EC010 701 VLSI DESIGN

Teaching Schemes **Credits: 4**

2 hours lecture and 2 hours tutorial per week.

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

Module 1(12 hrs)

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

Module 2 (12 hrs)

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

Module 3 (12 hrs)

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

Module 4 (12hrs)

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

Module 5 (12hrs)

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

References:

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

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

EC010 702 INFROMATION THEORY AND CODING

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

Objectives

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

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

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

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

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

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

References:

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

EC010 703 MICROWAVE ENGINEERING

Teaching Schemes **Credit : 3**

2 hours lecture and 1 hour tutorial per week.

Objectives

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

Module 1: (12 hours)

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

Module 2 :(15 hours)

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

Module 3: (13 hours)

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

Module 4: (10 hours)

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

Module 5: (10 hours)

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

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

Reference Books:

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

EC010 704 ELECTRONIC INSTRUMENTATION

Teaching Schemes **Credits: 3**

2 hours lecture and 1 hour tutorial per week.

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

Module **1(12 hrs)**

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

Module 2 (13 hrs)

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

Module 3 (13 hrs)

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

Module 4 (12 hrs)

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

Module 5(10 hrs)

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

References:

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

EC010 705 EMBEDDED SYSTEMS

Teaching Schemes **Credits: 3**

2 hours lecture and 1 hour tutorial per week.

Objectives

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

Module I (9hrs)

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

Module II (9 hrs)

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

Module III (9 hrs)

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

Module IV (9 hrs)

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

Module V (9 hrs)

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

Reference Books

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

EC010 706L01 OPTIMIZATION TECHNIQUES

Teaching Schemes **Credits: 4**

2 hours lecture and 1 hour tutorial per week.

Objectives:

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

Module I (12 hrs)

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

Module II (12hrs)

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

Module III (12hrs)

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

Module IV (12hrs)

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

Module V (12hrs)

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

References:

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

EC010 706L02 – SPEECH AND AUDIO PROCESSING

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

Objectives

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

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

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

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

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

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

References:

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

EC010 706L03 DIGITAL IMAGE PROCESSING

Teaching Schemes **Credits : 4**

2 hours lecture and 2 hour tutorial per week.

OBJECTIVES

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

Module 1 (12 hrs)

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

Module 2 (16 hrs)

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

Module 3 (10hrs)

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

Module 4 (10 hrs)

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

Module 5 (12 hrs)

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

Reference

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

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

EC010 706L04 – WAVELETS AND APPLICATIONS

Teaching Schemes **Credits: 4**

2 hours lecture and 2 hours tutorial per week.

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

Module 1(14 hrs)

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

Module 2 (10 hrs)

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

Module 3 (12 hrs)

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

Module 4 (12 hrs)

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

Module 5 (12 hrs)

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

References

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

EC010 706 L05 ANTENNA THEORY AND DESIGN

Teaching Schemes **Credit : 4**

2 hours lecture and 2 hour tutorial per week.

Objectives

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

Pre-requisites: EC010 603 Radiation & Propagation

Module 1: (10 hrs)

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

Module 2: (10 hrs)

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

Module 3: (15 hrs)

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

Module 4: (15 hrs)

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

Module 5: (10 hrs)

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

References:

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

EC 010 706L06 SYSTEM SOFTWARE

Teaching Schemes **Credits: 4**

2 hours lecture and 2 hours tutorial per week.

Objectives:

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

Module I (12 hrs)

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

Module II (12 hrs)

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

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

Module IV (12 hrs)

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

Module V(12 hrs)

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

References

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

EC010 707 ADVANCED COMMINCATION LAB

Teaching Schemes **Credits : 2**

3 hour practical per week

List of Experiments

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

MATLAB or LABview Experiments:

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

EC010 708 SIGNAL PROCESSING LAB

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

List of Experiments

Experiments based on MATLAB

1. Generation of Waveforms (Continuous and Discrete)

2. Verification of Sampling Theorem.

3. Time and Frequency Response of LTI systems.

4. Implement Linear Convolution of two sequences.

5. Implement Circular convolution of two sequences.

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

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

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

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

10. FIR Filter Design (Window method).

11. IIR Filter Design (Butterworth and Chebychev).

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

EC 010 709 Seminar

Teaching scheme **credits: 2**

2 hours practical per week

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

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

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

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

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

EC 010 710 Project Work

Teaching scheme **credits: 1**

1 hour practical per week

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

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

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

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

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

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

- Time schedule
- Cost estimate

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

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

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

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

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