NOOURL ISLAM CENTRE FOR HIGHER EDUCATION

NOORUL ISLAM UNIVERSITY, KUMARACOIL

B.E. MECHANICAL ENGINEERING

CURRICULUM & SYLLABUS

SEMESTER I

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

Sl. No	Course Code	Course Title	L	T	P	C
THEORY						
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
PRACTICAL						
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
TOTAL			18	4	8	26

*** 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"- 40th 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", 7th 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

PH1101 ENGINEERING PHYSICS – I 3 0 0 3

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_2-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 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 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. 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

ME1101 ENGINEERING GRAPHICS 3 0 0 3

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 Ghoush, “Programming in C”, Oxford University Press. (2007).
2. Byron Gottfried, “Programming with C”, 2nd 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^Hmetry)
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. MECHANICAL ENGINEERING

CURRICULUM & SYLLABUS

SEMESTER II

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

Sl. No	Course Code	Course Title	L	T	P	C
Theory						
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
Practical						
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
TOTAL			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.

MA1102 ENGINEERING MATHEMATICS II 3 1 0 4

AIM:

To impart the fundamental knowledge of Engineering Mathematics to the studentsin 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 parallelopipeds.

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"- 40th Edition , Khanna Publishers, Delhi 2007.

REFERENCES:

1. Erwin Kreyszig, " Advanced engineering Mathematics", 7th 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 –1 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 pubishers, 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_2)- H_2-O_2 fuel cell.

UNITV 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 ΔE & ΔH -II law of thermodynamics (statement only)- concept of entropy – Clausius-Clapeyron equation (no derivation)- Importance, terms involved (problem) -Free energy changes- ΔG – Gibbs Helmoltz 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;

FRICTION: 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 transmitter-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** **3 1 0 4**

(Basic Mechanical and Civil Engineering)

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 absorbtion 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 od 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 Pulications,
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

1. Unix Commands **15**

Study of Unix OS - Basic Shell Commands - Unix Editor

2. Shell Programming **15**

Simple Shell program - Conditional Statements - Testing and Loops

3. C Programming on Unix **15**

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** **0 0 4 2**

(Basic Electrical and Electronics Engineering Lab)

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** **0 0 4 2**

(Basic Mechanical and Civil Engineering Lab)

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, plastic pipes, flexible pipes, couplings, unions, elbows, plugs and other fittings. **15 Sets.**
2. Carpentry vice (fitted to work bench) **15 Nos.**
3. Standard woodworking tools **15 Sets.**
4. Models of industrial trusses, door joints, furniture joints **5 each**
5. Power Tools:

(a) Rotary Hammer	**2 Nos**
(b) Demolition Hammer	**2 Nos**
(c) Circular Saw	**2 Nos**
(d) Planer	**2 Nos**
(e) Hand Drilling Machine	**2 Nos**
(f) Jigsaw	**2 Nos**

6. Surveying equipment for Demonstration

NOOURL ISLAM CENTRE FOR HIGHER EDUCATION

NOORUL ISLAM UNIVERSITY, KUMARACOIL

B.E. MECHANICAL ENGINEERING

CURRICULUM & SYLLABUS

III SEMESTER

Code No.	Course Title	L	T	P	C
THEORY					
MA1201	Engineering Mathematics III	3	1	0	4
ME1201	Engineering Thermodynamics	3	1	0	4
ME1202	Fluid Mechanics and Machinery	3	1	0	4
ME1203	Kinematics of Machinery	3	1	0	4
ME1204	Manufacturing Technology –I	4	0	0	4
EE1213	Electrical Engineering and Control	3	1	0	4
PRACTICALS					
ME1271	Fluid Mechanics and Machinery Lab	0	0	2	1
EE1276	Electrical Engineering and Control Lab	0	1	2	2
ME1272	Manufacturing Technology Lab –I	0	0	2	1
ME1273	Machine Drawing & CAD Lab	0	0	4	2
TOTAL		19	6	10	30

MA1201 ENGINEERING MATHEMATICS - III 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:

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" – 40th 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.

ME1201 ENGINEERING THERMODYNAMICS 3 1 0 4

OBJECTIVES:

- To familiarize the students to understand the fundamentals of thermodynamics and to perform thermal analysis on their behavior and performance.

(Use of Standard and approved Steam Table, Mollier Chart, Compressibility Chart and Psychrometric Chart permitted)

UNIT I BASIC CONCEPTS AND FIRST LAW 9

Basic concepts - concept of continuum, comparison of microscopic and macroscopic approach. Path and point functions. Intensive and extensive, total and specific quantities. System and their types.Thermodynamic Equilibrium State, path and process. Quasi-static, reversible and irreversible processes. Heat and work transfer, definition and comparison, sign convention. Displacement work and other modes of work .P-V diagram. Zeroth law of thermodynamics – concept of temperature and thermal equilibrium– relationship between temperature scales –new temperature scales. First law of thermodynamics – application to closed and open systems – steady and unsteady flow processes.

UNIT II SECOND LAW AND AVAILABILITY ANALYSIS 9

Second Law of Thermodynamics, Kelvin-Planck and Clausius Statements and their Equivalence / Corollaries, PMM of Second kind, Carnot‟s principle, Carnot cycle and its specialties, Clausius Inequality, Entropy, Principle of Entropy Increase , Energy Equation, Availability and Irreversibility – Thermodynamic Potentials, Gibbs and Helmholtz Functions, Maxwell Relations, Joule-Thomson Coefficient, Clausius Clapeyron equation, –Elementary Treatment of the Third Law of Thermodynamics.

UNIT III PROPERTIES OF PURE SUBSTANCE AND STEAM POWER CYCLE 9

Formation of steam and its thermodynamic properties, p-v, p-T, T-v, T-s, h-s diagrams. p-v-T surface. Use of Steam Table and Mollier Chart. Determination of dryness fraction. Application of I and II law for pure substances. Ideal and actual Rankine cycles, Cycle Improvement Methods - Reheat and Regenerative cycles

UNIT IV GAS MIXTURES AND PSYCHROMETRY 9

Deviations from perfect Gas Model – Vander Waals Equation of State –Compressibility charts – variable specific Heats – Gas Tables. Mixtures of perfect Gases – Mole Fraction,

Mass Fraction, Gravimetric and Volumetric Analysis – Dalton‟s Law of partial pressures, Avogadro‟s Laws of additive volumes – Mole fraction , Volume fraction and partial pressure, Equivalent Gas constant and Molecular Internal Energy, Enthalpy, Specific Heats and Entropy of Mixture of Perfect Gases and Vapour, Atmospheric air - Psychometric Properties - Psychometric chart.

UNIT V THERMODYNAMIC CYCLES 9

THERMODYNAMIC CYCLES: Air standard cycles-Otto cycle, Diesel cycle, Dual cycle, comparison of Otto, diesel, and Dual Cycle ,Brayton cycle.

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

TEXT BOOKS:

1. Nag.P.K., “Engineering Thermodynamics”, 4thEdition, Tata McGraw-Hill, New Delhi, 2008.
2. Cenge Y Al and Boles M A "Thermodynamics, An Engineering Approach” Tata McGraw Hill, 2003

REFERENCES :

1. Kau-Fui Vincent Wong, "Thermodynamics for Engineers", CRC Press, 2010 Indian Reprint
2. Holman.J.P., "Thermodynamics", 3rd Edition, McGraw-Hill, 1995.
3. Rathakrishnan. E., "Fundamentals of Engineering Thermodynamics", 2nd Edition, Prentice-Hall of India Pvt. Ltd, 2006
4. Chattopadhyay, P, "Engineering Thermodynamics", Oxford University Press, 2010.
5. Arora C.P, “Thermodynamics”, Tata McGraw-Hill, New Delhi, 2003.
6. Van Wylen and Sonntag, “Classical Thermodynamics”, Wiley Eastern, 1987
7. Venkatesh. A, “Basic Engineering Thermodynamics”, Universities Press (India) Limited, 2007.

ME1202 FLUID MECHANICS AND MACHINERY 3 1 0 4

OBJECTIVES:

- The applications of the conservation laws to flow through pipes and hydraulic machines are studied
- To understand the importance of dimensional analysis.
- To understand the importance of various types of flow in pumps and turbines.

UNIT I FLUID PROPERTIES AND FLOW CHARACTERISTICS 9

Units and dimensions- Properties of fluids. Pressure-height relation for incompressible fluid - Manometers, Types of flow - laminar, turbulent, unsteady, steady, non-uniform and uniform flows. Stream line, streak line and path line. Bernoulli's equation, applications - Venturi meter, Orifice meter, Pitot tube. Statement of Navier Stokes equation, derivation of Euler's equation

UNIT II IDEAL FLOW& BOUNDARY LAYER THEORY 9

Ideal Flow: Ir-rotational and rotational, stream function, potential function, continuity equation, derivation of three dimensional equation, applications to one dimensional flows steady flow, differential momentum equation. Boundary Layer Theory- D‟Alembert paradox, Development of boundary layer, Prandtl‟s boundary layer equations, Blasius solution, integral momentum equation, drag on a flat plate, boundary layer separation and its control, streamlined and bluff bodies -flow around circular bodies and aero foils, calculation of lift and drag. Introduction to CFD: Necessity, limitations, philosophy behind CFD, applications**.**

UNIT III FLOW THROUGH CIRCULAR & PIPES, DIMENSIONAL ANALYSIS 9

Pipes in series and parallel. Reynolds number, Darcy-Weisbach equation, use of Moody diagram, minor losses-sudden expansion, sudden contraction and losses in pipe fittings. Dimensional analysis - Buckingham's Pei theorem- applications - similarity laws and models.

UNIT IV HYDRAULIC TURBINE: **9**

Hydraulic Turbines- Fluid machines definition and classification - exchange of energy - Euler's equation for turbo machines - Construction of velocity vector diagram's - head and specific work - components of energy transfer - degree of reaction. 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.

UNIT V PUMPS 9

Hydraulic Pumps- Pumps definition and classifications. Centrifugal pump classifications, working principles, velocity triangles, specific speed, efficiency and performance curves. Reciprocating pump classification, working principles, indicator diagram, work saved by air vessels and performance curves ,cavitation in pumps Rotary pumps working principles of gear and vane pumps, Selection of pumps

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

TEXT BOOK:

1. Kumar D S, "Fluid Mechanics and Fluid Power Engineering ", Kataria S K and Sons, New Delhi, 1997.
2. Robert W Fox, "Introduction to Fluid Mechanics", Fourth Edition, John Wiley and sons, Singapore, 1994.

REFERENCES:

1. Streeter, V. L. and Wylie E. B., "Fluid Mechanics", McGraw Hill Publishing Co. 2010
2. NPTEL courses: http://nptel.iitm.ac.in/courses.php - web and video resources on Fluid Mechanics.

3. Robert W.Fox, Alan T. McDonald, Philip J.Pritchard, “Fluid Mechanics and Machinery”, 2011.
4. Graebel. W.P, "Engineering Fluid Mechanics", Taylor & Francis, Indian Reprint, 2011
5. John D Anderson, “Computational Fluid Dynamics – The Basics with Applications”, McGraw Hill, New Delhi, 1995.

ME1203 KINEMATICS OF MACHINERY 3 1 0 4

OBJECTIVES:

- To understand the basic components and layout of linkages in the assembly of a system
- machine.
- To understand the principles in analyzing the assembly with respect to the displacement,
- To understand the motion resulting from a specified set of linkages, design few linkages
- To understand the basic concepts of toothed gearing and kinematics of gear trains and the effects of friction in motion transmission and in machine components.

UNIT I BASICS OF MECHANISMS 9

Terminology and definitions, degree of freedom, mobility. Grashoff‟s law. Kinematic inversions bar chain, slider crank chain. Mechanical advantage. Transmission angle. Description of common mechanisms, Introduction to 4-bar spatial mechanisms. applications of mechanisms.

Kinematics: Displacement, velocity and acceleration analysis in simple mechanisms, graphical method, velocity and acceleration polygons. Kinematic analysis by algebraic method, a demonstration, vector approach, Chace equation, computer applications in the kinematics analysis of simple mechanisms.

UNIT II LINKAGES & STATIC FORCES 9

Number and dimensional synthesis – two position synthesis of slider crank and four bar-mechanisms.Free Body diagram-conditions of equilibrium, two, three and four force members, effect of friction

UNIT III KINEMATICS OF CAM MECHANISMS 9

Classification of cams and followers – Terminology and definitions – Displacement diagrams –Uniform velocity, parabolic, simple harmonic and cycloidal motions – Derivatives of follower motions – Layout of plate cam profiles – Specified contour cams – Circular arc and tangent cams – Pressure angle and undercutting – sizing of cams.

UNIT IV GEARS AND GEAR TRAINS 9

Spur gear terminology and definitions. Fundamental law of toothed gearing and tooth forms. Interchangeable gears, gear tooth action-interference and undercutting. Helical,

bevel, worm, rack and pinion gears (basics only). Gear trains, epicyclic gear trains, differentials, automotive transmission gear trains

UNIT V FRICTION IN MACHINE ELEMENTS 9

Surface contacts – Sliding and Rolling friction – Friction drives – Friction in screw threads –Bearings and lubrication – Friction clutches – Belt and rope drives – Friction in brakes- Band and Block brakes.

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

TEXT BOOKS:

1. Uicker, J.J., Pennock G.R and Shigley, J.E., “Theory of Machines and Mechanisms”, 3rd Edition, Oxford University Press, 2009.
2. Rattan, S.S, “Theory of Machines”, 3rd Edition, Tata McGraw-Hill, 2009.

REFERENCES:

1. Thomas Bevan, "Theory of Machines", 3rd Edition, CBS Publishers and Distributors, 2005.
2. Cleghorn. W. L, “Mechanisms of Machines”, Oxford University Press, 2005
3. Robert L. Norton, "Kinematics and Dynamics of Machinery", Tata McGraw-Hill, 2009.
4. NPTEL courses: http://nptel.iitm.ac.in/courses.php, related web and video resources on Kinematics of Machines and Dynamics of Machines
5. Ghosh. A and Mallick, A.K., “Theory of Mechanisms and Machines", Affiliated East-West Pvt. Ltd., New Delhi, 1988.
6. Theory of Machines by Abdulla Sheriff, Dhanpat Rai, New Delhi,2006.
7.. Shigley J E and Uicker J J, “Theory of Machines and Mechanisms”, McGraw - Hill Inc., New Delhi, 1996.
8. Sadhu Sigh : Theory of Machines, "Kinematics of Machine", Third Edition, Pearson Education, 2012

ME1204 MANUFACTURING TECHNOLOGY – I 4 0 0 4

OBJECTIVES:

To introduce the concepts of basic manufacturing processes and fabrication techniques, such as metal casting, metal joining, metal forming and manufacture of plastic components & Composites

UNIT I METAL CASTING PROCESSES 9

Sand Casting : Sand Mould – Type of patterns - Pattern Materials – Pattern allowances – Moulding sand Properties and testing – Cores –Types and applications – Moulding machines– Types and applications; Principle of special casting processes : Investment casting, shell moulding, squeeze casting, vacuum casting, counter-gravity low - pressure casting, directional and monocrystal solidification, semisolid metal casting, Defects in casting

UNIT II JOINING PROCESSES 9

Gas Welding**:** Oxy-acetylene welding, types of flames, welding torches, welding techniques: Arc Welding And Resistance Welding: Arc welding-carbon arc, shielded metal arc, submerged arc, TIG and MIG welding. Welding electrodes-function and characteristics of electrode coating. Resistance welding-spot, seam, projection and butt welding, heat flow in welded components. Other welding process, Laser beam welding, Electron beam welding. Friction welding, Friction stir welding and Ultra sonic welding. Weld defects: types, causes and cure.

UNIT III METAL FORMING PROCESSES 9

Cold and hot working, rolling, drawing, extrusion and forging, sheet metal cutting, bending. Drawing applications, defects.– Forging tools and equipment , Press tool works-Basic principles, system, operations and applications. Special forming methods - explosive forming, electro hydraulic forming, magnetic pulse forming – super plastic forming – thermo forming – petro forge hammer and Dynapak process.

UNIT IV MANUFACTURING OF PLASTIC COMPONENTS 9

Different thermosetting and thermoplastic compounds, compression moulding, transfer moulding, injection moulding, film and sheet forming, thermoforming and their applications.

UNIT V MANUFACTURING OF COMPOSITES 9

Fabrication of Metal Matrix Composites: Commonly used Matrices, Basic Requirements in Selection of constituents, solidification processing of composites - XD process, Spray processes - Osprey Process, Rapid solidification processing, Dispersion Processes - Stir-casting & Compo casting, Screw extrusion, Liquid-metal impregnation technique , Pinciple of molten alloy infiltration, rheological behaviour of melt-particle slurry, Synthesis of In situ Composites; Fabrication of Polymer Matrix Composites - Commonly used Matrices Basic Requirements in selection of Constituents, Moulding method, Low pressure closed moulding, pultrusion, Filament winding, Fabrication of ceramic matrix composites - Various techniques of vapour deposition, Liquid phase method and Hot pressing etc., Fabrication of nano-composites

TOTAL: 60 PERIODS

TEXT BOOKS:

1. Hajra Chouldhary S.K and Hajra Choudhury. AK., "Elements of workshop Technology",volume I and II, Media promoters and Publishers Private Limited, Mumbai, 1997
2. Kalpakjian. S, “Manufacturing Engineering and Technology”, Pearson Education India Edition,2006

REFERENCES:

1. NPTEL courses, http://www.nptel.iitm.ac.in/courses.php?disciplineId=112 web and video resources on Manufacturing Processes I.
2. Roy. A. Lindberg, "Processes and Materials of Manufacture", PHI / Pearson education, 2006
3. Paul Degarma E, Black J.T and Ronald A. Kosher, "Materials and Processes, in

Manufacturing" Eight Edition, Prentice – Hall of India, 1997.
4. Krishna K Chawla, “Composite Materials-Science and Engineering”, Springer Verlag, New York, 1987.
5. Rao, P.N. "Manufacturing Technology Foundry, Forming and Welding", 2ndEdition, TMH-2003;
6. ASM Hand Book, “Casting”, ASM International, 1998.
7. Nanocomposite Science and Technology, P. M. Ajayan, L. S. Schadler, P. V. Braun, (2003), Wiley-VCH Verlag GmbH Co. KGaA, Weinheim

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

ME1271 FLUID MECHANICS AND MACHINERY LAB 0 0 2 1

OBJECTIVES:

Upon Completion of this subject, the students can able to have hands on experience in flow measurements using different devices and also perform calculation related to losses in pipes and also perform characteristic study of pumps, turbines etc.,

LIST OF EXPERIMENTS

1. Determination of the Coefficient of discharge of given Orifice meter.
2. Determination of the Coefficient of discharge of given Venturi meter.
3. Calculation of the rate of flow using Rota meter/Mass flowmeter.
4. Determination of friction factor for a given set of pipes.
5. Conducting experiments and drawing the characteristic curves of centrifugal pump/ submergible pump
6. Conducting experiments and drawing the characteristic curves of reciprocating pump.
7. Conducting experiments and drawing the characteristic curves of Gear pump.
8. Conducting experiments and drawing the characteristic curves of Pelton wheel.
9. Conducting experiments and drawing the characteristics curves of Francis turbine.
10. Conducting experiments and drawing the characteristic curves of Kaplan turbine.
11. Model study in wind tunnel.

TOTAL: 30 PERIODS

EE1276 ELECTRICAL ENGINEERING AND CONTROL LAB 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
    1. 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: 30 PERIODS

ME1272 MANUFACTURING TECHNOLOGY LAB – I 0 0 2 1

OBJECTIVE

- To impart practical training to the students on various welding processes
- To develop procedural and manual skills in machining and also to provide training in making greensand moulds

1. Facing, plain turning and step turning
2. Drilling and taper turning
3. Grooving, chamfering and knurling
4. Thread cutting operation – external and internal
5. Demonstration of press operations
6. Horizontal andVertical welding.
7. Gas Cutting, Gas Welding
8. Mould with solid, split patterns
9. Mould with loose-piece pattern
10. Mould with Core
11. Fabrication of a job involving turning, drilling, milling and welding
12. Visit to industry to study any one of the manufacturing process and submission its report.

TOTAL: 30 PERIODS

ME1273 MACHINE DRAWING & CAD LAB 0 0 4 2

OBJECTIVES

- To introduce to the students the importance of machine drawing in engineering applications
- To train the students in free hand sketching of machine components
- To impart the knowledge of assembly drawing and production drawing of machine

COMPONENTS

1. One full imperial drawing sheet consisting the drawing/ sketches of representation of standard components, symbols of pipe joints, weld joints, rivet joint etc, surface finish
2. To draw orthographic views from the given isometric views of simple objects. Detailed assembly drawing and additional views from the given drawing.
   (a) Shaft coupling - Pin type flexible coupling
   (b) Bearings and Supports - Plummer Block
   (c) Steam Engine stuffing box

(d) Screw Jack.

(e) Petrol engine connecting rod

3. ASSEMBLY USING SOLID MODELING: Modeling and assembly using software-extracting views and sections. Drawing of assemblies- machine vice, stop valve, screw jack, tail stock, cylindrical gear box, simple drill jig. Creation of bill of materials, calculation of mass and section properties, interference check between solids.

TEXT BOOKS:

1. Gopalakrishna K R, "Machine Drawing", Seventeenth Edition, Subhas Stores, Bangalore, 2003.
2. Bhatt N.D., Machine Drawing, Charotar pub.house, 39th ed., 2004.

TOTAL: 45 PERIODS

NOORUL ISLAM CENTRE FOR HIGHER EDUCATION

NOORUL ISLAM UNIVERSITY, KUMARACOIL

B.E. MECHANICAL ENGINEERING

CURRICULAM & SYLLABUS

IV SEMESTER

Code No.	Course Title	L	T	P	C
THEORY					
MA1204	Statistics and Numerical Methods	3	1	0	4
MS1201	Environmental Science	3	0	0	3
ME1205	Thermal Engineering	3	1	0	4
ME1206	Strength of Materials	3	1	0	4
ME1207	Dynamics of Machinery	3	1	0	4
ME1208	Manufacturing Technology- II	3	0	0	3
PRACTICALS					
ME1274	Strength of Materials Lab	0	0	2	1
ME1275	Dynamics Lab	0	0	2	1
ME1276	Thermal Engineering Lab-I	0	0	2	1
ME1277	Manufacturing Technology Lab-II	0	0	2	1
TOTAL		18	4	8	26

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.

MS1201 ENVIRONMENTAL SCIENCE 3 0 0 3

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

1. Cunnigham & saigo: 'Environmental science :A global concern' 4th Ed.W.c. Brown Publishers. USA. 1997

2. Chauhan A.S, 'Environmental studies' 2nd revised ed.2004, Jain Brother publishers, New Delhi

REFERENCE BOOKS

1. Benny Joseph : 'Environmental Science and Engineering', 2006, Tata McGraw-Hill Publication.
2. Siddique K.A. : Elements of Ecology and Environmental Pollution, 1st Ed. 2002, Kushal Publication, Varanasi.

ME1205 THERMAL ENGINEERING 3 1 0 4

OBJECTIVES

To apply the thermodynamic concepts into various thermal application like IC engines Steam engines and Compressors.

UNIT I IC ENGINES: 9

S.I. Engines- Types of carburetors, Electronic fuel injection system, MPFI, GDI. Combustion in spark Ignition engines, abnormal combustion. Phenomenon of Detonation in SI engines

C.I. Engines- Fuel supply system, types of fuel pump, injector and Common rail fuel injection system. Combustion in compression ignition engines, Phenomenon of knocking in CI engine. Effect of knocking. Concepts of Supercharging and Turbo charging.

Engine systems and components-Ignition system.(battery, magneto & electronic);

Lubrication system; Engine starting system; Engine cooling system; Governing system (quality and quantity hit & miss governing)

UNIT II TESTING, FUELS AND EMISSIONS OF I.C. ENGINES 9

Introduction to Indian. Standards for testing of I.C. Engine Methods to determine power and efficiencies ,heat balance sheet

Chemical structure of the Petroleum, Refining process for petroleum, important qualities of the Engine fuels - (SI & CI engines), Diesel, and Gasoline fuels Indian specifications. Alternate fuels (SI & CI engines)- Liquid fuels, gaseous fuels, hydrogen engines (LPG, HC NG (15%, 20%, 25 % Blends Hydrogen and Biofuels), Air pollution due to IC engine, Engine emissions, Hydrocarbon emissions, (HC) & PPM & Carbon monoxide emissions (CO), oxides of Nitrogen (NOx) Euro norms , Bharat stage norms, Introduction to EDC and IDC , Introduction to carbon credit, Emission control methods for SI and CI engines, Electronic control module, Catalytic converters, EGR Concept of hybrid vehicles.

UNIT III COMPRESSORS 9

Working principle of single stage and Multi stage Reciprocating Compressors -effect of clearance on volumetric efficiency,intercooling, equations for shaft work and efficiencies. Working principle, performance and characteristics of Rotary Compressors, Screw Compressors, Scroll Compressors and Centrifugal Compressors.

UNIT IV REFRIGERATION& AIR-CONDITIONING 9

Refrigeration- Methods of refrigeration-air refrigeration, Bell Coleman cycle, vapor compression refrigeration cycle, use of T-s diagrams, under-cooling and superheating. Performance calculations of air and vapour compression refrigeration systems. Study of absorption refrigeration system and comparison of various refrigeration cycles. Refrigerants - types and properties.

Air-Conditioning- Requirements for comfort and industrial air-conditioning, air washer, by-pass factor, summer and winter air conditioning systems.

UNIT VSTEAM NOZZLES AND TURBINES 9

Steam Nozzles - Effect of back pressure - condition for maximum discharge - effect of friction - supersaturated flow - impulse steam turbine - velocity diagrams - blade efficiency - stage efficiency - end thrust - reheat factor. Reaction steam turbine - degree of reaction - 50 % reaction turbine - influence of blade speed to steam speed - height of reaction blading - Method of compounding steam turbines

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

TEXT BOOKS:

1. Rajput. R. K., “Thermal Engineering” S.Chand Publishers , 2000
2. Ballaney P.L., Thermal Engineering, 24th edition, Khanna Publishers, New Delhi,2003.

REFERENCES:

1. Ganesan V, "Internal Combustion Engine", Tata McGraw Hill Publishers Co. Ltd., New Delhi, 1995.
2. Kothandaraman C P and Domkundwar S, "Thermodynamics and Thermal Engineering", DhanpatRai and Sons, New Delhi, 2004.
3. Arora.C.P,”Refrigeration and Air Conditioning ,” Tata McGraw-Hill Publishers 1994
4. Mathur M L, Sharma R P, “Internal Combustion Engines”, Dhanpat Rai and Sons, Delhi, 1997.

ME1206 STRENGTH OF MATERIALS 3 1 0 4

OBJECTIVES:

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

UNIT I STRESS& STRAIN 9

Stress and strain due to axial force, elastic limit, Hooke's law-factor of safety - stepped bars, uniformly varying sections, stresses in composite bar due to axial force and temperature. Elastic Constant Strain Energy due to axial force- proof resilience, stresses

due to gradual load, sudden load and impact load.

UNIT II TRANSVERSE LOADING ON BEAMS AND STRESSES IN BEAM 9

Beams – types transverse loading on beams – Shear force and bending moment in beams – Cantilevers – Simply supported beams and over – hanging beams. Theory of simple bending–bending stress distribution – Load carrying capacity – Proportioning of sections – Flitched beams Shear stress distribution.

UNIT III TORSION OF CIRCULAR SHAFT 9

Theory of torsion of shafts of circular, cross section. Assumptions, Derivation of torsion formulae, stresses strains and deformation in determinate and indeterminate shafts of hollow, solid, homogeneous and composite circular cross section subjected to twisting moments, stresses due to combine torsion, bending and axial force on shafts.

UNIT IV DEFLECTION OF BEAMS 9

Relation between B.M., slope and deflection slope and deflection by double integration method (McCauley's method).Slope and Deflection in determinate beams by Moment Area method and conjugate beam method. Euler & Rankine Formula.

UNIT V PRINCIPAL STRESSES ,PRINCIPAL STRAIN AND PRESSURE VESSELS. 9

Principal stresses and principal strain-Normal and shear stresses on any oblique planes and concept of principal planes and principal planes by analytical and graphical methods (Mohr's circle of stress 2-D).Stresses, strains and deformation in thin walled seamless cylindrical and spherical vessels due to internal fluid pressure. Change in volume, effects of additional compressible or Incompressible Fluid injected under pressure. Thick cylinders. Derivation of Lane's equation for stresses.

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

TEXT BOOKS:

1. Bansal, R.K., "Strength of Materials", Laxmi Publications (P) Ltd., 2007
2. Jindal U.C., "Strength of Materials", Asian Books Pvt. Ltd., New Delhi, 2007

REFERENCES:

1. Egor. P.Popov "Engineering Mechanics of Solids" Prentice Hall of India, New Delhi, 2001
2. Subramanian R., "Strength of Materials", Oxford University Press, Oxford Higher Education Series
3. NPTEL courses, http://nptel.iitm.ac.in/courses.php, web and video courses on Strength of Materials by Prof. Sharma, S. C., and Prof. Harsha, S. P.

ME1207 DYNAMICS OF MACHINERY 3 1 0 4

OBJECTIVES:

- To understand the method of static force analysis and dynamic force analysis of
- mechanisms
- To study the undesirable effects of unbalances in rotors and engines.
- To understand the concept of vibratory systems and their analysis
- To understand the principles of governors and gyroscopes.

UNIT I DYNAMIC FORCE ANALYSIS & FLYWHEEL 9

Dynamic Force Analysis of Mechanism- Inertia force and D Alembert's principle. Dynamic force analysis of mechanisms including slider crank mechanism. Flywheel - Turning moment diagram-fluctuation of energy and speed, weight of flywheel required.

UNIT II BALANCING 9

Balancing of revolving, reciprocating masses in single plane and several planes-primary and secondary forces and couples, balancing of multicylinder inline engine. Balancing of V type of engines, direct and reverse crank technique. Balancing machines- field balancing, single and two planes.

UNIT III FREE VIBRATION 9

Basic features of vibratory systems-elements, degrees of freedom, single degree of freedom system. Undamped free vibration-equation of motion, natural frequency. Damped free vibration, equation of motion, logarithmic decre-ment, critical speed of shaft, vibration measurements and control.

UNIT IV FORCED &TORSIONAL VIBRATION 9

Free Vibration- Response to periodic forcing-forcing by unbalance, support motion, force and amplitude transmissibility, force transmissibility, vibration isolation. Torsional Vibration- Torsional vibration of two and three rotor systems, geared systems, critical speed, signature analysis, two degrees of freedom system.

UNIT V GYROSCOPIC COUPLE &GOVERNORS 9

Gyroscopic couple - Introduction, Angular acceleration, Gyroscopic couple, Effect of gyroscopic couple on aeroplane, Naval ship, Stability of vehicles..

Governors-function of governors-Porter, Proell and spring loaded governors- stability and isochronism-effect of friction Calculation of equilibrium speeds ,range of speed of governors and recent trends in Governors.

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

TEXT BOOKS:

1. Shigley J E and Uicker J J, "Theory of Machines and Mechanisms", McGraw Hill , New Delhi, 1996.
2. Ballaney P L, "Theory of Machines and Mechanisms", Khanna Publishers, New Delhi, 2005.

REFERENCES:

1. Bevan T, “Theory of Machines”, Third Edition, CBS Publishers and Distributors, New Delhi, 2002.
2. Ghosh and Mallick A K, “Theory of Machines and Mechanisms”, Affiliated East West Private Limited New Delhi, 1988.
3. Rattan S S, “Theory of Machines”, Tata Mc Graw Hill , New Delhi, 2005.
4. Rao J S and Dukkipatti R V, “Mechanism and Machine Theory”, New Age International Limited , New Delhi ,1992.
5. John Hannah and Stephen R C, “Mechanics of Machines”, Viva low priced student edition, New Delhi, 1999.
6. Rao SS, “Mechanical Vibrations”, Addision Wesley Longman, New Delhi, 1995.
7. Derek Norfield, “Practical Balancing of Rotating Machinery”, Elsevier International Projects Ltd, 2006.
8. Nicholas P Cheremisinoff, “Noise Control in Industry: A Practical Guide”, Noyes Publications, William Andres Publishing, 2003.
9. Kameswara Rao N S V, “Mechanical Vibrations of Elastic Systems”, Asian Books Pvt. Ltd., 2006.
10. Graham Kelly S, “Fundamentals of Mechanical Vibrations”, Mcgraw Hill, Inc, 2000.
11. NPTEL courses: http://nptel.iitm.ac.in/courses.php, related web and video resources on Kinematics of Machines and Dynamics of Machines.
12. Erdman A G and Sandor G N, “Mechanism Design, Analysis and Synthesis”, Vol.I, PHI Inc., 1997.

ME1208 MANUFACTURING TECHNOLOGY – II 3 0 0 3

OBJECTIVES:

To understand the concept and basic mechanics of metal cutting, working of standard machine tools such as lathe, shaping and allied machines, milling, drilling and allied machines, grinding and allied machines

UNIT I THEORY OF METAL CUTTING 9

Mechanics of chip formation, single point cutting tool, forces in machining, Types of chip, orthogonal metal cutting, thermal aspects, cutting tool materials, , tool wear, tool life,surface finish, cutting fluids and Machinability

UNIT II MACHINE TOOLS: 9

Introduction to machine tools, lathe, shaper, planing, drilling and boring machines, working principle, operations, work holding devices**,** Calculation of machining time , cost estimation.

UNITIII MILLING,GEAR MANUFACTURING & RAPID PROTOTYPING 9

Milling Machine – Types, Nomenclature of Milling cutter, Application of milling

machine - Gear manufacturing processes-gear welding, gear hobbing, shaping machines, manufacture of spur, helical, bevel, worm and worm wheel. Gear finishing, Rapid Prototyping- Product development cycle, types of prototypes-principles and advantages, different types of generative manufacturing process viz. streolithography, FDM and SLS.

UNIT IV SPECIAL PROCESSES 9

Abrasive processes: grinding wheel – specifications and selection, types of grinding process–cylindrical grinding, surface grinding and centreless grinding Principles, silent features, advantages and applications of honing, lapping and super-finishing. Study of micro-electro manufacturing system (MEMS).broaching machines: broach construction – push, pull, surface and continuous broaching machines.

UNIT V NON - TRADITIONAL MACHINING 9

Need for non-traditional machining, ultrasonic machining, abrasive jet machining, laser beam machining, Micromachining . Electron beam machining, electric discharge machining, electric discharge wire cutting, electro chemical machining, electro chemical grinding, equipments, applications, advantages and limitations.

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

TEXT BOOKS:

1. Hajra Choudhury, "Elements of Workshop Technology", Vol.II., Media Promoters
2. Bhattacharya A, “New Technology”, IE Publishing, New Delhi, 1984

REFERENCES:

1. Richerd R Kibbe, John E. Neely, Roland O. Merges and Warren J.White “Machine Tool Practices”, Prentice Hall of India, 1998
2. HMT, "Production Technology", Tata McGraw Hill, 1998.
3. Geofrey Boothroyd, "Fundamentals of Metal Machining and Machine Tools", Mc Graw Hill, 1984
4. Roy. A.Lindberg, “Process and Materials of Manufacture,” Fourth Edition, PHI/Pearson Education 2006.
5. NPTEL courses, http://www.nptel.iitm.ac.in/courses.php?disciplineId=112 web and video resources on Manufacturing Processes II by Prof. A.K. Chattopadhyay,Prof. A.B. Chattopadhyay,Prof. S. Paul.
6. B.H. Amsteal, Philip F. Ostwald & Myron L. Begeman, “Manufacturing Processes”,John Wiley & Sons, eighth edition.

ME1274 STRENGTH OF MATERIALS LAB 0 0 2 1

OBJECTIVES

- To impart practical training on simple machines like screw jack, worm wheel, etc.,
- To understand the theoretical and practical aspects of elasticity and plasticity of the materials through a variety of experiments

1. Tension test on metals-stress strain characteristics, ductility, resilience, toughness.
2. Cupping test on metal sheets-load deformation characteristics, cupping load, cupping number.
3. Hardness test on metals-Brinell, Vicker and Rockwell Hardness tests.
4. Impact test on metals-Charpy, Izod impact tests.
5. Shear test on metals-direct shear strength, single shear, double shear.
6. Tests on helical springs-compression, tension springs-load deformation characteristics, stiffness, shear stress , modulus of rigidity, energy.
7. Torsion test on beams-torque and angle of twist characteristics, shear stress, modulus of rigidity, energy.
8. Tests on wood-tension, compression and bending-load deformation characteristics, Young's modulus, modulus of rupture.

TOTAL: 30 PERIODS

ME1275 DYNAMICS LAB 0 0 2 1

OBJECTIVES:

- To supplement the principles learnt in kinematics and Dynamics of Machinery.
- To understand how certain measuring devices are used for dynamic testing.

1. a). Balancing of rotating masses. (b) Balancing of reciprocating masses.
2. Preparation of cam displacement curve and determination of jump speed of a cam.
3. Determination of natural frequencies of transverse and torsional vibrations.
4. Shaft alignment testing.
5. Governor - Determination of range sensitivity, effort etc., for Watts, Porter, Proell, and Hartnell Governors..
6. Determination of critical speed of shafts.
7. Measurement of friction and wear.
8. Determination of moment of inertia of connecting rod
9. Measurement of radius of gyration of compound pendulum
10. Whirling of shafts – Determination of critical speeds of shafts with concentrated loads..

TOTAL: 30 PERIODS

ME1276 THERMAL ENGINEERING LAB-I 0 0 2 1

OBJECTIVES:

To study the components of I.C. engines, boilers, steam turbines and steam engines

1. Experimental study on valve timing diagram in 4-stroke engine cut model
2. Experimental study on port timing diagram in 2-stroke engine cut model
3. Performance test on constant speed 4-stroke diesel engine
4. Variable speed test on multi-cylinder diesel engine
5. Heat balance test on 4-stroke diesel engine
6. Performance test on constant speed single cylinder petrol engine
7. Performance test on high pressure two stage reciprocating air compressor
8. Performance testing of blower.
9. Study of Steam Generators and Turbines.
10. Performance and Energy Balance Test on a Steam Generator.
11. Performance and Energy Balance Test on Steam Turbine.
12. Visit to a industry/sugar factory for study of cogeneration plant

TOTAL: 30 PERIODS

ME1277 MANUFACTURING TECHNOLOGY LAB-II 0 0 2 1

OBJECTIVES:

To Study and practice the various operations that can be performed shaper, drilling, milling machines etc. and to equip with the practical knowledge required in the core industries.

1. Machining and Machining time estimations for Square Head Shaping
2. Machining and Machining time estimations for Hexagonal Head Shaping
3. Contour milling using vertical milling machine
4. Spur gear cutting in milling machine
5. Helical Gear Cutting in milling machine
6. Gear generation in hobbing machine
7. Plain Surface grinding
8. Cylindrical grinding
9. Tool angle grinding with tool and Cutter Grinder
10. Measurement of cutting forces in Milling / Turning Process

TOTAL: 30 PERIODS

NOOURL ISLAM CENTRE FOR HIGHER EDUCATION

NOORUL ISLAM UNIVERSITY, KUMARACOIL

B.E. MECHANICAL ENGINEERING

CURRICULUM & SYLLABUS

SEMESTER V

Code No.	Course Title	L	T	P	C
THEORY					
MS1202	Professional & Business Ethics	3	0	0	3
ME1209	Energy Conversion Technology	3	1	0	4
ME1210	Engineering Materials and Metallurgy	3	0	0	3
ME1211	Machine Design-I	3	1	0	4
ME1212	Heat and Mass Transfer	3	1	0	4
ME1213	Computer Graphics & CAD	3	0	0	3
PRACTICALS					
ME1278	Thermal Engineering Lab-II	0	0	2	1
ME1279	Simulation Lab I	0	0	2	1
ME1280	Metallurgy Lab	0	0	2	1
ME1281	Computer Aided Design and Modeling Lab	0	0	2	1
TOTAL		18	3	8	25

MS1202 PROFESSIONAL AND BUSINESS ETHICS 3 0 0 3

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 Leatning, 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.

ME1209 ENERGY CONVERSION TECHNOLOGY 3 1 0 4

OBJECTIVES

The course will introduce the students to most of the important aspects of Energy Conversion Technologies. This will enable them to gain understanding of these devices and how these may be combined with other technologies, so as to arrive at optimal solutions for different applications.

UNIT I: INTRODUCTION& THERMAL ENERGY SYSTEMS 9

Classification of Energy Sources. Direct use of primary energy sources, Conversion of primary into secondary energy sources such as Electricity, Hydrogen, Nuclear energy etc

Boilers -Types, combustion in boilers, performance evaluation, analysis of losses, feed water treatment, blow down. FBC Boilers: Introduction, mechanism of fluidized bed combustion, advantages, types of FBC boilers, operational features, retrofitting FBC system to conventional boilers furnaces, draught control, economizers, super heaters, pre heaters.

UNIT II: MECHANICAL ENERGY SYSTEMS & COGENERATION 9

Mechanical energy conversion, types, thermal power plant, Hydraulic turbines, Selection of site for a hydro electric power plant- essential elements of hydro electric power plants- classification of hydro electric power plants **,** gas turbines, Gas turbine power plants, pumps, fans, compressors, Conversion of Electrical Energy to Mechanical Energy (Electric Motors),Diesel Electric power plant, Application for cogeneration, types of cogeneration processes, topping cycle plant, bottoming cycle plant.

UNIT III: BIO MASS, SOLAR AND WIND ENERGY CONVERSION 9

Biomass conversion technologies (thermo chemical, biochemical and agrochemical) technology, briquetting, biomass gasification technology, waste to energy conversion, bio fuels. Photovoltaic conversion of solar energy, solar cell, types of solar cell modules, design of photovoltaic conversion systems. Basic principles of wind energy conversion, site selection considerations, basic components, classification advantages and disadvantages of WECS (Wind Energy Conversion System), types of wind machines, performance of wind machines, Wind turbine performance measurement – Loading analysis.

UNIT IV: NEW ENERGYCONVERSION TECHNOLOGIES 9

Hydrogen energy production, Introduction to geothermal energy, hydrothermal resources, geopressured resources, petro thermal resources, prime movers for geothermal energy conversion, applications of geothermal energy, basic principle of tidal power, components of

tidal power plant, site requirements, storage of tidal energy, advantages and limitations of tidal power generation.. Ocean Thermal Energy Cycle (OTEC) - Baseline design - Heat design - Power cycle design - plant working. Thermoelectric converter - Thermionic converter – Magneto Hydra Dynamic system (MHD) - Electro gas dynamics (EGD) principles - types.

UNIT V: NUCLEAR ENERGY CONVERSION AND ECONOMICS OF POWER GENERATION 9

Energy Conversion through fission and fusion, Nuclear power generation, types of reactors- PWR-BWR- gas cooled reactors- Heavy water reactors-India's nuclear power programmes.
Power Plant Economics & Environmental Considerations- Plant energy studies: concepts and resources, procedures and implementation. Energy accounting. Various thermal systems and energy management. Electrical load management. Economic analysis. Waste heat recovery. Multi objective energy management- conservation, pollution control and evaluation of alternative energy sources. Cost of energy management and payback.

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

TEXT BOOKS

1. Culp A W, "*Principles of Energy Conversion*", Tata McGraw Hill, 2000.
2. Reiner Decher, "*Energy Conversion: Systems", Flow Physics and Engineering*, Oxford University Press, 1994.

REFERENCE BOOKS

1. Thomas C. Elliot : '*Hand book of power plant engineering'* McGraw Hill, 1989.
2. Stephen Fonash, *Solar Cell Device Physics*, Academic Press, Publication ,2010
3. Manwell J. F.,Mcgowan,J.G, Rogers A.L., *Wind Energy Explained: Theory, Design and Application*, John Wiley & Sons, ISBN:9780470015001, 2010
4. H. Lee Willis and W.G. Scott: *Distributed Power Generation: Planning and Evaluation, Marcel Dekker*, 2000.
5. Garg H P., Prakash J., *Solar Energy: Fundamentals & Applications*, Tata McGraw Hill, New Delhi, 1997
6. Nag.P.K. *Power plant engineering*: Tata McGraw-Hill.
7. R. Yadav, "*Steam & Gas Turbines & Power Plant Engineering*", Central Publishing House, Allahabad,

ME1210 ENGINEERING MATERIALS AND METALLURGY 3 0 0 3

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.

To Know: Crystal Structure BCC, FCC and HCP structure- unit cell –crystallographic planes and directions, miller indices–Grain size, ASTM grain size number

UNIT I ENGINEERING STEELS & ALLOYS 9

Allotropy, Iron - Iron carbide equilibrium diagram, critical temperatures. cooling curve and volume changes of pure iron. Effect of alloying additions on steel (Mn, Si, Cr, Mo, V Ti & W) -

stainless and tool steels – HSLA. Gray, White malleable, spheroidal -Graphite - alloy cast-iron. Microstructures of slowly cooled steels, Estimation of carbon from Microstructures, non-equilibrium cooling of steels. Widman statten structures, Structures - property relationship.
Copper and Copper alloys, Aluminium and Aluminium alloys, Titatanium alloys, Magnesium alloys, Standards, precipitation strengthening treatment – Bearing alloys.

UNIT II HEAT TREATMENT 9

Heat treatment of steels, Transformation products of austenite, Time temperature Transformation diagrams(TTT), Critical cooling rate(CCR), continuous cooling transformation diagrams. Cooling media. Types - Annealing, normalizing, hardening. Tempering, Carburising, nitriding, carbonitriding,Flame and Induction hardening. Commercial heat treatment practice of gears of different sizes, tools, lathe beds, springs, etc.

UNIT III NON-METALLIC MATERIALS 9

Polymers – types of polymer, commodity and engineering polymers – Properties and applications of various thermosetting and thermoplastic polymers (PP, PS, PVC, PMMA, PET,PC, PA, ABS, PI, PAI,PPO, PPS, PEEK, PTFE, Polymers – Urea and Phenol formaldehydes)- Engineering Ceramics –Properties and applications of Al2O3, SiC, Si3N4, PSZ and SIALON – Powder metallurgy, Manufacturing Process, Compacting, Sintering, Vacuum processing. Properties of Powder processed materials, high energy compaction. Metal matrix composites, properties , Applications of Composites.

UNIT IV NANO MATERIALS 9

Nano structured materials, Low-dimensional structures: Quantum wells, Quantum wires, and Quantum dots, Nano clusters & Nano crystals. Electronic and optical properties of nano crystallites, Metallic and semiconducting super lattices. Synthesis of nanostructured materials, Fabrication and characterization of nano electronic devices. Basics of synthesis and characterization of nano-multi-component systems for sensors (magnetic, electronic and optical) and electrodes. Synthesis and fabrication of carbon nano structures for fuel cell and energy storage applications.

UNIT V MECHANICAL PROPERTIES AND TESTING 9

Mechanical Properties And Testing**:** Mechanism of plastic deformation, slip and twinning. Types of fracture – Testing of materials under tension, compression and shear loads Hardness tests (Brinell, Vickers and Rockwell) Impact test, Izod and charpy, fatigue and creep test
Non Destructive Testing**:** basic principles and testing method for Radiographic testing, Ultrasonic testing, Magnetic particle inspection and Liquid penetrant inspections, Eddy current testing.

TOTAL: 45 PERIODS

TEXT BOOK:

1. Kenneth G.Budinski and Michael K. Buinski, "*Engineering Materials*", Prentice Hall of India Private Limited, 4th Indian Reprint, 2002
2. Sydney H.Avner "*Introduction to Physical Metallurgy*" McGraw Hill Book Company, 2007

REFERENCES:

1. William D Callister, "*Material Science and Engineering*", John Wiley and Sons, 1997.
2. Raghavan V, "*Materials Science and Engineering*", Prentice Hall of India Pvt. Ltd., 1999.
3. Dieter G. E., *Mechanical Metallurgy*, Mc Graw Hill Book Company, 1988
4. O.P. Khanna , *A text book of Materials Science and Metallurgy*, Khanna Publishers, 2003.
5. NPTEL courses, *http://www.nptel.iitm.ac.in/courses.php?disciplineId=112:* related web and video resources under *Mechanical Engineering &Metallurgy and Material Science categorie*

ME1211 MACHINE DESIGN-I 3 1 0 4

(Use of approved Design data book is permitted in the Examination)

Objectives

- To make student understand the general principles of designing mechanical components subjected to static loading with mechanical strength as design criterion
- To make students conversant with fundamental aspect of design.
- To make students conversant with different types of stresses induced in a component due to different types of static loading conditions.
- Having developed the above concept, make them competent in designing various components screw fasteners, shaft and coupling, spring, welded joints etc.
- To develop competency in designing a system involving the various component, as a design project in practical.

Unit I FUNDAMENTAL ASPECT OF DESIGN & DESIGN AGAINST STATIC AND FLUCTUATING LOAD 9

Engineering design, Phases of design, stress and strain consideration, factor of safety, standardization , preferred series, Material selection. Stress-strain relationship, stresses due to bending and torsion load, eccentric loading, theories of failure, Stress concentration, fatigue failure, endurance limit, notch sensitivity, Goodman and Soderberg diagrams, and modified Goodman diagram, fatigue design under combined stresses.

Unit II DESIGN OF SHAFTS AND COUPLINGS 9

Design of solid and hollow Shaft and its design based on strength Torsional Rigidity and critical speed. Design of shaft for variable load and based on stiffness, ASME Code for shaft design Design of key and keyways. Couplings types - Rigid and flexible Couplings. Design of Knuckle joint.

Unit III DESIGN OF FASTENERS, RIVETS AND WELDED JOINTS 9

Threaded Fasteners, Design of screwed fastener – Design of bolted joints both axial and eccentric loading: Design of Riveted Joints: Types, Design of longitudinal & circumferential joint for various types, Simple Riveted Brackets.. Welded Joints: Types and Uses, Design of Welded Joints, Strength of Butt, parallel, transverse welds, eccentrically loaded welded joint subjected to torsion. & Bending moment.

Unit IV DESIGN OF MECHANICAL SPRINGS **9**

Springs: classification and use of springs- spring materials stresses in helical springs - deflection of helical springs - extension, compression and torsion springs - design of helical springs for static and fatigue loading - Design of leaf, Disc and Belleville Springs.

Unit V DESIGN OF IC ENGINES **9**

Design of I.C engine parts-piston connecting rod, Crankshaft and Fly wheel basic concepts - design requirements, Turning Moment diagram and energy estimations.

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

DESIGN DATA HAND BOOKS

1. Prof. Narayana Iyengar B. R. & Dr Lingaiah K., *Machine Design Data Handbook,* Vol. I &II
2. P.S.G., Tech., *Machine Design Data Handbook* Design data Book

TEXT BOOKS

1. _Shigley J.E. and Mischke C.R. – "*Mechanical Engineering Design*" McGraw Hill Publ.Co. Ltd.
2. Bhandari V.B. – "*Design of Machine Elements*" – Tata McGraw Hill Publ. Co. Ltd.

REFERENCES

1. Siegel, Maleev & Hartman, *Mechanical Design of Machines*, International Book Company
2. Phelan R.M., *Fundamentals of Mechanical Design,* TMH, Ltd.
3. Doughtie V.L., & Vallance A.V., *Design of Machine Elements*, McGraw Hill Book Company
4. Juvinall R.C. & Marshek K.M., *Fundamentals of Machine Component Design,* John Wiley
5. NPTEL courses: *http://nptel.iitm.ac.in/courses.php* - web and video resources on *Dynamics of Mechanical System/ Design of Machine Elements /Machine Design.*

ME1212 HEAT AND MASS TRANSFER 3 1 0 4

(Use of approved Heat and mass transfer data book is permitted in the Examination)

OBJECTIVE

- The course is intended to build up necessary background for understanding the physical behavior of various modes of heat transfer, like, conduction, convection and radiation.
- To understand the application of various experimental heat transfer correlations in engineering calculations.
- To learn the thermal analysis and sizing of heat exchangers.
- To understand the basic concepts of mass transfer

UNIT I: CONDUCTION **9**

Introduction to conduction heat transfer, Fourier's law of conduction, thermal conduction equation – derivation in Cartesian, Cylindrical and Spherical coordinates. One dimensional steady state conduction in plane wall and composite wall. Thermal contact resistance variable conductivity, thermal resistance, electrical analogy, radial systems – cylinder, sphere. Overall heat transfer coefficients, critical thickness of insulation. Heat generation in plane wall, cylinder and sphere. Extended surface (fins) heat transfer along a fin, fin with insulated tip and short fin. Application to error measurement of Temperature. Steady state conduction in two dimensions, conduction shape factor, numerical method of analysis. Unsteady state conduction – lumped heat capacity systems, significance of Biot and Fourier numbers, transient heat flow in a semi-infinite solid, use of Heisler and Grober charts.

UNIT II: CONVECTION **9**

Convective Heat Transfer- Classification of systems based on causation of flow, condition of flow, configuration of flow and medium of flow.Dimensional analysis as a tool for experimental investigation .Buckingham Pi Theorem and method, Application for developing semi-empirical non- dimensional correlation for convection heat transfer, Significance of nondimensional numbers. Concepts of Continuity. Momentum and Energy Equations. Forced convection: External Flows: Concepts about hydrodynamic and thermal boundary layer and use of empirical correlations for convective heat transfer.-Flat plates and Cylinders. Internal Flows: Concepts about Hydrodynamic and Thermal Entry Lengths Division of internal flow based on this Use of empirical relations for Horizontal Pipe Flow and annulus flow. Free Convection- Development of Hydrodynamic and thermal boundary layer along a vertical plate – Use of empirical relations for vertical plates and pipes.

UNIT: III PHASE CHANGE AND HEAT EXCHANGER **9**

Heat Transfer with Phase Change- Boiling: Pool boiling Regimes Calculations on Nucleate boiling, Critical Heat flux and Film boiling. Condensation: Film wise and drop wise condensation, Nusselt Theory of Condensation on a vertical plate - Film condensation on vertical

and horizontal cylinders using empirical correlations. Heat Exchangers- Classification of heat exchangers overall heat transfer -Coefficient and fouling factor. Concepts of LMTD and NTU methods - Problems using LMTD and NTU methods..

UNIT IV: RADIATION **9**

Radiation Heat Transfer- Emission characteristics and laws of black-body radiation, Irradiation total and monochromatic quantities, laws of Planck, Wien, Kirchhoff, Lambert, Stefan and Boltzmann, heat exchange between two black bodies, concepts of shape factor. Emissivity heat exchange between grey bodies radiation shields electrical analogy for radiation

UNIT V: MASS TRANSFER **9**

Mass transfer – Fick's law of diffusion, equi-molal counter diffusion, Stephen's law, Mass transfer coefficient, non-dimensional number in mass transfer, evaporation process in the atmosphere

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

TEXT BOOKS

1. Holman J.P., '*Heat and Mass Transfer*', Tata McGraw Hill, 8th Ed., 1989.
2. Sachdeva, '*Heat and Mass Transfer*', Wiley Eastern, 1986
3. Çengel, Y. A. *Heat transfer: a practical approach*: McGraw-Hill.

REFERENCE BOOKS

1. C.P. Kothandaraman., '*Fundamentals of Heat and Mass Transfe*r', 2nd Ed., New Age International, 1997.
2. Incropera, F. P., DeWitt, D. P., Bergman, T. L., & Lavine, A. S. *Fundamentals of Heat and Mass Transfer*: John Wiley & Sons
3. *Özısık, M. N. Heat transfer: a basic approach: McGraw-Hill.*
4. Eckert E.R.D. and Drake R.M., '*Analysis of Heat and Mass Transfer'*, McGraw Hill, 1980.
5. Donald Q. Kern: *Process Heat Transfer*, Tata McGraw Hill Publishing Company Ltd., New Delhi.

ME1213 COMPUTER GRAPHICS & CAD 3 0 0 3

OBJECTIVES:

- To study how various graphics images can be created on the computer and its representation standards.
- To study how computer can be used in Mechanical Engineering Design.

Unit I FUNDAMENTALS OF COMPUTER GRAPHICS: 9

Homogeneous coordinate system, Output primitives and their attributes, 2D and 3D transformations: scaling, translation, rotation, mirroring, clipping, scan conversion, Rasterisation: DDA & Bresenham's algorithm, discussion extended to circle generation

Unit II CAD SYSTEM 9

CAD system configuration; Hardware: Display devices, Hard-copy devices, Interactive input devices, Display processors Software: Features, Graphic standards (GKS, PHIGS, IGES, STEP, PDES), Applications and benefits of CAD

Unit III GEOMETRICAL MODELING CURVES AND SURFACES 9

Types & mathematical representation of curves, wire frame models, entities, representations, parametric representations, modeling of biparametric Surfaces, Surfaces- Coons, Bezier, B-spline and NURBS patches, Surface manipulation techniques.

Unit IV GEOMETRIC SOLID MODELING 9

Fundamentals of solid modeling, Half spaces, Boundary representation (B-rep), Constructive solid geometry (CSG), sweep representation, analytic solid modeling, solid manipulations, Orthographic projection, Boolean operation.

Unit V COMPUTER AIDED DESIGN OF MACHINE ELEMENTS 9

Development of programs in C++ design, drawing & plotting of Machine Elements shafts gears, pulleys, flywheel, connecting rods.

TOTAL: 45 PERIODS

TEXT BOOKS

1. McConnell, J. J. *Computer graphics theory into practice* Jones and Bartlett Publishers.
2. Davis, M. J. *Computer Graphics* Nova Science Pub Inc.
3. Rogers, D. F., Earnshaw, R. A., Graphics, B. C. S. C., Group, D., & Society, C. G. *Computer graphics techniques theory and practice* Springer-Verlag.
4. Salomon, D. *Transformations and projections in computer graphics* Springer.
5. Bethune, J. D. *Engineering Design and Graphics with Solid Works* Prentice Hall.

REFERENCES:

1. William .M. Neumann and Robert .F. Sproul " *Principle of Computer Graphics* ", McGraw Hill Book Co. Singapore ,1989.
2. Donald Hearn and .M. Pauline Baker " *Computer Graphics* " Prentice Hall ,Inc., 1992.
3. Mikell .P. Grooves and Emory .W. Zimmers Jr. " *CAD/CAM Computer -- Aided Design and Manafacturing*"Prentice Hall ,Inc., 1995.
4. Ibrahim Zeid " CAD/CAM -- *Thoery and Practice* " - McGraw Hill , International Edititon , 1998.
5. NPTEL courses *http//nptel.iitm.ac.in/courses.php*- web and video resources on *Computer Aided Design and Manufacturing*

ME1278 THERMAL ENGINEERING LAB - II 0 0 2 1

OBJECTIVES:

- To impart training to the students to conduct experiments on heat transfer equipments in which the different modes of heat transfer occurs
- To give training to conduct performance tests on heat exchangers
- To give hands-on training to conduct performance tests on refrigeration and Air-conditioning Plant.

1. Experiment on Pin Fin apparatus
2. Experiment on natural convective heat transfer from vertical cylinder
3. Experiment on forced heat transfer inside tube
4. Determination of Stefan-Boltzmann constant
5. Determination of emissivity of grey surface
6. Effectiveness of parallel /counter flow heat exchanger
7. Experiment on Thermal conductivity apparatus
8. To determine the flash and fire point of the given fuel
9. To determine the viscosity of the given fuel
10. Experiment on Refrigeration tutor
11. Experiment of air conditioning unit

12. Experiment on LPG Refrigerator

13. Visit to ice / Air conditioning plant to study the process and submission its report

ME1279 SIMULATION LAB-I 0 0 2 1

OBJECTIVES:

- To gain experience on simulation of air conditioning system, hydraulic / pneumatic cylinder, cam and follower mechanism using MAT LAB and c++ .
- To gain experience in the application of CFD analysis to real engineering problems.

1. Creating a two-dimensional Array (Matrix of given size) and (A). Performing Arithmetic Operations - Addition, Subtraction, Multiplication and Exponentiation. (B). Obtaining Modified Matrix - Inverse, Transpose, with Appended and Deleted Elements using MAT LAB.
2. Generating a set of commands on a given vector (Example: X = [1 8 3 9 0 1]) to (A). Add up the values of the elements (Check with sum) (B). Compute the running sum (Check with sum), where running sum for element j = the sum of the elements from 1 to j, inclusive. (C). Compute the sine of the given X-values (should be a vector). Also, Generating a Random Sequence using rand() / randn() functions and plotting them in the MAT LAB.
3. Using MAT LAB to generate normal and integer random numbers (1-D & 2-D) and plotting them; Also, Writing a Script (which keeps running until no number is provided to convert) that asks for Temperature in degrees Fahrenheit and Computes the Equivalent Temperature in degrees celsius. [Hint: Function is empty is useful]
4. Writing programs using C++ and MATLAB for Solution of ordinary differential equations.
5. Simulation of Air conditioning system with condenser temperature and evaporator temperatures as input to get COP using C++ and MAT LAB.
6. Simulation of Hydraulic / Pneumatic cylinder using C++ and MAT LAB
7. Simulation of cam and follower mechanism using C++ and MAT LAB
8. Study the overview of CFD process
9. Analysis of flow through pipes using CFD software.
10. Analysis of flow through Nozzle using CFD software
11. Fluid flow analysis in aerofoil using CFD Software.

ME1280 METALLURGY LAB 0 0 2 1

OBJECTIVES:

- To gain practical experience with the processing, microstructure and performance of Materials.
- To gain practical experience with the relationships between them

1. Study of Metallurgical Microscope
2. Identification of various engineering materials on the basis of density.
3. Study of Preparation of a Specimen for metallographic examination

4. Preparation of Mounted samples with the help of mounting press/cold setting resins.
5. Study and drawing of microstructures of Steels.
6. Study of effect of Annealing & Normalizing on properties of the steel Metallographic
7. Determination of harden ability of steel by Jominy end Quench test
8. To study various characteristics of copper powder and evaluate Green density as well as strength characteristics (Hardenss) of cold-compacted powder characterization.
9. To Evaluate Green density as well as strength characteristics (Hardenss) of sintered (conventional) compact powder characterization.

ME1281 COMPUTER AIDED DESIGN AND MODELING LAB 0 0 2 1

OBJECTIVES:

To impart knowledge on how to prepare drawings for various mechanical components using any commercially available 3D modeling software's With laboratory classes, it helps the students to get familiarized with the computer applications.

1. Create solid models from pictorial views using PRO-E
2. Orthographic Projections with three views of any one simple machine component such as bracket, Bearing Housing and its' 3-D model using PRO-E
3. Orthographic Projections with three views of any one Cast component for Engines such as Connecting rod, Piston etc and its' 3-D model using PRO-E
4. Create assembly of components like double riveted lap joint using PRO-E
5. Sheet metal design using PROE software.
6. Create assembly of different mechanisms slider crank mechanism using CATIA.
7. Create assembly of components like protected flanged coupling using CATIA.

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B.E. MECHANICAL ENGINEERING

CURRICULUM & SYLLABUS

SEMESTER VI

Code No.	Course Title	L	T	P	C
THEORY					
IT1212	Cyber Security	3	0	0	3
ME1214	Mechanical Measurements and Metrology	3	0	0	3
ME1215	Computer Aided Manufacturing	3	0	0	3
ME1216	Finite Element Analysis	3	1	0	4
ME1217	Machine Design-II	3	1	0	4
E-I	Elective – I (To be chosen from open category)	3	0	0	3
PRACTICALS					
ME1282	Simulation Lab II	0	0	2	1
ME1283	Mechanical Measurements Lab	0	0	2	1
ME1284	Metrology Lab	0	0	2	1
ME12P1	Inplant Training & Seminar	0	0	2	1
TOTAL		18	2	8	24

IT1212 CYBER SECURITY 3 0 0 3

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 OPERATINGSYSTEMS 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.

ME1214 MECHANICAL MEASUREMENTS AND METROLOGY 3 0 0 3

OBJECTIVES

- To understand the problems in the Measurement systems and develop the competency to
- resolve the problems.
- To understand the basic principles and applications of Engineering Mechanical Measurement science.
- To acquire proficiency in using, calibrating, designing precision instruments, gauges
- comparator, various measurement systems etc.

UNIT I: PRESSURE, STRAIN AND FORCE MEASUREMENT 9

General configuration and functional element of measuring instrument, types of inputs, High pressure measuring instruments- Burden pressure gauge , diaphragm gauge, dead weight pressure tester and bellow gauge. Low pressure measuring instruments- Mcload gauge, Knudsen gauge, Ionization, thermal conductivity gauge, Strain measuring instruments: strain gauges, types of strain gauges, strain gauge circuits temperature compensation selection and installation of strain gauge, use of strain gauges on rotating shafts, calibration and testing of above instruments.

Force Measurement: Hydraulic, Pneumatic and Electrical methods of force measurement.

UNIT II: TEMPERATURE, LIQUID LEVEL, SPEED AND FLOW MEASUREMENT 9

Temperature Measurement: Standards, various temperature measuring devices, bi-metallic strips, liquid in glass thermometer, pressure thermometer, thermocouple, electric resistance thermometer, thermister, radiation thermometer. Liquid Level Measurement: Various methods such as single float displacement or force transducers, pressure sensitivity bubbler or purge system, capacitance variation type, resistance variation type, radioisotopes. Speed Measurement: Tachometer and stroboscopes, Flow Measurement: Positive displacement flow meter, turbine meter, electromagnetic flow meter, rotameter.

UNIT III: PRECISION AND ACCURACY 9

Methods of estimating accuracy and precision; Needs for accuracy and precision; Standards and their evolution; Types of errors in measurements. Limits, Fits and Tolerances, & Gauge Design- Basic concepts in limits, fits and tolerances Tolerance grades; ISO system of tolerance, Principles gauge design. Work Shop and Inspection gauges

UNIT IV: LINEAR, ANGULAR AND GEAR MEASUREMENT 9

Linear measuring instruments, precision measuring instruments, comparators.

Angular measurement- Combination protractor, universal bevel protractor, sine bar, sine center, angle gauge block, clinometers, auto-collimator, angle décor, roller and cylindrical method, optical prism method. Screw thread measurement - Standard thread profiles, Different Thread Elements, Effective diameter, 2 wire and 3 wire methods as applied to standard and non-standard thread profiles, Best wire size, Virtual Effective Diameter.

Gear measurement- Different types of gears, Basic elements of a gear, Involute function, Relations between different gear elements of spur and helical gears, Virtual number of teeth, Use of gear tooth Vernier for chordal and constant chordal measurements, Span measurement using Base Tangent Micrometers.

UNIT V : SURFACE FINISH MEASUREMENT AND INTERFEROMETRY 9

Surface finish/texture measurement- Surface Roughness-Sources of surface irregularities in manufacturing, Different elements of surface roughness, Definition of center line and related roughness parameters, Measurement Instruments, Profilometers, Analysis of roughness

Interferometry: Principle and Application of Interferometry for analysis of surface texture. Study of tool maker microscope, profile projector, three coordinates measurement

TOTAL: 45 PERIODS

TEXT BOOKS

1. Beckwith, Marangoni & Lienhard, " *Mechanical measurements*", Addison-Wesley,5th edition, 2000. E.O.
2. Jain R.K ,*Engineering metrology* , Khanna publications , 1985

REFERENCE BOOKS

1. S.Reganathan "*Transducers Engineering*", Allied publishers Limited,1999
2. Deobline, "*Measurement systems, application and design*" McGraw-hill, 4th edition, 1990.
3. CS Rangan, VSV Mani, G.R. Sharma, *Instrumentation devices and systems*, Tata McGraw hill 1983.
4. ASTME *Handbook of Industrial Metrology*, prentice hall of India, ND, 1988
5. Collette & Hope, *Engineering Measurement*", ELBS publisher

ME1215 COMPUTER AIDED MANUFACTURING 3 0 0 3

OBJECTIVES

- To gain knowledge on how computers are integrated at various levels of planning and manufacturing.
- To understand the CNC and to handle the product data and various software used for manufacturing
- To understand the basics of robotics.

Unit I ADVANCED MANUFACTURING CONCEPTS 9

Type of automation and benefits, Various manufacturing systems – batch, mass, group, cellular, flexible manufacturing systems lean manufacturing, Agile Manufacturing, group technology.

Unit II TYPES OF AGVS 9

Industrial trucks, manual, powered automated guided vehicles, types of vehicles and AGVS application, vehicle guidance technology, vehicle management and safety, conveyors, cranes and hoists. Automatic data collection, bar code technology, Radio Frequency Identification.

PROCESS PLANNING: Approaches to process planning, CAPP- variant approach and generative approach, study of a typical process planning, system.

Unit III CNC MACHINES TOOLS: 9

Working principles of typical CNC lathes, turning centre, machining centre, CNC grinders, CNC gear cutting machines, wire cut EDM, turret punch press, CNC press brakes. Selection of CNC machine tools. Structure, drive kinematics, gear box, main drive, feed drive, selection of timing belts and pulleys, spindle bearings arrangement and installation. Re-circulating ball screws, linear motion guideways, tool magazines, ATC, APC, chip conveyors, tool turrets, pneumatic and hydraulic control systems, Control Systems And Interfacing

Unit IV PART PROGRAMMING 9

Tooling, typical tools for turning and machining centres. Axes definition, machine and workpiece datum, turret datum, absolute and incremental programming, tape codes - ISO and EIA codes, G and M functions, tool offset information, soft jaws, tool nose radius compensation, long turning cycle, facing cycle, constant cutting velocity, threading cycle, peck drilling cycle, part programming examples

Manual Part Programming Of A Machining Centre**:** Co-ordinate systems, cutter diameter compensation, fixed cycles- drilling cycle, tapping cycle, boring cycle, fine boring cycle, back boring cycle, area clearance programs, macros, parametric programming, part programming examples. CAD/CAM based NC part programming, features of typical CAM packages.

Unit V Robotics 9

Robot definition, robotics systems and robot anatomy, specification of robots. Resolution, repeatability and accuracy of a manipulator,Power transmission systems and control robot drive mechanisms, mechanical transmission method, rotary-to-rotary motion conversion, rotary-to-linear motion conversion, end effectors- types, gripping problem, remote-centered compliance devices, control of actuators in robotic mechanisms. Sensors for robotic applications, robot kinematics

TOTAL: 45 PERIODS

TEXT BOOKS:

1. Yoram Koren, "*Computer Control of Manufacturing Systems*", Tata McGraw Hill Book Co., 2005.
2. Deb S R, "*Robotics Technology and Flexible Automation*", Tata McGraw Hill Book Co., 2004.

REFERENCE BOOKS:

1. Mikell P Groover, Mitchell Weiss, Roger N Nagel, Nicholas G Odrey, "*Industrial Robotics*", McGraw Hill Book Co, NY, 2008.
2. Tien-chien Chang and Richard A Wysk, "*An Introduction to Automated Process Planning Systems*", Prentice Hall Inc., Englewood Cliffs, New Jersey, 1985.
3. NPTEL courses, http://www.nptel.iitm.ac.in/courses.php?disciplineId=112 web and video resources on *Manufacturing Processes & Advanced manufacturing processes*.
4. Joshi P H, "*Machine Tool Hand Book*, Design and Operation", Tata McGraw Hill, 2007.
5. Kulwise R A, "*Basics of Materials Handling*" M.H. Institute, New York, 1986.

ME1216 FINITE ELEMENT ANALYSIS 3 1 0 4

OBJECTIVES

- To understand the principles involved in discretization and finite element approach
- To learn to form stiffness matrices and force vectors for simple elements

Unit I FUNDAMENTALS OF FEM 9

Introduction, Historical background, Steps in FEM, Applications, Advantages and Disadvantages, Commercial FEM Softwares, Competing Technologies, Future Trends Weighted residual, Variation Formulation, Ritz, and Galerkin methods. Sources of errors in FEM, FEM convergence requirement.

Unit II DISCRITIZATION OF THE PROBLEM AND INTERPOLATION FUNCTIONS AND SIMPLEX ELEMENTS 9

Introduction, Geometrical approximations, Simplification through symmetry, Basic element shapes and behaviour, Choice of element type, Size and number of elements, Element shape and distortion, Location of nodes, Node and element numbering

Interpolation Functions and Simplex Elements: Introduction, simplex, complex and multiplex elements, linear interpolation polynomials for simplex elements, Natural co-ordinates, vector quantities, an axi-symmetric element

Unit III FEM APPLIED TO SOLID MECHANICS PROBLEMS 9

Introduction, co- ordinate transformations, assembly of element equations, incorporation of the boundary conditions, solution of the equations, elimination method, penalty method Classification of solid mechanic problems, Basics of elasticity, Formulation Of The Elements

Characteristic Matrices And Vectors For Elasticity Problems, Derivation of stiffness properties for 1-D, 2-D elements and 3-D elements, Mesh generation and modelling concerns.

Unit IV FEM FOR TRUSSES, BEAMS AND FRAMES 9

FEM for Trusses

Introduction, FEM equations, plane trusses, 3-dimensional trusses, Introduction to nonlinear static elasticity problems – Material non-linearity, Geometric non-linearity.

FEM for Beams and Frames

Introduction, element formulation, load vector, boundary conditions, Shear force and bending moment, Beams on elastic support, plane and 3-d frames.

Unit V FEM FOR HEAT TRANSFER PROBLEMS AND FURTHER APPLICATIONS 9

Field problems, weighted residual approach for FEM, 1D and 2Dheat transfer problem Further Applications Of The Finite Element Method Introduction to non-linear problems, Buckling problems, Dynamic problems – Modal analysis.

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

TEXT BOOKS:

1. Chandrapatala, Belgundu, "Introduction to Finite Elements in Engineering", Pearson Education
2. J. N. Reddy, "An Introduction to Finite Element Method", 2/e, McGraw Hill International Editions, ISBN 0-07-

REFERENCE BOOKS:

1. G.R. Liu, "*The Finite Element Methods* ";Rakmo Press Pvt Ltd, New Delhi-20
2. R. D. Cook, D. S. Malku; "*Concepts & Applications of Finite Element Analysis*"; John Wiley & sons Publications 3/e 1989
3. Logan D.L., *A First course in the Finite Element Method*, Third Edition, Thomson Learning
4. A. J. Baker; "*Finite Element Method 1-2-3*"; McGraw Hill International Editions, ISBN 0-07-909975-0
5. O. C, Zienkiewicz; "*The Finite Element Method – Basic Concepts and Linear Applications*"; McGraw Hill International Editions; ISBN 0-07-084175-6

ME1217 MACHINE DESIGN-II 3 1 0 4

(Use of approved Design data book is permitted in the Examination)

OBJECTIVES

- Introduction to conventional and optimum design, aesthetic and ergonomic consideration in design
- To develop competency in designing various types of bearing, spur, helical and bevel gears
- To develop competency in designing a system involving the various component, as a design project in practical.

Unit I DESIGN OF BEARINGS,BELT AND CHAIN 9

Bearing and Lubrication-Journal bearing-Introduction to lubrication – types of lubrication and lubricants - viscosity - Hydrodynamic bearings-Sommerfield Number, L/D ratio, Clearance ratio- Minimum film thickness-bearing materials- Hydrostatic bearings. Rolling contact bearings - bearing types - Ball & roller bearings- Static and Dynamic load capacity- Equivalent dynamic load-Bearing life- Stribeck's equations, selection of bearings. Design of Drives – Flat Belt, V belt, chains and design of ropes.

Unit I DESIGN OF SPUR AND HELICAL GEARS 9

Gear tooth profiles, ,Design of spur gears, force analysis, gear tooth failures, number of teeth, face width, beam strength of gear tooth, effective load on gear tooth, gear design for maximum power transmission.Design of helical gears, Virtual number of teeth, tooth proportions, force analysis, beam strength of helical gears, effective load on gear tooth, wear strength of helical gears.

Unit II DESIGN OF WORM AND BEVEL GEARS 9

Design of worm gears, Worm gear geometry and nomenclature, Force and efficiency analysis, Bending and surface fatigue strength, Worm gear thermal considerations, Design approach for bevel gears- equivalent tooth

Unit IV DESIGN OF GEAR BOX 9

Gear Box: Standard Step ratio - Speed diagram - Kinematics layout - Design of multispeed Gear box, Actual speed calculation.

Unit V DESIGN OF CLUTCH, BRAKES AND RATCHET AND PAWL MECHANISM 9

Design of Ratchet and Pawl Mechanism – Design of clutches, classifications –Plate, Axial and Cone Clutches. Design of Brakes

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

DESIGN DATA HAND BOOKS

1. Prof. Narayana Iyengar B. R. & Dr Lingaiah K., *Machine Design Data Handbook,* Vol. I &II
2. P.S.G., Tech., *Machine Design Data Handbook*

TEXT BOOKS

1. _Shigley J.E. and Mischke C.R. – "*Mechanical Engineering Design*" McGraw Hill Publ.Co. Ltd.
2. Bhandari V.B. – "*Design of Machine Elements*" – Tata McGraw Hill Publ. Co. Ltd.

REFERENCES

1. Spotts, M. F., Shoup, T. E., & Hornberger, L. E. *Design of machine elements*: Pearson /Prentice Hall
2. NPTEL courses: *http://nptel.iitm.ac.in/courses.php* - web and video resources on *Dynamics of Mechanical System/ Design of Machine Elements /Machine Design.*

3. Siegel, Maleev & Hartman, *Mechanical Design of Machines*, International Book Company
4. Phelan R.M., *Fundamentals of Mechanical Design*, TMH, Ltd.
5. Doughtie V.L., & Vallance A.V., *Design of Machine Elements*, McGraw Hill Book Company
6. Juvinall R.C. & Marshek K.M., *Fundamentals of Machine Component Design*, John Wiley

ME1282 SIMULATION LAB II 0 0 2 1

OBJECTIVES

- Perform deflection and stress analyses of planar truss structures.
- Use modeling with FEA tools to input the structure, perform the analysis and visualize the results.

1. Determine the nodal deflections, reaction forces, and stress for the truss system
2. Static analysis of typical industrial components using FEA software.
3. Dynamic analysis of automotive components using FEA software.
4. Steady state thermal analysis of engine/compressor parts using FEA software.
5. Transient thermal analysis of engine/compressor parts using FEA software.
6. Thermo mechanical analysis of spindle assembly welding process.
7. Design optimization of automotive components using FEA software.
8. Estimation of fatigue life of automotive components using FEA software.
9. Analysis of conduction problems using FEA software
10. Non-Linear Analysis of a Cantilever Beam
11. Crash analysis of an automobile using FEA software
12. Thermal Analysis of electronic equipments

ME1283 MECHANICAL MEASUREMENTS LAB 0 0 2 1

OBJECTIVES:

- To provides the students an active learning environment for the measurement technologies used in Mechanical engineering field.
- To collect and analyze measurement data, evaluate measurement methodologies, and learn the capabilities and limitations of measurement technologies.

1. Use of Floating carriage diameter measuring machine for measurement of screw thread characteristic dimensions such as major diameter, minor diameter and effective diameter.
2. Study of various measuring instruments like micrometers and calipers
3. Torsion test using Strain Gages.
4. Study and testing using Tool Dynamometer
5. Study and Experiment on Tool Maker’s microscope
6. Experiment Measurement of Displacement (Strain Gauge / LVDT / Wheatstone Bridge)
7. Measurement of Torque
8. Measurement of Vibration / Shock

ME1284 **METROLOGY LAB** **0 0 2 1**

OBJECTIVES:

To provide a hands-on experience in handling precision metrology instruments, their calibration

1. Study and experiment using profile projector
2. Experiment to test roundness
3. Experiment on Autocollimator
4. Experiment on Acceptance sampling
5. Calibration of straight edge.
6. Calibration of Bourdon Pressure Gauge using dead weight pressure gauge tester.
7. Calibration of temperature measuring instrument.
8. Calibration of Vernier / Micrometer / Dial Gauge
9. Checking Dimensions of part using slip gauges
10. Measurements of Gear Tooth Dimensions
11. Measurement of Taper Angle using sine bar / tool makers microscope
12. Measurement of straightness and flatness
13. Measurement of thread parameters
14. Checking the limits of dimensional tolerances using comparators (Mechanical / Pneumatic / Electrical)

ELECTIVE LIST

SL. No.	Course Code	Course Title	L	T	P	C
1	ME12A1	Supply Chain Management	3	0	0	3
2	ME12A2	Soft Computing Techniques	3	0	0	3
3	ME12A3	Advanced Numerical Modeling and Simulation	3	0	0	3
4	ME12A4	Design and Analysis of Algorithms	3	0	0	3
5	ME12A5	Artificial Intelligence and Robotics	3	0	0	3
6	CS1204	Database Management Systems	3	1	0	4
7	FS1206	Hazard and Risk Analysis	3	1	0	4
8	FS1207	Disaster Management	3	0	0	3
9	FS1212	Nuclear Engineering and Safety	3	0	0	3
10	CV1220	Construction Management	4	0	0	4
11	EC1202	Electron Devices	3	1	0	4
12	EC12B6	Medical Electronics	3	0	0	3
13	EI12A4	VLSI Design	3	0	0	3

ME12A1 SUPPLY CHAIN MANAGEMENT 3 0 0 3

OBJECTIVES

To obtain the recent trends in supply chain management

UNIT – I INTRODUCTION & SUPPLY CHAIN NETWORK DESIGN 9

INTRODUCTION: Definition, house of supply chain – customer satisfaction, integration, coordination - decision phases in a supply chain, objectives of SCM, examples of supply chains, supply chain drivers, supply chain performance measures.

SUPPLY CHAIN NETWORK DESIGN: Data collection – data aggregation, transportation modes and rates, mileage estimation, warehouse costs, warehouse capacity, potential warehouse locations, service level requirements and future demand. Network design in the supply chain – factors influencing the network design, framework for network design decisions, models for facility location and capacity allocation – capacitated plant location model

UNIT – II INVENTORY MANAGEMENT 9

Single warehouse inventory model - cycle inventory – economies of scale to exploit fixed costs, quantity discounts, short term discounting, multi-echelon inventory, example problems. managing uncertainty – safety inventory in the supply chain –safety level estimation, impact of supply uncertainty, impact of aggregation, impact of replenishment policies, managing safety inventory in multi echelon supply chain, managing safety inventory in practice – product availability – optimal level, affecting factors, supply chain contracts – risk pooling – examples. value of information – Bullwhip effect, information and supply chain technology.

UNIT III - DISTRIBUTION STRATEGIES DISTRIBUTION NETWORK DESIGN AND STRATEGIES: 9

Role of distribution in supply chain – distribution network design – factors influencing distribution network design. push strategy – pull strategy – Kanban replenishment systems, types, implementation, and push–pull strategy – demand driven strategy – impact of internet on supply chain strategy. distribution networks in practice – direct shipment, cross docking, warehousing, transshipment

UNIT IV - STRATEGIC ALLIANCE, CUSTOMER VALUE AND GLOBAL SUPPLY CHAINS 9

STRATEGIC ALLIANCE: Framework for srategic alliance - 3PL and 4PL – retailer-supplier partnerships – distribution integration – procurement and outsourcing – benefits, make/buy decisions, E-Procurement, supplier relationship management – supplier scoring and assessment, supplier selection and contracts – E-Business and the supply chain. design for logistics – supplier integration into new product development – mass customization.

CUSTOMER VALUE AND GLOBAL SUPPLY CHAINS: Customer value – dimensions, strategic pricing, customer value measures, information technology and customer value – customer relationship management. global supply chains – introduction, driving factors, risks and advantages, issues, regional differences in logistics.

UNIT V - INFORMATION TECHNOLOGY FOR SCM, E-BUSINESS AND THE SUPPLY CHAIN 9

INFORMATION TECHNOLOGY FOR SCM: Goals – standardization – infrastructure – interface devices, communications, databases, system architecture – system components – integrating the supply chain information technology - DSS for supply chain management.

E-BUSINESS AND THE SUPPLY CHAIN: Value of information, bullwhip effect, information and supply chain technology, customer relationship management, supplier relationship management.

TOTAL: 45 PERIODS

TEXT BOOKS

1. Simchi – Levi Davi, Kaminsky Philip and Simchi-Levi Edith, "Designing and Managing the Supply Chain", TMH Publishing Company Ltd, New Delhi, 2003.
2. Chopra S and Meindl P, "Supply Chain Management: Strategy, Planning, and Operation", Second edition, Prentice Hall India Pvt. Ltd, New Delhi, 2005.

REFERENCES

1. Robert B Handfield, And Ernest L Nichols, "Introduction To Supply Chain Management", Prentice Hall, Inc, New Delhi, 1999.
2. Sahay B S, "Supply Chain Management", Macmillan Company, 2000
3. David Brunt, And David Taylor, "Manufacturing Operations And Supply Chain Management : The Lean Approach", Vikas Publishing House , New Delhi, 2001
4. Hartmud Stadler, And Christoph Kilger, "Supply Chain Management And Advanced Planning: Concepts, Models, Software", Springer-Verlag, 2000
5. David F Ross," Introduction To E-Supply Chain Management", CRC Press, 2003.

ME12A2 SOFT COMPUTING TECHNIQUES 3 0 0 3

UNIT I Introduction to soft computing 9

Introduction- Introduction to soft computing; introduction to biological and artificial Neural network; Introduction to fuzzy sets and fuzzy logic systems.

UNIT I Artificial neural networks 9

Artificial neural networks and applications- Different artificial neural network models; learning in artificial neural networks; neural network applications in control systems.

UNIT III Fuzzy systems and applications 9

Fuzzy systems and applications- Fuzzy sets; fuzzy reasoning; fuzzy inference systems;fuzzy control; fuzzy clustering; applications of fuzzy systems. Neuro-fuzzy systems- Neuro-fuzzy modeling; Neuro-fuzzy control.

UNIT IV Genetic Algorithms 9

Genetic Algorithms- Simple GA, crossover and mutation, genetic algorithms in search and optimization

UNIT V Applications of Soft Computing 9

Applications- Pattern Recognitions, Image Processing, Biological Sequence Alignment and Drug Design, Robotics and Sensors, Information Retrieval Systems, Share Market Analysis, Natural Language Processing .

TOTAL: 45 PERIODS

TEXT/REFERENCE BOOKS:

1. Konar, A Computational intellingence [i.e. intelligence]: principles, techniques, and applications: Springer.
2. Friedman, M., & Kandel, A. Introduction to pattern recognition: statistical, structural, neural, and fuzzy logic approaches: World Scientific.
3. Jang, J. S. R., Sun, C. T., & Mizutani, E. Neuro-fuzzy and soft computing: a computational approach to learning and machine intelligence: Prentice Hall.
4. Mitchell, M. An introduction to genetic algorithms: MIT Press.
5. Ross, T. J. Fuzzy Logic with Engineering Applications: John Wiley & Sons.

ME12A3 ADVANCED NUMERICAL MODELING AND SIMULATION

3 0 0 3

UNIT I FUNDAMENTAL PRINCIPLES OF NUMERICAL METHODS: 9

Scientific Modeling - Numerical data and Numerical operations -Numerical Algorithms - Numerical Programs -Numerical Software - Approximations in Mathematical Model building - Numerical integration - Differentiation -Variational finite element methods - Rayleigh's method-Ritz method.

UNIT II MATHEMATICAL MODELING: 9

Mathematical modeling - physical simulation - advantages and limitations - process control - Transport phenomena - concept of physical domain and computational domain - assumptions and limitations in numerical solutions – Finite element method and Finite difference method.

UNIT IIIDIFFERENTIAL EQUATIONS & APPLICATIONS: 9

Euler method, Runge - Kutta method, Multi step - differential equations -boundary values - Elliptic equations - one dimensional parabolic equation - hyperbolic equation - partial differential equations -separation of variables - wave equation - Laplace equation - nonlinear partial differential equations - approximation methods of nonlinear differential equations.

UNIT IV SIMULATION: 9

Basic concepts of simulation - data manipulation, data exchange of the structure, properties and processing of materials -Three dimensional models for capillary nanobridges and capillary forces - Molecular dynamics simulation.

UNIT V MONTE CARLO METHODS: 9

Basics of the Monte Carlo method - Algorithms for Monte Carlo simulation - Applications to systems of classical particles - modified Monte Carlo techniques - percolation system - variation Monte Carlo method - diffusion Monte Carlo method - Quantum Monte Carlo method.

TOTAL: 45 PERIODS

REFERENCES:

1. Jerry Banks, John.S.Carson, Barry.C.Nelson and David.M.Nicol, "Discrete Event System Simulation", Printice Hall, 2009.
2. Averill.M.Law, "Simulation Modeling and Analysis", McGraw Hill, 2007.

3. Erwin Kreyzig, “Advanced Engineering Mathematics”, John Wiley & Sons, 2007.
4. R.J. Schilling and S.L. Harris, “Applied Numerical Methods for Engineers using MATLAB and C”, Thomson publishers, 2004.
5. D. Frenkel and B. Smith, “Understanding molecular simulation from algorithm to applications”, Academic Press, 2002.
6. K. Ohno, K. Esfarjani and Y. Kawazoe, “Computational Materials Science from Ab initio to Monte Carlo Methods”, Springer-Verlag, 1999.

ME12A4 DESIGN AND ANALYSIS OF ALGORITHMS 3 0 0 3

UNIT I **9**

Introduction- Fundamental characteristics of an algorithm. Basic algorithm analysis – Asymptotic analysis of complexity bounds – best, average and worst-case behaviour, standard notations for expressing algorithmic complexity. Empirical measurements of performance, time and space trade-offs in algorithms. Using recurrence relations to analyze recursive algorithms – illustrations using recursive algorithms.

UNIT II **9**

Fundamental Algorithmic Strategies: Brute-Force, Greedy, Branch-and-Bound, Backtracking and Dynamic Programming methodologies as techniques for design of algorithms –Illustrations of these techniques for Problem-Solving. Heuristics – characteristics and their domains of applicability. Design of algorithms for String/ Texmatching problems, Huffman Code and Data compression problems, Subset-sum and Knapsack problems.

UNIT III **9**

Graph and Tree Algorithms: Depth- and Breadth- First traversals. Shortest path algorithms, Transitive closure, Minimum Spanning Tree, Topological sort, Network Flow problems.

UNIT IV **9**

Tractable and Intractable Problems: Computability.The Halting problem. Computability classes – P, NP, NP-complete and NP-hard. Cook‟s theorem. Standard NP-complete problems Reduction techniques.

UNIT V **9**

Advanced Topics: Approximation algorithms, Randomized algorithms, Class of problems beyond NP – PSPACE.

TOTAL: 45 PERIODS

TEXT BOOKS:

1. Algorithm Design – Jon Kleinberg and Eva Tardos
2. Introduction to Algorithms – T.H. Corman et. al.

REFERENCE BOOKS:

1. Fundamentals of Algorithms – E. Horowitz et al.
2. Combinatorial Optimization: Algorithms and Complexity – C.H. Papadimitriou et a

ME12A5 ARTIFICIAL INTELLIGENCE AND ROBOTICS 3 0 0 3

UNIT I Scope of AI 9

Scope of AI - Games, theorem proving, natural language processing, vision and speech processing, robotics, expert systems, AI techniques- search knowledge, abstraction.

UNIT II Problem solving in AI 9

Problem solving - State space search; Production systems, search space control: depth first, breadth-first search, heuristic search - Hill climbing, best-first search, branch and bound.
Problem Reduction, Constraint Satisfaction End, Means-End Analysis

UNIT III Knowledge Representation in AI 9

Knowledge Representation- Predicate Logic: Unification, modus pones, resolution, dependency directed backtracking. Rule based Systems: Forward reasoning: conflict resolution, backward reasoning: use of no backtrack. Structured Knowledge Representation: Semantic Nets: slots, exceptions and default frames, conceptual dependency, scripts.

UNIT IV Handling uncertainty and learning 9

Handling uncertainty and learning- Non-Monotonic Reasoning, Probabilistic reasoning, use of certainty factors, fuzzy logic. Concept of learning, learning automation, genetic algorithm, learning by inductions, neural nets.

UNIT V Robotics concept 9

Robotics : Robot Classification, Robot Specification, notation; Direct and Inverse Kinematics: Co-ordinates Frames, Rotations, Homogeneous Coordinates, Arm Equation of four Axis SCARA Robot, TCV, Inverse Kinematics of Four Axis SCARA Robot.

TOTAL: 45 PERIODS

TEXT BOOKS:

1. E. Rich and K. Knight,“Artificial intelligence”, TMH, 2nd ed., 1992.
2. N.J. Nilsson, “Principles of AI”, Narosa Publ. House, 2000.
3. Robin R Murphy, Introduction to AI Robotics PHI Publication, 2000

REFERENCE BOOKS:

1. D.W. Patterson, “Introduction to AI and Expert Systems”, PHI, 1992.
2. R.J. Schalkoff, “Artificial Intelligence - an Engineering Approach”, McGraw Hill Int. Ed., Singapore, 1992.
3. George Lugar, .Al-Structures and Strategies for and Strategies for Complex Problem solving., 4/e, 2002, Pearson Education

CS1204 DATA BASE MANAGEMENT SYSTEM 3 1 0 4

AIM

To provide a strong foundation in database technology and an introduction to the current trends in this field.

OBJECTIVES

- To learn the fundamentals of data models and to conceptualize and depict a database system using ER diagram.
- To make a study of SQL and relational database design.
- To understand the internal storage structures using different file and indexing techniques which will help in physical DB design.
- To know the fundamental concepts of transaction processing- concurrency control techniques and recovery procedure.
- To have an introductory knowledge about the emerging trends in the area of distributed DB- OODB- Data mining and Data Warehousing and XML

UNIT I INTRODUCTION AND CONCEPTUAL MODELING 9

Introduction to File and Database systems- Database system structure – Data Models – Introduction to Network and Hierarchical Models – ER model – Relational Model – Relational Algebra and Calculus.

UNIT II RELATIONAL MODEL 9

SQL – Data definition- Queries in SQL- Updates- Views – Integrity and Security – Relational Database design – Functional dependences and Normalization for Relational Databases (up to BCNF).

UNIT III DATA STORAGE AND QUERY PROCESSING 9

Record storage and Primary file organization- Secondary storage Devices- Operations on Files- Heap File- Sorted Files- Hashing Techniques – Index Structure for files –Different types of Indexes- B-Tree - B+Tree – Query Processing.

UNIT IV TRANSACTION MANAGEMENT 9

Transaction Processing – Introduction- Need for Concurrency control- Desirable properties of Transaction- Schedule and Recoverability- Serializability and Schedules – Concurrency Control – Types of Locks- Two Phases locking- Deadlock- Time stamp based concurrency control – Recovery Techniques – Concepts- Immediate Update- Deferred Update - Shadow Paging.

UNIT V CURRENT TRENDS 9

Object Oriented Databases – Need for Complex Data types- OO data Model- Nested relations- Complex Types- Inheritance Reference Types - Distributed databases- Homogenous and Heterogenous- Distributed data Storage – XML – Structure of XML- Data- XML Document- Schema- Querying and Transformation. – Data Mining and Data Warehousing.

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

TEXT BOOKS

1. Abraham Silberschatz, Henry F. Korth and S. Sudarshan- "Database System Concepts", Fourth Edition, McGraw-Hill, 2002.

REFERENCES

1. Ramez Elmasri and Shamkant B. Navathe, "Fundamental Database Systems", Third Edition, Pearson Education, 2003.
2. Raghu Ramakrishnan, "Database Management System", Tata McGraw-Hill Publishing Company, 2003.
3. Hector Garcia–Molina, Jeffrey D.Ullman and Jennifer Widom- "Database System Implementation"- Pearson Education- 2000.
4. Peter Rob and Corlos Coronel- "Database System, Design, Implementation and Management", Thompson Learning Course Technology- Fifth edition, 2003.

FS1206 HAZARD AND RISK ANALYSIS 3 1 0 4

UNIT I HAZARD AND RISK 9

Hazard and risk, Types of hazards – fire, explosion and toxic gas release, Structure of hazard identification and risk assessment.

Identification of hazards - Fire and explosion hazard rating of process plants - The Dow Fire and Explosion Hazard Index, The Mond Index, Plant layout and unit hazard rating, Preliminary hazard analysis, Hazard and Operability study (HAZOP), What If analysis.

UNIT II PLANT AVAILABILITY AND PROCESS RELIABILITY 9

Plant availability and process reliability : ways of improving plant availability, MTBF and MTTF, the reliability function, failure rate, bathtub curve, probability relationships, simple reliability estimation.

Estimation of frequency of occurrence of a hazard: The logic tree approach, set theory and Boolean algebra, application to probability, Boolean manipulation. Fault tree analysis – logic symbols, minimal cut set, logic gates, fault tree quantification. Event Tree Analysis – notation, event tree construction, advantages and disadvantages of ETA.

Failure mode and Effect Analysis (FMEA) – methodology, criticality analysis, corrective action and follow-up.

UNIT III CONSEQUENCE MODELLING 9

Consequence modelling :

Source models – discharge rate models, flash and evaporation, dispersion models.

Explosions and fires – vapour cloud explosions, flash fires, physical explosions, BLEVE and fire ball, confined explosions, pool fires, jet fires. Effect models –dose-response functions, probit functions, toxic gas effects, thermal effects, explosion effects.

UNIT IV RISK ASSESSMENTS 9

Quantification of risk : Quantitive Risk Analysis, Vulnerability analysis, accepted and

imposed risk, perception of risk, risk indices, individual risk and societal risk, acceptance criteria for risk, ALARP, Presentation of measures of risk – risk contour, F-N curve. Calculation of individual risk and societal risk.

UNIT V HUMAN RELIABILITY ANALYSIS 9

Human reliability analysis (HRA) : factors leading to human error, characteristics of HRA techniques, Technique for Human Error Rate Prediction (THERP), Accident Sequence Evaluation Program (ASEP), Techniques using expert judgment, Operator Action tree (OAT).

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

TEXT BOOKS

1. AIChE/CCPS, *Guidelines for Hazard Evaluation Proce*dures second edition. Centre for Chemical Process Safety, American Institute of Chemical Engineers, New York, 1992.
2. AIChE/CCPS, *Guidelines for Chemical Process Quantitative Risk Analysis* second edition. Centre for Chemical Process Safety, American Institute of Chemical Engineers, New York, 2000.

REFERENCE

1. Lees F.P. *Loss Prevention in the Process Industries* second edition. Butterworths, London, 1996.

FS1207 DISASTER MANAGEMENT 3 0 0 3

UNIT I Introduction Concepts and definitions 9

Introduction Concepts and definitions: disaster, hazard, vulnerability, risk, capacity, impact, prevention, mitigation). Disasters, Environment and Development *(5 lectures)*- Factors affecting vulnerability such as impact of developmental projects and environmental modifications (including of dams, land-use changes, urbanization etc.), sustainable and environmental-friendly recovery; reconstruction and development methods.

UNIT II Disasters classification 9

Disasters classification; natural disasters (floods, draught, cyclones, volcanoes, earthquakes, tsunami, landslides, coastal erosion, soil erosion, forest fires etc.); manmade disasters (industrial pollution, artificial flooding in urban areas, nuclear radiation, chemical spills etc); hazard and vulnerability profile of India, mountain and coastal areas, Ecological fragility.

UNIT III Disaster impacts 9

Disaster impacts (environmental, physical, social, ecological, economical, political, etc.); health, psycho-social issues; demographic aspects (gender, age, special needs); hazard locations; global and national disaster trends; climate-change and urban disasters.

UNIT IV Disaster Risk Reduction (DRR) 9

Disaster Risk Reduction (DRR Disaster management cycle – its phases; prevention, mitigation, preparedness, relief and recovery; structural and non-structural measures; risk analysis, vulnerability and capacity assessment; early warning systems, Post-disaster environmental response (water, sanitation, food safety, waste management, disease control); Roles and

responsibilities of government, community, local institutions, NGOs and other stakeholders; Policies and legislation for disaster risk reduction, DRR programmes in India and the activities of National Disaster Management Authority.

UNIT V Emergency Planning and Preparedness

Emergency Planning- on site and offsite emergency planning –**unit V from old syllabus**

TOTAL: 45 PERIODS

Text/Reference Books:

1. http://ndma.gov.in/ (Home page of National Disaster Management Authority).
2. http://www.ndmindia.nic.in/ (National Disaster management in India, Ministry of Home Affairs).
3. Pradeep Sahni, 2004, Disaster Risk Reduction in South Asia, Prentice Hall.
4. Singh B.K., 2008, Handbook of Disaster Management: techniques & Guidelines, Rajat Publication.
5. Ghosh G.K., 2006, Disaster Management ,APH Publishing Corporation.

FS1212 NUCLEAR ENGINEERING AND SAFETY 3 0 0 3

UNIT I NULEAR ENGINEERING 9

Nuclear Reactor-Types-Reactor physics, Fuel, Fuel element temperatures, Gas pressure inside sheath, Fuel behavior, Over power, dry out, Low coolant flow, Loss of coolant, Heat transport system, Fuel channels

UNIT II NUCLEAR REACTOR SAFETY OPERATION 9

Purpose, Scope, Relevant Legislation, Safety Analysis Objectives and requirements, Responsibility, Events to be Analyzed, Identifying Events, Scope of Events, Classification of Events, Acceptance Criteria , Normal Operation, Anticipated Operational Occurrences and Design Basis Accidents , Beyond Design Basis Accidents, Acceptance Criteria for AOOs and DBAs, Safety Analysis Methods and Assumptions, General, Analysis Method, Analysis Data, Analysis Assumptions, Conservatism in Analysis, Safety Analysis Documentation, Safety Analysis Review and Update, Review of Safety Analysis.

UNIT III REACTOR CONTAINMENT AND SAFETY FEATURES 9

Engineered Safety Features, Containment-Types, Passive Containment Cooling System, Containment Isolation System, Passive Core Cooling System, Main Control Room Emergency Habitability System, Fission Product Control

UNIT IV NRC REGULATIONS AND PROCEDURES 9

Statement of organization and general information, Rules of practice for domestic licensing proceedings and issuance of orders, Interpretations, Criteria and procedures for determining eligibility for access to restricted data or national security information or an employment

clearance, Criteria and procedures for determining eligibility for access to or control over special nuclear material

UNIT V REACTOR SAFETY ANALYSES 9

Reactor Safety Temperature Excursion/Temperature Runaway, Safe Design and Operating Guidelines, Stability Criteria, Catalyst Loading and Preparations, General Emergency Guidelines,Troubleshooting High Reactor Pressure Drop, Pressure Drop Buildup During Operating Cycle, Pressure Pulsing of the Reactor, Channeling, Flow Maldistribution, Temperature Maldistribution, Quench Efficiency, Low Initial Catalyst Activity, Loss of Catalyst Activity, Low Temperature Response .

TOTAL: 45 PERIODS

TEXT BOOK

1. J.J. Duderstadt & L.J. Hamilton, "Nuclear Reactor Analysis", John Wiley and Sons, 1976.

REFERENCE BOOKS

1. J.R. Lamarsh, "Introduction to Nuclear Reactor Theory", Addison-Wesley, 1966.
2. D.J. Bennet, "The Elements of Nuclear Power", Longman Group Limited, 1972.
3. John R. Lamarsh, "Introduction to Nuclear Engineering", Addison-Wesley Publishing Company, 1983, ISBN0-201-14200-7.
4. Hand book of nuclear engineering, Cacuci, Dan Gabriel (Ed)
5. Nuclear Engineering , Glasstone & Sesoske

CV1220 CONSTRUCTION MANAGEMENT 4 0 0 4

UNIT I CONSTRUCTION PLANNING 9

Basic concepts in the development of construction plans-choice of Technology and Construction method - Defining Work Tasks-Definition-Defining Precedence relationships Among activities-Estimating Activity Durations-Estimating Resource Requirements for work activities-coding systems

UNIT II SCHEDULING PROCEDURES AND TECHNIQUES 9

Relevance of construction schedules-The critical path method (CPM) -Calculations for critical path scheduling-Activity float and schedules-Presenting project schedules-Critical path scheduling for Activity -on-node and with leads, Lags and Windows-Calculations for scheduling with leads, lags and windows-Resource oriented scheduling-Scheduling with resource constraints and Precedences-Use of Advanced Scheduling Techniques-Scheduling with uncertain durations-Calculations for Monte Carlo Schedule simulations-crashing and time/cost tradeoffs-scheduling in poorly structured problems-Improving the Scheduling process

UNIT III COST CONTROL MONITORING AND ACCOUNTING 9

The cost control problem-The project Budget-Forecasting for Activity cost control Financial accounting systems and cost accounts-Control of project cash flows-Schedule control-Schedule and Budget updates-Relating cost and schedule information

UNIT IV QUALITY CONTROL AND SAFETY DURING CONSTRUCTION 9

Quality and safety Concerns in Construction-Organizing for Quality and Safety-Work and Material Specifications-Total Quality control-Quality control by statistical methods - Statistical Quality control with sampling by Attributes-Statistical Quality control by Sampling and Variables-Safety.

UNIT V ORGANIZATION AND USE OF PROJECT INFORMATION 9

Types of project information-Accuracy and Use of Information-Computerized organization and use of information-Organizing information in databases-relational model of Data bases-Other conceptual Models of Databases-Centralized databases Management systems-Databases and application programs-Information transfer and Flow.

TOTAL: 60 PERIODS

REFERENCES

1. Chitkara, K.K. " Construction Project Management Planning ", Scheduling and Control, Tata McGraw Hill Publishing Co., New Delhi, 1998.
2. Calin M. Popescu, Chotchai Charoenngam, " Project planning, Scheduling and Control in Construction: An Encyclopedia of Terms and Applications ", Wiley, New York, 1995.
3. Chris Hendrickson and Tung Au, " Project Management for Construction – Fundamentals Concepts for Owners ", Engineers, Architects and Builders, Prentice Hall, Pitsburgh, 2000.
4. Moder.J., C.Phillips and Davis, " Project Management with CPM ", PERT and Precedence Diagramming, Van Nostrand Reinhold Co., Third Edition, 1983.
5. Willis., E.M., " Scheduling Construction projects ", John Wiley and Sons 1986.
6. Halpin,D.W., " Financial and cost concepts for construction Management ", John Wiley and Sons, New York, 1985.

EC1202 ELECTRON DEVICES 3 1 0 4

AIM

To learn the fundamental operation of electron devices

OBJECTIVES

- To introduce basic construction and working principles of Electron devices
- To outline the basic of power and Display devices

UNIT I SEMICONDUCTOR DIODES 9

Review of intrinsic & extrinsic semiconductors –Theory of PN junction diode – Energy band structure – current equation – space charge and diffusion capacitances – effect of temperature and breakdown mechanism. Zener diode-Theory and applications,The Hall Effect.Application of diodes -Clippers and Clampers,

UNIT II BIPOLAR JUNCTION TRANSISTOR 9

Construction of transistor-Transistor biasing,Principle of operation of PNP and NPN transistors, Characteristics of transistor configurations(CE, CB and CC), comparison of their

characteristics,Relation between current gain of CE,CB and CC, Breakdown in transistors ,Application of transistor-Switch,regulators and amplifiers.

UNIT III FIELD EFFECT TRANSISTORS 9

The Junction Field Effect Transistor- JFET concepts, MOS transistor,Ideal I-V characteristics,C-V characteristics,Non ideal effects,DC transfer characteristics. Equivalent Circuit and Frequency Limitations. MOSFET – Enhancement and depletion types – structure and operation – comparison of BJT with MOSFET – thermal effect on MOSFET.

UNIT IV SPECIAL SEMICONDUCTOR DEVICES 9

Metal-Semiconductor Junction- Schottky barrier diode- Varactor diode – Tunnel diode- Gallium Arsenic device- LASER diode,LDR, and MESFETs(Principle of operation and applications only)

UNIT V POWER DEVICES AND DISPLAY DEVICES 9

UJT,SCR,DIAC,TRIAC,DMOS,VMOS,FINFET,DUALGATE MOSFET, LED, LCD, Photo transistor(construction, characteristics and applications)Opto Coupler, Solar cell, CCD,. Introduction to simulation tools-pspice.

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

TEXT BOOKS

1. Donald A Neaman,“Semiconductor Physics and Devices”, Third Edition, Tata McGrawHill Inc. 2007.
2. Jacob Millman & Christos C. Halkias Electronic Devices & Circuits McGraw-Hill 2012.

REFERENCES

1. B.Jayant Baliga “Power semiconductor Devices”-THOMPSON Press-1996
2. H.Taub Donald Schilling “Digital Integrated Electronics” Mc Graw Hill-2006
3. Yang, “Fundamentals of Semiconductor devices”, McGraw Hill International Edition,
4. Streetman,”Solid State Electronic Devices “-Fifth Edition-Prentice Hall Of India-2004.
5. Neil H.E Weste and K.Eshragain,”Principles of CMOS VLSI Design”second edition,Addison Wesley ,New Jersey-2000.

EC12B6 MEDICAL ELECTRONICS 3 0 0 3

AIM

To make students to understand the applications of electronics in diagnostic and therapeutic area.

OBJECTIVES

- To gain knowledge about the various physiological parameters both electrical and non electrical and the methods of recording and also the method of transmitting these parameters.
- To study about the various assist devices used in the hospitals.

- To gain knowledge about equipment used for physical medicine and the various recently developed diagnostic and therapeutic techniques

UNIT I ELECTRO-PHYSIOLOGY AND BIO-POTENTIAL RECORDING 9

The origin of Bio-potentials; biopotential electrodes, biological amplifiers, ECG, EEG, EMG, PCG, EOG, VAG lead systems and recording methods, typical waveforms and signal characteristics.

UNIT II BIO-CHEMICAL AND NON ELECTRICAL PARAMETER MEASUREMENT 9

PH, PO2, PCO2, PHCO3, Electrophoresis, colorimeter, photometer, Auto analyzer, Blood flow meter, cardiac output, respiratory measurement, Blood pressure, temperature, pulse, Blood cell counters.

UNIT III ASSIST DEVICES AND BIO-TELEMETRY 9

Cardiac pacemakers, DC Defibrillator, Telemetry principles, frequency selection, Bio-telemetry, radio-pill and tele-stimulation.

UNIT IV RADIOLOGICAL EQUIPMENTS 9

Ionosing radiation, Diagnostic x-ray equipments, use of Radio Isotope in diagnosis, Radiation Therapy.

UNIT V RECENT TRENDS IN MEDICAL INSTRUMENTATION 9

Thermograph, endoscopy unit, Laser in medicine, Diathermy units, Scanner-PET, MRI, CT, Electrical safety in medical equipment.

TOTAL: 45 PERIODS

TEXTBOOK

1. Leislie Cromwell, “Biomedical instrumentation and measurement”, Prentice Hall of India, New Delhi, 2002.

REFERENCES

1. Khandpur, R.S., “Handbook of Biomedical Instrumentation”, TATA McGraw-Hill, New Delhi, 1997.
2. Joseph J.Carr and John M.Brown, “Introduction to Biomedical equipment Technology”, John Wiley and Sons, New York, 1997.

EI12A4 VLSI DESIGN 3 0 0 3

1. MOS TECHNOLOGY AND CIRCUITS 9

MOS Technology and VLSI, Process parameters and considerations for BJT, MOS and CMOS, Electrical properties of MOS circuits and Device modeling.

2. MOS CIRCUIT DESIGN PROCESS 9

MOS Layers, Stick diagram, Layout diagram, Propagation delays, Examples of combinational

logic design, Scaling of MOS circuits.

3. ANALOG VLSI AND HIGH SPEED VLSI 9

Introduction to Analog VLSI, Realisation of Neural Networks and Switched capacitor filters, Sub-micron technology and GaAs VLSI technology

4. DESIGN OF COMBINATIONAL ELEMENTS 9

Programmable Logic devices (PLA, CPLD), Introduction to FPGA. Tally circuits – (NAND-NAND, NOR-NOR and AOI logic) – EXOR structure – Multiplexer structures – Barrel shifter.

5. HARDWARE DESCRIPTION LANGUAGES 9

VHDL background and basic concepts, Structural specifications of hardware design organisation and parametrisation. (Examples: adders, counters, flip flops, Multiplexers / Demltiplexers), Overview of digital design with Verilog HDL.

TOTAL: 45 PERIODS

REFERENCES:

1. Douglas A. Pucknell and Kamran Eshraghian, Basic VLSI Design Systems and Circuits, 3rd edition, Prentice Hall of India Pvt Ltd.2003.
2. A. Albert Raj, T. Latha. VLSI Design. PHI Learning Pvt. Ltd., 2008.
3. N.H.Weste, 'Principles of CMOS VLSI Design', Pearson Eduction, India, 2002.
4. Wayne Wolf, Modern VLSI Design, 2nd Edition, Prentice Hall,1998.
5. Randall .L.Geiger and P.E. Allen, VLSI Design Techniques for Analog and Digital Circuits, McGraw Hill International Company, 1990.
6. Fabricious. E , Introduction to VLSI Design, McGraw Hill, 1990.
7. Navabi .Z., VHDL Analysis and Modeling of Digital Systems, McGraw Hill, 1993.
8. Mohmmed Ismail and Terri Fiez, Analog VLSI Signal and Information Processing, McGraw Hill, 1994.
9. Douglas Perry, 'VHDL Programming by example', Tata McGraw Hill, 3rd Edition, 2003.
10. JayaramBhasker, 'A VHDL Primer' 3rd edition, Prentice Hall PTR, 1999.