SRI JAYACHAMARAJENDRA COLLEGE OF ENGINEERING

Scheme of teaching and examination for B.E (E & C) - Autonomous

SEMESTER: III

Sl. No	Subject code	Course title	Teaching department	CREDITS L	T	P	TOTAL	Contact hours	Marks CIE	SEE	Total	
1	MA310	Engineering Mathmatics III (Fourier Series & Integral Transforms)	MA	4	0	0	4	4	50	50	100	3
2	EC310	Circuit Theory & Analysis	EC	3	1	0	4	5	50	50	100	3
4	EC320	Transducers and instrumentation	EC	3	1	0	4	5	50	50	100	3
4	EC330	Analog Electronic Circuits	EC	3	0	1	4	5	50	50	100	3
5	EC340	Digital electronic Circuits I	EC	3	0	1	4	5	50	50	100	3
6	EC350	Engineering Electromagnetics	EC	3	1	0	4	5	50	50	100	3
				Total credits			24	29	Total marks		600	

SRI JAYACHAMARAJENDRA COLLEGE OF ENGINEERING

Scheme of teaching and examination for B.E (E & C) - Autonomous

SEMESTER: IV

Sl. No	Subject code	Course title	Teaching department	CREDITS L	T	P	TOTAL	Contact hours	Marks CIE	SEE	Total	
1	MA410	Engineering Mathmatics IV (Statistical & Probabilistic Methods)	MA	4	0	0	4	4	50	50	100	3
2	EC410	Linear Integrated Circuits & Systems	EC	3	0	1	4	5	50	50	100	3
3	EC420	Telecommunication & Switching	EC	3	1	0	4	5	50	50	100	3
4	EC430	Signals and Systems	EC	3	1	0	4	5	50	50	100	3
5	EC440	Digital Electronic Circuits II	EC	3	1	0	4	4	50	50	100	3
6	EC450	Transmission Lines	EC	4	0	0	4	5	50	50	100	3
				Total credits			24	28	Total marks		600	

SRI JAYACHAMARAJENDRA COLLEGE OF ENGINEERING

Scheme of teaching and examination for B.E (E & C) - Autonomous

SEMESTER: V

Sl. No	Subject code	Course title	Teaching department	CREDITS L	T	P	TOTAL	Contact hours	Marks CIE	SEE	Total	
1	MA510	Engineering Mathematics V (Linear Algebra)	MA	3	0	0	3	4	50	50	100	3
2	EC510	Analog Commn Systems	EC	3	0	1	4	5	50	50	100	3
3	EC520	Digital Signal Processing	EC	3	1	0	4	5	50	50	100	3
4	EC530	Microprocessors and Microcontrollers	EC	3	0	1	4	5	50	50	100	3
5	EC540	Control Systems	EC	3	1	0	4	5	50	50	100	3
6	EC550	Microwave Engineering	EC	3	0	0	3	3	50	50	100	3
7	EC560	Digital System design with VHDL	EC	2	0	1	3	4	50	50	100	3
				Total credits		-	25	31	Total marks		700	

SRI JAYACHAMARAJENDRA COLLEGE OF ENGINEERING

Scheme of teaching and examination for B.E (E & C) - Autonomous

SEMESTER: VI

Sl. No	Subject code	Course title	Teaching department	CREDITS				Contact hours	Marks			
				L	T	P	TOTAL		CIE	SEE	Total	
1	MA610	Maths VI Computational Mathematics and Modeling	MA	3	1	0	4	5	50	50	100	3
2	EC610	Advanced Microprocessors	EC	3	0	1	4	5	50	50	100	3
3	EC620	Power Electronics	EC	3	0	1	4	5	50	50	100	3
4	EC630	Antennas and Propagation	EC	3	1	0	4	5	50	50	100	3
5	EC640	Digital Communication	EC	3	1	0	4	5	50	50	100	3
6	EC66L	Digital Signal Processing Laboratory	EC	0	0	1	1	2	50		50	
7	EC67L	Design and Implementation Lab	EC	0	0	4	4	4	100		100	
				Total credits			25	31	Total marks		650	

SRI JAYACHAMARAJENDRA COLLEGE OF ENGINEERING

Scheme of teaching and examination for B.E (E & C) - Autonomous

SEMESTER: VII

Sl. No	Subject code	Course title	Teaching department	CREDITS				Contact hours	Marks			
				L	T	P	TOTAL		CIE	SEE	Total	
1	EC710	Wireless & Mobile Communication	EC	3	1	0	4	5	50	50	100	3
2	EC720	Computer Networks	EC	3	0	1	4	5	50	50	100	3
3	EC730	VLSI circuits and systems	EC	3	0	1	4	5	50	50	100	3
4	EC740	Optical Fiber Communication	EC	3	0	1	4	4	50	50	100	3
5	EC7XY	Elective 1	EC	4	0	0	4	4	50	50	100	3
6	EC7XY	Elective 2	EC	4	0	0	4	4	50	50	100	3
7	EC77L	Project- Phase 1	EC	0	0	4	4	4	100		100	
				Total credits			28	31	Total marks		700	

Courses offered in Elective

Sl. No.	Subject Code	Course Title
1	EC711	Advanced Digital Signal Processing
2	EC712	Image Processing Techniques
3	EC713	Stochastic Systems
4	EC714	Statistical Signal Processing
5	EC721	Embedded Linux
6	EC722	Computer Architecture
7	EC723	Robotics
8	EC724	Automotive Electronics
9	EC725	Smart Materials and applications
10	EC726	RF Microelectronics

Courses offered in Elective

Sl. No.	Subject Code	Course Title
1	EC731	Cryptography & Network Security
2	EC732	Network Programming
3	EC733	Satellite Communication
4	EC734	Microwave and Optical Integrated Circuits
5	EC735	Random Processes and Queuing Theory
6	EC741	Distributed Completing
7	EC742	Multimedia Common
8	EC743	JAVA Programming
9	EC744	Operating Systems

SRI JAYACHAMARAJENDRA COLLEGE OF ENGINEERING

Scheme of teaching and examination for B.E (E & C) - Autonomous

SEMESTER: VIII

Sl. No	Subject code	Course title	Teaching department	CREDITS L	T	P	TOTAL	Contact hours	Marks CIE	SEE	Total	
1	EC810	Entrepreneurship and Management	EC	4	0	0	4	4	50	50	100	3
2	EC8XY	Elective 3	EC	3	1	0	4	5	50	50	100	3
3	EC8XY	Elective 4	EC	3	1	0	4	5	50	50	100	3
4	EC8XY	Elective 5	EC	3	1	0	4	5	50	50	100	3
5	EC85L	Project work Phase 2 and seminar	EC			12	12	12	100	50	150	3
				Total credits			28	31	Total marks		550	

Courses offered as Electives

Sl. No.	Subject Code	Course Title
1	EC811	Operations Research
2	EC812	Reliability Engineering
3	EC821	Low Power Design
4	EC822	Analog & Mixed Mode Design
5	EC823	MEMs and Nanotechnology
6	EC824	Optical Computing
7	EC825	Wavelet Transforms

Courses offered as Electives

Sl. No.	Subject Code	Course Title
1	EC831	Optical Networks
2	EC832	Ad Hoc Networks
3	EC833	High Performance Communication Networks
4	EC834	Wireless Sensor Networks
5	EC835	Network Management Systems
6	EC841	Grid Computing
7	EC842	Mobile Computing
8	EC843	Fuzzy Logic and neural networks
9	EC844	Protocol Engineering
10	EC845	Compression Techniques

MA310 FOURIER SERIES AND INTEGRAL TRANSFORMS 4:0:0

Fourier series: Introduction, Fourier series for even and odd functions; half-range expansions; practical harmonic analysis.

Fourier transforms, applications to ordinary and partial differential equations; Fast Fourier transforms.

Laplace transforms and inverse Laplace transforms; applications to ordinary and partial differential equations.

Hankel, Mellin and z-transforms, Solution of difference equations.

Computational techniques: Computing Fourier transforms, FFTs; two dimensional FFTs; convolution; correlation; digital filters.

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EC310 CIRCUIT THEORY AND ANALYSIS 3:1:0

Unit 1: 8h

Basic concepts - Introduction, Network terminologies, Review of KVL & KCL, Energy sources - ideal & practical, Source Transformations, Mesh Analysis of DC & AC circuits, Circuits with independent voltage sources only Mesh analysis - circuits containing independent current sources & dependent sources, Concept of super mesh, Nodal analysis - Circuits containing independent current sources, Nodal analysis - circuits containing dependent sources, Concept of super node, Star - Delta transformations & network reduction using them, Source Shifting , problems.

UNIT 2: 8h

Network Theorems - Superposition theorem, problems. Thevenin's theorem as applied to AC & DC circuits, Norton's theorem as applied to DC & AC circuits, Maximum power transfer theorem as applied to DC & AC circuits, Millman's theorem, applications & problems. Tellegen's theorem & problems, Miller's theorem.

UNIT 3: 8h

Resonance - Series resonance, resonant frequency, reactance curves, voltage & current variable with frequency, Selectivity & bandwidth, Q - factor, circuit magnification factor Selectivity with variable C & variable L Parallel resonance, resonant frequency, impedance, selectivity, bandwidth Maximum impedance conditions with C, L, & f variable, current & Q - factor.
Initial conditions - Need, Initial conditions in R, L, & C elements Final conditions and Geometrical interpretation of derivatives, Procedure to evaluate initial conditions. Initial state of a network.

Unit 4: 8h

Circuit Analysis using Laplace Transforms - Review of Laplace transforms, Natural & Forced responses, Advantages of LT techniques, Modeling R, L, & C in s - domain, DC transients, Step response of RC, RL & RLC circuits, Impulse & Pulse response of RC & RL circuits & AC transients, Circuit analysis with LT using partial fraction expansion & convolution integral. .
Fourier method of waveform analysis - Applications of Fourier techniques to circuit analysis, Waveform symmetry, Line spectrum, Waveform synthesis Effective value & power, problems, Application of FS in circuit Analysis.

UNIT 5: 8h

Network Functions - Concept of complex frequency, Network functions for one & two - port networks. Poles & zeros of network functions, Restrictions on pole & zero locations for driving point functions & transfer functions, Time domain behavior from pole - zero plots

Two Port parameters -Short - Circuit admittance parameters, Open circuit impedance parameters, Transmission parameters, Hybrid parameters, problems, Relationships between parameters, problems.

References:

1. M.E.Van Valkenburg: Network Analysis, 3rd edition, Pearson/ PHI, Reprint 2006.
2. William H.Hayt, Jr, Jack E.Kimmerly, Steven M.Durbin: Engineering Circuit Analysis,6th edition, Tata McGraw-Hill, 2002
3. D. Roy Choudhury: Networks and Systems, New Age International, Reprint 2005.
4. J. David Irwin, R. Mark Nelms: Basic Engineering Circuit Analysis, 8th edition, John Wiley & Sons, 2006

EC 320 TRANSDUCERS AND INSTRUMENTATION 3:1:0

Unit 1: 8h

General Concept of Instrumentation Systems, Distributed & Stand Alone Systems, Generalized Functional Elements, Input output configuration, Instrument Transducers & Sensor, Classification of Transducers, General Transducer Characteristics, Static characteristics, Dynamic Characteristics, Reliability Characteristics

Unit 2: 8h

Mathematical Model of a Measurement system, Concept of first order system, Concept of second order systems, Determination of Measurement system Parameter, Loading effects

Unit 3: 8h

Temperature Transducers, Importance in Industry , Sensing methods including IC transducers, Processing & Display Method , Electronic circuits simulation ,Typical Industrial Temperature System, Pressure Transducer Importance in Industry , Sensing methods including IC transducers, Processing & Display Method , Electronic circuits simulation ,Typical Industrial Pressure System

Unit 4: 8h

Displacement Transducers , Different Sensing Methods , Digital Transducers, Instrumentation System, Piezoelectric Transducers , Piezoelectric Materials, Modes of Operations , Optical detectors, Photo voltaic, Photo conductive, Thermo electric transducers

Unit 5: 8h

Introduction to computer based IS , Data Transmission schemes, Modulation Techniques, Telemetry & DSP systems,

References: :

1. Herman .K.P. Neubert : Instrument Transducers -An introduction to their performance and design, 2nd Edition, Oxford University Press, 2003
2. Ernest .O. Doebelion, Dhanesh N Manik, Measurement Systems : Application & Design , 5th Edition, Tata McGraw-Hill, 2007
3.. H.S. Kalsi : Electronic Instrumentation, 2nd Edition, Tata McGraw-Hill, 2008

EC330 ANALOG ELECTRONIC CIRCUITS 3:0:1

Unit 1: BJT AC analysis 8h

BJT modeling, r_e model, hybrid model, hybrid π model, CE fixed bias, Voltage divider bias and emitter bias configurations, emitter follower, cascaded systems Darlington connection, feedback pair, current mirror, current source.

Unit 2: FET AC analysis 8h

JFET Small Signal model, JFET Fixed bias, Self bias, Voltage divider bias configurations, source follower common gate configuration, design of FET amplifier, E-MOS and D-MOS amplifiers.

Unit 3: BJT and FET Frequency response 8h

General frequency considerations, low frequency response of BJT and FET amplifiers, Miller effect capacitance, High frequency response of BJT and FET amplifiers, multistage effects.

Unit 4: Feed back and oscillators 8h

Concept of feedback, feedback topologies, practical feedback circuits, basic principle of oscillators, RC, LC and crystal oscillators.

Unit 5: Power amplifiers 8h

Class A series fed and transformer coupled class A power amplifier, class B and class AB power amplifiers, Harmonic distortion, power transistor heat sinking, class C and class D power amplifiers.

References:

1. Robert Boylestad : Electronic Devices and circuits, 9th edition, Pearson, 2007
2. Jacob Milman and Halkias : Integrated electronics , 15th edition, Tata McGraw-Hill 1999

LAB EXPERIMENTS:

1. Design and testing of single stage RC coupled amplifier for given specifications.
2. Design and testing of Emitter follower for given specifications.
3. Design and testing of FET CS amplifier for given specifications
4. Design and testing of Class-B power amplifier for given specifications
5. Design and testing of Current series feedback amplifier for given specifications
6. Design and testing of Voltage shunt feedback amplifier for given specifications
7. Design and testing of RC phase shift and Wein bridge oscillators.
8. Design and testing of LC oscillators.
9 Design and testing of Two stages RC coupled amplifier for given specifications.

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EC340 DIGITAL ELECTRONIC CIRCUITS 1 3:0:1

Unit 1 8h

Simplification of Boolean expressions: Review of digital fundamentals, subsumes implicants, implicates prime implicants and EPI's. Introduction to K-maps basis for simplification. Four, five and six variables K-maps. Simplification procedure. Quine & McClussky method: Introduction .Decimal method of generation of PI's PI chart to generate EPI's .Map extend variables. Procedure for simplification

Unit 2 8h

Design of combinational logic circuits using MSI components and PLD's. Design of binary adders and subtractors. Carry look ahead adders: design principles. Decimal address and IC parallel adders. Comparators: a general n-bit comparator, Logic design using multiplexers and demultiplexers, Decoders, encoders and priority encoders.

Unit 3 8h

Logic design using PROMS, PALS & PLAS : Introduction to PLD's, terminology and notation, PROMS: Principles & logic design using PROMS, PALS: & PAL'S IC Logic Families: Digital IC terminology, V&I parameters, propagation delay, Noise margin, speed power product, V-I characteristics Fan-in and Fan-out concepts,TTL logic family circuit, characteristics,Loading, Fan-out tri-state & open collector TTL

Unit 4 8h

MOS logic family: characteristics, Open drain and tri-state outputs, CMOS bilateral switch, IC interfacing : Introduction, Different logic families : driving each other, Flip flops and their applications, SR latch switch de-bouncer, gated latch, Master slave SR & JK flip flops, Edge triggered D flip flop and JK flip flop characteristic equations, Conversion of one flip flop to other type setup & hold times

Unit 5 8h

Registers and counters, Design of binary ripple and synchronous counters of arbitrary modulo using different flip flop, Comparison of ripple and synchronous counters parallel carry & ripple carry, Shift registers of different kinds uni & bidirectional, universal shift registers, Sequential logic design: Introduction to mealy and moore models, State diagrams excitations & transition tables, Derivation of switching functions and final logic diagram

References:

1. Donald Givone, Digital principles & design TM-H,2003
2. Morris Mano,Digital logic and computer design PHI/Pearson

Lab Experiments :

1 Simplification & realization of Boolean expressions(SOP POS forms) using logic gates
2 Design of arithmetic circuits adders & sub tractors . 4-bit IC parallel adders. Complement arithmetic & decimal adders
3 Design of comparators & code converters
4 Logic design using multiplexers , decoders and demultiplexers
5 Design of seven segment display using decoders
6 Design of 3-bit synchronous & Asynchronous counters of arbitrary modulo UP, DOWN & UPDOWN using flip flops
7 Design of counters different types using IC versions(4-bit)
8 Design of Shift registers using flip flops universal shift registers and shift register IC versions

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EC350 ENGINEERING ELECTROMAGNETICS 3:1:0

Unit-1 : 8h

Vector Analysis, Co-ordinate System ,Coulomb's Law, Electric field intensity, Electric field due to various charge distribution, Electric flux & flux density, Flux density due to various charge

distribution, Gauss Law, Applications of Gauss law, Divergence & Maxwell's Equations

Unit-2 : 8h

Work done & Line Integral Concept, Potential, Potential due to various charge distribution, Conservative field, Potential gradient & Dipole, Energy density in ES field , Equation of continuity , Conductors & dielectric , Boundary conditions , Concept of capacitance , Energy density

Unit-3 8h

Poisson's & Laplace Equations , Uniqueness Theorem , Magnetic field & its properties, Biot Savart's Law, Computation of H using BSL ,Ampere's Law, Computation of H using ASL Curl & Stokes Theorem, Magnetic flux & flux density, Scalar & Vector Potentials

Unit-4 : 8h

Magnetic forces, Introduction to Time Varying fields, Faradays equations, Displacement current Field relations for Time Varying Electric & Magnetic fields , Maxwell's Equations, Boundary conditions

Unit-5 : 8h

Uniform plane waves, General equations, UPW in free space & various media, Poynting Vector & Poynting Theorem, Polarization of UPW

References :

1. Hayt Jr : Engineering Electro Magnetics -McGrawHill
2. John D Kraus: Engineering Electro Magnetics- McGraw Hill :

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SEMESTER IV

MA 410 STATISTICAL AND PROBABILISTIC METHODS 4:0:0

Statistical Methods: Sampling theory: random samples, sampling distributions, central limit theorem, statistical inference, point estimation, unbiasedness, MLEs, interval estimation of mean and variances, hypothesis testing, types of errors, one- sided, two-sided test, tests concerning means and variances, goodness of fit tests, data analysis, correlation and regression of data, simple linear regression; use of statistical tables.

Probabilistic Methods: sample space, conditional probability, Bayes' theorem, random variables, pmf, cdf, marginal and conditional distributions, mean and variance, covariance and correlation. Probability distributions: Bernoulli, binomial, Poisson, uniform, exponential, normal, Gamma.

References:

1. B V Ramana: Higher Engineering Mathematics; Tata McGraw-Hill, 2007

2. J S Milton and J C Arnold: Introduction to Probability and Statistics, Tata McGraw-Hill, 2007.

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EC 410 LINEAR INTEGRATED CIRCUITS AND SYSTEMS 3:0:1

Unit 1: 8h

Op-Amp Parameters and DC Amplifiers: Basic op-amp circuit, IC 741op-amp, Input/output impedances, Slew-rate & frequency limitations, Direct-coupled voltage followers, inverting and non inverting amplifiers, Summing and difference amplifiers.

Unit 2: 8h

Op-Amp AC Amplifiers and Frequency Response: Capacitor-coupled voltage follower, non inverting and inverting amplifiers, High impedance amplifiers, use of a single polarity supply, Frequency and phase responses, Compensation methods, Slew-rate effects, Zin Mod compensation, Circuit stability precautions.

Unit 3: 8h

Op-Amp Linear Applications & Signal Processing: Instrumentation amplifier, V to I and I to V converters, Precision half-wave and full-wave rectifiers, Clipping and Clamping circuits, Peak detectors, Sample and Hold circuits, A to D and D to A converters

Unit 4: 8h

Op-Amp Nonlinear Applications and Oscillators: Comparators, Schmitt trigger circuits, Phase shift and Wien-Bridge oscillators, Square/Rectangular and Triangular wave generators, Design of Active Filters

Unit 5: 8h

Voltage Regulators and 555Timer: Fixed and Adjustable voltage regulators, Switching regulators.555 Timer as Monostable and Astable multivibrators, applications. Introduction to Phase-locked loops (PLL).

References:

1. **David A. Bell:** Operational Amplifiers and Linear ICs, 2nd Edition, PHI/Pearson, New Delhi, 2004.
2. **Ramakanth A. Gayakwad:** Op-Amps and Linear Integrated Circuits, 4th Edition, Pearson Education Asia, Reprint 2002.

2. **D. Roy Choudhury, Shail B. Jain:** Linear Integrated Circuits, 3rd Edition, New Age International Publishers, New Delhi, 2007.

LABORATORY EXPERIMENTS :

01 Capacitor-Coupled Voltage followers
02 Capacitor-Coupled inverting and non-inverting amplifiers.
03 Slew-rate Effects
04 Voltage and Current Sources.
05 Instrumentation Amplifier
06 Precision Rectifiers
07 Schmitt Trigger Circuits
08 Op-Amp Astable and Monostable Multivibrators
09 Triangular / Rectangular Waveform Generators
10 Sinusoidal Oscillators
11 555 Timer Astable Multivibrator
12 555 Timer Monostable Multivibrator

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EC 420 TELECOMMUNICATION AND SWITCHING 3:1:0

Unit 1: 8h

Developments of telecommunications, Network structure, Network services, terminology, Regulation, Standards. Introduction to telecommunications transmission, Power levels, Four wire circuits, Digital transmission, FDM, TDM, PDH and SDH, Transmission performance.

Unit 2: 8h

Evolution of Switching Systems: Introduction, Message switching, Circuit switching, Functions of switching systems, Distribution systems, Basics of crossbar systems, Electronic switching, Digital switching systems

Digital Switching Systems: Fundamentals Purpose of analysis, Basic central office linkages, Outside plant versus inside plant, Switching system hierarchy, Evolution of digital switching systems, Stored program control switching systems, Digital switching system fundamentals, Building blocks of a digital switching system, Basic call processing.

Unit 3: 8h

Telecommunications Traffic: Introduction, Unit of traffic, Congestion, Traffic measurement, Mathematical model, Lost call systems, Queuing systems.

Unit 4: 8h

Switching Systems: Introduction, Single stage networks, Gradings, Link Systems, GOS of Linked systems .

Time Division Switching : Introduction, space and time switching, Time switching networks, Synchronisation.

Unit 5: 8h

Switching System Software: Introduction, Scope, Basic software architecture, Operating systems, Database Management, Concept of generic program, Software architecture for level 1 control, Software architecture for level 2 control, Software architecture for level 3 control, Digital switching system software classification, Call models, Connect sequence, Software linkages during call, Call features, Feature flow diagram, Feature interaction.

A Generic Digital Switching System Model: Introduction, Scope, Hardware architecture, Software architecture, Recovery strategy, Simple call through a digital system, Common characteristics of digital switching systems. Analysis report. Reliability analysis.

References:

1. **J E Flood:** Telecommunication and Switching, Traffic and Networks. Pearson Education, Reprint 2002

2. **Syed R. Ali**, Digital Switching Systems - Reliability and analysis, Tata McGraw-Hill , 2002.

3. **John C Bellamy:** Digital Telephony, 3rd Edition, Wiley India , 2000

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EC 430 SIGNALS AND SYSTEMS 3:1:0

Unit 1: Basics of Signals and Systems: 8h

Introduction, Definitions and examples of a signal and a system, Classification of signals, Basic operations on signals, Elementary signals, Systems viewed as interconnection of operations, properties of systems.

Unit 2: Time Domain Representation of LTI systems 8h

Introduction, Impulse response characterization and convolution sum for the discrete time LTI systems, Properties of convolution sum, Impulse response characterization and convolution integral for continuous time LTI systems, properties of convolution integral, Interconnection of LTI systems, LTI system properties in terms of impulse response, Step response, Differential and Difference equation representation of LTI systems, Characterization of Systems described by differential or difference equations, Block diagram representation.

Unit 3: Fourier Analysis of Continuous time signals and LTI systems: 8h

Introduction, Complex sinusoids and frequency response of LTI systems, Fourier representation for four classes of signals, Fourier series representation of Continuous time periodic signals(CTFS), Convergence of Fourier Series , Properties of Amplitude and Phase spectra, Continuous time Fourier transform (CTFT), properties, Magnitude and Phase spectra, Frequency response of continuous time LTI systems, application of Fourier transform, relating FT to FS, Relationship between LT and FT.

Unit 4: Fourier Analysis of discrete time signals and LTI systems: 7h

Fourier representation of Periodic signals in discrete time (DTFS), Properties, Discrete time Fourier transform(DTFT), properties and applications of DTFT, Relating the FT to the DTFT, Relating the FT to the DTFS, Sampling and Reconstruction

Unit 5: Z transforms and Applications: 9h

Introduction, the Z transform, ROC and its properties, properties of Z transform, Inverse Z transform, Analysis and characterization of LTI systems using Z transforms, Computational structures for implementing Discrete time LTI systems, Unilateral Z transforms and their applications for solving difference equations, Relationship between Z , Laplace and DTFT

References:

1. Simon Haykin and Barry Van Veen , Signals and systems - Wiley India Edition, Second edition, 2008.
2. Alan V Oppenheim, Alan S Wilsky, S Hamid Nawab: Signals and system 2nd edition , PHI/Pearson Education, 2004.
3. T P Hsu, Signals and systems- Tata McGraw Hill, 2006.

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EC 440 DIGITAL ELECTRONIC CIRCUITS II 3:1:0

Unit 1: 8h

Introduction: Inter Register Transfer Arithmetic. Logic and Shift Micro operations. Conditional control statement Fixed point Binary Data Overflow. Arithmetic Shift Decimal data. Floating point data and Non numeric data. Instruction codes Macro Vs Micro Operations.

Unit 2: 8h

Design of a simple computing system. Processor logic Design : Introduction processor organization, ALU design of Arithmetic circuits. Design of logic units. Design of A and L unit Status Register Design of Shifters. Processor unit. Design of Accumulator.

Unit 3: 8h

Control organization: one flip-flop PG state method. PLA control and micro program control. Hard wired control. Micro program control. PLA control. Micro program Sequences .Micro programmed CPU organization. Complete design fundamentals: Introduction system configurations. Computer Instructions Execution of Instructions.

Unit 4: 8h

Design of registers. Microcomputer system design: Introduction Organisation. Microprocessor organization. Block schematic. Memory cycle. Instruction and addressing modes. Stack, subroutines and Interrupt Memory Oraganisation. .

Unit 5: 8h

I/O interface parallel peripheral Interface. Serial communication interface . DMA and DMA transfer in microcomputer system Role of cache memory. Data hazards. Introduction hazards. Conditional and un conditional hazards

References:

1 . **Morris Mano:** Digital Logic and Computer Design., Pearson Education, 2006

2. **Carl Hamacher, Zvonko Vranesic, and Safwat Zaky:**, Computer Organization, Fifth Edition, McGraw-Hill, 2002

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EC 450 TRANSMISSION LINES 3: 0: 1

Unit 1: 8h

Introduction to Passive filters, Constant k filters ,m derived filters, T and pi section, Neper, Decibel, Characteristic impedance, propagation constant, symmetrical networks, Attenuators, T, pi, bridged T and lattice sections

Unit 2:

Transmission at low frequencies, Types, distributed parameters, transmission line equation and solutions, Line constants, input impedance, infinite lines, distortion less lines and conditions, reflections, open circuit and short circuit lines, reflection co-efficient, T and pi equivalent circuits, Reflection and insertion loss

Unit 3: 8h

Line at RF, Introduction, line constants, SWR, Relation ship between SWR and reflection coefficient, Power measurements, stub matching, OC and SC lines, Smith chart and applications, Introduction to waveguides, Rectangular and circular waveguides, Modal theory-TE and TM waves, Impossibility of TEM waves

Unit 4: 8h

Waveguide parameters, Waveguide components- directional coupler and magic Tee, S parameter analysis, Introduction to MICs and planar devices, Introduction to optical fibers, History, Merits, demerits, TIR principle, fiber cross section, Types, Acceptance angle, Numerical aperture, V number, Fiber modes, Materials, Fabrication, Signal degradation in optical fibers- Attenuation, absorption, Scattering, bending losses, group delay, Material and waveguide dispersion

Unit 5: 8h

Pulse broadening in fibers, information capacity, Modal loss in fibers, Optical and electrical bandwidth, Optical waveguides and cables, Single mode fibers, ISI, information rate

References:

1. **John D Ryder:** Fields, lines and waves, 2nd Edition, Pearson Education/ Prentice Hall of India, 2002
2. **Gerd Keiser:** Optical fiber communication, 4th Edition, Tata McGraw- Hill, 2008
3. **Joseph C Palais:** Fiber optic communication, 4th Edition, Pearson Education, 2008

LABORATORY EXPERIMENTS :

01 Passive filters k type and m derived : LPF, HPF and BPF
02 Attenuators, T, pi Bridged T and lattice types
03 Characteristic impedance, inverse impedance measurements.
04 Magic Tee. Directional couplers
05 Microwave power measurement
06 Measurement of SWR, Reflection coefficient, Smith chart applications
07 Optical fibers, attenuation, NA , acceptance angle, Coupling loss Measurement
08 Analog link setup - Bandwidth capability, Digital link, bit rate
09 Insertion and reflection loss measurements
10 Multiplexing using fibers

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SEMESTER V

EC 510 ANALOG COMMUNICATION SYSTEMS 3:0:1

Unit 1: 8h

Introductions to electronic communication systems. Power measurement units, EM frequency spectrum, Noise analysis , Signal analysis and mixing , power spectra

Unit 2: 4h

Phase lock loops and frequency synthesizers

Unit 3: 8h

AM transmission, principles, AM circuits, AM Transmitters, QAM, AM reception

Unit 4: 4h

SSB transmission, Suppressed carrier systems, Mathematical analysis

Unit 5: 12h

Angle modulation systems, Mathematical analysis, Demodulators, Frequency analysis of angle modulated systems, bandwidth requirements, Commercial FM broadcast, noise and angle modulation, FM transmitters, Reception and FM Stereo, Linear integrated FM receivers, two way mobile communication services, two way FM communications

Unit 6: 4h

Recent advances and developments from current publications and journals

References:

1. Wayne Tomasi : Electronic Communication Systems, 5th edition, Pearson Education, 2007
2. Simon Haykins: Communication Systems, 4th Edition, John Wiley , 2000
3. Michael Fitz: Fundamentals of Communication Systems, TMH, 2008 (for MATLAB exercises and mini projects)

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EC 520 DIGITAL SIGNAL PROCESSING 3:1:0

Unit 1: 4h

Review of Z transforms and Inverse Z transforms,. DFT, Frequency domain sampling and reconstruction of discrete time signals, DFT as a linear transformation, its relationship with other transforms. Properties of DFT

Unit 2: 6h

Use of DFT in linear filtering. Direct computation of DFT, FFT algorithms for computing DFT, Radix -2 DIT and DIF algorithms for computing DFT and IDFT. Goertzel algorithm, Chirp-z Algorithm.

Unit 3: 8h

IIR filter design: Introduction to IIR filters, characteristics of commonly used analog filters, frequency transformations, design of IIR filters from analog filters using IIT and BLT techniques

Unit 4 : 8h

FIR filter design: Introduction to FIR filters, Design of FIR filters using windowing and frequency sampling technique

Unit 5: 8h

Implementation of discrete time systems: structures for IIR and FIR filters Direct form-I, direct form-II, Transposed, cascade, parallel and lattice realizations. Quantization of filter coefficients, Round-off effects in digital filters.

Unit 6: 6h

Introduction to STFT and wavelet transforms, Recent developments and applications of signal processing, Digital Signal Processors.

References:

1. Proakis and Manolakis, Digital signal processing - principles , Algorithms and applications, Pearson Education, 4th Edition, 2007
2. Oppenheim and Schaffer, Discrete time signal processing, PHI, 2003
3. S.K. Mitra, Digital signal Processing, TMH, 2004
4. IEEE Transactions on Signal Processing

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EC530 MICROPROCESSORS AND MICROCONTROLLERS 3:0:1

Unit 1: 10h

Introduction to 8 bit microprocessor (8085), Block diagram, internal architecture, addressing modes, instructions, instruction execution timing, programming examples, interfacing devices, Interfacing of memory and i/o devices, PPI(8255) in mode 0 configuration and its applications-interfacing of LEDs, keyboard, stepper motor, ADC and DAC

Unit 2:

8051 Microcontroller:- Architecture, 8051 hardware, i/p and o/p pins, ports and port circuits, external memory, counters and timers, serial communication

Unit 3: 10h

Addressing modes& instructions:- Addressing modes, external data moves, code memory read only data moves, PUSH & POP op-codes, data exchanges, arithmetic, logical, jump and call instructions

Unit 4: 8h

Timer/counter, serial communication and interrupt programming:-
Programming 8051 timer/counter, basics of serial communication, 8051 connection to RS 232, 8051 serial port programming, 8051 interrupts, programming timer interrupts, programming external hardware interrupts, programming serial communication interrupts

Unit 5: 4h

Applications:- Interfacing keyboard, LCD, ADC ,DAC, Stepper motor

References

1. Gaonkar: 8085 Microprocessor- architecture, programming and interfacing-
2. Kenneth J Ayala : The 8051 Microcontroller Architecture, Programming and Applications- 2ed Penram International 1996
3. Muhammad Ali Mazidi and Janice Gillespie : The 8051 Microcontroller and embedded Systems- - Pearson Education 2003
4. Rajkamal: Microcontrollers- Architecture, Programming Interfacing and System Design, Pearson Education
5. Prediko : Programming and Customizing the 8051 Microcontroller-TMH

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EC 540 CONTROL SYSTEMS 3:1:0

Unit 1 : 8h

Concept of feedback control, Examples of control systems (Electrical, mechanical, fluid flow) and their dynamical system model, Laplace transform review, Block diagram representation and its algebra, Signal flow graphs and Mason's gain formula, State-space models.

Unit 2 : 8h

Time domain analysis, Effect of pole-zero location and addition, step response and impulse response of the standard first and second order systems, Steady state error analysis of Type-0,1,2 systems, Classical PID controller.

Unit 3 : 8h

Stability w.r.t. transfer function and state-space (external and internal stability), Routh-Hurwitz method, root-locus of a basic feedback system and guidelines, dynamic compensation, frequency response, Nyquist stability criterion, stability margins, closed-loop frequency response, Phase lag-lead compensation

Unit 4 : 8h

State-space design and its advantages, analysis of state-equations, full-state feedback control, selection of pole locations for good design, estimator design, combined control law and estimator.

Unit 5 : 8h

Case studies: An outline of control systems design, satellite's altitude control, Maglev control, Read-write head assembly of hard disk.

References:

1. G. F. Franklin., G. D. Powell., A. E. Naeini, 4th Edition, Feedback Control of Dynamic Systems, Pearson Education, 2002
2. K. Ogata, Modern Control Engineering, 4th Edition, Pearson Education, 2006
3. S. K. Bhattacharya, Control Systems Engineering, Pearson Education, 2005

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EC 550 MICROWAVE ENGINEERING 3:0:0

Unit 1 : Introduction to microwaves 12h

Introduction, bands, advantages, application and radiation hazards, S parameters, Transmission Matrix, microwave filters, klystron, magnetron & TWT, Gunn diode, Tunnel

diode, varactor diode , parametric amplifiers, Cross field amplifiers, IMPATT and TRAPATT diodes.

Unit 2 : Strip lines & MIC 8h

Micro strip lines, parallel strip lines, co-planar strip lines, shielded strip lines , introduction to MIC , materials , MOSFET fabrication, thin film formation, hybrid circuits

Unit 3: 8h

Radiometry, Introduction to TV standards, scanning principles, composite video, VSB transmission, colour transmission, TV cameras, HDTV principles.

Unit 4: 8h

Radar system principles, Unambiguous range equations, pulse radar, CW and FM Radar, MTI principles, MTI Radar, Pulse Doppler Radar, Scanning and Tracking, Radar displays and Radar beacons.

Unit 5: 4h

Recent advances and trends from latest publications and magazines

References:

1. Annapoorna Das ; Microwave Engineering , TMH .
2. Samuel .Y.Liao : Microwave devices and circuits, 3ed, 2004 , Prentice Hall
3. M I Skolnik : Introduction to Radar, McGrawHill, 4th ed., 2004
4. Kennedy : Communication Systems, McGraw Hill

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EC 560 DIGITAL SYSTEM DESIGN USING VHDL 2:0:1

Theory Session 25 Lab Session 15

Unit 1: 5h

Code structure, Data types, Operators, Attributes, Concurrent code, Sequential statements, Styles of descriptions: Data flow, Behavioral and Structural

Combinational Circuits simulation 3sessions

Decoders/Encoders, Mux / Demux, Magnitude comparator, Parity generator & checker, Adder/ Subtractor, Parallel adder, BCD adder, Ripple carry adder.

Unit 2: 5h

Signals & variables, Functions & Procedures, Data type-Vector, Generate, Generic

Sequential circuit's simulation

Latches, Flip-flops, Counters, Shift Registers 3 sessions

Unit 3: 5h

System design1:State Machine, Arrays, Memory devices, Code Converters, Universal shift register

Simulation of the examples worked out in the theory classes

03 sessions

Unit 4: 5h

System design 2:String detector, signal generator, display decoders (BCD - 7 Segment), Multiplier

Simulation of the examples worked out in the theory classes

03 sessions

Unit 5: 5h

System design 3: Advanced HDL descriptions: File processing, Examples, Synthesis basics ALU , Traffic light controller, Dice game 03 sessions

References:

1. Charles H Roth Jr. ' Principles of Digital system design using VHDL' Cengage Learning, 1998
2. Robert K Dueck ' Digital design with CPLD applications and VHDL' Thomson Asia Pvt Ltd, 1st reprint 2002
3. Nazeith M Botros 'HDL Programming Fundamentals' Thomson ,First Indian reprint 2007
4. J J Bhaskar ' A VHDL Primer' PHI, 3rd edition 2003

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SEMESTER VI

EC610 ADVANCED MICROPROCESSORS 3:0:1

Unit 1: 10h

8086 microprocessor- introduction, CPU architecture, Machine language instructions and instruction execution timing.

Instruction set of 8086 :- Data transfer, arithmetic, branch, loop, NOP and Halt, flag manipulation, logical and rotate instructions, directives and operators, programming examples.

Unit 2: 5h

Byte and String instructions:- string instructions, REP prefix, table translation, number format conversions, procedure, macros, programming using keyboard and video display.

Unit 3: 7h

8086 configurations:-minimum mode and maximum mode configuration,

Interfacing memory and i/o devices, interfacing of keyboard, LEDS, Stepper motor to 8086 using 8255 in mode 0 configuration.

Unit 4: 8h

8086 interrupts :- 8086 interrupts and interrupt responses, hardware interrupts, software interrupts, its applications

Unit 5: 10h

Pentium processor :- Introduction to Pentium processor, functional description of Pentium, its registers, data organization instruction types, addressing modes interrupts

References:

1. Y C Liu and Gibson Microcontroller Systems-The 8086/8088 family--PHI 2003
2. Barry B Bray The Intel Microprocessor, Architecture, Programming, and interfacing- 8 ed. PEARSON EDUCATION
3. James L Antonakos The Pentium Microprocessor _-Pearson education
4. Douglas V Hall Microprocessor and Interfacing- Programming and Hardware - 2ed PEARSON EDUCATION
5. A K Ray and K M Bhurchandl Advanced Microprocessors and Peripherals -, TMH 2001

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EC620 POWER ELECTRONICS 3:0:1

Unit 1 : 10h

Power Semiconductor Devices: Introduction to Power Electronics. Types of Power Electronic circuits. Power Diodes and Transistors - Types and switching characteristics. Thyristors - Construction, operation, switching characteristics and types. Series and Parallel operation of power devices. di/dt and dv/dt protections. Firing circuits

Unit 2: 6h

Controlled Rectifiers: Introduction. Single phase Half-wave and Full-wave converters, Semiconverters. AC Voltage Converters: Introduction, On-Off and Phase control. Single phase Half-wave ac voltage controllers. Single - phase Bidirectional controllers with resistive and inductive loads

Unit 3: 7h

DC - DC Converters or Choppers: Introduction, Step-down chopper with R and RL loads, Step-up operation, Chopper Classification, Switching-Mode regulators - Buck and Boost regulators.

Unit 4: 7h

Inverters: Introduction, Single phase Bridge inverters, Voltage control of Single phase inverters, Introduction to Three phase inverters, Current source inverters.

Unit 5: 6h

Power supplies :
UPS, SMPS AC and DC Power scavenging, Battery Systems

Unit 6: 4h

Recent Developments and Case Studies based on Current Technical Literatures (Reference Books and Journals)

References:

1. Muhammad H. Rashid: Power Electronics - Circuits, Devices and Applications, 3rd edition, Pearson Education/ PHI, 2007
2. R.S. Ananda Murthy, V. Nattarasu: Power Electronics, 2nd edition Sanguine Technical Publishers, India, 2005.
3. Daniel W. Hart: Introduction to Power Electronics, Addition Wesley, 1997.

Laboratory Experiments:

1. Voltage controlled switch using MOSFET.
2. Study of Energy recovery circuit.
3. Controlled HWR and FWR using RC triggering.
4. UJT firing circuit for controlled HWR and FWR.
5. Firing Circuit using Ramp-pedestal control technique.
6. Firing circuit using ZCD and ramp-comparator technique.
7. Generation of firing signals for converters / inverters using digital circuits / microprocessors.
8. Single phase fully controlled bridge converter with R and RL loads.
9. AC voltage controller using Triac-Diac combination.
10. Voltage(Impulse) commutated chopper - constant frequency and variable frequency operations.
11. Speed control of separately excited DC motor.
12. Series / Parallel inverter.

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EC 630 ANTENNAS AND PROPAGATION 3:1:0

Unit 1 : Antenna Basics 6h

Basic antenna parameters, patterns, beam area, radiation intensity, beam efficiency, directivity and directive gain, antenna apertures, effective height, Frii's transmission formula, antenna field zones

Unit 2 : Simple antennas 8h

Point sources , arrays of two point sources , principle of pattern multiplication , short dipole , radiation resistance of short dipole , quarter wave & half wave dipole , folded dipole , Yagi-Uda antenna , small loop antenna ,slot antenna , patch or microstrip antenna , horn and parabolic dish antennas & log periodic antenna .

Unit 3 : Antennas for special applications 6h

LEO sat link antennas, antennas for terrestrial mobile communication, base station antennas, antennas for ground penetrating radar, embedded antennas

Unit 4 : Radiowave Propagation 14h

Introduction : Ground wave and Free space propagation, Surface waves, Ground reflection and refraction, Critical frequency, Virtual height, skip distance, Tropospheric propagation, scattering, Ionospheric propagation, Polarization, Sky wave propagation and effect of earth magnetic field,

Unit 5: Advanced Topics in Antennas 6h

Intelligent antennas, High resolution data, real time channel predictions and modelling, Topics from recent Journals and Publications.

References

1 . J. D. Krauss : Antennas for all applications, 3ed 2006, Mc GrawHill .

2. Simon. R. Saunders : Antennas and Propagation for wireless communication system, John Wiley Publications, 3rd ed., 2001.

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EC 640 DIGITAL COMMUNICATION 3:1:0

Unit 1 : 7h

Basic signal processing operations in digital communication. Sampling, Principles: Sampling Theorem, Quadrature sampling of Band pass signal, Practical aspects of sampling and signal recovery.

Unit 2: 7h

PAM, TDM. Waveform Coding Techniques, PCM, Quantization noise and SNR, robust quantization.

Unit 3: 6h

DPCM, DM, applications. Base-Band Shaping for Data Transmission, Discrete PAM signals, power spectra of discrete PAM signals.

Unit 4 : 6h

ISI, Nyquist's criterion for distortion less base-band binary transmission, correlative coding, eye pattern, base-band M-ary PAM systems, adaptive equalization for data transmission.

Unit 5 : 7h

Digital Modulation formats, Coherent binary modulation techniques, Coherent quadrature modulation techniques. Non-coherent binary modulation techniques.

Unit 6 : 7h

Spread Spectrum Modulation: Pseudo noise sequences, notion of spread spectrum, direct sequence spread spectrum, coherent binary PSK, frequency hop spread spectrum, applications.

Unit 7:

Recent developments and articles from latest publications (To be covered in tutorial sessions)

References:

1. Simon Haykin : Digital communications, , John Wiley, 2003.
2. K. Sam Shanmugam : Digital and Analog communication systems & An Introduction to Analog and Digital Communication, John Wiley, 1996.
3. Bernard Sklar Digital communications -: Pearson education 2007
4. Ian A Glover and Peter M Grant: Digital Communications 2nd Ed , Pearson Education, 2008

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EC 66L DIGITAL SIGNAL PROCESSING LABORATORY 0:0:1

A LIST OF EXPERIMENTS USING MATLAB

1. Verification of Sampling theorem.
2. Impulse response of a given system
3. Linear convolution of two given sequences.
4. Circular convolution of two given sequences
5. Autocorrelation of a given sequence and verification of its properties.
6. Cross correlation of given sequences and verification of its properties.
7. Solving a given difference equation.
8. Computation of N point DFT of a given sequence and to plot magnitude and phase spectrum.
9. Linear convolution of two sequences using DFT and IDFT.
10. Circular convolution of two given sequences using DFT and IDFT
11. Design and implementation of FIR filter to meet given specifications.
12. Design and implementation of IIR filter to meet given specifications.

B. LIST OF EXPERIMENTS USING DSP PROCESSOR

1. Linear convolution of two given sequences.
2. Circular convolution of two given sequences.
3. Computation of N- Point DFT of a given sequence
4. Realization of an FIR filter (any type) to meet given specifications.
5. Noise removal : Add noise above 3kHz and then remove Interference suppression using 400 Hz tone.
6. Impulse response of first order and second order system

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EC 67L DESIGN AND IMPLEMENTAION LAB 0:0:4

Students are required to carry out a project approved by the department, which will be evaluated periodically by way of presentations, viva and Demonstrations and documentation. Break up for the evaluation of these events and the schedule will be announced by the department towards the end of 5th Semester. The implementation should preferably a hardware scheme with design scheme and procedures clearly documented.

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SEMESTER VII

EC 710 WIRELESS AND MOBLE COMMUNICATION 3:1:0

Unit 1: 10h

Introduction to wireless telecommunication systems and Networks, History and Evolution Different generations of wireless cellular networks 1G, 2g,3G and 4G networks.
Common Cellular System components, Common cellular network components, Hardware and software, views of cellular networks, 3G cellular systems components, Call establishment.

Unit 2: 10h

Wireless network architecture and operation, Cellular concept Cell fundamentals, Capacity expansion techniques, Cellular backbone networks, Mobility management, Radio resources and power management Wireless network security
GSM and TDMA techniques, GSM system overview, GSM Network and system Architecture, GSM channel concepts, GSM identifiers

Unit 3: 8h

GSM system operation, Traffic cases, Cal handoff, Roaming, GSM protocol architecture. TDMA systems CDMA technology, CDMA overview, CDMA channel concept CDMA operations

Unit 4: 6h

Wireless Modulation techniques and Hardware, Characteristics of air interface, Path loss models, wireless coding techniques,, OFDM, UWB radio techniques, Diversity techniques, Typical GSM Hardware

Unit 5: 6h

Introduction to wireless LAN 802.11X technologies, Evolution of Wireless LAN Introduction to 802.15X technologies in PAN Application and architecture Bluetooth Introduction to Broadband wireless MAN, 802.16X technologies.

References:

1. Mullet: Wireless Telecom Systems and networks, Thomson Learning 2006:
2. Lee W.C.Y, Mobile Cellular Telecommunication, MGH, 2002.
3. D P Agrawal: Wireless communication 2nd Edition Thomson learning 2007
4. David Tse, Pramod Viswanath, Fundamentals of Wireless Communication, Cambridge 2005

EC 720 COMPUTER NETWORKS 3:0:1

Unit 1: 8h

Layered tasks, OSI Model, Layers in OSI model, TCP?IP Suite, Addressing, Telephone and cable networks for data transmission, DSL,
Data link control: Framing, Flow and error control, Protocols, Noiseless channels and noisy channels, HDLC

Unit 2: 8h

Multiple access: Random access, Controlled access, Channelisation
Wired LAN, Ethernet, IEEE standards, Standard Ethernet. Changes in the standards, Fast Ethernet, Gigabit Ethernet, Wireless LAN IEEE 802.11

Unit 3: 8h

Network Layer, Logical addressing, Ipv4 addresses, Ipv6 addresses, Ipv4 and Ipv6 Transition from Ipv4 to Ipv6

Unit 4: 8h

Delivery, Forwarding, Unicast Routing Protocols, Multicast Routing protocols

Unit 5: 8h

Transport layer Process to process Delivery, UDP, TCP, Domain name system, Resolution

References:

1. B Forouzan: Data communication and networking 4th Ed TMH 2006
2. B Forouzan: TCP/IP Protocol suite 4th Edition, TMH 2010
3. James F. Kurose, Keith W. Ross: Computer networks, Pearson education, 2nd Edition, 2003
4. Wayne Tomasi: Introduction to Data communication and networking , Pearson education 2007

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EC 730 VLSI CIRCUITS AND SYTEMS 3:0:1

Unit 1: 8h

Introduction: A Brief History, MOS Transistors, CMOS Logic, CMOS fabrication and Layout, VLSI Design Flow, Fabrication, Packaging, and Testing

Unit 2: 8h

MOS Transistor Theory: Introduction, Ideal I-V Characteristics, C-V Characteristics, Non ideal I-V Effects, DC Transfer Characteristics, Switch - level RC Delay Models

Unit 3: 8h

Circuit Characterization and Performance Estimation: Introduction, Delay Estimation, Logical effort and transistor sizing, Power Dissipation, Interconnect, Design Margin, Reliability

Unit 4: 8h

Circuit Simulation: Introduction: A Spice Tutorial, Device Models, Device Characterization, Circuit Characterization, Interconnect Simulation

Unit 5: 8h

Combinational and Sequential circuit design: Introduction, Circuit families, Sequencing static circuits, Circuit design of Latches and Flip-flops

Recent trends and current publications: Nalwa "Handbook of Advanced electronics and Photonic Materials and Devices" , Volume 1-10, Academic Pres, IEEE transactions on electronic devices.

Lab course will be conducted with available Microwind tool. Design of layout and circuit simulation will be carried out.

References:

1. Neil H.E. Weste, David Harris, Ayan Bannerjee: CMOS VLSI DESIGN: A Circuits and Systems Perspective, 3rd Edition, Published by Pearson Education, 2005.
2. Douglas. A. Pucknell, Kamran Eshragian: Basic VLSI Design, 3rd Edition, Eastern Economy Edition, 1994.
3. R. Jacob, W. Li, David .E. Boyce: CMOS Circuit Design, Layout, and Simulation, Prentice Hall India, 1998.

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EC 740 OPTICAL FIBER COMMUNICATION 3:0:1

Unit 1 8h

Overview of Optical Fiber Communication: Introduction, Historical development, general system, advantages, disadvantages, and applications of optical fiber communication, optical fiber waveguides, Ray theory, cylindrical fiber (no derivations in article 2.4.4), single mode fiber, cutoff wave length, mode filed diameter. Optical Fibers: fiber materials, photonic crystal, fiber optic cables specialty fibers.

Unit 2: 8h

Transmission characteristics of optical fibers: Introduction, Attenuation, absorption, scattering losses, bending loss, dispersion, Intra model dispersion, Inter model dispersion. Optical Sources and Detectors: Introduction, LED's, LASER diodes, Photo detectors, Photo detector noise, Response time, double hetero junction structure, Photo diodes, comparison of photo detectors.

Unit 3: 8h

Fiber Couplers and Connectors: Introduction, fiber alignment and joint loss, single mode fiber joints, fiber splices, fiber connectors and fiber couplers.

Optical Receiver: Introduction, Optical Receiver Operation, receiver sensitivity, quantum limit, eye diagrams, coherent detection, burst mode receiver, operation, Analog receivers

Unit 4 8h

Analog and Digital Links: Analog links - Introduction, overview of analog links, CNR, multichannel transmission techniques, RF over fiber, key link parameters, Radio over fiber links, microwave photonics.

Digital links - Introduction, point-to-point links, System considerations, link power budget, resistive budget, short wave length band, transmission distance for single mode fibers, Power penalties, .

Unit 5:

WDM Concepts and Components: WDM concepts, overview of WDM operation principles, WDM standards, active optical components, MEMS technology, variable optical attenuators, Optical Networks, SONET'SDH, ADM, Recent Developments 8 hrs

References:

1. Gerd Keiser, "Optical Fiber Communication", 4th Ed., MGH, 2008.
2. John M. Senior, "Optical Fiber Communications", Pearson Education. 3rd Impression, 2007.
3. Joseph C Palais: Fiber optic communication 5th Edition, Pearson Education,

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EC 711 ADVANCED DIGITAL SIGNAL PROCESSING 3:1:0

Unit 1: 10h

Parametric Signal modeling, Linear Prediction, Properties of LP filters, Lattice filters, Wiener filters, AR and ARMA lattice ladder filters.

Unit 2: 10h

Introduction to Adaptive filters, applications of adaptive filters, LMS and RLS algorithms, and applications of adaptive filters

Unit 3: 8h

Introduction to Power Spectrum Estimation, Parametric and Non- Parametric methods for Power Spectrum Estimation.

Unit 4: 12h

Introduction to Multirate DSP, Decimation, Interpolation, Sampling rate conversion, Applications of Multirate signal processing, Digital filter Banks, Introduction to STFT and Wavelet transforms, Applications. Recent Developments

References:

1. John G Proakis and Dimitris G Manolakis, "Digital Signal Processing", Fourth Edition, Pearson Education, 2007.

2. P.P.Vaidyanathan, "Multirate Systems and Filter Banks", Pearson Education, 2006

3. Sophacles J Orfanandes, "Optimum Signal Processing", McGrawHill

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EC 712 IMAGE PROCESSING TECHNIQUES 3:1:0

Unit 1 10h

Digital Image Fundamentals: Elements of visual perception, Light and electromagnetic spectrum, image sensing and acquisition, Image sampling and quantization, Basic relationships between pixels.

Image Enhancement in Spatial Domain: Basic gray level transformations, histogram processing, equalization, enhancement, image subtraction, averaging, smoothing and sharpening using spatial filters and their combination.

Unit 2 8h

Image Enhancement in Frequency Domain: 2dimentional DFT, correspondence between filtering in spatial and frequency domain, smoothing and sharpening using Butterworth and Guassian Lowpass and highpass filters, Convolution, correlation, FFT and IFFT in 2d.

Unit 3 10h

Color image processing: Color models RGB, CMY, HSI, Color transformations, Smoothing and sharpening, Segmentation in HIS and RGB color space,

Basic Morphological Algorithms: Dilation and erosion, Opening and closing, boundary extraction, region filling, extraction of connected components, thinning, thickening and pruning.

Unit 4 8h

Image segmentation: Point, line and edge detection (Robert, Canny and Prewitt techniques).

Unit 5 4h

Case studies: Character recognition, face detection problems from recent journals

References:

1. Rafael Gonzalez, Richard Woods: Digital Image Processing USING MATLAB, PHI Publications 2nd Ed.,2005
2. Anil K. Jain: Fundamentals of Digital Image Processing, Prentice Hall India, 1988.
3. John C Russ, The Image Processing Handbook, 5th Ed, 2006, CRC Press

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EC 713 STOCHATSIC SYSTEMS 3:1:0

Unit 1 : 8h

Review of Probability Theory: Axioms and definition of Probability, Random variables, Conditional probability of random variables; CDF and PDF, Functions of RV; Expectation and entropy, Moment generating functions, Functions of multiple RV and Random vector, Random Processes, correlation, covariance, Stationarity, Ergodicity, Central limit theorem, Power spectral density

Unit 2 : 8h

Linear Systems with Random Inputs: Introduction, Linear System with white-noise as the input, Analysis of LS with non-white noise as input, System Identification Problem, Autoregressive (AR), Moving Average (MA) and ARMA Processes, Lattice Filters and Levinson's Algorithm, Yule-walker equations

Unit 3 ; 8h

Estimation Theory: Introduction, Deterministic LMS algorithm, Stochastic LMS Algorithm, Innovation Process, State-space model, Innovation of stationary process, Weiner Filter, Innovation of non-stationary process, Kalman Filter, Optimal Control Problem and Estimation, Duality in Estimation and Control, Applications: Global Positioning System, Satellite control,

Unit 4 :

Discrete time Markov chains: Evolution equation, Properties of state and chain, Continuous time Markov Chains: Evolution equation, Properties of state and chain, Hidden Markov Models, Applications (Speech recognition, Stochastic Control

Unit 5 :

Recent advances in Stochastic signal processing, estimation and control. Survey of topics in recent journals like: IEEE Transactions in Signal Processing, IEEE Transactions in Automatic Control.

References

1. A. Popoulis and S. Unnikrishnan Pillai, Probability, Random Variables and Stochastic Processes, 4th Edition, Tata McGraw Hill (India), 2001
2. J.G. Proakis, D. G. Manolakis, Digital Signal Processing: Principles, Algorithms and Applications, 4th Edition, Pearson Educations, 2007
3. Simon Haykin, "Adaptive Filters," Pearson Education (Asia) Ltd, 4th edition, 2002.
4. K. J. Astrom, Introduction to Stochastic Control Theory, Dover Publications, 2006.

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EC 714 STATISTICAL SIGNAL PROCESSING 3:1:0

Unit 1: 8h

Review of Probability and Random Variables: Review of Probability Theory: Axioms and definition of Probability, Random variables, Conditional probability of random variables; CDF and PDF, Functions of RV; Expectation and entropy, Moment generating functions, Functions of multiple RV and Random vector, Random Processes, correlation, covariance, Stationarity, Ergodicity, Central limit theorem, Power spectral density

Unit 2: 8h

Signal Modeling: White noise, filtering random processes, spectral factorization, ARMA, AR and MA processes. Least squares method, Padé Approximation, Prony's method, finite data records, stochastic models, Levinson-Durbin recursion; Schur recursion; Levinson recursion.

Unit 3: 8h

Filters: Lattice filter structure (IIR/ FIR), Lattice methods for all pole modeling, Weiner filter (IIR/FIR) for linear prediction, Discrete Kalman filter.

Unit 4: 8h

Spectrum Estimation: Nonparametric methods, minimum-variance spectrum estimation, maximum entropy method, parametric methods, frequency estimation, principal components spectrum estimation.

Unit5 : 8h

Optimal and Adaptive Filtering: FIR and IIR Wiener filters, Discrete Kalman filter, Recent advances in Statistical Signal Processing, Survey of topics in recent journals like: IEEE Transactions in Signal Processing

References:

1. Monson H. Hayes, "Statistical Digital Signal Processing and Modeling," John Wiley & Sons (Asia) Pte. Ltd., 2002.

2. H. Stark, J. W. Woods, "Probability and Random Processes with Applications to Signal Processing", 3rd Edition, Pearson Education, 2006
3. Dimitris G. Manolakis, Vinay K. Ingle, and Stephen M. Kogon, "Statistical and Adaptive Signal Processing: Spectral Estimation, Signal Modeling, Adaptive Filtering and Array Processing," McGraw-Hill International Edition, 2000.
4. Simon Haykin, "Adaptive Filters," Pearson Education (Asia) Ltd, 4th edition, 2002.
5. J.G. Proakis, C.M. Rader, F. Ling, C.L. Nikias, M. Moonen and I.K. Proudler, "Algorithms for Statistical Signal Processing," Pearson Education (Asia) Pte. Ltd, 2002.

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EC 721 EMBEDDED LINUX 3:1:0

Unit 1: 8h

Introduction: Why Embedded Linux? Embedded Linux,II Getting Started Architecture of Linux Kernel Architecture Linux Start-up Space
III Board Support Package Memory Map The PCI System UART

Unit 2: 8h

Power Management IV Embedded Storage MTD - Memory Technology MTD - Architectures The Flash Mapping Drivers Embedded File System Optimizing Storage Space Tuning memory Space

Unit 3: 8h

V Embedded Linux Linux Serial Drivers Ethernet Drivers USB Drivers Kernel Modules

Unit 4: 8h

VI Porting Applications Application Porting Roadmap Programming with Threads : OSPL Kernel API Driver VII Real Time Linux

Unit 5: 8h

RTOS Linux & Real-Time Real-Time Programming VIII Building Debugging Building the Kernel Building Applications Debugging Virtual Memory Kernel Debuggers

References:

1. R Ragavan et al :Embedded Linux System Design & Development,Auerbach Publications, 2009
2. Craig Hollabaughm : Embedded Linux, , Pearson Education, 2009

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EC 722 COMPUTER ARCHITECTURE 3:1:0

UNIT 1: Fundamentals of Computer Design: 8h

Introduction, Classes of computers, Defining computer architecture, Trends in technology, cost, power and dependability. Quantitative principles of computer design, classifying instruction set architecture, memory addressing and operations in the instruction set, type and size of operands, encoding an instruction set.

Unit 2: Pipelining: 8h

Introduction, basics of a RISC instruction set, a simple implementation of a RISC instruction set, the classic five stage pipeline for a RISC processor, basic performance issues in pipelining, Major hurdles of pipelining- pipeline hazards, a simple implementation of MIPS, a basic pipeline for MIPS, implementing the control for MIPS, dealing with branches, dealing with exceptions.

UNIT 3: Instruction level Parallelism and its exploitation: 8h

Instruction level parallelism: concepts and Challenges, basic compiler techniques for exposing ILP, reducing branch costs with prediction, overcoming data hazards with Dynamic Scheduling, Dynamic Scheduling: examples and the algorithm, hardware based speculation, exploiting ILP using multiple issue and static scheduling, exploiting ILP using dynamic Scheduling, multiple issue and speculation.

UNIT 4: Limits on Instruction-level Parallelism: 8h

Introduction, studies of the limitations of ILP, limitations on ILP for realizable processors, hardware versus software speculation, multithreading: using ILP support to exploit thread level parallelism, performance and efficiency in advanced multiple issue processors.

UNIT 5: Memory Hierarchy Design: 8h

Introduction, cache performance, cache mapping techniques, block replacement algorithms, write policies, advanced optimizations of Cache performance, memory technology and optimizations, protection: virtual memory and virtual machines, Design of memory hierarchies.

References:

1. John L Hennessey and David A Patterson, Computer architecture-A quantitative approach, Elsevier,4th edition.

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EC 723 ROBOTICS 3:1:0

Unit 1 : 8h

Mathematical Modeling of robots - robots as mechanical devices - common kinematic arrangements Representation of positions and rotations - rotational transformations - composition of rotations - parameterization of rotations

Unit 2: 8h

Kinematic chains - DH convention - inverse kinematics

Unit 3 : 8h

The Euler-Lagrange equations - Kinetic and potential energy - equations of motion - some common configurations - properties of dynamic equations - Newton-Euler formulation

Unit 4 : 8h

Planning of manipulator trajectories - general consideration - joint interpolated trajectories

Unit 5: 8h

Range sensing - proximity sensing - touch sensing - Image acquisition - illumination techniques - imaging geometry - preprocessing - segmentation - description

References

1. M W Spong, S Hutchinson and M Vidyasagar,Robot Modeling and Control, Wiley Student Edition, 2006

2. K S Fu, R C Gonzalez and C G S Lee,:Robotics - Control Sensing, Vision and Intelligence, Mc Graw Hill International Editions, 1987

EC 724 AUTOMOTIVE ELECTRONICS 3:1:0

Unit 1 : 8h

Electrical and electronic systems in the vehicle: Overview, Motronic-engine management system, Electronic diesel control, Lighting technology, Electronic stability program, Adaptive cruise control, Occupant-protection systems.

Unit 2: 8h

Networking and bus systems: Cross-system functions, Requirements for bus systems, Classification of bus systems, Applications in the vehicle, Coupling of networks, Examples of networked vehicles.

Architecture of electronic systems & Control Units: Overview, Vehicle system architecture. Control units: Operating conditions, Design, Data processing, Digital modules in the control unit and control unit software.

Unit 3 : 8h

Automotive sensors: Basics and overview, Automotive applications, Sensor market, Features of vehicle sensors, Sensor classification, Selection of sensor technologies.

Unit 4 : 8h

Sensor measuring principles: Sensors for the measurement of position, speed, rpm, acceleration, pressure, force, and torque, Flow meters, Gas sensors and concentration sensors, temperature sensors,

Sensor types: Engine speed sensors, Hall phase sensors, Sensors for transmission control & wheel speed, Yaw-rate sensors, Pressure sensors, Temperature sensors, Accelerator-pedal sensors, Steering angle sensors, Position sensors, Axle sensors, Piezoelectric knock sensors, Air mass sensors, Acceleration sensors, Force & torque sensors, Rain/light sensors,.

Unit 5 8h

Actuators: Electromechanical & fluid mechanical actuators, Electrical machines

Hybrid drives: Drive concepts, Operating strategies for electric hybrid vehicles, Recuperative brake system, Electrical energy accumulators.

Symbols and circuit diagrams: Circuit symbols & circuit diagrams, Designations for electrical devices, Terminal designations.

References:

1. Robert Bosch GmbH: Automotive Electrics Automotive Electronics, 5th Edition, John Wiley & Sons Ltd, 2007.
2 . William B. Ribbens: Understanding Automotive Electronics, 6th Edition, Elsevier, 2003

EC 725 SMART MATERIALS & STRUCTURES 3:0:1

Unit 1: 8h

Overview of Smart Materials, Structures and Products Technologies. Physical Properties of Piezoelectric Materials, Electrostrictive Materials, Magnetostrictive Materials, Magnetoelectric Materials. Magnetorheological Fluids, Electrorheological Fluids, Shape Memory Materials, Fiber-Optic Sensors.

Unit 2: 8h

Smart Sensors: Accelerometers; Force Sensors; Load Cells; Torque Sensors; Pressure Sensors; Microphones; Impact Hammers; MEMS Sensors; Sensor Arrays. Smart Actuators: Displacement Actuators; Force Actuators; Power Actuators; Vibration Dampers; Shakers; Fluidic Pumps; Motors. Smart Transducers: Ultrasonic Transducers; Sonic Transducers; Air Transducers

Unit 3: 8h

Measurement, Signal Processing, Drive and Control Techniques in Quasi-Static and Dynamic Measurement Methods; Signal-Conditioning Devices; Constant Voltage, Constant Current and Pulse Drive Methods; Calibration Methods; Structural Dynamics and Identification Techniques; Passive, Semi-Active and Active Control; Feedback and Feed forward Control Strategies

Unit 4 : 8h

Design, Analysis, Manufacturing: Case studies incorporating design, analysis, manufacturing and application issues involved in integrating smart materials and devices with signal processing and control capabilities to engineering applications.

Unit 5: 8h

Applications of Engineering Smart Structures and Products. Emphasis on structures, automation and precision manufacturing equipment, automotives, consumer products, sporting products, computer and telecommunications products, as well as medical and dental tools and equipment.

References:

1. M. V. Gandhi and B. So Thompson, Smart Materials and Structures, Chapman & Hall, London; NewYork, 1992 (ISBN: 0412370107).
2. B. Culshaw, Smart Structures and Materials, Artech House, Boston, 1996 (ISBN:0890066817).
3. A. V. Srinivasan, Smart Structures: Analysis and Design, Cambridge University Press, Cambridge;New York, 2001 (ISBN: 0521650267).
4. A. J. Moulson and J. M. Herbert, Electroceramics: Materials, Properties, Applications, 2nd Edition, John Wiley & Sons, Chichester, West Sussex; New York, 2003 (ISBN: 0471497479).
5. G. Gautschi, Piezoelectric Sensorics: Force, Strain, Pressure, Acceleration and Acoustic Emission Sensors. Materials and Amplifiers, Springer, Berlin; New York, 2002 (ISBN: 3540422595).
6. K. Uchino, Piezoelectric Actuators and Wtrasonic Motors, Kluwer Academic Publishers, Boston, 1997 (ISBN: 0792398114).
7. G. Engdahl, Handbook of Giant Magnetostrictive Materials, Academic Press, San Diego, Calif.;London, 2000 (ISBN: 012238640X).
8. K. Otsuka and C. M. Wayman, Shape Memory Materials, Cambridge University Press,. Cambridge; New York, 1998 (ISBN: 052144487X).
9. Eric Udd, Fiber Optic Sensors: An Introduction for Engineers and Scientists, John Wiley & Sons, New York, 1991 (ISBN: 0471830070).
10. Andre Preumont, Vibration Control of Active Structures: An Introduction, 2nd Edition, Kluwer Academic Publishers, Dordrecht; Boston, 2002 (ISBN: 1402004966).
11. Hojjat Adeli, Control. Optimization, and Smart Structures: High-Performance Bridges and Buildings of the Future, John Wiley, New York, 1999 (ISBN: 047135094X).

12. T. T. Soong, Passive Energy Dissipation Systems in Structural Engineering, Wiley, Chichester;New York, 1997 (ISBN: 0471968218).

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EC 726 RF MICROELECTRONICS 3:1:0

Unit 1: 6h

Introduction to RF and wireless technology. basic concepts in RF circuit design. Multiple access techniques and wireless standards. Mobile RF communications

Unit 2: 10h

Transceiver architecture

General considerations, receiver architectures, heterodyne receivers, homodyne receivers, image reject receivers digital IF receivers sub sampling receivers

Transmitter architecture

Base band RF interface, PA/antenna interface, direct- conversion transmitters, two step transmitter. case studies

Unit 3: 8h

Low noise amplifiers and mixers

Low noise amplifiers, general considerations, input matching bipolar LAN's CMOS LAN's Down conversion mixers, general considerations, bipolar mixers, CMOS mixers, noise in mixers

Unit 4: 8h

RF synthesizer architectures

Integer N architectures fractional N architecture, dual loop architectures, direct digital synthesizer, frequency dividers, divide by two circuit, direct modulo dividers

Unit 5: 8h

Power amplifiers

General considerations, classification of power amplifiers high efficiency power amplifier, small signal impedance matching, linearization technique design examples Recent developments

Reference:

Behazid Rrazavi : RF microelectronics , Prentice hall (Pearson education) 1998

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EC 731 CRYPTOGRAPHY AND NETWORK SECURITY 3:1:0

UNIT 1 8h

Services, mechanisms and attacks, The OSI security architecture, A model for network security. SYMMETRIC CIPHERS: Symmetric Cipher Model, Substitution Techniques, Transposition Techniques, Simplified DES, Data encryption standard (DES), The strength of DES, Differential and Linear Cryptanalysis, Block Cipher Design Principles and Modes of Operation, Evaluation Criteria for Advanced Encryption Standard, The AES Cipher.

UNIT 2 8h

Principles of Public-Key Cryptasystems, The RSA algorithm, Key Management, Diffie - Hellman Key Exchange, Elliptic Curve Arithmetic, Authentication functions, Hash Functions.

UNIT 3 8h

Digital signatures, Authentication Protocols, Digital Signature Standard. Web Security Consideration, Security socket layer (SSL) and Transport layer security, Secure Electronic Transaction.

UNIT 4 8h

Intruders, Intrusion Detection, Password Management. MALICIOUS SOFTWARE: Viruses and Related Threats, Virus Countermeasures.

UNIT 5: 8h

Firewalls Design Principles, Trusted Systems Topics of recent interest from journals and magazines

REFERENCES:

1. William Stallings: Cryptography and Network Security, , Pearson Education, 2003.
2. Behrouz A. Forouzan: Cryptography and Network Security, , TMH, 2007.
3. Atul Kahate :Cryptography and Network Security, , TMH, 2003.

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EC 732 NETWORK PROGRAMMING 3:1:0

Unit 1: 8h

Introduction History, Layering, OSI Model, Processes, a Simplified Model, Client-Server Model The Unix Model: Introduction, Basic Definitions, Input and Output, Signals, Process Control, Daemon Processes

Unit 2: Interprocess Communication 8h

Introduction, File and Record Locking, A Simple Client-Server Example, Pipes, FIFOs, Streams and Messages, Name Spaces, System V IPC: Message Queues, Semaphores, Shared Memory, Sun RPC

Unit 3: 8h

Introduction Transport Layer Sockets Introduction Elementary TCP Sockets TCP Client/Server Example Elementary SCTP Sockets SCTP Client/Server Example Name and Address Conversions

Unit 4: 8h

IPv4 and IPv6 Interoperability, Daemon Processes and the inetd Superserver, Advanced I/O Functions Unix Domain Protocols, Non blocking I/O, ioctl Operations

Unit 5: 8h

Routing Sockets, Key Management Sockets, Broadcasting, Multicasting, Advanced UDP Sockets, Advanced SCTP Sockets, Out-at-Band Data, Signal-Driven I/O, Threads, IP Options, Raw Sockets, Data link Access, Client/Server Design Alternatives

References:

1. Richard Stevens: UNIX Network Programming, Prentice Hall, 1990.
2. Richard Stevens: UNIX Network Programming, Volume 2, Second Edition: Interprocess Communications, Prentice Hall, 1999..
3. Richard Stevens: UNIX Network Programming, Volume 1, Second Edition: Networking APIs: Sockets and XTI, Prentice Hall, 1998

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EC 733 SATELLITE COMMUNICATION 3:1:0

Unit 1 : 5h

Introduction to satellite communication : Kepller's laws , orbital elements , orbit perturbations , different types of orbits - sun synchronous , geo stationary , inclined and launching orbits , antenna look angles

Unit 2 : 8h

Wave propagation : Atmospheric losses, ionospheric effects, rain attenuation, other propagation impairments, polarization

Unit 3: 12h

Space and Earth segments : Space segment, introduction, power supply, attitude control, station keeping, TT&C, thermal control, transponders, antenna subsystem.

Earth segment : Introduction , receive only home systems, master antenna system , community antenna TV system, TX-RX earth station

Unit 4: 12h

Link equation and multiple access : Space link, EIRP, transmission losses, link power budget, system noise, CNR , uplink &down link, effects of rain, combined CNR, interference, satellite access, FDMA, TDMA & CDMA

Unit 5 : 6h

Advanced topics : Satellite in network , direct broadcast TV , satellite for mobile and specialized services , VSAT, INSAT & Indian satellite program , GPS

References:

1. Dennis Roddy Satellite communication , 4ed , 2006 , McGrawHill
2. Timothy Pratt & John Bostain : Satellite communication

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EC734 MICROWAVE AND OPTICAL INTEGRATED CIRCUITS 3:1:0

Unit 1: 8h

Basic concepts of microwave integrated circuits: Wave propagation and circuit theory, transmission lines, planar circuits, Analytical methods associated with MIC theory, Passive elements, components and devices: Filters, couplers, circulators, isolators, antenna elements,

Unit 2: 10h

Basic circuits: Method of MIC synthesis, matrix representation, network matrix decomposition, Basic linear and non linear circuits, MICs: filters, oscillators, Mixers, frequency divider, Digital modulators, switches, phase shifters, multipliers and up-converters MIC Measurement:Device and circuit measurement techniques, measurement in MIC media, MIC test system, System applications of MICs: Radio system, satellite communication, Broadcast system, Future trend in MICs

Unit 3: 8h

Advantages of Integrated Optics, Substrate Materials for Optical Integrated Circuits, Optical Waveguide modes, Modes in a Planar Waveguide structure, Ray Optic approach to Optical Mode theory, theory of Optical Waveguides. Unit 4: Waveguide fabrication techniques, Polymer and Fiber Integrated Optics, Losses in Waveguides, Waveguide Input and Output Couplers, Coupling between waveguides

Unit 4: 9h

Application of OI circuits, Optoelectronic IC, Optical switches, convolvers and correlators, Devices & systems for Telecommunications, Photonic and Microwave Wireless Systems.

Unit 5: 5h

Recent developments and articles from latest publications

References:

1. Hiroshi Nishihara, Masamitsu Haruna, Toshiaki Suhara, Optical Integrated Circuits, McGraw -Hill, New York, 1992.
2. Robert .G. Hunsperger, Integrated Optics, Springer - Verlag, 5th Edition, New York 2002.
3. Ivan Kneppo, , "Microwave Integrated Circuits". Kluwer
4. Yoshihiro Konishi, "Microwave Integrated Circuits" CRC press

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EC735 RANDOM PROCESSES AND QUEUEING THEORY 3:1:0

Unit 1: 5h

INTRODUCTION TO PROBABILITY THEORY: Experiments, sample space, Events, Axioms, Assigning probabilities, Joint and conditional probabilities, Baye's Theorem, Independence, Discrete Random Variables, Engg Example

Unit 2: 5h

Random Variables, Distributions, Density Functions: CDF, PDF, Gaussian random variable, Uniform Exponential, Laplace, Gamma, Erlang, Chi-Square, Raleigh, Rician and Cauchy types of random variables

Unit 3: 8h

OPERATIONS ON A SINGLE R V: Expected value, EV of Random variables, EV of functions of Random variables, Central Moments, Conditional expected values. Characteristic functions, Probability generating functions, Moment generating functions, Engg applications, Scalar quantization, entropy and source coding.

Unit 4: 7h

Pairs of Random variables, Joint CDF, joint PDF, Joint probability mass functions, Conditional Distribution, density and mass functions, EV involving pairs of Random variables, Independent Random variables, Complex Random variables, Engg Application.

Unit 5: 6h

RANDOM PROCESS: Definition and characterization, Mathematical tools for studying Random Processes, Stationary and Ergodic Random processes, Properties of ACF. Markov processes, Gaussian Processes, Poisson Processes, Engg application, Computer networks, Telephone networks.

Unit 6: Basics of Queuing Theory : 9h

Introduction: Queuing notation; Rules for all Queues; Little's law; Types of stochastic processes. Analysis of Single Queue: Birth-Death processes; M / M / 1 Queue; M / M / m Queue; M / M / m / B Queue with finite buffers; Results for other M / M /1 Queuing Systems. Queuing Networks: Open and closed Queuing Networks; Product form networks; Queuing Network models of Computer Systems. Operational Laws: Utilization law; Forced flow law; Little's law; General response time law; Interactive response time law; Bottleneck analysis.; Limitations of Queuing Theory

References:

1. S L Miller and D C Childers: Probability and random processes: application to Signal processing and communication Academic Press / Elsivier 2004

2. A. Papoullis and S U Pillai:Probability, Random variables and stochastic processes McGraw Hill 2002
3. Peyton Z Peebles : Probability, Random variables and Random signal principles : TMH 4th Edition 2007
4. H Stark and Woods: Probability, random processes and applications PHI 2001
5. Allen., A.O., "Probability, Statistics and Queuing Theory", Academic press, New Delhi, 1981.
6. Gross, D. and Harris, C.M., "Fundamentals of Queuing theory", John Wiley and Sons, Second Edition, New York, 1985
7. Raj Jain "The Art of Computer Systems Performance Analysis", John Wiley and Sons, 1991.

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EC 741 DISTRIBUTED COMPUTING 3:1:0

Unit 1: 6h

Fundamentals of Distributed Computing: Architectural models for distributed and mobile computing systems, Basic concepts in distributed computing such as clocks, message ordering, consistent global states, and consensus.

Unit 2: 6h

Basic Algorithms in Message: Passing Systems, Leader Election in Rings, and Mutual Exclusion in Shared Memory, Fault-Tolerant Consensus, Causality and Time. Message Passing: PVM and MPI.

Unit 3: 8h

Distributed Operating Systems: OS and network operating systems, Distributed File systems, Middleware, client/server model for computing, common layer application protocols (RPC, RMI, and streams), distributed processes, network naming, distributed synchronization and distributed object-based systems

Unit 4:

Notion of time in distributed systems: Logical clocks, vector clocks, bit matrix clocks, virtual clocks, Byzantine agreement, agreement protocols and commit protocols, Mutual exclusion in distributed systems

Unit 5: 14h

Simulation: A Formal Model for Simulations, Broadcast and Multicast, Distributed Shared Memory, Fault-Tolerant Simulations of Read/Write Objects Simulating Synchrony, Improving the Fault Tolerance of Algorithms, Fault-Tolerant Clock Synchronization.
Distributed Environments: Current systems and developments (DCE, CORBA, and JAVA) recent developments and overview of advanced topics

References:

1. George Coulouris, Jean Dollimore and Tim Kindberg, "Distributed Systems: Concepts and Design" Third Edition Addison-Wesley, Pearson Education, 2001.
2. Hagit Attiya, Jennifer Welch, "Distributed Computing: Fundamentals, Simulations, and Advanced Topics", 2nd Edition, March 2004
3. Mullendar S. "Distributed Systems", 2nd Ed. Addison, Wesley 1994.
4. Tanenbaum, "A. Distributed Operating Systems", Prentice Hall 1995.
5. Helal, Abdelsalam A. et al. "Anytime, Anywhere Computing: Mobile Computing Concepts and Technology", Kluwer Academic Publishers 1999.
6. Cay S Horst Mann and Gary Cornell, "Java 2 Vol I and II" Sun Micro Systems-2001

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EC 742 MULTIMEDIA COMMUNICATION 3:1:0

Unit 1 5h

Multimedia communications: multimedia information representation, multimedia networks, multimedia applications, network QoS and application QoS

Unit 2 10h

Information representation: text, images, audio and video, Text and image compression, compression principles, text compression, image compression. Audio and video compression, audio compression, video compression, video compression principles, video compression standards: H.261, H.263, P1.323, MPEG 1, MPEG 2, Other coding formats for text, speech, image and video.

Unit 3 8h

Detailed study of MPEG 4: coding of audiovisual objects, MPEG 4 systems, MPEG 4 audio and video, profiles and levels. MPEG 7 standardization process of multimedia content description, MPEG 21 multimedia framework, Significant features of JPEG 2000, MPEG 4 transport across the Internet.

Unit 4 8h

Synchronization: notion of synchronization, presentation requirements, reference model for synchronization, Introduction to SMIL, Multimedia operating systems, resource management, and process management techniques.

Unit 5 9h

Multimedia communication across networks: Layered video coding, error resilient video coding techniques, multimedia transport across IP networks and relevant protocols such as RSVP, RTP, RTCP, DVMRP, multimedia in mobile networks, multimedia in broadcast networks, Content based retrieval in Digital libraries

NOTE: Assignments / Tutorials can be given on writing the programs to encode and decode the various kinds of data by using the algorithms. Students can collect several papers from journals/conferences/Internet on a specific area of multimedia communications and write a review paper and make a presentation.

References:

1. Ze-Nian Li & Mark S.Drew, "Fundamentals of Multimedia", Pearson Edition, 2004
2. J.-R. Ohm, "Multimedia Communication Technology", Springer International Edition, 2005
3. K.Sayood, "Introduction to Data Compression", 2nd Ed, Morgan Kauffman, Indian Edition, 2000.
4. V.Bhaskaran and K.Konstantinedes, "Image and Video Compression Standards, Algorithms and Architecture", 2nd ed, Kluwer publications, 1997

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EC 743 JAVA PROGRAMMING 3:1:0

Unit 1 : 10h

Introduction: An Introduction to Java, the Java Programming Environment, Fundamental Programming Structures in Java Basics of Java Programming

Unit 2: 10h

Core Java: Objects and Classes, Inheritance, Interfaces and Inner Classes, Exceptions and Debugging Streams and Files, Generic Programming

Unit 3: 10h

Java Graphics Programming: Graphics Programming, Event Handling, User Interface Components with Swing, Deploying Applets and Applications,

Unit 4: 10h

Advanced Java: Multithreading Collections Networking Database Programming Distributed Objects JavaBeans Components Security Native Methods

References:

1. David Flanagan, O'Reilly & Associates Java in a Nutshell 4th Edition, , 2002.
2. Deitel, H. M., et. al Java How to Program 5th Edition, , Prentice Hall, 2002,
3. Cay S. Horstmann and Gary Cornell, Core Java 2 Volume I - Fundamentals 6th Edition, Prentice Hall, 2002.
4. Cay S. Horstmann and Gary Cornell Core Java 2 Volume II - Advanced Features 5th Edition, by, Prentice Hall, 2001.

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EC 744 OPEARTING SYSTEMS 3:1:0

Unit 1 8h

Introduction And Overview Of Operating Systems : Operating system, Goals of an O.S, Operation of an O.S, Resource allocation and related functions, User interface related functions, Classes of operating systems, O.S and the computer system, Batch processing system, Multi programming systems, Time sharing systems, Real time operating systems, distributed operating systems.

Unit 2 8h

Structure Of The Operating Systems: Operation of an O.S, Structure of the supervisor, Configuring and installing of the supervisor, Operating system with monolithic structure, layered design, Virtual machine operating systems, Kernel based operating systems, and Microkernel based operating systems. Process Management: Process concept, Programmer view of processes, OS view of processes, Interacting processes, Threads, Processes in UNIX, Threads in Solaris.

Unit 3 8h

Memory Management: Memory allocation to programs, Memory allocation preliminaries, Contiguous and noncontiguous allocation to programs, Memory allocation for program controlled data, kernel memory allocation.
Virtual Memory: Virtual memory basics, Virtual memory using paging, Demand paging, Page replacement, Page replacement policies, Memory allocation to programs, Page sharing, UNIX virtual memory.

Unit 4 10h

File Systems: File system and IOCS, Files and directories, Overview of I/O organization, Fundamental file organizations, Interface between file system and IOCS, Allocation of disk space, Implementing file access, UNIX file system.
Scheduling: Fundamentals of scheduling, Long-term scheduling, Medium and short term scheduling, Real time scheduling, Process scheduling in UNIX

Unit 5 6h

Message Passing: Implementing message passing, Mailboxes, Inter process communication in UNIX)
Recent trends and advanced topics

References:

1. D.M.Dhamdhare, "Operating Systems - A Concept based Approach" ,TMH, 2nd Ed, 2006.
2. Silberschatz and Galvin, Operating Systems Concepts, John Wiley, 5th Edition, 2001.

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SEMESTER VIII

EC 810: ENTERPRENEURSHIP AND MANAGEMENT 4:0:0

Unit 1 10h

Entrepreneurship: Concept, meaning, need and Competencies/qualities/traits of an entrepreneur, technopreneurship. Innovation: Introduction, Motivating to innovate, Introduce core ideas about how to think about innovation, including key theories about factors that affect innovation. An in depth review of how companies structure to encourage and develop innovation. Product development and design.

Unit 2 10h

Role of financial institutions in entrepreneurship development Role of financial institutions in entrepreneurship development like District Industry Centres (DICs), State Financial Corporations, Small Industries Service Institutes (SISIs), Small Industries Development, Bank of India (SIDBI), National Small Industries Corporation (NSIC) and other relevant institutions/organizations.
Market Survey and Opportunity Identification (Business Planning) :How to start an industry, procedures for registration of industry, assessment of demand and supply, in potential areas of growth, understanding business opportunity, considerations in product selection, data collection for setting up new ventures

Unit 3: 10h

Introduction to Engineering Management: Engineering and Management, historical development of engineering management.
Functions of technology management: planning and forecasting, decision making, organizing, motivating and leading technical people, controlling.

Unit 4: 10h

Managing projects: Project planning and acquisition, project organization, leadership and control. Case Studies

Unit 5 10h

Project Report Preparation: Preliminary report, Techno-economic feasibility report, Project viability.
Case studies examples

References :

1. Peter Duckers, Innovation and Entrepreneurship Practice and Principles, Heinnemann, 1985
2. Babcock and Morse, Managing Engineering and Technology , Pearson Education, 2004.
3. B. S. Rathore and J. S. Saini, A Handbook of Entrepreneurship, Aapga Publications, Panchkula (Haryana)
4. C. B. Gupta and P. Srinivasan , Entrepreneurship Development, Sultan Chand and Sons, New Delhi, 1999
5. J. Tidd, J. Bessant and K. Pavitt, Managing Innovation: Integrating Technical, Market and Organizational Change, Wiley, 3rd ed, 2005

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EC 811 OPERATIONS RESEARCH 3:1:0

Unit 1: 8h

Introduction to OR, OVERVIEW OF or Modeling approaches, Introduction to Linear Programming assumptions, problem formulation

Unit 2: 8h

Solving LP Problems, Simples method Computer implementation Other algorithms for Linear programming Dual simples, parametric, Upper bound and interior point algorithms

Unit 3: 8h

Transportation and assignment problems. Network optimization methods examples, case studies

Unit 4: 8h

BIP, Integer Programming branch and bound, constraint programming capacity assignments

Unit 5: 8h

Game theory, Solving simple games, Introduction to Queuing theory, distributions, applications

References:

1. Hiller and Lieberman: Introduction to Operations research eight edition TMH 2007
2. Hamdy Taha: Operations Research TMH 6th Edition 2003
3. R. Pannerselvam: Operations Research TMH
4. Bronson and Naadimuthu : Operations Research - Schaum's Series, Tata McGraw Hill, 2nd Edition
5. Wayne Winston: Operations Research - Applications and Algorithms, Cengage, 4th Edition

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EC 812 RELIABILTY ENGINEERING 3:1:0

Unit 1: 10h

Discrete random variables, Binomial distribution ,Poisson distribution. Acceptance testing, :Continuous random variables, Normal distribution, Exponential distribution, Weibull distribution

Unit 2: 8h

Data and distributions, Goodness-of-fit, Statistical process control, Case Studies

Unit 3: 8h

Reliability and rates of failure, Constant failure rate model, Time-dependent failure rates

Unit 4: 8h

Redundancy , Active parallel systems, High- and low-level redundancy, Case Studies

Unit 5: 6h

Maintained systems ,Ideal and imperfect preventive maintenance, Availability, Maintainability, Failure Interactions, Markov analysis

References :

1. Lewis, E., Introduction to Reliability Engineering, 2nd Edition, 1994, ISBN: 0471018333
2. E Balaguruswamy: Reliability Engineering TMH 1994

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EC 821 LOW POWER DESIGN 3:1:0

Unit 1: Introduction 8h

Need for low-power VLSI chips, Sources of power dissipation , Designing for low-power, Physics of power dissipation in CMOS circuits, low-power design limits,

Unit 2: Power Estimation 14h

Modeling of signals, Signal probability calculation, Probabilistic techniques for signal activity, Statistical techniques, Estimation of glitching power, Sensitivity analysis, power estimation

using input vector compaction, Circuit reliability, Power estimation at circuit level, High-level power estimation, Information theory based approaches, Estimation of maximum power.
Unit 3: Synthesis for Low power
Behavioral level transforms, Logic level optimization, Circuit level transforms.

Unit 4: Design and Test of Low - voltage CMOS circuits 10h

Circuit design style, Leakage currents in deep submicron transistors, Deep submicron device design issues, Key to minimizing SCE, Low-voltage current design techniques, Testing deep submicron ICs with elevated intrinsic leakage, Multiple supply voltages.

Unit 5: Software Design for Low Power 8h

Sources of software power dissipation, Software power estimation, Software power optimizations, Automated low-power code generation, codesign for low-power, Recent advances in low power design.

References:

1. Kaushik Roy & Sharat Prasad: Low Power CMOS VLSI Design John Wiley & Sons Inc 2000
2. Gary K Yeap: Practical Low Power Digital VLSI Design Kluwer Academic Publishers 1998.

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EC 822 ANALOG AND MIXED MODE VLSI DESIGN 3:1:0

Unit 1: 8h

Single stage amplifier Basic concepts, cs stage with restive load, diode load, current source load, triode load, cs stage with source degeneration, source follower cg stage, cascode stage, folded cascode .

Unit 2: 8h

Differential amplifiers Single ended differential operation, basic differential pair, common mode response, differential pair with MOS loads, Gilbert cell
Passive and active current mirrors Basic current mirror, cascode current mirror, active current mirror

Unit 3: 8h

Operational amplifiers General considerations, one stage op-amp, two stage op-amp, gain boosting, common mode feed back, input range limitations, slew rate, power supply rejection, noise in op-amp ,stability and frequency compensation

Unit 4: 8h

Phase locked loops Simple PLL, charge pump PLL, non ideal effects in PLL, delay locked loop, applications.

Unit 5: 8h

Switched capacitor filters General considerations, sampling switches, switched capacitor amplifier, switched capacitor common mode feed back

Reference:

Behzad Razavi : Design and CMOS IC Tata Mc Grawhill 2002

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EC 823 MEMS AND NANOTECHNOLOGY 3:1:0

Unit 1: 8h

Overview and working of MEMS & Microsystems, Micro sensors, Micro actuators, Microsystems design and fabrication

Unit 2 : 8h

Scaling laws in Miniaturization, Materials for MEMS and Microsystems,

Unit 3: 8h

Micro manufacturing, LIGA process, Microsystems Design, CAD packages for Microsystems

Unit 4: 8h

Introduction to BioMEMS, Microactuators and drug delivery, Emerging BioMEMS technology,

Unit 5: 8h

Introduction to Nanotechnology, Nano Technology in Biology & Medicine, Nano fabrication towards Biomedical applications.

References:

1. Tai Ran Hsu: MEMS and Microsystems,TMH 2002
2. Hari Sigh Nalwa: Handbook on Nanoscience and technology
3. Mohammad El Hak: Nanoscience and NanoTechnology, CRC press

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EC 824 OPTICAL COMPUTING 3:1:0

Unit 1 6h

Mathematical and Digital Image Fundamentals : Introduction, Fourier Transform, discrete Fourier transform, basic diffraction theory, Fourier transform property of lens , sampling and quantization, image enhancement, image restoration .

Unit 2: 8h

Analog Optical Arithmetic: Introduction, Halftone processing, nonlinear optical processing, Arithmetic operations.

Recognition using analog optical systems: Introduction, Matched filter, Joint transform correlation, Phase-only filter, Amplitude modulated recognition filters, Generalized correlation filter, Melllin transform based correlation.

Unit 3: 6h

Digital optical computing devices: Introduction, Nonlinear devices, Integrated optics, Threshold devices, Spatial high modulators, Theta modulation devices.

Shadow-casting and symbolic substitution: Introduction,
Shadow casting system and design algorithm, POSC logic operations, POSC multiprocessor, Parallel ALU using POSC, Sequential ALU using POSC, POSC image processing, Symbolic substitutions, Optical implementation of symbolic substitution, Limitations and challenges.

Unit 4: 6h

Optical Matrix Processing: Introduction, Multiplication, Multiplication using convolution, Matrix operations, Cellular logic architecture, Programmable logic array.

Unit 5: 4h

Artificial Intelligent computations: Introduction, Neural networks, Associative memory, Optical implementations, Interconnections, Artificial Intelligence.

References:

1. Mohammed A. Karim, "Optical Computing An Introduction", John Wiley & Sons, 1992.
2. Optical signal Processing by Vanderlugnt John willy & sons NY 1992.
3. Signal Processing in Optics Bradly G Boore Oxford University Press 1998

EC 825 WAVELET TRANSFORMS 3:1:0

Unit 1 8h

Linear Algebra Review: Vector spaces and bases, inner products, diagonalization, shift invariant linear transform, convolution and DFT and signal as vector representation using Fourier basis.

Unit 2 8h

Construction of discrete wavelets: mother wavelet and scaling function, first stage, iteration, Multi resolution analysis, Filter bank, Up sampling and down sampling, Quadrature mirror filters and conjugate filters, Haar transform as rotation operator, Daubeschies wavelet,

Unit 3 8h

Construction of continuous wavelets, MRA, beta wavelet, Mexican hat wavelet, Shannon wavelet.

Unit 4 8h

Applications: image compression, feature extraction, Audio processing.

Unit 5 8h

Lifting Wavelet Scheme: Polyphase representation, Laurent polynomials, lifting properties and applications.

References:

1. Michael Frazier, An Introduction to Wavelets Through Linear Algebra, 1st Ed, Springer 2004.
2. Michael Weeks, Digital Signal Processing using MATLAB and Wavelets, Infinity Sciene Press, 2007.
3. Sidney Burrus, R. Gopinath, H. Guo, An Introduction to Wavelets and wavelet transforms: A Primer, PHI Publications, 2000.

EC 831 OPTICAL NETWORKS 3:1:0

Unit 1: 8h

Introduction to optical networks: Telecommunication networks, First generation optical networks, Multiplexing techniques, Second generation optical networks, System and network evolution. Non linear effects SPM, CPM, four wave mixing, Solitons

Unit 2: 8h

Components: Couplers., isolators and Circulators, Multiplexes and filters Optical amplifiers Transmitters, detectors, Switches, Wavelength converters

Unit 3: 8h

Transmission system Engineering: System model, Power penalty, Transmitter, receiver, optical amplifiers, Crosstalk, Dispersion, Overall design Consideration
First generation networks, SONET/SDH, Optical transport networks, IP,MPLS,WDM network elements, OLT,OLTA,OADM, Optical cross connects

Unit 4: 8h

WDM Network Design: Cost tradeoffs, LTD and RWA problems, Dimensioning wavelength routed networks, Access networks: Network architecture overview, present and future access networks, HFC, FTTC, PON

Unit 5: 8h

Photonic packet switching, OTDM, Multiplexing and demultiplexing, Synchronisation.
Recent developments and trends

References :

1. Kumar Sivarajan and Rajiv Ramaswamy: Optical networks: A practical perspective Elsivier and Morgan Kauffman publishing, Third Edition, 2010
2. Biswajit Mukherjee: Optical communication networks: TMG 1998
3. Ulysees Black: Optical networks, Pearson education 2007

EC 832 ADHOC NETWORKS 3:1:0

Unit 1 8h

Ad hoc Networks: Introduction, Issues in Ad hoc wireless networks, Ad hoc wireless internet.
MAC Protocols for Ad hoc wireless Networks: Introduction, Issues in designing a MAC protocol for Ad hoc wireless Networks, Design goals of a MAC protocol for Ad hoc wireless Networks, Classification of MAC protocols, Contention based protocols with reservation mechanisms.

Unit 2 8h

Contention-based MAC protocols with scheduling mechanism, MAC protocols that use directional antennas, Other MAC protocols.
Routing protocols for Ad hoc wireless Networks: Introduction, Issues in designing a routing protocol for Ad hoc wireless Networks, Classification of routing protocols, Table drive routing protocol, On-demand routing protocol.

Unit 3 8h

Hybrid routing protocol, Routing protocols with effective flooding mechanisms, Hierarchical routing protocols, Power aware routing protocols.
Transport layer protocols for Ad hoc wireless Networks: Introduction, Issues in designing a transport layer protocol for Ad hoc wireless Networks, Design goals of a transport layer protocol for Ad hoc wireless Networks, Classification of transport layer solutions, TCP over Ad hoc wireless Networks,

Unit 4: 8h

Security: Security in wireless Ad hoc wireless Networks, Network security requirements, Issues & challenges in security provisioning, Network security attacks, Key management, Secure routing in Ad hoc wireless Networks.

Unit 5 8h

Quality of service in Ad hoc wireless Networks: Introduction, Issues and challenges in providing QoS in Ad hoc wireless Networks, Classification of QoS solutions, MAC layer solutions, network layer solutions.

References:

1. C. Siva Ram Murthy & B. S. Manoj, "Ad hoc wireless Networks", Pearson Education, 2nd Edition, reprint 2005
2. Ozan K. Tonguz and Gianguigi Ferrari, "Ad hoc wireless Networks", Wiley
3. Xiuzhen Cheng, Xiao Hung, Ding-Zhu Du, "Ad hoc wireless Networking", Kluwer Academic publishers.

EC 833 HIGH PERFORMANCE COMMUNICATION NETWORKS 3:1:0

Unit 1: 8h

Network services and Layered Architecture: Applications, Traffic characterization and quality of services, Network services, High performance networks, Network Elements., Layered applications, Open data network model, Network architectures, Network bottlenecks.

Unit 2: 8h

Internet and TCP/IP Networks: Multicast IP, Mobile IP, TCP and UDP, Applications, FTP, SMTP. Internet success and limitations, Performance of TCP/IP Networks, Performance of circuit switched networks
SONET, DWDM, FTH, DSL, Intelligent networks .

Unit 3: 8h

ATM: Main features of ATM, Addressing, signaling and Routing, ATM header structure, ATM AAL, Internetworking with ATM
Wireless Networks: Link level design, Channel Access, Network design, Wireless networks today, Future networks, ad hoc networks,, High speed Digital cellular, Home RF and Bluetooth.

Unit 4: 8h

Control of networks, Objectives and methods of control, Circuit switched networks, Datagram Networks Network economics, Derived demand for network services, ISPs, subscriber demand model, Empirical model

Unit 5: 8h

Optical networks: WDM systems, Optical cross connects, Optical LANs, Optical paths and networks

Refrences:

1. Warland and Varaiya: High performance communication networks, Morgan Kauffman/ Elsivier 2nd Edition 2000
2. William Stallings, High-Speed Networks and Internet: Performance and Quality of service, Pearson Edu., 2001
3. Tere Parnell, Building High-Speed Networks, TMGH, 2000

EC 834 WIRELESS SENSOR NETWORKS 3:1:0

Unit 1: 8h

Introduction Unique constraints and challenges, advantages of sensor networks, sensor network applications ,collaborative processing, key definition.
Localization and tracking:
Tracking scenario, problem formulations, distributed representation and interference of states, tracking multiple objects, sensor models, performance comparisons and metrics

Unit 2: 8h

Networking sensors Key assumptions, medium access control, general issues, geographic, energy awareness routing, attribute based routing.

Unit 3: 8h

Infrastructure establishment
Topology control, clustering, time synchronizations, localizations and localization services

Unit 4 8h

Sensor tracking and control Task driven sensor, roles of sensors models and utilities information based sensor tracking joint routing and information aggregation

Unit 5 8h

Sensor network data bases Sensor data base challenges and querying physical environment, query interface, high level data base, organization, in-network aggregation, data centric storage, data indices and range queries, distributed hierarchal aggregation, temporal data

Reference:

1. Feng Zhao and Leonidal J Guibal Wireless sensor network an information processing approach Elsevier Inc 2004

EC 835 NETWORK MANAGEMENT SYSTEMS 3:1:0

Unit 1: 8h

Networking Components, Overview of Network Management

Unit 2: 8h

Network Management Strategies, Configuration Client Server Components, Configuration: Infrastructure Components

Unit 3: 8h

SNMP, MIBs

Unit 4: 8h

RMON, RMON2, Desktop Managements, Web-based Managements

Unit 5: 8h

Network Management Initiatives, Secure SNMPv3

References:

1. J. Richard Burke: Network Management: Concepts and Practice, A Hands-On Approach, Prentice Hall, 2004
2. Alexander Clemm: Network Management Fundamentals, Cisco Press, 2007.

3. Douglas Mauro, Kevin Schmidt: Essential SNMP, Second Edition: O'Reilly Media Inc, 2005.

EC 841 GRID COMPUTING 3:1:0

Unit 1: 12h

Advanced topics In parallel and distributed high performance computing (HPC) with a focus of advanced parallelisms, implementations, and applications. Review of basic knowledge of parallel systems (architectures, technical parallel processing, and applications).

Unit 2: 8h

Overview of Grid computing, history and technical development, computational and data Grids

Unit 3: 12h

Concepts of distributed parallel systems: Relevant high-end technologies utilized in distributed high performance computing (such as multithreading, security, networked-based database, collaborative systems, and P2P environment).

Unit 4: 8h

Open Grid Services Architecture (OGSA), Grid Management systems, security, Grid Grid-Enabling software and Grid-enabling network services, and various Grid applications.

References:

1. Ahmar Abbas, "Grid Computing: Practical Guide to Technology and Applications:", , 2004, ISBN, 1-58450-276-2
2. Fran Bermn, Geoffrey Fox Anthony J G, Hay "Grid Computing: Making the Global Infrastructure a Reality", Wiley, 2003,ISBN: 0-470 85319-0
3. Ian Foster, Carl Kesselman, "The Grid2: Blueprint for a New Computing Infrastructure". Morgan Kaufman, 2004, ISBN: 1-55860-933-4
4. Alexey Lastovetsky, "Parallel Computing on Heterogenous Networks", Wiely, 2004, ISBN: 0-471-22982-2

EC 842 MOBILE COMPUTING 3:1:0

Unit 1: 8h

Wireless and Mobile Network Architecture: Principle of Cellular Communication, Overview 1G, 2G, 2.5G and 3G and 4G technologies. GSM Architecture and Mobility management hand off management, Network signaling.

Unit 2: 8h

Mobile Computing fundamental challenges, Mobile Devices -PDA and mobile OS, PalmOs, Win CE and Symbian.

Unit 3: 8h

Mobile IP and IP v 6 and its application in mobile computing, Cellular Digital Packet Data CDPD, VOIP, GPRS Services, Wireless Local Loop-WLL system

Unit 4: 8h

Wireless Application Protocol (WAP): The Wireless Application Protocol application environment, wireless application protocol client software, hardware and websites, wireless application protocol gateways, implementing enterprise wireless application protocol strategy

Unit 5: 8h

Wireless Mark-up Language: An Introduction to Wireless Technologies, Markup Languages, An Introduction to XML, Fundamentals of WML., Writing and Formatting Text, Navigating between Cards and Decks, Displaying Images, Tables, Using Variables, Acquiring User Input

References:

1. Yi Bing Lin, "Wireless and Mobile Networks Architecture", John Wiley
2. Wrox "The Beginning WML and WML Script", Wrox Publication
   Tomasz Imielinski et.al, "Mobile Computing", Kluwer Academic Press 1996

EC843 FUZZY LOGIC AND NEURAL NETWORKS 3:1:0

Unit 1 8h

Introduction: Theory of fuzzy sets, Properties of fuzzy sets, Operations on fuzzy sets Fuzzy relations, the extension principle, Linguistic variables, fuzzy propositions Inference rules, Compositional rule of inference, Fuzzy v/s Probability

Unit 2 8h

Fuzzy knowledge based controller: Basic structure, Membership functions, Fuzzification, Defuzzification, Applications

Unit 3 8h

Fuzzy for a Non-linear controller: FKBC as linear transient PID, Brief introduction to non-linear control, Sliding mode control, Sliding mode FKBC, Sugeno FKBC, Examples

Unit 4 8h

Neural networks: Brief Introduction to Neural Networks, Neuro-fuzzy systems, Logic based neurons, Optimizing weighting coefficients

Unit 5 8h

Adaptive control: Process performance monitoring, Adaption mechanisms, Membership functions using gradient descent, Performance criteria in adaptive control, Set organizing controller, Model based control

References

1. G. J. Klir, T. A. Folger ,Fuzzy sets, uncertainty and information, Special Indian Edition,Prentice-Hall India,2000
2. Driankov, Hellendoorn, Reinfrank,An introduction to fuzzy control, 3dt Edition,Springer,1996
3. B. Kosko, Prentice Hall of India, Neural Networks and Fuzzy Systems: A Dynamical Systems Approach To Machine Intelligence, Prentice-Hall India, 1997

EC 844 PROTOCOL ENGINEERING 3:1:0

Unit 1: 6h

Communication model, software, subsystems, protocol development methods, protocol engineering process; Network reference model: services and interfaces, protocol functions, OSI and TCP/IP model, Host to network interface protocols, network protocols transport protocols, application protocols

Unit 2: 8h

Protocol specifications: Components of protocol, service specifications, entity specifications, interface and interactions, multimedia protocol specifications, HDLC, ABP and RSVP specifications

Unit 3: 10h

SDL: features, communication system using SDL, examples of SDL based protocol specifications, other specification languages; Protocol verification, FSM based verification, validation, design errors, validation approaches, verification and validation of ABP using SDL

Unit 4: 8h

Conformance testing, framework, conformance test architectures, test sequence generation methods, TTCN, multimedia testing, MPLS testing; Performance testing methods, testing of TCP and OSPF, interoperability testing, scalability testing

Unit 5: 8h

Protocol synthesis algorithms, resynthesis, protocol implementation requirements, methods of implementation

References:

1. Pallapa Venkataram, Sunil Kumar Manvi, "Communication Protocol Engineering", PHI, 2004.
2. G. J. Holtzmann, "Design and validation of Computer protocols", Prentice hall, 1991 (available on web)
3. K. Tarnay, "Protocol specification and testing", Plenum press, 1991

EC 845 COMPRESSION TECHNIQUES 3:1:0

Unit 1 8h

Introduction:Lossless compression, lossy compression, modeling and coding, brief review of information theory, Mathematical preliminaries for lossless compression, minimum description length principle, physical, probabilistic, Markov models.

Unit 2 8h

Huffman coding algorithm, Adaptive Huffman coding, Applications of Huffman coding to text and audio processing, Arithmetic coding, generating and deciphering the tag, binary coding, comparison with Huffman coding, adaptive arithmetic coding and applications.

Unit 3 8h

Dictionary techniques: static/adaptive dictionary, Applications: UNIX compress, GIF image compression, old JPEG, JPEG-LS lossless compression techniques,
Mathematical preliminaries for Lossy Compression techniques: Distortion criteria, conditional entropy, differential entropy, Models: physical, probabilistic, linear system models.

Unit 4 8h

Scalar quantization, uniform, adaptive quantizers, Vector quantization, advantages of VQ over SQ, LBG algorithm.
Transform coding: Karhunen-Loeve transform, DCT, Quantization and coding of transform coefficients, JPEG for image and Modified DCT for audio compression.

Unit 5 8h

Sub band coding algorithm: analysis, quantization, coding, synthesis, Bit allocation, application to MPEG audio and image compression,
Wavelets: Multi-resolution analysis and scaling function, implementation using filters, image compression using wavelets, JPEG 2000.

References:

1. Khalid Sayood, Introduction to Data Compression, 3rd Ed, Elsevier Inc, 2006
2. David Solomon, Data Compression, Complete Reference, 3rd Edition, Springer, 2005