Tata McGraw-Hill Publishing Company Limited, (2008).
  6. S.Thamarai Selvi and R.Murugan, “C for All”, Anuradha Publishers, (2008).

**CS1171**

**COMPUTER PRACTICE LAB - I**

**0 1 2 2**

**LIST OF EXERCISES**

**a) Word Processing 15**

1. Document creation, Text manipulation with Scientific notations.
2. Table creation, Table formatting and Conversion.
3. Mail merge and Letter preparation.
4. Drawing - flow Chart

**b) Spread Sheet 15**

5. Chart - Line, XY, Bar and Pie.
6. Formula - formula editor.
7. Spread sheet - inclusion of object, Picture and graphics, protecting the document and sheet.
8. Sorting and Import / Export features.

**c) Simple C Programming \* 15**

9. Data types, Expression Evaluation, Condition Statements.
10. Arrays
11. Structures and Unions
12. Functions

**\* For programming exercises flow chart and pseudo code are mandatory.**

**TOTAL: 45 PERIODS**

**Hardware / Software required for a batch of 30 Students**

**Hardware**

LAN System with 33 nodes (OR) Standalone PCs– 33 Nos.  
Printers– 3 Nos.

**Software**

OS– Windows / UNIX Clone  
Application Package– Office suite  
Compiler– C

**ME1171      COMPUTER AIDED DRAFTING AND MODELING LAB**

**L-T-D: 0-0-2 Credits: 2**

- (i) Introduction to computer aided drafting and solid modeling: software and hardware.
- (ii) Understand basic 2D geometric construction techniques.
  - a. Cartesian and polar coordinate systems: locating points, coordinate entry methods, units and limits.
  - b. Object generation: lines, arcs, polylines, and multilines; rectangles, circles, polygons, and ellipses.
  - c. Transformations: move, copy, rotate, scale, mirror, offset and array; trim, extend, fillet, chamfer
  - d. Layers: creation, naming, properties manager.
  - e. Blocks: create, edit, import and explode.
  - f. Text: creating and editing, formatting, text styles.
  - g. Dimensions: creating and editing, dimension styles.
- (iii) Exercise on basic drafting principles to create technical drawings.
  - a. Create orthographic views of machine parts from pictorial views.
  - b. Create isometric views of machine parts from orthographic views
  - c. Create hatched sectional views of machine parts.
- (iv) Understanding basic solid modeling techniques
  - a. Creation of solid primitives
  - b. Boolean operations
  - c. Extrude, Revolve operations
  - d. 3D Views
- (v) Exercise on basic modeling to create machine parts Create solid models from pictorial views

**TOTAL: 45 PERIODS**

**University Examination:**

Question paper may contain two parts. Part A shall contain 2D drafting which carries 40% marks, Part B shall contain 3D drafting which carries 40% marks and 20% marks is for viva voce conducted during the exam.

**PH1171**

**PHYSICS LAB- I**

**0 0 2 1**

**LIST OF EXPERIMENTS**

(Any five experiments)

1. (a) Particle size determination using Diode Laser  
(b) Determination of Laser parameters- Wavelength and Numerical aperture
2. Determination of velocity of sound and compressibility of liquid- Ultrasonic Interferometer.
3. Determination of thermal conductivity of a bad conductor- Lee's Disc method
4. Determination of thickness of a thin wire- Airwedge
5. Torsional Pendulum- Determination of rigidity modulus
6. Compound pendulum- Determination of acceleration due to gravity
7. Determination of Young's Modulus- Non-Uniform bending

**Reference: Physics lab manual- Department of Physics**

**CH1171**

**CHEMISTRY LAB - I**

**0 0 2 1**

**List of Experiments**

1. Determination of total hardness of water by EDTA method.
  2. Determination of alkalinity (titrimetry method)
  3. Determination of percentage purity of washing soda
  4. Conductometric titration of a strong acid with a strong base
  5. Determination of strength of hydrochloric acid ( $p^H$ metry)
  6. Determination of the amount of  $Na^+$  in water sample (Flame photometry)
  7. Determination of molecular weight and degree of polymerization of a polymer
  8. Determination of the amount of  $Ca^{2+}$  in water sample .
  9. Determination of iron in rust by Permanganometry.
- Minimum five experiments shall be offered.

**References:**

1. J. Bassette, R. B. Deanen & G. H. Jeffery & J. Mendham, Text book of Vogel Quantitative Inorganic Analysis, ELBS, England.

**TOTAL: 45 PERIODS**

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**B.E. AUTOMOBILE ENGINEERING**

**CURRICULUM & SYLLABUS**

**SEMESTER II**

*(Common for All B.E/B.Tech Programmes Except Marine Engineering)*

<b>Sl. No</b>	<b>Course Code</b>	<b>Course Title</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>Theory</b>						
1.	EG1102	Technical English – II	3	0	0	3
2.	MA1102	Engineering Mathematics – II	3	1	0	4
3.	PH1102	Engineering Physics – II	3	0	0	3
4.	CH1102	Engineering Chemistry – II	3	0	0	3
5.	ME1102	Engineering Mechanics	3	0	0	3
6.	BE1101	Basic Engineering - I (Basic Electrical and Electronics Engineering)	3	1	0	4
7.	BE1102	Basic Engineering – II (Basic Mechanical and Civil Engineering)	3	1	0	4
<b>Practical</b>						
8.	CS1172	Computer Practice Lab - II	0	1	2	2
9.	PH1172	Physics Lab – II	0	0	2	1
10.	CH1172	Chemistry Lab - II	0	0	2	1
11.	BE1171	Basic Engineering Lab – I (Basic Electrical and Electronics Engineering Lab)	0	0	4	2
12.	BE1172	Basic Engineering Lab – II (Basic Mechanical and Civil Engineering Lab)	0	0	4	2
<b>TOTAL</b>			21	4	14	32

**\*Those who have admitted from the Academic Year 2013-2014 onwards.**

**EG1102**

**TECHNICAL ENGLISH - II**

**3 0 0 3**

**UNIT-I**

**9**

Technical Vocabulary - Active and Passive Vocabulary – Articles - Prepositions – Expansion of Abbreviations and Acronyms

**UNIT-II**

**9**

Phrases- Adverbs –Different grammatical forms of the same word –Active Voice-Passive Voice

**UNIT-III**

**9**

Phonemes - Vowels, Consonants and Diphthongs – Word Stress and Intonation

**UNIT-IV**

**9**

Writing Recommendations – Checklists - Essay Writing - Business Letters: - Letter Calling for quotation, Letter Placing Order, Letter of Complaint, Letter Seeking Clarification - Business Proposal Writing

**UNIT-V**

**9**

Numerical Adjectives – CV/Resume Writing – One Word Substitutes – Virtual Communication: E-Mail Writing

**TOTAL: 45 PERIODS**

**TEXT BOOK:**

Department of Humanities and Social Sciences, Anna University, English for Engineers and Technologists, Combined Edition (Volumes 1 @ 2), Chennai: Orient Black Swan Pvt.Ltd. 2006 Themes 5-8 (Technology, Communication, Environment, Industry)

**EXTENSIVE READING:**

Shiv Khera, You Can Win, Milan, Delhi, 2004

**OR**

CanField Jack, Chicken Soup for the Soul, Westland, Chennai, 1999.

**NOTE:**

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

**AIM:**

To impart the fundamental knowledge of Engineering Mathematics to the students in order to achieve a well founded knowledge about the principles of Mathematics.

**OBJECTIVE:**

To develop basic knowledge to the students in differential equations and vector calculus. This subject is further broadened to the functions of complex variables and complex integration. A thorough knowledge about Laplace transforms is also covered to aid the students solve the differential equations.

**UNIT I ORDINARY DIFFERENTIAL EQUATIONS 9**

Linear differential equations of second order with constant and variable coefficients- Cauchy's and Legendre's linear equations – Method of variation of parameters

**UNIT II COMPLEX VARIABLES 9**

Functions of a complex variable – Analytic function – Necessary conditions- Cauchy-Riemann equations in cartesian and polar co-ordinates - Sufficient conditions(excluding proof) – Properties of analytic function – Harmonic and its conjugate – Construction of analytic function by Milne Thomson method – Conformal mappings  
 $w = z + c, cz, 1/z$  and Bilinear transformation.

**UNIT III COMPLEX INTEGRATION 9**

Statement and applications of Cauchy's integral theorem and Cauchy's integral formula – Laurent's expansion – Singular points – Residues – Cauchy's Residue theorem – Evaluation of real definite integral using contour integration(excluding poles on the real

axis) -  $\int_0^{2\pi} f(\cos \theta, \sin \theta) d\theta$  and  $\int_{-\infty}^{\infty} \frac{f(x)}{g(x)} dx$

**UNIT IV VECTOR CALCULUS 9**

Gradient, Divergence and Curl – Directional derivative – Irrotational and solenoidal vector fields – Vector integration – Green's theorem in a plane, Gauss divergence theorem and Stokes' theorem (excluding proofs) – Simple applications involving cubes and rectangular parallelepipeds.

**UNIT V LAPLACE TRANSFORMS 9**

Laplace transform – Existence condition– Transforms of elementary functions – Basic properties – Transforms of derivatives and integrals – Transform of Periodic functions. Inverse Laplace transform – Convolution, Initial and Final value theorems (statement only) – Solutions of linear ordinary differential equation of second order with constant coefficients using Laplace transform techniques.

**L: 45 + T: 15, TOTAL: 60 PERIODS**

**TEXT BOOK:**

Grewal B.S., "Higher Engineering Mathematics"- 40<sup>th</sup> Edition , Khanna Publishers, Delhi 2007.

**REFERENCES:**

1. Erwin Kreyszig, " Advanced engineering Mathematics", 7<sup>th</sup> Edition, Wiley India, 2007
2. Veerarajan T, " Engineering Mathematics (for first year)", Tata McGraw- Hill Publishing Company Ltd.,New Delhi,2007.
3. P.Kandasamy , K.Thilagavathy , K.Gunavathy" Engineering Mathematics" S.Chand & Company Ltd.2002.
4. B.V. Ramana,"Higher Engineering Mathematics" Tata McGraw- Hill Publishing Company Ltd.,New Delhi,2006.

**PH1102****ENGINEERING PHYSICS – II****3 0 0 3****AIM:**

To enable the students' understand the Physics behind various engineering materials and correlate it to technological applications.

**OBJECTIVE:**

At the end of the course students would be exposed to

- Fundamentals of quantum mechanics and its application to electron microscopy
- Various crystal structures and their defects
- The synthesis, properties and applications of various engineering materials

**UNIT –I Quantum Mechanics****9**

Matter waves- de-Broglie wavelength - Schrodinger's wave equation-time independent and time dependent equations- physical significance of wave function- particle in a one dimensional box- electron microscope- scanning electron microscope- transmission electron microscope.

**UNIT II Elementary crystal physics****9**

Lattice – Unit cell, Bravais lattice ,lattice planes-Miller indices ,d-spacing in cubic lattice. Calculation of number of atoms per unit cell,atomic radius, coordination number and packing factor for SC,BCC,FCC and HCP structures- diamond cubic, NaCl and ZnS structures. Crystal defects.

**UNIT- III Conducting & Semiconducting Materials****9**

Conducting materials – Drawbacks of classical theory – Quantum theory – Fermi distribution function – Effect of temperature on Fermi Function – Density of energy states Semiconducting materials: intrinsic semiconductor-carrier concentration derivation

- fermi level - electrical conductivity- band gap determination, extrinsic semiconductors, compound semiconductors (qualitative), Hall effect -determination of hall coefficient - applications.

**UNIT- IV Magnetic, Superconducting and Dielectric Materials** **9**

Magnetic Materials: Origin of magnetic moment-Bohr magneton - ferromagnetism – magnetic domains- hysteresis-soft and hard magnetic materials- applications.

Superconductivity: Properties-types of super conductors - BCS theory of superconductivity (qualitative) - applications of superconductors.

Dielectric materials - active and passive dielectrics - types of polarization- dielectric loss- dielectric breakdown – uses of dielectric materials.

**UNIT- V New Engineering Materials** **9**

Metallic glasses: preparation, properties and applications. Shape Memory Alloys (SMA): characteristics, properties and applications.

Nanomaterials -synthesis-top-down approach (Ball milling), bottom-up approach (CVD)- properties and applications.

**TOTAL: 45 PERIODS**

**TEXT BOOKS:**

1. Rajendran, V, and Marikani A, ‘Materials science’ TMH publications, New Delhi
2. Palanisamy P.K “Materials Science”, Scitech publications Pvt Ltd, Chennai
3. Arumugam M, “Materials Science”, Anuradha publications, Kumbakonam
4. R.K. Gaur and S.L.Gupta, ‘Engineering Physics’ Dhanpat Rai publications, New Delhi

**REFERENCES:**

1. Charles Kittel ,” Introduction to solid state physics “, John Wiley & sons, 8ed.
2. Charles P.Poole and Frank J. Owner, “ Introduction to Nanotechnology, Wiley India.
3. Pillai, S.O. ‘Solid state physics’ NewAge international publishers, Chennai.

**CH1102**

**ENGINEERING CHEMISTRY-II**

**3 0 0 3**

**AIM**

To have a thorough knowledge of the basics of chemistry particularly engineering oriented topics to engineering students

**OBJECTIVES**

To make the students conversant with the principles of the following topics: (i) Fuels And Combustion,(ii) Electrochemistry And Corrosion, (iii) Energy Sources And Batteries, (iv) Phase Rule And Alloys And (v) Thermodynamics.



**UNIT I FUELS AND COMBUSTION 9**

Classification of fuels with examples– characteristics of a good fuel- fossil fuels- Coal – proximate and ultimate analysis- metallurgical coke – manufacture by Otto-Hoffmann method – Petroleum processing and refining – cracking (definition only) - knocking – octane number and cetane number – synthetic petrol – Bergius process- Calorific value –GCV, LCV (problems)- Gaseous fuels- water gas and producer gas, Flue gas analysis – Orsat apparatus – theoretical air for combustion (problems).

**UNIT-II ELECTROCHEMISTRY AND CORROSION 9**

Electrochemical cells – reversible and irreversible cells – EMF – measurement of emf – single electrode potential – Nernst equation– reference electrodes – Standard Hydrogen electrode -Calomel electrode – Ion selective electrode – glass electrode and measurement of pH – electrochemical series – significance- Electrochemical corrosion – protective coatings – paints – constituents and functions.

**UNIT –III ENERGY SOURCES AND BATTERIES 9**

Renewable & non-renewable energy sources- wind energy, solar energy and solar cell- Nuclear reactions – Fission and fusion – nuclear reactors – light water and breeder nuclear reactors (elementary ideas only) – Nuclear power plants in India. Batteries- primary and secondary cells- alkaline battery- lead acid battery- nickel cadmium battery- lithium battery (Li-TiS<sub>2</sub>)- H<sub>2</sub>-O<sub>2</sub> fuel cell.

**UNITIV PHASE RULE AND ALLOYS 9**

Statement and explanation of terms involved – one component system – water system – condensed phase rule – simple eutectic system (lead-silver system only) – alloys – importance, ferrous alloys – nichrome, invar and stainless steel – heat treatment of steel, non-ferrous alloys – brass, bronze and solder.

**UNIT-V THERMODYNAMICS 9**

Introduction- I law of thermodynamics (statement only)- Relation between  $\Delta E$  &  $\Delta H$  -II law of thermodynamics (statement only)- concept of entropy – Clausius-Clapeyron equation (no derivation)- Importance, terms involved (problem) -Free energy changes-  $\Delta G$  – Gibbs Helmholtz equation ( derivation) - III law of thermodynamics- concept of absolute entropy- zeroth law of thermodynamics (statement only).

**TOTAL: 45 PERIODS**

**TEXT BOOKS:**

- 1 P.C. Jain and Monica Jain, Engineering Chemistry DhanpatRai Pub, Co., New Delhi (2002)
- 2 S.S. Dara, A text book of engineering chemistry S. Chand & C. Ltd., New Delhi (2006)
3. B. Sivasankar Engineering Chemistry Tate McGraw- Hill Pub. Co. Ltd, New Delhi (2008).

## REFERENCES:

- 1 B. K. Sharma Engineering Chemistry Krishna Prakasan Media (P) Ltd., Meerut (2001)
- 2 Principles of physical chemistry by Samuel Glasstone, Van Nostrand pub.comp, Newyork.
- 3 Principles of physical chemistry by Puri & Sharma, Vikas pub.comp, 2008.

**ME1102**

**ENGINEERING MECHANICS**

**3 0 0 3**

## OBJECTIVE

This is a basic engineering course common to all branches to inculcate in the students, problem solving abilities and to enhance their analytical abilities.

### Unit I - Statics of Particles

**10**

Statics –Basics Concepts, Fundamental principles & concepts: Vector algebra, Newton’s laws, gravitation, force (external and internal, transmissibility), couple, moment (about point and about axis), Varignon’s theorem, resultant of concurrent and non-concurrent coplanar forces, static equilibrium, free body diagram, reactions. Problem formulation concept; 2-D statics, two and three force members, alternate equilibrium equations, constraints and static determinacy; 3-D statics.

### Unit II - Application of Statics & Friction

**9**

Analysis of Structures- Trusses: Assumptions, rigid and non-rigid trusses; Simple truss (plane and space), analysis by method of joints. Analysis of simple truss by method of sections;

**FRICITION:** Friction- Coulomb dry friction laws, simple surface contact problems, friction angles, types of problems, wedges. Sliding friction and rolling resistance

### Unit III - Centroid, Centre of Gravity and Moment of Inertia

**8**

Moment of Inertia- First moment of mass and center of mass, centroids of lines, areas, volumes, composite bodies. Area moments- and products- of inertia, radius of gyration, transfer of axes, composite areas. Rotation of axes, principal area-moments-of-inertia,. Second moment of mass, Mass moments- and products- of inertia, radius of gyration, transfer of axes, flat plates (relation between area- and mass- moments- and products- of inertia), composite bodies. Rotation of axes, principal mass-moments-of-inertia.

### Unit IV - Particle Dynamics

**8**

Rectilinear motion; Plane curvilinear motion (rectangular, path, and polar coordinates). 3-D curvilinear motion; Relative and constrained motion; Newton’s 2nd law (rectangular, path, and polar coordinates). Work-kinetic energy, power, potential energy. Impulse-momentum (linear, angular); Impact (Direct and oblique).

### Unit V Kinematics & Kinetics of Rigid Bodies:

**10**

Plane kinematics of rigid bodies- Rotation; Parametric motion. Relative velocity,

instantaneous center of rotation. Relative acceleration, rotating reference frames. Rotating reference frames, 3-part velocity and 5-part acceleration relations, Coriolis acceleration. Plane kinetics of rigid bodies- Kinetics of system of particles and derivation of moment equation. Translation. Fixed axis rotation; General planar motion.

**TOTAL: 45 PERIODS**

**TEXT BOOKS:**

1. Beer F P and Johnson E R, “Vector Mechanics for Engineers, Statics and Dynamics”, Tata Mc-Graw Hill Publishing Co. Ltd., New Delhi, 2006.
2. Tayal A K, “Engineering Mechanics- Statics and Dynamics” , Umesh Publications, Delhi, 2004
3. Irving H. Shames, Engineering Mechanics, Prentice Hall, New Delhi 1997.

**REFERENCES:**

1. Bansal R K, “Engineering Mechanics”, Laxmi Publications Pvt. Ltd., New Delhi, 2006.
2. Bhavikatti S S, “Engineering Mechanics”, New Age International Pvt. Ltd., New Delhi, 2003.
3. Young D H and Timashenko S, “Engineering Mechanics”, Tata Mcgraw-Hill, Fourth Edition, 2006.
4. Jivan Khachane, Ruchi Shrivastava, “Engineering Mechanics: Statics and Dynamics”, ANE Books, 2006.
5. Rajasekaran S and Sankarasubramanian G, “Engineering Mechanics-Statics and Dynamics”, Vikas Publishing House Pvt. Ltd., New Delhi, 2006.
6. NPTEL courses: <http://nptel.iitm.ac.in/courses.php>, web and video resources on *Engineering Mechanics*.

**BE1101**

**BASIC ENGINEERING - I**

**3 1 0 4**

(Basic Electrical and Electronics Engineering)

**Objectives:**

- To understand the basic solutions of AC and DC circuits.
- To study the basic principle and operation of AC and DC machines.
- To study the fundamental operations of measuring instruments.
- To study the layout of power system.

**Unit: 1 – Electrical circuits**

**9**

Ohms Law, Kirchhoff’s laws, Mesh and Nodal Analysis for DC Circuits. Introduction to AC Circuits, Faraday’s Law of Electromagnetic Induction, Lenz law, Inductor, Capacitor, Power factor, Waveforms and RMS value, Average Value, Peak factor and Form factor, Single phase circuits- Series and Parallel, Three phase balanced circuits. Fundamentals of wiring and earthing.

**Unit: II – Electrical Measurements, Machines and Power system 9**

Operating principles of Moving coil and Moving iron instruments (Ammeter and voltmeter), Dynamometer type watt meter and Energy meter, Errors in Measurements. Construction, Principle of operation and Applications of DC Generators, DC Motors, Single phase transformers. Structure of power system

**UNIT- III Semiconductor devices and applications 9**

Characteristics of PN Junction diode-Zener Effect-Zener diode and its characteristics-Half wave and Full wave Rectifiers-Voltage regulation,Bipolar Junction transistor-CB,CE,CC Configuration and characteristics.

**UNIT-IV Digital Electronics 9**

Binary number system-logic gates-Boolean algebra-Combinational Circuit-half and Full adder,Sequential Circuit-Flip flops-Shift Registers(SIPO,SISO,PIPO,PISO) – Counters: Synchronous and Asynchronous –A/D conversion-Successive approximation,D/A conversion-Weighted Resistor

**UNIT – V Fundamentals of Communication Engineering 9**

Types of Signals: Analog and Digital Signals – Modulation and Demodulation – Principles of Amplitude and Frequency modulation – Communication Systems: Radio, TV, Fax, Microwave, Satellite and Optical Fiber (Block Diagram)

**L: 45 + T: 15, TOTAL: 60 PERIODS**

**TEXT BOOKS:**

1. V.N. Mittle “Basic Electrical Engineering”, Tata McGraw Hill Edition, New Delhi, 1990.
2. V.K.Mehta “Principles of Power System”, S.Chand & Company Ltd, New Delhi, 2001.
3. R.S.Sedha,”Applied electronics”S.Chand&Co.,2006.

**REFERENCES:**

1. Muthusubramanian R, Salivahanan S and Muraleedharan K A, “Basic Electrical, Electronics and Computer Engineering”, Tata McGraw Hill, Second Edition, (2006).
2. Nagsarkar T K and Sukhija M S, “Basics of Electrical Engineering”, Oxford press (2005).
3. Chakrabarti A, Soni M.L, Gupta P.V, Bhatnagar U.S , “ A Text book on Power System Engineering,” Dhanpat Rai & Co, New Delhi,2010.
4. Muthusubramanian R, Salivahanan S and Muraleedharan K A, “Basc Electrical Electronics and Computer engineering”,Tata McGraw Hill, Second edition(2006).
5. Nagsarkar T K and Sukhija M S, “Basics of Electrical Engineering”, Oxford Press(2005).
6. Mehta V K, “Principles of Electronics”,S.Chand&Company Ltd(1994).
7. Mahmood Nahvi and Joseph A. Edminister, “Electric Circuits”, Schaum’ Outline Series McGraw Hill,(2002).
8. Premkumar N, “Basic Electrical Engineering”, Anuradha Publishers,(2003)

**BE1102**

**BASIC ENGINEERING – II**  
(Basic Mechanical and Civil Engineering)

**3 1 0 4**

**Aim:**

To introduce students to the profession of Mechanical and Civil Engineering and involve them in small-scale projects which would allow them to develop teamwork skills.

**Objective:**

- To understand the basic knowledge about the Mechanical components used in various application
- To be aware of the different fields of Civil Engineering, such as Surveying, Structural and Transportation Engineering.

**Unit I – IC Engine and Boilers**

**9**

IC Engines: Working and comparison of two stroke and four stroke petrol and diesel engines - general description of various systems using block diagrams – air system, fuel system and ignition system. A brief description of CRDI, MPFI, GDI and Hybrid Vehicles.

Steam boilers: Classification – Cochran boiler, Babcock and Wilcox boiler, High pressure Boilers - Lamont, Benson boiler

**Unit II – Compressor, Blower, Pumps, Power plants, Refrigeration and Air Conditioning**

**9**

Principles and fields of application of compressors - reciprocating and centrifugal, blower principle, pumps- reciprocating, and centrifugal pumps steam

Elementary ideas of hydroelectric, thermal and nuclear power plants

Refrigeration & Air Conditioning: Refrigerants, Vapor compression system, Vapor absorption system window air conditioning unit -types (general description only).

**Unit III – Manufacturing Processes**

**9**

Basic Principles of Manufacturing processes – casting, metal forming - forging, rolling, Metal joining - soldering, Welding Machining processes- Lathe construction, operation - turning, taper turning, thread cutting

**UNIT - IV Civil Engineering and Materials**

**9**

**Introduction:** Civil Engineering, branches of Civil Engineering, contribution to society, Scope,

**Civil Engineering Materials:** Bricks – stones – sand – cement – concrete – steel sections, glass, wood, FRP

**Surveying:** Objects – types – classification – principles – measurements of distances – angles – leveling – determination of areas – illustrative examples.

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

**Superstructure:** Brick masonry – stone masonry – beams – columns – lintels – roofing – flooring – plastering– Types of Bridges and Dams

## UNIT- V Civil Engineering structures

### Building planning

9

Residential, Institutional and industrial – functional requirements. – Basics of Interior Design and Landscaping.

**Roads-** benefits- classifications- traffic signs

**Bridges-** components of bridges-Dam-Purpose of reservoir.

**Environmental Engineering:** Protected water supply, water treatment methods-sewage treatment- Pollution-Types-causes-remedial measures

**L: 45 + T: 15, TOTAL: 60 PERIODS**

### TEXT BOOKS

- 1) Dr. B.C. Punmia, Ashok Kumar Jain, Arun Kr. Jain, “Basic Civil Engineering”, Laxmi Publications,
- 2) Roy and Choudhary, “*Elements of Mechanical Engineering*”
- 3) J Benjamin, “*Basic Mechanical Engineering*”

### References

1. K.Venugopal and v prabu raja “*Basic Mechanical Engineering*” Anuradha Agencies
2. Shanmugam G and Palanichamy M.S “*Basic Mechanical Engineering*” Tata MC Graw Hill.
3. Shanmugam G and Palanichamy M S, “Basic Civil and Mechanical Engineering”, Tata McGraw Hill Publishing Co., New Delhi, (1996).
4. Ramamrutham. S, “Basic Civil Engineering”, Dhanpat Rai Publishing Co. (P) Ltd. (1999).
5. Seetharaman S. “Basic Civil Engineering”, Anuradha Agencies, (2005).

**CS1172                      COMPUTER PRACTICE LAB – II                      0 1 2 2**

**Prerequisite: None**

### List of Experiments

- |   |           |
|---|-----------|
| <b>1.      Unix Commands</b>                                      | <b>15</b> |
| Study of Unix OS - Basic Shell Commands - Unix Editor             |           |
| <b>2.      Shell Programming</b>                                  | <b>15</b> |
| Simple Shell program - Conditional Statements - Testing and Loops |           |
| <b>3.      C Programming on Unix</b>                              | <b>15</b> |
| Dynamic Storage Allocation-Pointers-Functions-File Handling       |           |

**TOTAL: 45 PERIODS**

**Hardware / software requirements for a batch of 30 students**

**Hardware**

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

**Software**

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

**PH1172**

**PHYSICS LAB - II**

**0 0 2 1**

**LIST OF EXPERIMENTS**

(Any five experiments)

1. Determination of focal length of convex lens- Newtons Rings
2. Determination of wavelength of mercury spectrum- Spectrometer grating
3. Determination of Viscosity of a liquid- Poiseuille's method.
4. Determination of hysteresis loss in a ferromagnetic material.
5. Determination of dielectric constant of a material at room temperature.
6. Determination of band gap of a semiconducting material.
7. Determination of Young's modulus- Uniform bending.

**REFERENCE:** Physics lab manual- Department of Physics

**CH1172**

**CHEMISTRY LAB- II**

**0 0 2 1**

**LIST OF EXPERIMENTS**

1. Determination of concentration of ferrous ion by potentiometry.
  2. Conductometric titration of mixture of acids.
  3. Estimation of copper in brass by EDTA method.
  4. Determination of chloride content in water sample by argentometry.
  5. Determination of acidity by titrimetry.
  6. Determination of iron content in a solution by spectrophotometric method.
  7. Determination of amount of water of crystallization in hydrated barium chloride.
  8. Percentage purity of limestone (permanganometry)
- Minimum five experiments shall be offered.

**TOTAL: 45 PERIODS**

**REFERENCES:**

1. J. Bassette, R. B. Deanen & G. H. Jeffery & J. Mendham, Text book of Vogel Quantitative Inorganic Analysis, ELBS, England.

**BE1171**

**BASIC ENGINEERING LAB – I**  
(Basic Electrical and Electronics Engineering Lab)

**0 0 4 2**

**I. Electrical Engineering Lab**

- 1 Study of Symbols, Cables and Earthing.
- 2 Residential house wiring using switches, fuse, indicator, lamp and energy meter.
- 3 Fluorescent lamp wiring.
- 4 Stair case wiring / Lamp control from three different places/ Doctor Room control/ Go down control
- 5 Measurement of electrical quantities – voltage, current, power & computation of power factor in RLC circuit.
- 6 Measurement of energy using single phase energy meter.
- 7 Fan Wiring.

**II. Electronics Engineering Lab**

- 1 Study of Electronic components and equipments – Resistor, colour coding, Measurement of AC signal parameter (peak-peak, rms period, frequency) using CRO.
- 2 Study of logic gates AND, OR, EX-OR and NOT, NAND and NOR.
- 3 Generation of Clock Signal.
- 4 Soldering practice – Components, Devices and Circuits – Using general purpose PCB.
- 5 Measurement of ripple factor of HWR and FWR.
- 6 Characteristics of PN Junction diode
- 7 Characteristics of Zener diode
- 8 Voltage Regulator using Zener diode

**TOTAL: 45 PERIODS**

**BE1172**

**BASIC ENGINEERING LAB – II**  
(Basic Mechanical and Civil Engineering Lab)

**0 0 4 2**

**OBJECTIVE:**

Introduction to different materials in engineering practices with respect to their workability, formability & machinability with hand tools & power tools and to develop skills through hands on experience.

**I. Mechanical Engineering Lab**

1. Welding - Metal arc welding tools and equipment, exercises.
2. Fitting - Tools, operations, exercises, types of joints. (*Term work to include one job involving fitting to size, male-female fitting with drilling and tapping.*)



3. Foundry- Tools, preparation of moulding sand, patterns, cores, foundry exercises.
4. Carpentry- Tools, carpentry process, carpentry exercises, types of joints.
5. Assembly and Inspection.( *Assembly and Disassembly of some products, tools used. Videos of advancement in manufacturing technology. Inspection of various components using different measuring instruments.*)
6. Machine Tools I - Demonstration of drilling machine.
7. Machine Tools II - Demonstration of Lathe.
8. Study of Automobile and Power Transmission.
9. Wood working - Demonstration of wood working machinery and furniture manufacturing.( *Term work includes one job involving joint and woodturning*)

## II. Civil Engineering Lab

### Buildings:

- (a) Study of plumbing and carpentry components of residential and industrial buildings. Safety aspects.

### Plumbing Works:

- (a) Study of pipeline joints, its location and functions: valves, taps, couplings, unions, reducers, elbows in household fittings.
- (b) Study of pipe connections requirements for pumps and turbines.
- (c) Preparation of plumbing line sketches for water supply and sewage works.
- (d) Hands-on-exercise:  
Basic pipe connections – Mixed pipe material connection – Pipe connections with different joining components.
- (e) Demonstration of plumbing requirements of high-rise buildings.

### Carpentry using Power Tools only:

- (a) Study of the joints in roofs, doors, windows and furniture.
- (b) Hands-on-exercise: Wood work, joints by sawing, planing and cutting.
- (c) Demonstration of elementary surveying techniques

**TOTAL: 45 PERIODS**

### List of equipment and components (For a Batch of 30 Students)

- |  |                                       |
|--|---------------------------------------|
| 1. Assorted components for plumbing consisting of metallic pipes, flexible pipes, couplings, unions, elbows, plugs and other fittings. | plastic pipes,<br><br><b>15 Sets.</b> |
| 2. Carpentry vice (fitted to work bench)   | <b>15 Nos.</b>                        |
| 3. Standard woodworking tools  | <b>15 Sets.</b>                       |
| 4. Models of industrial trusses, door joints, furniture joints   | <b>5 each</b>                         |
| 5. Power Tools:  |                                       |

- |                           |              |
|---------------------------|--------------|
| (a) Rotary Hammer         | <b>2 Nos</b> |
| (b) Demolition Hammer     | <b>2 Nos</b> |
| (c) Circular Saw          | <b>2 Nos</b> |
| (d) Planer                | <b>2 Nos</b> |
| (e) Hand Drilling Machine | <b>2 Nos</b> |
| (f) Jigsaw                | <b>2 Nos</b> |

6. Surveying equipment for Demonstration

**NOORUL ISLAM CENTRE FOR HIGHER EDUCATION**

**NOORUL ISLAM UNIVERSITY, KUMARACOIL**

**B.E. AUTOMOBILE ENGINEERING**

**CURRICULAM & SYLLABUS**

**SEMESTER III**

<b>Code No.</b>	<b>Course Title</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>THEORY</b>					
MA1201	Engineering Mathematics – III	3	1	0	4
AM1201	Applied Engineering Thermodynamics	3	1	0	4
AM1202	Solid and Fluid Mechanics	3	1	0	4
AM1203	Automotive Petrol Engines	3	0	0	3
AM1204	Production Engineering	3	0	0	3
EE1213	Electrical Engineering and Control	3	1	0	4
<b>PRACTICALS</b>					
AM1271	Solid and Fluid Mechanics Laboratory	0	1	2	2
AM1272	Production Engineering Laboratory	0	1	2	2
EE1276	Electrical Engineering and Control Laboratory	0	1	2	2
<b>TOTAL</b>		<b>18</b>	<b>7</b>	<b>6</b>	<b>28</b>

**AIM:**

To impart the fundamental knowledge of Engineering Mathematics to the students in order to achieve a well founded knowledge about the principles of Mathematics.

**OBJECTIVE:**

To develop the skill of the students in the areas of boundary value problems and Transform techniques. This will be necessary for their effective studies in a large number of Engineering subjects like heat conduction, communication systems, electro-optics and electromagnetic theory. This course will also serve as a prerequisite for post graduate and specialized studies and research.

**UNIT I PARTIAL DIFFERENTIAL EQUATIONS 9**

Formation of partial differential equations by elimination of arbitrary constants and arbitrary functions – Solutions of standard types of first order partial differential equations – Lagrange's linear equation – Homogeneous linear partial differential equations of second and higher order with constant coefficients.

**UNIT II FOURIER SERIES 9**

Dirichlet's conditions – Fourier series – Change of interval - Odd and Even functions – Half range sine and cosine series – Parseval's identity – Harmonic Analysis.

**UNIT III BOUNDARY VALUE PROBLEMS 9**

Classification of second order linear partial differential equations – One dimensional wave and heat equations – Assumptions – Fourier series solution – Steady state solution of two dimensional heat equation (insulated edges excluded) – Fourier series solution in Cartesian co-ordinates.

**UNIT IV FOURIER TRANSFORMS 9**

Fourier integral theorem (without proof) – Fourier transform – Sine and Cosine transforms – Properties - Inverse Fourier transform – Inverse sine and cosine transforms – Properties - Transforms of simple functions – Convolution theorem – Parseval's identity

**UNIT V Z-TRANSFORMS 9**

Z- transform – Elementary properties – convolution theorem - Inverse Z-transform – Partial fraction Method, Inversion integral method and Convolution – Initial and Final value theorems – Formation of difference equations – Solution of difference equations using Z-transform

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

**TEXT BOOK:**

Grewal B.S., "Higher Engineering Mathematics" – 40<sup>th</sup> Edition, Khanna Publishers, Delhi 2011.

## REFERENCES:

1. Kandasamy P, Thilagavathy K, and Gunavathy K., “Engineering Mathematics Volume III”, First Edition, S.Chand & Company Ltd., New Delhi, 1996
2. Veerarajan T., “Engineering Mathematics (for Semester III), Third Edition, Tata McGraw – Hill Publishing Company Limited, New Delhi 2007.
3. Bali, N.P. and Manish Goyal, A Text Book of Engineering Mathematics, Seventh Edition, Lakshmi Publications Pvt. Ltd., New Delhi, 2009.

## AM1201 APPLIED ENGINEERING THERMODYNAMICS

3 1 0 4

### OBJECTIVES

To make the students understand thermodynamic Principles, Compressible flow and fundamentals of heat transfer with its concepts in the operation of automotive engines.

### UNIT I : FIRST LAW OF THERMODYNAMICS 9

System, thermodynamic equilibrium, state, property, process, cycle, zeroth law of thermodynamics, energy, work, heat, first law of thermodynamics, PMM I, ideal gases, application of first law of thermodynamics to closed and open systems, pressure – volume diagrams, steady flow process, application of steady flow energy equation.

### UNIT II : SECOND LAW OF THERMODYNAMICS 9

Limitations of first law, statements of second law of thermodynamics, PMM II, Clausius inequality, heat engine, heat pump, refrigerator, carnot cycle, carnot theorem, entropy, temperature – entropy diagram, entropy changes for a closed system.

### UNIT-III GAS POWER CYCLES 9

Carnot cycle, Steirling cycle, Ericsson Cycle, Overview of Reciprocating engines, Air standard cycles, Otto cycle, Diesel cycle, Dual cycle Brayton cycle, Brayton – Rankine Combine cycle, Problems.

### UNIT-IV GAS COMPRESSORS 9

General aspects, Classifications, Reciprocating Compressors – Single stage multistage, Volumetric efficiency, Various effects on compressor output, Rotary Compressors – Displacement, Steady flow Compressors, Comparison, Problems.

### UNIT-V HEAT TRANSFER 9

Modes of heat transfer, Fourier’s law of Conduction, One dimensional steady state Conduction through plane and Composite walls, Cylinders, Convection heat transfer, fins, Basics of heat exchangers radiation heat transfer, Problems.

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

### TEXTBOOKS

1. Nag.P.K., “Engineering Thermodynamics”, Tata McGraw-Hill, New Delhi, 2013.
2. R.K.Rajput – “A Textbook of Engineering thermodynamics”- Laxmi Publications (P) Ltd, New Delhi-2012.

3. Biray K. Dutta – “Heat Transfer Principles and Applications”- Prentice hall of India, New Delhi- 2013
4. R.Rudramoorthy- “Thermal Engineering” - Tata McGraw Publishing Co. Ltd, New Delhi- 2006

#### REFERENCES

1. R.S.Khurmi, J.K.Gupta – “A textbook of Thermal Engineering”- S.Chand & company Ltd- 2014.
2. E.Ratha Krishnan “Fundamentals of Engineering thermodynamics”, Eastern Economy Edition-Prentice Hall of India Private Limited, New Delhi–110 001, 2010.
3. Yunus A. Cengel, Michael A.Boles – “Thermodynamics An Engineering approach”- Sixth Edition- 2009.
4. Y.V.C.Rao – Heat transfer – University press, Hyderabad – 2009.

**AM1202**

**SOLID AND FLUID MECHANICS**

**3 1 0 4**

**AIM:** 1.To understand the behavior of metals subjected to different types of loads.  
2. To impart Knowledge on Properties of fluids and on Turbo machines (pumps and turbines)

#### OBJECTIVES

- To gain knowledge of simple stresses, strains and deformation in vehicle components due to external loads
- To study the effects of stresses and deformations through mathematical models of beams, twisting bars also understand the effect of component dimensions and shape on stresses and deformations.
- To understand the structure and the properties of the fluid, analyze and appreciate the complexities involved in solving the fluid flow problems.
- To study the mathematical techniques already in vogue and apply them to the solutions of practical flow problems.

#### **UNIT I: STRESS, STRAIN AND DEFORMATION OF ELEMENTS 9**

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

#### **UNIT II: THEORY OF SIMPLE BENDING 9**

Types of beams: Supports and Loads – Shear force and Bending Moment in beams – Theory of simple bending –Stresses in beams, Stress variation along the length and in the beam section – Effect of shape of beam section on stress induced – Deflection – slope of Beams- Double Integration Method- Columns.

#### **UNIT III: TORSION 9**

Stresses and deformation in circular and hollow shafts – stepped shaft – Shaft fixed at both ends – stresses in helical springs – Deflection of springs

Biaxial state of stresses - Thin Cylindrical and spherical shells – Deformation in thin cylindrical and spherical shells

#### **UNIT IV: FLUID STATICS AND DYNAMICS**

**9**

Fluid – definition, properties of fluids, distinction between solid and fluid. Fluid statics: concept of fluid static pressure, absolute and gauge pressures - Pressure measurements by manometers and pressure gauges. Fluid Kinematics - Flow visualization - lines of flow - types of flow - velocity field and acceleration - continuity equation (one and three dimensional differential forms). Fluid dynamics - equations of motion - Euler's equation along a streamline - Bernoulli's equation – applications - Venturi meter, Orifice meter, Pitot tube - dimensional analysis - Buckingham's  $\pi$  theorem-applications.

#### **UNIT V: HYDRAULIC PUMPS AND TURBINES**

**9**

Pumps: definition and classifications - Centrifugal pump: classifications, working principle, velocity triangles, specific speed, efficiency and performance curves - Reciprocating pump: classification, working principle - cavitations in pumps, Rotary pumps: working principles of gear and vane pumps. Hydro turbines: definition and classifications - Pelton turbine - Francis turbine - propeller turbine - Kaplan turbine - working principles - velocity triangles - work done - specific speed - efficiencies - performance curve for turbines. Euler's equation for turbo machines

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

#### **TEXT BOOKS**

1. Popov E.P., “Engineering Mechanics of Solids”, Prentice-Hall of India, New Delhi, 2010.
2. Beer F. P. and Johnson R, “Mechanics of Materials”, McGraw-Hill Book Co, Third Edition, 2010.
3. Streeter, V.L., and Wylie, E.B., “Fluid Mechanics”, McGraw-Hill, 2010.
4. Kumar, K.L., “Engineering Fluid Mechanics”, Eurasia Publishing House (P) Ltd, New Delhi (8<sup>th</sup> edition), 2009.
5. Vasandani, V.P., “Hydraulic Machines - Theory and Design”, Khanna Publishers (10<sup>th</sup> edition), 2004.

#### **REFERENCES**

1. Nash W.A, “Theory and problems in Strength of Materials”, Schaum Outline Series, McGraw-Hill Book Co, New York, 2010
2. Kazimi S.M.A, “Solid Mechanics”, Tata McGraw-Hill Publishing Co, New Delhi, 2011
3. Bansal, R.K., “Fluid Mechanics and Hydraulics Machines”, (5<sup>th</sup> edition), Laxmi publications (P) Ltd, New Delhi, (9<sup>th</sup> edition), 2011.
4. White, F.M., “Fluid Mechanics”, Tata McGraw-Hill, 5<sup>th</sup> Edition, New Delhi, 2003.
5. Ramamirtham, S., "Fluid Mechanics and Hydraulics and Fluid Machines", Dhanpat Rai and Sons, Delhi, 1998.
6. Som, S.K., and Biswas, G., “Introduction to Fluid Mechanics and Fluid Machines”, Tata McGraw-Hill, 2<sup>nd</sup> Edition, 2010.

**OBJECTIVES**

To learn the basic principles, structures, auxiliary systems and functions of automotive petrol engines.

**UNIT-1 CONSTRUCTION AND OPERATION OF PETROL ENGINES**

Description of Engine components - Working principle of two stroke and four stroke petrol engine, air standard Otto cycle, actual indicator diagram, comparison of four strokes and two-stroke engine operation, firing order and its significance. Port Timing, Valve Timing of petrol engines.

9

**UNIT-II PETROL FUEL FEED SYSTEMS & CARBURETORS**

Methods of fuel supply system- gravity system, pressure system, Vacuum system, pump system, Fuel injection system, Components of fuel supply system –Fuel tank, fuel pump (Mechanical and Electrical) Vapour return line, Air cleaner, Fuel filters, Carburetion, Functions of carburetor, simple carburetor, Limitations of simple carburetor, Types of carburetor, Special features of modern carburetor, Solex carburetor, Introduction to mpfi.

9

**UNIT-III COMBUSTION IN S.I. ENGINE**

Ignition limits, Stages of combustion in petrol engine, Ignition lag, Effect of engine variables on ignition lag, Effect of engine variables on flame propagation, Abnormal combustion, Detonation, Effects of detonation, Theories of detonation. Surface ignition, Pre ignition, Post ignition, S.I.engine combustion chamber design, Types of combustion chambers for S.I. engine, Very high output combustion chamber engines .

9

**UNIT-IV ENGINE COOLING AND LUBRICATION SYSTEM**

Distribution of heat supplied to engine, Necessity of engine cooling, Piston and engine Cylinder temperatures, Factors affecting on piston temperature, Types of cooling system, Air cooling system, Water cooling system, Thermosyphon cooling, Cooling with thermostatic regulator. Components of water- air cooling system- Coolants and its additives - Radiator, Pressure Cap ,Pressurized cooling system, Expansion Reservoir, Thermostat, Water Pump, Comparison between water cooling and air cooling, Other cooling methods- liquid cooling, steam cooling. Effects of overcooling. Different parts of engine to be lubricated, Types of lubrication system- petrol system, Wet sump method, Dry sump method, Fully and partially pressurized lubrication system, Components of lubrication system- oil strainer, Oil filter and its types.

9

**UNIT-V IGNITION AND SUPERCHARGING IN SI ENGINES**

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 system. Objectives of supercharging, Relative power with and without supercharging, Supercharging of spark ignition engine, Supercharging of S.I. engine, Effects of supercharging on performance of engine, Supercharging limits for S.I engine, Methods of super charging, Types of Superchargers.



**TOTAL: 45 PERIODS**

**TEXT BOOKS**

1. Automotive Mechanics by W. Crouse/ Anglin, Tata McGraw Publication, Delhi, (10<sup>th</sup> edition),2008.
2. Automobile Engineering by Kripal Singh, Standard Pub. & Distributors, Delhi, (12<sup>th</sup> edition) 2011,
3. Automobile Engineering by R. B. Gupta, Satya Prakashan, Delhi(7<sup>th</sup> edition) 2008.

**REFERENCES**

- 1.Ganesan.V., “Internal Combustion Engines”, Tata McGraw-Hill Publishing Co., New Delhi, (3<sup>rd</sup> edition) 2011.
- 2.M.L.Mathur and R.P.Sharma, “Internal combustion engines”, Dhanpat Rai & Sons Publications, New Delhi, 2010.
- 3.K.K.Ramalingam, “Internal Combustion Engines”, Scitech Publications, Chennai, (2<sup>nd</sup> edition), 2012.
- 4.Automobile Mechanics by Joseph Heitner, Affiliated East-West Press Pvt. Ltd.,Delhi(2<sup>nd</sup> edition), 2004.

**AM1204**

**PRODUCTION ENGINEERING**

**3 0 0 3**

(Lab based theory course)

**OBJECTIVE**

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

**UNIT-I CASTING**

**9**

Casting types, procedure to make sand mould, types of core making, moulding tools, machine moulding, special moulding processes – CO<sub>2</sub> 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**

**9**

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 - CNC machine

General principles and applications of the following processes: Abrasive jet machining, Ultrasonic machining, Electric discharge machining, Electro chemical machining, Plasma arc machining, Electron beam machining and Laser beam machining.

#### **UNIT-IV FORMING AND SHAPING OF PLASTICS**

**9**

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

**TOTAL: 45 PERIODS**

#### **TEXT BOOK**

1. Hajra Choudhury, Elements of Workshop Technology, Vol. I and II, Media Promoters and Publishers Pvt., Ltd., Mumbai, 2012.

#### **REFERENCES**

1. R.K.Jain and S.C. Gupta, Production Technology, Khanna Publishers. 17<sup>th</sup> Edition, 2011.
2. H.M.T. Production Technology – Handbook, Tata McGraw-Hill, 2003.
3. Roy. A. Linberg, Process and Materials of Manufacture, PHI, (4<sup>th</sup> edition), 2011.
4. M.Adithan and A.B. Cupta, Manufacturing Technology, New Age, 1996,
5. Serope Kalpajian, Steven R.Schmid, Manufacturing Engineering and Technology, Pearson Education, Inc. 2002(Second Indian Reprint)

#### **EE1213 ELECTRICAL ENGINEERING AND CONTROL 3 1 0 4**

##### **UNIT I TRANSFORMERS**

**9**

Construction, Principle of operation of single phase transformers – emf equation – testing - approximate equivalent circuit - losses - efficiency and regulation.

##### **UNIT II DC & AC MACHINES**

**9**

DC motor - Principle of operation – types - torque equation – Characteristics - speed control - dc motor starters – applications. AC motors - Construction, principle of operation of synchronous motor, Induction motor –types - speed control - applications.

##### **UNIT III SPECIAL MACHINES**

**9**

Construction, Working Principle of Servomotor - AC & DC, Stepper motor - types, Permanent Magnet DC motor & Universal motor.

#### **UNIT IV CONTROL SYSTEMS**

**9**

Basic elements in control systems, Introduction to linear and non-linear systems – Open and closed loop systems - Transfer function - Modeling of systems - Electrical analogy of mechanical systems - Introduction to P,PI,PID controllers.

#### **UNIT V MICROPROCESSOR**

**9**

8085 ARCHITECTURE: Functional Diagram, Addressing modes, Instructions, Timing Diagrams - simple programs, Introduction to PLC & PLD.

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

#### **TEXT BOOKS**

1. Theory and Performance of Electrical Machines by J.B. Gupta.
2. Control Systems Engineering by I.J. Nagarath and M.Gopal.
3. “Microprocessor and Interfacing” , Tata McGraw-Hill by LD.V.Hall.
4. Electrical machines by Kothari and Nagarath, TMH Publications

#### **REFERENCES**

1. Kenneth J Ayala, “The 8086 Micro processors Architecture, Programming and Applications”, Thomson Publishers, 2005.
2. B.L.Theraja, A.K.Theraja “Electrical Technology” Volume 2

**AM1271**

**SOLID AND FLUID MECHANICS LABORATORY**

**0 1 2 2**

#### **LIST OF EXPERIMENTS**

1. To study & perform the various hardness test (Brinell hardness test, Rockwell hardness test, Vickers hardness test)
2. To study the Impact testing machine and perform the Impact tests (Izod & Charpy).
3. To study the Universal testing machine and perform the tensile test.
4. To perform compression & bending tests on UTM.
5. To perform compression tests on open coil spring.
6. Strain Measurement using Rosette strain gauge
7. Determination of the Coefficient of discharge for given Orifice meter
8. Determination of the Coefficient of discharge for given Venturi meter.
9. Calculation of the rate of flow using Rota meter.
10. Determination of friction factor for a given set of pipes.
11. To investigate the performance of the centrifugal pump and draw its characteristic curves.
12. To investigate the performance of the reciprocating pump and draw its characteristic curves.
13. To investigate the performance of the Pelton Wheel turbine with different range of flow and draw its characteristic curves.
14. To investigate the performance of the Francis turbine with different range of flow and draw its characteristic curves.

**TOTAL: 45 PERIODS**

## **LIST OF EQUIPMENTS**

*(for a batch of 30 students)*

1. Universal Tensile Testing machine with double shear attachment – 40 Ton Capacity
2. Torsion Testing Machine (60 NM Capacity)
3. Impact Testing Machine (300 J Capacity)
4. Brinell Hardness Testing Machine
5. Rockwell Hardness Testing Machine
6. Spring Testing Machine for tensile and compressive loads (2500 N)
7. Rosette strain gauge
8. Orifice meter setup
9. Venturi meter setup
10. Rotameter setup
11. Pipe Flow analysis setup
12. Centrifugal Pump setup
13. Reciprocating Pump setup
14. Pelton wheel turbine setup.
15. Francis turbine setup.

**AM1272**

**PRODUCTION ENGINEERING LABORATORY 0 1 2 2**

### **OBJECTIVE:**

To gain a practical knowledge of production processes such as turning, facing, thread cutting, drilling, boring, knurling, shaping, milling, cylindrical grinding etc., which are involved in the manufacturing of various automobile components.

Exercise in Lathe, Shaper, Planer, Milling and Grinding machine in the following machining operations.

#### **1. LATHE**

- 1.1. Facing, plain turning and step turning and Chamfering
- 1.2. Taper turning using compound rest.
- 1.3. Taper turning using taper turning attachment
- 1.4. Single start V thread, cutting and knurling

#### **2. SHAPER AND SLOTTER**

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

#### **3. DRILLING**

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

#### **4. MILLING**

- 4.1. Plain Milling Exercise
- 4.2. Gear Milling Exercise

5. **GRINDING**
  - 5.1 Cylindrical Grinding Exercise
  - 5.2 Surface Grinding Exercise
  
6. **CNC MACHINING**
  - 6.1 CNC Milling
  - 6.2 CNC Turning

**TOTAL: 45 PERIODS**

**LIST OF EQUIPMENTS FOR A BATCH OF 30 STUDENTS**

1.	Centre Lathe with accessories (At least four lathes must have tape-turning attachment)	15 No.
2.	Shaping Machine	2 No.
3.	Slotting Machine	1 No.
4.	Radial Drilling Machine	1 No.
5.	Upright Drilling Machine	1 No.
6.	Horizontal Milling Machine	3 No.
7.	Cylindrical Grinding Machine	1 No.
8.	Surface grinding machine	1 No.
9.	CNC Machine ( Milling and Turning)	1 No.

**EE1276 ELECTRICAL ENGINEERING AND CONTROL LABORATORY**  
**0 1 2 2**

1. OC and SC tests on single phase transformer (Predetermination of efficiency and regulation at given power factors)
2. Load test on 3-phase Induction motor (Determination of performance Characteristics)
3. Speed control of DC Shunt motor by
  - a) Armature Voltage control
  - b) Field flux control method
4. Load test on DC shunt motor.
5. Simulation of Non-linear system.
6. Simulation of stability analysis of linear system.
7. Arithmetic operation: 8 byte addition and subtraction using 8085 Microprocessor.
8. Stepper motor interfacing using 8085 Microprocessor.
9. Microprocessor Interfacing (with any one of the followings)
  - 8259 – Interrupt Controller
  - 8279 – Keyboard Display
  - 8225- PPI
  - 8251- USART
10. Exercise in PLC: Frequency Response, Time Response, Sequence Response.

**TOTAL: 45 PERIODS**

**NOORUL ISLAM CENTRE FOR HIGHER EDUCATION**

**NOORUL ISLAM UNIVERSITY, KUMARACOIL**

**B.E. AUTOMOBILE ENGINEERING**

**CURRICULAM & SYLLABUS**

**SEMESTER IV**

<b>Code No.</b>	<b>Course Title</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>THEORY</b>					
MS1201	Environmental Science	3	1	0	4
MA1204	Statistics and Numerical Methods	3	1	0	4
AM1205	Automotive Diesel Engines	3	0	0	3
AM1206	Automotive Materials and Metallurgy	2	1	0	3
AM1207	Theory of Machines	3	1	0	4
AM1208	Automotive Electrical and Electronics System	3	0	0	3
<b>PRACTICALS</b>					
AM1273	Engine and Fuel Testing Laboratory	0	1	2	2
AM1274	Dynamics and Engineering Metallurgy Laboratory	0	1	2	2
AM1275	Automotive Electrical and Electronics System Laboratory	0	1	2	2
<b>TOTAL</b>		<b>17</b>	<b>7</b>	<b>6</b>	<b>27</b>

**OBJECTIVES**

- To provide the students about general aspirants of environment and ecology, the environment pollution and the current social issues.

**UNIT I: NATURE OF ENVIRONMENT STUDIES AND NATURAL RESOURCES 9**

Environment studies- definition- multi disciplinary nature – scope and importance- need for public awareness- Natural resources- Forest resources- energy resources- food Resources- water resources – land resources - mineral resources.

**UNIT II: ECO SYSTEMS AND BIO-DIVERSITY 9**

Concept and component of eco systems- producer, consumer, decomposer- structure and function of eco system- food chain and food web- energy flow model- aquatic eco system- forest eco system- desert eco system- pyramid of biomass- ocean eco system- grass land eco system- Bio diversity in India- value of bio diversity- biodiversity threatens- biodiversity protection- In-situ and Ex-situ conservation.

**UNIT III: ENVIRONMENTAL POLLUTION 9**

Meaning of environmental pollution- air pollution- acid rain – global warming- water pollution- water pollution control- soil pollution- urban waste and soil pollution- marine pollution- noise pollution- thermal pollution- solid and hazardous waste management- waste disposal methods- solid waste and India- natural disaster and disaster management. Low carbon perspectives, Energy savings, Safety and Security

**UNIT IV: SOCIAL ISSUES AND THE ENVIRONMENT 9**

Unsustainable to sustainable development- sustainable development in India- water conservation, watershed management and water harvesting- environmental ethics- role of engineer in environmental protection- economic aspects of environment.

**UNIT V: HUMAN POPULATION AND ENVIRONMENT 9**

Population growth- distribution of population- factors affecting variation in population- theories of population- future of human population- family welfare programme- HIV and AIDS- environment and human health- human rights- value education- women and child welfare.

**TOTAL: 45 PERIODS**

**TEXT BOOKS**

- i. Cunnigham & saigo: 'Environmental science :A global concern' 4<sup>th</sup> Ed.W.c. Brown Publishers. USA. 1997
- ii. Chauhan A.S, 'Environmental studies' 2<sup>nd</sup> revised ed.2004, Jain Brother publishers, New Delhi

**REFERENCE BOOKS**

- i. Benny Joseph : 'Environmental Science and Engineering', 2006, Tata McGraw- Hill Publication.

- ii. Siddique K.A. : Elements of Ecology and Environmental Pollution, 1<sup>st</sup> Ed. 2002, Kushal Publication, Varanasi.

**MA1204 STATISTICS AND NUMERICAL METHODS 3 1 0 4**

**UNIT I PROBABILITY AND DISTRIBUTIONS 9**

Axioms of probability – Independent Events -Random variable - Probability mass functions - Probability density functions -Distribution functions- Properties – Expectation. Binomial, Poisson, Geometric, Uniform, Exponential, Gamma, Weibull and Normal distributions and their properties (Problems only)

**UNIT II CORRELATION, REGRESSION AND ANALYSIS OF VARIANCE 9**

Pearson's Correlation coefficient- Spearman's Rank correlation coefficient. Regression lines – Analysis of Variance- One-way classification and two way classification. Principles of design of experiments - Completely randomized design – Randomized block design

**UNIT III TESTING OF HYPOTHESIS 9**

Sampling distribution – Standard error – Sample size –Type I error and Type II error - One tailed and Two tailed tests – large sample tests- Proportions – means and difference of means – Small sample tests – t-tests : Single mean, difference of means – F test for variances – Chi square test for independence of attributes and goodness of fit.

**UNIT IV SOLUTION OF EQUATIONS 9**

Fixed point iteration method - Newton-Raphson method- Gauss Elimination method – Gauss-Jordan methods – Iterative methods of Gauss-Jacobi and Gauss-Seidel. Advantages and limitations of the above methods.

**UNIT V INTERPOLATION, NUMERICAL DIFFERENTIATION AND INTEGRATION 9**

Lagrange's interpolation – Newton's forward and backward difference interpolation formula- Numerical differentiation using Newton's forward and backward difference interpolation formula - Numerical integration using Trapezoidal and Simpson's 1/3 rules.

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

**TEXT BOOKS**

1. S.C. Gupta and V.K. Kapoor, Fundamentals of Mathematical Statistics, Eight Edition, Sultan Chand & Sons, 1996. Unit 1 ,2,3
2. Venkatraman M.K, "Numerical Methods" Fifth Edition, National Pub. Company, Chennai 2005 Unit 4, 5

**REFERENCES:**

1. Veerarajan T., Probability, Statistics and Random Processes, Second Edition, Tata McGraw Hill, 2007
2. R.A. Johnson and C.B. Gupta, "Miller and Freund's Probability and Statistics for Engineers", Fifth Edition, Pearson Education, Asia, 1994 (For units 3, 4 and 5).
3. Gerald, C. F. and Wheatley, P. O., "Applied Numerical Analysis", Sixth Edition, Pearson Education Asia, New Delhi, 2006.



4. Grewal, B.S. and Grewal, J.S., “ Numerical methods in Engineering and Science”, Eighth Edition, Khanna Publishers, New Delhi, 2009.

**AM1205**

**AUTOMOTIVE DIESEL ENGINES**

**3 0 0 3**

### **OBJECTIVES**

To understand the basic principles, structures, auxiliary systems and functions of automotive diesel engines.

#### **UNIT – I : BASIC CONCEPTS OF DIESEL ENGINES**

**9**

. Diesel engine construction and operation, comparison of diesel engine with petrol engine two stroke and four stroke diesel engines dual cycle engines, diesel cycle, fuel-air and actual cycle analysis, diesel fuel, ignition quality, cetane number, laboratory tests for diesel fuels, standards and specifications.

#### **UNIT- II : DIESEL FUEL FEED SYSTEM AND INJECTORS**

**9**

, Requirements of diesel injection system, Fuel feed pump, Types of injection system, fuel injection pump, fuel injectors, Fuel filter, Air cleaner, Phasing and calibration of fuel injection pump, Testing of Injectors (pressure test, leak test), Introduction to CRDi system.

#### **UNIT-III : AIR MOTION & COMBUSTION IN C.I. ENGINE**

**9**

Importance of air motion, swirl, squish and turbulence, swirl ratio, fuel air mixing .Air fuel ratio in C.I. engine, Stages of combustion in C.I. engine, Delay period, Variables affecting on delay period, Diesel knock, Methods of controlling diesel knock, C.I. engine combustion chamber, Direct injection type, Open type, Turbulent type, Cold starting of C.I. engine- decompression lever, heater plug, inlet manifold heater, Chemical spray.

#### **UNIT –IV : COMBUSTION CHAMBERS AND SUPERCHARGING**

**9**

Combustion chambers - Prechamber, M combustion chamber, Objectives of supercharging, Relative power with and without supercharging, Supercharging of spark ignition engine, Supercharging of C.I. engine, Effects of supercharging on performance of engine, Supercharging limits for C.I. engine, Methods of supercharging, Supercharges, Turbo charging, Comparison with supercharging, Methods of turbo charging, Limitations of turbo charging- Matching of turbo charging.

#### **UNIT- V : DIESEL ENGINE TESTING AND PERFORMANCE**

**9**

Automotive and stationary diesel engine testing and related emission standards. Engine performance and emission characteristics, variables affecting engine performance and emission, methods to improve engine performance, heat balance, performance maps.

**TOTAL: 45 PERIODS**

### **TEXT BOOKS**

1. Ganesan.V.Internal Combustion Engines, Tata-McGraw Hill Publishing Co., New Delhi, 4<sup>th</sup> edition. 2012.
2. Heldt.P.M.,High Speed Combustion Engines, Oxford IBH Publishing Co.,1985.

## REFERENCES

1. Dr.K.K.Ramalingam “Internal Combustion Engines Theory and Practice”, Scitech Publications (India) Pvt. Ltd.,Chennai, 4 th edition. 2012.
2. Heywood.J.B “Internal Combustion Engine Fundamentals”, McGraw-Hill Book Co., 2012.
3. Heinz Heister “Advanced Engine Technology”, SAE, 1995.
4. Pulkrabek “Engineering Fundamentals of the Internal Combustion Engines”, Practice Hall of India 2004.

## AM1206 AUTOMOTIVE MATERIALS AND METALLURGY 2 1 0 3

**Aim:** To impart knowledge on various mechanical properties of various materials & application of these materials in practice

### OBJECTIVE

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

Review (Not for Exam):

Crystal structure – BCC, FCC and HCP structure – unit cell – crystallographic planes and directions, miller indices – crystal imperfections, point, line, planar and volume defects – Grain size, ASTM grain size number.

### UNIT I: ELASTIC AND PLASTIC BEHAVIOR OF MATERIALS 9

Elasticity. Stress and strain relationship in engineering materials. Deformation mechanism. Strain hardening, alloying, polyphase mixture, martensitic, precipitation, dispersion, fibre and texture strengthening. Iron carbon diagram – TTT diagram.

### UNIT II: HEAT TREATMENT AND SURFACE TREATMENT 9

Heat treatment of steel. Annealing –types, normalising, hardening and tempering with specific relevance to automotive components, surface hardening techniques, induction flame and chemical hardening. Coating and corrosion resistance. Electroplating, phosphating, anodizing, hot dipping, thermal spraying, hard-facing and thin film coatings.

### UNIT III: FRACTURE, FATIGUE AND CREEP 9

Fracture, classification and types, Griffith’s theory, notch effects, stress concentration, concept of fracture toughness. Ductile brittle transition. Fatigue Mechanism of crack initiation and growth, factors affecting fatigue creep, creep curve, Ashby deformation mechanism maps, and creep mechanism, metallurgical variables of creep.

### UNIT IV: CHARACTERISTICS OF MATERIALS 9

Castability, machinability, formability and weldability of engineering materials such as steel, cast iron, alloy steels, brass, bronze and aluminum alloys. Composite materials: fabrication techniques, materials for high temperature. Cryogenic wear, corrosion fatigued creep and oxidation resistance application.

## **UNIT V : MATERIALS FOR AUTOMOTIVE APPLICATIONS 9**

Criteria of selecting materials for automotive components viz Cylinder block, Cylinder head, Piston, Piston ring, Gudgeon pin, Connecting rod, Crank shaft, Crank case, Cam, Cam shaft, Engine valve, Gear wheel, Clutch plate, Axle bearings, Chassis, Spring, body panel radiator, brake lining etc. Application of non-metallic materials such as composite, ceramic and polymers in automobile.

**TOTAL: 45 PERIODS**

### **TEXT BOOKS:**

1. Khanna.O.P.Material Science and Metallurgy, Dhanpat Rai & Sons, 2004.
2. Kapoor, Material Science and Processes, New India Publishing House, 1987.

### **REFERENCES:**

1. Dieter, G.E., Mechanical Metallurgy, McGraw Hill, New York, 2001.
2. Avner.S.H.Introduction to physical metallurgy, McGraw Hill, New York, 2<sup>nd</sup> Edn 2009.
3. Raghavan.V.Physical Metallurgy, Principle and Practice 2<sup>nd</sup> Edn 2012.

**AM1207**

**THEORY OF MACHINES**

**3 1 0 4**

### **OBJECTIVE**

To expose the students the different mechanisms, their method of working, Forces involved, profiles and their motions.

## **UNIT I MECHANISMS 9**

Introduction – Links – Pairs – Chain – Mechanism – Machine structure – Degrees of freedom – Four bar chains – Terminology and definition – Planer, Spherical and Spatial Mechanisms – Grashoff's law – Kutzbach criterion – Grubler's criterion for plane mechanism. Inversion of mechanisms – Four bar, single slider crank and double slider crank mechanisms– Hooke's joint –Double Hooke's joint – Velocity and Acceleration of Four bar and single slider crank mechanisms by relative velocity Method.

## **UNIT II FRICTION & VIBRATIONS 9**

Applications – Friction in screw and nut – Effort calculations –Efficiency– Self locking and overhauling of screws. Pivot and collar – Thrust bearing- Introduction to clutches. Free, forced and damped vibrations of single degree of freedom systems – Magnification factor- Force transmitted to supports - Torsional vibration of shaft – Critical speed of shaft.

## **UNIT III GEAR TRAINS AND CAMS 9**

Spur gear terminology and definition – Gear trains: simple, compound, reverted and epicyclic – Velocity ratio and torque calculation in gear trains – Automobile differential.

Cams – Types of cams – Design of profiles – Knife edged, flat faced and roller ended followers with and without offsets for various types of follower motions

#### **UNIT IV BALANCING OF MASSES 9**

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

#### **UNIT V GYROSCOPE, TURNING MOMENT DIAGRAM AND FLYWHEELS 9**

Gyroscopes: Gyroscopic forces and couple – Forces on bearing due to gyroscopic action – Gyroscopic effect in ship, motor cycle, car and aircraft.

Turning moment diagrams: four stroke IC engines, multi cylinder engines, fluctuation of energy. Fly wheels – energy stored, dimension of rim, Application of flywheel – Punching presses.

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

#### **TEXT BOOKS**

1. Rattan.S.S, “Theory of Machines”, Tata McGraw–Hill Publishing Co., New Delhi, 2009.
2. Ballaney.P.L, “Theory of Machines”, Khanna Publishers, New Delhi, 2005.

#### **REFERENCES**

1. Rao,J.S and Dukkipati, R.V, “Mechanism and Machine Theory”, Second Edition, Wiley Eastern Ltd., 2007.
2. Malhotra, D.R and Gupta, H.C., “The Theory of Machines”, Satya Prakasam, Tech. India Publications, 6<sup>th</sup> Edn 2010.
3. Gosh, A. and Mallick, A.K., “Theory of Machines and Mechanisms”, Affiliated East West Press, 3<sup>rd</sup> Edn 2006.
4. Shigley, J.E. and Uicker, J.J., “Theory of Machines and Mechanisms”, McGraw-Hill, 1995.

#### **AM1208 AUTOMOTIVE ELECTRICAL AND ELECTRONICS SYSTEM 3 0 0 3**

#### **UNIT-I AUTOMOTIVE WIRING AND ACCESSORIES 9**

Introduction- Wire types and materials – wire size – connectors and terminals- Ground paths common electrical parts – wire color coding – system diagrams – lighting system – detail of head light and side light – head light aiming alignment – horn – wiper system – fault analysis on lighting system

#### **UNIT-II AUTOMOTIVE BATTERY 9**

Introduction to fuel cell – Electro chemical action – types of battery Chemical vacation in the battery – Battery rating – battery size collection – Battery efficiency- Battery testing – Battery testing – Battery life – Battery Installation components – Battery charging – Battery Maintenance.

#### **UNIT-III CHARGING AND STARTING SYSTEM OPERATION 9**

Generation of DC current – Construction of DC generator – types of DC generator – Characteristics of DC generator - Regulators for DC generator – Principle and Construction of AC generator –Starting motor \_ Principle and Construction of starting motor – Starting motor drive arrangements –.Common fault and fault analysis

#### **UNIT – IV AUTOMOTIVE ELECTRONICS AND ENGINE CONTROLS: 9**

Current trends in automotive electronic engine management system, electro magnetic interference suppression, electromagnetic compatibility, electronic dashboard instruments, onboard diagnostic system, security and warning system – Common fault and fault analysis

Concept of an electronic engine control system, electronic fuel injection - throttle body fuel injection, multi point fuel injection, gasoline direct injection, common rail direct injection, electronic ignition control, engine mapping, on-board diagnostics – engine control module and power train control module - – Common fault and fault analysis

#### **UNIT – V SENSORS AND ACTIVATORS 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 PERIODS**

#### **TEXT BOOKS:**

1. William B.Riddens -Understanding Automotive Electronics, 7<sup>th</sup> edition- Butter worth Heinemann Woburn- 2014.
2. Mohammed Ismail and Terri Faiz Analog VLSI Signal and Information Process, Mc-Graw Hill Book Company, 1994.
3. Randall L. Geiger, Phillip E. Allen, Noel R. Strader, "VLSI Design Techniques for Analog and Digital Circuits", McGraw Hill, International Edition 1990.
4. Crouse W.H. "Automobile Electrical Equipment" McGraw Hill Book Co., Inc., New York 3<sup>rd</sup> edition,1986

#### **REFERENCES:**

1. Jose E. Franca Hannis Tsvividis, "Design of Analog - Digital VLSI Circuits for Telecommunication and Signal Processing", Prentice Hall, International Edition, 2002.
2. David A. Johns, Ken Martin, "Analog Integrated Circuit Design" John Wiley & Sons, 2008.
3. Benhard Razavi, "Data Converters" Kluwer Publishers, 2000.
4. Phillip Allen and Douglas Holmberg "CMOS Analog Circuit Design" Oxford University Press, 2<sup>nd</sup> Edn2004.
5. Robert Bosch, "Automotive Hand Book" SAE, 7<sup>th</sup> edition, 2014.
6. Jacob Baker R., Lee H.W. and Boyce D.E., "CMOS Circuit Design, Layout and Simulation" Prentice Hall of India, 1998.

#### **AM1274 ENGINE AND FUEL TESTING LABORATORY 0 1 2 2**

1. Study of hydraulic, electrical and eddy current dynamometers
2. Valve timing and port timing diagram
3. Performance test on two stroke SI engine
4. Performance test on automotive multi-cylinder SI engine
5. Performance test on automotive multi-cylinder CI engine
6. Retardation test on I.C. Engines.
7. Heat balance test on automotive multi-cylinder SI engine

8. Heat balance test on automotive multi-cylinder CI engine
9. Morse test on multi-cylinder SI engine
10. Temperature dependence of viscosity of lubrication oil by Redwood Viscometer
11. Viscosity Index of lubricating oil by Saybolt Viscometer
12. Flash and Fire points of fuels.
13. Flash and Fire points of lubricants
14. Calorific value of liquid and gaseous fuel.

**TOTAL: 45 PERIODS**

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

- |  |         |
|--|---------|
| 1. Hydraulic dynamometer   | - 1 No. |
| 2. Eddy current dynamometer  | - 1 No. |
| 3. Electrical dynamometer  | - 1 No. |
| 4. Single cylinder two stroke cut section engine                             | - 1 No. |
| 5. Single cylinder four stroke cut section engine                            | - 1 No. |
| 6. Two-wheeler engine test rig.  | - 1 No. |
| 7. Automotive multicylinder SI engine test rig with heat balance arrangement | - 1 No. |
| 8. Automotive multicylinder CI engine test rig with heat balance arrangement | - 1 No. |
| 9. Redwood Viscometer  | - 1 No. |
| 10. Saybolt Viscometer   | - 1 No. |
| 11. Flash and Fire point apparatus   | - 1 No. |
| 12. Bomb Calorimeter   | - 1 No. |
| 13. Gas Calorimeter  | - 1 No. |

**AM1275 DYNAMICS AND ENGINEERING METALLURGY LABORATORY**

**0 1 2 2**

**LIST OF EXPERIMENTS**

1. Governors - Determination of sensitivity, effort, etc. for Watt, Porter, Proell, Hartnell governors
2. Cam - Study of jump phenomenon and drawing profile of the cam.
3. Motorised Gyroscope-Verification of laws -Determination of gyroscopic couple.
4. Whirling of shaft-Determination of critical speed of shaft with concentrated loads.
5. Balancing of reciprocating masses.
6. Balancing of rotating masses.
7. Determination of moment of inertia by oscillation method for connecting rod and flywheel.
8. Vibrating system - Spring mass system-Determination of damping co-efficient of single degree of freedom system.
9. Determination of influence co-efficient for multidegree freedom suspension system.
10. 10.Determination of transmissibility ratio - vibrating table.
11. Determination of torsional frequencies for compound pendulum and flywheel system with lumped Moment of inertia.

12. Transverse vibration –free- Beam. Determination of natural frequency and deflection of beam.
13. Effect of hardening- Improvement in hardness and impact resistance of steels.
14. Tempering- Improvement and comparison Mechanical properties
  - (i) Unhardened specimen
  - (ii) Quenched Specimen and
  - (iii) Quenched and tempered specimen.
15. Microscopic Examination of
  - (i) Hardened samples and
  - (ii) Hardened and tempered samples.

**TOTAL: 45 PERIODS**

**LIST OF EQUIPMENTS**

(for a batch of 30 students)

- |  |              |
|--|--------------|
| 1. Governors- Watt, Porter, Proell, Hartnell | - 01 No each |
| 2. Cam                                       | - 01 No      |
| 3. Motorised Gyroscopes                      | - 01 No      |
| 4. Compound pendulum                         | - 01 No      |
| 5. Metallurgical Microscopes                 | - 01 No      |
| 6. Muffle Furnace (800 °C)                   | -01 No       |

**AM1276 AUTOMOTIVE ELECTRICAL AND ELECTRONICS SYSTEM**

**LABORATORY**

**0 1 2 2**

**a. Electrical Laboratory**

1. Testing of batteries and battery maintenance
2. Testing of starting motors and generators
3. Testing of regulators and cut – outs
4. Diagnosis of ignition system faults
5. Automobile electrical wiring
6. Study of lighting and accessories in automobiles

**b. Electronics Laboratory**

7. Study of rectifiers and filters
8. Study of logic gates, adder and flip-flops
9. Study of SCR and IC timer
10. Interfacing A/D converter and simple data acquisition
11. Micro controller programming and interfacing
12. Study of sensors & Actuators (Charge-Air pressure sensor, Temperature Sensor, Pump Speed sensor, Rack travel sensor, Vehicle speed sensor)

**TOTAL: 45 PERIODS**

## **LIST OF EQUIPMENTS**

*(for a batch of 30 students)*

i. Battery, hydrometer, voltage tester	-1 No. each
ii. Starter motor, regulator, cut-out	-1 No. each
iii. Distributor, ignition coil, spark plug	-1 No. each
iv. Auto electrical wiring system	-1 No.
v. Rectifiers, filters	-1 No. each
vi. Amplifier	-1 No.
vii. IC timer	-1 No.
viii. Data logger	-1 No.
ix. Charge-Air pressure sensor	-1 No
x. Temperature sensor	-1 No
xi. Pump speed sensor	-1 No
xii. Rack travel sensor	-1 No
xiii. Vehicle speed sensor	-1 No



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**B.E. AUTOMOBILE ENGINEERING**

**CURRICULUM & SYLLABUS**

**SEMESTER V**

<b>Code No.</b>	<b>Course Title</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>THEORY</b>					
MS1202	Professional and Business Ethics	3	0	0	3
AM1209	Vehicle Motor Engineering	3	0	0	3
AM1210	Design of Engine Components	3	1	0	4
AM1211	Manufacturing of Automotive Components	3	0	0	3
AM1212	Automotive Transmission System	3	1	0	4
AM1213	Automotive Ergonomics and Vehicle Body Engineering	3	0	0	3
<b>PRACTICALS</b>					
AM1276	Automotive Engine Components Laboratory	0	1	2	2
AM1277	Automotive Chassis Components Laboratory	0	1	2	2
<b>TOTAL</b>		<b>18</b>	<b>4</b>	<b>4</b>	<b>24</b>

**OBJECTIVES**

- To create an awareness on Engineering Ethics and Human Values.
- To instill Moral and Social Values and Loyalty
- To appreciate the rights of Others.

**UNIT I: HUMAN VALUES****9**

Morals, Values and Ethics – Integrity – Work Ethic – Service Learning – Civic Virtue – Respect for Others – Living Peacefully – caring – Sharing – Honesty – Courage – Valuing Time – Co-operation – Commitment – Empathy – Self-Confidence – Character – Spirituality.

**UNIT II: ENGINEERING ETHICS****9**

Senses of 'Engineering Ethics' - variety of moral issues - types of inquiry - moral dilemmas - moral autonomy - Kohlberg's theory - Gilligan's theory - consensus and controversy – Models of Professional Roles - theories about right action - Self-interest - customs and religion - uses of ethical theories.

**UNIT III: ENGINEERING AS SOCIAL EXPERIMENTATION****9**

Engineering as experimentation - engineers as responsible experimenters - codes of ethics - a balanced outlook on law - the challenger case study

**UNIT IV: SAFETY, RESPONSIBILITIES AND RIGHTS****9**

Safety and risk - assessment of safety and risk - risk benefit analysis and reducing risk - the Three Mile Island and chernobyl case studies. Collegiality and loyalty - respect for authority - collective bargaining - confidentiality - conflicts of interest - occupational crime -Professional rights - employee rights - Intellectual Property Rights (IPR) - discrimination.

**UNIT V: GLOBAL ISSUES****9**

Multinational corporations - Environmental ethics - computer ethics - weapons development - engineers as managers-consulting engineers-engineers as expert witnesses and advisors - oral leadership-sample code of Ethics like ASME, ASCE, IEEE, Institution of Engineers (India), Indian Institute of Materials Management, Institution of electronics and telecommunication engineers (IETE), India, etc.

**TOTAL: 45 PERIODS****TEXT BOOKS**

1. Mike Martin and Roland Schinzinger, "Ethics in Engineering", McGraw-Hill, New York.1996.
2. Govindarajan M, Natarajan S, Senthil Kumar V. S, "Engineering Ethics", Prentice Hall of India, New Delhi, 2004.

**REFERENCES**

1. Charles D. Fleddermann, "Engineering Ethics", Pearson Education / Prentice Hall, New Jersey, 2004 (Indian Reprint now available).

2. Charles E Harris, Michael S. Protchard and Michael J Rabins, "Engineering Ethics – Concepts and Cases", Wadsworth Thompson Learning, United States, 2000 (Indian Reprint now available)
3. John R Boatright, "Ethics and the Conduct of Business", Pearson Education, New Delhi, 2003.
4. Edmund G Seebauer and Robert L Barry, "Fundamentals of Ethics for Scientists and Engineers", Oxford University Press, Oxford, 2001.

**AM1209**

**VEHICLE MOTOR ENGINEERING**

**3 0 0 3**

**UNIT – I AUTOMOBILE TYPES**

**9**

Brief history, introduction about an automobile, layout of an automobile, automobile sub systems and their role. Classification – Passenger vehicles, goods vehicles, off highway. Two wheel drive, four wheel drive vehicles. Load acting on frames – Construction details – materials for frames

**UNIT – II FRAME AND BODY**

**9**

Role and requirement of a chassis frame. Space frame (Perimeter frame) Types of chassis – Light, medium and heavy duty vehicle chassis, ladder chassis, integral body construction techniques. Design features of a body – Types of bodies, Materials used in construction of bodies - coach built, convertibles. Body accessories, bumpers.

**UNIT – III SUSPENSION SYSTEM**

**9**

Desirable characteristics. Types of suspension systems – Rigid axle suspension and independent suspension systems. Types of suspension springs – Leaf springs, coil springs, torsion bar springs, air springs, rubber springs, hydro elastic springs. Linked suspension system, variable rate springs. Shock absorbers – Role of shock absorber – Types of shock absorbers- Twin tube and gas filled shock absorber - construction and working of telescopic shock absorber.

**UNIT – IV STEERING SYSTEM**

**9**

Desirable characteristics, principle of steering, steering linkage layouts for rigid axle suspension and independent suspension systems, reversible and irreversible steering. Steering gearbox – Purpose, types of steering gearboxes. Front wheel alignment and steering geometry, centre point steering. Conditions for true rolling motion- Ackerman's and Davies Steering mechanism - Power steering – Purpose, basic principle, types of power steering - trouble shooting

**UNIT – V BRAKING SYSTEM**

**9**

Need, characteristics of good braking system, principle of working of a braking system, wheel locking and stopping distance, self energizing and self locking. Types of brakes – Drum brakes, disc brakes. Types of brake actuating systems – Mechanical brakes, hydraulic brakes, power brakes, servo brakes, Fail safe brake – Air brake – proportionate valve brake – Tandem master cylinder and wheel – brake bleeding – brake fading- brake retarders- types constructions – Introduction to ABS.

**TOTAL: 45PERIODS**

**TEXT BOOKS:**

1. Garrett T K, Newton K and Steeds W, "Motor Vehicle", Butter Worths & Co., Publishers Ltd., New Delhi, 2001.
2. Heinz Heister, "Vehicle and Engine Technology", SAE Second Edition, 1999.

**REFERENCES:**

1. Peter Twigg, "Science for Motor Vehicle Engineering" Paston press Ltd., London, 1996.
2. Kett P W, "Motor Vehicle Science Part I and Part II", Chapman and Hall Ltd., London, 1982.

**AM1210****DESIGN OF ENGINE COMPONENTS****3 1 0 4****UNIT –I INTRODUCTION 9**

Engineering materials and their physical properties applied to design, selection of materials, factor of safety, endurance limit, notch sensitivity, principles of design optimization, future trends, computer aided drafting. Principles, design of engine based on vehicle characteristics, engine mounting and its types.

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

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

**UNIT – III DESIGN OF CYLINDER AND PISTON 9**

Calculation of gas forces, variation of gas forces, Choice of material for cylinder and piston, piston friction, piston slap, design of cylinder, design of cylinder liner – (wet and dry) piston, piston pin, piston rings, materials , piston failures, lubrication of piston assembly – cylinder head.

**UNIT – IV DESIGN OF CONNECTING ROD, 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, FLYWHEEL AND GEARS 9**

Design of valves, valve springs, tappet. Cam design, cam profile generation, cam shaft design, rocker and rocker shaft design considerations, materials Design aspects of intake and exhaust manifolds, inlet and Exhaust valves, multivalves- valve springs, tappets, valve train. Materials and design of flywheel. Selection of bearing – Types of rollers – fasteners – bolts, nuts and threads.

**T: 45 + L: 15 = TOTAL: 60 PERIODS****TEXT BOOKS:**

1. Prabhu T J, "Design of Transmission Elements", P R Lithographers, 2003.
2. Lichty, "IC Engines", Kogakusha Co., Limited , Tokyo, 1986.
3. Sundararaja Murthy T.V "Machine Design", Khanna Publishers, New Delhi, 1991.
4. A.Kolchin and V.Demidov, "Design of Automotive Engines", MIR Publishers, Moscow, 1984.
5. Design Data Book", PSG College of Technology, Coimbatore, 2000.

## REFERENCES:

1. Giles J G, "Engine Design", Illiff Books Ltd., London 1968.
2. John Fenton., "Gasoline Engine analysis for CAD", MEP, London 1986.
3. Fred Scarfer & Richard Van Basshuysen, "Internal Combustion Engine" Handbook- Basic Components, Systems and Perspectives", SAE2004.
4. Hall, Allen S Holowenko, Alfred R Laughlin, Herman G, "Schaum's Outline of Theory and Problems of Machine Design", Tata McGraw Hill Publishers, 2002.
5. Heldt P M, "High Speed Combustion Engines", Oxford IBH Publishing Co., Calcutta, 1996.

## AM1211 MANUFACTURING OF AUTOMOTIVE COMPONENTS 3 0 0 3

### UNIT I: MANUFACTURING OF ENGINE COMPONENTS: 9

Casting of engine block - conventional and expendable pattern, Preparation of casting for cylinder heads, forging of crank shaft, connecting rod and gudgeon pins, casting of piston by gravity casting, squeeze casting, upset forging of valves, heat treatment and surface improvement, cylinder liners and piston ring manufacturing.

### UNIT II: MANUFACTURE OF CLUTCH, GEARBOX & PROPELLER SHAFT COMPONENTS: 9

Manufacturing of friction plates using conventional blanking and fine blanking -Casting of gear box casing, precision forging of gears, gear hobbing, shaping, powder metallurgy, orbital forming of spur, helical, and bevel gears, hypoid gears-Casting and extrusion of propeller shaft- Forging of front and rear axles, casting of rear axle casing - wheels, brake drum and tyre manufacturing.

### UNIT III: BODY COMPONENTS: 9

Introduction, thermoforming and hydro forming, press forming, welding of body panels, principle of injection moulding, injection moulding of instrument panel, moulding of bumpers, reinforced reaction injection moulding, manufacture of metal/polymer/metal panels. Adhesives and sealants, manufacturing of leaf spring, composite leaf spring, wrap forming of coil springs.

### UNIT IV: SURFACE COATINGS: 9

Chemical vapour deposition, physical vapour deposition, sol-gel processing, spraying, plating, painting, paint booth, electro plating of metals, metal coatings, case hardening, thermal spraying, vapour deposition, electro plating , electro-less plating, anodizing .

### UNIT V: MODERN MANUFACTURING SYSTEMS 9

Introduction to -production systems – Basic elements of an Automated Systems – Robotics – Application in Automobile Industries – Introduction to Material Handling – Manufacturing systems - Group technology- Basis of FMS –Inspection – CMM - Elements of CIM – JIT – Kanban – Lean manufacturing system – E Manufacturing.

**TOTAL: 45 PERIODS**

## REFERENCES:

1. Philip F. Ostwald & Jairo Munuz, "Manufacturing Processes and Systems", John Wiley & Sons, New York, 1998.

- Degarmo E.P., “Materials and process in Manufacturing”, Macmillan Publishing Co., 1997.
- Heldt P.M., “High Speed Combustion Engines”, Oxford IBH publishing Co., Calcutta, 1996.
- Kalpakjian, “Manufacturing and Engineering and Technology”, Addison Wesley, Publishing Company, 1995.
- Sanjay K Mazumdar, “Composites Manufacturing”, CRC Press, NY, 2003.
- Mikell P Groover, Automation, Production Systems and Computer – Integrated Manufacturing, Third Edition, Prentice Hall International.

**AM1212 AUTOMOTIVE TRANSMISSION SYSTEM 3 1 0 4**

**OBJECTIVES**

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

**UNIT – I CLUTCHES AND GEAR BOX 9**

Necessity of clutch in a automobile, different types of clutches, friction clutches, cone clutch, Single plate - multi coil & diaphragm spring clutches, multi plate clutch, centrifugal clutches, electromagnetic clutches, hydraulic clutches, torque capacity of clutches, clutch facing, materials, clutch adjustments – clutch actuating mechanism.

Need for a gearbox – Various resistance – Tractive effort and performance of vehicle - types of gear boxes, sliding mesh, constant mesh and synchromesh gear boxes, calculation of gear ratios, epicyclical gearboxes, overdrives, transfer case - auxiliary gearbox, gear shifting mechanisms.

**UNIT – II DRIVE LINE 9**

All spur and internal gear type planetary gearboxes, Ford T-model, Cotal and Wilson Gear box, determination of gear ratios, automatic overdrives., Chain drive, propeller shaft drive, torque reaction and drive thrust , Hotchkiss drive, Torque tube drive, universal joints, trunnion type, ring type, flexible disc type, constant velocity joint type, swinging arm drive – slip joint, centre joint bed – Transfer case.

**UNIT – III AXLE 9**

Live and dead axles, front axle and its types, stub axle and its types, rear axle and its types, fully floating, semi- floating and three quarter floating axles, two speed axles, twin axles, swing axles – multi axle.

**UNIT – IV FINAL DRIVE AND DIFFERENTIAL 9**

Need for final drive and differential, types of final drives, single reduction and double reduction final drives, differential and its types, conventional and non-slip differentials, differential lock, Inter axle differential transaxle types. Electrical drives: advantages and limitations, Ward Leonard system electric drive.

**UNIT – V AUTOMATIC TRANSMISSION 9**

Need for fluid coupling and torque converters, Borg Warner type, control mechanisms, limitations. Transmission Electronics, Automatic Manual Transmission. Relative merits and demerits when compared to conventional transmission, automatic control of gears, study of typical automatic transmissions, continuous variable transmission – types and operation.

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

**TEXT BOOKS:**

1. Garrett T K, Newton K. and Steeds W. "Motor Vehicle", Butter Worths & Co. Publishers Ltd., New Delhi, 2001.
2. Heinz Heisler, "Advanced Vehicle Technology". Butterworth Heinemann Publishers, 2002.
3. Heldt P.M - Torque converters- Chilton Book Co.-1992
4. Newton and Steeds - Motor Vehicle- Illiffee Publisher- 2000

**REFERENCES:**

1. Crouse W H, "Automotive Chassis and Body," McG raw Hill Book Co., 5<sup>th</sup> edition, 1976.
2. Crouse W H, "Automotive Transmissions and Power Trains", McGraw Hill Book Co., 5<sup>th</sup> edition, 1976.
3. Fenton J, "Hand book of Automotive Power Trains and Chassis Design", Progressive publisher, 1998.
4. Martin W Stockel and Martin T Stockel, "Auto Mechanics Fundamentals ", The Good Heart and Wilcox Co. Inc., 1982.
5. Design Practices, passenger Car Automotive Transmissions- SAE Hand book- 1994.

**AM1213 AUTOMOTIVE ERGONOMICS AND VEHICLE BODY**

**ENGINEERING**

**3 0 0 3**

**UNIT – I SPECIAL VEHICLES**

**9**

Types of cars and busses – special utility vehicles - vehicle body technology, trends, special goods vehicle, special haulage vehicles cab body., Buses and coaches PSV (passenger specialty vehicle) structural design, low floor and articulate buses, Three wheelers, developing country vehicles, light weight trailers.

**UNIT – II ERGONOMICS**

**9**

Introduction, seating dimensions, interior ergonomics, ergonomics system design, seat comfort, suspension seats, split frame seating, back passion reducers, dash board instruments, electronic displays, commercial vehicle cabin ergonomics, mechanical package layout, goods vehicle layout.

**UNIT – III AERODYNAMICS**

**9**

Vehicle drag and types, effects of forces ( lift, drag) and moments ( pitch, roll and yaw), side wind effects on forces and moments, various body optimization techniques for minimum drag – wind tunnel testing, scale model testing, flow visualization, spoilers and deflectors.

**UNIT – IV VEHICLE BODY ANALYSIS**

**9**

Introduction, criteria for vehicle body design, design based on deflection criteria, sheet metal representation, curved panels, equation for flexure, torsion, twist and differential bending, beam idealization and flexural axis, instability of thin walled structures.

## **UNIT – V SAFETY AND FATIGUE ASPECTS**

**9**

Design of body, forces in roll over, head on impact, plastic collapse and analysis, fatigue and vibration, test on box sections, structural vibration. Idealization for analysis, Unit load method and structural deflection, observed deflections of a car, torsional stiffness car body idealization, symmetric bending and torsional loading, closed integral car structure, bus body idealization for analysis, bus body in torsion.

Structural design for production: Gravimetric analysis, design for press working, design for spot welding, adhesives and sealants, goods vehicle structure design, chassis frame configuration, structural properties of chassis frame members.

**TOTAL: 45 PERIODS**

### **TEXT BOOKS:**

1. Jnusz Pawlowski, “Vehicle Body Engineering”, Business books limited, 1989.
2. Thomas D Gillespie, “Fundamentals of Vehicle dynamics”, SAE USA 1992.

### **REFERENCES:**

1. John Fenton, “Hand book of automotive power train and chassis design”, SAE, 1998.
2. Ian Andrew Norman, “Heavy Duty Vehicle systems”, third edition, Delmar-Thomson Learning ltd.

## **AM1276 AUTOMOTIVE ENGINE COMPONENTS LABORATORY 0 1 2 2**

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

**TOTAL: 45 PERIODS**



## LIST OF EQUIPMENTS

*(for a batch of 30 students)*

1. Four cylinder petrol engine	-1No.
2. Six cylinder diesel engine	-1No.
3. Fuel filter, fuel injection pump, injector, carburetor, MPFI component	-1No.each
4. Ignition coil, magneto, electronic ignition system components	-1No.each
5. Water pump, thermostat, radiator, temperature gauge	-1No.each
6. Lub oil pump, pressure relief valve, filter, oil pressure gauge	-1No.each
7. Internal micrometer, external micrometer, dial gauges	-3Nos.each
8. Bore Dial gauge	-3Nos.each
9. Vernier Caliper Inside and Outside	-3Nos.each
10. Cylinder Head 4 cylinder Engine	-2 No
11. Tool box	- 3 Sets.
12. Torque wrench	- 1 No.

### **AM1277 AUTOMOTIVE CHASSIS COMPONENTS LABORATORY 0 1 2 2**

#### **I. Study and measurement of the following chassis frames:**

1. Heavy duty vehicle frame (Leyland, Tata etc)
2. Light duty vehicle frame (Ambassador, Maruti van etc)

#### **II. Study, Dismantling, inspect and assembling of**

3. Front Axle
4. Rear Axle
5. Differential
6. Steering systems along with any two types of steering gear box
7. Braking systems – hydraulic servo vacuum, compressed air power brakes.
8. Leaf spring, coil spring, torsion bar spring, Hydraulic shock absorber

#### **III. Study, Dismantling, inspect and Assembling of**

9. Clutch assembly of different types
10. Gear Box
11. Transfer case

#### IV. Performance Test of bold

12. Wind Tunnel.

**TOTAL: 45 PERIODS**

#### LIST OF EQUIPMENTS

*(for a batch of 30 students)*

1. Four cylinder petrol engine	-1No.
2. Six cylinder diesel engine	-1No.
3. Fuel filter, fuel injection pump, injector, carburetor, MPFI component	-1No.each
4. Ignition coil, magneto, electronic ignition system components	-1No.each
5. Water pump, thermostat, radiator, temperature gauge	-1No.each
6. Lub oil pump, pressure relief valve, filter, oil pressure gauge	-1No.each
7. Internal micrometer, external micrometer, dial gauges	-3Nos.each
8. Bore Dial gauge	-3Nos.each
9. Vernier Caliper Inside and Outside	-3Nos.each
10. Cylinder Head 4 cylinder Engine	-2 No
11. Heavy duty vehicle chassis frame (Leyland or Tata)	- 1 No.
12. Light duty vehicle chassis frame	- 1 No.
13. Front axle	- 1 No.
14. Rear axle	- 1 No.
15. Steering system	- 1 No
16. Steering gear box (Rack and pinion, recirculating ball type)	- 1 No. each
17. Hydraulic brake system	- 1 No.
18. Air brake system	- 1 No.
19. Leaf spring, coil spring, torsion bar	- 1 No. each
20. Hydraulic shock absorber	- 1 No.
21. Diaphragm clutch assembly	- 1 No.
22. Gear box (light duty, heavy duty)	- 1 No. each
23. Transfer case	- 1 No.
24. Tool box	- 3 Sets.
25. Torque wrench	- 1 No.
26. Wind Tunnel	- 1 No

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

**TOTAL: 45 PERIODS**

**LIST OF EQUIPMENTS FOR A BATCH OF 30 STUDENTS**

1. Computer nodes - 30 Nos.
2. Software like AutoCAD or Pro-E or Catia - 15 licenses

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**B.E. AUTOMOBILE ENGINEERING**

**CURRICULUM & SYLLABUS**

**SEMESTER VI**

<b>Code No.</b>	<b>Course Title</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>THEORY</b>					
IT1212	Cyber Security	3	0	0	3
AM1214	Automotive Emission and Control	3	0	0	3
AM1215	Automation and Pneumatic Control	3	0	0	3
AM1216	Design of Vehicle Components	3	1	0	4
AM1217	Applied Finite Element Analysis	3	1	0	4
xx12xx	Elective - I	3	0	0	3
<b>PRACTICALS</b>					
AM1278	Computer Aided Vehicle Components Design and Manufacturing Laboratory	0	1	2	2
AM1279	Instrumentation and Metrology Laboratory	0	1	2	2
AM1280	Industrial Training and Seminar	0	1	2	2
<b>TOTAL</b>		<b>18</b>	<b>5</b>	<b>6</b>	<b>26</b>

**AIM**

The Course curriculum aims at imparting the fundamentals of cyber crime investigation, the tools used for the investigation, in addition to giving an exposure to the various kinds of cyber security threats and their impact on connected systems/resources.

**OBJECTIVES**

- The course also gives an exposure to the different types of mechanisms to sanitize the cyber space by adopting standardized operating procedures while transacting business/commerce online, and also to ensure security of information handled over the net.
- Introduction to the Cyber Laws and the IPC/Cr.PC equips the students with sufficient legal knowledge about deterrence in preventing cyber crimes.

**UNIT I COMPUTER ORGANIZATION & ARCHITECTURE AND OPERATING SYSTEMS 6**

Computer Organization, Architecture, Operating Systems, Process Management, CPU Scheduling, I/O Memory Management, file systems and deadlocks. LAN, MAN, WAN, ISO/OSI seven layer architecture.

**UNIT II INFORMATION SECURITY FUNDAMENTALS 6**

Background, Importance, statistics, national and international scenarios. Identification and authentication, confidentiality, privacy, integrity, non-repudiation. Goals of security: prevention, detection and recovery. E-commerce security. Critical Infrastructure Protection.

**UNIT III SECURITY THREATS AND VULNERABILITIES 9**

Overview of security threats, various kinds of threats; Authentication-weak passwords. Insecure internet connection- internet cookies, viruses and other infections. Security of hard drives, security of laptops; sniffers, backdoors and Trojans. Buffer overflow and other programming bugs. Common attacks- DoS, man-in-the-middle, brute force attacks

**UNIT IV OVERVIEW OF SECURITY PRINCIPLES 15**

Security policies and procedures, International standards, Security consideration of OS- OS hardening - Internet protocols and security: SSL/TLS, IP Security, Application layer security - Access Control: Physical, Logical and Biometric - Tools and Techniques: Firewalls, Antivirus, IDS, Log analysis, Cryptography, steganography - Security Infrastructure: PKI, VPN, Digital signature - Network scanners, vulnerability scanners - Device Security - Cloud computing security, Database security.

**UNIT V CYBER CRIMES. 9**

Cyber crimes, Cyber crime Investigation, and Cyber forensic tools. Cyber Laws. Information Technology Act, Cyber laws and cyber crime investigation. Social networks and analysis.

**TOTAL: 45 PERIODS**

## **TEXT BOOKS**

1. Thomas Calabres and Tom Calabrese, "Information Security Intelligence: Cryptographic Principles & Application", Thomson Delmar Learning, 2004.
2. Bernadette H Schell, Clemens Martin, "Cyber Crime", ABC-CLIO Inc, California, 2004.
3. Swiderski, Frank and Syndex, "Threat Modeling", Microsoft Press, 2004.
4. William Stallings and Lawrie Brown, "Computer Security: Principles and Practice", Prentice Hall, 2008.

## **REFERENCES**

1. Silberschatz A, Galvin P, Gagne G, "Operating Systems Concepts", John Wiley & Sons, Singapore, 2006.
2. Principles and Practices of Information Security by Michael.E. Whiteman and Herbert .J. Mattord.
3. Cyber Laws by Aparna Viswanathan.
4. Joseph M Kizza, "Computer Network Security", Springer Verlag, 2005.

**AM1214      AUTOMOTIVE EMISSION AND CONTROL      3 0 0 3**

## **OBJECTIVES**

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

### **UNIT I INTRODUCTION      9**

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, NO<sub>x</sub> 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. No<sub>x</sub> formation and control. Color and Aldehyde emissions - Turbocharging - Noise pollution from automobiles- Maintenance aspects of pollution – preventive – periodical measurement and standards- Engine tuning.

### **UNIT IV CONTROL OF EMISSIONS FROM SI AND CI ENGINES      9**

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

**UNIT V MEASUREMENT TECHNIQUES EMISSION STANDARDS AND TEST PROCEDURE 9**

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

**TOTAL: 45 PERIODS**

**TEXT BOOKS**

1. Paul Degobert – Automobiles and Pollution – SAE International ISBN-156091-563-3, 1991.
2. Ganesan, V- “Internal Combustion Engines”- Tata McGraw-Hill Co.- 2003.
3. Springer and Patterson, Engine Emission, Plenum Press, 1990.

**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

**AM1215 AUTOMATION AND PNEUMATIC CONTROLS 3 0 0 3**

**UNIT – I INTRODUCTION TO AUTOMATION 9**

Introduction - fundamental concepts in manufacturing and automation, definition of automation, reasons for automation, types of production and types of automation, automation strategies, levels of automation, detroit type automation.

**UNIT–II PNEUMATIC SYSTEMS & CIRCUITS 9**

Application of pneumatics, physical principles, basic requirement of pneumatic system, comparison with hydraulic systems. Elements of pneumatics, constructional details of air compressors, air motors, pneumatic control valves, actuators and mountings, filter, lubricator, regulator, types of cylinders  
Basic pneumatic circuit, impulse operation, speed control, pneumatic motor circuit, sequencing of motion, time delay circuits and their applications.

**UNIT–III PNEUMATIC CONTROL SYSTEM 9**

General approach to control system design, symbols and drawing, schematic layout, travel step diagram, circuit, control modes, program control, sequence control, Cascade, Karnaugh-Veitch mapping method, air hydraulic control, fringe condition modules, start, emergency, start restriction, typical application circuits.

**UNIT – IV ELECTRO PNEUMATIC AND PLC 9**

Compound circuit, combinational circuit, ladder diagram, Programmable Logic Controller (PLC) configuration, input, output ports, memory, timers and counters, PLC programming, advantages and limitations of PLC.

**UNIT – V SENSORS****9**

P/E converter – optical, capacitance type, inductive type, reflexive nozzle, back pressure nozzle, interruptible airjet, principle of operation and applications of proportional and servo valves, pneumatic sensors and applications.

**TOTAL: 45 PERIODS****TEXT BOOKS:**

1. Wener Deppat and Kurt Stoll, “Pneumatic Control”, Vogel Buch Verlag Wruzbudg, 1987.
2. Peter Rohner, “Fluid Power Logic Circuit Design”, Mac Miller Company Publishers, 1979.

**REFERENCES:**

1. Srinivasan R, ”Hydraulics and Pneumatic Controls”, Vijay Nicole Imprint Pvt. Ltd., 2004.
2. Pippenger, J J, “Industrial Hydraulics & Pneumatics”, McGraw Hill, 2002.
3. Andrew Parr, “Hydraulics and Pneumatics”, Jaico publishing house, 1999.
4. Festo K G, “Pneumatic Tips”, Festo, Germany, 1987.

**AM1216 DESIGN OFVEHICLE COMPONENTS****3 1 0 4****UNIT – I DESIGN OF FRAME****9**

Different layouts with reference to power plant, location and drive. Types of frames, various forces acting on frames, different sections, materials, crash safety.

**UNIT – II DESIGN OF CLUTCH****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 sprag type of clutches

**UNIT – III DESIGN OF STEERING SYSTEM****9**

Functions, requirements, conditions for true rolling – Ackerman and Davis mechanisms, roll centre and roll axis. Steering geometry – camber, castor, king pin inclination, toe-in, toe out, steering angle and steering ratio. Steering gear boxes- recirculating ball, worm and worm wheel, rack and pinion. Steering linkages, steering kinematics.

**UNIT – IV DESIGN OF SUSPENSION AND BRAKING SYSTEM****9**

Types of suspension, factors affecting ride quality, suspension springs. Shock absorbers, different suspension systems, suspension spring design, gyroscopic effects. Function, stopping time and distance, weight transfer during braking, brake actuating mechanisms – mechanical, hydraulic and pneumatic, disc and drum brakes - design and analysis of brake shoes and friction pads.



## **UNIT – V SELECTION OF WHEELS AND TYRES**

**9**

Wheels - Types –alloy-disc – spokes wheels and mountings - Tyre requirements, selection of tyres, tyre size specification, ply, bias, load carrying capacity, tyre rotation – tubeless, radial, tyres – tyre materials- lateral force and friction co-efficient, self aligning torque and caster offset, overturning moment, torque steer effects.

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

### **TEXT BOOKS:**

1. Reimpell J, Stoll H, Betzler J W, “The Automotive Chassis”, SAE International, Second Edition, 2001.
2. Julian Happian-Smith, “An Introduction to Modern Vehicle Design”, Butterworth Heinemann Publishers, 2002.

### **REFERENCES:**

1. Rudolf Limpert, “Brake Design and Safety”, SAE International, Second Edition, 1999.
2. John Fenton, “Handbook of Automotive Power trains and Chassis Design”, Professional Engineering Publishing, 1998.
3. Donald Bastow, Geofry Howard and John P.Whitehead “Car Suspension and Handling”, 4<sup>th</sup> edition, SAE2004.
4. Giri N K, “Automobile Mechanics”, Khanna Publishers, 2006.
5. Lukin R, Gasparyants G, Rodionov V, “Automobile Chassis Design and Calculations”, MIR Publishers, Moscow, 1989.

## **AM1217 APPLIED FINITE ELEMENT ANALYSIS**

**3 1 0 4**

### **UNIT – I Introduction to FEM**

**9**

Engineering design analysis-meaning and purpose, Steady state, propagation and transient problems. Basic concepts of FEM. Applicability of FEM to structural analysis, heat transfer and fluid flow problems. Advantages and limitations of FEM. Test for convergence. Element choice. Commercial finite element packages-organization-advantages and limitations.

### **UNIT – II Solution methods for finite element equations**

**9**

General procedure of FEM. Skeletal and continuum structures. Discretization of domain-basic types of elements. Handling of simultaneous equations-Gaussian elimination method and Choleski method. Solving eigen value problems-Jacobi method. Numerical integration

### **UNIT – III ONE DIMENSIONAL ANALYSIS**

**9**

Concept of stiffness analysis-direct approach, formal approach using shape function, Reyleigh-Ritz method. Formulation of element stiffness matrices-1D bar and beam elements,

#### **UNIT – IV TWO DIMENSIONAL ANALYSIS**

**9**

2D triangular and quadrilateral elements, Isoparametric elements. Treatment of boundary condition. Equations of motion for dynamic problems. Consistent and lumped mass matrices. Formulation of element mass matrices. Free vibration problem formulation.

#### **UNIT – V Heat Transfer and Fluid flow analysis**

**9**

Basic equations of heat transfer and fluid flow problems. Finite element formulation. One dimensional heat transfer and fluid flow problems. Case Studies – Problems in heat transfer - engines, vibration.

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

#### **TEXT BOOKS:**

1. Chandrupatla T R and Belegundu A D, “Introduction to Finite Elements in Engineering”, Pearson Education, New Delhi, 2002.
2. Logan D L, “A First Course in the Finite Element Method”, Third Edition, Thomson Learning, 2002.

#### **REFERENCES:**

1. David V Hutton, “Fundamentals of Finite Element Analysis”, 2004. McGraw-Hill Int. Ed., New York.
2. Rao S S, “The Finite element Method in Engineering”, Pergammon Press, New York, 1989.
3. Reddy J N, “An Introduction to Finite Element Method”, McGraw-Hill International Student Edition, New York, 1985
4. Seshu P, “A Text book on Finite Element Analysis”, Prentice Hall of India, New Delhi, 2003.
5. Cook R D, Malkus D S and Plesha M E, “Concepts and Applications of Finite Element Analysis”, Fourth Edition, John Wiley and Sons, New Delhi, 2003.

**AM1278      COMPUTER AIDED VEHICLE COMPONENTS DESIGN AND  
MANUFACTURING LABORATORY                      0 1 2 2**

#### **LIST OF EXPERIMENTS**

#### **A)      COMPUTER AIDED VEHICLE COMPONENTS DESIGN (CAD)**

1. 3D Part modeling – protrusion, cut, sweep, draft, loft, blend, rib
2. Editing – Move, Pattern, Mirror, Round, Chamfer
3. 3D modeling of Vehicle components.
4. Assembly – creating assembly from parts – assembly constraints
5. Conversion of 3D solid model to 2D drawing - different views, sections, isometric view and dimensioning
6. Introduction to File Import, Export – DXF, IGES, STL, STEP

**Note:** Any one of the 3D MODELING softwares like Pro/E, IDEAS, CATIA, UNIGRAPHICS, AutoCAD to be used.

## **B) COMPUTER AIDED VEHICLE MANUFACTURING (CAM)**

### **1. MANUAL PART PROGRAMMING (Using G and M Codes) in CNC lathe**

- 1.1 Part programming for Linear and Circular interpolation, Chamfering and Grooving
- 1.2 Part programming using standard canned cycles for Turning, Facing, Taper turning and Thread cutting

### **2. MANUAL PART PROGRAMMING (using G and M codes) in CNC milling**

- 2.1 Part programming for Linear and Circular interpolation and Contour motions.
- 2.2 Part programming involving canned cycles for Drilling, Peck drilling, and Boring.

## **C) SIMULATION AND NC CODE GENERATION**

NC code generation using CAD / CAM softwares - Post processing for standard CNC Controls like FANUC, Hiedenhain etc.

**TOTAL: 45 PERIODS**

**AM1279 INSTRUMENTATION AND METROLOGY LABORATORY 0 1 2 2**

## **LIST OF EXPERIMENTS**

- 1. Measurement of Taper Angle using sine bar / tool makers microscope
- 2. Calibration of Vernier / Micrometer / Dial Gauge
- 3. Checking Dimensions of part using slip gauges
- 4. Measurements of Gear Tooth Dimensions
- 5. Measurement of straightness and flatness
- 6. Measurement of thread parameters  
Checking the limits of dimensional tolerances using comparators  
(Mechanical / Pneumatic / Electrical)
- 7. Measurement of Temperature using Thermocouple / Pyrometer
- 8. Measurement of Displacement (Strain Gauge / LVDT / Wheatstone Bridge)
- 9. Measurement of Force
- 10. Measurement of Torque
- 11. Measurement of Vibration / Shock

**TOTAL: 45 PERIODS**

**AM1280      INDUSTRIAL TRAINING AND SEMINAR**

- Visit to local industries arranged by the Department of study the industrial practices
- Lectures by industrial experts will be arranged to gain exposure to the trends in design, manufacturing and quality control in industries.

## B.E. AUTOMOBILE ENGINEERING

### LIST OF ELECTIVES

Sl.No	Subject Code	Subject Name	L	T	P	C
1.	AM12A1	Operations research	3	0	0	3
2.	AM12A2	Computer Aided Vehicle Design Characteristics	3	0	0	3
3.	AM12A3	Automotive Aerodynamics	3	0	0	3
4.	AM12A4	Alternate Fuels and Energy Systems	3	0	0	3
5.	AM12A5	Modern Automobile Technologies	3	0	0	3
6.	AM12A6	Automotive Safety	3	0	0	3
7.	AM12A7	Transport Management	3	0	0	3
8.	AM12A8	Automotive Airconditioning	3	0	0	3
9.	AM12A9	Quality Control and Reliability Engineering	3	0	0	3
10.	AM12B1	Composite Materials	3	0	0	3
11.	AM12B2	Robotics	3	0	0	3
12.	AM12B3	Two and Three Wheeled Vehicles	3	0	0	3
13.	AM12B4	Advanced Theory of I.C Engines	3	0	0	3
14.	AM12B5	Off road Vehicles	3	0	0	3
15.	AM12B6	Total Quality Management	3	0	0	3
16.	AM12B7	Automotive Test Instrumentation	3	0	0	3

**OBJECTIVE**

- i) To create awareness about optimization in utilization of resources.
- ii) To understand and apply operations research techniques to industrial operations.

**1. LINEAR MODEL 9**

The phases of OR study – formation of an L.P model- graphical solution – simplex algorithm – artificial variables technique– Big M method, two phase method.

**2. TRANSPORTATION PROBLEM 9**

Optimal solution by north west corner method- least cost method – vogels approximation method – optimality test – MOBI method. Assignment problem – formulation – Hungarian method. -unbalanced assignment problem.

**3. NETWORK MODELS 9**

Shortest route – minimal spanning tree - maximum flow models – project network- CPM and PERT network-critical path scheduling.

**4. REPLACEMENT MODELS: 9**

Replacement of items that deteriorate with time – value of money changing with time – not charging with time – optimum replacement policy – individual and group replacement. Sequencing problem: models with n jobs with 2 machines – problem with in jobs with 3 machines.

**5. QUEUING THEORY 9**

Queuing models – queuing systems and structures – notation –parameter – single server and multiserver models – Poisson input – exponential service – constant rate service – infinite population

**TOTAL: 45 PERIODS**

**TEXT BOOK**

1. Taha H.A, “Operation Research”, Pearson Education sixth edition, 2003

**REFERENCES**

1. Hira and Gupta “Introduction to Operations Research”, S.Chand and Co.2002
2. Hira and Gupta “ Problems in Operations Research”, S.Chand and Co, 2002.
3. Panneerselvam, “Operations Research” Prentice Hall Of India, 2003.
4. Wagner, “Operations Research”, Prentice Hall Of India, 2000.

**OBJECTIVE**

To make the students understand the basic principles involved in the computer aided vehicle design and apply the same for the optimum designing of the vehicle components.

**UNIT – I INTRODUCTION 9**

Study and selection of vehicle specifications - Choice of Cycle, fuel, speed, cylinder arrangement, number of cylinders, method of cooling, material, design variables and operating variables affecting performance and emission.

- UNIT – II PERFORMANCE CURVES 9**  
Residence, Power and torque curve, Driving force against vehicle speed – Acceleration and gradability in different gears for a typical car or truck plotted from specifications.
- UNIT – III RESISTENCE TO VEHICLE MOTION 9**  
Calculation and plotting the curves of air, rolling and gradient resistances, driving force – Engine power, speed, rear axle ratio, Torque and mechanical efficiency at different vehicle speeds.
- UNIT – IV ENGINE DESIGN 9**  
Pressure volume diagram, frictional mean effective pressure, engine capacity, calculation of bore and stroke length, velocity and acceleration, gas force, inertia and resultant force at various crank angles – Side thrust on cylinder walls.
- UNIT – V GEAR RATIOS 9**  
Determination of Gear Ratios, Acceleration and gradability - typical problems.

**TOTAL: 45 PERIODS**

**TEXT BOOKS**

1. Giri. N.K. “Automobile Mechanics” Khanna Publishers – New Delhi – 2002.
2. Heldt P.M “High Speed Combustion Engine” Oxford & IBH Publishing Co., Calcutta 1989.

**REFERENCES**

1. Lichty “IC Engines”, Kogakusha Co., Ltd. Tokyo, 1991.

**AM12A3 AUTOMOTIVE AERODYNAMICS 3 0 0 3**

**OBJECTIVE**

At the end of the course, the students will be able to apply basic principles of aerodynamics for the design of vehicle body.

**UNIT I INTRODUCTION 9**

Scope, historical developments, fundamental of fluid mechanics, flow phenomenon related to vehicles, external and Internal flow problem, resistance to vehicle motion, performance, fuel consumption and performance potential of vehicle aerodynamics, engine cooling requirement, air flow to passenger compartment, duct for air conditioning, cooling of transverse engine and rear engine.

**UNIT II AERODYNAMIC DRAG OF CARS 9**

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

**UNIT III SHAPE OPTIMIZATION OF CARS 9**

Front end modification, front and rear wind shield angle, boat tailing, hatch back, fast back and square back, dust flow patterns at the rear, effects of gap configuration, effect of fasteners.

**UNIT IV VEHICLE HANDLING 9**

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

**UNIT V WIND TUNNELS FOR AUTOMOTIVE AERODYNAMICS 9**

Introduction, principle of wind tunnel technology, limitation of simulation, stress with scale models, full scale wind tunnels, measurement techniques, equipment and transducers, road testing methods, numerical methods.

**TOTAL: 45 PERIODS**

**TEXT BOOK**

1. Hucho.W.H. - “Aerodynamic of Road Vehicles” - Butterworths Co., Ltd., - 1997.

**REFERENCES**

1. A. Pope - “Wind Tunnel Testing “ - John Wiley & Sons - 2<sup>nd</sup> Edition, New York - 1974.
2. Automotive Aerodynamic: Update SP-706 - SAE - 1987
3. Vehicle Aerodynamics - SP-1145 - SAE – 1996.

**AM12A4 ALTERNATE FUELS AND ENERGY SYSTEMS 3 0 0 3**

**OBJECTIVES**

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

**UNIT I INTRODUCTION 9**

Need for alternate fuel, availability and properties of alternate fuels, general use of alcohols, LPG, hydrogen, ammonia, CNG and LNG, vegetable oils and biogas, merits and demerits of various alternate fuels, introduction to alternate energy sources. Like EV, hybrid, fuel cell and solar cars.

**UNIT II ALCOHOLS 9**

Properties as engine fuel, alcohols and gasoline blends, performance in SI engine, methanol and gasoline blends, combustion characteristics in CI engines, emission characteristics, DME, DEE properties performance analysis, performance in SI & CI Engines.

**UNIT III NATURAL GAS, LPG, HYDROGEN AND BIOGAS 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 of LPG. Hydrogen; storage and handling, performance and safety aspects.

**UNIT IV VEGETABLE OILS 9**

Various vegetable oils for engines, esterification, performance in engines, performance and emission characteristics, bio diesel and its characteristics



## **UNIT V ELECTRIC, HYBRID, FUEL CELL AND SOLAR CARS 9**

Layout of an electric vehicle, advantage and limitations, specifications, system components, electronic control system, high energy and power density batteries, hybrid vehicle, fuel cell vehicles, solar powered vehicles.

**TOTAL: 45 PERIODS**

### **TEXT BOOK**

1. Richard.L.Bechfold – Alternative Fuels Guide Book - SAE International Warrendale - 1997.

### **REFERENCES**

1. Maheswar Dayal - “Energy today & tomorrow“ - I & B Horishr India - 1982.
2. Nagpal - “Power Plant Engineering” - Khanna Publishers - 1991.
3. “Alcohols as motor fuels progress in technology” - Series No.19 - SAE Publication USE - 1980.

## **AM12A5 MODERN AUTOMOBILE TECHNOLOGIES 3 0 0 3**

### **OBJECTIVE:**

To explain the principle of chassis management system and different sensors used in the systems.

### **UNIT I INTRODUCTION: (9)**

Components of chassis management system – role of various sensors and actuators pertaining to chassis system – construction – working principle of wheel speed sensor, steering position, tyre pressure, brake pressure, steering torque, fuel level, Engine and vehicle design data.

### **UNIT II DRIVELINE CONTROL SYSTEM: (9)**

Speed control – cylinder cut - off technology, Gear shifting control – Traction / braking control, brake by wire – Adaptive cruise control, throttle by wire. Steering - power steering, collapsible and tiltable steering column – steer by wire.

### **UNIT III COMFORT SYSTEM: (9)**

Active suspension systems, requirement and characteristics, different types, Vehicle Handling and Ride characteristics of road vehicle, pitch, yaw, bounce control, power windows, thermal management system, adaptive noise control.

### **UNIT IV ENGINE MANAGEMENT SYSTEMS (9)**

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

### **UNIT V INTELLIGENT TRANSPORTATION SYSTEM (9)**

Traffic routing system - Automated highway systems - Lane warning system – Driver Information System, driver assistance systems - Data communication within the car, Driver conditioning warning - Route Guidance and Navigation Systems – vision enhancement system - In-Vehicle Computing – Vehicle Diagnostics system – Hybrid / Electric and Future Cars – Case studies.

**TOTAL: 45 PERIODS**

**TEXT BOOKS:**

1. U. Kiencke, and L. Nielsen, Automotive Control Systems, SAE and Springer-Verlag, 2000.
2. Ljubo Vlacic, Michel Parent, Fumio Harashima, "Intelligent Vehicle Technologies", Butterworth-Heinemann publications, Oxford, 2001.

**REFERENCES:**

1. Crouse, W.H. & Anglin, D.L., "Automotive Mechanics", Intl. Student edition, 9th edition, TMH, New Delhi, 2002.
2. William B. Ribbens - Understanding Automotive Electronics, 5th e
3. Bosch, "Automotive Handbook", 6th edition, SAE, 2004.

**AM12A6****AUTOMOTIVE SAFETY****3 0 0 3****OBJECTIVE**

At the end, the student will have good exposure to Automotive safety aspects including safety equipments.

**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 crumple 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 PERIODS****TEXT BOOK**

1. Bosch - "Automotive Handbook" - 5<sup>th</sup> edition - SAE publication - 2000.

**REFERENCES**

1. J. Powloski - "Vehicle Body Engineering" - Business books limited, London - 1969.

2. Ronald.K.Jurgen - "Automotive Electronics Handbook" - Second edition-McGraw-Hill Inc., - 1999.

**AM12A7**

**TRANSPORT MANAGEMENT**

**3 0 0 3**

### **OBJECTIVE**

After completion of this course the students are able to manage a transport fleet and their related activities for minimizing operational cost.

### **UNIT – I INTRODUCTION 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 PERIODS**

### **TEXTBOOK**

1. John Duke - Fleet Management – McGraw-Hill Co, USA -1984.

### **REFERENCES**

1. Government Motor Vehicle Act – Eastern Book Company, Lucknow - 1989
2. Kitchin.L.D., - Bus Operation - Illiffie and Sons Co., London, III edition - 1992
3. The motor vehicle Act 1939 - Ejaz Ahemad, Ashok law house, India - 1989

**OBJECTIVE**

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

**UNIT I AIRCONDITIONING FUNDAMENTALS 9**

Basic air conditioning system - location of air conditioning components in a car, schematic layout of a refrigeration system, compressor components, condenser and high pressure service ports, thermostatic expansion valve, expansion valve calibration, controlling evaporator temperature, evaporator pressure regulator, evaporator temperature regulator.

**UNIT II AIR CONDITIONER – HEATING SYSTEM 9**

Automotive heaters, manually controlled air conditioner, heater system, automatically controlled air conditioner and heater systems, automatic temperature control, air conditioning protection, engine protection.

**UNIT III REFRIGERANT 9**

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

**UNIT IV AIR ROUTING AND TEMPERATURE CONTROL 9**

Objectives, evaporator airflow through the recirculating unit, automatic temperature control, duct system, controlling flow, vacuum reserve, testing the air control and handling systems.

**UNIT V AIR CONDITING SERVICE 9**

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

**TOTAL: 45 PERIODS**

**TEXT BOOK**

1. William H. Crouse and Donald I. Anglin - "Automotive Air conditioning" - McGraw Hill Inc. - 1990.

**REFERENCES**

1. Mitchell information Services, Inc - "Mitchell Automatic Heating and Air Conditioning Systems" - Prentice Hall Ind. - 1989.
2. Paul Weiser - "Automotive Air Conditioning" - Reston Publishing Co., Inc., - 1990.
3. MacDonald, K.I., - "Automotive Air Conditioning" - Theodore Audel series - 1978
4. Goings.L.F. – "Automotive Air Conditioning" - American Technical services - 1974.
5. Boyce H.Dwiggins - "Automotive Air Conditioning" - Delmar – 2002

### OBJECTIVES

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

### UNIT I INTRODUCTION AND PROCESS CONTROL FOR VARIABLES 10

Introduction, definition of quality, basic concept of quality, definition of SQC, benefits and limitation of SQC, Quality assurance, Quality cost-Variation in process- factors – process capability – process capability studies and simple problems – Theory of control chart- uses of control chart – Control chart for variables – X chart, R chart and  $\sigma$  chart.

### UNIT II PROCESS CONTROL FOR ATTRIBUTES 8

Control chart for attributes –control chart for proportion or fraction defectives – p chart and np chart – control chart for defects – C and U charts, State of control and process out of control identification in charts.

### UNIT III ACCEPTANCE SAMPLING 9

Lot by lot sampling – types – probability of acceptance in single, double, multiple sampling techniques – O.C. curves – producer's Risk and consumer's Risk. AQL, LTPD, AOQL concepts-standard sampling plans for AQL and LTPD- uses of standard sampling plans.

### UNIT IV LIFE TESTING - RELIABILITY 9

Life testing – Objective – failure data analysis, Mean failure rate, mean time to failure, mean time between failure, hazard rate, system reliability, series, parallel and mixed configuration – simple problems. Maintainability and availability – simple problems. Acceptance sampling based on reliability test – O.C Curves.

### UNIT V QUALITY AND RELIABILITY 9

Reliability improvements – techniques- use of Pareto analysis – design for reliability – redundancy unit and standby redundancy – Optimization in reliability – Product design – Product analysis – Product development – Product life cycles.

**TOTAL: 45 PERIODS**

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

### TEXT BOOKS

1. GRANT, EUGENE .L“Statistical Quality Control “, McGraw-Hill, 1996
2. L.S.SRINATH,“Reliability Engineering” Affiliated East west press, 1991

### REFERENCES

1. MONOHAR MAHAJAN, “Statistical Quality Control”, Dhanpat Rai & Sons, 2001.
2. R.C.GUPTA, “Statistical Quality control”, Khanna Publishers, 1997
3. BESTERFIELD D.H., “Quality Control”, Prentice Hall, 1993
4. SHARMA S.C., “Inspection Quality Control and Reliability”, Khanna Publishers, 1998

5. DANNY SAMSON, "Manufacturing & Operations Strategy", Prentice Hall, 1991
6. CONNOR, P.D.T.O., "Practical Reliability Engineering", John Wiley, 1993

**AM12B1**

**COMPOSITE MATERIALS**

**3 0 0 3**

**OBJECTIVE**

This subject introduces to the students the different types of composite materials, their properties and applications.

**1. INTRODUCTION TO COMPOSITES**

**8**

Fundamentals of composites - need for composites – Enhancement of properties - classification of composites – Matrix-Polymer matrix composites (PMC), Metal matrix composites (MMC), Ceramic matrix composites (CMC) – Reinforcement – Particle reinforced composites, Fibre reinforced composites. Applications of various types of composites.

**2. POLYMER MATRIX COMPOSITES**

**12**

Polymer matrix resins – Thermosetting resins, thermoplastic resins – Reinforcement fibres – Rovings – Woven fabrics – Non woven random mats – various types of fibres. PMC processes - Hand lay up processes – Spray up processes – Compression moulding – Reinforced reaction injection moulding - Resin transfer moulding – Pultrusion – Filament winding – Injection moulding. Fibre reinforced plastics (FRP), Glass fibre reinforced plastics (GRP).

**3. METAL MATRIX COMPOSITES**

**9**

Characteristics of MMC, Various types of Metal matrix composites Alloy vs. MMC, Advantages of MMC, Limitations of MMC, Metal Matrix, Reinforcements – particles – fibres. Effect of reinforcement - Volume fraction – Rule of mixtures. Processing of MMC – Powder metallurgy process - diffusion bonding – stir casting – squeeze casting.

**4. CERAMIC MATRIX COMPOSITES**

**9**

Engineering ceramic materials – properties – advantages – limitations – Monolithic ceramics - Need for CMC – Ceramic matrix - Various types of Ceramic Matrix composites- oxide ceramics – non oxide ceramics – aluminium oxide – silicon nitride – reinforcements – particles- fibres- whiskers. Sintering - Hot pressing – Cold isostatic pressing (CIPing) – Hot isostatic pressing (HIPing).

**5. ADVANCES IN COMPOSITES**

**7**

Carbon / carbon composites – Advantages of carbon matrix – limitations of carbon matrix Carbon fibre – chemical vapour deposition of carbon on carbon fibre perform. Sol gel technique. Composites for aerospace applications.

**TOTAL: 45 PERIODS**

**TEXT BOOKS**

1. Mathews F.L. and Rawlings R.D., Composite materials: Engineering and Science, Chapman and Hall, London, England, 1<sup>st</sup> edition, 1994.
2. Chawla K.K., Composite materials, Springer – Verlag, 1987

## REFERENCES

1. Clyne T.W. and Withers P.J., Introduction to Metal Matrix Composites, Cambridge University Press, 1993.
2. Strong A.B., Fundamentals of Composite Manufacturing, SME, 1989.
3. Sharma S.C., Composite materials, Narosa Publications, 2000.
4. Short Term Course on Advances in Composite Materials, Composite Technology Centre, Department of Metallurgy, IIT- Madras, December 2001.

## AM12B2

## ROBOTICS

3 0 0 3

### OBJECTIVES

- To introduce the basic concepts, parts of robots and types of robots
- To make the student familiar with the various drive systems for robot, sensors and their applications in robots, programming of robots
- To discuss about the various applications of robots, justification, implementation and safety of robot

### 1. FUNDAMENTALS OF ROBOT

7

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

### 2. ROBOT DRIVE SYSTEMS AND END EFFECTORS

10

Pneumatic Drives – Hydraulic Drives – Mechanical Drives – Electrical Drives – D.C. Servo Motors, Stepper Motor, A.C. Servo Motors – Salient Features, Applications and Comparison of All these Drives End Effectors – Grippers – Mechanical Grippers, Pneumatic and Hydraulic Grippers, Magnetic Grippers, Vacuum Grippers; Two Fingere and Three Fingere Grippers; Internal Grippers and External Grippers; Selection and Design Considerations

### 3. SENSORS AND MACHINE VISION

10

Requirements of a sensor, Principles and Applications of the following types of sensors – Position of sensors (Piezo Electric Sensor, LVDT, Resolvers, Optical Encoders, Pneumatic Position Sensors), Range Sensors (Triangulation Principle, Structured, Lighting Approach, Time of Flight Range Finders, Laser Range Meters), Proximity Sensors (Inductive, Hall Effect, Capacitive, Ultrasonic and Optical Proximity Sensors), Touch Sensors, (Binary Sensors, Analog Sensors), Wrist Sensors, Compliance Sensors, Slip Sensors Camera, Frame Grabber, Sensing and Digitizing Image Data – Signal Conversion, Image Storage, Lighting Techniques. Image Processing and Analysis – Data Reduction, Segmentation, Feature Extraction, Object Recognition, Other Algorithms. Applications – Inspection, Identification, Visual Serving and Navigation.

### 4. ROBOT KINEMATICS AND ROBOT PROGRAMMING

10

Forward Kinematics, Inverse Kinematics and Differences; Forward Kinematics and Reverse Kinematics of Manipulators with Two, Three Degrees of Freedom (In 2 Dimensional), Four Degrees of Freedom (In 3 Dimensional) – Deviations and Problems Teach Pendant Programming, Lead through programming, Robot programming

Languages – VAL Programming – Motion Commands, Sensor Commands, End effector commands, and Simple programs

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

**TOTAL: 45 PERIODS**

**TEXT BOOK**

1. M.P.Groover, Industrial Robotics – Technology, Programming and Applications, McGraw-Hill, 2001

**REFERENCES**

1. Fu.K.S. Gonzalz.R.C., and Lee C.S.G., Robotics Control, Sensing, Vision and Intelligence, Mc Graw Hill Book Co., 1987
2. Yoram Koren, Robotics for Engineers, McGraw-Hill Book Co., 1992
3. Janakiraman.P.A., Robotics and Image Processing, Tata McGraw-Hill, 1995

**AM12B3 TWO AND THREE WHEELED VEHICLES 3 0 0 3**

**OBJECTIVE**

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

**UNIT I POWER UNIT 9**

Two stroke SI engine, four stroke SI engine; merits and demerits. Symmetrical and unsymmetrical port timing diagrams. Types of scavenging processes; merits and demerits, scavenging pumps. Rotary valve engine. Fuel system. Lubrication system. Magneto coil and battery coil spark ignition system, electronic ignition system. Starting system; Kick starter system.

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

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

**UNIT III BRAKES, WHEELS AND TYRES 9**

Drum brakes, disc brakes, front and rear brake links, layouts. Spoked wheel, cast wheel, disc wheel, disc types. Tyres and tubes.

**UNIT IV TWO WHEELERS 9**

Case study of major Indian models of motorcycles, scooters and mopeds. TVS mopeds and motorcycles, HeroHonda motorcycles, Bajaji scooters and motorcycles, Yamaha, Enfield motorcycles. Servicing and maintenance.

**UNIT V THREE WHEELERS 9**

Case study of Indian models. Auto rickshaws, pickup van, delivery van and trailer. Maintenance: daily, weekly, monthly, Fault tracing.



**TOTAL: 45 PERIODS**

**TEXT BOOK**

1. Irving.P.E. - Motor Cycle Engineering - Temple Press Book, London – 1992.

**REFERENCES**

1. The Cycle Motor Manual - Temple Press Limited, London - 1990
2. Encyclopedia of Motorcycling - 20 volume Marshall, Cavensih, UK - 1989
3. Brayant R.V, Vespa - Maintenance and Repair Series – S.Chand & Co., New Delhi - 1986.
4. Raymond Broad Lambretta - A Practical Guide to maintenance and repair – S.Chand & Co., New Delhi - 1987.

**AM12B4      ADVANCED THEORY OF I.C ENGINES      3 0 0 3**

**OBJECTIVE:**

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

**UNIT I COMBUSTION IN SI ENGINES      9**

Stages of combustion - ignition, flame propagation, factors affecting flame structure and speed, cycle by cycle variations, misfire, knock and pre-ignition. Factors controlling combustion chamber design. Combustion in diesel engines, comparison of different combustion systems, fuel spray structure and factors affecting it. Models for combustion in SI and CI engines.

**UNIT II GAS EXCHANGE PROCESSES      9**

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

**UNIT III COMBUSTION ANALYSIS      9**

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

**UNIT IV ALTERNATIVE FUELS      9**

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

**UNIT V RECENT DEVELOPMENTS      9**

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

**TOTAL: 45 PERIODS**

**TEXT BOOKS:**

1. Internal Combustion Engines by V. Ganesan, 2007, Tata Mc Graw Hill
2. Internal Combustion Engine Fundamentals, John B Heywood, Mc Graw Hill
3. Advanced Engine Technology by Heisler, SAE Publication

**REFERENCES:**

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

**AM12B5**

**OFF ROAD VEHICLES**

**3 0 0 3**

**OBJECTIVE:**

At the end of the course, the students will be able to understand the various features of Off road vehicles and their systems.

**UNIT I CLASSIFICATION AND REQUIREMENTS OF OFF ROAD VEHICLES** **6**

Construction layout, capacity and applications. Power Plants, Chassis and Transmission, Multi-axle vehicles.

**UNIT II EARTH MOVING MACHINES** **10**

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

**UNITY III SCRAPERS ,GRADERS, SHOVELS AND DITCHERS** **10**

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

**UNIT IV FARM EQUIPMENTS, MILITARY AND COMBAT VEHICLES** **8**

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

**UNIT V VEHICLE SYSTEMS ,FEATURES** **11**

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 PERIODS**

**TEXT BOOKS**

1. Robert L Peurifoy, “Construction, planning, equipment and methods” Tata McGraw Hill Publishing company Ltd.
2. Nakra C.P., “Farm machines and equipments” Dhanparai Publishing company Pvt. Ltd.



## REFERENCES

1. James R. Evans and William M. Lindsay, "The Management and Control of Quality", 6th Edition, South-Western (Thomson Learning), 2005.
2. Oakland, J.S. "TQM – Text with Cases", Butterworth – Heinemann Ltd., Oxford, 3<sup>rd</sup> Edition, 2003.
3. Suganthi, L and Anand Samuel, "Total Quality Management", Prentice Hall (India) Pvt. Ltd., 2006.
4. Janakiraman, B and Gopal, R.K, "Total Quality Management – Text and Cases", Prentice Hall (India) Pvt. L

## **AM12B7      AUTOMOTIVE TEST INSTRUMENTATION      3 0 0 3**

### **UNIT I MEASUREMENT SYSTEMS      6**

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

### **UNIT II TRANSDUCERS, MODIFIERS AND TERMINATING DEVICES      8**

Transducers for Automotive Applications – Amplifiers- filters –data Acquisition- Indicators, Printers and displays –Signal Analyzing.

### **UNIT III MECHANICAL MEASUREMENT      10**

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

### **UNIT IV ENGINE EXPERIMENTAL TECHNIQUES      12**

I.S Code for Engine testing – Instrumentation for performance testing of engine, Instrumentation for Research and development, Instrumentation for noise, vibration, in cylinder gas flow, flame temperature Dynamic Cylinder pressure measurements.

### **UNIT V VEHICLE EXPERIMENTAL TECHNIQUES      9**

Laboratory tests- test tracks - Endurance Tests- crash tests- Vehicle performance test – Brake tests.

**TOTAL: 45 PERIODS**

## **REFERENCES:**

1. A.W. JUDGE, Engineering Precision Measurement, Chapman and Hall Ltd, Essex Street W.C., 1951,
2. T.G. Beckwith and Buck, Mechanical Measurements, Oxford and IBH Publishing House, New Delhi, 1995
3. D.Patambis, Principle of Industrial Instrumentation, Tata McGraw Hill Publishing Co, New Delhi, 1990.
4. Rangan, Sharma and Mani, Instrumentation Devices and systems, Tata McGraw Hill Publishing Co., Ltd., 1990
5. J.G. Giles, Engine and Vehicle Testing, Illiffe books Ltd., London, 1968.