Electronics and Communication Engineering (EC)

EN010301A ENGINEERING MATHEMATICS II
(Common to all branches except CS & IT)

Teaching scheme **Credits: 4**

2 hours lecture and 2 hour tutorial per week

Objectives

- *To apply standard methods and basic numerical techniques for solving problems and to know the importance of learning theories in Mathematics.*

MODULE 1 Vector differential calculus (12 hours)

Scalar and vector fields – gradient-physical meaning- directional derivative-divergence an curl - physical meaning-scalar potential conservative field- identities - simple problems

MODULE 2 Vector integral calculus (12 hours)

Line integral - work done by a force along a path-surface and volume integral-application of Greens theorem, Stokes theorem and Gauss divergence theorem

MODULE 3 Finite differences (12 hours)

Finite difference operators Δ, ∇, E, μ and δ - interpolation using Newtons forward and backward formula – problems using Stirlings formula, Lagrange's formula and Newton's divided difference formula

MODULE 4 Difference Calculus (12 hours)

Numerical differentiation using Newtons forward and backward formula – Numerical integration – Newton's – cotes formula – Trapezoidal rule – Simpsons $1/3^{rd}$ and $3/8^{th}$ rule – Difference equations – solution of difference equation

MODULE 5 **Z** transforms (12 hours)

Definition of Z transforms – transform of polynomial function and trignometric functions – shifting property , convolution property - inverse transformation – solution of 1^{st} and 2^{nd} order difference equations with constant coifficients using Z transforms.

Reference

1. Erwin Kreyszing – Advance Engg. Mathematics – Wiley Eastern Ltd.
2. B.S. Grewal – Higher Engg. Mathematics - Khanna Publishers
3. B.V. Ramana - Higher Engg. Mathematics – McGraw Hill
4. K Venkataraman- Numerical methods in science and Engg -National publishing co
5. S.S Sastry - Introductory methods of Numerical Analysis -PHI
6. T.Veerarajan and T.Ramachandran- Numerical Methods- McGraw Hill
7. Babu Ram – Engg. Mathematics -Pearson.
8. H.C.Taneja Advanced Engg. Mathematics Vol I – I.K.International

EN010 302 ECONOMICS AND COMMUNICATION SKILLS

(Common to all branches)

Teaching scheme
2hours lecture and 2 hours tutorial per week **Credits: 4(3+1)**
Objectives

- To impart a sound knowledge of the fundamentals of Economics.

Economics

Module I (7 hours)
Reserve Bank of India-functions-credit control-quantitative and qualitative techniques
Commercial banks-functions- Role of Small Industries Development Bank of India and National Bank for Agriculture and Rural Development
The stock market-functions-problems faced by the stock market in India-mutual funds

Module II (6 hours)
Multinational corporations in India-impact of MNC's in the Indian economy
Globalisation-necessity-consequences
Privatisation-reasons-disinvestment of public sector undertakings
The information technology industry in India-future prospects
Module III (6 hours)
Direct and indirect taxes- impact and incidence- merits of direct and indirect taxes-progressive and regressive taxes-canons of taxation-functions of tax system-
tax evasion-reasons for tax evasion in India-consequences-steps to control tax evasion
Deficit financing-role-problems associated with deficit financing

Module IV (5 hours)
National income-concepts-GNP, NNP, NI, PI and DPI-methods of estimating national income-difficulties in estimating national income
Inflation-demand pull and cost push-effects of inflation-government measures to control inflation

Module V (6 hours)
International trade-case for free trade-case for protectionism
Balance of payments-causes of disequilibrium in India's BOP-General Agreement on Tariffs and Trade-effect of TRIPS and TRIMS in the Indian economy-impact of WTO decisions on Indian industry

Text Books

1. Ruddar Datt, Indian Economy, S.Chand and Company Ltd.
2. K.K.Dewett, Modern Economic Theory, S.Chand and Company Ltd.

References

1. Paul Samuelson, Economics, Tata McGraw Hill
2. Terence Byres, The Indian Economy, Oxford University Press
3. S.K.Ray, The Indian economy, Prentice Hall of India
4. Campbell McConnel, Economics, Tata McGraw Hill

Communication Skills

Objectives

- To improve Language Proficiency of the Engineering students
- To enable them to express themselves fluently and appropriately in social and professional contexts
- To equip them with the components of different forms of writing

MODULE – 1 (15 hours)

INTRODUCTION TO COMMUNICATION

Communication nature and process, Types of communication - Verbal and Non verbal, Communication Flow-Upward, Downward and Horizontal, Importance of communication skills in society, Listening skills, Reading comprehension, Presentation Techniques, Group Discussion, Interview skills, Soft skills

MODULE – II (15 hours)

TECHNICAL COMMUNICATION

Technical writing skills- Vocabulary enhancement-synonyms, Word Formation-suffix, affix, prefix, Business letters, Emails, Job Application, Curriculum Vitae, Report writing-Types of reports

Note: No university examination for communication skills. There will be internal evaluation for 1 credit.

REFERENCES

1. The functional aspects of communication skills, P.Prasad and Rajendra K. Sharma, S.K. Kataria and sons, 2007
2. Communication skills for Engineers and Scientists, Sangeeta Sharma and Binod Mishra, PHI Learning private limited, 2010
3. Professional Communication, Kumkum Bhardwaj, I.K. International (P) House limited, 2008
4. English for technical Communication, Aysha Viswamohan, Tata Mc Graw Publishing company limited, 2008

EC010 303 NETWORK THEORY

Teaching scheme **Credits:** 4

2 hours lecture and 2 hours tutorial per week

Objectives

- *To study time domain, phasor and Laplace transform methods of linear circuit analysis*

Module I (12 hrs)

Reference directions for two terminal elements - Kirchhoff's Laws - Independent and Dependent Sources – Resistance Networks: Node and Mesh analysis of resistance networks containing both voltage and current independent and dependent sources – Source Transformations – Superposition, Thevenin, Norton and Maximum Power Transfer Theorems applied to resistance networks

Module II (12 hrs)

Capacitors and Inductors – Current-voltage relationships – Step and Impulse functions – Waveshapes for Capacitor and Inductor – Series and Parallel combinations – Coupled coils – Mutual Inductance – First order Circuits: Excitation by initial conditions – Zero input response – Excitation by sources – Zero state response – Step and impulse response of RL and RC circuits - Excitation by sources and initial conditions – Complete response with switched dc sources

Module III (12 hrs)

Sinusoidal Steady State Analysis: Review of complex numbers – Rectangular and Polar forms – Phasors and the sinusoidal steady state response - Phasor relationships for R, L and C – Impedance and Admittance – Node and Mesh analysis, Superposition, Source transformation, Thevenin and Norton's theorems applied to Phasor circuits – Sinusoidal Steady State power – Average Power – Maximum power transfer theorem – Phasor analysis of Magnetically coupled circuits

Module IV (12 hrs)

Laplace Transform: Definition of Unilateral Laplace Transform- Properties –Laplace Transform of common time functions – Inverse Laplace Transform by Partial Fraction Expansion – Initial value and Final value theorems –Solution of network differential equations - Transformation of a circuit into s-domain – Transformed equivalent of resistance, capacitance, inductance and mutual inductance – Impedance and Admittance in the transform domain – Node and Mesh analysis of the transformed circuit - Network theorems applied to the transformed circuit – Network Functions: Driving point and Transfer functions - Poles and zeros

Module V (12 hrs)

Frequency Response: Network functions in the sinusoidal steady state with $s = j\omega$ – Magnitude and Phase response - Magnitude and Phase response of First order Low pass and High pass RC

circuits –- Bode Plots – First order and Second order factors.
Two port networks: Characterization in terms of Impedance, Admittance, Hybrid and Transmission parameters – Interrelationships among parameter sets - Reciprocity theorem – Interconnection of two port networks- series, parallel and cascade.

References

1. W H. Hayt, Kemmerly and S M Durbin, *Engineering Circuit Analysis*, Tata Mc.Graw Hill
2. DeCarlo, Lin, *Linear Circuit Analysis*, OUP
3. B Carlson, *Circuits*, Ceneage Learning
4. M E. Van Valkenburg, *Network Analysis*, Prentice Hall of India.
5. L P .Huelsman, *Basic Circuit Theory*, Prentice Hall of India.
6. Robert L.Boylestad , *Introductory Circuit Analysis* , 12th e/d ,Prentice Hall of India.
7. C A Desoer & E S Kuh, *Basic Circuit Theory*, Tata Mc.Graw Hill
8. F F Kuo, *Network Analysis and Synthesis*, WileyInterscience.

EC 010 304 SOLID STATE DEVICES

Teaching Scheme

3 lecturer hours and 1 tutorial hour **Credit :4**

Objectives

- *To provide students with a sound understanding of existing electronic devices, so that their studies of electronic circuits and systems will be meaningful.*
- *To develop the basic tools with which students can later learn about newly developed devices and applications.*

Module I (13 hours)

Bonding forces in solids – Energy Bands – Metals, semiconductors and insulators – Direct and indirect Semiconductors – Variation of Energy Bands with alloy composition – Charge carriers in semiconductors – Electrons and holes – Effective mass – Intrinsic and extrinsic materials.

Charge concentrations – Fermi level – Electrons and hole concentrations at equilibrium – Temperature dependence of carrier concentrations – Compensation and space charge neutrality.

Drift of carriers in electric and magnetic fields – Drift and resistance – Effects of temperature on doping and mobility – High-field effects – Hall effect.

Module II (13 hours)

Excess carriers in semiconductors – Carrier lifetime – Direct and indirect recombination – Steady state carrier generation – Quasi Fermi levels.

Diffusion of carriers – Diffusion process – Diffusion coefficient – Einstein relation – Continuity equation – Steady state carrier injection – Diffusion length.

P-N junctions – Equilibrium conditions – Contact potential – Equilibrium Fermi levels – Space charge at a junction – Forward and reverse biased conditions – Steady state conditions – Qualitative description of current flow at a junction – Carrier injection – Diode equation – Majority and minority currents through a p-n junction – V-I characteristics of a p-n junction diode.

Module III (12 hours)

Reverse breakdown in p-n junctions – Zener and avalanche mechanisms – Breakdown diodes.

Time variation of stored charge in p-n junctions – Reverse recovery transient – Switching diodes – Capacitance of p-n junctions – Varactor diodes.

Metal-semiconductor junctions – Schottky barriers – Rectifying and ohmic contacts.

Optoelectronic devices – Optical Absorption – Solar Cells – Photo detectors – Photoluminescence and electroluminescence – Light emitting diodes – Laser diodes.

Module IV (12 hours)

Bipolar Junction Transistor – Bipolar Transistor action – Basic principle of operation – Simplified current relations – Modes of operation – Majority and minority current components – Emitter injection efficiency – Base transport factor – Current transfer ratio – Current amplification factor – Amplification and switching – Base width modulation – Avalanche Breakdown – Base resistance and emitter crowding

Field Effect Transistor – Basic JFET operation – pinch off and saturation – Transconductance and amplification factor – V-I characteristics – Transfer characteristics

Basic principles of high frequency transistors – Schottky transistors; Phototransistors

Module V (10 hours)

Ideal MOS capacitor – Energy band structure in depletion, accumulation and inversion modes, C-V characteristics – Threshold voltage.

MOSFETs – Enhancement and depletion MOSFETs – Current-voltage relationship – Transconductance – Control of threshold voltage – Basic principles of CMOS.

Tunnel diodes – pnpn diodes – Introduction to SCR and IGBT.

Reference Books

1. B. G. Streetman, S. K. Banerjee, *Solid State Electronic Devices,* 6th ed., PHI Learning Pvt. Ltd., New Delhi, 2010.
2. D. A. Neamen, *Semiconductor Physics and Devices,* 3rd ed., Tata McGraw Hill Education Pvt. Ltd., New Delhi, 2010.
3. M. S. Tyagi, *Introduction to Semiconductor Materials and Devices,* Wiley India Pvt. Ltd., New Delhi, 2008.
4. J. Millman, C. C. Halkias, S. Jit, *Electronic Devices and Circuits,* 3rd ed., Tata McGraw Hill Education Pvt. Ltd., New Delhi, 2010.
5. M. K. Achuthan, K. N. Bhat, *Fundamentals of Semiconductor Devices,* Tata McGraw Hill Education Pvt. Ltd., New Delhi, 2010.
6. V. Suresh Babu, *Solid State Devices and Technology,* 3rd ed., Pearson Education, 2010.

EC010 305: ANALOG CIRCUITS – I

Teaching Scheme : **Credits : 4**
3 lecture hours and 1 tutorial hour

0bjectives:

- *To understand applications of diodes and transistors*
- *To understand working of MOSFET*
- *To provide an insight into the working, analysis and design of basic analog circuits using BJT and MOSFET*

Module I (10)

RC Circuits: Response of high pass and low pass RC circuits to sine wave, step, pulse and square wave inputs, Tilt, Rise time. Differentiator, Integrator. Small signal diode model for low and high frequencies, clipping and clamping circuits.

Analysis of half wave, full wave and bridge rectifiers. Analysis of L, C, LC & π filters. Zener voltage regulator, transistor series (with feedback) and shunt voltage regulators, short circuit and fold back protection.

Module II (14)

DC analysis of BJTs - BJT as amplifier. Small signal equivalent circuits (Low frequency π and h models only). Transistor Biasing circuits, Stability factors, Thermal runaway. Small signal analysis of CE, CB, CC configurations using approximate hybrid π model (gain, input and output impedance)

Module III (12)

MOSFET I-V relation, load lines, small signal parameters, small signal equivalent circuits, body effect. Biasing of MOSFETs amplifiers. Analysis of single stage discrete MOSFET amplifiers – small signal voltage and current gain, input and output impedance of Basic Common Source amplifier, Common Source amplifier with and without source bypass capacitor, Source follower amplifier, Common Gate amplifier.

Module IV (12)

High frequency equivalent circuits of BJTs, MOSFETs, Miller effect, short circuit current gain, s-domain analysis, amplifier transfer function. Analysis of high frequency response of CE, CB, CC and CS, CG, CD amplifiers.

Module V (12)

Power amplifiers: Class A, B, AB and C circuits - efficiency and distortion. Biasing of class AB circuits. Transformer less power amplifiers.

Feed back amplifiers - Properties of negative feed back. The four basic feed back topologies- Series-shunt, series-series, shunt-shunt, shunt-series. Analysis and design of discrete circuits in each feedback topology - Voltage, Current, Trans conductance and Trans resistance amplifiers, loop gain, input and output impedance. Stability of feedback circuits.

References:

1. Sedra and Smith: *Microelectronic Circuits*, 4/e, Oxford University Press 1998.
2. B. Razavi , "*Fundamentals of Microelectronics*", Wiley
3. Donald A Neamen. : *Electronic Circuit Analysis and Design*, 3/e, Tata Mc.Graw Hill.
4. Millman and Halkias: *Integrated Electronics*, Tata Mc.Graw Hill, 2004.

5. Spencer & Ghausi: *Introduction to Electronic Circuit Design,* Pearson Education, 2003.
6. Roger T. Howe, Charles G. Sodini**:** *Microelectronics: An Integrated Approach,* Pearson Education, 1997.
7. R E Boylstead and L Nashelsky: *Electronic Devices and Circuit Theory*, 9/e, Pearson Education

EC010 306 COMPUTER PROGRAMMING

Teaching Scheme

3 lecture hours and 1ntutorial hour **4 credits**

Objectives

- *To develop the programming skill using C*

Module 1 (12 hrs)
Problem solving with digital Computer - Steps in Computer programming - Features of a good program, Algorithms – Flowchart.
Introduction to C: C fundamentals - The character set - identifiers and keywords - Data types - constants - variables and arrays - declarations - expressions - statements - symbolic constants- arithmetic operators - Relational and Logical operators - The conditional operator - Library functions - Data input and output - getchar – putchar, scanf, printf - gets and puts functions - interactive programming.

Module 2 (12 hrs)
Control Statements: While - do while - for - nested loops -if else switch- break - continue - The comma operator - go to statement, Functions - a brief overview - defining a function - accessing a function - passing arguments to a function - specifying argument - data types - function prototypes - Recursion.

Module 3 (12 hrs)
Program structure: storage classes - Automatic variables - external variables - multi file programs. Arrays: defining an array - processing an array - passing arrays in a function – multi dimensional arrays - array and strings. Structures and unions: defining a structure - processing a structure - user defined data types - passing structure to a function – self referential structures - unions.

Module 4 (12hrs)
Pointers: Fundamentals - pointer declaration - passing pointers to a function - pointers and one dimensional arrays - operations on pointers - pointers and multi dimensional arrays – passing functions to other functions.

Module 5 (12 hrs)
Data files: Opening and closing of a data file - creating a data file - processing a data file, low level programming - register variables – bit wise operation - bit fields - enumeration - command line parameters - macros - the C pre-processor.

References

1. Byron Gottfried, *Programming with C, Schaum's Outlines* ,Tata Mc.Graw Hill.
2. Kernighan & Ritchie , "*The C programming language:",* Prentice Hall of India..
3. Venkateshmurthy , "*Programming Techniques through* C":, Pearson Education.

4. Al Kelley, Ira Pohl , "*A book on C*" , Pearson Education.
5. Balaguruswamy , "*Programming in C"* , Tata Mc Graw Hill.
6. Ashok N Kanthane , "*Programming with ANSI and Turbo C*", Pearson Education.
7. Stephen C. Kochan , "*Programming in C*" , CBS publishers.

EC010 307 ANALOG CIRCUITS LAB

Teaching Schemes

3 hours practical per week **Credits: 2**

Objectives

- *To provide experience on design, testing, and analysis of few basic electronic circuits using BJT and MOSFET.*
- *To provide experience on electronic circuit simulation software like SPICE .*

1. Characteristics of Diodes & Zener diodes.
2. Characteristics of Transistors (CE & CB).
3. Characteristics of MOSFET.
4. Frequency responses of RC Low pass and high pass filters. RC Integrating and Differentiating circuits.
5. Rectifiers-half wave, full wave, Bridge with and without filter- ripple factor and regulation.
6. Clipping and clamping circuits.
7. Zener Regulator with & without emitter follower.
8. RC Coupled CE amplifier - frequency response characteristics.
9. MOSFET amplifier (CS) - frequency response characteristics.
10. Feedback amplifiers (current series, voltage series) - Gain and frequency response
11. Power amplifiers (transformer less), Class B and Class AB.

Introduction to SPICE

Models of resistor, capacitor, inductor, energy sources (VCVS, CCVS, Sinusoidal source, pulse, etc) and transformer.
Models of DIODE, BJT, FET, MOSFET, etc..
Simulation of following circuits using spice (Schematic entry of circuits using standard packages).
Analysis- (transient, AC, DC, etc.):
1. Potential divider.
2. Integrator & Differentiator (I/P PULSE) – Frequency response of RC circuits.
3. Diode Characteristics.
4. BJT Characteristics.
5. FET Characteristics.
6. MOS characteristics.
7. Full wave rectifiers (Transient analysis) including filter circuits.
8. Voltage Regulators.
9. Sweep Circuits.
10. RC Coupled amplifiers - Transient analysis and Frequency response.
11. FET & MOSFET amplifiers.

EC010 308:PROGRAMMING LAB

Teaching scheme **Credits:** 2
3 hours practical per week

Objectives

- *To familiarize with computer hardware, operating systems and commonly used software packages*
- *To learn computer programming and debugging*

Part 1

1. Computer hardware familiarization.
2. Familiarization/installation of common operating systems and application software.

Part 2

Programming Experiments in C/C++: Programming experiments in C/C++ to cover control structures, functions, arrays, structures, pointers and files.

EN010401 ENGINEERING MATHEMATICS III

(Common to all branches)

Teaching scheme **Credits: 4**

2 hours lecture and 2 hour tutorial per week

Objectives: *Apply standard methods of mathematical &statistical analysis*

MODULE 1 Fourier series (12 hours)

Dirichlet conditions – Fourier series with period 2 π and 2l – Half range sine and cosine series – Harmonic Analysis – r.m.s Value

MODULE 2 Fourier Transform (12 hours)

Statement of Fourier integral theorem – Fourier transforms – derivative of transforms- convolution theorem (no proof) – Parsevals identity

MODULE 3 Partial differential equations (12 hours)

Formation by eliminating arbitrary constants and arbitrary functions – solution of Lagrange's equation – Charpits method –solution of Homogeneous partical differential equations with constant coefficients

MODULE 4 Probability distribution (12 hours)

Concept of random variable , probability distribution – Bernoulli's trial – Discrete distribution – Binomial distribution – its mean and variance- fitting of Binominal distribution – Poisson distribution as a limiting case of Binominal distribution – its mean and variance – fitting of Poisson distribution – continuous distribution- Uniform distribution – exponential distribution – its mean and variance – Normal distribution – Standard normal curve- its properties

MODULE 5 Testing of hypothesis (12 hours)

Populations and Samples – Hypothesis – level of significance – type I and type II error – Large samples tests – test of significance for single proportion, difference of proportion, single mean, difference of mean – chi –square test for variance- F test for equality of variances for small samples

References

1. Bali& Iyengar – A text books of Engg. Mathematics – Laxmi Publications Ltd.
2. M.K. Venkataraman – Engg. Mathematics vol II 3rd year part A & B – National Publishing Co.
3. I.N. Sneddon – Elements of partial differential equations – Mc Graw Hill
4. B.V. Ramana – Higher Engg. Mathematics – Mc Graw Hill
5. Richard A Johnson – Miller Fread's probability & Statistics for Engineers- Pearson/ PHI

6. T. Veerarajan – Engg. Mathematics – Mc Graw Hill
7. G. Haribaskaran – Probability, Queueing theory and reliability Engg. – Laxmi Publications
8. V. Sundarapandian - probability ,Statistics and Queueing theory – PHI
9. H.C.Taneja – Advanced Engg. Mathematics Vol II – I.K.International
10. A.K.Mukhopadhyay-Mathematical Methods For Engineers and Physicists-I.K.International

EN010 402(ME): PRINCIPLES OF MANAGEMENT

(Common with EN010 502(ME))

Teaching scheme **Credits:** 4

3 hours lecture and 1 hour tutorial per week

Objectives

- *To develop an understanding of different functional areas of management.*
- *To understand the functions and duties an individual should perform in an organisation.*

Module I (12 hours)

Management Concepts: Vision, Mission, Goals and Objectives of management-MBO-Scientific management- Functions of management- Planning- Organizing- Staffing-Directing- Motivating- Communicating- Coordinating- Controlling- Authority and Responsibility- Delegation- Span of control- Organizational structure- Line, Line and staff and Functional relationship.

Module II (12 hours)

Personnel Management: Definition and concept- Objectives of personnel management-Manpower planning- Recruitment and Selection of manpower- Training and development of manpower- Labour welfare- Labour turnover- Quality circle- Industrial fatigue- Industrial disputes-Method of settling disputes- Trade unions.

Module III (12 hours)

Production management: Objectives and scope of production management- Functions of production department- production management frame work- product life cycle-Types of production- Production procedure- Project planning with CPM and PERT- Basic concepts in network.

Module IV (12 hours)

Financial Management: Objectives and Functions of Financial Management- Types of Capital- Factors affecting working capital- Methods of financing.
Cost Management: Elements of cost- Components of cost- Selling Price of a product.

Module V (12 hours)

Sales and Marketing Management: Sales management- Concept- Functions of sales department- Duties of sales engineer- Selling concept and Marketing concept- Marketing-Definition and principles of marketing- Marketing management and its functions- Sales forecasting- Pricing- Advertising- Sales promotion- Channels of distribution- Market research.

Text Books

1. Koontz and Weihrich, *Essentials of Management*, Tata McGraw Hill.
2. Mahajan M., *Industrial Engineering and Production Management*, Dhanpat Rai and Co.
3. Kemthose and Deepak, *Industrial Engineering an Management,* Prentice Hall of India.

Reference Books

1. Martand Telsang, *Industrial Engineering and Production Management.*
2. Khanna O.P., *Industrial Engineering and Management*, Dhanpat Rai and Co.
3. Philip Kotler, *Marketing Management*, Prentice Hall of India.
4. Sharma S. C. & Banga T. R., *Industrial Organisation and Engineering Economics,* Khanna Publishers.
5. Prasanna Chandra, *Financial Management,* Tata McGraw Hill.

EC010 403 SIGNALS AND SYSTEMS

Teaching scheme **Credits:** 4

2 hours lecture and 2 hours tutorial per week

Objectives

- *To study the methods of analysis of continuous time and discrete time signals and systems to serve as a foundation for further study on communication, signal processing and control*

Module I (12 hrs)

Classification of signals: Continuous time and Discrete time, Even and Odd , Periodic and Non-periodic , Energy and Power – Basic operations on signals: Operations performed on the dependent variable , operations on the independent variable: Shifting , Scaling – Elementary Discrete time and Continuous time signals: Exponential , Sinusoidal , Step , Impulse , Ramp – Systems: Properties of Systems: Stability, Memory, Causality, Invertibility, Time invariance, Linearity – LTI Systems: Representation of Signals in terms of impulses – Impulse response – Convolution sum and Convolution integral – Cascade and Parallel interconnections – Memory, Invertibility, Causality and Stability of LTI systems – Step response of LTI systems – Systems described by differential and difference equations (solution by conventional methods not required)

Module II (12 hrs)

Fourier analysis for continuous time signals and systems: Representation of periodic signals: Continuous Time Fourier Series – convergence of Fourier series – Gibbs phenomenon – Representation of aperiodic signals: Continuous Time Fourier Transform – The Fourier Transform for periodic signals – Properties of Fourier representations – Frequency Response of systems characterized by linear constant coefficient differential equations

Module III (12 hrs)

Fourier analysis for discrete time signals and systems: : Representation of periodic signals: Discrete Time Fourier Series – Representation of aperiodic signals: Discrete Time Fourier Transform – The Fourier Transform for periodic signals – Properties of Fourier representations – Frequency Response of systems characterized by linear constant coefficient difference equations

Module IV (12 hrs)

Filtering: Frequency domain characteristics of ideal filters – Time domain characteristics of ideal LPF – Non-ideal filters – First and Second order filters described by differential and difference equations – Approximating functions: Butterworth, Chebyshev and elliptic filters (Magnitude response only) – Sampling: The sampling theorem – Reconstruction of a signal from its samples using interpolation – Aliasing

Module V (12 hrs)

Bilateral Laplace Transform – ROC – Inverse – Geometric evaluation of the Fourier transform from pole-zero plot – Analysis and characterization of LTI systems using Laplace Transform – The Z Transform – ROC – Inverse – Geometric evaluation of the Fourier Transform from pole-zero plot – Properties of Z transform - Analysis and characterization of LTI systems using Z-Transform

References:

1) A V Oppenheim, A S Willsky and S H Nawab, *Signals and Systems,* Prentice Hall of India.
2) S Haykin, and B V Veen, *Signals and Systems*, Wiley
3) B P Lathi, *Signal Processing and Linear Systems,* OUP
4) E W Kamen, and B Heck, *Fundamentals of Signals and Systems using the web and Matlab*, Pearson
5) Luis F Chaparro , *Signals and Systems Using MATLAB*, Elsevier
6) R E Ziemer, and W H Tranter, *Signals and Systems*, Pearson.
7) R A Gabel and R A Roberts, *Signals and Linear Systems*, Wiley

EC010 404: DIGITAL ELECTRONICS

Teaching scheme **Credits: 4**
3hours lecture and 1 hour tutorial per week.

Objectives

- *To Work with a variety of number systems and numeric representations, including signed and unsigned binary, hexadecimal, 2's complement.*
- *To introduce basic postulates of Boolean algebra and show the correlation between Boolean expression.*
- *To introduce the methods for simplifying Boolean expressions.*
- *To outline the formal procedures for the analysis and design of combinational circuits and sequential circuits.*

Module I (12hours)

Positional Number System: Binary, Octal, Decimal, Hexadecimal number system, Number base conversions, complements - signed magnitude binary numbers - Binary Arithmetic- addition, subtraction - Binary codes- Weighted, BCD, 8421, Gray code, Excess 3 code, ASCII, Error detecting and correcting code, parity, hamming code.
Boolean postulates and laws with proof, De-Morgan's Theorems, Principle of Duality, Minimization of Boolean expressions, Sum of Products (SOP), Product of Sums (POS), Canonical forms, Karnaugh map Minimization, Don't care conditions

Module II (12 hours)

Digital Circuits: Positive and Negative logic, Transistor transistor logic, TTL with totem pole, open collector and tri state output, Emitter coupled logic – basic ECL inverter, NMOS NOR gate, CMOS inverter, NAND and NOR, Gate performance parameters – fan in, fan out, propagation delay, noise margin, power dissipation for each logic, characteristics of TTL and CMOS, subfamilies of TTL and CMOS.

Module III (12 hours)

Introduction to Combinational Circuits: Basic logic gates, Universal gates, Realization of Boolean functions using universal gates, Realization of combinational functions: addition – half and full adder – n bit adder – carry look ahead adder, subtraction, comparison, code conversion, and decoder, encoder, multiplexer, demultiplexer, parity checkers, and parity generator.
Introduction to Sequential Circuits: latches, timing, Flip Flops, types, characteristic equations, excitation tables, Realization of one flip flop using other flip flops.

Module IV (12 hours)

Application of flip flops as bounce elimination switch, register, counter and RAM, Binary ripple counter, synchronous binary counter, Design of modulo 'n' synchronous counter, up/down counters,
Shift registers – SISO, SIPO, PISO, PIPO, bidirectional shift register and universal register, counters based on shift registers

Module V (12 hours)

Hazards in combinational circuits: Static hazard, dynamic hazard, essential hazards, hazard free combinational circuits.
Introduction to programmable logic devices: PLA- block diagram, PAL – block diagram, registered PAL, Configurable PAL, GAL - architecture, CPLD –

classification internal architecture, FPGA - architecture, ASIC – categories , full custom and semi custom.

Reference Books

1. Donald D Givone, *Digital Principles and Design*, Tata McGraw Hill, 2003.
2. G K Kharate, *Digital Electronics*, Oxford university press, 2010
3. Ronald J Tocci, *Digital Systems*, Pearson Education, 10th edition 2009.
4. Thomas L Floyd, *Digital Fundamentals*, Pearson Education, 8th edition, 2003.
5. Donald P Leach, Albert Paul Malvino, *Digital Principles and Applications*, Tata McGraw Hill 6th edition, 2006.
6. Charles H.Roth, *Fundamentals of Logic Design*, Thomson Publication Company 5th edition, 2004.
7. Milos Ercegovac*, Introduction to Digital Systems*, Wiley India, 2010
8. Moris mano, *Digital Design*, Prentice Hall of India, 3rd edition, 2002.
9. Anada kumar, *Fundamentals of Digital Circuits*, Prentice Hall of India, 2008.
10. Brain Holdesworth, *Digital Logic Design*, Elsevier, 4th edition, 2002.

EC010 405 ANALOG COMMUNICATION

Teaching scheme **Credits:** 4
3 hours lecture and 1 hour tutorial per week

Objectives:

- *Present an introduction to linear and non linear modulation and circuits.*
- *Familiarize students with the basics of probability theory and noise in communication system.*
- *Introduce students to telephone system*

Module 1(12 hrs)

Introduction: Block diagram of communication system –need for modulation
Linear Modulation: Mathematical representation of AM- frequency spectrum - Power relations, SSB, VSB and ISB (Basics only)
Angle Modulation: FM and PM, Spectrum of FM signal, Power and Bandwidth of FM signals, Comparison of AM- FM- PM.

Module 2 (12 hrs)

Linear Modulators and Demodulators: Diode and Transistor Modulator, Square Law Detector Envelope Detector.
Generation and Detection of DSB-SC signal :-Balanced Modulator, Ring Modulator, Synchronous Detection.
SSB-SC generation:-Filter method, Phase shift method, Detection of SSB- Product demodulator

Module 3 (12 hrs)

Non Linear modulators and Demodulators:-FM Generation: Direct and Indirect methods, FM Detection:-Simple slope, balanced slope detection, Foster –Seeley detection, Ratio Detection
Radio Transmitters and Receivers:- AM transmitters:-High level and Low level, Receivers:-characteristics of receivers, Super heterodyne receiver, Image frequency rejection, choice of intermediate frequency, mixer, AGC .
FM Stereo Transmitter and Receiver.

Module 4 (12 hrs)

Probability and Random Variables: -Probability, Sample Space, Events, Conditional Probability and Statistical Independence, Bayes' Theorem, Discrete And Continuous Random Variables, CDF and PDF Joint and Conditional PDF, Statistical Averages: Means, Moments, Expectation Probability models: Binomial Distribution, Gaussian Distribution, Rayleigh Distribution

Module 5 (12 hrs)

Noise:- Sources of noise, shot noise, resistor noise, white noise, additive noise, noise bandwidth, noise temperature, noise figure, signal to noise ratio, noise for cascaded stages

Telephone Systems - Telephone subscribers loop system, switching and transmission plan, Transmission system, Signalling techniques, Interchannel signalling, common channel signalling, standard telephone set, telephone call procedures, call progress.

References

1. LE Frenzel, *Principles of Electronic Communication System 3rd Edition*, Tata Mc.GrawHill.
2. Kennedy,Davis , *Electronic Communication systems 4th Edition* ,Tata Mc.GrawHill.
3. D Roddy and J Coolen: *Electronic Communications*, Prentice Hall of India.
4. RP Singh ,S D Sapre ,*Communication System, Analog &Digital*, Tata Mc.Graw Hill
5. AB Carlson,PB Crilly,JC Rutledge, *Communication Systems 4th Edition*, Mc.GrawHill
6. Wayne Tomasi ,*Electronic communication Systems 5th Edition*, Pearson Edn
7. RJ Shoenbeck ,*Electronic communication ,Modulation & Transmission*. Prentice Hall of India.
8. ThiagarajanViswanathan, *Telecommunication Switching systems and Networks*, Prentice Hall of India.
9. Simon Haykin ,*Communication System*,Wiley

EC010 406 : ANALOG CIRCUITS – II

Teaching Scheme : **Credits : 4**

3 hours lecture and 1 hour tutorial per week.

Objectives:

- *To understand differential amplifiers using BJT and MOSFET*
- *To understand operational amplifier and its applications.*

Module I (12)

Differential Amplifiers - BJT differential pair, large signal and small signal analysis of differential amplifiers, Input resistance, voltage gain, CMRR, non ideal characteristics of differential amplifier. Frequency response of differential amplifiers. MOS differential amplifiers, Current sources, Active load, cascode load, current mirror circuits, Wilson current mirror circuits. Small signal equivalent circuits, multistage differential amplifiers.

Module II (12)

Simplified internal circuit of 741 op-amp. DC analysis, Gain and frequency response. MOS Operational Amplifiers, single stage- cascode and folded cascode, two stage op-amp, op-amp with output buffer, frequency compensation and slew rate in two stage Op-amps. Ideal op-amp parameters, Non ideal op-amp. Effect of finite open loop gain, bandwidth and slew rate on circuit performance.

Module III (12)

Opamp applications: Inverting and non-inverting amplifier, summing amplifier, integrator, differentiator, Differential amplifiers, Instrumentation amplifiers, V to I and I to V converters, Comparators, Schmitt Trigger, Square and triangular waveform generator, Oscillators – RC Phase-shift and Wein-Bridge, Multivibrators – Astable and Monostable, Precision rectifiers, Programmable gain Amplifier

Module IV (12)

Filters: I^{st} order Low pass, high pass and all pass filters - Bandpass and band elimination filters Biquadratic filters (single op-amp with finite gain non inverting Sallen-Key of Low pass, High pass, Band pass and Band elimination filters. Switched capacitor Resistor, switched capacitor Integrator, I^{st} order SC filter

Module V (12)

D/A converters: DAC characteristics- resolution, output input equations, weighted resistor, R-2R network. A/D converter: ADC characteristics, Types - Dual slope, Counter ramp, Successive approximation, flash ADC, oversampling and delta sigma ADC.

Waveform generators – grounded capacitor VCO and emitter coupled VCO. Basic PLL topology and principle, transient response of PLL, Linear model of PLL, Major building blocks of PLL – analog and digital phase detector, VCO, filter. Applications of PLL. Monolithic PLL - IC LM565 and CD4046 CMOS PLL. 555 Timer Astable Multi vibrator and Monostable Multi vibrator using 555.

References:

1. Sergio Franco: *Design with Operational Amplifiers and Analog Integrated Circuits*, 3/e,Tata Mc.Graw Hill.
2. Behzad Razavi : *Design of Analog CMOS IC,* Tata Mc.Graw Hill, 2003.
3. Gayakwad : *Op-Amps and Linear Integrated Circuits* , 4/e, Prentice Hall of India..
4. David A.Johns, Ken Martin: *Analog Integrated Circuit Design*, Wiley India, 2008
5. Gray, Hurst, Lewis and Meyer *Analysis and Design of Analog Integrated Circuits*, Wiley
6. Baker R Jacob: *CMOS Circuit Design, Layout and Simulation*, Prentice hall of India.,2005

EC010 407 ANALOG CIRCUITS-II LAB

Teaching Schemes
3 hours practical per week. **Credits: 2**

Objectives

- *To provide experience on design, testing, and analysis of few electronic circuits.*
- *To provide experience on design ,testing and analysis of op-amp circuits .*

LIST OF EXPERIMENTS

1. Differential amplifiers (using BJT and MOSFETs) - Measurement of CMRR
2. Cascade amplifiers - Frequency response.
3. Cascode amplifiers (using BJT and MOSFETs) - Frequency response.

4. Familiarization of Operational amplifiers- Inverting and Non inverting amplifiers, frequency response, Adder, Integrator, comparator and voltage level detector.
5. Measurement of Op-Amp. parameters.
6. Difference Amplifier and Instrumentation amplifier.
7. Astable, Monostable and Schmitt trigger circuit using Op -Amps.
8. Triangular and square wave generators using Op- Amplifier.
9. Wien bridge oscillator using op-amplifier with amplitude stabilization and amplitude control, RC Phase shift Oscillator.
10. Study of 555 and Astable, Monostable multivibrator using 555.
11. Active second order filters using Op-Amp (LPF, HPF, BPF and BSF)
12. . A/D converters- counter ramp and flash type.
13. D/A Converters- ladder circuit.

EC010 408 ANALOG COMMUNICATION LAB

Teaching scheme **Credits: 2**

3 hours practical per week

Objectives

- *To provide experience on design, testing, and analysis of few electronic circuits used for communication engineering.*

  To understand basic transmission concepts and to develop strong concepts in fundamentals.

List of Experiments Using discrete components only:

1. Amplitude Modulator-Measurement of Modulation index.
2. Amplitude Demodulator
3. Study of PLL and VCO ICs
4. Frequency Modulator using VCO
5. Frequency Demodulator
6. DSB-SC Modulator
7. DSB-SC Demodulator
8. Tuned Amplifier
9. Mixer
10. AGC
11. Study of 8038
12. Spectral Analysis of AM and FM .
13. Multiplexing using analog multiplexer ICs

Note:Any other relevant experiments related to EC 010 405

EN010501A ENGINEERING MATHEMATICS IV

(Common to all branches except CS & IT)

Teaching scheme **Credits: 4**

2 hours lecture and 2 hour tutorial per week

Objectives: *Use basic numerical techniques to solve problems and provide scientific techniques to decision making problems.*

MODULE 1 Function of Complex variable (12 hours)

Analytic functions – Derivation of C.R. equations in cartision co-ordinates – harmonic and orthogonal properties – construction of analytic function given real or imaginary parts – complex potential – conformal mapping of z^2 , $\frac{1}{z}$ - Bilinear transformation – cross ratio – invariant property (no proof) – simple problems

MODULE 2 Complex integration (12 hours)

Line integral – Cauchy's integral theorem – Cauchy's integral formula – Taylor's series- Laurent's series – Zeros and singularities – types of singularities – Residues – Residue theorem – evaluation of real integrals in unit circle – contour integral in semi circle when poles lie on imaginary axis.

MODULE 3 Numerical solution of algebraic and transcendental equations (10 hours)

Successive bisection method – Regula –falsi method – Newton –Raphson method - Secant method – solution of system of linear equation by Gauss – Seidel method

MODULE 4 Numerical solution of Ordinary differential equations (10 hours)

Taylor's series method – Euler's method – modified Euler's method – Runge – Kutta method (IV order) - Milnes predictor – corrector method

MODULE 5 Linear programming problem (16 hours)

Definition of L.P.P., solution, optimal solution, degenerate solution – graphical solution –solution using simplex method (non degenerate case only) Big -M method – Duality in L.P.P. – Transportation problem –Balanced T.P. – initial solution using Vogel's approximation method - modi method (non degenerate case only)

References

1. B.V. Ramana – Higher Engg. Mathematics – Mc Graw Hill
2. M.R.Spicgel , S.Lipschutz , John J. Schiller, D.Spellman – Complex variables, schanm's outline series - Mc Graw Hill
3. S.Bathul – text book of Engg.Mathematics – Special functions and complex variables –PHI
4. B.S. Grewal – Numerical methods in Engg. and science - Khanna Publishers
5. Dr.M.K Venkataraman- Numerical methods in science and Engg -National publishing co

6. S.S Sastry - Introductory methods of Numerical Analysis -PHI
7. P.K.Gupta and D.S. Hira – Operations Research – S.Chand
8. Panneer Selvam– Operations Research – PHI
9. H.C.Taneja – Advanced Engg. Mathematics Vol II – I.K.International

EC010 502 CONTROL SYSTEMS

Teaching Scheme

2 hours lecture and 2 hours tutorial per week. Credit :4

Objectives

- *To develop the basic understanding of control system theory and its role in engineering design.*
- *To familiarize the inputs, outputs, and building blocks of a control system; to differentiate between open-loop and closed-loop control systems.*
- *To understand the utility of Laplace transforms and transfer functions for modeling complex interconnected systems.*
- *To understand the concept of poles and zeros of a transfer function and how they affect the physical behavior of a system.*
- *To understand the concept of Time Domain and Frequency Domain analysis and to determine the physical behavior of systems using these analysis.*
- *To understand state variable analysis of systems and the relationship with state variable representation and transfer functions.*

Module 1 (14 hours)

Introduction to Control Systems – Basic building blocks of a Control System – Open-Loop and Closed-Loop Control Systems – Feedback and effects of feedback – Types of feedback Control Systems – LTI Systems.

Impulse Response and Transfer Functions of LTI Systems – Properties of Transfer Functions – SISO and MIMO Systems – Mathematical modeling of electrical and mechanical systems (simple systems only) – Analogy between mechanical and electrical systems.

Block Diagrams – Reduction of Block Diagrams – Signal Flow Graph – Mason's Gain Formula – Conversion of Block Diagrams to Signal Flow Graphs.

Module 2 (14 hours)

Stability of Linear Control Systems – BIBO Stability and Asymptotic Stability – Relationship between characteristic equation roots and stability – Method of determining stability – Routh-Hurwitz Criterion.

Time-Domain Analysis of Control Systems – Transient Response and Steady-State Response – Typical test signals – Unit-Step response and Time-Domain specifications of first-order and prototype second-order systems – Steady-State Error – Static and Dynamic Error Constants.

Effects of adding poles and zeros to the Transfer Function – Dominant Poles and Insignificant Poles of Transfer Functions.

Module 3 (10 hours)

Root-Locus Technique – Basic properties of the Root Loci – Angle and Magnitude conditions – Rules for the construction of approximate Root Loci.

Control System Design by the Root-Locus Method – Preliminary design considerations – Lead Compensation – Lag Compensation – Lead-Lag Compensation – Parallel Compensation.

Module 4 (12 hours)

Frequency-Domain Analysis of Control Systems – Frequency-Domain specifications of prototype second order system – Effects of adding zeros and poles to the Forward-Path Transfer Function.

Nyquist Stability Criterion: Fundamentals – Relationship between the Root Loci and the Nyquist Plot.

Relative Stability – Gain Margin and Phase Margin – Stability analysis with Bode Plot and Polar Plot – Introduction to Nichols Plot, Constant-M & Constant-N circles and Nichols Chart (no analysis required).

Module 5 (10 hours)

State-Variable Analysis of Control Systems – Vector-Matrix representation of State Equations – State-Transition Matrix – State-Transition Equation – Relationship between State Equations and Higher-Order differential equations – Relationship between State Equations and Transfer Functions - Characteristic Equation, Eigen values and Eigen vectors.

References

1. B. C. Kuo, *Automatic Control Systems,* 7th ed., PHI Learning Pvt. Ltd., New Delhi, 2009.
2. K. Ogata, *Modern Control Engineering*, 5th ed., PHI Learning Pvt. Ltd., New Delhi, 2010.
3. R. C. Dorf, R. H. Bishop, *Modern Control Systems*, 11th ed., Pearson Education, New Delhi, 2008.
4. N. S. Nise, *Control Systems Engineering,* 5th ed., Wiley India Pvt. Ltd., New Delhi, 2009.
5. M. Gopal, *Control Systems: Principles and Design,* 3rd ed., Tata McGraw Hill Education Pvt. Ltd., New Delhi, 2008.

EC010 503 DIGITAL SYSTEM DESIGN

Teaching scheme **Credits: 4**
3 hours lecture and 1 hour tutorial per week.

Objectives

- *To design and implement combinational circuits using basic programmable blocks*
- *To design and implement synchronous sequential circuits*
- *To study the fundamentals of Verilog HDL*
- *Ability to simulate and debug a digital system described in Verilog HDL*

Module I (12hours)
Introduction to Verilog HDL: Design units, Data objects, Signal drivers, Delays , Data types, language elements, operators, user defined primitives, modeling-data flow, behavioral, structural, Verilog implementation of simple combinational circuits: adder, code converter, decoder, encoder, multiplexer, demultiplexer.

Module II (12 hours)
Combinational circuit implementation using Quine–McCluskey algorithm, Decoders, Multiplexers, ROM and PLA, Implementation of multi output gate implementations

Module III (12 hours)
Finite State Machines: State diagram, State table, State assignments, State graphs, Capabilities and limitations of FSM, Meta stability, Clock skew, Mealy and Moore machines, Modelling of clocked synchronous circuits as mealy and Moore machines: serial binary adder, Sequence detector, design examples.

Module IV (12 hours)
Digital System Design Hierarchy: State assignments, Reduction of state tables, Equivalent states, Determination of state equivalence using implication table, Algorithmic State Machine, ASM charts, Design example.

Module V (12 hours)
Verilog HDL implementation of binary multiplier, divider, barrel shifter, FSM, Linear feedback shift register, Simple test bench for combinational circuits.

Reference

1. Michael D.Ciletti, *Advanced Digital design with Verilog HDL*, Pearson Education, 2005.
2. S. Brown & Z. Vranestic, *Fundamentals of Digital Logic with Verilog HDL*, Tata McGraw Hill, 2002.
3. Samir Palitkar, *Verilog HDL A Guide to Digital Design and Synthesis*, Pearson, 2nd edition, 2003.
4. Peter J Ashenden ,*Digital Design, an embedded system approach using Verilog*, Elsevier, 2008
5. Frank Vahid, *Digital Design*, Wiley Publishers.
6. T R Padmanabhan, *Design through Verilog HDL*, IEEE press, Wiley Inter science, 2002.
7. Donald D Givone, *Digital Principles and Design*, Tata McGraw Hill, 2003.
8. Wakerly J F, *Digital Design Principles and Practices*, Prentice hall of India, 2008.
9. Nazeih M Botros, *HDL programming VHDL and Verilog*, Dreamtech press, 2009
10. David J. Comer, *Digital Logic and State Machine Design,* Oxford university press, 3rd edition, 1995.

EC 010 504(EE) Electric Drives & Control

Teaching Schedule

2 hours Lecture and 2 hours tutorial /week Credits -4

Objectives:

- *To understand the characteristics and operational features of important power electronic devices*
- *Understanding the basic working principles of DC and AC machines*

Module 1(10 Hours)

D.C.Machines – DC Generator- Types, Open Circuit Characteristics and Load characteristics of d.c. shunt generator – Losses and efficiency. D C motor – starter – torque equation – speed torque characteristics of shunt, series and compound motors – Losses – efficiency – Brake test – Swinburne's test.

Module 2(12 Hours)

A.C Machines – Transformers: transformer on no-load and load operation – phasor diagram – equivalent circuit – regulation – losses and efficiency – o.c. and s.c. tests. Three phase induction motors: types –Principle of operation-slip- torque equation – torque-slip characteristics–starters – single phase induction motors – types – working. Alternator –types- principle- emf equation – regulation by emf and mmf methods. Synchronous motor – Principle of operation.

Module3(10 Hours)

Power semiconductor Devices – SCR-Constructional features- Characteristics- rating and specification- Triggering circuits-protection and cooling. Construction and characteristics of power diodes, TRIAC, BJT, MOSFET and IGBT. .

Module 4(14 Hours)

Phase controlled Rectifiers - Operation and analysis of Single phase and multi-phase-controlled rectifiers with R, RL and back EMF load- free wheeling effect. Chopper-classification- Step down- step up- two and four quadrant operations.

Inverters- Single phase and three phase bridge inverters- VSI and CSI- PWM Inverters. SMPS, UPS– principle of operation and block schematic only.

Module 5(14 Hours)

DC drives**:** Methods of Speed control of dc motors– single phase and three phase fully controlled bridge rectifier drives. Chopper fed drives: Single, Two and four quadrant chopper drives. Induction Motor drives: Stator voltage, stator frequency and V/f

Control, Static rotor resistance control. Synchronous motor drives: Open loop and self controlled modes.

Text Books:

1 J B Gupta, *Electrical Machines* , S K Kataria and Sons

2 Vedam Subramaniam ,*Power Semiconductor Drives* –, TMH
3 Rashid Muhammad, *Power Electronics*: Pearson Edn.

References

1. Electrical & Electronic Technology: Hughes, Pearson Education
2. Harish C Ray *Power Electronics*:, Galgotia Pub
3. P S Bimbhra ,*Power Electronics*: Khanna Publishers
4. M.D Singh and K.B Khanchandani, *Power Electronics* –, TMH, 1998
5. Wildi - Electrical Machines, Drives and Power systems 6/ePearson Education

EC010 505 APPLIED ELECTROMAGNETIC THEORY

Teaching Schemes **Credit: 4**
3 hours lecture and 1 hour tutorial per week.

OBJECTIVES

- *To analyze fields potentials due to static changes*
- *To evaluate static magnetic fields*
- *To understand how materials affect electric and magnetic fields*
- *To understand the relation between the fields under time varying situations*
- *To understand principles of propagation of uniform plane waves.*

Module I (14hours)

Review of vector analysis: Cartesian, Cylindrical and Spherical co-ordinates systems- Coordinate transformations. Vector fields: Divergence and curl- Divergence theorem- Stoke's theorem. Static electric field: Electrical scalar potential- different types of potential distribution- Potential gradient- Energy stored in Electric field - Derivation of capacitance of two wire transmission line and coaxial cable –Electrostatic boundary conditions– Steady magnetic field: Ampere's Law, Faraday's Law, Helmholtz's theorems, Energy stored in magnetic fields- Magnetic dipole- Magnetic boundary conditions- Vector magnetic potential A- Magnetic field intensity, Inductance of two wire transmission line and coaxial cable- Relation between E, V and A.- Equation of continuity, Poisson and Laplace equations.

Module II (12 hours)

Maxwell's equations and travelling waves: Conduction current and displacement current, Maxwell's equations- Plane waves- Poynting theorem and Poynting vector- Power flow in a co-axial cable – Instantaneous Average and Complex Poynting Vector. Plane electromagnetic waves- Solution for free space condition- Uniform plane wave:-wave equation for conducting medium- wave propagation in conductors and dielectric, depth of penetration, reflection and refraction of plane waves by conductor and dielectric. Wave polarization - Polarization of electromagnetic wave and derivation of polarization angle.

Module III (14 hours)

Guided wave :-Guided waves between parallel planes- Transverse Electric and Transverse Magnetic waves and its characteristics- Waves in Rectangular Waveguides- Transverse Magnetic Waves in Rectangular Wave guides – Transverse Electric Waves in Rectangular Waveguides – characteristic of TE and TM Waves – Cut off wavelength and phase velocity – Impossibility of TEM waves in waveguides – Dominant mode in rectangular waveguide – Attenuation of TE and TM modes in rectangular waveguides – Wave impedances – characteristic impedance – Excitation of modes.

Moddule IV(10 hours)

Circular waveguides and resonators:- Bessel functions – Solution of field equations in cylindrical co-ordinates – TM and TE waves in circular guides – wave impedances and characteristic impedance – Dominant mode in circular waveguide – excitation of modes – Microwave cavities, Rectangular cavity resonators, circular cavity resonator, Q factor of a cavity resonator.

Module IV (10hours)

Transmission lines:- Uniform transmission line- Transmission line equations. Voltage and Current distribution, loading of transmission lines. Transmission line Parameters – Characteristic impedance - Definition of Propagation Constant. General Solution of the transmission line, Derivation of input impedance of transmission line. VSWR and reflection coefficient – wavelength and velocity of propagation. Waveform distortion – distortion less transmission line. The quarter wave line and impedance matching:-The Smith Chart – Application of the Smith Chart – Single stub matching and double stub matching.

REFERENCES

1. W H.Hayt & J A Buck : "*Engineering Electromagnetics*" Tata McGraw-Hill, 7th Edition 2007.
2. Mathew N.O. Sadiku: "*Elements of Electromagnetics*"–, Oxford Pub, 3rd Edition.
3. David K.Cheng: "*Field and Wave Electromagnetics* - Second Edition-Pearson Edition, 2004.
4. W H.Hayt & J A Buck ,*"Problems and Solutions in Electromagnetics"* - Tata McGraw-Hill,2010
5. E.C. Jordan & K.G. Balmain: "*Electromagnetic Waves and Radiating Systems*." PHI.
6. J. D. Kraus : "*Electromagnetics*", 5th Edition, Mc Graw Hill Publications.
7. Edminister : "*Electromagnetics*", Schaum series, 2 Edn.
8. D A Pozar, Microwave Engineering, Wiley
9. Umran S. Inan & Aziz S. Inan: *Engineering Electromagnetics*, Pearson Education, 1999.
10. Nannapaneni Narayana Rao: *Elements of Engineering Electromagnetics*, 5th Edition, Pearson Education.
11. Clayton R.Paul ,Keith W.Whites, Syed A Nasar "Introduction to Electromagnetic Fileds" TATA McGraw-Hill 3rd Edition

EC010 506 MICROPROCESSORS AND APPLICATIONS

Teaching scheme **Credits: 4**
3 hours lecture and 1 hour tutorial per week.

Objectives

- *To study the architecture of microprocessors 8085 and 8086.*
- *To understand the instruction set of 8085.*
- *To know the methods of interfacing them to the peripheral devices.*
- *To use all the above in the design of microprocessor based systems.*

Module I (12hours)
Introduction to microprocessors and microcomputers: Function of microprocessors- organisation of a microprocessor based system – microprocessor architecture and its operations – memory – I/O devices - pin configuration and functions of 8085 – tristate bus concept - control signals– de-multiplexing AD_0-AD_7 – flags - memory interfacing - I/O addressing - I/O mapped I/O - memory mapped I/O schemes - instruction execution - fetch/execute cycle - instruction timings and operation status.

Module II (12 hours)
Intel 8085 instruction set - instruction and data format – simple programs - programs in looping, counting and indexing – 16 bit arithmetic operations - stack and subroutines - basic concepts in serial I/O – 8085 serial I/O lines

Module III (12 hours)
Basic interfacing concepts – interfacing input devices – interfacing output devices – interfacing as memory mapped I/O - Interrupts – vectored interrupt – restart as software instruction – interfacing A/D and D/A converters.

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Module IV (12 hours)
Programmable interface devices – basic concepts – 8279 programmable keyboard / display interface – 8255A programmable peripheral interface – 8254 programmable interval timer – 8259A programmable interrupt controller - DMA and 8237 as DMA controller.

Module V (12 hours)
Intel 8086 Microprocessor - Internal architecture – Block diagram – Minimum and maximum mode operation – Interrupt and Interrupt applications – memory organization – even and odd memory banks – segment registers – logical and physical address – advantages and disadvantages of physical memory.

Reference

1. Ramesh S Goankar, *8085 Microprocessors Architecture Application and Programming,* Penram International, 5th edition, 1999.
2. Aditya P Mathur, *Introduction to Microprocessor*, Tata McGraw-Hill, 3rd edition, 2002.
3. Douglas V Hall, *Microprocessors and Interfacing*, Tata McGraw-Hill 2nd edition, 2008.
4. N Senthil Kumar, M Saravanan, *Microprocessors and Microcontrollers*, Oxford University press, 2010.
5. John Uffenbeck, *Microcomputer and Microprocessor, The 8080, 8085 And Z80 Programming, Interfacing and Trouble Shooting*, PHI, 3rd edition, 2006.
6. Michel Slater, *Microprocessor Based Design A Comprehensive Guide to Effective Hardware Design*, PHI, 2009.

7. P K Ghosh, P R Sridhar, *0000 to 8085 Introduction to Microprocessors for Engineers and Scientists*, Prentice Hall of India, 2nd edition, 2006.

EC010 507 DIGITAL ELECTRONICS LAB

Teaching scheme **Credits: 2**
3 hours practical per week.

Objectives

- *To provide experience on design, testing, and realization of few digital circuits used.*
- *To understand basic concepts of memories, decoders etc.*

LIST OF EXPERIMENTS:-

1. Study of Logic Gates: Truth-table verification of OR, AND, NOT, XOR, NAND and NOR gates.
2. Implementation of the given Boolean function using logic gates in both SOP and POS forms.
3. Design and Realization of half, full adder or subtractor using basic gates and universal gates.
4. Flip Flops: Truth-table verification of JK Master Slave FF, T and D FF.
5. Asynchronous Counter: Realization of 4-bit up counter and Mod-N counters.
6. Synchronous Counter: Realization of 4-bit up/down counter and Mod-N counter.
7. Shift Register: Study of shift right, SIPO, SISO, PIPO, PISO and shift left operations
8. Ring counter and Johnson Counter.
9. Design examples using Multiplexer and De multiplexer.
10. LED Display: Use of BCD to 7 Segment decoder / driver chip to drive LED display
11. Static and Dynamic Characteristic of NAND gate (both TTL and MOS)

Mini Project based on above experiments.

EC 010 508(EE) Electric Drives and Control Lab

Teaching scheme **Credits:** 2
3 hours practical per week

Objectives

- *To familiarise the students with the working and characteristics of various electrical machines.*
- *To provide experience on design and analysis of few power electronic circuits*

Experiments

1. OCC of self and separately excited D.C machines – critical resistances of various speeds. Voltage build-up with a given field circuit resistance. Critical speed for a given field circuit resistance.
2. Characteristics of D.C series motor
3. Load Test on D.C shunt motor and obtain the performance characteristics.
4. Swinburne's test on D.C machine
5. Polarity, transformation ratio tests of single phase transformers
6. O.C and S.C tests on single phase transformers – calculation of performance using equivalent circuit – efficiency, regulation at unity, lagging and leading power factors.
7. Load test on a single phase transformer .
8. Load test on induction motor.
9. Pre-determination of regulation of an alternator by emf and mmf methods.
10. VI characteristics of SCR .
11. VI characteristics of TRIAC.
12. R and RC-firing scheme for control of SCR.
13. UJT-firing scheme for SCR.
14. Design and Implementation of digital firing scheme for simple SCR circuits.

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References:

1. Dr. P S Bimbra, *Electrical Machinery*, Khanna Publishers
2. R K Rajput, *A text book of Electrical Machines*, Laxmi publishers
3. . Umanand, *Power Electronics- Essentials and Applications*, Wiley India 2009

EC010 601 DIGITAL COMMUNICATION TECHNIQUES

Teaching scheme **Credits:** 4

2 hours lecture and 2 hour tutorial per week

Objectives: To develop ability to analyze communication engineering problems and also to design and develop different communication and electronics systems for processing signals and data.

MODULE I (12 hrs)

Random Signal Theory: Random process*:* stationarity,ergodicity, mean, auto correlation, cross correlation, covariance, random process transmission through linear filters, power spectral density, cross correlation functions, cross spectral densities, Gaussian process*,* Discrete Time Random Process, White Process

Signal Space Representation of Waveforms: Vector Space Concept, Signal Space Concepts, Orthogonal Expansion, Gram- Schmidt Orthogonalization Procedure

MODULE II (12 hrs)

Detection and Estimation: Model of digital communication system, response of bank of correlators to noisy input. Detection of known signals in noise:-ML Receiver. Probability of error calculation, erf, Correlation Receiver, Matched Filter Receiver, properties, detection of signals with unknown phase in noise, Estimation concepts: ML Estimate.

MODULE III (12 hrs)

Pulse Modulation Techniques: Sampling and pulse modulation: Sampling theorem, Ideal sampling and reconstruction, practical sampling and Aliasing, PAM, PWM, PPM, Quantizing, Quantization Noise, Companding, PCM generation and reconstruction, DPCM, Delta Modulation, Adaptive Delta Modulation, digital multiplexing

MODULE IV (12 hrs)

Baseband shaping for Data Transmission: Binary signaling format, Inter Symbol Interference, Nyquist criterion for distortion less base band binary transmission: Ideal solution, practical solution, correlative coding: Duobinary signaling, modified duobinary, generalized form of correlative coding, eye pattern, equalization ,adaptive equalization, synchronization techniques: bit synchronization, frame synchronization

MODULE V (12 hrs)

Bandpass Digital Transmission: Digital CW Modulation: ASK, BFSK, BPSK, MSK, Coherent binary system, timing and synchronization, Non coherent binary system, Differentially coherent PSK, Quadrature carrier and M-ary systems: quadrature carrier system, MPSK, M-ary QAM, Trellis coded modulation

References:

1. Simon Haykin , *Introduction To Analog And Digital Communications*, Wiley India Edition

2. Proakis& Salehi*, Digital Communications*, Mc Graw Hill International Edition.

3. Herbert Taub, Schilling Donald L.,"*Principles of Communication Systems*,3rd e/d, Tata Mc Graw Hill,2007.

4. Carlson, Crilly, Rutledge, "*Communication Systems" 4th Edition*, McGraw Hill

5. Simon Haykin , *Digital Communications*, Wiley India Edition

6. Sklar,Kumar Ray*, Digital Communications*, Pearson Education

7. Glover,Grant, *Digital Communications*, Pearson Education

EC010 602 DIGITAL SIGNAL PROCESSING

Teaching scheme **Credits**: 4

2 hours lecture and 2 hours tutorial per week

Objectives

- *To study the fundamentals of discrete-time system analysis, digital filter design and the DFT*

Module I (12 hrs)

Advantages of DSP – Review of discrete time signals and systems – Discrete time LTI systems – Review of DTFT – Existence – Symmetry properties – DTFT theorems – Frequency response- Review of Z transform – ROC – Properties

Sampling of Continuous time signals – Frequency domain representation of sampling – Aliasing - Reconstruction of the analog signal from its samples – Discrete time processing of continuous time signals – Impulse invariance – Changing the sampling rate using discrete time processing – Sampling rate reduction by an integer factor – Compressor – Time and frequency domain relations – Sampling rate increase by an integer factor – Expander – Time and frequency domain relations – Changing the sampling rate by a rational factor.

Module II (12 hrs)

Transform analysis of LTI systems – Phase and group delay – Frequency response for rational system functions – Frequency response of a single zero and pole – Multiple poles and zeros - Relationship between magnitude and phase – All pass systems – Minimum phase systems – Linear phase systems – Generalised linear phase – 4 types – Location of zeros.

Module III (12 hrs)

Structures for discrete time systems – IIR and FIR systems – Block diagram and SFG representation of difference equations – Basic structures for IIR systems – Direct form - Cascade form - Parallel form - Transposed forms – Structures for FIR systems – Direct and Cascade forms - Structures for Linear phase systems – Overview of finite precision numerical effects in implementing systems

Analog filter design: Filter specification – Butterworth approximation – Pole locations – Design of analog low pass Butterworth filters – Chebyshev Type 1 approximation – pole locations – Analog to analog transformations for designing high pass, band pass and band stop filters.

Module IV (12 hrs)

Digital filter design: Filter specification – Low pass IIR filter design – Impulse invariant and Bilinear transformation methods – Butterworth and Chebyshev – Design of high pass, band pass and band stop IIR digital filters – Design of FIR filters by windowing – Properties of commonly used windows – Rectangular, Bartlett, Hanning, Hamming and Kaiser.

Module V (12 hrs)

The Discrete Fourier Transform - Relation with DTFT – Properties of DFT – Linearity – Circular shift – Duality – Symmetry properties – Circular convolution – Linear convolution using the DFT – Linear convolution of two finite length sequences – Linear convolution of a finite length sequence with an infinite length sequence – Overlap add and overlap save – Computation of the DFT – Decimation in time and decimation in frequency FFT – Fourier analysis of signals using the DFT – Effect of windowing – Resolution and leakage – Effect of spectral sampling.

References

1. A V Oppenheim, R W Schaffer, *Discrete Time Signal Processing* , 2nd Edition Pearson Education.
2. S K Mitra, *Digital Signal Processing: A Computer Based Approach* ,Tata Mc.Graw Hill.
3. J G Proakis, D G Manolakis, *Digital Signal Processing: Principles, Algorithms and Applications*, Prentice Hall of India..
4. L C Ludeman, *Fundamentals of Digital Signal Processing*, Wiley
5. J R Johnson, *Introduction to Digital Signal Processing*, Prentice Hall of India.

EC010 603 RADIATION AND PROPAGATION

Teaching Schemes **Credits: 4**

3 hours lecture and 1 hour tutorial per week.

OBJECTIVES

- *To impart the basic concepts of radiating structures and their arrays*
- *To give understanding about analysis and synthesis of arrays*
- *To give idea about basic propagation mechanisms*

MODULE 1 (13 hours)

Retarded potentials: Concept of vector potential- Modification for time varying- retarded case- Fields associated with Hertzian dipole- Power radiated and radiation resistance of current element-Radiation from half-wave dipole and quarter-wave monopole antennas.

Antenna Parameters: Introduction, Isotropic radiators, Radiation pattern, Gain -radiation intensity-Directive gain, Directivity, antenna efficiency- antenna field zones. Reciprocity theorem & its applications, effective aperture, Effective height, radiation resistance, terminal impedance, front-to-back ratio, antenna beam width, antenna bandwidth, antenna beam efficiency, antenna beam area or beam solid angle, polarization, antenna temperature.

MODULE 2 (13hours)

Antenna Arrays: Introduction, various forms of antenna arrays, arrays of point sources, non isotropic but similar point sources, multiplication of patterns, arrays of n-isotropic point sources, Grating lobes, Properties and Design of Broadside, Endfire, Binomial and Dolph Chebyshev arrays, Phased arrays, Frequency- Scanning arrays- Adaptive arrays and Smart antennas.

MODULE 3 (13hours)

Antenna Types:- Horizontal and Vertical Antennas above the ground plane. Loop Antennas: Radiation from small loop and its radiation resistance- Radiation from a loop with circumference equal to a wavelength-Helical antenna: Normal mode and axial mode operation-Yagi uda Antenna- Log periodic antenna- rhombic antenna- Horn antenna-Reflector antennas and their feed systems- Micro strip antenna-Selection of antenna based on frequency of operation – Antennas for special applications: Antenna for terrestrial mobile communication systems, Ground Penetrating Radar(GPR), Embedded antennas, UWB, Fractal antenna ,Plasma antenna.

MODULE 4 (13hours)

Ground wave propagation: Attenuation characteristics for ground wave propagation-Calculation of field strength at a distance –

Space wave propagation: Reflection characteristics of earth- Resultant of direct and reflected ray at the receiver- LOS distance – Effective earth's radius – Field strength of space wave - duct propagation

Sky wave propagation: Structure of the ionosphere- effect of earth's magnetic field Effective dielectric constant of ionized region- Mechanism of refraction- Refractive index- Critical frequency- Skip distance- Effect of earth's magnetic field- Attenuation factor for ionospheric propagation- Maximum usable frequency(MUF) – skip distance – virtual height – skip distance, Fading and Diversity reception.

MODULE 5 (8 hours)

Antenna Measurements: Reciprocity in Antenna measurements – Measurement of radiation pattern – Measurement of ranges - Measurement of different Antenna parameters- Directional pattern, Gain, Phase, Polarization, Impedance, and Efficiency, Effective gain,SAR.

REFERENCES

1. John D. Krauss, Ronald J Marhefka: "*Antennas and Wave Propagation"*, 4th Edition, Tata Mc Graw Hill
2. Jordan & Balman. "*Electromagnetic waves & Radiating Systems"*– Prentice Hall India
3. Constantine. A. Balanis: "*Antenna Theory- Analysis and Design*", Wiley India, 2nd Edition, 2008
4. R.E Collin: "*Antennas & Radio Wave Propagation",* Mc Graw Hill. 1985.
5. Terman: "*Electronics & Radio Engineering"*, 4th Edition**,** McGraw Hill.
6. Kamal Kishor: *"Antenna and Wave propagation"* , IK International

EC010 604: COMPUTER ARCHITECTURE AND PARALLEL PROCESSING

Teaching scheme **Credits:** 4
3 hours lecture and 1 hour tutorial per week

Objectives

- *To impart the basic concepts of architecture and organisation of computers*
- *To develop understanding about pipelining and parallel processing techniques.*
- *To impart knowledge about the current PC hardware*

Pre-requisites: *Digital Electronics and Microprocessors*

Module I (12 hours)

Introduction : Difference between Architecture, Organisation and Hardware, Review of basic operational concepts – Stored program concept, Instruction sequencing, bus structure, Software support- translating and executing a program- assembler, linker, loader, OS, Instruction types and Addressing modes.
CPU Performance and its factors, Performance evaluation, The Power wall, Switch from uniprocessors to multiprocessors, Basic concepts of pipelining, superscalar architecture and multithreading, Instruction level parallelism (basic idea only).

Module II (12 hours)

Processor Organisation: Control Unit design: Execution of a complete instruction, Single bus and multibus organisation, Sequencing of control signals, Hardwired control unit, Microprogrammed control unit.
Arithmetic and logic design – review of signed and unsigned binary arithmetic, fast adders, Array multiplier, sequential multiplier, Booth's algorithm, fast multiplication methods, integer division – restoring and non restoring methods, floating point numbers.

Module III (12 hours)

Memory and I/O Organisation Memory hierarchy, Memory characteristics, Internal organization of semiconductor RAM memories, Static and Dynamic RAM memories, flash memory, Cache memory – mapping function, replacement algorithm, measurement and improvement of cache performance, Virtual memory and address translation, MMU.
Secondary memories – magnetic and optical disks, I/O accessing – Programmed, Interrupt driven and DMA , Buses- synchronous and asynchronous, bus standards.

Module IV (12 hours)

Parallel Processing :Enhancing performance with pipelining-overview, Designing instruction set for pipelining, pipelined datapath, Hazards in pipelining.
Flynn's classification, Multicore processors and Multithreading, Multiprocessor systems-Interconnection networks, Multicomputer systems, Clusters and other message passing architecture.

Module V (12 hours)

PC Hardware: Today's PC architecture – block diagram, Familiarisation of PC hardware components.

Processor - Pentium series to higher processors - single core, hyperthreading, dual core, multi core and many core processors (brief idea about evolution and improvements in performance)

Motherboard – Typical architecture , Essential Chipsets, Sockets, Slots and ports – serial, parallel, USB, RAM , Brief idea about buses, Subsystems (Network, Sound and Graphics, Ethernet port),

Storage devices : Hard Disks-Types and Classification based on interface- Optical Storage – CD, DVD, BLURAY

SMPS – Functions, power connectors.

Typical specifications for a computer

Reference Books

1. Carl Hamacher : "Computer Organization ", Fifth Edition, Mc Graw Hill.
2. David A. Patterson and John L.Hennessey, "Computer Organisation and Design", Fourth Edition, Morgan Kaufmann.
3. William Stallings : "Computer Organisation and Architecture", Pearson Education.
4. John P Hayes : "Computer Architecture and Organisation", Mc Graw Hill.
5. Andrew S Tanenbaum : "Structured Computer Organisation", Pearson Education.
6. Craig Zacker : "PC Hardware : The Complete Reference", TMH.
7. Nicholas P Carter : "Computer Architecture and Organization", Mc Graw Hill.
8. Pal Chaudhari: "Computer Organisation and Design", Prentice hall of India.

EC010 605 MICROCONTROLLERS AND APPLICATIONS

Teaching scheme **Credits:** 4
3 hours lecture and 1 hour tutorial per week

Objectives

- *To study the architecture of 8051, PIC18 microcontrollers*
- *To understand the instruction set and programming of 8051.*
- *To know the Interfacing methods and programming using 8051.*

Module I (9hours)
Introduction to Microcontrollers: Comparison with Microprocessors – Harvard and Von Neumann Architectures - 80C51 microcontroller – features - internal block schematic - pin descriptions, I/O ports.

Module II (9 hours)
Memory organization – Programming model - Program status word - register banks - Addressing modes - instruction set –Programming examples.

Module III (9 hours)
Interrupts - interrupt sources - interrupt handling – programming examples. Timers operation- different modes –waveform generation- programming examples - Serial communication- different modes - programming examples.

Module IV (9 hours)
Interfacing of DIP switch- LED -7 segment displays -alphanumeric LCD – relay interface – Stepper motor –ADC-DAC-interfacing programs using assembly language.

Module V(9 hours)
Overview of PIC 18, memory organisation, CPU, registers, pipelining, instruction format, addressing modes, instruction set, interrupts, interrupt operation, resets, parallel ports, timers, CCP.

References

1. Muhammad Ali Mazidi, *The 8051 Microcontroller and embedded sytems*, Pearson Education 2nd edition, 2006
2. Kenneth J Ayala, *The 8051 Microcontroller*, Penram International, 3rd edition 2007
3. Myke Predko, "*Programming and customizing the 8051 microcontroller*" Tata Mc.Graw Hill, 2004
4. Han Way Huang, "*PIC microcontroller An introduction to software and hardware interfacing*", Cenage learning 2007
5. Muhammad Ali Mazidi "*PIC microcontroller and embedded systems using assembly and C for PIC 18*" , Pearson 2009

EC010 606 L01: DATA STRUCTURES AND ALGORITHMS

Teaching scheme **Credits:** 4
3 hours lecture and 1 hour tutorial per week

Objectives

- *To impart the basic concepts of data structures and algorithms.*
- *To develop understanding about writing algorithms and solving problems with the help of fundamental data structures using object oriented concepts.*

Module I (10 hours)
Introduction to Data Structures, arrays, records, stacks, queue, linked list, linked stacks and queues, doubly linked list. Polynomial representation using arrays and lists.

Module II (12hours)
Trees, binary tree, traversals, binary search tree, creation insertion, deletion, searching. Graph:-representation, depth first search, breadth first search, path finding.

Module III (12hours)
Search algorithms, sequential binary interpolation, sorting, insertion, bubble, radix, quick sort, merge sort, and heat sort.

Module IV (14 hours)
Analysis of algorithms: - Time and space complexity, complexity notations, best, worst, average cases.
Algorithmic techniques-brute force, greedy, divide and conquer, dynamic programming

Module V (12 hours)
Analysis of search algorithms, sort algorithms. P and NP problems, travelling sales man problems.

Reference Books

1. Horowitz ,Sahni & Anderson Freed, Fundamentals of Data Structures in C, 2nd ed., Universities Press, Hyderabad, 2009
2. Sartaj Sahni , *Data Structures, Algorithms and Applications in C++* , 2nd ed., Universities Press, Hyderabad, 2009
3. Michael T Goodrich, Roberto Tamassia, David Mount, *Data Structures and Algorithms in C++*, Wiley India Edition, New Delhi, 2009
4. B.M. Harwani, *Data Structures and Algorithms in C++*, Dreamtech Press, New Delhi, 2010
5. Langsam, Augenstein ,Tanenbaum, *Data Structures in C & C++* , 2nd Edition, Pearson Education.
6. John Hopcroft, Rajeev Motwani & Jeffry Ullman, *Introduction to Automata Theory, Languages & Computation*, Pearson Education.
7. Tremblay & Sorenson, *Introduction to Data Structures with Applications*, Tata Mc Graw Hill
8. Sara Baase & Allen Van Gelder ,*Computer Algorithms – Introduction to Design and Analysis* , Pearson Education
9. Sahni, *Data Structures algorithms and applications* , Tata Mc GrHill

10. K.L.P. Mishra, N. Chandrashekharan, *Theory of Computer Science* , Prentice Hall of India

EC010 606 L602: DATABASE MANAGEMENT SYSTEMS

Teaching scheme **Credits:** 4
3 hours lecture and 1 hour tutorial per week

Objectives

- *To impart an introduction to the theory and practice of database systems.*
- *To develop basic knowledge on data modelling and design of efficient relations.*
- *To provide exposure to oracle database programming.*

Module I (10 hours)

Basic Concepts - Purpose of Database Systems- 3 Schema Architecture and Data Independence- Components of DBMS –Data Models, Schemas and Instances-Data Modeling using the Entity Relationship Model-Entity types, Relationship Types, Weak Entity Types .

Module II (14 hours)

Relational Model Concepts –Constraints – Entity Integrity and Referential Integrity, Relational Algebra -Select, Project, Operations from Set Theory, Join, OuterJoin and Division - Tuple Relational Calculus.

SQL- Data Definition with SQL - Insert, Delete and Update Statements in SQL, Defining Domains, Schemas and Constraints, Constraint Violations - Basic Queries in SQL - Select Statement, Use of Aggregate functions and Group Retrieval, Nested Queries, Correlated Queries – Views.

Module III (12 hours)

Oracle Case Study : The Basic Structure of the Oracle System – Database Structure and its Manipulation in Oracle- Storage Organization in Oracle.- Programming in PL/SQL- Cursor in PL/SQL - Assertions – Triggers.

Indexing and Hashing Concepts -: Ordered Indices, Hash Indices, Dense and Sparse Indices, Multi Level Indices, Cluster Index, Dynamic Hashing.

Module IV (11 hours)

Database Design– Design Guidelines– Relational Database Design – Functional Dependency- Determination of Candidate Keys, Super Key, Foreign Key, Normalization using Functional Dependencies, Normal Forms based on Primary keys- General Definitions of First, Second and Third Normal Forms. Boyce Codd Normal Form– Multi-valued Dependencies and Forth Normal Form – Join Dependencies and Fifth Normal Form – Pitfalls in Relational Database Design.

Module V (13 hours)

Introduction to Transaction Processing- Transactions- ACID Properties of Transactions- Schedules- Serializability of Schedules- Precedence Graph- Concurrency Control – Locks and Timestamps-Database Recovery

Query processing and Optimization- Translating SQL Queries into a Relational Algebra Computing Select, Project and Join

Object Relational Databases-Distributed Databases-Different Types-Fragmentation and Replication Techniques-Functions of DDBMS.

Reference Books

1. Elmsari and Navathe, *Fundamentals of Database System,* Pearson Education Asia, 5th Edition, New Delhi, 2008.
2. Henry F Korth, Abraham Silbershatz , *Database System Concepts*, Mc Graw Hill 6td Edition, Singapore, 2011.
3. Elmsari and Navathe, *Fundamentals of Database System,* Pearson Education Asia, 3rd Edition, New Delhi, 2005, for oracle
4. Alexis Leon and Mathews Leon, *Database Management Systems*, Leon vikas Publishers, New Delhi.
5. Narayanan S, Umanath and Richard W.Scamell*, Data Modelling and Database Design,Ce*ngage Learning, New Delhi, 2009.
6. S.K Singh,*Database Systems Concepts,Design and Applications,* Pearson Education Asia, New Delhi, 2006.
7. Pranab Kumar Das Gupta, *Database management System Oracle SQL And PL/SQL,* Easter Economy Edition, New Delhi, 2009
8. C.J.Date *, An Introduction to Database Systems,* Pearson Education Asia, 7th Edition, New Delhi.
9. Rajesh Narang, *Database Management Systems,* Asoke K ghosh , PHI Learning, New Delhi, 2009.
10. Ramakrishnan and Gehrke, *Database Management Systems*, Mc Graw Hill, 3rd Edition , 2003.

EC010 606L03 HIGH SPEED DIGITAL DESIGN

Teaching scheme **Credits:** 4
3 hours lecture and 1 hour tutorial per week

Objectives

- *To develop the skills for analyzing high-speed circuits with signal behaviour modelling.*
- *To demonstrate proficiency in understanding signal integrity concepts and terminology and to understand the signal integrity on circuit design.*
- *To be able to perform and analyze signal measurements and to be able to make trade off decisions based on signal budget and design requirements.*

Pre-requisites: Digital Electronics, Digital system design

Module I (12hours)
High Speed Digital Design Fundamentals: Frequency and time, Time and distance, Lumped vs distributed, four kinds of reactance- ordinary capacitance and inductance, mutual capacitance and inductance, Relation of mutual capacitance and mutual inductance to cross talk.
High Speed properties of Logic gates: Power, Quicent vs active dissipation, Active power driving a capacitive load, Input power, Internal dissipation, drive circuit dissipation, Totem pole and open circuit, speed, Sudden change in voltage and current.

Module II (12 hours)
Measurement Techniques; Rise time and bandwidth of oscilloscope probes, self inductance of probe ground loop, Effects of probe load on a circuit, special probing fixtures.
Transmission Lines; Problems of point to point wiring, signal distortion, EMI, cross talk.

Module III (12 hours)
Transmission Lines at High frequency: Infinite uniform transmission line, Lossy transmission line, Low loss transmission line, RC transmission line, Skin effect, Proximity effect, and Dielectric loss.

Module IV (12 hours)
Termination: End termination, rise time, dc biasing, power dissipation, Source termination, Resistance value, Rise time, Power dissipation, Drive current, Middle terminators,
Vias: mechanical properties, capacitance and inductance
Connectors: mutual, series and parasitic capacitance.

Module V (12 hours)
Power system: Stable voltage reference, Uniform voltage distribution, choosing a bypass capacitor,
Clock Distribution: Timing margin, Clock skew, delay adjustments, Clock jitter.

Reference

1. Howard Johnson, *High-Speed Digital Design: A Handbook of Black Magic* , Prentice Hall
2. Dally W.S. & Poulton J.W., "*Digital Systems Engineering*", Cambridge University Press.
3. Masakazu Shoji, "*High Speed Digital Circuits*", Addison Wesley Publishing Company
4. Jan M, Rabaey, *Digital Integrated Circuits: A Design perspective*, Second Edition, 2003.

EC 010 606 L04 MEDICAL ELECTRONICS

Teaching Scheme

3 hours lecture and 1 hour tutorial per week. **Credits: 4**

Objectives:-

- *To study the working of different medical equipments.*

Module 1 (12 hrs)

Introduction to the physiology of cardiac, nervous & muscular and respiratory systems. Transducers and Electrodes: Different types of transducers & their selection for biomedical applications. Electrode theory, selection criteria of electrodes & different types of electrodes such as, Ag - Ag Cl, pH, etc

Module 2 (12 hrs)

Cardiovascular measurement: The heart & the other cardiovascular systems. Measurement of Blood pressure-direct and indirect method, Cardiac output and cardiac rate. Electrocardiography-waveform-standard lead systems typical ECG amplifier, phonocardiography, Ballisto cardiography, Cardiac pacemaker –defibrillator –different types and its selection.

Module 3 (12 hrs)

EEG Instrumentation requirements –EEG electrode –frequency bands – recording systems EMG basic principle-block diagram of a recorder –pre amplifier. Bed side monitor –block diagram- measuring parameters-cardiac tachometer-Alarms-Lead fault indicator-central monitoring. Telemetry – modulation systems – choice of carrier frequency – single channel telemetry systems.

Module 4 (12 hrs)

Instrumentation for clinical laboratory: Bio electric amplifiers-instrumentation amplifiers-isolation amplifiers-chopper stabilized amplifiers –input guarding - Measurement of pH value of Blood-blood cell counting, blood flow, Respiratory transducers and instruments.

Module 5 (12hrs)

Medical Imaging: Computer tomography – basic principle, application –advantage, X ray tubes, collimators, detectors and display - Ultra sound imaging

References

1. J J Carr, "*Introduction to Biomedical Equipment Technology"* : Pearson Education 4th e/d.
2. K S Kandpur, "*Hand book of Biomedical instrumentation"*, Tata McGraw Hill 2nd e/d.
3. John G Webster, "*Medical Instrumentation application and design*", John Wiley 3rd e/d.
4. Richard Aston, "*Principle of Biomedical Instrumentation and Measurement*".

EC010 606 L05 SOFT COMPUTING

Teaching scheme **Credits: 4**
3 hour lecture and 1 hour tutorial per week.

Objectives

- *To develop basic knowledge about neuron and neural networks.*
- *To develop basic knowledge about fuzzy stems.*
- *To be able to understand basic concepts of soft computing frame work and neuro fuzzysystems*

Module 1 (12 hrs)

Introduction- artificial neuron - activation functions - Single layer & multi-layer networks - Training artificial neural networks - Perception - Representation - Linear separability - Learning - Training algorithms.

Module 2 (12 hrs)

Back Propagation - Training algorithm - Applications - network configurations - Local minima -. Hopfield nets - Recurrent networks - Adaptive resonance theory - Architecture classification - Implementation

Module 3 (12 hrs)

Introduction to Fuzzy sets and systems: Fuzzy operations-support of a fuzzy set, height - normalised fuzzy set, α – cuts- The law of the excluded middle and law of contradiction on fuzzy sets. Properties of fuzzy set operations.

Module 4 (12 hrs)

Operations on fuzzy relations - projection, max-min. and min and max-compositions. Fuzzy membership functions- Fuzzy logic controller: fuzzification - Rule base – Defuzzifiifaction-case study for engineering applications.

Module 5 (12hrs)

Soft computing frame work – comparisons- evolutionary algorithm/Genetic Algorithm: basic structure – Neuro fuzzy controller – Applications – case study.

Reference

1. C.T lin & C S George Lee, *Neural Fuzzy Systems*, Prentice Hall of India, 1996
2. Lawrence Fausset, *Fundamentals of Neural Networks*, Prentice Hall
3. Timmoty J. Rose, *Fuzzy Logics & Applications*, Willey publications, 2010
4. Bart Kosko. *Fuzzy Engineering*, Prentice Hall.
5. A.R.Alive, *Soft Computing & its applications*
6. Fakhreddine O, Karray Clarence W De Silva, *Soft Computing and Intelligent Systems Design: Theory, Tools and Applications*, Pearson India
7. Christina Ray, *Artificial neural networks*, Tata Mc.Graw Hill, 1997
8. J.S.R.Jang, C.T. Sun and E.Mizutani, *Neuro-Fuzzy and Soft Computing*, Prentice hall of India, 2004,

EC010 606L06– TELEVISION AND RADAR ENGINEERING

Teaching Scheme:

3 hours lecture and 1 hour tutorial. **Credit 4**

Objective

- *To familiarise the students with the fundamentals of TV Engineering and its applications*
- *To familiarise the students with the fundamentals of Radar Engineering and its applications*

Module 1 (12 hrs)

Principles of television - image continuity - interlaced scanning - blanking - synchronizing – composite video signal - video and sound signal modulation - channel bandwidth - vestigial sideband transmission – television signal propagation
Television receiver circuits – IF section, video detector-video amplifiers-AGC,Sync processing and AFC-Horizontal and vertical deflection circuits –sound section-tuner .

Module 2 (12 hrs)

Colour TV - Colour perception - luminance, hue and saturation - colour TV camera and picture tube(working principle only) - colour signal transmission - bandwidth - modulation - formation of chrominance signal - principles of NTSC, PAL and SECAM coder and decoder.

Module 3(12 hrs)

Digital TV - composite digital standards - 4 f sc NTSC standard - general specifications - sampling structure - digital transmission, Flat panel display TV receivers-LCD and Plasma screen receivers-3DTV-EDTV.
Cable TV - cable frequencies - co-axial cable for CATV - cable distribution system - cable decoders - wave traps and scrambling methods, Satellite TV technology-Geo Stationary Satellites-Satellite Electronics

Module 4(12hrs)

Introduction- Radar Equation- Block diagram- Radar frequencies- Applications- Prediction of range performance –Pulse Repetition Frequency and Range ambiguities –Antenna parameters- System losses.
CW Radar-The Doppler Effect- FM-CW radar- Multiple frequency radar – MTI Radar-Principle- Delay line cancellors- Noncoherent MTI-Pulse Doppler Radar- Tacking Radar – Sequential lobing-Conical Scan- Monopulse – Acquisition- Comparison of Trackers.

Module 5(12 hrs)

Radar Transmitters- Modulators-Solid state transmitters, Radar Antennas- Parabolic-Scanning feed-Lens- Radomes, Electronically steered phased array antenna-Applications, Receivers-Displays-Duplexers.
Special purpose radars-Synthetic aperture radar- HF and over the horizon radar- Air surveillance radar- Height finder and 3D radars – Bistatic radar-Radar Beacons- Radar Jamming and Electronic Counters .

References:-

1. Gulati R.R., *Modern Television Engineering*, Wiley Eastern Ltd.
2. Dhake A.M., *Television Engineering*, Tata McGraw Hill, 2001 .
3. R.P.Bali, "*Color Television, Theory and Practice",* Tata McGraw-Hill, 1994
4. R.G Gupta., " *Television Engineering and Video System",* Tata McGraw-Hill, 2005
5. Bernard Grob & Charles E. Herndon, "*Basic Television and Video Systems"*, McGraw Hill International
6. Damacher P., "*Digital Broadcasting",* IEE Telecommunications Series
7. Merrill I. Skolnik, "*Introduction to Radar Systems*"– 3rd Edition, McGraw Hill, 2001.
8. Merril I.Skolnik , *"Radar Handbook"-,* 3rd Edition, McGraw Hill Publishers,2008.
9. J. C. Toomay, Paul Hannen, *"Radar Principles for the Non-Specialist*", Printice hall of India,2004

EC010 607 MICROPROCESSOR & MICROCONTROLLER LAB

Teaching scheme **Credits: 2**

3 hours practical per week.

Objectives:-

- *To provide experience on programming and testing of few electronic circuits using 8086*
- *. To provide experience on programming and testing of few electronic circuits using 8051simulator.*
- *To understand basic interfacing concepts between trainer kit and personal computers.*

A. Programming experiments using 8086 (MASM)

1. Sum of N Numbers.
2. Display message on screen using code and data segment.
3. Sorting, factorial of a number
4. Addition /Subtraction of 32 bit numbers.
5. Concatenation of two strings.
6. Square, Square root, & Fibonacci series.

B. Programming experiments using 8051 simulator (KEIL).

1. Addition and subtraction.
2. Multiplication and division.
3. Sorting, Factorial of a number.
4. Multiplication by shift and add method.
5. Matrix addition.
6. Square, Square root, & Fibonacci series.

C. Interface experiments using Trainer kit / Direct down loading the programs from Personal computer.

1. ADC / DAC interface.
2. Stepper motor interface.
3. Display (LED, Seven segments, LCD) interface.
4. Frequency measurement.
5. Wave form generation.
6. Relay interface.

EC 010 608 MINI PROJECT LAB

Teaching Scheme

3 hours practical per week. **2 credits**

The mini project will involve the design, construction, and debugging of an electronic system approved by the department. There will be several projects such as intercom, SMPS, burglar alarm, UPS, inverter, voting machine etc. The schematic and PCB design should be done using any of the standard schematic capture & PCB design software. Each student may choose to buy, for his convenience, his own components and accessories. Each student must keep a project notebook. The notebooks will be checked periodically throughout the semester, as part of the project grade.

In addition to this, the following laboratory experiments should also be done in the lab.

1. 555 applications
2. Light activated alarm circuit
3. Speed control of electric fan using TRIAC
4. Illumination control circuits
5. Touch control circuits
6. Sound operated circuits
7. Relay driver circuit using driver IC
8. Interfacing using Opto coupler
9. Schematic capture software (OrCAD or similar) familiarization.
10. PCB design software (OrCAD Layout or similar) familiarization.

A demonstration and oral examination on the mini project also should be done at the end of the semester. The university examination will consist of two parts. One of the lab experiments will be given for examination to be completed within 60 to 90 minutes with a maximum of 30% marks. 70% marks will be allotted for the demonstration and viva voce on the mini project.

EC010 701 VLSI DESIGN

Teaching Schemes **Credits: 4**

2 hours lecture and 2 hours tutorial per week.

Objective: To cater the needs of students who want a comprehensive study of the principle and techniques of modern VLSI design and systems.

Module 1(12 hrs)

Process steps in IC fabrication: Silicon wafer preparation-Diffusion of impurities-physical mechanism-ion implantation- Annealing process- Oxidation process-lithography-Chemical Vapour Deposition -epitaxial growth –reactors-metallization-patterning-wire bonding -packaging

Module 2 (12 hrs)

Monolithic components: Isolation of components-junction isolation and dielectric isolation. Monolithic diodes- schottky diodes and transistors-buried layer-FET structures- JFET-MOSFET-PMOS and NMOS. Control of threshold voltage-silicon gate technology- monolithic resistors-resistor design-monolithic capacitors-design of capacitors- IC crossovers and vias.

Module 3 (12 hrs)

CMOS technology: CMOS structure-latch up in CMOS, CMOS circuits-combinational logic circuit-invertor- NAND-NOR-complex logic circuits, full adder circuit. CMOS transmission gate(TG)T-realization of Boolean functions using TG. Complementary Pass Transistor Logic (CPL)-CPL circuits: NAND, NOR-4 bit shifter. Basic principle of stick diagrams.

Module 4 (12hrs)

CMOS sequential logic circuits: SR flip flop, JK flip flop, D latch circuits. BiCMOS technology-structure-BiCMOS circuits: inverter, NAND, NOR-CMOS logic systems-scaling of MOS structures-scaling factors-effects of miniaturization.

Module 5 (12hrs)

Gallium Arsenide Technology: Crystal structure-doping process-channeling effect-MESFET fabrication-Comparison between Silicon and GaAs technologies. Introduction to PLA and FPGA

References:

1. N Weste and Eshrangian, “Principles of CMOS VLSI Design: A system perspective”, Addison Wesley
2. S M SZE, “VLSI Technology”, Mc Graw Hill
3. Douglass Pucknell, “Basic VLSI design”, Prentice Hall of India.
4. K R Botkar,” Integrated circuits”, Khanna Publishers

5. Jan M Rabaey, Anantha Chandrakasan and Borivoje Nikolic, “Digital Integrated Circuits- a Design perspective”, Prentice Hall.
6. S M Kang & Y Leblebici, “CMOS digital integrated circuits”, Mc Graw Hill.

EC010 702 INFROMATION THEORY AND CODING

Teaching Schemes **Credits: 4**
2 hours lecture and 2 hour tutorial per week.

Objectives

- *To give a basic idea about the information theory.*
- *To get a knowledge about various coding schemes.*

Module 1(12 hrs)
Concept of amount of information-Entropy-Joint and Conditional Entropy-Relative Entropy-Mutual information-Relationship between Entropy and Mutual information-Rate of information-Channel capacity-Redundancy and efficiency of channels.

Module 2 (12 hrs)
Data compression:-Examples of codes- Krafts inequality, optimal codes-Bounds on optimal code length-Huffman codes-Shannon-Fanno Elias coding-Arithmetic coding-ZIP coding.

Module 3 (12 hrs)
Channel capacity:-Noiseless binary channel, BSC, BEC-Symmetric channels-Shannons Channel capacity theorem, Properties of channel capacity-Trade off between SNR and Bandwidth-Channel coding theorem-Zero Error Codes.
The Gaussian Channel:-Band limited channel-Gaussian multiple user channels

Module 4 (12 hrs)
Channel coding:-Concepts of group and fields-Binary field arithmetic-Construction of Galois field-Vector spaces-Matrices
Linear Block Codes:-Encoding-Decoding-Syndrome and error detection-Minimum distance of a block code-Error detection and correction-Capabilities of a linear block code-Standard array and syndrome decoding.

Module (12 hrs)
Important Linear block code:-Hamming codes-Cyclic code-BCH code-Convolution codes-Systematic and non systematic codes –Encoding-Decoding-Viterbi algorithm-Stack (ZJ) decoding algorithm-Turbo codes-LDP codes.

References:

1. T M.Cover,J A.Thomas-“Elements of Information Theory”-Wiley Inter Science.
2. Lin,Costello-“Error Control Coding”-Pearson Education.
3. Singh,Sapre-“Communication systems”-Tata McGraw Hill.
4. T K.Moon-“Error correction coding”-Wiley Inter science.

EC010 703 MICROWAVE ENGINEERING

Teaching Schemes **Credit : 3**

2 hours lecture and 1 hour tutorial per week.

Objectives

- *To give the basic ideas about the characteristics and applications of microwave frequency bands*
- *To understand the working of various microwave passive and active devices and circuits*

Module 1: (12 hours)

Microwave network Characterization and passive devices: Characteristic, features and applications of microwaves- Circuit and S parameter representation of N port microwave networks - Reciprocity Theorem- Lossless networks and unitary conditions- ABCD parameters-Cascaded networks-Relations between S- Y and ABCD parameters. Properties and s-matrices for typical network such as section of uniform transmission line, 3-port networks (reciprocal and nonreciprocal), T-junctions directional coupler, magic tee, ferrite devices, isolator, circulators.

Module 2 :(15 hours)

Microwave Tubes: Generation of microwaves by tubes, limitations of conventional tubes, klystron amplifiers - analysis, reflex klystron oscillator-analysis, magnetrons, traveling wave tube (TWT), backward wave oscillator (BWO)-basic principles. Millimetre wave tubes-introduction

Module 3: (13 hours)

Microwave semiconductor: High frequency limitations of transistors, microwave transistors (theory only), Manley Rowe relations, parameteric amplifiers and frequency multipliers, tunnel diodes, Gunn effect, Gunn Diode oscillators, Avalanche effect, IMPATT & TRAPATT diodes, PIN diodes and their applications, Schottky barrier and backward diodes.

Module 4: (10 hours)

Microwave Measurements: VSWR measurement, microwave power measurement, impedance measurement, frequency measurement, measurement of scattering parameters Return loss measurement using directional couplres-introduction to vector network analyzer and its uses.

Module 5: (10 hours)

Planar Transmission Lines: Planer transmission lines such as stripline, microstrip line, slotline and coplanar waveguides. Characteristics of planar transmission lines. Losses in Microstrip Lines- Quality Factor Q of Microstrip Lines- Substrate materials.

Introduction to MIC's:-Technology of hybrid MICs, monolithis MICs. Comparison of both MICs.

Reference Books:

1. Liao S.Y."Microwave devices and Circuits", Prentice Hall Of India, New Delhi, 3rd Ed. 2006
2. Rizzi P.A,"Microwave Engineering,Passive Circuits" Prentice Hall of India
3. Pozar D.M .," Microwave Engineering", John Wiley
4. Annapurna Das and Sisir Das, "Microwave Engineering", Tata-McGraw Hill , New Delhi, 2008.
5. R.E. Collin : Foundations for Microwave Engg- – IEEE Press Second Edition.

EC010 704 ELECTRONIC INSTRUMENTATION

Teaching Schemes **Credits: 3**

2 hours lecture and 1 hour tutorial per week.

Objective: To cater the needs of students who want a comprehensive study of the electronic measurements, technology and instruments.

Module **1(12 hrs)**

Objectives of engineering measurement-Basic measuring system-block diagram and description-Performance characteristics of instruments-Static and Dynamic. Errors in measurement – error analysis. Units-Dimensions – Standards. Instrument calibration.

Module 2 (13 hrs)

Transducers-parameters of electrical transducers-types-active and passive-analogue and digital types of transducers. Electromechanical type-potentiometric, inductive, thermocouple, capacitive, resistive, piezo electric, strain gauge, ionization gauge,LVDT,hall effect sensor,thin film sensor, proximity sensor, displacement sensor, load cell, nano sensors and Ultrasonic transducers. Opto electrical type-photo emissive, photo conductive and photo voltaic type. Digital encoders- optical encoder-selection criteria for transducers.

Module 3 (13 hrs)

Intermediate elements- instrumentation amplifier, isolation amplifier, opto-couplers. DC and AC bridges- Wheatstone bridge - guarded Wheatstone bridge - Owen's bridge - Shering Bridge - Wein Bridge - Wagner ground connection. Data transmission elements-block diagram of telemetry system-Electrical telemetering system--voltage, current and position type-RF telemetery-pulse telemetery (analog and digital).FDM-TDM.

Module 4 (12 hrs)

End devices –Digital voltmeter and ammeter. Recording techniques-strip chart recorders-XT and XY recorders. Basic principles of digital recording. Basic principles of Signal Analyzers-Distortion analyzer, wave analyzer, spectrum analyzer, DSO. Control system-electronic control-analog-digital-Basic principles of PLC. Basic principles of data acquisition system.

Module 5(10 hrs)

Basic measurements – Resistance, Capacitance, Inductance, Voltage, Current, Power, Strain, Pressure, Flow, Temperature, Force, Torque, mass, conductivity, PH.

References:

1. Doeblin, “Measurement Systems”, MCGraw Hill.
2. H S Kalsi, “Electronic Instrumentation”, Tata McGraw Hill
3. W D Cooper, “Modern Electronic Instrumentation and Measurement techniques”, Prentice Hall of India
4. Morris, “Principles of Measurement & Instrumentation”, Prentice Hall of India
5. D.U. S Murthy, “Transducers & Instrumentation”, Prentice Hall of India.
6. David A Bell, “Electronic Instrumentation and Measurements”, Oxford
7. Rangan, Sarma & Mani, “Instrumentation-devices and systems”, Tata McGraw Hill.

EC010 705 EMBEDDED SYSTEMS

Teaching Schemes **Credits: 3**

2 hours lecture and 1 hour tutorial per week.

Objectives

- *To introduce students to the embedded systems, its hardware and software.*
- *To introduce devices and buses used for embedded networking.*
- *To explain programming concepts and embedded programming in C.*
- *To explain real time operating systems.*

Module I (9hrs)

Introduction to Embedded System**,** Definition and Classification, Requirements of Embedded Systems, Applications of Embedded Systems in Consumer Electronics, Control System, Biomedical Systems, Handheld computers, Communication devices, Embedded Systems on a Chip (SoC).

Module II (9 hrs)

Embedded Hardware & Software Development Environment, Hardware Architecture, Embedded System Development Process, Embedded C compiler, advantages, code optimization, Programming in assembly language vs. High Level Language, C Program Elements, Macros and functions, Interfacing programs using C language.

Module III (9 hrs)

Embedded Communication System: Serial Communication, PC to PC Communication, Serial communication with the 8051 Family of Micro-controllers, I/O Devices - Device Types and Examples , synchronous and Asynchronous Communications from Serial Devices - Examples of Internal Serial-Communication Devices - UART and HDLC - Parallel Port Devices - Sophisticated interfacing features in Devices/Ports- Timer and Counting Devices - 1^2C, USB, CAN and advanced I/O Serial high speed buses- ISA, PCI, PCI-X, and advanced buses. Voice-over-IP, Embedded Applications over Mobile Network.

Module IV (9 hrs)

Matrix key board interface - AT keyboard – commands – keyboard response codes - watch dog timers - DS1232 watch dog timer – real time clocks – DS1302 RTC – interfacing - measurement of frequency - phase angle - power factor – stepper motor interface - dc motor speed control – L293 motor driver - design of a position control system - Interfacing with Displays, D/A and A/D Conversions, interfacing programs using C

Module V (9 hrs)

Definitions of process, tasks and threads – Clear cut distinction between functions – ISRs and tasks by their characteristics – Operating System Services- Goals – Structures- Kernel - Process Management – Memory Management – Device Management – File System Organisation and Implementation – I/O Subsystems – Interrupt Routines Handling in RTOS, REAL TIME OPERATING SYSTEMS : Introduction to Real – Time Operating Systems: Tasks and Task States, Tasks and Data, Semaphores, and Shared Data; Message Queues, Mailboxes and Pipes, Timer Functions, Events, Memory Management, Interrupt Routines in an RTOS Environment

Reference Books

1. Rajkamal, "Embedded Systems Architecture, Programming and Design", Tata McGraw-Hill
2. Steve Heath, "Embedded Systems Design", Newnes.
3. David E.Simon, "An Embedded Software Primer", Pearson Education Asia.
4. Wayne Wolf, "Computers as Components; Principles of Embedded Computing System Design" Harcourt India, Morgan Kaufman Publishers.
5. Frank Vahid and Tony Givargis, "Embedded Systems Design – A unified Hardware /Software Introduction" , John Wiley
6. Kenneth J.Ayala, "The 8051 Microcontroller", Thomson.
7. Labrosse, "Embedding system building blocks", CMP publishers.
8. Ajay V Deshmukhi, "Micro Controllers", Tata McHraw-Hill.

EC010 706L01 OPTIMIZATION TECHNIQUES

Teaching Schemes **Credits: 4**

2 hours lecture and 1 hour tutorial per week.

Objectives:

Understand the need and origin of the optimization methods. Get a broad picture of the various applications of optimization methods used in engineering. Define an optimization problem and its various components.

Module I (12 hrs)

One Dimensional Unconstrained Minimization techniques, single variable minimization, unimodality, bracketing the minimum, necessary and sufficient conditions for optimality, convexity, steepest descent method.

Module II (12hrs)

Linear programming, introduction, linear programming problem, linear programming problems involving LE (≤) constraints, simplex method, optimality conditions, artificial starting solutions, the M method.

Module III (12hrs)

Transportation models, definition, non traditional models, transportation algorithm, East West corner method, Vogel approximation method. Assignment model, Introduction, Hungarian method.

Module IV (12hrs)

Forecasting Models, moving average technique, regression method, exponential smoothing. Game Theory, two persons zero sum games, mixed strategy games-graphical method.

Module V (12hrs)

Queuing models, elements of queuing model, pure birth and death model, specialized Poisson queues, single server models. Multiple server models, self service model.

References:

1. Ashok D Belegundu, Tirupathi R Chandrupatla, “Optimization concepts and Application in Engineering”, Pearson Education.
2. Kalynamoy Deb, “Optimization for Engineering Design, Alogorithms and Examples”, Prentice Hall,
3. Hamdy A Taha, “Operations Research – An introduction”, Pearson Education,
4. Hillier / Lieberman, “Introduction to Operations Research”, Tata McGraw Hill Publishing company Ltd,
5. Singiresu S Rao, “Engineering optimization Theory and Practice”, New Age International,
6. Mik Misniewski, “Quantitative Methods for Decision makers”, MacMillian Press Ltd.,

EC010 706L02 – SPEECH AND AUDIO PROCESSING

Teaching Schemes **Credits: 4**
2 hours lecture and 2 hours tutorial per week

Objectives

- *To study the theory and applications of speech processing, to study the success and limitation of different methods in speech processing*.

Module 1 (12hrs)
Production and Classification of Speech Sounds: Brief anatomy and physiology of speech production – categorisation of speech sounds – vowels, nasals, fricatives and plosives – prosody – **Analysis and Synthesis of Pole -zero speech models :** time dependent processing – all pole modelling of deterministic signals – formulation – error minimisation - autocorrelation method – the Levinson recursion – linear prediction analysis of stochastic speech sounds - formulation – error minimisation – autocorrelation method – pole-zero estimation – linearization – application to speech.

Module 2 (12 hrs)
Homomorphic signal processing: Concept – Homomorphic systems for convolution **– Short Time Fourier Transform Analysis and Synthesis:** introduction – short time analysis – Fourier transform view – filtering view – time-frequency resolution tradeoffs – short time synthesis – formulation – FBS method – OLA method – time-frequency sampling – STFT magnitude – time scale modification and enhancement of speech – time scale modification – noise reduction.

Module 3 (10 hrs)
Filter-Bank Analysis/Synthesis: Introduction – FBS method – phase vocoder – constant-Q analysis/synthesis –wavelet transform – DWT – applications – **Sinusoidal Analysis/Synthesis:** sinusoidal speech model – estimation of sinewave parameters – voiced speech- unvoiced speech – analysis systems – synthesis.

Module 4 (14hrs)
Frequency-Domain Pitch Estimation: Introduction – correlation based pitch estimator – pitch estimation based on comb filter – **Speech coding:** Introduction – statistical models – scalar quantization – fundamentals – quantization noise – companding – adaptive quantization - differential and residual quantization – vector quantization – approach – VQ distortion measure – use of VQ in speech transmission - frequency-domain coding – subband coding – sinusoidal coding – model-based coding – basic linear prediction coder – VQ LPC coder.

Module 5(12 hrs)
Speech Enhancement : Intoduction - problem formulation – spectral subtraction – Wiener filtering - basic approaches to estimating the object spectrum – **Speaker Recognition:** Introduction – spectral features for speaker recognition – formulation – mel-cepstrum – sub-cepstrum – speaker recognition algorithms – minimum distance classifer – vector quantization - GMM.

References:

1. Thomas F. Quatieri, "Discrete-Time Speech Signal Processing", Pearson Education.
2. L R Rabiner, R W Schafer, "Digital Processing of Speech Signals", Pearson Education.
3. J R Deller, J H L Hansen, J G Proakis, "Discrete-time Processing of Speech Signals", IEEE

EC010 706L03 DIGITAL IMAGE PROCESSING

Teaching Schemes **Credits : 4**

2 hours lecture and 2 hour tutorial per week.

OBJECTIVES

- *To study the image fundamentals and mathematical transforms necessary for image processing.*
- *To study the image enhancement techniques*
- *To study image restoration procedures.*
- *To study the image compression procedures.*
- *To study the image segmentation and representation techniques.*

Module 1 (12 hrs)

Introduction to Image Processing:-2D sampling, quantization, resolution, brightness, contrast, Machband effect, classification of digital images, image processing system, image file formats.

Module 2 (16 hrs)

2D transforms: 2D signals, 2D systems, 2D transforms -convolution, Z transform, correlation, DFT, its properties, Walsh transform, Hadamard transform, Haar transform, Slant transform, DCT, KL transform and Singular Value Decomposition.

Module 3 (10hrs)

Image enhancement in spatial line, enhancement through point operation, types of point operators, histogram manipulation, linear gray level transformation, local and neighbourhood operation, median filter, Image sharpening, image enhancement in frequency domain, homomorphic filter.

Module 4 (10 hrs)

Classification of Image segmentation techniques, region approach, clustering techniques, segmentation based on thresholding, edge based segmentation, classification of edges, edge detection, hough transform, active contour.

Module 5 (12 hrs)

Image compression: need for compression, redundancy, classification of image compression schemes, Huffman coding, arithmetic coding, dictionary based compression, transform based compression, image compression standards, vector quantization, wavelet based image compression

Reference

1. S Jayaraman, S Esakkirajan, "Digital image processing" Tata Mc Graw Hill.
2. Rafael C Gonzalez, R Woods, "Digital image processing" Pearson Education.
3. Kenneth R Castleman, "Digital image processing". Pearson Education.
4. Anil K Jain, "Fundamentals of Digital image processing" Prentice Hall of India.
5. J Lim, "2 dimensional signal and image processing" Pearson Education

6. Tamal Bose, “Digital signal and image processing”, John Wiley & sons.
7. W K Pratt, “Digital image processing” John Wiley.

EC010 706L04 – WAVELETS AND APPLICATIONS

Teaching Schemes **Credits: 4**

2 hours lecture and 2 hours tutorial per week.

Objective: To study the theory and applications of multirate DSP, filter banks and wavelets

Module 1(14 hrs)

Multirate Digital Signal Processing – Basic sampling rate alteration devices- Sampling rate reduction by an integer factor: Down sampler - Time and frequency domain characterization of downsampler – Anti-aliasing filter and decimation system – Sampling rate increase by an integer factor: Upsampler –Time and frequency domain characterization of upsampler – Anti-imaging filter and interpolation system – Gain of anti-imaging filter – Changing the sampling rate by rational factors – Transposition theorem- Multirate identities - Direct and Transposed FIR structures for interpolation and decimation filters – The Polyphase decomposition - Polyphase implementation of decimation and interpolation filters – Commutator models - Multistage implementation of sampling rate conversion – Filter requirements for multistage designs – Overall and individual filter requirements.

Module 2 (10 hrs)

Two channel analysis and synthesis filter banks- QMF filter banks – Two channel SBC filter banks – Standard QMF banks – Optimal FIR QMF banks – Filter banks with PR – Conditions for PR – Conjugate Quadrature filters – Valid Half-band filters –Transmultiplexer filter banks – Uniform M channel filter banks – Tree structured filter banks.

Module 3 (12 hrs)

Short time Fourier Transform – Filtering interpretation of STFT – Filter bank implementation - Time frequency resolution tradeoff –Sampling of STFT in time and frequency - Motivation for Wavelet transform - The Continuous Wavelet Transform - scaling - shifting – Filtering view – Inverse CWT – Discrete Wavelet transform – dyadic sampling – Filter bank implementation – Inverse DWT.

Module 4 (12 hrs)

Multiresolution formulation of Wavelet systems – Scaling function and wavelet function – dilation equation –Filter banks and the DWT - Analysis – from fine scale to coarse scale – Analysis tree – Synthesis – from coarse scale to fine scale – Synthesis tree - Input coefficients – Lattices and lifting.

Module 5 (12 hrs)

Wavelet based signal processing and applications: Wavelet packets – Wavelet packet algorithms – Thresholding – Interference suppression – Signal and image compression – Application to communication – OFDM multicarrier communication, Wavelet packet based MCCS.

References

1. R E Crochiere, L E Rabiner, “Multirate Digital Signal Processing”, Prentice Hall
2. P PVaidyanathan, “Multirate Systems and Filter Banks”, Pearson
3. N J Fliege, “Multirate Digital Signal Processing”, Wiley
4. S K Mitra, “Digital Signal Processing: A computer based approach”, Tata Mc.Graw Hill
5. A V Oppenheim, R W Shaffer, “Discrete time Signal Processing”, Pearson
6. C S Burrus, R A Gopinath, H Guo, “Introduction to Wavelets and Wavelet Transforms”, Aprimer, Prentice Hall
7. J C Goswami, A K Chan, “Fundamentals of Wavelets: Theory, Algorithms and Applications”, Wiley.
8. G Strang and T Q Nguyen, “Filter banks and Wavelets”, Wellesly Cambridge press.

EC010 706 L05 ANTENNA THEORY AND DESIGN

Teaching Schemes **Credit : 4**

2 hours lecture and 2 hour tutorial per week.

Objectives

- *To impart the concepts different types of antennas and antenna-arrays-analysis & synthesis*
- *To develop understanding about design and modeling of antenna using computational methods.*

Pre-requisites: EC010 603 Radiation & Propagation

Module 1: (10 hrs)

Antenna Fundamentals: Radiation mechanism – over view, Electromagnetic Fundamentals, Solution of Maxwell's Equations for Radiation Problems, Ideal Dipole, Radiation Patterns, Directivity and Gain, Antenna Impedance, Radiation Efficiency. Antenna Polarization.

Module 2: (10 hrs)

Antenna Arrays: Array factor for linear arrays, uniformly excited, equally spaced Linear arrays, pattern multiplication, directivity of linear arrays, non uniformly excited -equally spaced linear arrays, Mutual coupling, multidimensional arrays, phased arrays, feeding techniques, perspective on arrays.

Module 3: (15 hrs)

Types of Antennas: Traveling - wave antennas, Helical antennas, Biconical antennas, sleave antennas, and Principles of frequency independent Antennas, spiral antennas, and Log - Periodic Antennas. Aperture Antennas- Techniques for evaluating Gain, reflector antennas - Parabolic reflector antenna principles, Axi - symmetric parabolic reflector antenna, offset parabolic reflectors, dual reflector antennas, Gain calculations for reflector antennas, feed antennas for reflectors, field representations, matching the feed to the reflector, general feed model, feed antennas used in practice. Microstrip Antennas-Introduction, rectangular patch, circular patch, bandwidth, coupling, circular polarization, arrays and feed network.

Module 4: (15 hrs)

Antenna Synthesis: Formulation of the synthesis problem, synthesis principles, line sources shaped beam synthesis, linear array shaped beam synthesis — Fourier Series, Woodward — Lawson sampling method, comparison of shaped beam synthesis methods, low side lobe narrow main beam synthesis methods Dolph Chebyshev linear array, Taylor line source method.

Module 5: (10 hrs)

Computational Electromagnetic for Antennas: Introduction to computational electromagnetics, Introduction to method of moments-Pocklington's integral equation, source modeling, weighted residuals. Introduction to Finite Difference Time Domain Method- Finite difference and Yee's algorithm, cell size, numerical stability and dispersion. Absorbing boundary conditions.

References:

1. Warren L Stutzman and Gary A Thiele, "Antenna Theory and Design", 2nd Edition, John Wiley and Sons Inc. 1998.
2. Constantine. A. Balanis: "Antenna Theory- Analysis and Design", Wiley India, 2nd Edition,2008
3. Kraus, "Antennas", Tata McGraw Hill, NewDelhi, 3rd Edition, 2003
4. R.E.Collin, "Antennas and Microwave propagation", Tata Mc-Graw Hill,2004
5. R.C.Johnson and H.Jasik, "Antenna Engineering hand book", Mc-Graw Hill,1984
6. I.J.Bhal and P.Bhartia, "Micro-strip Antennas, Design Handbook", Artech house,1980

EC 010 706L06 SYSTEM SOFTWARE

Teaching Schemes **Credits: 4**

2 hours lecture and 2 hours tutorial per week.

Objectives:

- *To introduce the students about the Operating systems and the processes*

Module I (12 hrs)

System Software - Language processors: Introduction, Language processing activities, fundamentals of Language processing, fundamentals of Language specifications.
Assemblers: Elements of assembly language programming, A simple assembly scheme, Pass structure of assemblers. Macros and Macro pre processors: Macro definition and call, Macro expansion, Nested macrocalls

Module II (12 hrs)

Compilers and Interpreters: Interpreters: Phases of compilation, scanning, parsing, Intermediate codes, optimization. Memory allocation, Linkers and Loaders: Relocation and linking concepts. Software tools: Software tools for program development, Language processor development tools.

Module III (12 hrs)
Operating systems - Evolution of OS systems. Operating systems structures
Process Management:
Processes: Process definition, Process control, Interacting Processes, Implementation of interacting Processes, Threads. Scheduling: Scheduling policies, Job Scheduling, Process Scheduling. Deadlocks: Definitions, Handling Deadlocks, Deadlock detection and resolution, Deadlock avoidance. Process synchronization, Implementing control, synchronization , critical sections, Semaphores.

Module IV (12 hrs)

Memory management& Information Management: Memory allocation preliminaries, Contiguous Memory allocation, noncontiguous Memory allocation, Virtual memory using paging, Virtual memory using segmentation. Over view of file processing, files and file operations, fundamentals of file organizations and access methods, Directories, file protections, File processing file system reliability. Implementation of file operations.

Module V(12 hrs)

Protection and security : Encryption of data, Protection and security mechanisms. Distributed operating systems: Definition and examples, Design issues of Distributed operating systems , Networking issues ,Communication protocols, Resource allocation.

References

1. D M Dhamdhere, "System programming and Operating systems 2nd revised edition", Tata McGraw-Hill
2. Milan Milenkovic, "Operating Systems", 2nd edition, Tata McGraw-Hill.
3. John J Donovan, "System Programming", 2nd edition, Tata McGraw-Hill.
4. Leland L Beck, "System Software: An Introduction to System Programming", 3rd edition, Pearson Education.

EC010 707 ADVANCED COMMINCATION LAB

Teaching Schemes **Credits : 2**

3 hour practical per week

List of Experiments

1. Delta Modulation & Demodulation.
2. Sigma delta modulation.
3. PCM (using Op-amp and DAC).
4. BASK (using analog switch) and demodulator.
5. BPSK (using analog switch).
6. BFSK (using analog switch).
7. Error checking and correcting codes.
8. 4 Channel digital multiplexing (using PRBS signal and digital multiplexer).
9. Microwave experiments (Experiments based on subject EC010 703)

MATLAB or LABview Experiments:

1. Mean Square Error estimation of a signals.
2. Huffman coding and decoding.
3. Implementation of LMS algorithm.
4. Time delay estimation using correlation function.
5. Comparison of effect in a dispersive channel for BPSK, QPSK and MSK.
6. Study of eye diagram of PAM transmission system.
7. Generation of QAM signal and constellation graph.
8. DTMF encoder/decoder using simulink.
9. Phase shift method of SSB generation using Simulink.
10. Post Detection SNR estimation in Additive white Gaussian environment using Simulink.

EC010 708 SIGNAL PROCESSING LAB

Teaching Schemes **Credits : 2**
3 hour practical per week

List of Experiments

Experiments based on MATLAB

1. Generation of Waveforms (Continuous and Discrete)

2. Verification of Sampling Theorem.

3. Time and Frequency Response of LTI systems.

4. Implement Linear Convolution of two sequences.

5. Implement Circular convolution of two sequences.

6. To find the DFT and IDFT for the given input sequence.

7. To find the DCT and IDCT for the given input sequence.

8. To find FFT and IFFT for the given input sequence.

9. FIR and IIR filter design using Filter Design Toolbox.

10. FIR Filter Design (Window method).

11. IIR Filter Design (Butterworth and Chebychev).

Mini Project based on digital signal processing or control systems or communication applications.

EC 010 709 Seminar

Teaching scheme **credits: 2**

2 hours practical per week

The seminar power point presentation shall be fundamentals oriented and advanced topics in the appropriate branch of engineering with references of minimum seven latest international journal papers having high impact factor.

Each presentation is to be planned for duration of 25 minutes including a question answer session of five to ten minutes.

The student's internal marks for seminar will be out of 50. The marks will be awarded based on the presentation of the seminar by the students before an evaluation committee consists of a minimum of 4 faculty members. Apportioning of the marks towards various aspects of seminar (extent of literature survey, presentation skill, communication skill, etc.) may be decided by the seminar evaluation committee.

A bona fide report on seminar shall be submitted at the end of the semester. This report shall include, in addition to the presentation materials, all relevant supplementary materials along with detailed answers to all the questions asked/clarifications sought during presentation. All references must be given toward the end of the report. The seminar report should also be submitted for the viva-voce examination at the end of eighth semester.

For Seminar, the minimum for a pass shall be 50% of the total marks assigned to the seminar.

EC 010 710 Project Work

Teaching scheme **credits: 1**

1 hour practical per week

Project work, in general, means design and development of a system with clearly specified objectives. The project is intended to be a challenge to intellectual and innovative abilities and to give students the opportunity to synthesize and apply the knowledge and analytical skills learned in the different disciplines.

The project shall be a prototype; backed by analysis and simulation etc. No project can be deemed to be complete without having an assessment of the extent to which the objectives are met. This is to be done through proper test and evaluation, in the case of developmental work, or through proper reviews in the case of experimental investigations.

- The project work has to be started in the seventh semester and to be continued on to eighth semester.
- Project work is to be done by student groups. Maximum of four students only are permitted in any one group.
- Projects are expected to be proposed by the students. They may also be proposed by faculty member (Guide) or jointly by student and faculty member.
- Students are expected to finalise project themes/titles with the assistance of an identified faculty member as project guide during the first week of the seventh semester.

The progress from concept to final implementation and testing, through problem definition and the selection of alternative solutions is monitored. Students build self confidence, demonstrate independence, and develop professionalism by successfully completing the project.

Each student shall maintain a project work book. At the beginning of the project, students are required to submit a project plan in the project book. The plan should not exceed 600 words but should cover the following matters.

- ❖ Relevance of the project proposed
- ❖ Literature survey
- ❖ Objectives
- ❖ Statement of how the objectives are to be tackled

- Time schedule
- Cost estimate

These proposals are to be screened by the evaluation committee (EC- minimum of 3 faculty members including the guide) constituted by the head of department, which will include a Chairman and the EC will evaluates the suitability and feasibility of the project proposal. The EC can accept, accept with modification, request a resubmission, or reject a project proposal.

Every activity done as part of project work is to be recorded in the project book, as and when it is done. Project guide shall go through these records periodically, and give suggestions/comments in writing in the same book.

The students have to submit an interim report, along with project work book showing details of the work carried out by him/her and a power point presentation at the end of the 7^{th} semester to EC. The EC can accept, accept with modification, request a resubmission, or extension of the project.

The student's internal marks for project will be out of 50, in which 30 marks will be based on day to day performance assessed by the guide. Balance 20 marks will be awarded based on the presentation of the project by the students before an evaluation committee consists of a minimum of 3 faculty members including the guide.

For Project, the minimum for a pass shall be 50% of the total marks assigned to the Project work.

EC010 801 WIRELESS COMMUNICATION

Teaching Schemes **Credits: 4**

2 hours lecture and 2 hours tutorial per week.

Objective: To give the students an idea about the cellular communication theory and technology.

Module 1 (12 hrs)

Cellular concept-frequency reuse, channel assignment, hand off, interference, trunking and grade of service, cell splitting, sectoring, microcell concept.

Module 2 (12 hrs)

Introduction to radio wave propagation-free space propagation model, round reflection (2-ray) model, impulse response model of a multipath channel, parameters o mobile multipath channels, type of small scale fading, fading effect due to multipath time delay spread and Doppler spread, diversity technique for mobile wireless radio system.

Module 3 (12 hrs)

Multiple access technique for wireless communication-FDMA, TDMA, spread spectrum multiple access-FHMA, CDMA, hybrid spread spectrum technique-space division multiple access- packet radio.

Module 4 (12 hrs)

GSM-GSM network architecture, GSM channel type, frame structure for GSM,(signal processing in GSM-speech coding, channel coding, interleaving, ciphering, burst formatting, modulation, frequency hopping, demodulation) authentication and security in GSM, GSM call procedures, GSM hand off procedures.

Module 5 (12 hrs)

CDMA digital cellular standards- Introduction, frequency and channel specification, forward and reverse CDMA channel, CDMA call processing, soft hand off, performance of a CDMA system, comparison of CDMA with GSM, digital cellular standards- DECT, PDC, PHS

References:

1. Andrea Goldsmith, “Wireless Communications”, Cambridge University Press, 2005.
2. Simon Haykin & Michael Moher, “Modern Wireless Communications”, Person Education, 2007.
3. T. S. Rappaport, “Wireless Communication, Principles & Practice”, Dorling Kindersley (India) Pvt. Ltd., 2009.
4. G. L. Stuber, “Principles of Mobile Communications”, 2nd Edition, Springer Verlag. 2007.
5. Kamilo Feher, 'Wireless Digital Communication', Dorling Kindersley (India) Pvt. Ltd., 2006.

6. R. L. Peterson, R. E. Ziemer & David E. Borth, “Introduction to Spread Spectrum Communication”, Prentice Hall, 1995.
7. A. J. Viterbi, “CDMA- Principles of Spread Spectrum”, Prentice Hall, 1995.

EC010 802 COMMUNICATION NETWORK

Teaching Schemes **Credits:4**
2 hours lecture and 2 hours tutorial per week

Objectives:

- *To impart a basic knowledge on networking techniques.*
- *To provide a strong foundation to students about the internet protocols and network security.*

Module 1 (12 hrs)
Network services and layered architecture.Network topology, Switching: basics of message switching, packet switching, circuit switching and cell switching. :Layering architecture, the OSI reference model, Layers, protocols and services, overview of TCP/IP architecture, TCP/IP protocol.

Module2 (12 hrs)
Multiple access communications, local area networks (LAN) structure, the medium access control sub layer, the logical link control layer, random access, ALOHA, slotted ALOHA, CSMA, CSMA/CD, scheduling approaches to medium access control, reservation systems, polling, token passing rings, comparison of random access and scheduling. Medium access controls, IEEE 802.3 standards for 10Mbps and 1000 Mbps LANs, repeaters and hubs, LAN bridges, transparent bridges, source routing bridges, mixes media bridges, LAN switches.

Module 3 (12 hrs)
Internetworking: Inter network, datagram forwarding in IP, ARP, DHCP, ICMP, Virtual networks and Tunnels. Routing: Distance vector routing, Link state Routing. Routing for Mobile hosts. Global internet: Subnetting, CIDR, BGP. IPV4 and IPV6.

Module4 (12 hrs)
Asynchronous Transfer Mode (ATM):Addressing, signaling and routing. ATM header structure, ATM adaptation layer, management and control, Internetworking with ATM. Control of ATM networks.

Module 5 (12 hrs)
Network security: Symmetric and asymmetric key cryptography. Security services, Digital signature, IPsecurity(IPsec),SSL/TLS,PGP, Firewalls.

References:

1. Jean Walrand & Pravin Varaiya, “High Performance Communication Networks” , Elsevier
2. Behrouz.a. Forouzan, “Data Communication and Networking”, Tata McGraw Hill
3. Larry L. Peterson, Bruce S. Davie, “Computer networks”, 4th edition, Elsevier
4. Andrew S Tanenbaum, “Computer Networks”, Pearson Education
5. William Stallings,”Data and computer communication”, Pearson Education

EC010 803 LIGHT WAVE COMMUNICATION

Teaching Schemes **Credits: 4**

2 hours lecture and 2 hours tutorial per week

Objectives

- *To understand the behaviour of light wave*
- *To know principle of light wave communication and the characteristics of optical devices.*

Module 1 (12hrs)

Recollection of basic principles of optics: ray theory- critical angle- total internal reflection - Optical wave guides - Propagation in fibre- expression for acceptance angle-numerical aperture- V number – modes, mode coupling - SI fibre and GI fibre - single mode fibers

Module 2 (12 hrs)

Transmission characteristics – Attenuation – absorption losses – scattering losses – bend losss –Dispersion- chromatic dispersion – intermodal dispersion –Optical fiber cables – cable design -- Optic fibre connections– fibre alignment and joint loss - splicing techniques- optical fibre connectors – fiber couplers

Module 3 (12 hrs)

Optical sources- LEDs – LED structures – LED characteristics –semiconductor injection LASER- LASER structures- LASER characteristics – Optical detectors - principles of photo detection –quantum efficiency, responsivity - PIN diode – APD – operating principles – source to fibre power launching – lens coupling to fiber.

Module 4 (12 hrs)

Optical amplifiers- Semiconductor optical amplifiers – Erbium doped fiber amplifiers-comparison between semiconductor and fiber amplifiers - wavelength conversion – Optical modulation – Mach Zender interferometer – MZ optical modulator – operating requirements.

Module 5 (12 hrs)

Optical networks – wavelength routing networks – wavelength switching networks – network protection and survivability - Optical fiber link design – long haul systems, power budget, time budget, maximum link length calculation.

References

1. John M Senior, “Optical fiber Communications Principles and Practice:”, Pearson Education
2. Djafer K Mynbaev, “Fibre optic communication technology:”, Pearson Education.
3. Franz and Jain , “Optical Communications Components and Systems”,: Narosa
4. Harold Kolimbiris, “Fiber Optics Communications”, Pearson Education
5. John Gower , “Optical communication system”, Prentice Hall of India
6. Sharma, “Fibre optics in telecommunication”, Mc Graw Hill
7. Subir Kumar Sarkar, “Optical fibre and fibre optic communication”, S Chand & co. Ltd

8. M Mukund Rao , “Optical communication”, Universities press.
9. Palais, “Fiber Optic Communication”, Pearson Education.
10. Black, “Optical Networks - 3rd Generation Transport systems”, Pearson Education.

EC010 804L01 NANO ELETCRONICS

Teaching Schemes **Credits: 4**

2 hours lecture and 2 hours tutorial per week.

Objectives

- *To introduce students to the nano electronics and the systems.*
- *To understand the basic principles of carbon nano tubes.*

Module I (12hrs)

Challenges going to sub-100 nm MOSFETs Oxide layer thickness, tunnelling, power density, non-uniform dopant concentration, threshold voltage scaling, lithography, hot electron effects, sub-threshold current, velocity saturation, interconnect issues, fundamental limits for MOS operation.

Module II (12 hrs)

Novel MOS-based devices Multiple gate MOSFETs, Silicon-on-insulator, Silicon-on-nothing, Fin FETs, vertical MOSFETs, strained Si devices.

Module III (12 hrs)

Quantum structures quantum wells, quantum wires and quantum dots, Single electron devices charge quantization, energy quantization, Coulomb blockade, Coulomb staircase, Bloch oscillations.

Module IV (12 hrs)

Hetero structure based devices Type I, II and III hetero junctions, Si-Ge hetero structure, hetero structures of III-V and II-VI compounds - resonant tunnelling devices.

Module V (12 hrs)

Carbon nanotubes based devices CNFET, characteristics; Spin-based devices spin FET, characteristics.

Reference Books:

1. Mircea Dragoman and Daniela Dragoman, " Nano electronics Principles & devices", Artech House Publishers, 2005.
2. Karl Goser, "Nanoelectronics and Nanosystems: From Transistors to Molecular and Quantum Devices", Springer 2005.
3. Mark Lundstrom and Jing Guo, "Nanoscale Transistors: Device Physics Modelling and Simulation", Springer, 2005.
4. Vladimir V Mitin, Viatcheslav A Kochelap and Michael A Stroscio, "Quantum hetero structures", Cambridge University Press, 1999.
5. S M Sze (Ed), " High speed semiconductor devices", Wiley, 1990.

EC010 804L02MICRO ELECTRO MECHANICAL SYSTEMS

Teaching Schemes **Credits: 4**

2hours lecture and 2 hours tutorial per week

Objectives

- *To introduce students to the MEMS systems, its hardware.*
- *To introduce devices and their working principles..*

Module I (12hrs)

Overview of MEMS and Microsystems –Typical MEMS product – Evolution of Microfabrication – Multidisciplinary nature of MEMS – Applications.

Module II (12 hrs)

Working Principle of Microsystems – Microsensors – Microactuation – Microaccelerometers - Microfluidics

Module III (12 hrs)

Engineering Science for Microsystem Design - Atomic Structure of Matter – Ions – Molecular Theory – Intermolecular Force – Doping of Semiconductors – Diffusion Process – Electrochemistry – Quantum Physics – Materials for MEMS and Microsystems – Substrate and Wafer – Silicon as Substrate Material – Silicon compounds – Silicon Piezoresistors – Gallium Arsenide – Quartz – Piezoelectric Crystals – Polymers.

Module IV (12 hrs)

Micro system Fabrication Process – Photolithography – Ion implantation – Diffusion – Oxidation – Chemical Vapour Deposition – Physical Vapour Depostion – Deposition of Epitaxy - Etching

Module V (12 hrs)

Overview of Micromanufacturing – Bulk Micromanufacturing – Surface Micromachining – The LIGA Process.

Reference Books:

1. Tai-Ran Hsu , “MEMS & Microsystems Design and Manufacture”, Mc Graw Hill.
2. Nitaigur Premchand Mahalik , “MEMS”, Tata Mc Graw Hill
3. James D. Plummer, Michael D.Deal, Peter B. Griffin, “Silicon VLSI Technology’, Pearson Education.

EC010 804L03 SECURE COMMUNICATION

Teaching Schemes **Credits: 4**

2 hours lecture and 2 hours tutorial per week.

Objective: To impart the students about the theory and technology behind the secure communication..

MODULE 1 (12 hrs)

Modular arithmetic : Groups, Ring, Fields. The Euclidean algorithm-Finite fields of the form GF(p). Polynomial arithmetic: Finite fields of the form GF(2^n).

MODULE 2 (12 hrs)

Introduction, security attacks-security services- Symmetric Ciphers-Symmetric Cipher Model-Substitution Techniques-Caesar Cipher-Mono alphabetic Cipher-Play fair cipher-Hill cipher-Poly alphabetic Cipher – one time pad.

MODULE 3 (12 hrs)

Transposition techniques- Block Ciphers.

Data encryption Standards- DES Encryption-DES decryption-Differential and Linear Crypt analysis Advanced Encryption standard- The AES Cipher- substitute bytes transformation-Shift row transformation-Mix Column transformation.

MODULE 4 (12 hrs)

Public key cryptosystem- Application for Public key cryptosystem- Requirements-RSA algorithm. Key management-Distribution of public key, public key certificates ,Distribution of secret keys.

MODULE 5 (12 hrs)

Intruders: Intrusion techniques, Intrusion detection, Statistical anomaly detection, Rule based intrusion detection, Distributed intrusion detection, Honey pot, Intrusion detection exchange format.

Password management: Password protection, password selection strategies.

Reference:

1. William Stallings, “Cryptography and Network Security” ,4th Edition, Pearson Education ,2009
2. Ferouzen,’ Cryptography and network security”, Tat Mc GrawHill
3. Tyagi and Yadav ,” Cryptography and network security”, Dhanpatrai
4. Douglas A. Stinson, “Cryptography, Theory and Practice”, 2nd Edition, Chapman & Hall, CRC Press Company, Washington, 2005.
5. Lawrence C. Washington, “Elliptic Curves: Theory and Cryptography”, Chapman & Hall, CRC Press Company, Washington, 2008.
6. David S. Dummit & Richard M Foote, “Abstract Algebra”, 2nd Edition, Wiley India Pvt. Ltd., 2008.

EC010 804L04 MANAGEMENT INFORMATION SYSTEMS

Teaching Schemes **Credits :4**

2hours lecture and 2 hours tutorial per week.

Objectives:

Describe the various types of information systems by breadth of support. Identify the major information systems that support each organizational level. Describe how information resources are managed, and discuss the roles of the information systems

Module I (12hrs)

Information systems, dimensions of information systems, approaches to information systems, information processing systems, characteristics, types, impacts and applications, moral dimensions of information systems, information rights, property rights

Module II (12 hrs)

Information Technology infrastructure, levels, infrastructure components, competitive model for information technology infrastructure, types of information system controls, risk assessment, security, auditing

Module II (12hrs)

Enterprise systems, architecture, process, supply chain management systems, push verses pull based supply chain management, internet driven enterprise integration.

Module IV (12hrs)

Knowledge management systems, dimensions, organizational learning, knowledge management value chain, types of knowledge management systems, enterprise wide KMS, structured KMS, semi structured KMS, knowledge network, knowledge work systems, intelligent techniques, expert systems, fuzzy logic, neural networks, genetic algorithms

Module V (12hrs)

Decision support systems, decision making, systems and technologies in decision making and business intelligence, decision making levels, types of decisions, stages in decision making process, difference between MIS and DSS, types of DSS, components of DSS, group decision making systems, Executive support systems

Reference:

1. Kenneth C. Laudon and Jane Price Laudon, “Management Information systems Managing the digital firm”, Pearson Education Asia.
2. James AN O’ Brein, “Management Information Systems”, Tata McGraw Hill, New Delhi,
3. Gordon B.Davis, “Management Information system: Conceptual Foundation, Structure and Development”, McGraw Hill,
4. Joyce J. Elam, “Case series for Management Information System Silmon and Schuster”, Custom Publishing.

5. Steven Alter, “Information system – A Management Perspective” – Addison – Wesley,
6. Ralph M.Stair and George W.Reynolds “Principles of Information Systems – A Managerial Approach Learning”,

EC010 804 L05 : PATTERN RECOGNITION

Teaching Schemes **Credits:4**
2 hours lecture and 2 hours tutorial per week

Objectives:

- *To impart a basic knowledge on pattern recognition and to give a sound idea on the topics of parameter estimation and supervised learning, linear discriminant functions and syntactic approach to PR.*
- *To provide a strong foundation to students to understand and design pattern recognition systems.*

Module I (12 hrs)
Introduction: introduction to statistical, syntactic and descriptive approaches, features and feature extraction, learning and adaptation. Bayes Decision theory, introduction, continuous case, 2-categoryclassification, minimum error rate classification, classifiers. Discriminant functions and decision surfaces.

Module 2 (12 hrs)
Introuction- Maximum likelihood estimation - General principle,Gaussian case ; bias. Bayesian estimation – class conditioned density, parameterdistribution, Bayesian Parameter estimation – General Theory,Gibb's Algorithm – Comparison of Bayes Method with Maximum likelihood.

Module 3 (12 hrs)
Introduction,Density Estimation. Parzen Windows – Convergence of mean, variance,Kn – Nearest Neighbourestimation,Nearest neighbor rule,Converge error rate, error bound , partial distance.

Module 4 (12 hrs)
Linear discriminate functions and decision surfaces:-Introduction, training error, Threshold weight, discriminate function – two category case, multicategory case. Generalized discriminant function, Quadratic discriminant functions, Polynomial discriminant, PHI functions. Augmented vector.Two category linearly separable case: weight space, solution region, margin, learning rate ,algorithm(Gradient descent – newton)Relaxation procedures.

Module 5 (12 hrs)
Syntactic approach to PR : Introduction to pattern grammars and languages ,higher dimensional grammars, tree, graph, web, plex, and shape grammars, stochastic grammars , attribute grammars, Parsing techniques, grammatical inference.

Reference Books

1. R.O Duda, Hart P.E, "Pattern Classification And Scene Analysis", John Wiley
2. Gonzalez R.C. & Thomson M.G., "Syntactic Pattern Recognition - An Introduction", Addison
   Wesley.
3. J. T. Tou and R. C. Gonzalez, "Pattern Recognition Principles", Wiley, 1974
4. Fu K.S., "Syntactic Pattern Recognition And Applications", Prentice Hall,

5. Rajjan Shinghal, “Pattern Recognition: Techniques and Applications”, Oxford University Press, 2008.

EC010 804L06: RF CIRCUITS

Teaching Schemes **Credit: 3**

2 hours theory and 1 hour tutorial per week.

Objectives

- *To give the basic ideas about the characteristics of components in Radio frequency*
- *To understand the working of various active devices and circuits in Radio frequency*

Module 1: (10 hrs)

Introduction, Components and systems : Wire – Resistors – Capacitors – Inductors – Toroids – Toroidal Inductor Design – Practical Winding Hints. Resonant Circuits: Some Definitions – Resonance (Lossless Components) – Loaded *Q* – Insertion Loss – Impedance Transformation – Coupling of Resonant Circuits.

Module 2: (15 hrs)

Filter Design: Background – Modern Filter Design – Normalization and the Low-Pass Prototype – Filter Types – Frequency and Impedance Scaling – High-Pass Filter Design – The Dual Network – Bandpass Filter Design –Bandpass Filter Design Procedure – Band-Rejection Filter Design – The Effects of Finite *Q*.

Module 3: (12 hrs)

Impedance Matching: Background – The L Network – Dealing With Complex Loads – Three-Element Matching – Low-*Q* or Wideband Matching Networks – The Smith Chart – Impedance Matching on the Smith Chart.

Module 4: (15 hrs)

Small-Signal and Large signal RF Amplifier Design: RF Transistor Materials – The Transistor Equivalent Circuit – Y Parameters – S Parameters. Transistor Biasing – Design Using Y Parameters – Design Using S Parameters. RF Power Transistor Characteristics – Transistor Biasing – RF Semiconductor Devices – Power Amplifier Design – Matching to Coaxial Feed lines.

Module 5: (8 hrs)

RF Front-End Design and RF Design Tools: Higher Levels of Integration, Basic Receiver Architectures, ADC'S Effect on Front-End Design, Software Defined Radios. Design Tool Basics – RFIC Design Flow – RFIC Design Flow, Modelling – PCB Design – Packaging.

References:

1. Christopher Bowick, John Blyler and Cheryl Aljuni , " RF Circuit Design", 2nd Edition, Elsevier ,2008.
2. Reinhold Ludwig & Powel Bretchko, "RF Circuit Design – Theory and Applications", 1st Ed., Pearson Education Ltd., 2004.
3. Davis W. Alan, "Radio Frequency Circuit Design", Wiley India, 2009.
4. Joseph J. Carr, "RF Components and Circuits", Newnes, 2002.
5. Mathew M. Radmanesh, "Advanced RF & Microwave Circuit Design-The Ultimate Guide to System Design", Pearson Education Asia, 2009.
6. David M. Pozzar , " Microwave Engineering", 3r Ed., Wiley India, 2007.
7. Ulrich L. Rohde & David P. NewKirk, "RF / Microwave Circuit Design", John Wiley & Sons, 2000.

EC010 805 G01 TEST ENGINEERING

Teaching Schemes **Credits : 4**

2 hrs lecture and 2 hrs tutorial per week

Objectives

1. *To provide an insight into multi-disciplinary approach to test engineering including test economics and management.*
2. *To understand practical, concise descriptions of the methods and technologies in modern mechanical, electronics and software testing.*
3. *To provide an insight into the developing interface between modern design analysis methods and testing practice.*
4. *To understand why products and systems fail, which testing methods are appropriate to each stage of the product life cycle and how testing can reduce failures.*
5. *To provide an overview of international testing regulations and standards.*

Module 1 (12 hrs)

Introduction: need for test, analysis and simulation, good and bad testing, test economics, managing the test programme

Stress, Strength and Failure of Materials: mechanical stress and fracture, temperature effects, wear corrosion, humidity and condensation, materials and component selection

Electrical and Electronics Stress, Strength and Failure: stress effects, component types and failure mechanisms, circuit and system aspects

Module 2 (12 hrs)

Variation and Reliability: variation in engineering, load-strength interference, time-dependent variation, multiple variations and statistical experiments, discrete variations, confidence and significance, reliability

Design Analysis: Quality Function Deployment, design analysis methods, analysis methods for reliability and safety, design analysis for processes, software for design analysis, limitations of design analysis, using analysis results for test planning

Module 3 (12 hrs)

Development Testing Principles: functional testing, testing for reliability and durability, testing for variation, process testing, 'Beta' testing

Materials and Systems Testing: materials, assemblies and systems, system aspects, data collection and analysis, standard test methods, test centres

Testing Electronics: circuit test principles, test equipment, test data acquisition, design for test, electronic component test, EMI / EMC testing

Module 4 (12 hrs)

Software: software in engineering systems, software errors, preventing errors, analysis of software system design, data reliability, managing software testing

Manufacturing Test: manufacturing test principles, manufacturing test economics, inspection and measurement, test methods, stress screening, electronics manufacturing test options and economics, testing electronic components, statistical process control and acceptance sampling

Testing in Service: in-service test economics, test schedules, mechanical and systems, electronic and electrical, sotaftware, reliability centred maintenance, stress screening of repaired items, calibration

Module 5 (12 hrs)

Data Collection and Analysis: FRACAS, acceptance sampling, probability and hazard plotting, time series analysis, software for data collection and analysis, reliability demonstration and growth measurement, sources of data

Laws, Regulations and Standards: safety and product liability, main regulatory agencies in USA, Europe and Asia, International standards, BIS, ISO standards, industry / technology standards

Management: organization and responsibilities, procedures for test, development test programme, project test plan, training and education for test, future of test.

References:

1. Patrick D. T. O'connor, "A Concise Guide to Cost-effective Design, Development and Manufacture", John Wiley & Sons, 2001
2. Patrick D. T. O'connor, "Practical Reliability Engineering", Wiley India, 2008
3. Naikan V. N. A., "Reliabilty Engineering and Life Testing", PHI Learning, 2008
4. Kapur K. C., Lamberson L. R., "Reliability in Engineering Design", Wiley India, 2009
5. Srinath L. S., "Reliability Engineering", East West Press, 2005

EC010 805G02 E-LEARNING

Teaching scheme **Credits : 4**

2 hrs lecture and 2 hrs tutorial per week

Objectives

1. *To understand the basic concepts of e-learning.*
2. *To understand the technology mediated communication in e-learning.*
3. *To learn the services that manage e-learning environment.*
4. *To know the teaching and learning processes in e-learning environment.*

Module 1 (12 hrs) – Introduction

Evolution of Education – Generations of Distance Educational Technology – Role of e-learning – Components of e-learning: CBT, WBT, Virtual Classroom – Barriers to e-learning

Roles and Responsibilities: Subject Matter Expert – Instructional Designer – Graphic Designer – Multimedia Author – Programmer – System Administrator – Web Master

Module 2 (12 hrs) – Technologies

Satellite Broadcasting – Interactive Television – Call Centres – Whiteboard Environment

Teleconferencing: Audio Conferencing – Video Conferencing – Computer Conferencing

Internet: e-mail, Instant Messaging, Chat, Discussion Forums, Bulletin Boards, Voice Mail, File Sharing, Streaming Audio and Video

Module 3 (12 hrs)– Management

Content: e-content, Dynamic Content, Trends – Technology: Authoring, Delivery, Collaboration – Services: Expert Service, Information Search Service, Knowledge Creation Service – Learning Objects and E-learning Standards

Process of e-learning: Knowledge acquisition and creation, Sharing of knowledge, Utilization of knowledge – Knowledge Management in e-learning

Module 4 (12hrs) – Teaching-Learning Process

Interactions: Teacher-Student – Student-Student – Student-Content – Teacher-Content – Teacher-Teacher – Content-Content

Role of Teachers in e-learning – Blended Learning – Cooperative Learning – Collaborative Learning – Multi Channel learning – Virtual University – Virtual Library

Module 5 (12 hrs) – Development Issues

Assessment in e-learning – Quality in e-learning – Tools for Development – Costs for Developing and Using E-learning Environments – Challenges and Careers – Future of e-learning

References:

1. Michael W. Allen, “Michael Allen’s Guide to E-learning”, John Wiley & Sons, 2003.
2. Michael W. Allen, “Successful E-learning Interface: Making Learning Technology Polite, Effective and Fun”, Pfeffer & Company, 2011.
3. Michael W. Allen, “Michael Allen’s 2012: E-learning Annual”, Pfeffer & Company, 2011.

4. Gourishankar Patnaik, “E-learning”, Vdm Verlag, 2010.
5. Gaurav Chadha & Nafay Kumail S. M., “E-Learning: An Expression of the Knowledge Economy”, Tata McGraw-Hill Publication, 2002.
6. Singh P. P. & Sandhir Sharma, “E-Learning: New Trends and Innovations”, Deep & Deep Publications, 2005.

EC010 805 G03 MECHATRONICS

Teaching Schemes **Credits: 4**

2 hours lecture and 2 hours tutorial per week

Objective: Mechatronics is a synergistic combination of Mechanical, Electrical and Computer Engineering and Information Technology, which includes control systems as well as numerical methods to design products. This subject shall lay the foundations of this multidisciplinary field of engineering.

Module 1 (12 hrs)

Introduction to Mechatronics: Mechatronics key elements, Mechatronics design process, approaches in Mechatronics Modeling and Simulation of Physical System Simulation and Block Diagrams, Analogies and Impedance Diagrams, Electrical Systems, Mechanical Translation systems, Mechanical rotational system, Electromechanical coupling, Fluid systems

Module 2 (12 hrs)

Sensors and Transducers: Introduction to Sensors and transducers, Sensors for motion and position Measurement, force, torque, and Tactile sensors, flow sensors, Temperature – sensing devices, Ultrasonic sensors, range sensors, active vibration control Using agnetostrictive transducers, Fiber optic devices in mechatronics.

Module 3 (12 hrs)

Actuating Devices- Direct current motor, permanent magnet stepper motor, fluid power actuation, Fluid power design elements, Piezoelectric Actuators. Hardware components for Mechatronics. Transducer signal conditioning and devices for data conversion, programmable Controllers.

Module 4 (12 hrs)

Signals, systems and controls: Introduction to signals, systems, and controls, system representation, Linearization of Nonlinear systems, time delays, measures of system Performance, root locus and bode plots. Real- Time Interfacing. Introduction, Elements of a Data Acquisition and Control system, overview of the I/O process, Installation of the I/O card and software, installation of the Application software, examples of interfacing

Module 5 (12 hrs)

Closed Loop controllers Continuous and discrete processes, control modes, two step mode, proportional mode, derivative control, integral control, PID controller, digital controllers, control system performance, controller tuning, velocity control and Adaptive control Advanced applications in mechatronics -Sensors for condition monitoring, Mechatronic control in automated Manufacturing, artificial intelligence in mechatronics, Fuzzy logic applications in Mechatronics, Micro sensors in mechatronics.

References:

1. Devdas Shetty and Richard.A.Kolk, “Mechatronics system design”, Thomson Asia Pte. Ltd. Second reprint, 2001

2. W.Bolton, “Mechatronics”, Pearson Education Asia, Third Indian Reprint 2001.
3. David G Alciatore and Michael.B.Histand, “Introduction to Mechatronics and Measurement systems”, Tata McGraw Hill, Second Edition, 2003.

EC010 805 G04 BIO INFORMATICS

Teaching Schemes **Credits: 4**
2 hours lecture and 2 hours tutorial per week.

Objective: To cater the needs of students who want a comprehensive study of the principle and techniques of bioinformatics..

Module 1 (12 hrs)

Nature and scope of life science, Various branches of life sciences, Organization of life at various levels, Overview of molecular biology, The cell as basic unit of life- Prokaryotic cell and Eukaryotic cell - Central Dogma: DNA-RNA-Protein, Introduction to DNA and Protein sequencing, Human Genome Project, SNP, **Bioinformatics databases**, - Nucleotide sequence databases, Primary nucleotide sequence databases-EMBL, GeneBank, DDBJ; Secondary nucleotide sequence databases Protein sequence databases- SwissProt. Protein Data Bank

Module 2 (12 hrs)

Basic concepts of sequence similarity, identity and homology, definitions of homologues, orthologues, paralogues. Scoring matrices- PAM and BLOSUM matrices, Pairwise sequence alignments: Needleman & Wuncsh, Smith & Waterman algorithms for pairwise alignments. BLAST and FASTA. Multiple sequence alignments (MSA)- CLUSTALW.

Module 3 (12 hrs)

Phylogeny: Basic concepts of phylogeny; molecular evolution; Definition and description of phylogenetic trees. Phylogenetic analysis algorithms - Maximum Parsimony, UPGMA and Neighbour-Joining. Evaluation of phylogenetic trees- reliability and significance; Boot strapping; Jackknifing

Module 4 (12 hrs)

Computational approaches for bio-sequence analysis - Mapping bio-sequences to digital signals – various approaches – indicator sequences – distance signals – use of clustering to reduce symbols in amino acid sequences - analysis of bio-sequence signals – case study of spectral analysis for exon location.

Module 5 (12 hrs)

Systems Biology: System Concept- Properties of Biological systems, Self organization, emergence, chaos in dynamical systems, linear stability, bifurcation analysis, limit cycles, attractors, stochastic and deterministic processes, continuous and discrete systems, modularity and abstraction, feedback, control analysis, Mathematical modeling; Biological Networks- Signaling pathway, GRN, PPIN, Flux Balance Analysis, Systems biology v/s synthetic biology

References.

1. Claverie & Notredame, "Bioinformatics - A Beginners Guide", Wiley-Dreamtech India Pvt.
2. Uri Alon, "An Introduction to Systems Biology Design Principles of Biological Circuits", Chapman & Hall/CRC.
3. Marketa Zvelebil and Jeremy O. Baum, "Understanding Bioinformatics", Garland Science.
4. Bryan Bergeron, "Bioinformatics Computing, Pearson Education", Inc., Publication.
5. D. Mount, "Bioinformatics: Sequence & Genome Analysis", Cold spring Harbor press.
6. Charles Semple, Richard A. Caplan and Mike Steel, "Phylogenetics", Oxford University Press.
7. C. A. Orengo, D.T. Jones and J. M. Thornton, "Bioinformatics- Genes, Proteins and Computers", Taylor & Francis Publishers.
8. Achuthsankar S. Nair et al. "Applying DSP to Genome Sequence Analysis: The State of the Art, CSI Communications", vol. 30, no. 10, pp. 26-29, Jan. 2007.
9. Resources at web sites of NCBI, EBI, SANGER, PDB etc

EC 010 805 G05: Intellectual Property Rights

Teaching scheme **Credits:4**

2 hour lecture and 2 hour tutorial

Objectives

1. *To appreciate the concept of Intellectual Property and recognize different kinds of Intellectual Property*
2. *To appreciate the rationale behind IP and underlying premises*
3. *To know the position of IP under the constitution of India*

Module 1(12 Hours)

Concept of intellectual property – different types of IP-Rationale behind Intellectual property-Balancing the rights of the owner of the IP and the society – Enforcement of IPRs – IP and constitution of India.

Module 2 (12 Hours)

World intellectual Property Organization (WIPO) – WTO/TRIPS Agreement – India and the TRIPS Agreement – Patent law in India –Interpretation and implementations – Transitional period.

Module 3 (12 Hours)

Patent system – Patentable Invention – Procedure for obtaining patent – Rights of a patentee – Limitations on Particular's Rights – Revocation of patent for Non – working Transfer of patent – Infringement of patent.

Module 4 (12 Hours)

Indian Designs Law – Meaning of Design Registration and Prohibitions – Copyright in Designs – Piraiy of Design and Penalities – Steps for foling an Application – Copyright law in India –Owner of the copyright – Rights of Broad Casters and Performers – Registration of Copyright – Assignment, Licensing and Transmission – Infringement – International Copyright and Copyright Societies

Module 5 (12 Hours)

Trade Mark Law in India – Functions of a Trade Mark – Registration of Trade Mark Exploiting Trade Mark – Infringement –Offenses and Penalties – Indian Trade Mark Act 1999; salient features. Geographical Indications – Registration of Geographical Indication – Term and Implication of Registration – Reciprocity and Prohibition on Registration.

Text books

1. Jayasree Watal **-Intellectual Property Rights:** In the WTO and Developing Countries -Oxford University Press
2. V.Sarkar-Intellectual Property Rights and Copyright- ESS publications

References

1. R..Anita Rao and Bhanoji Rao - Intellectual Property Rights –Eastern Book Company

2. Arthur R Miller and Michael H Davis – Intellectual Property in a Nutshell: marks patents, Trade and Copy Right

3. Richard Stim - Intellectual Property marks patents, Trade and Copy Right – Cangage Learning
4. Christopher May and Susan K Sell - Intellectual Property Rights –A critical History - Viva Books

EC010 805G06 PROFESSIONAL ETHICS

Teaching Schemes **Credit: 4**

2 hours lecture and 2 hours tutorial per week.

Objectives:

- *To create awareness on professional ethics for engineers*
- *To instil human values and integrity*
- *To respect the rights of others and develop a global perspective*

Module 1 (12 hrs)

Understanding Professional Ethics and Human Values Current scenario – contradictions – dilemmas – need for value education and self esteem – Human values – morals – values – integrity – civic virtues - work ethics – respect for others – living peacefully – caring – honesty – courage – valuing time – co operation – commitment – empathy – self confidence - character

Module 2 (12 hrs)

Ethics for Engineers Ethics – its importance – code of ethics – person and virtues – habits and morals – 4 main virtues – ethical theories – Kohlberg's theory – Gilligan's theory – towards a comprehensive approach to moral behaviour – truth – approach to knowledge in technology

Module 3 (12 hrs)

Environmental Ethics and sustainability problems of environmental ethics in engineering - engineering as people serving profession – engineer's responsibility to environment – principles of sustainability - industrial, economic, environmental, agricultural and urban sustainability - Sustainable development.

Module 4 (12 hrs)

Social Experimentation, Responsibility and Rights Engineers as responsible experiments – safety and risk – confidentiality – knowledge gained confidentiality – experimental nature of engineering – Intellectual Property Rights – professional rights – employee rights – occupational crime

Module 5 (12 hrs)

Global Issues Globalisation – unethical behaviour – computer ethics – weapons development – engineers as expert witness and advisors – moral leadership

Reference

1. Mike W Martin, Roland Schinzinger, " Ethics in Engineering", Tata McGraw -Hill, 2003
2. Govindarajan M, Natarajan S, Senthil Kumar V S, "Engineering Ethics" PHI India, 2004
3. P Aarne Vesblind, Alastair S Gunn, " Engineering Ethics and the Enviornment"
4. Edmund G Seebauer, Robert L Barry, " Fundamentals of Ethics for scientists and engineers" Oxford University Press 2001

5. R RGaur, R Sangal, G P Bagaria, " A foundation course in value education and professional ethics"

EC010 806 VLSI & EMBEDDED SYSTEM LAB

Teaching Schemes **Credits : 2**

3 hour practical per week

VLSI LAB

1. Verilog implementations of
   a) Multiplexer
   b) Demultiplexer
   c) Full adder & Full subtractor
   d) Decoder
   Using data flow style of modelling.
2. Using Structural modelling implement
   a) 4:1 multiplexer using 2:1 multiplexer.
   b) Four bit full adder using one bit full adder.
   c) 4 bit counters.
3. Using behavioural modelling implement
   a) D Flip Flop
   b) J K Flip Flop
4. Using switch level modelling implement
   a) One bit Full adder
   b) Multiplexer – 2 channel
   c) CMOS AND gate
   d) CMOS OR gate
5. Verilog implementation of Moore and Mealy FSM.

EMBEDDED LAB (PIC)

1. Four bit binary counter using LEDs.
2. Interfacing 7 segment LED and a character LCD.
3. Timers and counters.
4. Analog to digital convertor.
5. DC motor control using.
6. Understanding interrupts.
7. Asynchronous Serial Communication.

*Program the PIC microcontroller and realize the circuits in breadboard (Avoid use of readymade kits).

EC010 807 Project Work

Teaching scheme **credits: 4**

6 hours practical per week

The progress in the project work is to be presented by the middle of eighth semester before the evaluation committee. By this time, the students will be in a position to publish a paper in international/ national journals/conferences. The EC can accept, accept with modification, and request a resubmission.

The progress of project work is found unsatisfactory by the EC during the middle of the eighth semester presentation, such students has to present again to the EC at the end of the semester and if it is also found unsatisfactory an extension of the project work can be given to the students.

Project report: To be prepared in proper format decided by the concerned department. The report shall record all aspects of the work, highlighting all the problems faced and the approach/method employed to solve such problems. Members of a project group shall prepare and submit **separate** reports. Report of each member shall give details of the work carried out by him/her, and only summarise other members' work.

The student's sessional marks for project will be out of 100, in which 60 marks will be based on day to day performance assessed by the guide. Balance 40 marks will be awarded based on the presentation of the project by the students before an evaluation committee.

For Project, the minimum for a pass shall be 50% of the total marks assigned to the Project work.

EC010 808 Viva -Voce

Teaching scheme **credits: 2**

A comprehensive oral Viva-voce examination will be conducted to assess the student's intellectual achievement, depth of understanding in the specified field of engineering and papers published / accepted for publication etc. At the time of viva-voce, certified bound reports of seminar and project work are to be presented for evaluation. The certified bound report(s) of educational tour/industrial training/ industrial visit shall also be brought during the final Viva-Voce.

An internal and external examiner is appointed by the University for the Conduct of viva voce University examination.

For Viva-voce, the minimum for a pass shall be 50% of the total marks assigned to the Viva-voce.

Note: If a candidate has passed all examinations of B.Tech. course (at the time of publication of results of eighth semester) except Viva-Voce in the eighth semester, a re-examination for the Viva-Voce should be conducted within one month after the publication of results. Each candidate should apply for this 'Save a Semester examination' within one week after the publication of eighth semester results.