KUMARAGURU COLLEGE OF TECHNOLOGY, COIMBATORE-6
(An Autonomous Institution Affiliated to Anna University, Coimbatore)

CURRICULUM 2009

B.E - MECHATRONICS ENGINEERING
SEMESTER - I

Code No.	Course Title	L	T	P	C
THEORY					
ENG101	Technical English	2	1	0	3
MAT101	Engineering Mathematics – I	3	1	0	4
PHY101	Engineering Physics	3	0	0	3
CHY101	Engineering Chemistry	3	0	0	3
MEC101	Engineering Graphics	2	0	3	3
CSE101	Programming with 'C'	3	1	0	4
GHE101	Personal Values -I	1	0	0	1
PRACTICAL					
PHY401	Physics Laboratory	0	0	3	1
MEC401	Engineering Practices Laboratory	0	0	3	1
CSE401	Programming Laboratory	0	0	3	1

TOTAL PERIODS – 32   **TOTAL CREDIT – 24**

SEMESTER - II

Code No.	Course Title	L	T	P	C
THEORY					
ENG102	English For Pragmatic Usage	1	0	2	2
MAT102	Engineering Mathematics – II	3	1	0	4
PHY103	Materials Science	3	0	0	3
CHY103	Applied Chemistry	3	0	0	3
MEC102	Engineering Mechanics	3	1	0	4
ECE280	Electronic Devices and Circuits	3	0	0	3
PRACTICAL					
CHY401	Chemistry Laboratory	0	0	3	1
CSE451	Advanced Programming Laboratory	0	0	3	1
ECE480	Electronics Laboratory	0	0	3	1
GHE102	Personal Values -II	0	0	2	1

TOTAL PERIODS – 31   **TOTAL CREDIT – 23**

ENG101 TECHNICAL ENGLISH
(Common to all branches of Engineering and Technology)

L	T	P	C
2	1	0	3

OBJECTIVES
- To assist learners enhance their technical jargon and to impart knowledge about the application of technical English.
- To familiarize learners with different rhetorical functions of technical syntax
- To inculcate written proficiency in commercial and business context
- To improve the competency of professional writing with special reference to career related situations
- To provide pragmatic exposure to technical correspondence.

UNIT – I   FOUNDATIONS OF TECHNICAL COMMUNICATION   5
Technical Jargon – Formation of engineering & technical vocabulary – Affixing – Derivational jargon – Inflectional Morphemes – Nominal Compounds & technical vocabulary – Acronyms and abbreviations, Concord – Agreement and Government of scientific / technical syntax – Tense – Impersonal passive structure used in engineering & technical texts, Modal verbs, Infinitives and Gerunds

UNIT - II   TECHNICAL SYNTAX   5
Kinds of Technical Syntax – Causal expressions – Purpose and functional expressions, Conditional syntax – Four types, Reported speech – Imperative structure – Instructions in industrial situation, Discourse markers – Equipment / Process description, Analytical writing – Writing a paragraph – Scientific text – Juxtaposed technical facts

UNIT – III   CORRESPONDENCE IN CORPORATE SECTOR   9
Creating an advertisement, Transcoding – Graphics into text – Text into Charts / Tables – Bar charts – Pie Charts – Flow charts, Editing – Contextual occurrence of common errors – Syntactic & Semantic Errors – Preventive Parameters – General application of articles and preposition – Punctuation – Spelling – Tags – Interrogative structures – Proof reading

UNIT – IV   TECHNICAL WRITING   5
Writing abstracts, Note making, Summarizing – Diction – Objective tone, Report writing – Techniques of writing a report – Kinds of Reports – Industrial Report – Project Proposals – Report on the status of a project – Report on the challenges of a project.

UNIT - V   GENERAL CORRESPONDENCE   6
Modules of a letter – Official & Demi-Official Letters – Applying for Educational / Car / Home Loans – Internet connection – Joining Report – Leave letter – email correspondence – Industrial visit – Inplant Training – Letter to the Editor, Business Letters – Calling for a quotation – Placing Order – Letter of Complaint – Letter seeking Clarification – Acknowledging prompt / quality service

L: 30   T: 15   Total : 45Hrs

TEXT BOOK

1. Dhanavel.S.P, English and Communication Skills for students of Science & Engineering, Chennai: Orient Blackswan, 2009 (ISBN 13: 9788125037392)

REFERENCES

1. Rizvi Ashraf .M., Effective Technical Communication, Tata McGraw Hill Publishing Co., Ltd., New Delhi, 2008.
2. Seely John., The Oxford Guide to Writing and speaking, Oxford University Press, Chennai, 2006.
3. Devadoss K., Professional Communication for Engineers, Inder Publications, Coimbatore, 2009.
4. Devadoss K, & Malathy P., Enhance your Employability, Inder Publications, Coimbatore, 2009.

MAT101 ENGINEERING MATHEMATICS I
(Common to All Branches of Engineering & Technology)

L	T	P	C
3	1	0	4

OBJECTIVES:

On completion of the course the students are expected

- To know eigen values and eigen vectors and diagonalization of a matrix.
- To understand the concepts of three dimensional geometry including plane, straight line and sphere.
- To know about the geometrical aspects of curvature, evolute and envelope.
- To understand the concepts of partial differentiation, maxima and minima.
- To solve ordinary differential equations of certain types.

UNIT – I   MATRICES **9**

Eigen values and eigenvectors of a real matrix – Properties of eigen values and eigenvectors- Cayley - Hamilton theorem (excluding proof) – Orthogonal matrices – Orthogonal transformation of a symmetric matrix to diagonal form – Reduction of quadratic form to canonical form by orthogonal transformation.

UNIT – II   THREE DIMENSIONAL ANALYTICAL GEOMETRY **9**

Equations of a plane – Equations of a straight line – Coplanar lines – Shortest distance between skew lines – Sphere – Plane section of a sphere – Orthogonal spheres.

UNIT – III   GEOMETRICAL APPLICATIONS OF DIFFERENTIAL CALCULUS **9**

Curvature – Cartesian co-ordinates – Centre and radius of curvature – Circle of curvature –Evolutes – Envelopes.

UNIT – IV   FUNCTIONS OF SEVERAL VARIABLES **9**

Total derivative – Taylor's series expansion – Maxima and minima for functions of two variables – Constrained maxima and minima – Lagrange's multiplier method – Jacobians.

UNIT – V ORDINARY DIFFERENTIAL EQUATIONS **9**

Linear equations of second order with constant coefficients – Euler's and Legendre's linear equations - Method of variation of parameters – Simultaneous first order linear equations with constant coefficients.

L: 45 ,T: 15 Total : 60Hrs

TEXT BOOK

1. Veerarajan T., Engineering Mathematics (for First Year) , Revised Edition, Tata McGraw Hill Pub. Co. Ltd., New Delhi, 2007.

REFERENCES

1. Kreyzig E., "Advanced Engineering Mathematics", John Wiley & Sons (Asia) Pvt, Ltd., Singapore, 8th Edition, 2001.
2. Grewal B.S., "Higher Engineering Mathematics", Khanna Publishers, Delhi, 36th Edition, 2001.

3. Venkataraman M.K., "Engineering Mathematics", Volume - II, The National Pub. Co., Chennai, 2003.
4. Kandasamy P., Thilagavathy K., and Gunavathy K., "Engineering Mathematics", S. Chand & Co., New Delhi, (Re print) 2008.
5. Arunachalam T., "Engineering Mathematics I", Sri Vignesh Publications, Coimbatore. (Revised) 2009.

PHY101 ENGINEERING PHYSICS
(Common to all branches of Engineering and Technology)

L	T	P	C
3	0	0	3

OBJECTIVES
At the end of the course the students would be exposed to
- To impart fundamental knowledge in various engineering subjects and applications
- Design of acoustically good buildings
- Structure identification of engineering materials
- Non destructive techniques
- Interferometric techniques in metrology, communication and civil engineering
- Application of quantum physics to optical & electrical phenomena
- Application of lasers in engineering and technology.

UNIT – I   ACOUSTICS AND ULTRASONICS   9
Classification of sound characteristics of musical sound, Loudness Weber Fechner law Decibel, Phon,-Reverberation Reverberation time, Derivation of Sabine s formula for reverberation time (Rate of Growth and Rate of Decay) Absorption coefficient and its determination - Factors affecting acoustics of buildings (Optimum reverberation time, Loudness, Focussing, Echo, Echelon effect, Resonance and Noise) and their remedies. Ultrasonic production Magnetostriction & piezoelectric methods - Detection Thermal and Piezoelectric methods, properties, Determination of velocity of ultrasonic waves in liquid using acoustic grating - Applications SONAR, Measurement of velocity of blood flow & movement of heart.

UNIT – II   CRYSTALLOGRAPHY & NON-DESTRUCTIVE TESTING 9
Space lattice, unit cell, Bravais space lattices, Lattice planes, Miller indices Calculation of inter planar Distance, number of atoms per unit cell, Atomic radius, coordination number & packing factor for simple cubic, BCC, FCC and HCP structures NDT methods: Liquid penetrant method, Ultrasonic flaw detector, X-ray radiography & fluoroscopy. Thermography

UNIT – III   WAVE OPTICS   9
Air wedge (theory and experiment) - testing of flat surfaces - Michelson interferometer, Types of fringes, Determination of wavelength of monochromatic source and thickness of a thin transparent sheet - Theory of plane, circularly and elliptically polarized light - quarter and half wave plates, production and analysis of plane, circularly and elliptically polarized light - Photo elasticity Birefringence - effect of a stressed model in a plane polariscope Isoclinic and isochromatic fringes Photo elastic bench

UNIT – IV QUANTUM PHYSICS   9
Planck s quantum theory of black body radiation (Derivations), Photo electric effect - Compton effect (derivation) and Experimental verification of Compton effect Schr dinger wave equation Time independent and time dependent equations (derivation), Physical significance of wave function, particle in a box (in one dimension) electrons in a metal.

UNIT – V LASER & FIBRE OPTICS   **9**

Einstein s coefficients (A & B), Nd-YAG laser, He-Ne laser, CO_2 laser, semiconductor laser - Homo-junction and Hetero-junction (only qualitative description) - Applications Material processing, CD-ROM & Holography (Qualitative) Optical fibre- Principle and Propagation of light in optical fibres-Numerical aperture and acceptance angle-types of optical fibres Single and Multimode, step index & graded index fibres Applications - Fibre optics communication system, Fibre optic sensors(Displacement and temperature sensors), Medical endoscope.

L: 45, T : 15 Total :60Hrs

TEXT BOOK

1. Avadhanalu.M.N., & Kshirsagar.P.G,, A textbook of Engineering Physics, S.Chand & Company Ltd, New Delhi, 2005.
2. Gaur R.K., & Gupta S.L., Engineering Physics, 8th edition, Dhanpat Rai Publications (P) Ltd., New Delhi, 2003.

REFERENCES

1. Rajendran V., & Marikani A., Applied Physics for Engineers, 3rd Edition, Tata McGraw Hill Publishing Company Limited, New Delhi, 2003.
2. Gopal.S., Engineering Physics, Inder Publications, Coimbatore, 2006.
3. Arumugam M., Engineering Physics, 5th Edition, Anuradha Agencies, Kumbakonam, 2003.
4. Palanisamy P.K., Physics for Engineers, Vol.1 & Vol.2, 2nd Edition, Scitech publications, Chennai, 2003.

CHY101 ENGINEERING CHEMISTRY
(Common to all branches of Engineering and Technology)

L	T	P	C
3	0	0	3

OBJECTIVES

- To develop a sound knowledge of theoretical and modern technological aspects of applied chemistry.
- To correlate the theoretical principles with application oriented studies.

UNIT – I   ELECTROCHEMISTRY   9

Single electrode potential - standard electrodes (Hydrogen & calomel electrodes) - electrochemical series - Nernst equation and problems. Types of electrodes (Metal-metal ion electrode, metal -metal insoluble salt electrode, glass electrode) - determination of pH using glass electrode - application of emf measurements and problems - reversible and irreversible cell - Galvanic cell - Concentration cells -   Kohlrausch law of independent migration of ions and its application - Conductometric titration - Polarization - Overvoltage - Decomposition potential.

UNIT – II   ENERGY STORING DEVICES   9

Introduction - primary and secondary batteries (dry cells - alkaline batteries, lead acid storage cell, nickel - cadmium cell, lithium battery) - fuel cell (hydrogen and oxygen fuel cell) - photogalvanic cell.
Nuclear Energy Sources
 Nuclear fission process - characteristics of nuclear fission - chain reactions - nuclear energy - nuclear reactors (light water nuclear power plant).

UNIT – III   THERMODYNAMICS   9

 Thermodynamics - thermodynamic processes (isothermal, isobaric, isochoric and adiabatic processes) - internal energy mathematical form of first law – enthalpy - limitation of first law - statement of second law of thermodynamics (Clausius and Kelvin) - definition of entropy - entropy change for a reversible process - entropy change for an isothermal expansion of an ideal gas and problems - definition of free energy and work function - Gibbs Helmholtz equation - applications and problems – Van't Hoff isotherm and isochore - applications and problems.

UNIT – IV   SURFACE CHEMISTRY   9

Adsorption: Types of adsorption - adsorption of gases on solids - adsorption isotherm (Freundlich, Langmuir isotherms) - adsorption of solutes from solutions - applications role of adsorption in catalytic reactions - ion exchange adsorption - basic principles in adsorption chromatography.

UNIT – V   SPECTROSCOPY   9

Beer Lambert's Law - colorimetric analysis - principles, instrumentation (block diagram only) - estimation of concentration of a solution by colorimetry - flame photometry - theory, instrumentation (block diagram only) and application – UV – Visible & IR spectroscopy - principles, instrumentation (block diagram only) and simple applications.

Total : 45Hrs

TEXT BOOK

1. Jain P.C. and Monika Jain, Engineering Chemistry, Dhanpat Rai Pub. Co. (P) Ltd., New Delhi, 14th edition, 2002.

2. Kuriacose J.C. and Rajaram J., Chemistry in Engineering and Technology, Vol. 1& 2 , Tata McGraw-Hill Publishing Co. Ltd.., New Delhi, 2005.

REFERENCES

1. Bahl B.S., Tuli G.D., and Arun Bahl, Essentials of Physical Chemistry, S.Chand & Co. Ltd., New Delhi, 2004.
2. Somorjai G A, Introduction to Surface Chemistry and Catalysis, John Wiley and Sons. Inc. New York, 1994.
3. Shaw D.J., Introduction to Colloid and Surface Chemistry, Butterworth-heinemann publishers, 1992.
4. Syed Shabudeen P.S., and Shoba U.S., Applied Engineering Chemistry, Inder publications, Coimbatore 2009.

MEC101 ENGINEERING GRAPHICS
(Common to all branches of Engineering and Technology)
OBJECTIVES

L	T	P	C
2	0	3	3

- To understand the principle of orthographic projection of points, lines, surfaces and solids.
- To understand the principle of section and development of solids.
- To understand the principle of Isometric and Perspective projections.
- To study the principle of free-hand sketching techniques.

UNIT- I   PLANE CURVES, PROJECTION OF POINTS AND LINES   15

Importance of graphics in design process, visualization, communication, documentation and drafting tools, Construction of curves - ellipse, parabola, and hyperbola by eccentricity method only.   Orthographic projection of points.
Projections of straight lines located in first quadrant - determination of true length and true inclinations.

UNIT -II   PROJECTIONS OF SURFACES AND SOLIDS   15

Projections of plane surfaces - polygonal lamina and circular lamina, located in first quadrant and inclined to one reference plane., Projection of simple solids - prism, pyramid, cylinder and cone. Drawing views when the axis of the solid is inclined to one reference plane.

UNIT- III   SECTION OF SOLIDS AND DEVELOPMENT OF SURFACES   15

Sectioning of simple solids - prisms, pyramids, cylinder and cone.   Obtaining sectional views and true shape when the axis of the solid is vertical and cutting plane inclined to one reference plane.
Development of lateral surfaces of truncated prisms, pyramids, cylinders and cones.

UNIT -IV   PICTORIAL PROJECTIONS   15

Isometric projection, Isometric scale, Isometric views of simple solids, truncated prisms, pyramids, cylinders and cones.
Perspective projection of prisms and pyramids when its base resting on the ground by vanishing point method.

UNIT -V   FREE-HAND SKETCHING   15

Free hand sketching techniques sketching of orthographic views from given pictorial views of objects, including free-hand dimensioning.
Sketching pictorial views from given orthographic views.

L: 30, P: 45 Total : 75Hrs

TEXT BOOK

1. Basant Agrawal and CM Agrawal, Engineering Drawing, McGraw-Hill, New Delhi, First Edition, 2008
2. Venugopal K., and Prabhu Raja V., Engineering Graphics, New Age International (P)   Limited, New Delhi , 2008.

REFERENCES

1. Nataraajan K.V, Engineering Drawing and Graphics, Dhanalakshmi Publisher, Chennai, 2005.
2. Warren J. Luzadder and Jon. M.Duff, Fundamentals of Engineering Drawing, Prentice Hall of India Pvt. Ltd., New Delhi, Eleventh Edition, 2005.
3. Gopalakirishna K.R., Engineering Drawing (Vol. I & II), Subhas Publications, 2001.

CSE101   PROGRAMMING WITH 'C'

L	T	P	C
3	1	0	4

OBJECTIVES
- To learn the basic concepts of computing.
- To know the methodology of problem solving.
- To develop skills in programming using C language.

UNIT-I   BASICS OF COMPUTERS AND PROGRAMMING LANGUAGES   9
Components of a computer system – Hardware – Software - Problem solving techniques-Program control structures – Programming paradigms – Programming languages-Generations of programming languages -Language translators - Features of programming languages.

UNIT II   C FUNDAMENTALS   9
Introduction to C –Overview of compilers and interpreters – Structure of a C program – Programming rules – Executing the program -   **C declarations –** Introduction – C character set – Delimiters – C key words – Identifiers – Constants – Variables – Rules for defining variables – Data types – Declaring variables – Initializing variables – Type conversion – Constant and volatile variables - **Operators and Expressions –** Introduction – Priority of operators and their clubbing- Comma and conditional operator- Arithmetic operators- Relational, Logical and Bitwise operators- **Input and Output in C-** Introduction – Formatted and Unformatted functions- Commonly used library functions- **Decision statements –** Introduction – *if, if-else,* nested *if-else, break, continue*, *goto, switch ( ),* nested *switch ( ), switch ( ) case* and nested *if* statements - **Loop control statements-** Introduction- *for* loop, nested *for* loop,*while* loop, *do-while* loop, *do- while* statement with *while* loop

UNIT III   FUNCTIONS AND ARRAYS   9
Functions – Introduction- Declaration of function and function prototypes-The return statement- Types of functions-Call by value and Call by reference-Function returning more values-Function as an argument- Function with operators - Function and decision statements-Function and loop statements-Functions with arrays and pointers- Recursion-Pointer to function- **Storage class –**Introduction- Automatic, External, Static and Register variables- **Arrays-** Introduction- Array initialization – Definition of array-Characteristic of array-One dimensional array - Predefined Streams - Two dimensional array - Three or multi-dimensional arrays – *sscanf ( )* and *sprintf ( )* functions – Operation with arrays.

UNIT IV   STRINGS AND POINTERS   9
Working with strings and Standard functions - Introduction   **-** Declaration and initialization of string – Display of strings with different formats – String standard functions – **Pointers –** Introduction – Features of pointers – Pointer declaration – Arithmetic operations with pointers – Pointers and arrays – Pointers and two-dimensional arrays – Array of pointers – Pointers to pointer – Pointers and strings – Void pointers **–Dynamic memory allocation –** Dynamic memory allocation – Memory models – Memory allocation functions.

UNIT V   STRUCTURE, UNION AND FILES   9
Structure and Union – Introduction – Features of structures – Declaration and initialization of structures – Structure within structure – Array of structures – Pointer to structure – Structure and functions – Typedef – Bit fields – Enumerated data type – Union – Calling BIOS and DOS services – Union of structures - **Files –** Introduction - Streams and file types – Steps for file operations – File I/O – Structures read and write – Other files functions – Searching errors in reading / writing files – Low level disk I/O – Command line arguments – Application of command line argruments – Environment variables – I/O redirection.

L: 45, T: 15 Total : 60Hrs

TEXT BOOK

1. ITL Education Solutions Limited, A N Kamthane, "Computer Programming ", Pearson   Education (India), 2009.

REFERENCES

1. Byron S Gottfried, "Programming with C", Second Edition, Schaum's OuTlines, Tata MCGraw –Hill Publishing Company Limited, 2006.
2. E.Balagurusamy,"Programming in ANSI C", Fourth Edition, TMH, 2007.

GHE101   PERSONAL VALUES - I
(Common to all branches of Engineering and Technology)

L	T	P	C
1	0	0	1

UNIT – I 5

Introduction – Importance's of Human Excellence – Objectives – Personal Values – definitions- purpose and Philosophy of Human life – Body, Mind and Soul – Physical exercises introductions.

UNIT – II 5

Introduction - Need and Practice – Analysis of thought – origins of thought and its effect – what you think, you become – Refinement of desire – Physical exercises continuation – Meditations – I stage (Agna Initiation)

UNIT- III 5

Anger management - What is Anger – Its evil effect - Neutralizations of anger– Practice – Worry – why to Worry – Eradications of worries – Method – Physical exercises – continuation – Meditation – II stage (Santhi Initiation)

Total : 15Hrs

L	T	P	C
0	0	3	1

PHY401 PHYSICS LABORATORY
(Common to all branches of Engineering and Technology)

1. Torsional Pendulum determination of rigidity modulus of wire and moment of inertia of disc.
2. Non Uniform Bending - Young modulus determination
3. Viscosity- Determination of co-efficient of Viscosity of liquid by Poiseuilles flow
4. Lee s disc- Determination of thermal conductivity of a bad conductor
5. Air wedge- Determination of thickness of a thin wire
6. Determination of velocity of sound and compressibility of liquid - Ultrasonic interferometer.
7. Determination of specific resistance of given coil of wire – Carey Foster's Bridge.
8. Spectrometer - Determination of wavelength of Hg source using Grating
9. Determination of wavelength of Laser using Grating and Particle size determination and acceptance angle in an optical fibre.
10. Determination of Band gap of semiconductor material.

Total : 45Hrs

16

L	T	P	C
0	0	3	1

MEC401 ENGINEERING PRACTICES LABORATORY
(Common to all branches of Engineering and Technology)

A. CIVIL ENGINEERING

1. Carpentry

- Study of carpentry tools
- Preparation of T joint
- Preparation of dovetail joint

2. Plumbing
- Study of pipeline joints
- Preparation of plumbing line sketches for water supply.

B. MECHANICAL ENGINEERING

1. Fitting
- Study of fitting tools
- Preparation of L joint
- Preparation of square joint

2. Sheet Metal Working

- Study of sheet metal working tools
- Preparation of cone and tray

3. Welding

- Study of arc welding tools and equipment
- Preparation of butt joint

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Group - II (Electrical & Electronics Engineering)

C. ELECTRICAL ENGINEERING PRACTICE   **12**

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

D. ELECTRONIC ENGINEERING PRACTICE   **12**

List of Experiments

1. Assembling simple electronic component on a small PCB and Testing.
2. Soldering simple electronic circuits and checking continuity.
3. Measurements using digital multimeter.
   - DC and AC voltage measurement
   - DC and AC current measurements.
   - Resistance Measurement.
   - Continuity measurement.
4. Testing of Electronic components
   - Resistors
   - Inductors and capacitors
   - Diodes (resistance in forward bias and reverse bias)
   - Transistors

5. Study of CRO and Function generator
   - Study of Panel Controls
   - Measurement of Amplitude, Frequency, phase difference

.

                                               Total : 45Hrs

CSE401   PROGRAMMING LABORATORY
 (Common to all branches of Engineering and Technology)

L	T	P	C
0	0	3	1

LIST OF EXERCISES

1. Practice sessions on the usage of Office package**.**
2. To find the biggest of 3 numbers.
3. To find whether the given number is an Armstrong number.
4. To find the roots of a quadratic equation.
5. To sum the individual digits of an integer.
6. To evaluate the sine series and to generate Fibonacci series.
7. To perform matrix operations
   - Calculation of row sum and column sum
   - To find the maximum and minimum number
   - Addition and multiplication

8. To perform string operations.
9. To check whether a given number is prime or not using functions(use all function prototypes)
10. To compare two strings using pointers.
11. Mark sheet processing using files.

Total   : 45Hrs

L	T	P	C
1	0	2	2

ENG102 ENGLISH FOR PRAGMATIC USAGE
(Common to all B.E / B.Tech courses)

OBJECTIVES

To impart the reading comprehension through interpretative and analytic reading exercises, provide exposure to the learners on drafting letters and filling up several applications, improve the level of competency of public speaking with special reference to academic related situations besides, giving practical exposure to professional and formal speaking.

READING COMPREHENSION   10
1. Exercises to examine the reading comprehension capacity
2. reading for global understanding
3. Reading for specific information
4. Reading for Reviewing (Books, Articles)

TARGETTED WRITING   15
5. Writing Applications
Opening an SB account and filling bank challans for various purposes
Applying for a Passport
Filling applications for competitive exams
Applying for Medical Leave
6. Drafting Job Application Letters
Writing Resume
7. Writing Statement of Purpose for pursuing higher studies abroad
8. Preparing Notices and Circulars
9. Booking train tickets Online
10. Thematic writing

PUBLIC SPEAKING   10
11. Appropriate stress and tonal variation
12. Accent neutralization and pronunciation improvement
13. Welcoming a gathering
14. Proposing a Vote of Thanks
15. Compering
16. Presenting one's perception on the picture given
17. Giving Seminars

KINESTHETICS & FORMAL SPEAKING   10
18. Assessing body language during presentation
19. Involving in constructive conversation
20. Assigning formal situations to enhance the style of telephonic conversation
21. Discriminating assertive and aggressive conversation
22. Power point presentations

Total : 45Hrs

TEXT BOOKS

1. Rizvi Ashraf. M, Effective Technical Communication, Tata McGraw Hill Publishing Co., Ltd., New Delhi.

REFERENCES

1. Aruna Koneru , Professional Communication, Tata McGraw Hill Publishing Co., Ltd., New Delhi, 2008.
2. Devadoss, K & Malathy. P, Enhance your Employability, Inder Publications, Coimbatore, 2009

MAT102   ENGINEERING MATHEMATICS II
 (Common to CE, AE, ME, MCE, EEE, ECE & EIE branches)

L	T	P	C
3	1	0	4

OBJECTIVES
>   On completion of the course the students are expected
- To understand double and triple integrations and enable them to find area and volume using multiple integrals.
- To know the basics of vector calculus comprising gradient , divergence and curl and line, surface and volume integrals.
- To understand analytic function and conformal mappings.
- To know the basics of residues, complex integration and contour integration.
- To understand about Laplace transform and its properties and to solve certain linear differential equations using Laplace transform technique.

UNIT – I   MULTIPLE INTEGRALS   9
Double integration – Cartesian and polar coordinates – Change of order of integration – Area as a double integral – Triple integration in cartesian coordinates – Change of variables between cartesian and polar coordinates.

UNIT –II   VECTOR CALCULUS   9
Gradient, divergence and curl – Directional derivative – Irrotational and solenoidal vector
fields - Green's theorem in the plane, Gauss divergence theorem and Stoke's theorem (excluding proofs) – Simple applications involving cubes and rectangular parallelopipeds.

UNIT – III   ANALYTIC FUNCTION   9
Functions of a complex variable – Analytic function – Necessary conditions, Cauchy Riemann equations in Cartesian coordinates and sufficient conditions (excluding proofs) – Properties of analytic function – Construction of analytic function by Milne Thomson method – Conformal mapping $w = z + c, cz$, $1/z$ and bilinear transformation.

UNIT – IV   COMPLEX INTEGRATION   9
Cauchy's integral theorem and Cauchy's integral formula (excluding proofs) – Taylor's and Laurent's series expansions – Singularities – Classification – Residues – Cauchy's residue theorem (excluding proof) – Contour integration – Unit circle and semi-circular contours (excluding poles on real axis).

UNIT – V   LAPLACE TRANSFORM   9
Laplace Transform – Sufficient conditions – Transforms of elementary functions – Basic properties — Transforms of derivatives and integrals – Transform of periodic functions – Inverse transforms - Convolution theorem – Application to solution of linear ordinary differential equations of second order with constant coefficients.

L: 45, T: 15 Total : 60Hrs

TEXT BOOK

1. Veerarajan T., "Engineering Mathematics" (for First Year), Tata McGraw Hill Pub. Co. Ltd., New Delhi, Revised Edition, 2007.

REFERENCES

1. Kreyzig E., "Advanced Engineering Mathematics", John Wiley & Sons (Asia) Pvt, Ltd., Singapore, 8th Edition, 2001.
2. Grewal B.S., "Higher Engineering Mathematics", Khanna Publishers, Delhi, 36th Edition, 2001.
3. Kandasamy P., Thilagavathy K., and Gunavathy K., "Engineering Mathematics", S. Chand & Co., New Delhi, (Re print) 2008.
4. Arunachalam, T., "Engineering Mathematics II", Sri Vignesh Publications, Coimbatore. (Revised) 2009.

L	T	P	C
3	0	0	3

PHY103   MATERIALS SCIENCE
 (Common to Mechanical, Mechatronics and Aeronautical Engineering)

OBJECTIVES
At the end of the course students would be exposed to
- Types of defects in engineering materials and mechanisms of strengthening
- Properties of conducting, super conducting, magnetic and dielectric materials.
- Properties of Semi conducting, optical and new engineering materials

UNIT – I CONDUCTING MATERIALS   9
Classical free electron theory of metals-electrical conductivity – Thermal conductivity - expression – Wiedemann Franz law(derivation) – Lorentz number – drawbacks of classical theory – Fermi distribution function – density of energy states – effect of temperature on Fermi energy – Superconducting phenomena – properties of superconductors – Meissner effect, Isotope effect, Type I &Type II superconductors – High Tc superconductors - Applications – cryotron, magnetic levitation and squids.

UNIT – II SEMICONDUCTING   MATERIALS   9
Origin or band gap in solids (Qualitative treatment only) - Concept of effective mass of an electron and hole – carrier concentration in an intrinsic semi conductor (derivation) – Fermi level – variation of Fermi level with temperature - Electrical conductivity – band gap semiconductor – carrier concentration in n-type and p-type semi conductors (derivation) – Variation of Fermi level with temperature and impurity concentration – Hall effect – Determination of Hall coefficient – experimental set up – Applications.

UNIT – III MAGNETIC & DIELECTRIC MATERIALS   9
Properties of dia, para, ferro, anti ferro and ferri magnetic materials - Langevin's theory of paramagnetism – Determination of paramagnetic susceptibility of a solid Weiss theory of Ferromagnetism – Domain theory of ferromagnetism - hysteresis – soft and hard magnetic materials – Ferrites – Applications - magnetic recording and readout - Storage of magnetic data, Tapes, floppy and magnetic disc drives – magnetic memories – Core memory and Bubble memory - dielectric materials – Electronic ionic, orientation and space charge polarization - Frequency and temperature dependence of polarization – Die electric loss – Dielectric breakdown – different types of break down mechanism - Ferro electric materials - properties and applications.

UNIT – IV NANOTECHNOLOGY AND NEW ENGINEERING MATERIALS   9
Metallic glasses – preparation, properties and applications – shape memory alloys (SMA) – characteristics, properties of NiTi alloy applications advantages and disadvantages of SMA – Nano materials - synthesis - plasma arcing – Chemical vapour deposition – sol-gel - Electro deposition – ball milling – properties of nanoparicles and applications. – Carbon nano tubes – fabrication - arc method – pulsed laser deposition - Chemical vapour deposition - structure,   properties & applications.

UNIT – V CRYSTAL DEFECTS AND STRENGTHENING OF MATERIALS   9
Crystal imperfection - point defects-line defects - planar defects - bulk-Dislocations- Edge dislocation Screw dislocation Burger Vector Dislocation climb-slip, twinning – multiplication of dislocations. Strengthening mechanisms for the improvement of mechanical properties- cold working precipitation hardening, solute hardening and

diffusion hardening-Fracture-Mechanism of brittle fracture (Griffith's theory) and Ductile fracture - difference between brittle and ductile fracture - fatigue failure and its prevention - creep different stages in creep curve-Factors affecting mechanical properties Grain size and heat treatment Mechanical test Tensile, compression, hardness, impact creep, fatigue and stress.

Total : 45Hrs

TEXT BOOKS

1. 1 William.D.Callister, Jr, "Material Science and Engineering", John Wiley & Sons, New York, 2002.
2. Avadhanalu.M.N. and Kshirsagar.P.G, "A textbook of Engineering Physics," S.Chand & Company Ltd, New Delhi,2005.
3. Pillai S.O., Solid State Physics, 5th edition, New Age International Publication, New Delhi, 2003.

REFERENCES

1. Rajendran V. and Marikani A., "Materials Science" Tata McGraw Hill Publishing Company Limited, New Delhi, 2005
2. Gopal.S, "Materials Science" Inder Publications, Coimbatore, 2007.
3. William F.Smith, Foundations of Materials Science and Engineering, 3rd Edition, McGraw-Hill, New York, 2003.
1. Arumugam M, Materials Science 3rd Edition, Anuradha Agencies, Kumbakonam, 2003.

CHY103 APPLIED CHEMISTRY
(Common to Mechanical, Mechatronics and Aeronautical Engineering)

L	T	P	C
3	0	0	3

OBJECTIVES

To impart a sound knowledge of theoretical and modern technological aspects of fuels and combustion, specialty materials, water technology, corrosion studies, phase equilibria and powder metallurgy as required for the mechanical and related engineering students.

UNIT- I   FUELS   11

Classification of fuels, coal varieties, analysis of coal – proximate and ultimate analysis - coke manufacture (Otto-Hoffman by product coke oven method) - characteristics of metallurgical coke - cracking - thermal cracking and catalytic (fixed bed & fluidized bed), synthetic petrol – polymerization - thermal - catalytic methods (Fischer Tropsch method, Bergius process), knocking - octane number - antiknock characteristics - diesel - cetane number - gaseous fuels (production composition and uses of producer gas, water gas and natural gas).

Combustion - gross and net calorific value - determination of calorific value by bomb colorimeter - explosive range- spontaneous ignition temperature - flue gas analysis (Orsat apparatus).

UNIT -II   MECHANICAL ENGINEERING MATERIALS   11

Abrasives: Moh's scale of hardness - natural abrasives (diamond, corundum, emery, garnets and quartz) - artificial abrasives (silicon carbide, boron carbide).

Refractories: characteristics, classification (acid, basic and natural refractories), properties (refractoriness, refractoriness under load, dimensional stability, porosity thermal spalling) - manufacture of refractories (general methods) - preparation, properties and uses of high alumina bricks, magnesite and zirconia bricks only.

lubricants: functions - classification with examples - properties (viscosity index, flash and fire point, oiliness, carbon residue, aniline point, cloud and pour point) - greases (calcium based, sodium based, lithium based only) - solid lubricants (graphite, molybdenum sulphide). **Engineering plastics** - polymer blends and alloys - properties with examples - polyamide, poly carbonates polyurethanes and thermocole.

UNIT- III   CORROSION SCIENCE   8

Corrosion - principles of electrochemical corrosion difference between chemical and electrochemical corrosion - factors influencing corrosion - types of corrosion - galvanic corrosion, differential aeration corrosion – (soil (microbial) corrosion, pitting corrosion, water line corrosion) - stress corrosion - corrosion control (cathodic protection - sacrificial anode) - Protective Coatings – Paint, Electroplating of Copper.

UNIT- IV   WATER TECHNOLOGY   8

Boiler feed water - requirements - formation of deposits in steam boilers and heat exchangers - disadvantages (wastage of fuel, decrease in efficiency, boiler explosion) - prevention of scale formation - external treatment (ion exchange method) - internal treatment (phosphate, calgon, carbonate, colloidal) - caustic embrittlement - boiler corrosion - priming and foaming - desalination by reverse osmosis – Treatment of Domestic water.

UNIT -V   PHASE RULE   **7**

Phase rule - condensed phase rule -construction of phase diagram - thermal analysis - simple eutectic system (Ag-Pb system only) - applications of phase rule.

POWDER METALLURGY

Preparation of metal powders (mechanical pulverization, atomization, chemical reduction, electrolytic process, decomposition) - mixing and blending - compacting - sintering - advantages and limitations of powder metallurgy.

                                             Total : 45Hrs

TEXT BOOKS

1. Jain P.C. and Monika Jain, Engineering Chemistry, Dhanpat Rai Pub. Co. (P) Ltd., New Delhi, Edition 2002.
2. Dara S.S., A text book of Engineering Chemistry, S. Chand Co. (P) Ltd., New Delhi, 2003.

REFERENCES

1. Samir Sarkar, "Fuels and Combustion", Orient Longman, India, 1996.
2. Dr.P.S.Syed Shabudeen Chemistry II, Inder publications, Coimbatore 2009(revised edition)
3. Derek Pletcher and Frank C Walsh, "Industrial Electrochemistry", Blackie Academic and Professional, London, 1993.

MEC102　ENGINEERING MECHANICS
(Common to CE, AE, ME, MCE, TXT, FT & BIO branches)

L	T	P	C
3	1	0	4

OBJECTIVES
- To understand the concept of equilibrium of particles and rigid bodies.
- To understand the concept of first and second moment of area.
- To understand the concept of various types of frictions.
- To understand the principle of work energy method, Newton's law and impact of elastic bodies.

UNIT -I　　　BASICS & STATICS OF PARTICLES　　　　　　　　12
Introduction - Units and Dimensions - Laws of Mechanics Lame's theorem, Parallelogram and triangular Laws of forces – Coplanar Forces - Resolution and Composition of forces – Free body diagram - Equilibrium of a particle.

UNIT- II　　　EQUILIBRIUM OF RIGID BODIES　　　　　　　12
Moment of a force about point – Varignon s theorem- Moment of a couple-Resolution of force in to force couple system-Resultant of coplanar non concurrent system - Types of supports and their reactions- Requirements of stable equilibrium - Equilibrium of Rigid bodies in two dimensions.

UNIT- III　　　PROPERTIES OF SURFACES AND SOLIDS　　　12
First moment of area and the Centroid of sections Rectangle, circle, triangle, T section, I section Angle section and Hollow section. Second and product moments of plane area Rectangle, triangle, circle. T Section, I section, Angle section and Hollow section, Parallel axis theorem and perpendicular axis theorem - Polar moment of inertia.

UNIT- IV　　FRICTION　　　　　　　　　　　　　　　12
Frictional force-Law of coloumb friction , simple contact friction, Rolling resistance and Belt friction, Ladder friction, Wedge friction

UNIT- V　　　DYNAMICS OF PARTICLES　　　　　　　　　12
Kinematics: Rectilinear & Curvilinear motion of particles, Displacements Velocity and acceleration.
Kinetics: Newton's law, Work Energy method, Impulse and Momentum, Impact of elastic bodies.

L: 45, T: 15, Total : 60Hrs

TEXT BOOKS

1. Rajasekaran S, Sankarasubramanian, G, Fundamentals of Engineering Mechanics, Vikas Publishing House Pvt. Ltd., Second Edition, 2002.
2. Beer, F.P. and Johnson Jr. E.R. Vector Mechanics for Engineers, Vol. 1. Statics and Vol. 2 Dynamics, McGraw-Hill International Edition, 2004.

REFERENCES

1. Hibbeller, R.C. Engineering Mechanics, Vol, 1 Statics, Vol, 2 Dynamics, Pearson Education Asia Pvt. Ltd., 2000

2. Ashok Gupta, Interactive Engineering Mechanics Statics A Virtual Tutor, Pearson Education Asia Pvt. Ltd., New Delhi, 2002.
3. Palanichamy, M.S, and Nagan, S., Engineering Mechanics (Statics & Dynamics) Tata McGraw Hill, 2001.
4. Irving H, Shames, Engineering Mechanics – Statics and Dynamics, IV Edition, Pearson Education Asia Pvt. Ltd., 2003.

ECE280 ELECTRONIC DEVICES AND CIRCUITS
 (For Mechatronics only)

L	T	P	C
3	0	0	3

UNIT – I   **10**
Network Theorems: Kirchoff's laws – Thevinin's and Norton's theorems – Superposition theorem – Star Delta Conversion.
Two port networks: Z Parameters – Y parameters – ABCD parameters – h parameters – 2 - port networks connected in series, parallel and cascade.

UNIT – II   **10**
Theory of semiconductors and semiconductor devices; energy levels – band theory – conductors, insulators and semiconductors – intrinsic and extrinsic semiconductors – PN junction – diode equation (Derivation not required) – forward and reverse bias – Diode dc and ac resistances – Zener diode – Bipolar Junction Transistor – CE, CB and CC configurations – Biasing of a transistor; fixed bias, collector feedback bias, self bias – FET – Common source and drain characteristics of JFET and MOSFET.

UNIT – III   **7**
Application of Diodes : HW and FW rectifiers – Clippers and Clampers – Voltage Multipliers – Voltage regulators – Zener, series and shunt types.

UNIT – IV   **8**
Amplifiers and Oscillators : Small signal amplifiers – h parameter model for low frequencies – Feedback amplifiers – Oscillators – Hartley and Colpitt oscillators.

UNIT - V   **10**
Operational Amplifiers – Ideal characteristics – Inverting, Non-inverting – summer – Comparator – Schmitt trigger – R.C. Phase shift oscillator, Wein Bridge Oscillator – Multivibrators.

                                                                                                    Total   : 45Hrs

TEXT BOOKS

1. Circuits and networks : Analysis & Synthesis – 3rd Edition, Sudhakar, Shyammohan . S. Palli, Tata Mc Graw Hill publishing company , New Delhi
2. Electronics Devices and Circuits, S. Salivahanan, N.Suresh kumar , A. Vallavaraj, Second Edition, 2008. Tata Mc Graw Hill publishing company , New Delhi

REFERENCES

1. Electronic Principles – Fifth edition 1990, Albert Paul Malvino, Tata McGrew-Hill Publishing Company Ltd.
2. Electronic Devices – Fifth edition 2001, Thomas L. Floyd, Pearson Education Asia.
3. Engineering Circuit Analysis – Sixth edition 2002, William H. Hayt, Jr., Jack E. Kemmerly and Steven. M.Durban, McGraw–Hill International Editions, Electrical Engineering series.

CHY401 CHEMISTRY LABORATORY
(Common to all branches of Engineering and Technology)

L	T	P	C
0	0	3	1

OBJECTIVES

Should be Conversant with the theoretical principles and experimental procedures for quantitative estimations and hands on experience in using analytical equipments.

PREPARATION OF SOLUTIONS (STANDARD)

1. Preparation of molar and normal solutions of the following substances - oxalic acid, sodium carbonate, sodium hydroxide, hydrochloric acid.
2. Preparation of buffer solutions: borate buffer, phosphate buffer using Henderson equation.

WATER TESTING

3. Determination of total hardness, temporary & permanent hardness of water by EDTA method.
4. Determination of DO content by Winkler s method.
5. Determination of alkalinity in a water sample.
6. Determination of chloride content of water sample by argentometric method.

ELECTRO CHEMICAL ANALYSIS

7. To find out the strength of given hydrochloric acid by pH meter.
8. Conductometric titration of mixture of acids.
9. Conductometric precipitation titration using $BaCl_2$, Na_2SO_4.
10. Redox titration Iron Vs. dichromate.

PHOTOMETRY

11. To determine the iron content of an unknown solution (1, 10 phenanthroline / Thiocyanate method)
12. To determine sodium and potassium in water

VISCOMETRY

13. Determination of molecular weight of a polymer.

Total   : 45Hrs

REFERENCES

1. Vogel A.I., A Text of Quantitative Inorganic Analysis, ELBS, London.
2. Shoemaker D.P., & C.W. Garland., Experiments in Physical Chemistry, McGraw-Hill, London.

CSE451 ADVANCED PROGRAMMING LABORATORY
(For all branches other than CSE & IT)
List of Programs
UNIX & C

L	T	P	C
0	0	3	1

The following programs are to be executed in Linux environment.
C programs are expected to employ pointers wherever possible.

1. Create a file which contains the student details and perform the following operations.

   a. Display the contents of a file on the screen.
   b. Rename the file
   c. Create a new directory and move the above file into it.
   d. Copy the contents of two files into a third file.

2. Create a file which contains the employee details such as Employee No., Employee Name, Employee Salary, Employee Designation and perform the following operations.
   e. Search for a particular employee.
   f. Create a file containing details of employees with salary greater than 5000 using pipes.

3. List the files and directories created and change the access rights of the employee file as follows.
   g. Only readable
   h. Only writable

4. Write a C program to find the roots of a quadratic equation of the form $ax^2+bx+c=0$. The roots can be calculated using the formula $\dfrac{-b \pm \sqrt{b^2-4ac}}{2a}$.

   Write a function to calculate the roots of the given equation. The function must use three formal parameters to receive the coefficients a, b and c and two pointer parameters to send the roots to the calling function.

5. Write a C program to find the sum of two (nxn) matrices and to print the resultant matrix using pointers.

6. Write a C program to count
   a. No .of characters.
   b. No .of words.
   c. No .of lines / sentences
   in a given text file.

7. Write a C program that compares two text files and returns 0 if they are identical and 1 if they are not identical

MATLAB PROGRAMS

8. Matrices – Addition, subtraction, multiplication, Inverse and Determinant of a matrix calculation.
9. Polynomials –Evaluating & Plotting, determining roots of a polynomial.
10. Polynomial curve fitting.
11. Numerical integration.
12. Differential equations- numerical solution.

Total : 45Hrs

ECE480   ELECTRONICS LABORATORY
 (For Mechatronics   only)

L	T	P	C
0	0	3	1

1. Characteristics of Semiconductor diode and Zener diode
2. Input and Output characteristics of BJT
3. Characteristics of JFET
4. Frequency response of CE amplifier
5. Clipper and Clamper
6. Phase shift and Wein Bridge oscillators using OP-AMP
7. Astable multivibrator using OP-AMP
8. Monostable and Bistable multivibrator using OP-AMP
9. Voltage Regulator (Zener diode, Transistor series and shunt)
10. Half-wave and Full-wave Rectifier with and without filter.

                                                          Total : 45Hrs

GHE102   PERSONAL VALUES - II

L	T	P	C
0	0	2	1

UNIT – I   5
Understanding Self – Who am I? – self realisation - our different self – Kaya Kalpam – Theory & practice – physical exercises – Completion – Meditation III stage (Thuria Initiations)

UNIT – II   5
Harmony between body, mind & soul – physical well being – Exercises practical benefits - Benefits of meditations – benefits of Kaya Kalpa – Applying the practices in Life –

UNIT – III   5
Personal values – Identifications – Adaptations – Implementations – practices & Benefits – Exercises, Meditation and Kaya Kalpa practices – perceptions.

Total : 15Hrs

KUMARAGURU COLLEGE OF TECHNOLOGY, COIMBATORE -641 006.
(An autonomous institution affiliated to Anna University, Coimbatore)

CBCS CURRICULUM 2009

B.E MECHATRONICS ENGINEERING

SEMESTER III

Code No.	Course Title	L	T	P	C
THEORY					
MAT 104	Engineering Mathematics – III	3	1	0	4
MCT 101	Kinematics of Machinery	3	1	0	4
MCT 102	Engineering Materials and Metallurgy	3	0	0	3
MCT 103	Fluid Mechanics and Machinery	3	1	0	4
ECE 103	Digital Electronics	3	0	0	3
EEE 223	Electrical Machines and Drives	3	1	0	4
PRACTICAL					
MCT 401	Fluid Mechanics and Machinery Laboratory	0	0	3	1
EEE 421	Electrical Engineering Laboratory	0	0	3	1
MCT 402	Computer Aided Machine Drawing Laboratory	0	0	3	1
GHE 103	Human Excellence - Family Values	0	0	2	1

Total periods : 33   **Total credits : 26**

SEMESTER IV

Code No.	Course Title	L	T	P	C
THEORY					
MAT108	Numerical Methods	3	1	0	4
CHY 107	Environmental Science and Engineering	3	0	0	3
MCT 104	Manufacturing Technology	3	0	0	3
MEC 109	Strength of Materials	3	1	0	4
MCT 105	Dynamics of Machinery	3	1	0	4
MCT 106	Industrial Electronics	3	0	0	3
PRACTICAL					
MCT 403	Manufacturing Technology Laboratory	0	0	3	1
MCT 404	Machine Dynamics Laboratory	0	0	3	1
MCT 405	Industrial Electronics Laboratory	0	0	3	1
GHE 104	Human Excellence - Professional Values	0	0	2	1

Total periods: 32   **Total credits: 25**

Signature of the Chairman BOS MCE

MAT104 ENGINEERING MATHEMATICS III   3   1   0   4
(Common for III Semester CE, ME, MCE, EEE, EIE, ECE &AE)

OBJECTIVES
- o To impart analytical skills in the areas of boundary value problems and transform techniques.
- o To understand the basic concepts of partial differential equations

1.   PARTIAL DIFFERENTIAL EQUATIONS   9
Formation of partial differential equations by elimination of arbitrary constants and arbitrary functions - Solution of standard types of first order partial differential equations (excluding reducible to standard types) – Lagrange's linear equation – Linear Homogeneous partial differential equations of second and higher order with constant coefficients.

2.   FOURIER SERIES   9
Dirichlet's conditions – General Fourier series – Odd and even functions – Half range sine series – Half range cosine series – Parseval's identity – Harmonic Analysis.

3.   BOUNDARY VALUE PROBLEMS   9
Classification of second order quasi linear partial differential equations – Solutions of one dimensional wave equation – One dimensional heat equation (excluding insulated ends) – Steady state solution of two-dimensional heat equation (Insulated edges excluded) – Fourier series solutions in Cartesian coordinates.

4.   FOURIER TRANSFORM   9
Infinite Fourier transform pair – Infinite Sine and Cosine transforms – Properties – Transforms of simple functions – Convolution theorem – Parseval's identity.

5.   Z –TRANSFORM   9
Z-transform - Elementary properties – Convolution theorem- Inverse Z – transform (by using partial fractions, residue methods and convolution theorem) - Solution of difference equations using Z - transform.

L: 45   T:15   Total: 60Hrs

TEXT BOOK:

1. Veerarajan T., "Engineering Mathematics" (for semester III), Third Edition, Tata McGraw Hill, New Delhi (2007)

REFERENCES:

1. Grewal B.S., "Higher Engineering Mathematics", Thirty Sixth Edition, Khanna Publishers, Delhi, 2001.
2. Kandasamy P., Thilagavathy K. and Gunavathy K., "Engineering Mathematics Volume-III", S. Chand & Company ltd., New Delhi, 1996.
3. Ian Sneddon. , Elements of partial differential equations, McGraw – Hill New Delhi, 2003.
4. Arunachalam T., "Engineering Mathematics I", Sri Vignesh Publications, Coimbatore. (Revised) 2009.

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MCT 101   **KINEMATICS OF MACHINERY**   **3 1 0 4**

OBJECTIVES

o To understand the basic mechanism and to know the layout of linkages in the assembly of a system.
o To understand the principles in displacement, velocity and acceleration at a point in a link of a mechanism
o To understand the Friction concept and its aspects.

1.   BASICS OF MECHANISMS   7
Terminology and Definitions-Degree of Freedom Mobility-Kutzbach criterion-Grashoff's law-Kinematic Inversions of 4-bar chain and slider crank chains-Mechanical Advantage-Transmission angle-Description of common Mechanisms-Single, double and offset slider mechanisms - Quick return mechanisms - Ratchets and escapements - Indexing Mechanisms - Rocking Mechanisms - Straight line generators-Design of Crank-rocker Mechanisms.

2.   KINEMATICS   12
Displacement, velocity and acceleration and analysis in simple mechanisms - Graphical Method velocity and acceleration polygons - Kinematic analysis -Vector Approach, Computer applications in the kinematic analysis of simple mechanisms-Coincident points- Coriolis Acceleration.

3.   KINEMATICS OF CAM   8
Classifications - Displacement diagrams-parabolic Simple harmonic and Cycloidal motions - Layout of plate cam profiles - Derivatives of Follower motion - High speed cams - circular arc and tangent cams - Standard cam motion - Pressure angle and undercutting.

4.   GEARS   10
Spur gear Terminology and definitions-Fundamental Law of toothed gearing and involute gearing-Inter changeable gears-gear tooth action – Terminology - Interference and undercutting-Non standard gear teeth- Helical, Bevel, Worm, Rack and Pinion gears (Basics only)-Gear trains-Parallel axis gear trains-Epicyclic gear trains-Differentials

5.   FRICTION   8
Surface contacts-Sliding and Rolling friction - Friction drives – Friction in screw threads - Friction clutches - Belt and rope drives, Friction aspects in Brakes – Friction in vehicle propulsion and braking

                                        L: 45   T: 15   Total: 60Hrs

TEXT BOOKS:

1. Rattan S.S, "Theory of Machines'', Tata McGraw-Hill Publishing Company Ltd., New Delhi, 2009.
2. Shigley J.E and.Uicker J.J, "Theory of Machines and Mechanisms", McGraw-Hill, Inc. 1995.

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REFERENCES:

1. Thomas Bevan, "Theory of Machines", CBS Publishers and Distributors, 2003.
2. Ghosh A and A.K.Mallick, "Theory of Mechanisms and Machines", Affiliated East - West Pvt. Ltd., New Delhi, 2000.
3. Rao J.S and Dukkipati R.V, "Mechanism and Machine Theory", Wiley-Eastern Ltd., New Delhi, 2006.
4. John Hannah and Stephens R.C, "Mechanics of Machines", Viva Low-Prices Student Edition, 1999.

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MCT102   ENGINEERING MATERIALS AND METALLURGY   3 0 0 3

OBJECTIVES

- o To study various engineering materials and its characters for analyzing the suitability and fit them to manufacture components as applicable in engineering industries and other purposes.

1.   INTRODUCTION AND CONSTITUTION OF ALLOYS AND PHASE DIAGRAMS   9
Constitution of alloys – Solid solutions, substitutional and interstitial – phase diagrams, Isomorphous, eutectic, peritectic, eutectoid and peritectroid reactions, Iron – Iron carbide equilibrium diagram. Classification of steel and cast Iron microstructure, properties and application.

2.   HEAT TREATMENT   9
Definition – Full annealing, stress relief, recrystallisation and spheroidizing – normalising, hardening and Tempering of steel. Isothermal transformation diagrams – cooling curves, Hardenability, Jominy end quench test — case hardening, carburising, nitriding, cyaniding, carbonitriding.

3.   FERROUS AND NON FERROUS METALS   9
Effect of alloying additions on steel (Mn, Si, Cr, Mo, V Ti & W) **-** stainless and tool steels – High strength Low Alloy steels (HSLA).

Copper and Copper alloys – Brass, Bronze and Cupronickel – Aluminium and Al-Cu – precipitation strengthening treatment – Bearing alloys.

4.   NON-METALLIC MATERIALS   9
Polymers – types of polymer, commodity and engineering polymers – Properties and applications of PE, PP, PS, PVC, PMMA, PET, PC, PA, ABS, PI, PAI, PPO, PPS, PEEK, PTFE Polymers PU Teflon – Urea and Phenol formal deliydes – Engineering Ceramics – Properties and applications of Al_2O_3, SiC, SiC, Si_3, N_4, PSZ and Sialon – Fibre and particulate reinforced composites.

5.   MECH. PROPERTIES AND TESTING   9
Mechanism of plastic deformation – Slip and Twinning Types of fracture – Fatigue and creep mechanisms - Testing of materials under tension, compression and shear loads – Hardness Tests (Brinell, Vickers and Rockwell) – Impact Tests – Izod and charpy – Fatigue & Creep Tests.

                                                                                                Total : 45Hrs

TEXT BOOKS:

1. Kenneth G.Budinski and Michael K.Budinski "Engineering Materials" Prentice-Hall of India Private Limited, 4th Indian print 2008.
2. Donald R. Askeland and Pradeep P. Pbule "The Science and Engineering of Materials" 4th Edition – Thomson Engineering, 2005.

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REFERENCES:

1. William D Callsber "Material Science and Engineering", John Wiley and Sons 2006.
2. Raghavan.V. "Materials Science and Engineering", Prentice Hall of India Pvt. Ltd, 2007.
3. Sydney H.Avner, "Introduction to Physical Metallurgy" McGraw Hill Book Company, 2007.
4. L.H. Vanvlack, "Materials Engineering: concepts and applications", 1995.
5. Paul Dr. Garmo. E., Black .J.T. and Ronald A. Kohser, " Materials and Processes in Manufacturing" 8th Edition – Prentice Hall of India, 2005.

Signature of the Chairman BOS MCE

MCT 103   FLUID MECHANICS AND MACHINERY   3 1 0 4

OBJECTIVES

- o To understand the structure and the properties of the fluid.
- o To understand and appreciate the complexities involved in solving the fluid flow problems.
- o To understand the mathematical techniques already in vogue and apply them to the solutions of practical flow problems.
- o To understand the energy exchange process in fluid mechanics handling incompressible fluids.

1.   BASIC CONCEPTS AND PROPERTIES   6

Fluid - definition, distinction between solid and fluid - Units and dimensions - Properties of fluids - density, specific weight, specific volume, specific gravity, temperature, viscosity, compressibility, vapour pressure, capillary and surface tension - Fluid statics: concept of fluid static pressure, absolute and gauge pressures - pressure measurements by manometers and pressure gauges.

2.   FLIUD KINEMATICS AND FLUID DYNAMICS   12

Fluid Kinematics - Flow visualization - lines of flow - types of flow - velocity field and acceleration - continuity equation (one and three dimensional differential forms)- Equation of streamline - stream function - velocity potential function - circulation - flow net – fluid dynamics - equations of motion - Euler's equation along a streamline - Bernoulli's equation – applications - Venturi meter, Orifice meter, Pitot tube.

3.   INCOMPRESSIBLE FLUID FLOW   12

Viscous flow - Navier - Stoke's equation (Statement only) - Shear stress, pressure gradient relationship - laminar flow between parallel plates - Laminar flow through circular tubes (Hagen Poiseuille equation)- Hydraulic and energy gradient - flow through pipes - Darcy -weisbach equation - pipe roughness -friction factor - Moody's diagram- minor losses - flow through pipes in series and in parallel.

4.   HYDRAULIC TURBINES   8

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.

5.   HYDRAULIC PUMPS   7

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 - cavitations in pumps.

L: 45 T: 15   Total: 60Hrs

Signature of the Chairman BOS MCE

TEXT BOOKS:

1. Bansal, R.K., "Fluid Mechanics and Hydraulics Machines", (5th edition), Laxmi publications (P) Ltd., New Delhi, 2006.
2. Kumar, K.L., "Engineering Fluid Mechanics", Eurasia Publishing House (P) Ltd, New Delhi (7th edition), 2008.

REFERENCES:

1. White, F.M., "Fluid Mechanics", Tata McGraw-Hill, 5th Edition, New Delhi, 2007.
2. Ramamirtham, S., "Fluid Mechanics and Hydraulics and Fluid Machines", Dhanpat Rai and Sons, Delhi, 2006.
3. Som, S.K., and Biswas, G., "Introduction to fluid mechanics and fluid machines", Tata McGraw-Hill, 2nd edition, 2007.

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ECE 103   DIGITAL ELECTRONICS   3 0 0 3
Common for III semester CSE, ECE, IT,MCE & IV semester EEE, EIE)

OBJECTIVE

- o   To introduce the basic concept of Hardware Components
- o   To introduce the basic of circuit design with fundamental hardware components

1.   NUMBER SYSTEM AND BASIC LOGIC   10
Number systems-Binary, Octal, Hexadecimal, Number base conversions , Binary codes:
Weighted codes-BCD - 8421-2421, Non Weighted codes - Gray code - Excess 3 code
Binary arithmetic,1's complements , 2's complements, and Code conversions.
Boolean algebra , Boolean postulates and laws –De-Morgan's Theorem- Principle of
Duality – AND, OR, NOT NAND & NOR operation, Minterm- Maxterm- Canonical
forms - Conversion between canonical forms, sum of product and product of sum forms.
Karnaugh map Minimization – Don't care conditions, Tabulation method.

2.   COMBINATIONAL CIRCUITS   9
Problem formulation and design of combinational circuits, adder , subtractor, Serial
adder/ Subtractor - Parallel adder/ Subtractor- Carry look ahead adder- BCD adder-
Magnitude Comparator , parity checker , Encoder , decoder, Multiplexer/ Demultiplexer ,
code converters, Function realization using gates and multiplexers.

3.   **SEQUENTIAL CIRCUIT   9**
Flip flops SR, JK, T, D and Master slave – Characteristic table and equation –Application
table – Edge triggering –Level Triggering –Realization of one flip flop using other flip
flops –Synchronous Binary counters –Modulo–n counter- Decade - BCD counters.

4.   **DESIGN OF SEQUENTIAL CIRCUITS   9**
Classification of sequential circuits – Moore and Mealy - Design of Asynchronous
counters- state diagram- State table –State minimization –State assignment- Register –
shift registers - Universal shift register –Ring counters. Hazards: Static - Dynamic.

5.   DIGITAL LOGIC FAMILIES AND PLD   8
Memories – ROM, PROM, EEPROM, RAM.– Programmable Logic Devices:
Programmable Logic Array (PLA)- Programmable Array Logic (PAL)- Implementation
of combinational logic using PROM and PLA, Introduction to FPGA- Digital logic
families :TTL,ECL,CMOS.

                                                    Total : 45Hrs

TEXT BOOKS:

1. M. Morris Mano, Digital Design, 3rd Edition., Prentice Hall of India Pvt. Ltd., New
    Delhi, 2003/Pearson Education (Singapore) Pvt. Ltd., New Delhi, 2003
2. John .M Yarbrough, Digital Logic Applications and Design, Thomson- Vikas
    Publishing House, New Delhi, 2002.

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REFERENCES:

1. S. Salivahanan and S. Arivazhagan, "Digital Circuits and Design",Second Edition, Vikas Publishing House Pvt. Ltd, New Delhi, 2004
2. Charles H.Roth. "Fundamentals of Logic Design", Thomson Publication Company, 2003.
3. Donald P.Leach and Albert Paul Malvino, "Digital Principles and Applications", 5 Edition., Tata McGraw Hill Publishing Company Limited, New Delhi, 2003.
4. R.P.Jain, "Modern Digital Electronics", Third Edition., Tata McGraw–Hill publishing company limited, New Delhi, 2003.
5. Thomas L. Floyd, "Digital Fundamentals", Pearson Education, Inc, New Delhi, 2003
6. Donald D.Givone, "Digital Principles and Design", Tata Mc-Graw-Hill Publishing company limited, New Delhi, 2003.

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EEE 223   ELECTRICAL MACHINES AND DRIVES   3 1 0 4
(Common to III Semester ME & MCE)

OBJECTIVES
- o To understand the basic concepts of different types of electrical machines and their performance.
- o To study the different methods of starting D.C. motors and induction motors.

1.   DC AND AC MACHINES   9
Introduction to Magnetic Circuits – Magnetic flux – Magnetic intensity, density – Inductance-self, Mutual-Faradays Law-Lenz Law – Thumb rule – Flemings Rule – Constructional details and operating principles of DC motors – Back emf-Types of motors – Speed-torque equation-Load characteristics of DC motors – Constructional details and principle of operation of three phase induction motors – Emf equation-Torque-slip characteristics – Construction and principle of operation of single phase induction motors.

2.   STARTING AND BREAKING METHODS   9
Types of DC starters – Types of AC motor starters, starting methods – Breaking of electrical motors – DC motors-single phase and three phase induction motors.

3.   INTRODUCTION TO ELECTRICAL DRIVES   9
Basic elements – Types of electrical drives – Factors influencing the choice of electrical drives-Heating and cooling curves-Loading conditions and classes of duty-Selection of power rating for drive motors with regard to thermal overloading and load variation factors.

4.   CONVENTIONAL AND SOLID-STATE SPEED CONTROL OF DC
**   DRIVES   9**
Speed control of DC series and Shunt motors – Armature and Field control, Ward Leonard control system – Using controlled rectifiers and DC choppers – applications.

5.   CONVENTIONAL AND SOLID-STATE SPEED CONTROL OF AC
**   DRIVES   9**
Speed control of three phase induction motor – Voltage control, Voltage/frequency control, slip power recovery scheme – Using inverters and AC voltage regulators – applications.

                                    L : 45   T: 15   Total: 60Hrs

TEXT BOOKS:

1. Vedam Subrahmaniam, "Electric Drives (concepts and applications)", Tata McGraw-Hill, New Delhi, 2001.
2. Nagrath, I.J., & Kothari, D.P., "Electrical Machines", Tata McGraw-Hill, New Delhi, 1998.

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REFERENCES:

1. Pillai, S.K., "A first course on Electric drives", Wiley Eastern Limited, 1998.
2. Singh, M.D.,and Khanchandani, K.B., "Power Electronics", Tata McGraw-Hill, New Delhi, 1998.
3. Partab, H., "Art and Science and Utilisation of electrical energy", Dhanpat Rai and Sons, New Delhi, 1994.

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MCT 401   FLUID MECHANICS AND MACHINERY LAB   0 0 3 1

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 Roto meter.

4. Determination of friction factor of 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.

Total : 45Hrs

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EEE421   ELECTRICAL ENGINEERING LABORATORY   0 0 3 1
(**Common to III Semester ME & MCE**)

LIST OF EXPERIMENTS

1. Load test on DC Shunt motor
2. Load test on DC series motors
3. Speed control of DC shunt motor (Armature and Field Control)
4. Load Test on Three Phase Squirrel Cage Induction motor
5. Load Test on Single phase induction motor
6. Speed control of Three phase slip ring induction motor
7. Speed control of DC shunt motor using controlled rectifiers
8. Voltage / Frequency control of three phase induction motor using inverter.
9. Study of DC & AC starters

Total : 45Hrs

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MCT 402   COMPUTER AIDED MACHINE DRAWING LABORATORY
                                                              0 0 3 1

UNIT I   **9**
Indian standard code of practice for engineering drawing – general principles of
Presentation. Conventional representations of threaded parts, springs, gear and Common
features. Abbreviations and symbols for use on technical drawings. Conventions for
sectioning and dimensioning.

UNIT II   **9**
Tolerances – types – representation of tolerances on drawing, fits – types – selection of
Fits – allowance. Geometric tolerances – form – and positional tolerances – datum, datum
Features. Maximum material principle – symbols and methods of indicating it on drawing
Surface finish symbols – welding symbols and methods of indicating it on drawing.

UNIT III   (Drafting work using mini drafter)   **9**
Preparation of part and assembly drawings of Plummer block, screw jack, Flange
Coupling, stuffing box, universal joint, Knuckle joint , Foot step Journal Bearing.

UNIT IV   **9**
Introduction to the use of 3D modeling and drafting software – creation of simple
geometric bodies using basic commands. Assembling of various machine element parts.

UNIT V   **9**
Preparation of 3-D drawings using PROE software for components and assemblies of
Plummer block, screw jack, universal and flange coupling, Knuckle joint , Foot step
Journal Bearing.
                                                      Total : 45Hrs

TEXT BOOKS:

1. Sadhu Singh & P.L. Sah, Fundamentals of Machine Dynamics, Prentice Hall of India
   Pct Ltd, 2003.
2. P.N. Rao, CAD/CAM Principles and Applications, Tata McGraw-Hill 2003

REFERENCES:

1. K. Venugopal, Engineering Graphics AutoCAD, John Wiley & Sons, 2002
2. K.R. Gopal Krishanan , Text book of Machine Drawing.

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GHE 103   HUMAN EXCELLENCE – FAMILY VALUES   0 0 2 1
(Common to III Semester all Branches)

1. Family value-meaning –Introduction-values-Blessings for family peace-Restraint in family life- harmony in family-Interactive workshop.

2. Blissful married life-Greatness of good family relationship – Family life & Spiritual development.

3. Love and compassion –Greatness of womanhood –Food is medicine (healthy food habits)

4. Simple physical exercises.

5. Kayakalpa Yoga

6. Sun Rays Therapy

7. Padmasana.

8. Vajrasana.

9. Chakrasana & Viruchasana

10. Meditation

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MAT108   NUMERICAL METHODS   3 1 0 4
(Common for IV Semester ME, CE,MCE, EEE, AE, TXT & EIE)

OBJECTIVES

At the end of the course, the students would be acquainted with the basic concepts in numerical methods and their uses are summarized as follows:

o   The roots of nonlinear (algebraic or transcendental) equations, solutions of large system of linear equations and eigen value problem of a matrix can be obtained numerically where analytical methods fail to give solution.

o   When huge amounts of experimental data are involved, the methods discussed on interpolation will be useful in constructing approximate polynomial to represent the data and to find the intermediate values.

o   The numerical differentiation and integration find application when the function in the analytical form is too complicated or the huge amounts of data are given such as series of measurements, observations or some other empirical information.

o   Since many physical laws are couched in terms of rate of change of one/two or more independent variables, most of the engineering problems are characterized in the form of either nonlinear ordinary differential equations or partial differential equations. The methods introduced in the solution of ordinary differential equations and partial differential equations will be useful in attempting any engineering problem.

**1.   NUMERICAL SOLUTION OF ALGEBRAIC AND TRANSCENDENTAL
          EQUATIONS   9**
Linear interpolation method (method of false position) – Iteration method - Newton's method - Solution of linear system by Gaussian elimination and Gauss-Jordan methods-Iterative methods: Gauss Jacobi and Gauss-Seidel methods – Inverse of matrix by Gauss – Jordan method.

2.   INTERPOLATION   9
Newton's forward and backward difference formulas – Stirling's formula - Divided differences – Newton's divided difference formula - Lagrange's interpolation (derivations are excluded for all methods).

3.   NUMERICAL DIFFERENTIATION AND INTEGRATION   9
Numerical differentiation: Derivatives by using Newton's forward , backward and divided differences – Derivatives by using Stirling's formula - Numerical integration by Trapezoidal and Simpson's 1/3 and 3/8 rules – Double integrals using Trapezoidal and Simpson's 1/3 rules.

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4. NUMERICAL SOLUTION OF ORDINARY DIFFERENTIAL EQUATIONS   9

Single step methods: Taylor's series method – Euler and Improved Euler methods for solving first order equations – Fourth order Runge – Kutta method for solving first and second order equations – Multistep method: Milne's predictor and corrector method.

5. NUMERICAL SOLUTION OF PARTIAL   DIFFERENTIAL EQUATIONS   9

Finite difference solution of one dimensional heat equation by Bender Schmidt and Crank Nicholson methods – One dimensional wave equation by explicit method and two dimensional Laplace and Poisson equations.

L: 45   T: 15   Total: 60Hrs

TEXT BOOK:

1. Venkataraman M.K., "Numerical Methods in Science and Engineering", The National Publishing Company, 5th Edition, May 2003.

REFERENCES:

1. Gerald C. F. and Wheatley P.O, "Applied Numerical Analysis", Sixth Edition, Pearson Education Asia, New Delhi, 2002.
2. Sastry S.S, "Introductory Methods of Numerical Analysis", Third Edition, Prentice – Hall of India Pvt Ltd, New Delhi, 2003.
3. Kandasamy P., Thilagavathy K. and Gunavathy K., "Numerical Methods", S.Chand Co. Ltd., New Delhi, 2007.
4. Arunachalam. T., "Numerical Methods", Inder Publications, Coimbatore, 2009.

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CHY107   ENVIRONMENTAL SCIENCE AND ENGINEERING   3 0 0 3
(Common for III Semester EEE,IT,CSE & IV Semester TXT,FT,BIO,MCE,CIVIL, ME)

OBJECTIVES

At the end of this course the student is expected to understand what constitutes the environment, what are precious resources in the environment, how to conserve these resources, what is the role of a human being in maintaining a clean environment and useful environment for the future generations and how to maintain ecological balance and preserve bio-diversity.

1. INTRODUCTION TO ENVIRONMENTAL STUDIES AND NATURAL RESOURCES   10

Definition, scope and importance – Need for public awareness – Forest resources: Use and over-exploitation, deforestation, case studies. Timber extraction, mining, dams and their effects on forests and tribal people – Water resources: Use and over-utilization of surface and ground water, floods, drought, conflicts over water, dams-benefits and problems – Mineral resources: Use and exploitation, environmental effects of extracting and using mineral resources, case studies – Food resources: World food problems, changes caused by agriculture and overgrazing, effects of modern agriculture, fertilizer-pesticide problems, water logging, salinity, case studies – Energy resources: Growing energy needs, renewable and non renewable energy sources, use of alternate energy sources. Case studies – Land resources: Land as a resource, land degradation, man induced landslides, soil erosion and desertification – Role of an individual in conservation of natural resources – Equitable use of resources for sustainable lifestyles.

2. ECOSYSTEMS AND BIODIVERSITY   14

Concept of an ecosystem – Structure and function of an ecosystem – Producers, consumers and decomposers – Energy flow in the ecosystem – Ecological succession – Food chains, food webs and ecological pyramids – Introduction, types, characteristic features, structure and function of the (a) Forest ecosystem (b) Grassland ecosystem (c) Desert ecosystem (d) Aquatic ecosystems (ponds, streams, lakes, rivers, oceans, estuaries) – Introduction to Biodiversity – Definition: genetic, species and ecosystem diversity – Biogeographical classification of India – Value of biodiversity: consumptive use, productive use, social, ethical, aesthetic and option values – Biodiversity at global, National and local levels – India as a mega-diversity nation – Hot-spots of biodiversity – Threats to biodiversity: habitat loss, poaching of wildlife, man-wildlife conflicts – Endangered and endemic species of India – Conservation of biodiversity: In-situ and Ex-situ conservation of biodiversity.

3. ENVIRONMENTAL POLLUTION   8

Definition – Causes, effects and control measures of: (a) Air pollution (b) Water pollution (c) Soil pollution (d) Marine pollution (e) Noise pollution (f) Thermal pollution (g) Nuclear hazards – Soil waste Management: Causes, effects and control measures of urban and industrial wastes – Role of an individual in prevention of pollution – Pollution case studies – Disaster management: floods, earthquake, cyclone and landslides.

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4. SOCIAL ISSUES AND THE ENVIRONMENT   7

From Unsustainable to Sustainable development – Urban problems related to energy – Water conservation, rain water harvesting, watershed management – Resettlement and rehabilitation of people; its problems and concerns, case studies – Environmental ethics: Issues and possible solutions – Climate change, global warming, acid rain, ozone layer depletion, nuclear accidents and holocaust, case studies. – Wasteland reclamation – Consumerism and waste products – Environment Production Act – Air (Prevention and Control of Pollution) Act – Water (Prevention and control of Pollution) Act – Wildlife Protection Act – Forest Conservation Act – Issues involved in enforcement of environmental legislation – Public awareness

5. HUMAN POPULATION AND THE ENVIRONMENT   6

Population growth, variation among nations – Population explosion – Family Welfare Programme – Environment and human health – Human Rights – Value Education – HIV / AIDS – Women and Child Welfare – Role of Information Technology in Environment and human health – Case studies.

Field Work

Visit to local area to document environmental assets- river / grassland / hill / mountain, visit to local polluted site- urban / rural / industrial / agricultural, study of common plants, insects, birds, study of simple ecosystems-pond, river, hill slopes etc.,

Total : 45Hrs

TEXT BOOKS:

1. Deswal.S and Deswal.A, " A basic course in Environmental studies" Dhanpat Rai & Co, 2006.
2. Gilbert M.Masters, Introduction to Environmental Engineering and Science, Pearson Education Pvt., Ltd., Second Edition, ISBN 81-297-0277-0, 2004.
3. Miller T.G. Jr., Environmental Science – Sustaining the earth, Wadsworth Publishing Co., 1993

REFERENCES:

1. Bharucha Erach, The Biodiversity of India, Mapin Publishing Pvt. Ltd., Ahmedabad India, 2002
2. Trivedi R.K., Handbook of Environmental Laws, Rules, Guidelines, Compliances and Standards, Vol. I and II, Enviro Media. 1996
3. Cunningham, W.P.Cooper, T.H.Gorhani, Environmental Encyclopedia, Jaico Publ., House, Mumbai, 2001.
4. Wager K.D., Environmental Management, W.B. Saunders Co., Philadelphia, USA, 1998.
5. Townsend C., Harper J and Michael Begon, "Essentials of Ecology", Blackwell science Publishing Co., 2003
6. Trivedi R.K and P.K.Goel "Introduction to Air pollution" Techno-science Pubications. 2003
7. Yamuna R.T "Environmental Science" Inter Publications, 2008

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MCT 104   MANUFACTURING TECHNOLOGY   3 0 0 3

OBJECTIVES

     This course aims to impart the knowledge about various production processes. It deals with Metal Casting. Metal Forming, Metal Machining and Metal Joining Processes. After this course, a Mechatronics student will have a good exposure about the manufacturing processes and various operations and machinery.

1.   FOUNDRY TECHNOLOGY   9

Pattern and Core making – Moulding sand – Melting furnaces Cupola and Induction furnaces – Special casting processes – Shell, Investment, Die casting – Defects in casting.

2.   FORMING PROCESSES   9
Hot and Cold Working

Rolling: Introduction – Rolling Mills – Rolling Operations –Forging : Introduction – Related Forging Operations – Drop forging- Extrusion and Drawing: Extrusion Practice – Hot, Cold, Impact and Hydrostatic extrusion. Drawing Process – Defects and Residual Stresses – Drawing Equipment. Sheet metal operations – Blanking, Punching and Piercing. (Treatment is to be given only on operations)

3.   CONVENTIONAL MACHINING PROCESS   9

Lathes and Lathe Operations, Drilling and Drilling Machines, Reaming and Reamers, Tapping and Taps – Tool nomenclature, cutting speed, feed, machining Time calculations.(No Treatment on mechanisms)

4.   SPECIALIZED MACHINING AND SUPER FINISHING PROCESS 9

Milling Machines and Operations, Planning and Shaping, Broaching, Gear Hobbing and Shaping.Grinding Process – Abrasives – Finishing Operations – Lapping, Honing Burnishing .(No Treatment on mechanisms)

5.   PRINCIPLES & APPLICATIONS OF JOINING PROCESSES   9

Gas welding, Basic Arc Welding Processes, Thermit Welding, Electron – Beam Welding, Laser – Beam Welding.

Solid State Welding: Cold Welding, Ultrasonic Welding, Friction Welding, Resistance Welding and Explosive Welding. Principles and applications of Brazing and Soldering.

Total : 45Hrs

TEXT BOOK:

1. KALPAKJIAN, S., "Manufacturing Engineering and Technology", Pearson education India, 4th edition, 2009.

REFERENCES:

1. Hajra Choudhury, S.K., and Haqjra Choudhury, A.K., "Elements of Workshop Technology", Volume I and II, Media Promoters and Publishers Private Limited, Mumbai, 1997.
2. Paul Degarma E, Black J.T. and Ronald A. Kosher, Eighth edition, Materials and Processes in Manufacturing – Hall of India, 2008 .
3. Sharma P.C. A Textbook of Production Technology, S. Chand and Co., Ltd., 2009.

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MEC 109   STRENGTH OF MATERIALS   3 1 0 4
(Common to III Semester Aero, IV Semester ME and MCE)
OBJECTIVES

- o To study, stresses, strains and deformation in components
- o To study the effect of size and shape on stress and deformation of the components

1.   STRESS, STRAIN AND DEFORMATION OF SOLIDS   9
Rigid and Deformable bodies – Strength, Stiffness and Stability – Stresses; Tensile, Compressive and Shear – Strain – Poisson's ratio – lateral stress – Deformation of simple and compound bars under axial load – Thermal stress – Elastic constants – Strain energy and unit strain energy – Strain energy in uni axial loads.

2.   BEAMS – LOADS AND STRESSES   9
Types of beams: Supports and Loads – Shear force and Bending Moment in beams – Cantilever, Simply supported and Overhanging beams – Stresses in beams – Theory of simple bending – Stress variation along the length and in the beam section – Effect of shape of beam section on stress induced – Shear stresses in beams – Shear flow

3.   TORSION   9
Analysis of torsion of circular bars – Shear stress distribution – Bars of Solid and hollow circular section –Twist and torsion stiffness – Compound shafts – Fixed and simply supported shafts – Application to close-coiled helical springs – Maximum shear stress in spring section including Wahl Factor – Design of helical coil springs.

4.   BEAM DEFLECTION   9
Elastic curve of Neutral axis of the beam under normal loads – Evaluation of beam deflection and slope: Double integration method, Macaulay Method,–Columns – End conditions – Equivalent length of a column – Euler equation – Slenderness ratio – Rankine formula for columns

5.   ANALYSIS OF STRESSES IN TWO DIMENSIONS   9
Biaxial state of stresses at a point – Stresses on inclined plane – Principal planes and stresses – Mohr's circle for biaxial stresses – Maximum shear stress – Thin cylindrical and spherical shells – Deformation in thin cylindrical and spherical shells

                                        L : 45   T :15   Total : 60Hrs
TEXT BOOKS:

1. Popov, E.P, "Engineering Mechanics of Solids", Prentice-Hall of India, New Delhi, 2007.
2. Beer, F. P. and Johnston, R., "Mechanics of Materials", 3rd edition, McGraw-Hill, 2008.
3. Rajput, R. K, "A textbook of Strength of Materials", S. Chand, 2007.

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REFERENCES:

1. Nash, W.A, "Theory of problems in Strength of Materials", Schaum Outline Series, Mc Graw-Hill Book Co, New York, 1998.
2. Kazimi, S.M.A, "Solid Mechanics", Tata McGraw-Hill Publishing Co, New   Delhi, 2001.
3. Ryder, G.H., "Strength of Materials", Macmillan India Ltd., 2002.
4. Ray Hulse, Keith Sherwin & Jack Cain, "Solid Mechanics", Palgrave ANE Books, 2004.
5. Bansal, R.K., "A Text Book of Strength of Materials", Laxmi Publications, 2009.
6. Ramamrutham, S., "Strength of Materials", Dhanpal Rai, Publishing Company (P) Ltd., 2005

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MCT 105   DYNAMICS OF MACHINERY   3 1 0 4

OBJECTIVES

- o To understand the force-motion relationship in components subjected to External Forces
- o To understand the force-motion analysis of standard mechanisms
- o To understand the undesirable effects of unbalances resulting from prescribed motions in mechanism.
- o To understand the effect of Dynamics of Undesirable Vibrations
- o To understand the principles in mechanisms used for governing of machines.

1.   FORCE ANALYSIS   10

Rigid Body dynamics in general plane motion – Equations of motion.-Dynamic force analysis - Inertia force and Inertia torque – D'Alemberts principle - The principle of superposition - Dynamic Analysis in Reciprocating Engines – Gas Forces - Equivalent masses - Bearing loads - Crank shaft Torque - Turning moment diagrams - Fly wheels – Engine shaking Forces - Cam dynamics - Unbalance, Spring Surge and Windup.

2.   BALANCING   9

Static and dynamic balancing - Balancing of rotating masses - Balancing a single cylinder Engine - Balancing Multi-cylinder Engines - Partial balancing in locomotive Engines - Balancing linkages - balancing machines

3.   FREE VIBRATION   10

Basic features of vibratory systems - idealized models, Basic elements and lumping of parameters - Degrees of freedom - Single degree of freedom - Free vibration - Equations of motion - natural frequency - Types of Damping - Damped vibration - critical speeds of simple shaft - Torsional systems; Natural frequency of two and three rotor systems.

4.   FORCED VIBRATION   6

Response to periodic forcing - Harmonic Forcing - Forcing caused by unbalance - Support motion – Force transmissibility and amplitude transmissibility - Vibration isolation.

5.   MECHANISM FOR CONTROL   10

Governors - Types - Centrifugal governors - Gravity controlled and spring controlled centrifugal governors –Characteristics - Effect of friction - Controlling Force - other Governor mechanisms.

Gyroscopes - Gyroscopic forces and Torques - Gyroscopic stabilization - Gyroscopic effects in Automobiles, ships and airplanes.

L: 45   T: 15   Total : 60Hrs

TEXT BOOK:

1. Rattan S.S., "Theory of Machines", Tata McGraw-Hill Publishing Company Ltd., New Delhi, 2nd Edition,2007.
2. R.S.Khurmi, J.K.Gupta "Theory of machines", S.Chand & company ltd ,New Delhi,2003.

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REFERENCES:

1. Thomas Bevan, "Theory of Machines", CBS Publishers and Distributors, 2003.
2. Ghosh A. and Mallick A.K., "Theory of Mechanisms and Machines", Affiliated East-West Press,Pvt. Ltd., New Delhi, 2000.
3. Shigley J.E. and Uicker J.J., "Theory of Machines and Mechanisms", McGraw-Hill, Inc., 1995.
4. Rao J.S. and Dukkipati R.V., "Mechanism and Machine Theory", Wiley-Eastern Limited, New Delhi, 2006.
5. John Hannah and Stephens R.C., "Mechanics of Machines", Viva low-Priced Student Edition, 1999.
6. Sadhu Singh "Theory of Machines", Pearson Education, 2nd Edition, 2008.

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MCT 106   **INDUSTRIAL ELECTRONICS**   **3 0 0 3**

OBJECTIVES

The subject is intended to familiarize the Mechatronics students with major aspects of power electronics which has wide spread applications in today's industry such as power supplies, variable speed drives, transportation, robotics etc.

UNIT I   POWER, SEMICONDUCTOR DEVICES   9
Classification of Power semiconductor devices, characteristics, construction, application and theory of operation of power diode, power transistor, thyristors. Device specifications and ratings, working of Diac, Triac, IGBT, GTO and other power semiconductor devices.

UNIT II   PHASE CONTROLLED CONVERTERS   9
Single phase full converters, 3 phase half converter and 3 phase full converter – inverter operation – input power factor – effect of source inductance- use of flywheel diode in controlled rectifier configurations– Thyristor triggering circuits.

UNIT III   INVERTERS AND CHOPPERS   9
Classification of inverters, Thyristor inverters, Voltage and Current Communicated inverters, PWM inverters, Principle of Chopper, Chopper classification – step up and step down Chopper - Types of regulators.

UNIT IV   A. C. VOLTAGE CONTROLLERS AND CYCLO-CONVERTERS 9
Single phase AC voltage controller – multistage sequence control – step up and step down cycloconverters – three phase to single phase and three phase cycloconverters

UNIT V   INDUSTRIAL APPLICATIONS   9
Solid-state switching circuits, Relays, Electronic Timer, Sawtooth generator, applications in Industrial process control, Motor drive applications, Electronic regulators, etc., Induction heating, Dielectric Heating.

                                                          Total : 45Hrs

TEXT BOOK:

1. P S Bimbhra , "POWER ELECTRONICS" Tata Mc graw Hill ,2006

REFERENCES:

1. Dubey, G.K., Doradia, S.R., Joshi, A. and Singh, R.M., "Thyristorised Power Controllers", Wiley Eastern Limited, 2008.
2. Joseph Vithayathil, "Power Electronics – Principle and Applications", and Robbins, "Power Electronics", McGraw-Hill Inc, New York, 1995.
3. D. R. Patrick, S. W. Fardo, *Industrial Electronics, Devices and Systems*, Marcel Dekker, October 2000.
4. Rashid, M.H., "Power Electronics – Circuits Devices and Application" Prentice Hall International, New Delhi, 3rd Edition, 2004.
5. S. Bhattacharys , S. Chatterjee, "Industrial Electronics And Control " Tata Mc graw Hill ,2004

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MCT 403   MANUFACTURING TECHNOLOGY LABORATORY   0 0 3 1

LIST OF EXPERIMENTS

UNIT 1   LATHE PRACTICE

        a.   Plain Turning
        b.   Taper Turning
        c.   Thread Cutting

Estimation of machining time for the above turning processes.

UNIT II   DRILLING PRACTICE

        a.   Drilling
        b.   Tapping
        c.   Reaming

UNIT III   MILLING

        a.   Surface Milling
        b.   Gear Cutting
        c.   Contour Milling

UNIT IV   PLANNING AND SHAPING

        a.   Cutting Key Ways
        b.   Dove tail machining.

Total : 45Hrs

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MCT 404   **MACHINE DYNAMICS LABORATORY**   **0 0 3 1**

LIST OF EXPERIMENTS

1.   Governors - Determination of sensitivity, effort, etc. for watt, porter, proell, Hartnell governors

2.   Cam - Study of jump phenomenon and drawing profile of the cam.

3.   Motorized Gyroscope-Determination of Gyroscopic couple Verification of Laws.

4.   Bifilar Suspension and Compound Pendulum – Determination of Moment of Inertia of Rod.

5.   Turn Table – Determination os Moment of Inertia of Disc and Ring.

6.   Epicyclic Gear Train Apparatus – Gear Ratio and Torques.

7   Balancing of rotating masses (Static and Dynamic Balancing)

8.   Balancing of reciprocating masses.

9.   A) Helical Spring – Natural Frequency of Longitudinal Vibrations

       B) Transverse Vibrations Verification of Dunkerley's Rule.

10.   Rotor Systems – Natural Frequency of Torsional Vibrations.

11.   A) Whirling of Shaft – Determination of Critical Speed

       B) Vibrating Table – Determination of Transmissibility Ratio.

Total : 45Hrs

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MCT 405   INDUSTRIAL ELECTRONICS LABORATORY   0 0 3 1

LIST OF EXPERIMENTS

1. Study of SCR, MOSFET & IGBT characteristics

2. UJT, R, RC firing circuits for SCR

3. Voltage & current commutated chopper

4. SCR / TRIAC phase control circuits

5. Study of half controlled & fully controller converters

6. Speed control of DC shunts motor using three phase fully controlled converter.

7. SCR single-phase cyclo converter

8. SCR series and parallel inverters

9. IGBT Chopper

10. IGBT based PWM inverter (single phase)

Total : 45 Hrs

Signature of the Chairman BOS MCE

GHE 104   HUMAN EXCELLENCE – PROFESSIONAL VALUES   0 0 2 1
(Syllabus for IV Semester)

1. Personality –Concepts, definitions -5 C's and 5 E's – Self development –Leadership Traits –IQ,EQ,SQ.

2. Time management-Practice –Cause and Effect –Professional Ethics –Values.

3. Quality Enhancement – Empowerment of mind – Passion for Excellence –Auto suggestions – Self control.

4. Simplified physical exercises.

5. Yoga Mudra

6. Pachi Motasana

7. Ustrasana

8. Vakkarasana

9. Salapasana

10. Meditation

Signature of the Chairman BOS MCE

KUMARAGURU COLLEGE OF TECHNOLOGY,

COIMBATORE – 641 006

(An Autonomous Institution affiliated to Anna University, Coimbatore)
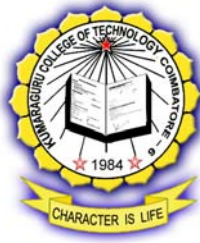
DEPARTMENT OF MECHATRONICS ENGINEERING

Minutes of Board of Studies Meeting (7th) of MCE

Meeting held at:
'B' Block Board Room/2.30 pm

20th November 2010

Updated on 25.04.2011

KUMARAGURU
COLLEGE OF TECHNOLOGY
COIMBATORE – 641 006
(An autonomous institution affiliated to Anna University, Coimbatore)

ISO 9001:2000
Certified

Department of Mechatronics Engineering

**KCT - Autonomous Activities
Mechatronics Engineering Course**

**Curriculum for
1st Semester - 8th Semester**

Mechatronics Engineering Curriculum
(Regulations 2009)

Kumaraguru College of Technology, Coimbatore -641 006.

(An autonomous institution affiliated to Anna University, Coimbatore)

Mechatronics Engineering Curriculum (Regulations 2009)

SEMESTER - I

Code No.	Course Title	L	T	P	C
THEORY					
ENG 101	Technical English	2	1	0	3
MAT 101	Engineering Mathematics – I	3	1	0	4
PHY 101	Engineering Physics	3	0	0	3
CHY 101	Engineering Chemistry	3	0	0	3
MEC 101	Engineering Graphics	2	0	3	3
CSE 101	Programming with 'C'	3	1	0	4
GHE 101	Personal Values-I	1	0	0	1
PRACTICAL					
PHY 401	Physics Laboratory	0	0	3	1
MEC 401	Engineering Practices Laboratory	0	0	3	1
CSE 401	Programming Laboratory	0	0	3	1

Total Periods = 32 **Total credit in 1ˢᵗ semester = 24**

SEMESTER - II

Code No.	Course Title	L	T	P	C
THEORY					
ENG 102	English For Pragmatic Usage	1	0	2	2
MAT 102	Engineering Mathematics – II	3	1	0	4
PHY 103	Materials Science	3	0	0	3
CHY 103	Applied Chemistry	3	0	0	3
MEC 102	Engineering Mechanics	3	1	0	4
ECE 280	Electronic Devices and Circuits	3	0	0	3
PRACTICAL					
CHY 401	Chemistry Laboratory	0	0	3	1
CSE 451	Advanced Programming Laboratory	0	0	3	1
ECE 480	Electronics Laboratory	0	0	3	1
GHE 102	Personal Values – II	0	0	2	1

Total Periods =31 **Total credit in 2ⁿᵈ Semester = 23**

SEMESTER III

Code No.	Course Title	L	T	P	C
THEORY					
MAT 104	Engineering Mathematics – III	3	1	0	4
MCT 101	Kinematics of Machinery	3	1	0	4
MCT 102	Engineering Materials and Metallurgy	3	0	0	3
MCT 103	Fluid Mechanics and Machinery	3	1	0	4
ECE 103	Digital Electronics	3	0	0	3
EEE 223	Electrical Machines and Drives	3	1	0	4
PRACTICAL					
MCT 401	Fluid Mechanics and Machinery Laboratory	0	0	3	1
EEE 421	Electrical Machines and Drives Laboratory	0	0	3	1
MCT 402	Computer Aided Machine Drawing Laboratory	0	0	3	1
GHE 103	Human Excellence - Family Values	0	0	2	1

Total periods = 33   **Total credits in 3rd Semester = 26**

SEMESTER IV

Code No.	Course Title	L	T	P	C
THEORY					
MAT108	Numerical Methods	3	1	0	4
CHY 107	Environmental Science and Engineering	3	0	0	3
MCT 104	Manufacturing Technology	3	0	0	3
MEC 109	Strength of Materials	3	1	0	4
MCT 105	Dynamics of Machinery	3	1	0	4
MCT 106	Industrial Electronics	3	0	0	3
PRACTICAL					
MCT 403	Manufacturing Technology Laboratory	0	0	3	1
MCT 404	Machine Dynamics Laboratory	0	0	3	1
MCT 405	Industrial Electronics Laboratory	0	0	3	1
GHE 104	Human Excellence - Professional Values	0	0	2	1

Total periods = 32   **Total credits in 4th Semester = 25**

SEMESTER V

Code No.	Course Title	L	T	P	C
THEORY					
MCT 107	Processes Control & Instrumentation	3	0	0	3
MCT 108	Micro Processors and Micro Controller	3	0	0	3
MCT 109	Control Systems	3	1	0	4
MCT 110	CNC Technology	3	0	0	3
MCT 111	Dimensional Metrology	3	0	0	3
MCT 112	Design of Machine Elements	3	1	0	4
PRACTICAL					
MCT 406	Instrumentation Laboratory	0	0	3	1
MCT 407	CAD/CAM Laboratory	0	0	3	1
MCT 408	Microprocessor & Microcontroller Laboratory	0	0	3	1
GHE 105	Human Excellence - Social Values	0	0	2	1

Total periods = 31   **Total credits in 5th Semester = 24**

SEMESTER VI

Code No.	Course Title	L	T	P	C
THEORY					
MCT 113	Sensors and Signal Processing	3	0	0	3
MCT 114	Applied Hydraulics and Pneumatics	3	0	0	3
MCT 115	Programmable Logic Controller	3	0	0	3
MCT 116	Thermodynamics and Heat Transfer	3	1	0	4
MCT 117	Virtual Instrumentation	3	0	0	3
E1*	Elective – I	3	0	0	3
PRACTICAL					
MCT 409	Hydraulics and Pneumatics Laboratory	0	0	3	1
MCT 410	Sensors and Signal Processing Laboratory	0	0	3	1
ENG 401	Communication Skill Laboratory	0	0	3	1
GHE 106	Human Excellence - National Values	0	0	2	1

Total periods = 30   **Total credits in 6th Semester = 23**

Code No.	Course Title	L	T	P	C
THEORY					
MCT 118	Robotics and Machine Vision System	3	0	0	3
MCT 119	Automotive Electronics	3	0	0	3
MCT 120	Design of Mechatronics System	3	0	0	3
MCT 121	Computer Integrated Manufacturing	3	0	0	3
E2**	Elective – II	3	0	0	3
E3***	Elective – III	3	0	0	3
PRACTICAL					
MCT 411	Robotics Laboratory	0	0	3	1
MCT 412	Process Control & Simulation Laboratory	0	0	3	1
MCT 413	Industrial Training / Mini Project#	0	0	2	1
GHE 107	Human Excellence - Global Values	0	0	2	1

 # Students are required to complete one industrial training either at the end of 4th semester or 6th semester
Total periods = 32   Total credits in 7th semester = 22

SEMESTER VIII

Code No.	Course Title	L	T	P	C
THEORY					
E4****	Elective – IV	3	0	0	3
E5*****	Elective – V	3	0	0	3
E6******	Elective – VI	3	0	0	3
PRACTICAL					
MCT 414	Project Work	0	0	18	6

Total periods = 27   Total credits in 8th Semester = 15

Semester	CREDITS		
	Theory	Lab	Total
First Semester	21	03	24
Second Semester	19	04	23
Third Semester	22	04	26
Fourth Semester	21	04	25
Fifth Semester	20	04	24
Sixth Semester	19	04	23
Seventh Semester	18	04	22
Eighth Semester	09	06	15
TOTAL			**182**

LIST OF ELECTIVES
ELECTIVES FOR SEMESTER VI
*ELECTIVE I

Code No.	Course Title	L	T	P	C
GSS 101	Professional Ethics	3	0	0	3
GSS 108	Operations Research	3	0	0	3
MCT 140	Embedded System Design	3	0	0	3
MCT 141	Plant Layout and Material Handling	3	0	0	3

ELECTIVES FOR VII SEMESTER
**ELECTIVE II & ***ELECTIVE III

Code No.	Course Title	L	T	P	C
MCT 142	Modeling and Simulation	3	0	0	3
MCT 143	Production Planning Control	3	0	0	3
MCT 144	Product Design and Development	3	0	0	3
MCT 145	Digital Signal Processing	3	0	0	3
MCT 146	Introduction to Finite Element Analysis	3	0	0	3
MCT 147	Statistical Quality Control	3	0	0	3
MCT 148	Digital Image Processing	3	0	0	3
MCT 149	Marketing Management	3	0	0	3
MAT 106	Probability and Applied Statistics	3	1	0	4
GSS 102	Principles of Management	3	0	0	3

ELECTIVES FOR VIII SEMESTER
ELECTIVES FOR IV ,V & VI

Code No.	Course Title	L	T	P	C
MCT 150	Computer Networks	3	0	0	3
MCT 151	Total Productive Maintenance Management	3	0	0	3
MCT 152	Rapid Prototyping	3	0	0	3
MCT 153	Unconventional Machining Processes	3	0	0	3
MCT 154	Micro Electro Mechanical Systems	3	0	0	3
MCT 155	Renewable Energy Sources	3	0	0	3
MCT 156	Medical Mechatronics	3	0	0	3
MCT 157	Intellectual Property Rights (IPR)	3	0	0	3
MCT 158	Artificial Intelligence	3	0	0	3
GSS 103	Total Quality Management	3	0	0	3
GSS 105	Entrepreneurship Development	3	0	0	3
GSS 106	Governance in India	3	0	0	3
GSS 107	Indian Economy	3	0	0	3

MCT 107   PROCESS CONTROL AND INSTRUMENTATION   3 0 0 3

Objectives:

- To study the basic characteristics of first order and higher order processes.
- To study about temperature, displacement, force and torque measurement.
- To study pressure, flow and level measurements.
- To get adequate knowledge about the characteristics of various controller modes and methods of tuning of controller.
- To study about the construction, characteristics and application of control valves.

UNIT I   GENERAL CONCEPTS OF MEASUREMENT   9 hrs

Generalized Measurement System – Performance Characteristics – Static and Dynamic Characteristics – Errors in Measurements – Calibration and Standards – Generalized Performance of Zero Order, First Order and Second Order Systems – Classifications of Transducers.

UNIT II   TEMPERATURE, DISPLACEM.ENT, FORCE, TORQUE
**   MEASUREMENT   9 hrs**

Filled Thermometers – RTD – Thermistor, Thermocouple, Non Contact Total Radiation Pyrometer – Optical Pyrometer. Load Cells – Different Types -Strain Gauges Resistive and Semiconductor – Different Forms – Measurement Circuit- LVDT Characteristics- Piezo Electric Transducer – Different Types – Characteristics.

UNIT III   PRESSURE, FLOW AND LEVEL MEASUREMENTS   9 hrs

Pressure Measurement: Manometers – Elastic Transducers – Bourdon Gauge – bellows – diaphragm – Calibration of Pressure Gauge using Dead Weight Testers. Vacuum Measurement: McLeod Gauge, Thermal Conductivity Gauge – Ionization Gauge. Flow Measurement: Orifice, Venturimeter, Turbine Flow meter, Hot wire Anemometer. Level Measurement: Float Level, surge type, Differential Pressure Type, Electrical Type- Resistance and Capacitance.

UNIT IV   PROCESS CONTROL   9 hrs

Need for process control-process variables-dynamics of simple pressure, flow, level & temperature processes - basic control actions - characteristics of on off , proportional, integral and derivative control modes - PI, PD and PID control modes - feed forward control - ratio control - cascade control - inferential control - selective control - split range control - adaptive control.

UNIT V   CONTROLLERS AND FINAL CONTROL ELEMENT   9 hrs

Pneumatic and Electronic PID Controllers - Pneumatic Two Step Controller – Electric actuators-solenoid valves, construction and working of stepper motor, servo motor.

**   TOTAL: 45 Hrs**

TEXT BOOKS:
1. Ernest O. Doebelin, "Measurement Systems Application and Design", McGraw-Hill, Fifth Edition, 2004.
2. Beckwith, T.G. and Buck, N.L. "Mechanical Measurements" Addition Wesley Publishing Company Limited, 1995.

REFERENCES:

1. Sawney, A.K. and Puneet Sawney, "A course in Mechanical Measurements and Instrumentation and Control," 12th edition, Dhanpat Rai & Co, New Delhi, 2001.
2. Jain R.K. "Mechanical and Industrial Measurements" Khanna, Delhi, 1984.
3. C.S. Rangan, G.R. Sharma, VSV.Mani, "Instrumentation Devices and Systems", 2nd edition, Tata McGraw-Hill, 2002.
4. Liptak .B.G, 'Process control instrument engineers' Handbook, Third edition, Butterworth and Heinemann, 1995.
5. DVS Murthy "Transducers and Instrumentation Printing Hall of India", New Delhi, 2003
6. Stephanopoulis.G, "Chemical process control", Prentice Hall of India, New Delhi, 8th Edition 2009.
7. D.S. Kumar "Mechanical Measurement & Control" 4th Edition , Metro politon Book, New Delhi

MCT 108   MICROPROCESSOR AND MICROCONTROLLER   3 0 0 3

Objectives:

- To study about the 8085 Microprocessor
- To study about data transfer methods
- To study about the peripheral devices
- To emphasize the basics of 8086 Microprocessor.
- Explains about the application of 8051

UNIT I   8085 MICROPROCESSOR   9 hrs

Organization of Micro Computers – Organization of 8085: Architecture, Internal Register Organization and Pin Configuration – Instruction Set of 8085 – addressing modes - instruction and machine cycles with states and timing diagram - 8085 assembly language programming.

UNIT II   INTERFACING AND I/O DEVICES   9 hrs

Need for Interfacing – Memory Interfacing: address space partitioning – address map – Address decoding – Designing decoder circuit for the given address map – Bus connection and 2 line Control – Access Time Computations. I/O Interfacing: Data transfer schemes – programmed Synchronous and asynchronous – Interrupt driven Transfer – Multiple devices and multiple interrupt levels – enabling disabling and masking of interrupts. DMA transfer: Cycle stealing – Burst mode – Multiple DMA devices –serial data transfer.

UNIT III   DESIGN USING PERIPHERAL DEVICES   9 hrs

Interfacing A/D and D/A converters – Matrix Keyboard design using 8255 using 8085 programs – Design of Keyboard and display interfacing using 8279 – Design of digital transmission with modems and telephone lines using 8251 A.

UNIT IV   8051 ARCHITECTURE   9 hrs

Microcontroller Hardware – I/O Pins, Ports – External memory – Counters and Timers – Serial data I/O – Interrupts – 8051 Assembly Language Programming: Instruction set of 8051, Addressing modes, Data transfer instructions, Arithmetic and Logical Instructions, Jump and Call Instructions, interrupts and returns interrupts and returns interrupt handling.

UNIT V   APPLICATIONS   9 hrs

Applications of 8051 Microcontroller: Interfacing of Keyboards – Interfacing of Display Devices – Pulse measurement – Analog to Digital and Digital to Analog Converter – Interfacing Hardware Circuit – Multiple interrupts – Serial Data Communication – Network Configuration - Introduction to 8086 Microprocessor.

TOTAL: 45 Hrs

TEXT BOOKS:

1. Ramesh Goankar, "Microprocessor Architecture. Programming and Applications with the 8085", 5th edition- Penram International (India).
2. Kennath J. Ayala, "The 8051 Microcontroller Architecture, Programming and Applications", 2nd edition, Penram International (India), Mumbai.

REFERENCES:

1. Aditya P Mathur, "Introduction to Microprocessor", 3rd edition, Tata McGraw Hill, New Delhi 2003
2. B.P. Singh, "Microprocessors and Microcontrollers", 1st Edition, Galgotia, New Delhi, 1997.
3. Embedded Controller Hand book, Intel Corporation, USA.
4. Microcontroller Hand Book, INTEL, 1984.

MCT 109   **CONTROL SYSTEMS**   **3 1 0 4**

Objective:
- To study the open loop and closed loop systems.
- To study time response of first and second order systems and basic state variable analysis and to do simple problems.
- To study the concept of stability and criteria for stability and to do simple problems.
- To study the frequency response through polar plots and Bode plots and Nyquist stability criteria and to do simple problems.
- To study the compensation technique that can be used to stabilize control systems.

UNIT I   SYSTEMS AND THEIR REPRESENTATION   9+3 hrs

Basic elements in control systems – open and closed loop systems Examples – Mathematical model, Translational & Rotational systems – transfer function – block diagram reduction techniques – signal flow graph. Introduction to AC & DC Servo motors and Stepper motors.

UNIT II   TIME RESPONSE   9+3 hrs

Time response – time domain specifications – types of test inputs – I and II order system response – error coefficients – generalized error series – steady state error.

UNIT III   FREQUENCY RESPONSE ANALYSIS AND DESIGN   9+3 hrs

Performance specifications – correlation to time domain specifications – Bode plots and polar plots – gain and phase margin.

UNIT IV   STABILITY OF CONTROL SYSTEMS   9+3 hrs

Characteristic equation – location of roots in s-plane for stability – Routh Hurwitz criterion – root locus techniques – construction – gain margin and phase margin – Nyquist stability criterion.

UNIT V   COMPENSATION DESIGN   9+3 hrs

Design concepts – realization of basis compensation using Bode plot – cascade compensation in frequency domain - simple software applications to analysis and compensators design problems.

TOTAL : 60 Hrs

TEXT BOOKS
1. I.J Nagrath, Madan Gopal , "Control Systems Engineering" New Age International, 5th Edition,2009
2. Katsuhiko Ogata, "Modern Control Engineering", 4th Edition, Pearson Education, 2002 (ISBN 81-7808-579-8)
3. Gopal M, "Control System Principles and Design", Tata McGraw-Hill, 1998

REFERENCES

1.   Chesmond C.J. "Basic Control System Technology", Viva Low Priced Student   Edition, 1998.
2.   Datton K., Banaclough W. and Thompson S., "The Art of Control Engineering", Addison Wesley 2000.
3.   Dorf R.C. and Bishop R.H., "Modern Control systems", Addison – Wesley, 1995
4.   Leonard N.E. and William Levine, "Using MATLAB to Analyze and Design Control Systems", Addison Wesley, 1995.

MCT 110   **CNC TECHNOLOGY**   **3 0 0 3**

Objective:
CNC machining is one of the widely accepted machining methods in industries
- To study the fundamentals of CNC machines
- To study the features of CNC Machines and Retrofitting
- To study about types of measuring systems in CNC machines
- To study about the maintenance features of CNC Machines

UNIT I   FUNDAMENTALS OF CNC MACHINES   9 hrs

Introduction to Computer Numerical Control: CNC Systems – An Overview of Fundamental aspects of machine control, Different types of CNC machines – Advantages and disadvantages of CNC machines- DNC and Adaptive control

UNIT II. CONSTRUCTIONAL FEATURES OF CNC MACHINES AND RETROFITTING   9 hrs
Features of CNC Machines: Structure, Drive Mechanism, gearbox, Main drive, feed drive, Spindle Motors, Axes motors. Spindle bearing – Arrangement and installation. Slide ways. Recirculating ball screws – Backlash measurement and compensation, linear motion guide ways. Tool magazines, ATC, APC, Chip conveyors. Retrofitting of Conventional Machine Tools.

UNIT III CONTROL SYSTEMS, FEED BACK DEVICES AND TOOLING   9 hrs
Description of a simple CNC control system. Interpolation systems. Features available in a CNC system – introduction to some widely used CNC control systems.
Types of measuring systems in CNC machines – Incremental and absolute rotary encoders, linear scale – resolver – Linear inductosyn – Magnetic Sensors for Spindle Orientation.
Qualified and pre-set tooling – Principles of location – Principles of clamping – Work holding devices.

UNIT IV CNC PART PROGRAMMING   9 hrs
Part Program Terminology- G and M Codes – Types of interpolation Methods of CNC part programming – Manual part programming: Fixed cycle, canned cycle – Computer Assisted part programming – APT language – CNC part programming using CAD/CAM-Introduction to Computer Automated Part Programming.

UNIT V ECONOMICS AND MAINTENANCE   9 hrs

Factors influencing selection of CNC Machines – Cost of operation of CNC Machines – Practical aspects of introducing CNC machines in industries – Maintenance features of CNC Machines – Preventive Maintenance, Other maintenance requirements.

TOTAL: 45hrs

TEXT BOOKS:
1. Radhakrishnan P., Computer Numerical Control Machines, New Central Book Agency, 2003.
2. Groover, M.P., Automation, Production Systems and Computer Integrated Manufacturing, Prentice Hall, 2007.

REFERENCES:
1. Yorem Koren, "Computer Control of Manufacturing Systems", Pitman, London, 1987.
2. Berry Leatham – Jones, "Computer Numerical Control", Pitman, London, 1987.
3. Steave Krar and Arthur Gill, "CNC Technology and Programming", McGraw Hill, 1990.
4. Hans B. Kief and T. Fredrick Waters, "Computer Numerical Control", Macmillan/McGraw-Hill, 2000.
5. Thyer, G.E., "Computer Numerical Control of Machine Tools", 2nd edition, B/H NEWNES, 1993.
6. Mike Mattson, "CNC Programming", Thomson Learning, 2003.

MCT 111   **DIMENSIONAL METROLOGY**   **3 0 0 3**

Objective:
- To understand the principle of Dimensional metrology
- To learn about Metrology instruments and application for various measurements
- To introduce concept of computer applications in Metrology
- To apply the principles, techniques and devices used for quality control in modern Industrial environment

UNIT I LINEAR METROLOGY   **9 hrs**

Definition of metrology – Linear measuring instrument : Vernier, micrometer measurement, dial indicator, Slip gauges and classification, interferometer, optical flats - limit gauges, Comparators - Mechanical, pneumatic, optical and electric types, applications

UNIT II ANGULAR METROLOGY   **9 hrs**

 Sine bar, Vernier bevel protractor, optical bevel protractor, auto collimator, angle gauges, Clinometer, angle Decker – taper measurements.

UNIT III   SCREW THREAD AND GEAR METROLOGY   **9 hrs**

Screw thread terminology –Measurement of various elements of Thread-Measurement of Major and minor diameter-Measurement of Thread angle by Two Ball Method-Pitch Measurement.

Types of Gear-Gear Terminology-Spur gear measurement -Run out ,Pitch ,Concentricity ,profile ,lead ,alignment ,Back lash- Chordal thickness Method-Constant chord method-Parkinson gear tester

UNIT IV   SURFACE MEASUREMENT   **9 hrs**

Surface evaluation, Stylus method, Numerical values for surface assessment, Surface texture specimens, straightness, flatness and roundness measurement.

5. ADVANCED TECHNIQUES IN METROLOGY   **9 hrs**

Coordinate measuring machine – constructional features – types and application, digital devices – computer aided inspection — machine vision systems, Profile projector, Universal Measuring Machine, Laser principles – Laser interferometer – application in linear, angular measurement and machine tool metrology.

                                                                TOTAL: 45 Hrs

TEXT BOOKS:
1. Jain. R K "Engineering Metrology" Khanna Publishers, 2009.
2. Manohar Mahajan, "A textbook of Metrology", Dhanpat Rai & Co (P) LTD.,2008

REFERENCES:

1. Alan S. Morris " The Essence of Measurement" Prentice Hall of India, 1997
2. Connie Dotson, Ronger Harlow and Richard L Thomson, "Fundamentals of Dimensional Metrology", 4th edition, Thompson – Delmar, 2006.
3. Gupta S C "Engineering Metrology "Dhanpat Rai Publications.

MCT 112   **DESIGN OF MACHINE ELEMENTS**   **3 1 0 4**
         (Use of approved design data book is permitted)

Objective:
- To understand the different design concepts.
- To enable the students to understand the considerations in design such that the functional and strength requirements are satisfied.
- To learn the evaluation and design of Simple Machine Components.
- To understand different types of welded joints.
- To understand the concept of friction, contact types in designing bearing

UNIT I   STEADY STRESSES AND VARIABLE STRESSES IN MACHINE   MEMBERS

11+3 hrs

Introduction - factor influencing machine design, selection of materials based on mechanical properties – Direct, Bending and torsional stress equations – Impact and shock loading – calculation of principal stresses for various load combinations, eccentric loading – Design of curved beams – crane hook and 'C' frame - Factor of safety - theories of failure – stress concentration – design for variable loading – Soderberg, Goodman and Gerber relations.

UNIT II   SHAFTS AND COUPLINGS   **7+3 hrs**

Design of solid and hollow shafts based on strength, rigidity - critical speed – keys and key ways – design of muffle and knuckle joints - Design of rigid and flexible couplings – shock absorbing couplings.

UNIT III   FASTNERS AND WELDED JOINTS   **9+3hrs**
Threaded fasteners - Design of bolted joints including eccentric loading – Design of welded joints for pressure vessels and structures - theory of bonded joints.

UNIT IV   SPRINGS AND LEVERS   **9+3 hrs**
Design of helical, leaf, disc and torsional springs under constant loads and varying loads – Concentric torsion springs   - Belleville springs – Design of Levers.

UNIT V   BEARINGS AND FLYWHEELS   **9+3 hrs**
selection of bearings and – sliding contact and rolling contact - types. – Cubic mean load – Design of journal bearings – Mckees equation – Lubrication in journal bearings – calculation of bearing dimensions – Design of flywheels involving stresses in rim and arm.

         TOTAL: 60Hrs
Note: *(Use of P S G Design Data Book is permitted in the University examination)*

TEXT BOOKS:
1. Joseph Edward Shigley and Charles R.Mischke, "Mechanical Engineering Design", 6th Edition, McGraw-Hill International Edition
2. Sundarajamoorthy.T.V,Shanmugam.N,"Machine Design", Khanna Publishers
3. Prabhu.T.J,"Fundamentals of Machine Design" Bharat Institute or Science and Technology

REFERENCES:

1. Juvinall, R.C. and Marshek, K.M, "Fundamentals of Machine Component Design", 3rd edition, John Wiley & Sons
2. Bhandari, V.B, "Design of Machine Elements", Tata McGraw-Hill
3. Norton, R.L, "Design of Machinery", Tata McGraw-Hill
4. Orthwein, W., "Machine Component Design", Jaico
5. Ugural, A.C., "Mechanical Design – An Integral Approach", McGraw-Hill
6. Patil, R.B, "Design of Machine Elements", Tech-Max

MCT 406   **INSTRUMENTATION LABORATORY**   **0 0 3 1**

OBJECTIVE

- To correlate the concepts studied in the instrumentation and control subject for the real world applications.
- To understand the concept of controlling the parameters based on measurement.

LIST OF EXPERIMENTS

1. Calibration of pressure gauge using dead weight pressure gauge tester
2. Calibration of vacuum sensor using vacuum measurement set-up
3. Measurement of temperature using thermocouple, RTD and thermistor and Speed Measurement using Stroboscope
4. Measurement of efficiency of Temperature distribution along the furnace
5. Force measurement using proving ring and load cell
6. Torque measurement using strain gauge
7. Power measurement using Prony-brake dynamometer
8. Strain measurement using strain gauge
9. Displacement measurement using LVDT
10. Speed measurement and control of DC servo motor using PI controller
11. Noise measurement using sound-level meter

TOTAL: 45 Hrs

LIST OF EQUIPMENTS

1. Vacuum measurement set-up
2. Prony-brake dynamometer with motor and accessories
3. Temperature measuring devices – thermocouple, RTD and thermistor.
4. Speed measurement system with accessories
5. DC-servo motor with PI controller interface
6. Digital sound-level meter
7. Dead weight pressure gauge tester
8. Displacement measurement set-up – LVDT
9. Strain measurement set-up
10. Torque measurement set-up
11. Force measurement set-up with load cell and proving ring

MCT 407   **CAD/CAM LABORATORY**   **0 0 3 1**

Objective:

- To study the various commands used in PRO E software.

- To study drafting and assembly through PRO E software for various machine components

COMPUTER AIDED DESIGN AND ANALYSIS LAB

LIST OF EXPERIMENTS

1. Solid modeling using SOLIDWORKS / ProE / CATIA / IDEAS software of given components / product assemblies (at least 2 components/product assemblies)
2. Analysis of engineering problems using FEA package (any 2 components)

LIST OF EQUIPMENTS

1. Any CAD software
2. Any FEA software

COMPUTER AIDED MANUFACTURING LAB

LIST OF EXPERIMENTS

1. Manual part programming using G and M codes for turning, step turning, taper turning and thread cutting and radius turning on cylindrical components.
2. Given a component drawing to write the manual part programming and execute on CNC Milling Machine.
3. Generation of NC codes and simulation of tool path using Master CAM software.
4. Post processing of NC code file for various controllers(FANUC, SINUMERIC)

LIST OF EQUIPMENTS

1. CNC Lathe
2. CNC Milling Machine
3. Master CAM software EDGECAM software
4. Computer nodes

TOTAL: 45Hrs

MCT 408   MICROPROCESSOR AND MICROCONTROLLER LABORATORY

0 0 3 1

Objectives:
- To experimentally understand the operation of Intel 8085 microprocessor and 8051 microcontroller.
- To realize the interfacing concepts with 8255, 8279.

LIST OF EXPERIMENTS

I.   PROGRAMMING   **30 hrs**

1.   Addition and subtraction of two 8-bit numbers in 8085 & 8051.
2.   Addition of 16 bits numbers in 8085 & 8051.
3.   To arrange a series of numbers in Ascending order and Descending order in 8085.
4.   8-bit Multiplication in 8085 & 8051.
5.   8-bit Division in 8085 & 8051.
6.   Decimal to hexadecimal conversion and hexadecimal number to decimal number conversion in 8085.

II.   INTERFACING   **15 hrs**

1.   Analog to digital conversion in 8085.
2.   Digital to analog conversion in 8085.
3.   Stepper motor controller in 8051.
4.   DC motor controller interface using 8051.

TOTAL: 45Hrs

Syllabus for V Semester

1. Evolution of man – Man in society.

2. Duties and Responsibilities, Duty to self, family, society and the world.

3. Disparity among human beings.

4. Social welfare – Need for social welfare – Pure mind for pure society.

5. Politics and society – Education and society-Case study and live examples.

6. Impact of science in society - social development & society upliftments by science.

7. Economics & society – role of economics in creating a modern society.

8. Central message of Religions.

9. Yogasanas-I

10. Meditation-II.[Thuriatheetham]

MCT 113   SENSORS AND SIGNAL PROCESSING   3 0 0 3
Objectives:

- To know about the types of transducers available.
- To understand the function of signal generators and analyzers.
- To gain information about the function of various measuring instruments and display and recording systems and the methods of using them.

UNIT I   SENSORS AND TRANSDUCERS   9 hrs

Sensors and classifications – Characteristics environmental parameters – Selection and specification of sensors – Ultrasonic sensors, Sound sensor – sound level meter, microphone – types, jerk pickups, Humidity sensor, and Nuclear radiation sensor – types, Rosettes.

UNIT II   SMART SENSORS   9 hrs

Introduction - primary sensors, characteristic, Information coding / processing, Data communication - Recent trends in sensors and Technology - Film sensor, MEMS and Nano Sensors.

UNIT III   SIGNAL CONDITIONING   9 hrs

Amplification, Filtering – Level conversion – Linearization - Buffering – Sample and Hold circuit – Quantization – Multiplexer / Demultiplexer – Analog to Digital converter – Digital to Analog converter- I/P and P/I converter - Instrumentation Amplifier-V/F and F/V converter.

UNIT IV   DATA ACQUISITION   9 hrs

Data Acquisition conversion-General configuration-single channel and multichannel data acquisition – Digital filtering – Data Logging – Data conversion – Introduction to Digital Transmission system.

UNIT V   DISPLAY DEVICES AND RECORDERS   9(hrs)

Digital Display methods and units – Segmental Displays – DOT matrices – LED, LCD – Resolution and Sensitivity of Digital meters – Recorders – Recording requirements – Analog recorders, Graphic recorders, X-Y recorders – Magnetic tape recorders – Digital tape recorders – CRO, CRT.

TOTAL: 45 Hrs

TEXT BOOKS:

1. Patranabis. D, "Sensors and Transducers", 2nd edition, PHI, New Delhi, 2003.
2. Ernest O. Doebelin, "Measurement Systems – Applications and Design", Tata McGraw-Hill, 2009.

REFERENCES:

1. David G. Alciatore and Michael B. Histand, "Introduction to Mechatronics and Measurement systems", 2nd edition Tata McGraw-Hill, 2003.
2. A.K.Sawney and Puneet Sawney, "A Course in Mechanical Measurements and Instrumentation and Control", 12th edition, Dhanpat Rai & Co, New Delhi, 2001.
3. C.S. Rangan, G.R. Sharma, VSV.Mani, "Instrumentation Devices and Systems", 2nd edition, Tata McGraw-Hill, 2002.

MCT 114   **APPLIED HYDRAULICS AND PNEUMATICS**   **3 0 0 3**

Objective:
- This course aims to provide basic concepts and various components in fluid power systems.
- It deals about the application and low cost automation in industries.

UNIT I FLUID POWER SYSTEMS AND FUNDAMENTALS   6 hrs

Introduction to fluid power, Advantages of fluid power, Application of fluid power system. Types of fluid power systems, Properties of hydraulic fluids – General types of fluids. Fluid power symbols.

UNIT II HYDRAULIC SYSTEM AND COMPONENTS (PUMPS and ACTUATORS) 9 hrs

Pumping theory – Pump classification – Gear pump, Vane Pump, piston pump, construction and working of pumps – pump performance – Variable displacement pumps.
Linear hydraulic actuators – Types of hydraulic cylinders – Single acting, Double acting special cylinders like tandem, Rodless, Telescopic - Construction and application. Cushioning mechanism, Rotary actuators -   Gear, Vane and Piston motors.

UNIT III HYDRAULIC VALVES, ACCUMULATORS AND CIRCUITS   10 hrs
hrs
Directional control valve – 3/2 way valve – 4/2, 4/3 way valve – Shuttle valve – check valve. Pressure control valves, Flow control valve – Fixed and adjustable, electrical control solenoid valves.
Types of accumulators, Accumulators circuits, Intensifier – Circuit and Application, Speed control circuits, synchronizing circuit and industrial application circuits – copying circuit and press circuit.

UNIT IV PNEUMATIC SYSTEMS, COMPONENTS AND CIRCUITS   10 hrs

Properties of air – Compressors – Filter, Regulator, and Lubricator Unit – Air control valves, Quick exhaust valves and pneumatic actuators.
Pneumo hydraulic circuit, Sequential circuit design for simple applications using cascade and step counter method.

5. FLUID LOGIC CONTROL SYSTEMS AND MAINTENANCE   10 hrs

Hydro Mechanical servo systems, Electro-hydraulic and Electro-pneumatic systems and proportional valves.
Logic and switching controls - PLC applications in fluid power control, Maintenance - Failure and trouble shooting in fluid power systems.

TOTAL 45 Hrs

TEXT BOOKS:

1. Anthony Esposito, "Fluid Power with Applications", Pearson Education Inc., 2009.
2. Majumdar S.R., "Pneumatic systems – Principles and maintenance", Tata McGraw-Hill, 2009.

REFERENCES:

1. Michael J. Pinches and John G. Ashby, "Power Hydraulics", Prentice-Hall, 1989.
2. Andrew Parr, "Hydraulics and Pneumatics (HB)", Jaico Publishing House, 2005.
3. James A. Sullivan, "Fluid Power: Theory and Applications", 4th edition, C.H.I.P.S, 2007.

MCT 115   PROGRAMMABLE LOGIC CONTROLLER   3 0 0 3

Objective:

- To explain the operation of relays, pushbuttons, limit switches, and other basic control devices.
- Using ladder diagrams, design basic motor control circuits.
- Describe the hardware of a PLC, identifying the functions of the main components.
- To explain the PLC programs to perform specified discrete sequential control operations.
- Configure a PLC, including choosing appropriate addressing for I/O for a specified application.

UNIT I   INTRODUCTION   9 hrs

Programmable controller – need for PLC – modular PLC and fixed PLC – block diagram of PLC – input and output modules – power supply – types of PLC system.

UNIT II   HARDWARE MODULES   9 hrs

CPU – processor's function – processor's operating system – processor ports –interfacing PC to PLC – processor operating modes – PLC system memory and application memory – input modules – output modules – module selection – PLC internal operation and signal processing – input and output processing – timing consideration.

UNIT III   PROGRAMMING OF PLC SYSTEM   9 hrs

Introduction to IEC 61131 - System functions – sequence control – ladder logic – programming sequences – limitation of ladder programming – logic instruction sets – standard PLC functions – special function relays – data handling instructions – arithmetic instructions – data manipulation – program subroutines – programming examples.

UNIT IV   PLC COMMUNICATION AND DCS   9 hrs

PLC communication ports – serial communications – RS232 – standard requirements – communication between several PLCs – PLC field bus - Manufacturing Automation Protocol (MAP) – Technical Office Protocol (TOP) - Distributed control system (DCS) – building blocks – descriptions and functions of field controlled units – operator stations – data highways – redundancy concepts – DCS system integration with PLC and computers – communication in DCS.

UNIT V   APPLICATIONS AND PLC MAINTENANCE   9 hrs

PLC as robot controller and FMS – PLC to factory automation – PLC in process control – PLC maintenance – internal PLC faults – faults external to PLC – programmed error – watch dogs – safety – hardware safety circuits – troubleshooting.

TOTAL: 45 Hrs

TEXT BOOKS:

1. Frank D. Petruzella, "Programmable Logic Controllers", McGraw-Hill Companies, Third Edition, March 2004.
2. Lukcas M.P., "Distributed Control Systems", Van Nostrand Reinhold Co., New York, 1986.

REFERENCES:

1. Ian G.Warnock, "Programmable Controllers Operation and Application", Prentice Hall International, UK, 1992.
2. John W. Webb and Ronald A.Reis, "Programmable Logic Controllers – Principles and Applications", III Edition, Prentice Hall Inc., New Jersey, 1995.
3. Krishnakant , "Computer Based Industrial Control", Prentice Hall of India, 1997.

MCT116   **THERMODYNAMICS AND HEAT TRANSFER**   **3 1 0 3**
Use of approved steam tables and charts are permitted.
Use of approved heat and mass transfer data book is permitted

UNIT I   LAWS OF THERMODYNAMICS   9+3 hrs

Systems-closed and open systems –properties, processes and cycles- equilibrium- work and heat transfers-first law for a closed system and flow processes - enthalpy - second law –entropy- entropy change- reversibility.

UNIT II   AIR-STANDARD CYCLES   9+3 hrs

Air standard cycles: Carnot cycle - Otto cycle - Diesel cycle - Brayton cycle - Rankine cycle- cycle efficiency - two stroke and four stroke engines - SI, and CI engines.

UNIT III   HEAT TRANSFER : CONDUCTION   9+3 hrs

Basic Concepts- Mechanism of Heat Transfer - Conduction, Convection and Radiation - Fourier Law of Conduction - General Differential equation of Heat Conduction -Cartesian and Cylindrical Coordinates - One Dimensional Steady State Heat Conduction - Conduction through Plane Wall, Cylinders and Spherical systems.

UNIT IV   CONVECTION AND RADIATION   9+3 hrs

Convection: Basic Concepts –Heat Transfer Coefficients – Boundary Layer Concept – Types of Convection – Forced Convection – External Flow and Internal Flow – Flow over Plates, Cylinders and Spheres
 Radiation: Basic Concepts, Laws of Radiation – Stefan Boltzman Law, Kirchoffs Law –Black Body Radiation –Grey body radiation -Shape Factor Algebra – Electrical Analogy

UNIT V   MASS TRANSFER   9+3 hrs

Basic Concepts – Diffusion Mass Transfer – Fick's Law of Diffusion – Steady state Molecular Diffusion – Convective Mass Transfer – Momentum, Heat and Mass Transfer Analogy – Convective Mass Transfer Correlations

                                                                   TOTAL:60 hrs

TEXT BOOKS
1. Yunus A. Cengel and Michael A Boles, "Thermodynamics – An Engineering Approach, in SI Units", 5th edition, Tata McGraw Hill, New Delhi, 2006.
2. CP.Kothandaraman, S.Subramanya, " Fundamentals of Heat and Mass Transfer" 3rd edition, New Age International Publishers, New Delhi, India, 2008.

REFERENCES
1. Nag P. K, 'Engineering Thermodynamics' 4th edition Tata McGraw-Hill, 2008.
2. Eastop, T. D. and McConkey, "Applied Thermodynamics for Engineering Technologists", 5th Edition, Pearson, New Delhi, 2004.
3. C. P. Kothandaraman, S. Domkundwar and A.V.Domkundwar, "A course in Thermal Engineering" Dhanpatrai & Co, 5th edition, 2000.
4. Frank P. Incropera and David P. DeWitt, "Fundamentals of Heat and Mass Transfer", 5th edition, John Wiley, Singapore, 2006.

MCT 117   VIRTUAL INSTRUMENTATION   3 0 0 3
Objectives:

- To review background information required for studying virtual instrumentation.
- To study the basic building blocks of virtual instrumentation.
- To study the programming techniques.
- To study the data acquisition and instrument control in virtual instrumentation
- To study the various techniques of interfacing of external instruments of PC.
- To study a few applications in virtual instrumentation.

UNIT I   INTRODUCTION   9 hrs

Historical perspective of traditional benchtop instruments, Architecture of Virtual Instrumentation -Advantages of Virtual Instrumentation over conventional instruments -Sequencing - data flow- Graphical programming concept.

UNIT II   SOFTWARE ENVIRONMENT   9 hrs

Introduction to VI software - Front panel - Block diagram - Icon and Connector – Palettes - Creating, editing, wiring, debugging and saving VIs - sub-VIs - creating sub-VIs - simple examples - Looping: For loop, while loop - Shift registers.

UNIT III   PROGRAMMING TECHNIQUES   9 hrs

Case and sequence structures, formula nodes, Arrays-clusters, charts and graphs, local and global variables - property node, string and file I/O.

UNIT IV   DATA ACQUISITION AND INSTRUMENT CONTROL   9 hrs

DAQ - Components - Buffers: Buffered and non buffered I/O – Triggering - Analog I/O, Digital I/O-Counters and timers-Instrument control: VISA**,** GPIB, PXI.

UNIT V   APPLICATIONS OF VIRTUAL INSTRUMENTATION   9 hrs

Process control- Physical- Biomedical- Image acquisition and processing.

TOTAL : 45 Hrs

TEXT BOOKS:

1. Sanjeev Gupta, "Virtual Instrumentation using Labview" Tata McGraw Hill, 2004.
2. Gary Johnson, "Lab view graphical programming", II Ed., McGraw Hill, 1999.

REFERENCES:

1. Lisa K Wells & Jeffrey Travels, "Lab view for everyone", Prentice Hall, 2003.

2. Jovitha Jerome "Virtual Instrumentation using Lab View" PHI Learning Pvt. Ltd, 2009.

MCT 409 **HYDRAULICS AND PNEUMATIC LABORATORY** **0 0 3 1**

Objective:
> Expose the students to technology of generation, control and transmission of power using pressurized fluids, with hands on training.

LIST OF EXPERIMENTS

1. Design and testing of the following hydraulic circuits:
   i) Pressure control
   ii) Flow control
   iii) Sequential circuit using an Electro hydraulic Trainer kit.
2. Design and testing of the following pneumatic circuits:
   i) Pressure control
   ii) Flow control
   iii) Circuits with logic controls
   iv) Circuits for multiple cylinder sequencing in Pneumatic, Electro pneumatic Trainer kits.
3. Simulation of basic hydraulic, pneumatic and electrical circuits using Automation Studio software.

TOTAL: 45 Hrs

Equipments	Qty
Hydraulic equipments	
1 Pressure relief valve	2
2 Flow control valves	2
3 Limit switches	2
4 Linear actuator	4
5 Rotary actuator	2
6 Double solenoid actuated DCV	3
7 Single solenoid actuated DCV	2
8 Hydraulic power pack with pump and pressure relief valve	1
Pneumatics equipments	
1 Pneumatic trainer kit with FRL Unit, Single acting cylinder, push button actuated DCV and manually actuated DCV	1
2 Pneumatic training kit with FRL unit, Double acting cylinder, pilot actuated DCV	1
3 Pneumatic trainer kit with FRL unit, Double acting cylinder, Double solenoid actuated DCV with sensors/ magnetic reed switches	1
4 Pneumatic trainer kit with FRL unit with PLC with Interface card	1
5 Automation studio software	10 licenses

MCT 410   SENSOR AND SIGNAL PROCESSING LABORATORY   0 0 3 1

LIST OF EXPERIMENTS

1.   Measurement of Position and velocity using encoders.
2.   Measurement of Position using linear scales.
3.   Measurement of speed using Inductive pickup / Proximity sensor.
4.   Design of Flash type Analog to Digital Converters.
5.   Design of Digital Comparator.
6.   Design of Voltage to frequency converter.
7.   Design of Frequency to Voltage Converter.
8.   Design of multiplexer and demultiplexer using logic gates or IC's.
9.   Design of sample and hold circuit.
10.   Design of instrumentation amplifier using OP-AMP.

TOTAL :45 **Hrs**

	L	P	C

ENG 401 Communication Skills Laboratory   0   3   1
(Common to all branches of Engineering and Technology)

OBJECTIVES:

- To equip students of engineering and technology with effective speaking and listening skills
   in English and

- To help them develop their soft skills and people skills, which will make the transition from college to workplace smoother and help them to excel in their jobs and to enhance students' performance at Placement Interviews, Group discussions and other recruitment exercises.

I English Language Lab
1. Listening Comprehension
   Listening – Listening and sequencing of sentences – Filling in the
   Blanks – Listening and answering the question

2. Reading Comprehension and Vocabulary
   Filling in the blanks – Cloze Exercises –Vocabulary building – Reading and
   Answering questions

3. Speaking:
   Intonation – Ear Training – Correct Pronunciation – Sound
   Recognition exercises – Common Errors in English

4. Conversations: Face to face Conversation – Telephone conversation - Role play
   Activities (Students take on roles and engage in conversation)

II Career Lab

1. Resume / Report Preparation / Letter Writing
   Structuring the resume / report – Letter writing / E-mail communication – Samples

2. Presentation Skills
   Elements of an effective presentation – Structure of a presentation –Presentation
   Tools – Voice Modulation – Audience analysis – Body Language

3. Soft Skills
   Time Management – Articulateness – Assertiveness – Innovation and Creativity –
   Stress Management & Poise

4. Group Discussion
   Why is GD part of the selection process? – Structure of a GD- Moderator-led and
   Other GDs – Strategies in GD – Team work – Body Language –Mock GD

5. Interview Skills

    Kinds of Interviews –Required Key Skills – Corporate culture- Mock Interviews

References:

Books:
1. Meenakshi Raman and Sangeetha Sharma, Technical Communication- Principles and Practice, Oxford University Press. New Delhi (2004)
2. Barker. A – Improve your communication skills – Kogan page India Pvt Ltd. New Delhi (2006)
3. Adrian Doff and Christopher Jones- Language in Use (Upper- Intermediate). Cambridge University Press. First South Asian Edition (2004)
4. John Seely, the Oxford Guide to writing and speaking, Oxford University Press, New Delhi (2004)

CD's

1. Train2sucess series 1.Telephone Skills.2. Interviewing Skills 3. Negotiation Skills by Zenith Global Consultants Ltd. Mumbai

2. BEC Series

3. Look Ahead by Cambridge University Press

Syllabus for VI Semester

1. Citizenship- its significance-Enlightened citizenship.

2. Emerging India-it's glory today- Global perspective-other view about India.

3. Indian culture and it's greatness.

4. India and Peace.

5. India and Spirituality- Great spiritual leaders.

6. India's message to the world – it's role in global peace.

7. Service and sacrifice-Unity in diversity – case studies-live examples.

8. National values identification and practice.

9. Yogasanas -II.

10. Meditation III.[Nithyanandam& Nine Centre Meditation]

MCT 118   ROBOTICS AND MACHINE VISION SYSTEMS   3 0 0 3

OBJECTIVE

- To study about the basics of drives and power transmission system.

- To study about the kinematics of robot.

- To study about sensors and Robot End Effectors and its types.

- To study about machine vision systems

UNIT I   **7 hrs**

Introduction: Basic Structure, Classification of robot and Robotic systems, laws of robotics, robot motions, work space and precision of movement.

Drives and control systems: Fluid power drives, DC servo motors and stepper motors. Control systems for robot.

UNIT II   **10 hrs**

Kinematics of Robot: Introduction, Matrix Representation, Homogeneous transformation, forward and inverse Kinematics, Inverse Kinematics Programming, degeneracy, dexterity, velocity and static forces, Basics of Trajectory planning.

UNIT III   **10 hrs**

Robot End Effectors: Types of end effectors, Mechanical grippers – Types of Gripper mechanisms – Grippers force analysis, other types of Grippers – Vacuum cups – Magnetic Grippers – Adhesive Grippers, Robot end effector interface.

Sensors: Position sensors – Potentiometers, encoders – LVDT, Velocity sensors, Acceleration Sensors, Force, Pressure and Torque sensors, Touch and Tactile sensors, Proximity, Range and sniff sensors, RCC, VOICE recognition and synthesizers.

UNIT IV   **8 hrs**

Image Sensing and Digitizing: Image definition, Image acquisition devices – videcon camera and digital camera, specialized lighting techniques.
Digital Images - Sampling, Quantization and Encoding. Image storage.

UNIT V   **10 hrs**

Image Processing and Analysis: Data reduction – digital conversion and windowing. Segmentation – Thresholding, Edge detection and Region growing. Binary Morphology and grey morphology operations.
Feature Extraction, Object recognition, Depth measurement. Application of Vision systems.
                                                                                                      TOTAL: 45 Hrs

TEXT BOOK:

1. Saeed B.Niku, Introduction to Robotics: Analysis, Systems, Applications, 2nd edition, Pearson Education India, PHI 2008 (ISBN 81-7758-756-0)

REFERENCES :

1. M.P. Groover, Industrial Robotics – Technology, Programming and Applications, McGraw-Hill, USA, 1986.
2. Ramesh Jam, Rangachari Kasturi, Brain G. Schunck, Machine Vision, Tata McGraw-Hill, 1991.
3. Yoremkoren, Robotics for Engineers, McGraw-Hill, USA, 1987.
4. P.A. Janaki Raman, Robotics and Image Processing, Tata McGraw-Hill, 1991.

MCT 119   **AUTOMOTIVE ELECTRONICS**   **3 0 0 3**

Objectives
- To study the basics of electronics, emission controls and its importance in automobiles
- To study the various sensors and actuators used in automobiles for improving fuel economy and emissions
- To study the various blocks of control units used for control of fuel, ignition and exhaust systems.
- To study the chassis electrical systems, comfort and safety systems in the automobiles for the safety of vehicle users.

UNIT I   INTRODUCTION   **9 hrs**
Evolution of electronics in automobiles – emission laws – introduction to Euro I, Euro II, Euro III, Euro IV, Euro V standards – Charging systems – working and design of charging circuit diagram – starter motors and starter circuits.

UNIT II   BASICS OF ENGINES   **9 hrs**
Operating principles of IC engine – major engine components – engine cylinder arrangements – the ignition systems – Electronic ignition, direct ignition, injection systems – working of the carburetor – throttle body injection – Multipoint fuel injection – sequential fuel injection.

UNIT III   SENSORS AND ACTUATORS   **9 hrs**
Working principle and characteristics of Airflow rate, Engine crankshaft angular position, Hall effect, Throttle angle, temperature, exhaust gas oxygen sensors – study of fuel injector, exhaust gas recirculation actuators, stepper motor actuator, vacuum operated actuator.

UNIT IV   ENGINE CONTROL SYSTEMS   **9 hrs**
Control modes for fuel control-engine control subsystems – ignition control methodologies – different ECU's used in the engine management – block diagram of the engine management system – In vehicle networks: CAN standard, format of CAN standard – diagnostics systems in modern automobiles.

UNIT V   CHASSIS, COMFORT AND SAFETY SYSTEMS   **9 hrs**
Traction control system – Cruise control system– electronic control of automatic   transmission antilock braking system – electronic suspension system – working of airbag and role of MEMS in airbag systems – centralized door locking system – Navigation systems – climate control of cars.
                                                         TOTAL : 45 Hrs

TEXT BOOKS:
1. TOM DENTON, "Automobile Electrical and Electronics Systems", Edward Arnold Publishers,2004.
2. William B. Ribbens, "Understanding Automotive Electronics", 5th edition, Newnes Publishing, 2003.

REFERENCES:

1. "BOSCH Automotive Handbook – 6th edition", Bentley publishers, 2005.
2. Barry Hollembeak, "Automotive Electricity, Electronics & Computer Controls",
    Delmar Publishers, 2001.
3. "Fuel System and Emission controls", Check Chart Publication, 2000.
4. Ronald. K. Jurgon, "Automotive Electronics Handbook", McGraw-Hill, 1999.

MCT120   **DESIGN OF MECHATRONICS SYSTEMS** **3 0 0 3**

OBJECTIVE
- To study about Mechatronics Design process.
- To study the data acquisition and control case studies
- To study about the application of Mechatronics system

UNIT I   **MECHATRONICS SYSTEM DESIGN**   **9 hrs**

Mechatronics Design process – Types of Design – Traditional and Mechatronics designs, Advanced approaches in Mechatronics - industrial design and ergonomics, safety.

UNIT II   **SYSTEM INTERFACING**   **9 hrs**

Introduction-selection of interface cards-DAQ card-single channel-multichannal-RS232/422/485 communication- IEEE 488 standard interface-GUI card-GPIB-Ethernet switch - Man machine interface.

UNIT III   **DATA ACQUISITION SYSTEM**   **9 hrs**

Introduction – Cantilever Beam Force Measurement system–Testing of Transportation bridge surface materials – Transducer calibration system for Automotive applications – Strain gauge weighing system – Solenoid Force-Displacement calibration system – Rotary optical encoder

UNIT IV   **DATA ACQUISITION AND CONTROL SYSTEM**   **9 hrs**

Introduction – Thermal cycle fatigue of a ceramic plate – pH control system – De-Icing Temperature Control system – Controlling temperature of a hot/cold reservoir – Skip control of a CD player– Autofocus Camera, exposure control – Pick and place robot.

UNIT V   **ADVANCED APPLICATIONS IN MECHATRONICS**   **9 hrs**

Sensors for condition Monitoring – Mechatronic Control in Automated Manufacturing – Artificial intelligence, Fuzzy Logic Applications, Micro actuation – Micro robot – Micro pump – Applications of micro Mechatronics components.

                     TOTAL: 45 hrs

TEXT BOOKS:

1. Devdas Shetty and Richard A. Kolk, "Mechatronics System Design", Thomson Asia Pte. Ltd., Singapore, 2002.

2. W.Bolton, "Mechatronics - Electronic Control systems in Mechanical and Electrical Engineering", 3rd Edition, Pearson Education Ltd., 2003.

REFERENCES:

1. Brian Morriss, "Automated Manufacturing Systems - Actuators, Controls, Sensors and Robotics", McGraw Hill International, 1995.
2. Bradley, D.Dawson, N.C. Burd and A.J. Loader, "Mechatronics: Electronics in Products and Processes", Chapman and Hall, London, 1993.
3. Georg pelz, Mechatronic Systems: Modeling and simulation with HDL's, John wiley and sons Ltd, 2003
4. HMT "Mechatronics", Tata McGraw Hill, 1998.

MCT 121   COMPUTER INTEGRATED MANUFACTURING   3 0 0 3

Objectives:
- To study about the use of computers and its integration at various levels of planning and manufacturing.
- To study about the flexible manufacturing system and to handle the product data and various software used for manufacturing

UNIT I INTEGRATED MANUFACTURING SYSTEM   8 hrs

Definition of CIM – Fundamental concepts in manufacturing and automation – Production, planning and control – types of manufacturing systems – material handling systems – computer control systems.
DNC systems - CAD/CAM system – Introduction to Artificial Intelligence – Expert systems in CIM.

UNIT II GROUP TECHNOLOGY AND COMPUTER AIDED PROCESS PLANNING
                                                               10 hrs

History of group technology- role of G.T. in CAD/CAM integration - part families -classification and coding - DCLASS and MICLASS and OPITZ coding systems-facility design using G.T. - benefits of G.T. - cellular manufacturing. Process planning - role of process planning in CAD/CAM integration - approaches to computer aided process planning -variant approach and generative approaches.

UNIT III FLEXIBLE MANUFACTURING SYSTEM   9 hrs

Shop floor control-phases -factory data collection system -automatic identification methods- Bar code technology-automated data collection system. FMS-components of FMS - types -FMS workstation -material handling and storage systems- FMS layout -computer control systems- application and benefits.

UNIT IV CIM IMPLEMENTATION AND DATA COMMUNICATION   10 hrs

CIM and company strategy - system modeling tools -IDEF models - activity cycle diagram CIM open system architecture (CIMOSA)- manufacturing enterprise wheel-CIM architecture- Product data management-CIM implementation software.
Communication fundamentals- local area networks -topology -LAN implementations - network management and installations.

UNIT V OPEN SYSTEM AND DATABASE FOR CIM   8 hrs
Open systems-open system inter connection - manufacturing automations protocol and technical office protocol (MAP /TOP)
Development of databases -database terminology- architecture of database systems-data modeling and data associations -relational data bases - database operators - advantages of data base and relational database.

                                                    TOTAL: 45 Hrs

TEXT BOOK:

1. Mikell.P.Groover "Automation, Production Systems and computer integrated manufacturing", Pearson Education, 2008.

REFERENCES:

1. Yorem koren, "Computer Integrated Manufacturing System", McGraw-Hill, 2007.
2. Roger Hanman "Computer Intergrated Manufacturing", Addison -Wesley, 1997.
3. Mikell.P.Groover and Emory Zimmers Jr., "CAD/CAM", Prentice hall of India Pvt. Ltd., New Delhi-1, 1998.
4. Kant Vajpayee S, "Principles of Computer Integrated Manufacturing, Prentice Hall India, 2007.
5. Radhakrishnan P, Subramanyan S.and Raju V., "CAD/CAM/CIM", 2nd Edition New Age International (P) Ltd., New Delhi, 2008.

MCT 411   **ROBOTICS LABORATORY**   **0 0 3 1**

Objectives:
- To study about different types of robot
- To study about different working of robot

LIST OF EXPERIMENTS

1. Assembly of different types of robots based on configuration and application.

2. Assembly of different type of links and joints used in robots

3. Assembly of components of robots with drive system and end effectors.

4. Determination of maximum and minimum position of links.

5. Verification of transformation (Position and orientation) with respect to gripper and world coordinate system

6. Estimation of accuracy, repeatability and resolution of pick and place robot.

7. Writing and verifying a Program to Pick and Place an object

8. Writing and verifying a Program for point to point operations

9. Writing and verifying a Program for continuous path operations.

10. Design of robot to avoid the obstacles using Whiskers

TOTAL: 45 Hrs

MCT 412   PROCESS CONTROL AND SIMULATION LABORATORY   0 0 3 1

I   PROCESS CONTROL
1.   Closed loop response of level control loop.
2.   Closed loop response of flow control loop.
3.   Closed loop response of temperature control loop.
4.   Closed loop response of pressure control loop.

II   PROGRAMMABLE LOGIC CONTROLLER
1.   Simulation exercises.
2.   Traffic light control.
3.   Stepper motor control.
4.   DC motor control.
5.   Relay testing.

III   LAB VIEW SIMULATIONS
1.   Programming exercises using loops and charts.
2.   Programming exercises using clusters and graphs
3.   Programming exercises using case and sequence structures, file input/output, string operations.
4.   Creating virtual instrumentation for simple applications.

TOTAL: 45 Hrs

MCT 413 Assessment Guidelines for Industrial Training

At the end of 6th semester, all UG students undergo industrial training for at least two weeks. They will work in industry under the guidance of a professional. Their work will be monitored by the KCT staff at least 2 times during the training period. The students shall keep a log book and write a weekly report on their work describing the assignment, acquired knowledge, activities performed, contribution to industry and other relevant matters. An introduction to the company with an organization chart shall be included in the log book. At the end of the training period, a detailed report on the project with accomplishments shall be written and submitted by the students for the joint review and assessment of KCT staff and industry guide. A training certificate signed by KCT staff, industry guide and KCT Principal will be given to the students on the basis of their contribution as satisfactory, good, very good and excellent.

First visit of KCT staff to industry will be in the middle of the training period and a review of the log book maintained by the student will be done.

First assessment

S.No	Activity	Rating				
		Satisfactory	Good	V. Good	Excellent	Comments
1.	Assignment					
2.	Attitude and Motivation					
3.	Contribution to industry					
4.	Progress of the assignment					

The above assessment will be signed by both industry guide and KCT staff.

At the end of the training period, both the log book and the report will be reviewed by KCT staff and industry guide.

Second assessment (End of training)

S.No	Activity	Rating			
		Satisfactory	**Good**	**V. Good**	**Excellent**
I	**Log book and interview**				
1	Assignment				
2	Work accomplishment				
3	Behaviour				
4	Contribution to industry				
II.	**Report**				
1	Presentation				
2	Technical content				
3	Results analysis, discussion and recommendation				
4	Benefit to industry				

The ranking for the issuance of the industrial training certificate will be determined by the KCT staff on the basis of the above assessments. A certificate will then be issued to the student in the presence of the class advisor and respective HOD. The student report in the form of a CD and hard copy shall be kept in the respective department library for inspection by the University Committee.

1. Global values – understanding and identification – its importance.

2. Racial discrimination and solution – Ecological imbalance and solution.

3. Political upheavals and solution – Social inequality and solution –

   live case discussions and debate.

4. Cultural degradation and solution – live case discussions and debate.

5. Emergence of monoculture – solution.

6. Global terrorism – it's cause and effect – solution.

7. Economic marginalization and solution – it's impact in the globe.

8. Man is the cause and man is the solution.

9. All Meditations.

10. All Yogasanas.

GSS 101   PROFESSIONAL ETHICS   3 0 0 3
OBJECTIVES
- To create an awareness on Engineering Ethics
- To instill Moral and Social Values and Loyalty
- To understand the professional rights of oneself

UNIT I   Engineering Ethics and Theories   9 hrs

Definition, Moral issues, Types of inquiry, Morality and issues of morality, Kohlberg and Gilligan's theories, consensus and controversy,   Professional and professionalism, moral reasoning and ethical theories, virtues, professional responsibility, integrity, self respect, duty ethics, ethical rights, self interest, egos, moral obligations etc.,

UNIT II   Social Ethics and Engineering as Social Experimentation   9 hrs

Engineering as social experimentation, codes of ethics, Legal aspects of social ethics, the challenger case study, Engineers duty to society and environment, Gandhian Principles of corporate trusteeship.

UNIT III   Safety   9 hrs

Safety and risk – assessment of safety and risk – risk benefit analysis and reducing risk – the Three Mile Island and Chernobyl case studies. Bhopal and tragedy.

UNIT IV   Responsibilities and Rights of Engineers   9 hrs

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 and Engineers as Managers, Consultants and Leaders   9 hrs

Multinational Corporations – Environmental ethics – computer ethics – weapons development – engineers as managers – consulting engineers – engineers as expert witnesses and advisors – moral leadership – Engineers as trend setters for global values, IT Industry (cultural aggression)

TOTAL: 45 Hrs

TEXT BOOKS:

1. Mike Martin and Roland Schinzinger, "Ethics in Engineering". (2005) McGraw-Hill, New York.

2. John R. Boatright, "Ethics and the Conduct of Business", (2003) Pearson Education, New Delhi.

3. Bhaskar S. "Professional Ethics and Human Values", (2005) Anuradha Agencies, Chennai.

REFERENCES:

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

2. Charles E. Harris, Michael S. Protchard and Michael J Rabins, "Engineering Ethics – Concepts and cases", 2000 (Indian Reprint now available) Wadsworth Thompson Leatning, United States.

GSS108   **OPERATIONS RESEARCH**   **3 0 0 3**

OBJECTIVES
On completion of the course the students are expected

- To be aware of optimization of resources.
- To understand and apply operations research techniques to industrial operations.
- To know how to formulate and solve Linear Programming Problems using various
- techniques.
- To solve transportation and assignment problems.
- To analyse CPM and PERT networks and evaluate projects.
- To solve replacement problems of different types.
- To solve sequencing problem.
- To know various queueing models and to solve queue problems.

UNIT I   LINEAR PROGRAMMING PROBLEM   **9 hrs**
The phases of OR study – formation of an L.P model – graphical solution – simplex algorithm – artificial variable technique: Big M Method, Two-phase method.

UNIT II TRANSPORTATION AND ASSIGNMENT PROBLEM   **9 hrs**
Initial basic solution by North West corner method – least cost method – Vogels approximation method – optimality test – MODI method. Unbalanced transportation problem. Assignment problem – Hungarian method – unbalanced assignment problem.

UNIT III NETWORK MODELS   **9 hrs**
Shortest route – minimal spanning tree – maximum flow models – Project network: CPM and PERT network.

UNIT IV REPLACEMENT AND SEQUENCING MODELS   **9 hrs**
Replacement of items that deteriorate with time – value of money changing with time –
Not changing with time – optimum replacement policy – individual and group replacement .Sequencing problem: models with n jobs with 2 machines – problem with n jobs with 3 machines.

UNIT V QUEUING THEORY   **9 hrs**
Queuing models – queuing systems and structures – notation – single server and multi server models – Poisson input – exponential service – constant rate service.
                                                                    Total: 45 Hrs
TEXT BOOKS:
1. Taha, H.A," Operations Research"(2007), Prentice Hall of India, New Delhi.

REFERENCES:
1. Gupta, P.K., and Hira, D.S.,"Operations Research "(2008) S.Chand and Co., New Delhi.
2. Gupta, P.K., and Hira, D.S.," Problems in Operations Research "(2008) S.Chand and   Co., New Delhi.
3. Panneerselvam, Operation Research "(2007) Prentice Hall of India, New Delhi.
4. Harvey M.Wagner,"Principles of Operations Research "(2007), Prentice Hall of India,   New Delhi.

MCT 140   EMBEDDED SYSTEM DESIGN   3 0 0 3
Objectives:

- Introduce to features that build an embedded system.
- To study the Embedded Software Architecture.
- To study Techniques of inter facing between processors & peripheral device related to embedded processing.
- To explain real time operating systems, inter-task communication.
- To present in lucid manner the basic concepts of systems programming like operating system, assembler compliers etc and to understand the management task needed for developing embedded system.

UNIT I   INTRODUCTION TO EMBEDDED SYSTEMS   9 hrs
Introduction to functional building blocks of embedded systems – Register, memory devices, ports, timer, interrupt controllers using circuit block diagram representation for each categories, Shared data problem, Interrupt Latency.

UNIT II   PIC MICROCONTROLLER   9 hrs
Introduction – CPU architecture – Instruction set – Addressing modes – Loop timing – Timers – Interrupt logic – I/O expansion – IIC bus operation – A/D converter.

UNIT III   EMBEDDED SOFTWARE ARCHITECTURE   9 hrs
Round robin - Round robin with interrupts - Function Queue scheduling Architecture - Real time operating systems Architecture - Selecting architecture.

UNIT IV   REAL TIME OPERATING SYSTEM   9 hrs
Tasks and Task states - Tasks and Data - Semaphore and shared data -Message queues, mail boxes and pipes - Encapsulating semaphores and queues - Timer functions - Events - Memory management - Interrupt routines in an RTOS Environment - Design of an embedded system (Underground tank monitoring System).

UNIT V   EMBEDDED SOFTWARE DEVELOPMENT TOOLS AND DEBUGGING
                                                               9 hrs
Linker/Locators for embedded software - embedded software in to the target system - Testing on host machine: Basic techniques - more Advanced techniques - Limitations and shortcomings - Instruction set simulators – The assert macro - Testing using laboratory tools.

                                                        TOTAL: 45 Hrs
TEXT BOOKS:
1. David E. Simon, "An embedded software primer", Addison – Wesley, Indian Edition Reprint (2009).
2. John B. Peatman, "Design with PIC Microcontrollers" Prentice Hall, 2003.

REFERENCES :
1. Steve Heath, 'Embedded System Design', II edition, Elsevier, 2003.
2. Rajkamal, 'Embedded System – Architecture, Programming, Design', Tata McGraw Hill, 2008
3. K.V.K.K.Prasad "**Embedded /Real-Time Systems: Concepts, Design and Programming"** Dream tech Press, reprint 2009

MCT 141　　　　PLANT LAYOUT AND MATERIAL HANDLING　　　　3 0 0 3

Objective:
- To study of location on plant layout, selection of plant site, consideration in facilities planning and layout.
- To study about the tool and techniques for developing layout.
- To study about the industrial buildings and utilities material handling
- To study designing of material handling systems

UNIT I　　　PLANT LOCATION AND PHYSICAL FACILITIES　　　　9 hrs

Factors to be considered – Influence of location on plant layout, selection of plant site, consideration in facilities planning and layout – Equipment required for plant operation, Capacity, Serviceability and flexibility and analysis in selection of equipments, space and man power requirements.

UNIT II　　　PLANT LAYOUT　　　　9 hrs

Need for layout, types of layout, factors influencing product, process, fixed and combination layout, tool and techniques for developing layout, process chart, flow diagram, string diagram, template and scale models – machine data. Layout planning procedure – visualization of layout, revision and improving existing layout, balancing of fabrication and assembly lines.

UNIT III　　　INDUSTRIAL BUILDINGS AND UTILITIES　　　　9 hrs

Centralized electrical, pneumatic, water line systems. Types of buildings, lighting, heating, air-conditioning and ventilation utilities – planning and maintenance, waste handling, statutory requirements, packing and storage of materials: Importance of packaging, layout for packaging – packaging machinery – wrapping and packing of materials, cushion materials.

UNIT IV　　　MATERIAL HANDLING　　　　9 hrs

Importance and Scopes – Principles of material handling – engineering and economic factors - planning, relationship to plant layout – types and selection of material handling systems, factors influencing their choice – concept of containerization and palletization.

UNIT V　　　ANALYSIS OF MATERIAL HANDLING　　　　9 hrs

Factors involved – motion analysis, flow analysis, graphical analysis, safety analysis, equipment cost analysis, palletization analysis, analysis of operation, material handling surveys – Designing of material handling systems – System equation - Planning chart, Unit load design – principle - efficiency of containers, pallet sizes.

**　　　　　　　　　　　　　　　　　　　　　　　　　　　TOTAL 45 Hrs**

TEXT BOOKS :
1.　　　Khanna, O. P., "Industrial Engineering and Management", Dhanpatrai and Sons, 2003.
2.　　　Apple, James M. *Plant Layout and Material Handling*, 3rd. ed. John Wiley and Sons, New York, 1977.

REFERENCES:

1. Fred E Meyers, "Plant Layout and Material Handling", 2nd edition, Prentice Hall, 1999.
2. James A. Tompkins , John A. White, Yavuz A. Bozer and J. M. A. Tanchoco "Facilities Planning", 3rd edition , John Wiley & Sons, 2003.
3. Govindan, K. R., "Plant Layout and Material Handling", Anuradha, Kumbakonam, 2001.

MCT 142   **MODELLING AND SIMULATION**   **3 0 0 3**

Objectives
- To explain the basic concepts of building a model, study of simulation and systems
- To study about the generation of random numbers, testing of random numbers
- To study about the generation of random variables
- To study the concepts of analysis and evaluation of models
- To study about various simulation soft wares

UNIT I   SYSTEM AND SYSTEM ENVIRONMENT   9 hrs

Component of a System – Continuous and discrete systems – Types of model; Steps in Simulation study; Simulation of an event occurrence using random number table – Single server queue –two server queue – inventory system.

UNIT II   RANDOM NUMBER GENERATION   9 hrs

Properties of random numbers – Generation of Pseudo – random numbers – techniques of generating pseudo random numbers; Test for random numbers: the Chisquare test-the kolmogrov Smirnov test – Runs test – Gap test – poker test.

UNIT III   RANDOM – VARIATE GENERATION   9 hrs

Inverse transform technique for Exponential, Uniform, triangular, weibull, empirical, uniform and discrete distribution, Acceptance rejection method for Poisson and gamma distribution; Direct Transformation for normal distribution.

UNIT IV   ANALYSIS AND EVALUATION OF MODEL   9 hrs

Data collection, identifying the distribution, Parameter estimation, goodness of fit tests, verification and validation of simulation models.

UNIT V   SIMULATION SOFTWARE PACKAGES   9 hrs

Comparison and selection of *General Purpose Simulation System* (*GPSS)* , SIMSCRIPT, SLAM, Arena simulation language, Modeling basic operations using Arena – An Electronic Assembly and testing system, Development of simulation models using Arena simulation package for queuing system, Production system, inventory system, Arena Integration and customization.

TOTAL: 45 Hrs

TEXT BOOKS:
1. Banks J., Carson J.S. and Nelson B.L., "Discrete – Event System Simulation", 3rd Edition, Pearson Education, Inc 2004
2. David Kelton.W. and Randall P. Sowdowski, "Simulation with Arena", 2nd Edition , McGraw Hill, 2002.

REFERENCES :

1. Geoffrey Gorden, "System Simulation", Prentice Hall of India, 2003.
2. Narsingh Deo., "System Simulation with Digital Computer", Prentice Hall of India, 2003.

WEB SITES REFERENCES

1. www.arenasimulation.com
2. www.gpss.co.uk
3. www.caciasl.com

MCT 143 **PRODUCTION PLANNING AND CONTROL** **3 0 0 3**
(Common to Mechanical and Mechatroincs Engineering)

OBJECTIVES:

To understand

- o The components and functions of production planning and control
- o Work study methodology
- o Product planning, process planning and process capabilities
- o Production scheduling
- o Inventory Control.

UNIT I INTRODUCTION 9 **hrs**

Objectives and benefits of planning and control-Functions of production control-Types of production-job- batch and continuous-Product development and design-Marketing aspect - Functional aspects-Operational aspect-Durability and dependability aspect-aesthetic aspect. Profit consideration-Standardization, Simplification & specialization-Break even analysis-Economics of a new design.

UNIT II WORK STUDY 9 **hrs**

Method study, basic procedure-Selection-Recording of process - Critical analysis, Development - Implementation - Micro motion and memo motion study - work measurement - Techniques of work measurement - Time study - Production study - Work sampling - Synthesis from standard data - Predetermined motion time standards.

UNIT III PRODUCT PLANNING AND PROCESS PLANNING 9 **hrs**

Product planning-Extending the original product information-Value analysis-Problems in lack of product planning-Process planning and routing-Pre requisite information needed for process planning-Steps in process planning-Quantity determination in batch production-Machine capacity, balancing.

UNIT IV PRODUCTION SCHEDULING 9 **hrs**

Production Control Systems-Loading and scheduling-Master Scheduling-Scheduling rules-Gantt charts-Perpetual loading-Basic scheduling problesms - Line of balance - Flow production scheduling-Batch production scheduling-Product sequencing - Production Control systems-Periodic batch control-Material requirement planning kanban –Dispatching-Progress reporting and expediting-Manufacturing lead time-Techniques for aligning completion times and due dates.

UNIT V INVENTORY CONTROL AND RECENT TRENDS IN PPC 9 **hrs**

Inventory control-Purpose of holding stock-Effect of demand on inventories-Ordering procedures.

Two bin system -Ordering cycle system-Determination of Economic order quantity and economic lot size-ABC analysis-Recorder procedure-Introduction to computer integrated production planning systems-elements of JUST IN TIME SYSTEMS-Fundamentals of MRP II and ERP, Lean Manufacturing.

Total: 45 Hrs

TEXT BOOKS:

1. Martand Telsang, "Industrial Engineering and Production Management", S. Chand and Company, Second Edition, 2006.

REFERENCES:

1. Samson Eilon, "Elements of production planning and control", Universal Book Corpn.1984

2. Elwood S.Buffa, and Rakesh K.Sarin, "Modern Production / Operations Management", 8th Ed. John Wiley and Sons, 2000.

3. K.C.Jain & L.N. Aggarwal, "Production Planning Control and Industrial Management", Khanna Publishers, (1990) reprint 2002.

4. N.G. Nair, "Production and Operations Management", Tata McGraw-Hill, 1996.

5. S.N.Chary, "Theory and Problems in Production & Operations Management", Tata McGraw Hill, 1995.

6. S.K. Hajra Choudhury, Nirjhar Roy and A.K. Hajra Choudhury, "Production Management", Media Promoters and Publishers Pvt. Ltd., 1998

MCT 144   PRODUCT DESIGN AND DEVELOPMENT   3 0 0 3

Objective
- To enable the student to understand several aspects of the design process and to apply them in practice.
- To study about the concept of product costing and other manufacturing economics in product design.

UNIT I CREATIVE THINKING AND ORGANIZING FOR PRODUCT INNOVATION   9 hrs

Product design function - Process design function - locating ideas for new products - selecting the right product. Qualifications of the production design engineer, Creative thinking-curiosity and imagination.

UNIT II CRITERIA FOR PRODUCT SUCCESS   12 hrs

Areas to be studied - preparatory to design, market research, functional design, product life cycle. The value of appearance - Principles and laws of appearance - incorporating quality and reliability into the design. Man-Machine considerations-Designing for ease of maintenance.

UNIT III COST AND PRODUCT DEVELOPMENT   8 hrs

Sources of funds - development cost - product costs - estimating product costs - value engineering - cost reduction.

UNIT IV Intellectual Property Rights(IPR) and PATENTS   8   hrs

Classes of exclusive rights-patents-combination versus aggregation-novelty and utility-Design patents-patent disclosure-patent application steps-patent office prosecution- sales of patent rights-trade marks-Copyrights.

UNIT V ECONOMICS OF DESIGN   8 hrs

Economic analysis of a product development project - economics of design- Break Even Point – selection of materials-material layout planning –value analysis.

                                                    TOTAL:45 Hrs
TEXT BOOKS:

1. BENJAMIN W.NIEBEL and ALANB.DRAPER, Product Design and Process Engineering, McGraw Hill Book Company, 1976.
2. Karl T. Ulrich, Stephen D. Eppinger, "Product Design and Development", Mcgraw-Hill, 2007.

REFERENCES:

1. S.Dalela and Mansoor Ali, Industrial Engineering and Management Systems, Standard Publishers Distributors, 2006.
2. Harry Nystrom, Creativity and Innovation, John Wiley & sons,1979.
3. George E. Dieter, Engineering Design – Materials and Process Approach, Tata Mcgraw-Hill, 2008.

MCT 145   DIGITAL SIGNAL PROCESSING   3 0 0 3

Objectives:
- To have an overview of signals and systems.
- To study DFT & FFT.
- To study the design of IIR filters.
- To study the design of FIR filters.
- To study about programmable DSP chips.

UNIT I   INTRODUCTION   9 hrs

Classification of systems: Continuous, discrete, linear, causal, stable, dynamic, recursive, time variance - classification of signals: continuous and discrete, energy and power - mathematical representation of signals - spectral density - sampling techniques, quantization, quantization error, Nyquist rate, aliasing effect - Digital signal representation, analog to digital conversion**.**

UNIT II   DISCRETE TIME SYSTEM ANALYSIS   9 hrs

Z-transform and its properties, inverse z-transforms - difference equation – Solution by z-transform, application to discrete systems - Stability analysis, frequency response – Convolution – Fourier transform of discrete sequence – Discrete Fourier series.

UNIT III   DISCRETE FOURIER TRANSFORM & COMPUTATION   9 hrs

DFT properties, magnitude and phase representation - Computation of DFT using FFT algorithm – DIT & DIF - FFT using radix 2 – Butterfly structure.

UNIT IV   DESIGN OF DIGITAL FILTERS   9 hrs

FIR & IIR filter realization – Parallel & cascade forms. FIR design: Windowing Techniques – Need and choice of windows – Linear phase characteristics.
IIR design: Analog filter design - Butterworth and Chebyshev approximations; digital design using impulse invariant and bilinear transformation - Warping, prewarping - Frequency transformation.

UNIT V   PROGRAMMABLE DSP CHIPS   9 hrs

Architecture and features of TMS 320C54 signal processing chip – Quantization effects in designing digital filters.

TOTAL: 45 Hrs

TEXT BOOKS:

1. J.G. Proakis and D.G. Manolakis, "Digital Signal Processing Principles, Algorithms and Applications", Pearson Education, New Delhi, 2003 / PHI.
2. S.K. Mitra, "Digital Signal Processing – A Computer Based Approach", Tata McGraw Hill, New Delhi, 2001.

REFERENCE BOOKS:

1. Alan V. Oppenheim, Ronald W. Schafer and John R. Buck, "Discrete – Time Signal Processing", Pearson Education, New Delhi, 2003.
2. B. Venkataramani, M. Bhaskar, "Digital Signal Processors, Architecture, Programming and Applications", Tata McGraw Hill, New Delhi, 2003.
3. S. Salivahanan, A. Vallavaraj, C. Gnanapriya, "Digital Signal Processing", Tata McGraw Hill, New Delhi, 2003.
4. Texas TMS 320C54X user manual.

MCT 146   INTRODUCTION TO FINITE ELEMENT ANALYSIS   3 0 0 3

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 INTRODUCTION   10 hrs

Historical background – Introduction to FEA – Review of Matrix Algebra and Gaussian elimination – Governing equations for continuum – Spring assemblage – Stiffness method & Potential Energy Approach – Galerkin's weighted residual method

UNIT II ONE DIMENSIONAL ELEMENTS – BAR, PLANE TRUSS & BEAM   9 hrs

Bar element - Stiffness Matrix in local and global coordinates, Computation of Stress – Potential Energy and Galerkin's residual method – Solution of Plane Truss – Beam element – Stiffness and assembly of stiffness matrices - Potential energy and Galerkin's approach

UNIT III PLANE STRESS & PLANE STRAIN – CST & LST APPROACH   8 hrs

Basic concepts of plane stress & plane strain – Constant Strain Triangle approach – Stiffness Matrix and Equations - Body & Surface Forces – FE solution for plane stress problem – Practical Considerations in Modeling (Qualitative treatment) – Linear Strain Triangle approach - Stiffness Matrix and Equations

UNIT IV AXISYMMETRIC ELEMENTS&ISOPARAMETRIC FORMULATION   10 hrs

Axisymmetric formulation – Stiffness Matrix – Pressure Vessel Analysis – Applications – Isoparametric formulation – Formulation for Bar and Plane Elements – Numerical Integration – Gaussian & Newton-Cotes Quadrature – Evaluation of Stiffness Matrix by Gaussian Quadrature

UNIT V PLATE BENDING AND THERMAL ANALYSIS   8 hrs

Basic Concepts of Plate Bending – Element Stiffness Matrix and Equations – Heat Transfer – Basic Differential Equation and Units – 1d and 2d formulation

TOTAL: 45 Hrs

TEXT BOOKS:
1. Daryl, L. Logan, "A First course in the Finite Element Method", 4th edition, Thomson Learning, 2007.

REFERENCES:
1. Chandrupatla T.R., and Belegundu A.D., Introduction to Finite Elements in Engineering, Pearson Education, 3rd Edition, 2002.
2. David V Hutton "Fundamentals of Finite Element Analysis", McGraw-Hill International Edition, 2004.
3. Rao S.S., The Finite Element Method in Engineering, Pergammon Press, 1989.
4. J. N. Reddy, "An Introduction to the Finite Element Method", 3rd Edition, Tata McGraw Hill, 2005.

MCT 147 **STATISTICAL QUALITY CONTROL** **3 0 0 3**

Objective
- To Study on sampling procedures.
- To Study the application of control charts to measure.
- To Study the improvement of the quality of products and processes.

UNIT I **INTRODUCTION** **7 hrs**

Probability concepts, Review of distribution: Normal, Poison's, and Binomial, Problems, Measuring of quality and control, Value and quality, Quality costs, Quality assurance.

UNIT II **CONTROL CHARTS FOR VARIABLES** **10 hrs**

Chance and assignable causes of quality variation, Control charts for variables, X-bar, R, and σ-charts, Warning and modified control limits, Process capability study, Ranges, Moving Averages, and Six σ- limits, multivariate charts.

UNIT III **CONTROL CHARTS FOR ATTRIBUTES** **8 hrs**

Limitation of variable chart, p-chart, problems with variable sample size, np-chart, c- chart, u-chart, and ku-chart, Demerits per unit control chart.

UNIT IV **ACCEPTANCE SAMPLING** **10 hrs**

Economics of sampling, Lot formation, OC-Curve-Producer's and Consumer's risk, Single and double sampling plans, AOQ, AOQL, ATI, ASN, Sequential sampling plan, MIL – STD – 1050 tables, MIL – STD – 414 tables, IS 2500 Standard.

UNIT V **QUALITY IMPROVEMENT** **10 hrs**

Zero defects program, Quality circle, Fishbone diagram, scatter diagram, Pareto Analysis, Deming cycle, Introduction to Reliability function, System reliability of series, parallel, and combined configurations, Reliability improvement techniques.

TOTAL : 45 Hrs

TEXT BOOK

1. Grant E.L. and Leavensworth, "Statistical Quality Control", Tata McGraw-Hill Publishing Company, 2000.

REFERENCES:
1. Douglas C. Montgomery, "Statistical Quality Control", John Wiley and Sons, 2001.
2. Fiegenbaum, A.V., "Total Quality Control", McGraw-Hill Inc., 1991.
3. Sharma S.C., "Inspection Quality Control and Reliability", Khanna Publishers, New Delhi (1998).
4. Srinath L.S "Reliability Engineering", Affiliated East west Press, 1998.

MCT 148   DIGITAL IMAGE PROCESSING   3 0 0 3
Objectives:

- To study the image fundamentals and mathematical transforms necessary for image processing.
- To study the image enhancement techniques.
- To study the image compression procedures.
- To study about color image processing and wavelets.
  To study the image segmentation and representation techniques.

UNIT I   DIGITAL IMAGE FUNDAMENTALS   9 hrs
Introduction – Examples of fields that use Digital image processing, Fundamental steps in Digital Image Processing systems, Components of an image processing systems, Light and EM spectrum, Image sensing and acquisition, Image sampling and quantization- Concepts, image representation, Spatial and gray level resolution, Aliasing and Morie patterns, Some basic relationships between pixels.

UNIT II   IMAGE ENHANCEMENT IN SPATIAL DOMAIN   9 hrs
Background, Gray level transformation- Image negatives, Log transformations, Power law transformations, Piecewise-Linear transformation functions, Histogram processing- Histogram equalization, Histogram matching(Specifications), Enhancement using ALU.

UNIT III   IMAGE ENHANCEMENT IN FREQUENCY DOMAIN   9 hrs
Introduction to the Fourier transform and the frequency domain – 1-D Fourier transform and its inverse, 2-D Fourier transform and its inverse, Smoothing frequency domain filters- Ideal, Butterworth, Gaussian low pass filters, Sharpening frequency domain filters- Ideal, Butterworth, Gaussian high pass filters.

UNIT IV   COLOR IMAGE PROCESSING AND WAVELETS   9 hrs
Color fundamentals, Color models- RGB color model, CMY and CMYK color model, HIS color model. Wavelets- Background- Image pyramids, sub band coding, Haar transform, Wavelet transform in 1-D- Wavelet series expansion, discrete wavelet transform, Continuous wavelet transform.

UNIT V   IMAGE COMPRESSION AND SEGMENTATION   9 hrs
Fundamentals – Image compression models, Error-free compression – Lossy compression - Lossy predictive coding, Transform coding, JPEG 2000 – Detection of discontinuities – Edge linking and boundary detection.

TOTAL: 45 Hrs

TEXT BOOKS:
1. Rafael C. Gonzalez and Richard E. Woods, "Digital Image Processing", Pearson Education Asia / Addison Wesley publishing company, Sixth Indian Reprint 2001.

REFERENCES:
1. Anil K. Jain, "Fundamentals of Digital Image Processing", Prentice-Hall of India, New Delhi, 2001.
2. Maher A. Sid-Ahmed, "Image Processing Theory, Algorithms and architectures", McGraw-Hill, 1995.
3. William K. Pratt, "Digital Image Processing", Wiley-Inter Science Publication, 2nd Edition, 1991.
4. Arthur K Wreeks, "Fundamentals of Electronics Image Processing", Prentice-Hall of India, New Delhi, 2001.

MCT 149   **MARKETING MANAGEMENT**   **3 0 0 3**
(Common to Mechanical and Mechatronics Engineering)

OBJECTIVES:

- o To understand the differences in selling and marketing and marketing philosophies.
- o To learn the buyer behaviour and the various techniques of segmenting markets.
- o To know the techniques of pricing of a product and process of marketing research.
- o To understand the importance of portfolio analysis in market planning.
- o To formulate strategies for advertising, sales promotion and distribution.

UNIT I   MARKETING PROCESS   10 hrs

Definition, Marketing process, needs, wants and demands, marketing concepts, environment, mix, types. Philosophies, selling versus marketing, marketing organizations, industrial versus consumer marketing, product hierarchy

UNITII BUYER BEHAVIOUR AND MARKET SEGMENTATION   7 hrs

Cultural, demographic factors, motives, types, buying decisions, customer value and loyalty, segmentation factors - demographic -Psycho graphic and geographic segmentation, New line.

UNIT III   PRODUCT PRICING AND MARKETING RESEARCH   9 hrs

Definition, Objectives, pricing, decision frame work, pricing methods, price sensitivity . Introduction, uses, process of marketing research, marketing information systems – Data mining & ware housing.

UNIT IV   MARKETING PLANNING   9 hrs

Market opportunity, Components of marketing plan, product market selection, the marketing planning process, portfolio analysis, BCG, GEC grids, strategic planning process.

UNIT V ADVERTISING, SALES PROMOTION AND DISTRIBUTION   10 hrs

Introduction to advertising, Factors in audience pervasions, decisions, role of media. Significance of sales promotion, planning sales promotion programmes, types. Marketing channels, channel design, wholesaling, retailing, modern trends in retailing.

Total: 45 Hrs

TEXT BOOKS:

1. Rajan Saxena, "Marketing Management", Tata Mc-graw Hill, 3rd edition, 2006.

2. Ramasamy and Nama kumari, "Marketing Environment: Planning, implementation

   and control the Indian context" Macmillan 4 edition, 2009.

REFERENCES :

1. Philip Kotler and Gary Armstrong "Principles of Marketing" – 12th Edition, Prentice Hall of India, 2008.

2. Green Paul, Donald Tull and Albaum, "Research for marketing decisions", 5th Edition Prentice Hall of India. 2008

MAT106 – PROBABILITY AND APPLIED STATISTICS   3   1   0   4

UNIT I   STATISTICAL MEASURES   9 hrs

Measures of central tendency: Mean, Median and Mode **–** Measures of variation – Range, standard deviation, Mean deviation and coefficient of variation. Correlation and Regression: Karl Pearson's coefficient of correlation –Rank Correlation – Regression lines (Definitions and simple numerical problems only).

UNIT II   PROBABILITY AND RANDOM VARIABLE   10 hrs

Axioms of probability - Conditional probability - Total probability – Baye's theorem - Random variable - Probability mass function - Probability density function- moments –moment generating function- properties.

UNIT III   STANDARD DISTRIBUTIONS   8 hrs

Binomial, Poisson and Normal distributions – properties- Fitting of Binomial, Poisson and normal distributions to data.

UNIT IV   TESTING OF HYPOTHESIS   9 hrs

Testing of hypothesis for large samples (single mean, difference of means, single proportion, difference of proportions) –   Small samples tests based on t and F distributions (single mean, difference of means,   paired t- test and variance ratio test) – Chi-square test for independence and goodness of fit - Simple numerical problems only.

UNIT V   DESIGN OF EXPERIMENTS AND QUALITY CONTROL   9 hrs

Analysis of variance – One way classification - Two – way classification – CRD - RBD - Latin square – LSD
Concept of process control - Control charts for variables – $\overline{X}$, R – charts – Control charts for attributes – p, np, c – charts – Tolerance limits.

                                                                      TOTAL: 60 Hrs
TEXT BOOKS:

1. Veerarajan T., "Probability and Statistics", Tata McGraw-Hill, New Delhi, 2007 &
      2nd Reprint 2004.
2. Gupta S. P., "Statistical Methods", Sultan Chand & Sons Publishers, 2004. (Unit - I)

REFERENCES

1. Johnson R. A., "Miller & Freund's Probability and Statistics for Engineers", Sixth
      Edition, Pearson Education, Delhi, 2000.
2. Gupta S.C. and Kapur J.N., "Fundamentals of Mathematical Statistics", Sultan
      Chand, Ninth Edition, New Delhi, 1996.
3. Walpole R. E., Myers S.L. & Keying Ye, "Probability and Statistics for
      Engineers and Scientists", Pearson Education Inc, 2002.
4. Arunachalam T., "Probability and Statistics", Inder Publications, Coimbatore, 2008.

GSS102- PRINCIPLES OF MANAGEMENT   **3 0 0 3**

OBJECTIVES
1. To study the importance and functions of management in an organization
2. To study the importance of planning and also the different types of plan
3. To understand the different types of organization structure in management
4. To understand the basis and importance of directing and controlling in management
5. To understand to the importance of corporate governance and social responsibilitie.

UNIT 1: MANAGEMENT CONTEXT   **9 hrs**
Management – Definition – Importance – Functions – Skills required for managers - Roles and functions of managers – Science and Art of Management –Management and Administration.
Evolution of Classical, Behavioral and Contemporary management thoughts.

UNIT 2: PLANNING   **9 hrs**
Nature & Purpose – Steps involved in Planning – Forms of Planning – Types of plans – Plans at Individual, Department and Organization level - Managing by Objectives. Forecasting – Purpose – Steps and techniques. Decision-making – Steps in decision making

UNIT 3: ORGANISING   **9 hrs**
Nature and Purpose of Organizing - Types of Business Organization - Formal and informal organization – Organization Chart – Structure and Process – Strategies of Departmentation– Line and Staff authority – Benefits and Limitations. Centralisation Vs De-Centralization and Delegation of Authority.
Staffing – Manpower Planning – Recruitment – Selection – Placement – Induction.

UNIT 4: DIRECTING & CONTROLLING   **9 hrs**
Nature & Purpose – Manager Vs. Leader - Motivation - Theories and Techniques of Motivation.
Leadership – Styles and theories of Leadership.
Communication – Process – Types – Barriers – Improving effectiveness in Communication.
Controlling – Nature – Significance – Tools and Techniques.

UNIT 5: CONTEMPORARY ISSUES IN MANAGEMENT   **9 hrs**
Corporate Governance Social responsibilities – Ethics in business – Recent issues.
American approach to Management, Japanese approach to Management, Chinese approach to Management and Indian approach to Management.

TOTAL: 45 Hrs

TEXT BOOKS
1 Tripathy PC And Reddy PN, "Principles of Management", Tata McGraw-Hill, 4th Edition, 2008.

REFERENCES
1. Dinkar Pagare, "Principles of Management", Sultan Chand & Sons, 2000.
2. Kanagasapapathi. P (2008) Indian Models of Economy, Business and Management, Prentice Hall of India, New Delhi, ISBN: 978-81-203-3423-6.
3. G.K.Vijayaraghavan and M.Sivakumar, "Principles of Management", Lakshmi Publications, 5th Edition, 2009.
4. Harold Koontz & Heinz Weihrich, "Essentials of Management – An International perspective", 8th edition. Tata McGraw-Hill, 2009.
5. Charles W.L. Hill and Steven L McShane – Principles of Management, Tata Mc Graw-Hill, 2009.

MCT 150   COMPUTER   NETWORKS   3 0 0 3
Objectives:

- To study the concepts of data communications.
- To study the functions of different layers.
- To introduce IEEE standards employed in computer networking.
- To make the students to get familiarized with different protocols and network components.

UNIT I   OPEN SYSTEM INTERCONNECTION MODEL   9 hrs

Network Goals – uses – network topologies – Network architecture - OSI Reference model services – Network standardization – ARPANET – SNA – USENET

UNIT II   DATA COMMUNICATIOM CONCEPTS   9 hrs

Guided and unguided Medias – Asynchronous and synchronous transmission – RS 485 Ethernet - Fast Ethernet RS232C Interface, X.21 interface switching technologies – Circuit, Message, packet and hybrid switching – Elementary data link protocols – sliding window – Automatic repeat request.

UNIT III   MEDIUM ACCESS SUB-LAYER AND NETWORK LAYER   9 hrs

Channel allocation methods – ALOHA protocols – Pure ALOHA – Slotted ALOHA – local area networks – IEEE standard 802 for LANS – Wireless LAN IEEE 802.11 FDD1 - Virtual circuits – datagram – comparison – Routing congestion control.

UNIT IV   TCP/IP –AND INTERNETWORKING   9 hrs

TCP/IP – architecture and operation – IP layers and functions – addressing and routing – Internet user services – E-Mail – w.w.w. - Internetworking – Bridges – Gateways – Repeaters – Routers – Brouters.

UNIT V   BROAD BAND NETWORKS AND CONNECTIVITY   9 hrs

ISDN Evolution – structures – Limitation - Broadband - ISDN, Transfer modes – Asynchronous transfer mode (ATM) – ATM cell format – Traffic Management – SONET – Introduction to VSAT networks.

TOTAL : 45 Hrs

TEXT BOOKS:

1. Andrew S. Tanenbaum, "Computer Networks", Prentice Hall of India, 3rd edition, 1998
2. Behrouz A. Forouzan, "Data communication and Networking", Tata McGraw-Hill, 2004.

REFERENCES:

1. Dimetri Bertsekas and Robert Gallager, "Data Networks", PH1, 1994.
2. Hughes.L. "Data Communication a Practical Approach", Narosa Publications 1997.
3. James F. Kurose and Keith W. Ross, "Computer Networking: A Top-Down Approach Featuring the Internet", Pearson Education, 2003.
4. Larry L.Peterson and Peter S. Davie, "Computer Networks", Harcourt Asia Pvt. Ltd., Second Edition.

MCT 151 TOTAL PRODUCTIVE MAINTENANCE MANAGEMENT   3   0   0   3

UNIT I MAINTENANCE CONCEPTS   **6 hrs**
Objectives and functions – Tero technology – Reliability Centered Maintenance (RCM) – maintainability prediction – availability and system effectiveness- maintenance costs

UNIT II MAINTENANCE MODELS   **9 hrs**
Minimal repair – AGAN policy – maintenance types – balancing PM and breakdown maintenance- PM schedules: deviations on both sides of target values – replacement models

UNIT III TOTAL PRODUCTIVE MAINTENANCE   **12 hrs**
Zero breakdowns – ZD and TPM – maximizing equipment effectiveness – Autonomous maintenance program – five pillars of TPM – TPM small group activities – TPM organization – Management Decision – Creation of Organizations – Establishment of basic policies and goals –TPM implementation

UNIT IV MAINTENANCE LOGISTICS   **9 hrs**
Human factors in maintenance – maintenance manuals – maintenance staffing methods – queuing applications – simulation – spare parts management – maintenance planning and scheduling

UNIT V ONLINE MONITORING   **9 hrs**
Condition monitoring – corrosion control – vibration monitoring, – Wear Debris Monitoring (WDM) – MMIS - expert systems.

                          TOTAL : 45 Hrs

TEXT BOOK :
     1.Seiichi Nakajima, "Introduction to TPM", Productivity Press, Chennai, 1992.

REFERENCES :
1. Fumiu Goto, "Equipment planning for TPM Maintenance Prevention Design", Productivity Press, 1992.
2. Kunio Shirose, "Total Productive Maintenance for Workshop Leaders", Productivity Press, 1992.
3. Kunio Shirose, "TPM for Operators", Productivity Press, 1996.
4. T. Suzuki, "New Directions for TPM", Productivity Press, 1993.
5. Kelly .A, "Maintenance planning and control", Butterworths, London, 1991.

MCT 152	RAPID PROTOTYPING	3 0 0 3

Objectives

- To study about learning Rapid Prototyping is to enhance the knowledge of students in the field of prototyping,
- The syllabus will also provide knowledge on the various RP Machines and their process capabilities.

UNIT I OVERVIEW OF RAPID PROTOTYPING   **9 hrs**
Definitions, evolution, CAD for RPT, Product design and rapid product development, conceptual design, detail design, prototyping, Fundamentals of RP systems, 3D solid modeling software and their role in RPT, creation of STL file

UNIT II LIQUID BASED RP PROCESSES   **9 hrs**
Liquid based RP systems: Stereo lithography (SLA)-principle-process parameters-process details-machine details- applications Solid Ground Curing - Principle- process parameters process details-machine details, Applications.

UNIT III SOLID BASED RP PROCESSES   **9 hrs**
Fusion Deposition Modeling - Principle- process parameters-process details-machine details, Applications. Laminated Object Manufacturing - Principle- process parameters-process details-machine details, Applications.

UNIT IV POWDER BASED RP PROCESSES   **9 hrs**
Powder based RP systems: Selective Laser Sintering (SLS)- Principle- process parameters process details-machine details- Applications. 3-Dimensional Printers - Principle- process parameters-process details-machine details, Applications, and other Concept Modelers like Thermo jet printers, Sander's model maker.

UNIT V RAPID TOOLING   **10 hrs**
Principles and typical process for quick batch production of plastic and metal parts through quick tooling. Reverse Engineering – 3D scanning-3D digitizing and Data fitting- Vacuum Casting.

TOTAL : 45 Hrs

TEXT BOOK:

1. Pham D.T & Dimov.S.S, "Rapid manufacturing" , Springer-Verlag, London, 2001

REFERENCES:

1. Chua C.K. et al., "Rapid Prototyping: principles and applications" Wiley, 2003
2. Jacobs P.F., "Stereolithography and other Rapid Prototyping & Manufacturing
   Technologies", Mc Graw Hill ,New york,1996
3. Hilton P.D., "Rapid Tooling" Marcel Dekkar, 2000
4. Zeid I., "CAD/CAM: Theory & Practice", McGrawHill, Singapore,1991.

MCT 153   UNCONVENTIONAL MACHINING PROCESS   3   0   0   3

(Common to Mechanical and Mechatronics Engineering branches)

OBJECTIVES:

To learn the basic concepts of unconventional machining processes.
o   To learn in detail about
-        o   the mechanical energy based processes
-        o   the electrical energy based processes
-        o   the chemical energy based processes and
-        o   the thermal energy based   processes

UNIT I   INTRODUCTION   8   hrs

Unconventional machining Process – Need – classification – Brief overview of all techniques

consideration in process selection.

UNIT II   MECHANICAL ENERGY BASED PROCESSES   9   hrs

Abrasive Jet Machining – Water Jet Machining – Ultrasonic Machining. (AJM, WJM and USM).
Working Principles – Equipment – Process parameters – MRR-Variation in techniques used –
Applications.

UNIT III   ELECTRICAL ENERGY BASED PROCESSES   8   hrs

Electric Discharge Machining (EDM) - Working Principles-Equipments-Process Parameters-
MRR- Electrode / Tool – Power Circuits-Tool Wear – Dielectric – Flushing – Wire cut EDM –
Applications.

UNIT IVCHEMICAL AND ELECTRO-CHEMICAL ENERGY BASED PROCESSES

                                                                              10 hrs

Chemical Machining and Electro-Chemical Machining (CHM and ECM)-Etchants-Maskant-
Techniques of applying maskants-Process Parameters – MRR-Applications.
Principles of ECM-Equipments-MRR-Electrical circuit-Process Parameters-ECG and ECH
Applications.

UNIT V   THERMAL ENERGY BASED PROCESSES   10   hrs

Laser Beam machining (LBM), Plasma Arc Machining (PAM) and Electron Beam Machining
(EBM). Principles-Equipment-Types-Beam control techniques – Applications.

                                                               Total: 45 Hrs

TEXT BOOKS:

1.   Vijay.K. Jain "Advanced Machining Processes" Allied Publishers Pvt. Ltd., New Delhi
        (2002) ISBN 81-7764-294-4.

REFERENCES:

1. Benedict. G.F. "Nontraditional Manufacturing Processes" Marcel Dekker Inc., New York (1987).

2. Pandey P.C. and Shan H.S. "Modern Machining Processes" Tata McGraw-Hill, New Delhi (1980).

3. Mc Geough, "Advanced Methods of Machining" Chapman and Hall, London (1998).

4. Paul De Garmo, J.T.Black, and Ronald.A.Kohser, "Material and Processes in Manufacturing" Prentice Hall of India Pvt. Ltd., New Delhi (8th Edition) (2001) ISBN – 81-203-1243-0.

MCT 154   **MICRO ELECTRO MECHANICAL SYSTEMS**   **3 0 0 3**

Objective:
- To study about micro sensors and actuators.
- To study about fabrication process
- To design micro systems.

UNIT I INTRODUCTION   9 hrs
Overview-Microsystems and microelectronics -definition-MEMS materials-scaling laws scaling in geomentry-scaling in rigid body dynamics- scaling in electrostatic forces- scaling in electricity- scaling in fluid mechanics- scaling in heat transfer.

UNIT II MICRO SENSORS AND ACTUATORS
        9 hrs

Working principle of Microsystems - micro actuation techniques - micro sensors-types - Microactuators – types – micropump – micromotors – micro – valves – microgrippers -micro Accelerometers

UNIT IIIFABRICATION PROCESS   9 hrs

Substrates-single crystal silicon wafer formation-Photolithography-Ion implantation-Diffusion –Oxidation-CVD-Physical vapor deposition-Deposition by epitaxy-etching process

UNIT IVMICRO SYSTEM MANUFACTURING   9 hrs

Bulk Micro manufacturing- surface micro machining –LIGA-SLIGA-Micro system packaging-materials-die level-device level-system level-packaging techniques-die preparation-surface bonding-wire bonding-sealing

UNIT VMICRO SYSTEM DESIGN   9 hrs

Design considerations-process design-mask layout design- mechanical design-applications of micro system in -automotive industry-bio medical –aero space-telecommunications.
       Total = 45 Hrs

Text Book:
1. Tai-Ran Hsu,MEMS & Microsystems Design and Manufacture,Tata McGraw-Hill,2006.

REFERENCES:
1. Mohamed Gad-el-Hak, The MEMS Hand book, CRC press 2002.
2. Julian W.Gardner,Vijay K.Varadan,Osama O.Awadel Karim,Microsensors MEMS and Smart Devices, John Wily & sons Ltd.,2001.
3. S.Fatikow,U.Rembold,Microsystem Technology and Microrobotics,Springer-Verlag Berlin Heidelberg ,1997.
4. Francis E.H Tay and W.O Choong, Microfludics and BioMEMS Applications, Springer, 2002.

MCT 155   **RENEWABLE ENERGY SOURCE**   **3 0 0 3**
(Common to Mechanical and Mechatronics Engineering)

OBJECTIVES

- o   To know about different primary energy sources and renewable energy sources
- o   To study the solar energy measurement and designing of various solar energy utilized systems
- o   To study the principles of different non-conventional energy sources and their utilization.
- o   To understand the applications of energy from waste and designing of biogas plant
- o   To get an exposure in various direct energy conversion systems

UNIT I **ENERGY AND ENVIRONMENT**   **9 hrs**

Primary energy sources - world energy resources - energy cycle of the earth –environmental aspects of energy utilization, Emissions and Global warming – Renewable energy resources and their importance - Potential impacts of harnessing the different renewable energy resources.

UNIT II   **SOLAR ENERGY**   **9 hrs**

Principles of solar energy collection -.solar radiation - measurements - instruments - data and estimation- types of collectors - characteristics and design principles of different type of collectors, performance and testing of collectors - Solar water and air heaters - performance and applications - solar cooling - solar drying - solar ponds - solar tower concept - solar furnace.

UNIT III   **WIND, TIDAL AND GEO THERMAL ENERGY**   **9 hrs**

General theory of windmills - types of windmills - design aspects of horizontal axis windmills –

applications - Energy from tides and waves – working principles of tidal plants and ocean thermal

energy conversion plants - Geothermal power plants.

UNIT IV   **BIO ENERGY**   **9 hrs**

Energy from bio mass and bio gas plant – types and design of biogas plants – applications - Energy from wastes - utilization of industrial, municipal and agricultural wastes.

UNIT V   **DIRECT ENERGY CONVERSION SYSTEM**   **9 hrs**

Magneto hydrodynamic systems (MHD) - thermoelectric generators – thermionic generators - fuel cells - solar cells - types, Emf generated, power output, losses and efficiency applications. Hydrogen conversion and storage systems.

Total: 45 Hrs

TEXT BOOKS:

1. Rai G.D, "Non conventional Energy sources" 4th edition (24th Reprint), 2009 Khanna Publishers, New Delhi.

2. "Renewable Energy Sources and Emerging Technologies", Kothari, Eastern Economy Edition, 2009.

REFERENCES:

1. Sukhatme, S.P., "Solar Energy, Principles of Thermal Collection and Storage", 3rd Edition, TataMCGraw Hill, 2008.

2. B.H.Khan, "Non Convention Energy Resources", 2nd Edition, Tata Mc Graw Hill, 2009.

3. S.RAo and Parul ehar, "Energy Technology – Non conventional, Renewable and Conventional, 3rd Edition (6th Reprint), Khanna Publishers, 2009.

4. Garg. H. P and Prakash. J., "Solar Energy - Fundamentals and applications", T1st revised edition, Tata Mc Graw Hill, 2000.

MCT 156   MEDICAL MECHATRONICS   3 0 0 3

Objectives:

- To study how to measure biochemical and various physiological information.
- To study the need and technique of electrical safety in Hospitals.
- To study the use of radiation for diagnostic and therapy.
- To study about computers in medicine

UNIT I   INTRODUCTION   9 hrs

Cell structure – electrode – electrolyte interface, electrode potential, resting and action potential – electrodes for their measurement, ECG, EEG, EMG – machine description – methods of measurement – three equipment failures and trouble shooting.

UNIT II   BIO-MEDICAL SENSORS AND TRANSDUCERS   9 hrs

Basic transducer principles Types – source of bioelectric potentials – resistive, inductive, capacitive, fiber-optic, photoelectric , chemical, active and passive transducers and their description and feature applicable for biomedical instrumentation – Bio ,Nano sensors and application.

UNIT III   SIGNAL CONDITIONING, RECORDING AND DISPLAY   9 hrs

Input isolation, DC amplifier, instrumentation, charge amplifier, power amplifier, and differential amplifier – feedback, op-Amp-electrometer amplifier, carrier Amplifier – instrument power supply. Oscillagraphic – galvanometric - X-Y, magnetic recorder, storage oscilloscopes – electron microscope – PMMC writing systems – Telemetry principles – Bio telemetry.

UNIT IV MEDICAL MEASUREMENT AND MONITORING SYSTEMS   9 hrs

Blood pressure measurement: by ultrasonic method – plethysonography – blood flow measurement by electromagnetic flow meter cardiac output measurement by dilution method – phonocardiography – vector cardiography. Heart lung machine – artificial ventilator – Anesthetic machine – Basic ideas of CT scanner – MRI and ultrasonic scanner- laser equipment and application – cardiac pacemaker – DC – defibrillator patient safety - electrical shock hazards - Centralized patent monitoring system.

UNIT V   BIO-MEDICAL DIAGNOSTIC INSTRUMENTATION   9 hrs

Introduction – computers in medicine - basis of signal conversion and digital filtering, data reduction technique – time and frequency domain technique – ECG Analysis.

TOTAL : 45 Hrs

TEXT BOOKS:

1. Khandpur, R.S., "Handbook of Biomedical Instrumentation", TMH, 2009.
2. Cromwell, Weibell and Pfeiffer, "Biomedical Instrumentation and Measurements", 2nd Edition, Prentice Hall of India, 1999.

REFERENCES:

1. Geddes L.A., and Baker, L.E., "Principles of Applied Bio-medical Instrumentation", 3rd Edition, John Wiley and Sons, 1995.

2. Tompkins W.J., "Biomedical Digital Signal Processing", Prentice Hall of India, 1998.

MCT 157   INTELLECTUAL PROPERTY RIGHTS (IPR)   3 0 0 100

1.   UNIT I   9 hrs
Introduction - Invention and Creativity - Intellectual Property (IP) - Importance - Protection of IPR - Basic types of property (i. Movable Property ii. Immovable Property and iii. Intellectual Property).

2.   UNIT II   9 hrs
IP - Patents - Copyrights and related rights - Trade Marks and rights arising from Trademark registration - Definitions - Industrial Designs and Integrated circuits - Protection of Geographical Indications at national and International levels - Application Procedures.

3.   UNIT III   9 hrs
International convention relating to Intellectual Property - Establishment of WIPO - Mission and Activities - History - General Agreement on Trade and Tariff (GATT).

4.   UNIT IV   9 hrs
Indian Position Vs WTO and Strategies - Indian IPR legislations - commitments to WTO-Patent Ordinance and the Bill - Draft of a national Intellectual Property Policy - Present against unfair competition.

5.   UNIT V   9 hrs
Case Studies on - Patents (Basumati rice, turmeric, Neem, etc.) - Copyright and related rights - Trade Marks - Industrial design and Integrated circuits - Geographic indications - Protection against unfair competition.
                                                                                    TOTAL: 45 Hrs

TEXT BOOK

1. Subbaram N.R., "Handbook of Indian Patent Law and Practice", S. Viswanathan (Printers and Publishers) Pvt. Ltd., 1998.

REFERENCES

1. Eli Whitney, United States Patent Number: 72X, Cotton Gin, March 14, 1994.

2. Intellectual Property Today: Volume 8, No. 5, May 2001, [www.iptoday.com].

3. Using the Internet for non-patent prior art searches, Derwent IP Matters, July 2000. [www.ipmatters.net/features/000707_gibbs.html.]

MCT 158   **ARTIFICIAL INTELLIGENCE**   **3 0 0 3**

Objective:

- To acquire knowledge about different searching techniques and algorithms.
- To train the system in playing games.
- To Study the concept of representing knowledge and facts using reasoning and structures.

UNIT I   INTRODUCTION   10 hrs

Definition – Pattern recognition – Criteria of success – Production Systems – Control Strategies – Heuristic Search – Problem Characteristics – Production System Characteristics – Forward and backward reasoning – Matching Indexing – Heuristic Functions, Search algorithms.

UNIT II   GAME PLAYING   8 hrs

Overview – Minimax search procedure – Adding Alpha – Beta cutoffs – Waiting for Ouiescence – Secondary search – Using book moves.

UNIT III   KNOWLEDGE REPRESENTATION USING CONVENTIONAL LOGICS   10 hrs

Use of Predicate logic – Introduction to representation – representing simple facts in logic augmenting the representation – resolution – Conversion to clause from – The basis of resolution Unification of algorithm – Question answering – Natural Deduction.

UNIT IV   KNOWLEDGE REPRESENTATION USING MODERN LOGICS   8 hrs

Nonmonotonic reasoning – Statistical Probabilistic reasoning – Techniques for dealing with a random world and deterministic world – rule based system.

UNIT V   STRUCTURAL REPRESENTATIONS OF KNOWLEDGE   9 hrs

Common knowledge structures – level of representation – Right structures – Declarative representations – Semantic nets – Conceptual dependency Frames Scripts – Procedural representation – Natural language understanding – Perception – learning – Implementation A.I. Systems.

TOTAL : 45   Hrs

TEXT BOOK:

1.   Elaine Rich, "Artificial Intelligence", McGraw-Hill Book Co., 2nd Ed., 2002.

REFERENCES:

1.   M. W. Richaugh, "Artificial Intelligence, A. Knowledge Based Approach", PWS Rent Publishing Boston, 1998.
2.   Charniac. E and M.C.Dermott. "Introduction to Artificial Intelligence", Addison Wesley Publishing Company, 2002.
3.   Robert Goodell Brown, "Materials Management Systems – A Members Library", John Wiley Publishers, 1977.
4.   Westing Fine and Zone, "Purchasing Management Principles", John Wiley Publishers, 1986

GSS103 -TOTAL QUALITY MANAGEMENT   **3 0 0 3**

OBJECTIVES

*To understand the Total Quality Management concept and principles and the various

  tools available to implementTQM.

*To understand the statistical approach for quality control.
*To create an awareness about the ISO and QS certification process and its need.

1. INTRODUCTION   **9 hrs**

Definition of Quality, Dimensions of Quality, Quality costs, Basic concepts of Total Quality Management, Role of Senior Management, Quality Council, Quality Statements, Barriers to TQM Implementation, Principles of TQM, Contributions of Deming, Juran and Crosby

2. TQM PRINCIPLES   **9 hrs**

Customer satisfaction – Customer Perception of Quality, Customer Complaints, Service Quality, Customer Retention, Employee Involvement – Motivation, Empowerment, Teams, Recognition and Reward, Performance Appraisal, Benefits, Continuous Process Improvement,5S, Kaizen, Supplier Partnership, Performance Measures – Basic Concepts, Strategy.

3. STATISTICAL PROCESS CONTROL   **9 hrs**

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

4. TQM TOOLS   **9 hrs**

Benchmarking, Quality Function Deployment (QFD), Taguchi Quality Loss Function, Total Productive Maintenance (TPM), FMEA

5. QUALITY SYSTEMS   **9 hrs**

Need for ISO 9000 and Other Quality Systems, ISO 9001:2008 Quality System – Elements, Implementation of Quality System, Documentation, Quality Auditing, ISO 14001:2004

                                          TOTAL: 45 Hrs

TEXT BOOK:

1. Dale H.Besterfiled, "Total Quality Management", Pearson Education, Inc. 2003.

   (Indian reprint 2004). ISBN 81-297-0260-6.

REFERENCES:

1. James R.Evans & William M.Lidsay, "The Management and Control of Quality", South-Western (Thomson Learning), 2008.
2. Feigenbaum.A.V. "Total Quality Management", McGraw Hill, 1993.
3. Oakland.J.S. "Total Quality Management", Butterworth – Hcinemann Ltd., Oxford. 2004.
4. Narayana V. and Sreenivasan, N.S. "Quality Management – Concepts and Tasks", New Age International 2007.
5. Zeiri. "Total Quality Management for Engineers", Wood Head Publishers, 2000.

GSS105 ENTREPRENEURSHIP DEVELOPMENT   **3 0 0 3**

Objectives:
1. To study the factors affecting Entrepreneurship growth and their problems.
2. To understand the importance of Entrepreneurial Development programmes.
3. To study the projects identification, selection and formulation
4. To understand the role of government in entrepreneurial development
5. To understand the basis of intellectual property rights in India.

UNIT I   **9 hrs**

Entrepreneur –Entrepreneurship and economic development – its importance – Entrepreneur Qualities, nature, types, traits of entrepreneur. Similarities and differences between entrepreneur and manager – factors affecting entrepreneurship growth-Problems of entrepreneurs

UNIT II   **9 hrs**
Entrepreneurial promotion: Motivation: Theories and factors – Entrepreneurial development programmes – need, objectives, phases and evaluation - Training and developing - occupational mobility - factors in mobility - Role of consultancy organizations is promoting entrepreneurs.

UNIT III   **9 hrs**
Project Management: Project identification and selection – project formulation – Report preparation – evaluation: marketing - technical and financial.

UNIT IV   **9 hrs**
Role of government in entrepreneurial development – District Industry Centre and its role – Government incentives – financial and non-financial – Sectoral reservation for SSI and tiny sector.

UNIT V   **9 hrs**
Property-definition and ownership-kinds of property-types of intellectual property-patent-trade marks – industrial design-need for protection for IP-WIPO and its activities-TRIPS Agreement-evoluation of IPR in India.

TEXT BOOKS: **Total - 45Hrs**

1.Entrepreneurial Development by S S Khanka, S. Chand & Co: 2008 ISBN: 81-219-1801-4

2.Intellectual Property Rights Text and Case, by Dr. R. Radhakrishnan and Dr. S.

   balasubramanian, Excel Books – 2008, ISBN: 978-81-7446-609-9

REFERENCE BOOKS

1. Vasanth Desai "Dynamics of Entrepreneurial Development and Management" Himalaya
    Publishing House.
2. N.P.Srinivasan & G.P. Gupta "Entrepreneurial Development" Sultanchand & Sons.
3. P.Saravanavelu "Entrepreneurship Development" Eskapee publications.
4. S.S.Khanka "Entrepreneurial Development" S.Chand & Company Ltd.,
5. Satish Taneja, Entrepreneur Development ; New Venture Creation
www.iprventure.com,

GSS106 -Governance of India   3 0 0 3

Unit – I   Constitution   9 hrs

Constitution of India – Objectives enshrined in Preamble, fundamental rights & duties, directive principles of state policy – Union executive, legislative and judiciary – state governments – Federal features and unitary bias-Different types of governments in the world.

Unit – II   Legislature and Judiciary   8 hrs

Parliament – Lok Sabha and Rajya Sabha – Legislative procedure – Union judiciary –   State legislature – State judiciary – Parliamentary democracy.

Unit – III   Central political executive   9 hrs

Roles of President, Vice President, Prime Minister, Council of Ministers, Cabinet Committees – Role of Central Secretariat – Boards and Commissions – Ministries and Departments.

Unit – IV   State administration   9 hrs

Roles of Governor, Chief Minister, Council of Ministers, State secretariat – Administration of law and order – District administration – Panchayati Raj – Municipal administration – Autonomy of local bodies.

Unit – V   E – Governance   10hrs

Overview – E-governance evolution – Global trends – Models of digital governance – E-Readiness – Infrastructural needs – Evolutionary stages in E-governance – NICNET – CARD project – Computerization of urban local bodies – E-governance in secretariat – Land records management software – IT in Indian judiciary – Rural e-seva.

Total: 45 Hrs

Text Books:

1. Vishnoo Bhagwan and Vidya Bhushan, "Indian Administration", S-Chand & Co., 2005.
2. C.S.R. Prabhu, "E-Governance - Concepts and Case Studies", Prentice-Hall of India 2005.
         (for Unit-V only)

References:

1. M. Laxmikanth, 'Public Administration', 5th edition, 2009.
2. *www.india.gov.in,* National portal of India.
3. Kiran Bedi and others, "Government @ net", Sage Publications, New Delhi 2001.
4. *www.nisg.org,* 'Architecting e-government' website of National Institute of Smart Government.

GSS107 - INDIAN ECONOMY   **3 0 0 3**

Objectives:
1. To understand the fundamentals of Macro Economics and National Income of India.
2. To study the importance of planning and economic growth in India.
3. To understand the importance of infrastructural development in the economy.
4. To know the causes of unemployment and different employment schemes for educated and uneducated.
5. To study the basis of Indian Banking system and its importance.

Unit – I: Fundamentals of Macro-economics   **9hrs**
Economics – economic activity -factors of production – factor income and circular flow of income. Concept of national income- definition of GNP, GDP – National Income of India - Growth and structure.

Unit – II : Planning and Economic Growth   **9hrs**
Indian planning – Planning commission – Five year plans – objectives and achievements – Industry policies – public sector understandings – private sector – SSIs Recent trends in SSIs, SME and SEZ – Economic reforms and globalization – IT and IT enable service in India.

Unit – III : Infrastructure of Indian Economy   **9hrs**
Infrastructure and Economic development – power and energy – Transport: road, rail –and civil aviation. Urban infrastructure – international transport system – sea and air.

Unit – IV : Labour and Unemployment   **9hrs**
Population –size and growth – demographic transition – age composition – education and its issues. Employment – nature of unemployment its causes – Employment schemes for educated and uneducated.

Unit - V: Indian Banking System and Credit   **9hrs**
Reserve Bank of India: its basic functions – commercial banks – its functions: deposit acceptance and lending – types of deposit – types of loans and advances –other banking services.

Text Books: **Total-45 Hrs**

1. Indian Economy by Ruddar Datt and KPM Sundaram, S. Chand and Co – 2004 ISBN: 81-219-2045-0
2. Macro Economics by H.L. Ahuja, S. Chand and Co – 2008, ISBN: 81-219-0433-1

Reference Books:
1. *Indian Economy*, Mishra, S. K. and V. K. Puri; Himalaya Publishing House, 2003, 21st revised edition.
2. Economics by Samuelson and Nordhaus, Tata – Mecrew Hill, 2007.