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.