JSS MAHAVIDYAPEETHA

JSS SCIENCE AND TECHNOLOGY UNIVERSITY, MYSURU

SRI JAYACHAMARAJENDRA COLLEGE OF ENGINEERING, MYSURU

DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

SYLLABUS I TO VIII SEMESTER: 2014-2015

I/II SEMESTERS

EC110 ELECTRONIC DEVICES AND CIRCUITS

Unit 1: Semiconductor diodes

Semiconductor diodes-biasing and their significance, temperature effects, diode resistances, equivalent circuits, diode capacitances and switching times, load line analysis for diodes, Zener diodes - rectifiers, filters, voltage regulators (discrete and integrated), clipping circuits and clamping circuits. Numerical problems.

12 hrs

Unit 2: Bipolar transistors and biasing

Transistor construction and working, configurations, amplifying action, operating point, load line and biasing, types of biasing, bias stabilization and stability factors. Numerical problems.

10 hrs

Unit 3: Field effect transistors

Construction and characteristics of field effect transistors (FET's), metal oxide semiconductor field effect transistor (MOSFET's) and its types, characteristics, Vertical-groove metal oxide semiconductor (VMOS) and complementary metal oxide semiconductor (CMOS) devices, Numerical problems. **10 hrs**

Unit 4: Operational amplifiers and Cathode Ray Oscilloscopes

Introduction, operating modes, characteristics, equivalent circuit, virtual ground, basic applications and practical circuits, Numerical problems. Cathode ray oscilloscope features, block diagram, focusing with electric and magnetic fields, deflection mechanism and synchronization, practical applications, dual beam and dual trace CROs.
10 hrs

Unit 5: Introduction to digital electronics

Review of number systems and conversions, 1's complement and 2's complement, arithmetic operation with signed numbers, logic gates, Boolean algebra, simplification and realization of Boolean expressions, half and full adder / subtractor circuits. **10 hrs**

CS110: ALGORITHMIC APPROACH TO PROBLEM SOLVING

- Introduction to C Programming
- Basics (Data Types, Operations on Data Types, Data

- Type Conversions, Basic I/O, Basic Formatting)
- C control Structures (Decisions, Loops)
- Functions
- Arrays
- Strings
- Searching and Sorting Programs
- File I/O

EC 21L: BASIC ELECTRONICS LAB

List of experiments:

1. Experimental determination of V-I characteristics of diodes (Junction diodes – Forward bias and point contact diodes- Reverse bias). Calculation of static, dynamic and reverse resistance from results and comparing it with the theoretical values.

2. Design of low pass and high pass RC circuits (single stage) and plotting the frequency response. Measurement and calculation of phase difference between i) input and output signal, ii) rise time and fall time.

3. Experimental determination of Zener as a voltage regulator. Plotting the graph of line and load regulation from experimental values. Design and testing of voltage regulator using three pin IC regulator.

4. Design and testing of half wave and full wave rectifiers (two and four diodes) with and without filters. Comparison of practical values with theoretical values.

5. Design and testing of clipping and clamping circuits.

6. Experimental determination of input and output characteristics of BJT and finding out related parameters.

7. Experimental determination of output and transfer characteristics of FET and finding out related parameters.

8. Design and testing of basic Op-amp circuits.

9. Verification of truth tables for logic gates and De Morgan’s theorem.

10. Building and testing of simple combinational logic circuits.

11. Verification of seven segment displays.

III SEMESTER

MA310: FOURIER SERIES AND INTEGRAL TRANSFORMS

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.

EC 310: CIRCUIT THEORY AND ANALYSIS

Unit 1: Basic concepts
Introduction, Network terminologies, Review of KVL & KCL, Energy sources – ideal and 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. **8 hrs**

Unit 2: 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. **8 hrs**

Unit 3: Resonance and Initial Conditions
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.

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. **8 hrs**

Unit 4: Circuit Analysis using Laplace Transforms and Fourier series

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.

Applications of Fourier techniques to circuit analysis, Waveform symmetry, Line spectrum, Waveform synthesis Effective value & power, problems, Application of FS in circuit Analysis.

8 hrs

Unit 5: Network Functions and Two Port parameters

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

Short – Circuit admittance parameters, Open circuit impedance parameters, Transmission parameters, Hybrid parameters, problems, Relationships between parameters, problems. **8 hrs**

EC 320: TRANSDUCERS AND INSTRUMENTATION

Unit 1: Instrumentation system

Introduction, Input output configuration, Generalized functional elements, Advantages of electronic measurement, Errors in measurement, Gross errors and systematic errors, Absolute and relative errors, Static Characteristics, Dynamic Characteristics, calibration and standards- process of calibration.
8hrs

Unit 2: Oscilloscopes

Introduction, Basic principles, CRT features, Block diagram and working of each block, Typical CRT connections, Dual beam and dual trace CROs, Electronic switch. Delayed time-base oscilloscopes, Sampling and Digital storage oscilloscopes. 8hrs

Unit 3: Transducers

Introduction, Electrical transducers, Selecting a transducer, Resistive transducer, Resistive position transducer, Strain gauges, Resistance thermometer, Thermistor, Inductive transducer, Capacitive transducers, Differential output transducers and LVDT. Piezoelectric transducer,

Photoelectric transducer, Photovoltaic transducer. Temperature transducers. Basics of pressure measurement- Thin Plate Diaphragms, Corrugated Diaphragms and Capsules, Bourdon tube elements, Ultrasonic sensors. 8hrs

Unit 4: Virtual Instrumentation

Introduction, advantages, block diagram and architecture of a virtual instrument, data-flow techniques, graphical programming in data flow. VIS and sub-VIS, loops and charts, arrays, clusters and graphs, case and sequence structures, formula nodes, local and global variables, string and file I/O, Instrument Drivers, Publishing measurement data in the web. 8hrs

Unit 5: Actuators

Fuctional components of an actuator, Actuator as a system component, Intelligent & Self sensing actuators, piezoelectric actuators, microactuators, pressure sensors, flow sensors, position & rotary sensors. Application examples (Automatic anti-lock braking systems) 8hrs

EC 330: ANALOG ELECTRONIC CIRCUITS

Unit 1: BJT AC analysis

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

Unit 2: FET AC analysis

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. **10 hrs**

Unit 3: BJT and FET Frequency response

General frequency considerations, low frequency response of BJT and FET amplifiers, Miller effect capacitance, High frequency response of BJT and FET amplifiers, multistage effects.**10 hrs**

Unit 4: Feedback and oscillators

Concept of feedback, feedback topologies, practical feedback circuits, basic principle of oscillators, RC, LC and crystal oscillators. **10 hrs**

Unit 5: Power amplifiers
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. **10 hrs**

EC 340: DIGITAL ELECTRONIC CIRCUITS

Unit 1
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 **10 hours**

Unit 2
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, Logic design using multiplexers and de-multiplexers, Decoders, encoders and priority encoders, Decoders, encoders and priority encoders **10 hours**

Unit 3
Logic design using PROMS, PALS & PLAS: Introduction to PLD's, terminology and notation
PROMS: Principles & logic design using PROMS, PALS: Principles & logic design using PROMS, PLAS: Principles & logic design using PROMS, 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 **10 hours**

Unit 4
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 **10 hours**

Unit 5
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 such as 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 **10 hours**

EC 350: ENGINEERING ELECTROMAGNETICS

Unit 1:
Fundamentals of vector algebra & calculus, Basic differential derivates of vector calculus. Co-ordinate systems & its components.

Electric charge, Coloumb's law, Electrical force, Electric field, electric Field Intensity, Field due to various charge distributions, Electric Flux & Flux density, Flux due to various charges distribution, gauss Law, Concept of Divergence. Computation of E filed using gauss law. **(8 Hrs)**

Unit 2:
Work done in field, Line Integral concept, Potential, Potential due to various charge distributions, Conservative field. Potential gradient, due to dipole, types of dipoles, dipole as antenna. Energy density in Electrostatic field.
Concept of current & current density Equation of continuity, law of conservation of charges, Conductors & Di electrics, Boundary conditions, Capacitance in E field.

Poission's & Laplace fields, computation of volume charge density, Computation of capacitance using Laplace Equation. **(12 Hrs)**

Unit 3:
Magnetic Field & its source. Properties of Magnetic field. Field computation using Biot-Savart's law. Concept of work done in magnetic field, Ampere's circuital law,
Computation of H using ACL. Rotational field leading to curl. Mathematics of curl. Stoke's theorem. Magnetic flux density, Vector Magnetic potential. **(8 Hrs)**

Unit 4:
Introduction to Time varying fields. Faraday's equations. Various forces in Magnetic field. Concept of Displacement current density. Field relations for Time varying fields. Maxwell's equations for both static & time varying fields**.** **(6 Hrs)**

Unit 5:
Generation of Electro Magnetic waves, Mathematical equation of EM waves**,** properties of EM waves. Concept of Uniform Plane wave. Equation of UPW UPW in free space & various media. Power in EM waves. Poyinting's theorem. **(6 Hrs)**

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EC 31L: ANALOG ELECTRONIC CIRCUITS LAB

List of Experiments:

1. Design and testing of BJT biasing circuits
2. Design and testing of single stage RC coupled amplifier for given specifications.
3. Design and testing of Emitter follower for given specifications.
4. Design and testing of Darlington Emitter follower for given specifications
5. Design and testing of FET CS amplifier for the given specifications
6. Design and testing of Current series feedback amplifier for given specifications
7. Design and testing of Voltage shunt feedback amplifier for given specifications
8. Design and testing of RC phase shift and Wein bridge oscillators.
9. Design and testing of LC oscillators.

EC 32L: DIGITAL ELECTRONIC CIRCUITS LAB

List of Experiments:

1. Simplification & realization of Boolean expressions(SOP,POS forms)using logic gates.
2. Design of arithmetic circuits - adders & subtractors. 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 using IC versions(4-bit).
8. Design Shift registers using flip flops universal shift registers and shift register IC versions.

IV SEMESTER

MA 410: STATISTICAL AND PROBABILISTIC METHODS

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.

EC 410: LINEAR INTEGRATED CIRCUITS AND SYSTEMS

Unit 1: 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. **10 hrs**

Unit 2: 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, Z_{in} Mod compensation, Circuit stability precautions. **10 hrs**

Unit 3: Op-Amp Linear Applications & Signal Processing
Instrumentation amplifier, V to I and I to V converters, integrator and differentiator, 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. **10 hrs**

Unit 4: Op-Amp Nonlinear Applications
Comparators, Schmitt trigger circuits, Square/Rectangular and Triangular wave generators, design of Active Filters, LOG and Antilog amplifiers. **10 hrs**

Unit 5: Voltage Regulators and 555Timer
Fixed and Adjustable voltage regulators, switching regulators.555 Timer as Monostable and Astable multivibrators and uses. Introduction to Phase-locked loops (PLL). **10 hrs**

EC 420: SWITCHING SYSTEMS AND ACCESS NETWORKS

Unit 1:
Developments of telecommunications: Network structure, Network services, terminology, Regulation, Standards. Introduction to telecommunications transmission, Power levels, Four wire circuits, Digital transmission, Frequnecy Division Multiplexing, TDM, PDH and SDH, Transmission performance. **8 hours**

Unit 2:
Evolution of Switching Systems: Introduction, Message switching, Circuit switching, Functions of switching systems, Distribution systems. **8 hours**

Digital Switching Systems: Fundamentals: Purpose of analysis, Basic central office linkages, switching system hierarchy, Evolution of digital switching systems, Stored program control switching systems, Digital switching system fundamentals, Building blocks of a digital switching system, PCM, digital transmission systems, Basic call processing.**10hours**

Unit 3:
Telecommunications Traffic: Introduction, Unit of traffic, Congestion, Traffic measurement, Mathematical model, Lost call systems, Queuing systems. **8 hours**

Unit 4:
Time Division Switching: Introduction, space and time switching, Time switching networks, Synchronization. Access networks: Local loop, ADSL, XDSL, WILL, Wi-fi, Wi-Max, FTTH, HFC. Introduction to Stored program control switches. **8 hours**

Unit 5:
Switching System Software: Introduction, Basic software architecture, Operating systems, DB Management, Concept of generic program, Software architecture for level 1 control, Software architecture for level 2 control, Software architecture for level 3 control, Data structures for SPC software, Network and operational aspects., Common channel signaling **8 hours**

EC 430: SIGNALS AND SYSTEMS

Unit 1: Basics of Signals and Systems
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. **8hrs**

Unit 2: Time Domain Representation of LTI systems
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. **8 hrs**

Unit 3: Fourier analysis of Continuous time signals and LTI systems
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. **8 hrs**

Unit 4: Fourier analysis of discrete time signals and LTI systems
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 **7 hrs**

Unit 5: z- transforms and Applications
Introduction to 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 transforms, Laplace and DTFTs. **9 hrs**

EC 440: DIGITAL SYSTEM DESIGN

Unit 1:
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**.** **10 hours**

Unit 2:
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**.** **10 hours**

Unit 3:
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 **10 hours**

Unit 4:
Design of registers. Microcomputer system design: Introduction Organisation. Microprocessor organization. Block schematic. Memory cycle. Instruction and addressing modes. Stack, subroutines and Interrupt Memory Organization. **10 hours**

Unit 5:
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**.** **10 hours**

EC 450: CHANNEL THEORY

Unit 1: Line at LF
Transmission lines 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. **10 hours**

Unit 2: Line at RF
Introduction, line constants, SWR, Relationship between SWR and reflection coefficient, Power measurements, loss less lines as impedance matching sections, stub matching,

OC and SC lines, Smith chart principles and applications
12 hours

Unit 3: Strip lines
Micro strip lines, parallel strip lines, co-planar strip lines, shielded strip lines, losses in strip lines, strip line parameters **8 hours**

Unit 4: Wave guides and Optical fibers
Introduction to waveguides, Rectangular and circular waveguides, Modal theory- TE and TM waves, Impossibility of TEM waves, Waveguide parameters, directional coupler, introduction to fibers, Pulse broadening in fibers, information capacity, Optical and electrical bandwidth, Single mode fibers, ISI, information capacity. **10 hours**

Unit 5: Wireless channels
Noise and interference in Communication Channels: Internal noise, external noise, noise modeling, frequency (orthogonal) domain representation, carrier to noise ratio, probability error, Gaussian noise (white noise) representation. Power spectral density of Noise, fading of signals, long term, short term fading and Rayleigh fading. **10 hours**

EC 41L: LINEAR INTEGRATED CIRCUITS LAB

List of Experiments:

1. Design and testing of op-amp DC amplifiers:Inverting amplifier, Non-inverting amplifier and voltage follower
2. Design and testing of op-amp DC circuits:amplifier, Averager Adder, subtractor, Difference
3. Design and testing of op-amp AC amplifiers: Inverting amplifier, Non- inverting amplifier and voltage follower
4. Design and testing of op-amp integrator
5. Design and testing of op-amp differentiator
6. Study of Precision Rectifiers and V to I converter
7. Design and testing of Schmitt Trigger Circuits
8. Design and testing of Op -Amp Triangular and Rectangular Waveform Generators
9. Design and testing of voltage regulator
10. Design and testing of 555 Timer astable Multivibrator

EC 42L: DIGITAL SYSTEM DESIGN LAB

List of Experiments (Programming using Verilog HDL):

1. **Combinational Circuits simulation using XILINX ISE**
Decoders/Encoders, Mux / Demux, Magnitude comparator, Parity generator & checker Adder/ Subtractor, Parallel adder, BCD adder, Ripple carry adder

2. **Sequential circuit's simulation using XILINX ISE**
Latches, Flip-flops, Counters, Shift Registers and simulation of the examples worked out in the theory classes

3. **Implementation of digital circuits using CPLD/FPGA**
ALU, Traffic light controller

4. **Mini Project**

V SEMESTER

MA510: LINEAR ALGEBRA

- Introduction to linear systems, Gauss-Jordan elimination, solutions of linear systems
- Linear transformations: linear transformations and their inverses, linear transformations in geometry
- Matrix products, the inverse of a linear transformation
- Subspaces of Rn and their dimension
- Linear spaces
- The matrix of a linear transformation
- Orthogonality, Gram-Schmidt process and QR factorization
- Orthogonal transformations, Least squares and data fitting, Inner product spaces
- Introduction to determinants, Introduction to eigenvalues and eigenvectors
- Determinants
- Eigenvalues and eigenvectors
- Complex eigenvalues and eigenvectors, Symmetric matrices and diagonalization
- Symmetric matrices and diagonalization

EC 510: ANALOG COMMUNICATION SYSTEMS

Unit 1: Introduction to electronic communication systems
Introduction to electronic communication systems, Power measurement units, EM frequency spectrum, Bandwidth and information capacity, Noise analysis, Signal analysis and mixing, power spectra. **10 hrs**

Unit 2: Phase lock loops and Frequency Synthesizers
Phase lock loops. PLL capture and lock ranges, PLL loop gain, Phase comparators, frequency synthesizers and Digital PLL. **10hrs**

Unit 3: **AM transmission and Reception**
Introduction, principles of Amplitude modulation, AM modulating circuits, AM Transmitters, AM receivers, AM receiver circuits, QAM. **10hrs**

Unit 4: Single sideband communication systems
SSB Generation, SSB transmitters, Mathematical analysis of Suppressed carrier systems, SSB reception. Single side band and suppressed carrier and FDM and SSB measurements. **10 hrs**

Unit 5: **Angle Modulation Transmission and reception**

Angle modulation systems, Mathematical analysis, Deviation sensitivity, 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. **10 hrs**

EC520: DIGITAL SIGNAL PROCESSING

Unit 1:
DFT, Frequency domain sampling and reconstruction of discrete time signals, DFT as a linear transformation, its relationship with other transforms. Properties of DFT. Use of DFT in linear filtering. Direct computation of DFT.
08 hours

Unit 2:
DIT and DIF algorithms for computing DFT and IDFT. Goertzel algorithm, Chirp-Z Transform. **08 hours**

Unit 3: IIR filter design:
Introduction to IIR filters, characteristics of commonly used analog filters, frequency transformations, and design of IIR filters from analog filters using IIT and BLT techniques. **08 hours**

Unit 4: FIR filter design:
Introduction to FIR filters, Design of FIR filters using windowing and frequency sampling techniques. **08 hours**

Unit 5: Implementation of discrete time systems:
Direct form-I, direct form-II, Transposed, cascade, parallel and lattice realizations of FIR and IIR filters. Quantization of filter coefficients,
Round-off effects in digital filters. **04 hours**

Introduction to STFT and wavelet transforms. Recent developments and applications of signal processing, Digital Signal Processors. **04 hours**

EC530: MICROPROCESSORS

UNIT 1: Introduction to 8086 microprocessors: - Architecture of 8086, Register organization, Physical memory organization, addressing modes, instruction set. 10 hrs

UNIT 2: **8086 assembly language programming** : - Programming using data transfer instructions, arithmetic and logical instructions, conditional and unconditional branch instructions, String instructions, Looping

instructions, Machine control instructions, Shift and rotate instructions, assembler directives, macros and procedures. 10 hrs

UNIT 3: 8086 configurations: - Minimum mode and maximum mode configuration, Interfacing memory and i/o devices, interfacing of keyboard, LEDS, Stepper motor, ADC DAC to 8086 using 8255 in mode 0 configuration, bus architecture.
10 hrs

Unit 4: 8086 interrupts: -8086 interrupts and interrupt responses, hardware interrupts, software

interrupts, its applications.DMA: Basic DMA operation.DMA controlled I/O. 10 hrs

UNIT 5: Introduction to advanced processors: - Introduction to 80386 processor, Special 80386 registers, 80386 memory management, introduction to 80486 microprocessors, Introduction to Pentium Processor, Special Pentium Registers, Pentium memory management, Introduction to Pentium Pro microprocessors. Special Pentium Pro features. 10hrs

EC540: CONTROL SYSTEMS

Unit 1:
Concept of feedback control, Laplace transform review, Examples of control systems (Electrical, mechanical, electromechanical) and their mathematical models with transfer function and State-space models. Block diagram representation and its algebra, Signal flow graphs and Mason's gain formula. **8 hrs**

Unit 2:
Time domain analysis, Effect of pole-zero location and addition, step response and impulse response of the standard first and second order systems, Stability w.r.t. transfer function, Routh-Hurwitz method, Steady state error analysis of Type-0,1,2 systems, Classical PID controller. **8 hrs**

Unit 3:
Root-locus of a basic feedback system and guidelines, Control design using RL technique, frequency response, Nyquist stability criterion, stability margins, closed-loop frequency response, Phase lead compensation and its design. **9 hrs**

Unit 4:
State-space design and its advantages, analysis of state-equations, Canonical structures, full-state feedback control, Controllability, Observability, selection of pole locations for good design, estimator design, combined control law and estimator. **9 hrs**

Unit 5:

Case studies: An outline of control systems design, satellite's attitude control, Maglev control, Read-write head assembly of hard disk. **6 hrs**

EC 550: DATA STRUCTURES AND ALGORITHMS

ADT array - Computations on arrays - sorting and searching algorithms.

ADT Stack, Queue, list - array, linked list, cursor based implementations of linear structures.

ADT Tree - tree representation, traversal of trees;

ADT Binary tree - binary trees, threaded binary trees, application of binary trees - Huffmann coding; application of threaded binary trees - differentiation;

Search Tree - Binary search tree; balanced binary search trees - AVL tree; Applications of Search Trees - TRIE; 2-3 tree, 2-3-4 tree; concept of B-Tree.

ADT Dictionary - array based and tree based implementations; hashing - definition and application - LZW encoding.

ADT Priority Queue - Heaps; heap-based implementations; applications of heaps - sorting;

Graphs - shortest path, minimum spanning tree, DFS, BFS - an application of DFS and BFS.

Algorithm Design Paradigms - greedy, divide and conquer, dynamic programming, backtracking.

EC 51L: MICROPROCESSOR LAB

Syllabus:

Software programs**:**

Programs involving

1) Data transfer instructions

2) Arithmetic & logical operations

3) Bit manipulation instructions

4) Branch/Loop instructions

5) Arrays

6) Near and Far Conditional and Unconditional jumps, Calls and Returns

7) Programs on String manipulation

6) Programs involving Software interrupts (DOS interrupt INT 21h Function calls) Hardware programs:

a) Matrix keyboard interfacing

b) Seven segment display interfaces

c) Logical controller interface

d) Stepper motor interface and DC motor interface

e) ADC interface

f) DAC interface

g) elevator interface

h) LCD interface

EC 52L: ANALOG COMMUNICATION LAB

List of Experiments:

1. Analog modulation and demodulation (Discrete/Kits): a) AM b) FM
2. Pulse modulation and demodulation (Discrete/Kits):
   a) PAM b) PWM c) PPM d) PCM
3. Attenuators (Design using discrete components):
   a) T b) PI c) Lattice d) Bridge
4. Class-C tuned amplifier
5. Mixer circuit, tone decoder & Video amplifier
6. Mini projects

VI SEMESTER

MA610: COMPUTATIONAL MATHS AND GRAPH THEORY

- Approximation in numerical computation: Truncation and rounding errors, Fixed and floating-point arithmetic, Propagation of errors.
- Interpolation: Newton forward & backward interpolation, Lagrange's and Newton's divided difference Interpolation.
- Numerical integration: Trapezoidal rule, Simpson's 1/3 rule, Weddle's rule.
- Numerical solution of a system of linear equations: Gauss elimination method, Matrix inversion, LU Factorization method, Gauss-Jacobi and Gauss Seidel iterative methods.
- Numerical solution of Algebraic equation: Bisection method, Secant method, Regula-Falsi method, Newton-Raphson method.
- Numerical solution of ordinary differential equation: Taylor's series method, Euler's method, Runge Kutta methods, Predictor-Corrector methods and Finite Difference method.
- Graph Theory: Basics, Djikstra's Algorithm. **40 hours**

EC 610: ADVANCED MICROCONTROLLERS

Unit 1:
8051 Microcontroller: - Architecture, 8051 hardware, i/o and o/p pins, ports and port circuits, external memory, counters and timers, serial communication. 10 hrs.

Unit 2:
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. 10hrs

Unit 3:
Timer/counter, serial communication and interrupt programming: - Programming 8051 timer/counter, basics of serial communication, 8051 connections to RS 232, 8051 serial port programming, 8051 interrupts, programming timer interrupts, programming external hardware interrupts, programming serial communication interrupts. Interfacing keyboard, LCD, ADC, DAC, Stepper motor. 12hrs

Unit 4:
Introduction to architecture of ARM Cortex M3: General Purpose Registers, Stack Pointer, Link Register, Program Counter, and Special Register. Stack implementation. Bus interfaces. 10 hrs.

Unit 5:
Exceptions, vector table, Interrupts, advanced programming features, memory protection, and power management. Debug Architecture. 08 hrs

EC 620: POWER ELECTRONICS

Unit 1: Power Semiconductor Devices
Introduction to Power Electronics. Power Diodes- Types, rating and switching characteristics. Current controlled devices: BJTs and Thyristors – Construction, operation, switching characteristics, rating and types. Voltage controlled devices: Power MOSFETs and IGBTs – construction, operation, switching characteristics, rating and types. Principles of series and parallel operation of power switching devices. Various types of Power Electronic circuits. **8 hrs**

Unit 2: Firing and Protection Circuits
Firing circuits for power electronic devices, Gate driver circuits for SCR, MOSFET and IGBT and base driving for power BJT, Over voltage, over current and gate protections, Necessity of isolation, pulse transformer, optocoupler, Design of snubbers. **7hrs**

Unit 3: Controlled Rectifiers
Introduction, Performance of Single phase fully controlled and semi controlled converters with R and RL Loads for continuous and discontinuous current modes. AC Voltage Controllers: - Introduction, On-Off and Phase control, Single - phase Bidirectional controllers with resistive and inductive loads **8 hrs**

Unit 4: DC – DC Converters or Choppers
Introduction, principle of operation, analysis of Buck, Boost, and Buck-boost converters, operation with R and RL loads, and their control strategies, performance parameters and classification. **8 hrs**

Unit 5: Inverters
Introduction, principle of operation, performance parameters, and control strategies of Single Phase Full and Half Bridge inverters with R and RL Loads, Introduction to Three phase, Current source inverters, Power Supplies: UPS, SMPS **9hrs**

Power Electronics Laboratory Experiments:

1. Analysis of static and dynamic characteristics of MOSFET and IGBT.

2. Analysis of static and dynamic characteristics of Power Transistor and SCR.

3. Performance analysis of Controlled HWR and FWR using RC triggering/ UJT firing circuit.

4. Performance of Single phase fully controlled and semi controlled converters for R and RL loads for continuous current mode.

5. Performance analysis of AC voltage controller using Triac- Diac combination.

6. Performance analysis of Series and Parallel inverters.

EC 630: MOBILE COMMUNICATION

Unit 1: 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: 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 **10 hrs**

Unit 3: GSM system operations

Traffic cases, Cal handoff, Roaming, GSM protocol architecture. TDMA systems CDMA technology, CDMA overview, CDMA channel concept CDMA operations **10 hrs**

Unit 4: Wireless Modulation techniques and Hardware

Characteristics of air interface, Path loss models, wireless coding techniques, OFDM, UWB Radio techniques, Diversity techniques, Typical GSM Hardware **10 hrs**

Unit 5: 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.

10 hrs

EC 640: Digital Communication

Unit 1: Basic signal processing operations in digital communication. Sampling Principles: Sampling Theorem, Quadrature sampling of Band pass signal, Practical aspects of sampling and signal recovery**.** PAM, TDM. Waveform Coding Techniques, PCM, Quantization noise and SNR, DPCM, DM
10 hours

Unit 2: Line Coding, Base-Band Shaping for Data Transmission, Discrete PAM signals, power spectra of discrete PAM signals**.** ISI, Nyquist criterion for distortion less base-band binary transmission, correlative coding, eye pattern, base-band M-ary PAM systems, adaptive equalization for data transmission.
10 hours

Unit 3: Digital Modulation formats, Coherent binary modulation techniques, Coherent Quadrature modulation techniques. Non-coherent binary modulation techniques. **8 hours**

Unit 4: Spread Spectrum Modulation: Pseudo noise sequences, notion of spread spectrum, direct sequence spread spectrum, coherent binary PSK, frequency hop spread spectrum,
applications**.** **8 hours**

Unit 5: Basics of Information and Coding theory. Shannon's theorem Source coding and error control coding, Recent developments and articles from latest publications
8 hours

EC 650: Operating Systems

UNIT 1:
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. Structure of the supervisor, Operating system with monolithic structure, layered design, Virtual machine operating systems, Kernel-based operating systems, microkernel based OS
10 hours

UNIT – 2:

PROCESS MANAGEMENT: Process concept, Programmer view of processes, OS view of processes, Interacting processes, Threads. Fundamentals of scheduling, Long-term scheduling, Medium and short-term scheduling, Real time scheduling. **10hours**

UNIT – 3:
MEMORY MANAGEMENT: Memory allocation to programs, Memory allocation preliminaries, Contiguous and noncontiguous allocation to programs, Memory allocation for program
controlled data, kernel memory allocation.

10hours

UNIT -4
Virtual memory: Virtual memory using paging, Demand paging, Page replacement, Page replacement policies, Memory allocation to programs, Page sharing

10hours

UNIT – 5
Deadlock: Deadlocks in resource allocation, deadlock detection & resolution, dead lock prevention, deadlock avoidance.

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. **10hours**

EC 66L: DSP LABORATORY

LIST OF EXPERIMENTS:

1. Write a MATLAB code to implement the Nyquist sampling theorem. The program should illustrate the effects the sampling the signal at

    a) Exactly the folding frequency

    b) Frequency less than the folding frequency

    c) Frequency greater than the folding frequency

    Plot the magnitude spectrum for all the above said cases.

2. Write a MATLAB code to implement the DTFT and DFT of a sequence x (n). Also plot the magnitude spectrum of both DTFT and DFT and provide the inference on the basis of results obtained. Further compute the IDTFT and IDFT.

3. Write a MATLAB code to verify the following properties of DFT

    a. Linearity, Periodicity

    b. Circular shift and Circular symmetry of a sequence

    c. Symmetry property

    d. Circular convolution and multiplication of two sequences

    e. Time reversal of a sequence, Parseval's theorem

    f. Circular time shift and Circular frequency shift of a sequence

4. Write a MATLAB code to implement the DFT of a sequence x (n) using DIT and DIF algorithm. Also indicate the speed improvement factor in calculating the DFT of a sequence using direct computation and FFT algorithm (Use the same sequence as used in Program 2). Further compute the IDFT using IDIT and IDIF algorithm.

5. Write a MATLAB code to implement the Low pass and High Pass FIR linear phase filter using Hamming and Hanning windows (with inbuilt and without using inbuilt commands). Plot the magnitude and phase response. Also, Provide the inference on the basis of results obtained for the set of specifications. (To design should be verified by convolving the input signal with the designed filter co-efficients)

6. Write a MATLAB code to implement the Band pass and Band reject FIR linear phase filter using Hamming and Hanning windows (with inbuilt and without using inbuilt commands). Plot the magnitude and phase response. Also, Provide the inference on the basis of results obtained for the set of specifications.

7. Write a MATLAB code to implement the Low pass Butterworth IIR filter using bilinear transformation (BLT) method and Impulse Invariant Technique (IIT) method.

8. Write a MATLAB code to implement the Low pass Chebyshev (Type 1) IIR filter using bilinear transformation (BLT) method and Impulse Invariant Technique (IIT) method.

9. Write a MATLAB code to illustrate the effect of Decimation and Interpolation by an integer factor. Plot the magnitude spectrum. Design the necessary filter to overcome aliasing and image frequencies after decimating and interpolating the signal respectively.

10. Write a MATLAB code to illustrate the effect of sampling rate conversion by a non-integer factor. Plot the magnitude spectrum. Design the necessary filter to overcome aliasing and image frequencies.

11. Consider a noisy audio signal that is corrupted with the 60Hz noise component. Write a MATLAB code to remove this 60Hz noise component from the signal using Notch filter and LMS adaptive filter. Plot the magnitude spectrum of the signal filtered using both Notch filter and LMS adaptive filter and provide the inference on the basis of results obtained.

12. Compute the linear and circular convolution of two sequences using CCS V5.3 simulator and using TMS6713 DSP processor. Plot the resultant signal.

13. Compute the N point DFT of a given sequence and plot the spectrum.

14. Realization of an FIR filter (any type) on TMS6713 to meet given specification. The input can be a signal from function generator/Audio signal. Filtered signal to be viewed on CRO.

EC 67L: Design and Implementation Lab

Course outcomes:

1. Demonstrate a hardware project based on problem formulation, design, testing, , analysis and fabrication.
2. Document the various stages of the project in a standard format with technical and related contents.
3. An oral presentation highlighting the design and fabrication process along with a performance assessment.

VII semester

EC 710: MICROWAVE AND ANTENNAS

Unit 1: Introduction to microwaves and devices

Introduction, bands, advantages, application and radiation hazards, S parameters, microwave filters, klystron, magnetron & TWT, Gunn diode, Tunnel diode, varactor diode, IMPATT and TRAPATT diodes. (One Vacuum tube and one Solid state device is to be covered) Introduction to MIC, materials, MOSFET fabrication, thin film components, hybrid circuits. 12 hours

Unit 2: **Satellite communication**

Introduction, basic definitions, satellite orbits, earth station, satellite transponder, link equations, satellites for mobile applications. 8 hours

Unit 3: Radiometry and TV

Radiometry principles, Introduction to TV standards, scanning principles, composite VSB transmission, color transmission, HDTV principles. 10 hours

Unit 4: Radar systems

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. 10 hours

Unit 5: **Antennas**

Antenna basics, field pattern, linear dipole antenna, slot antenna, helical antennas, reflector antennae, antennae for base stations, antennas for mobile units, special purpose antennas, antennas for ground penetrating radars, Micro strip antennas, patch antennas and intelligent antennas. 10 hours

EC 720: VLSI CIRCUITS AND SYTEMS

Unit 1:
Introduction: A Brief History, MOS Transistors, CMOS Logic, CMOS fabrication and Layout, VLSI Design Flow, Fabrication, Packaging, and Testing **8 Hours**

Unit 2:
MOS Transistor Theory: Introduction, Ideal I-V Characteristics, C-V Characteristics, Non ideal I-V Effects, DC Transfer Characteristics, Switch - level RC Delay Models **8 hours**

Unit 3:
Circuit Characterization and Performance Estimation**:** Introduction, Delay Estimation, Logical effort and transistor sizing, Power Dissipation, Interconnect, Design Margin, Reliability

Unit 4:
Circuit Simulation: Introduction: A Spice Tutorial, Device Models, Device Characterization, Circuit Characterization, Interconnect Simulation 8 Hours

Unit 5:
Combinational and Sequential circuit design: Introduction, Circuit families, Sequencing static circuits, Circuit design of Latches and Flip-flops

EC730: OPTICAL FIBER COMMUNICATION

Unit 1:
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, **08 hours**

Unit 2: Components: Couplers., isolators and Circulators, Multiplexer sand filters Optical Amplifiers Transmitters, detectors, Switches, Wavelength converters **08 hours**

Unit 3:
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, OADM, Optical cross connects **08 hours**

Unit 4:
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 **08 Hours**

Unit 5:
Photonic packet switching, OTDM, Multiplexing and demultiplexing, Synchronisation. Recent developments and trends **08 hours**

EC712: DIGITAL IMAGE PROCESSING

Unit 1:
Digital Image Fundamentals: Elements of visual perception, Image sensing and acquisition, Image sampling and quantization, 2D sampling theorem, 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. **8 hours**

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

8 hours

Unit 3:
Basic Morphological Algorithms: Dilation and erosion, Opening and closing, The Hit or Miss transformation, Boundary extraction, Region filling, Extraction of connected components, Convex Hull, Thinning, Thickening and Pruning.
8 hours

Unit 4:
Color image processing: Color models RGB, CMY, CMYK, HSI, Color transformations, Converting colors from RGB to HSI and HIS to RGB, Pseudo color image processing
Image segmentation: Point, line and edge detection (Robert, Canny and Prewitt techniques). **8 hours**

Unit 5:
Image Compression: Fundamentals, Some basic compression methods- Huffman, Arithmetic and LZW coding techniques, Digital image watermarking.

Recent trends and Case studies: Character and face recognition problems from recent journal publications. **8 hours**

EC743: JAVA PROGRAMMING

Unit 1:
Introduction: An Introduction to Java, the Java Programming Environment, Fundamental Programming Structures in Java Basics of Java Programming **10 hours**

Unit 2:
Core Java: Objects and Classes, Inheritance, Interfaces and Inner Classes, Exceptions and Debugging Streams and Files, Generic Programming **10 hours**

Unit 3:
Java Graphics Programming: Graphics Programming, Event Handling, User Interface Components with Swing, Deploying Applets and Applications **10 hours**

Unit 4: 10h
Advanced Java: Multithreading Collections Networking Database Programming Distributed Objects JavaBeans Components Security Native Methods **10 hours**

VIII semester

EC810: ENTREPRENEURSHIP AND MANAGEMENT

Unit 1
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. **10 hours**

Unit 2

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 **10 hours**

Unit 3:

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. **10 hours**

Unit 4:

Managing projects: Project planning and acquisition, project organization, leadership and control. Case Studies **10 hours**

Unit 5:

Project Report Preparation**:** Preliminary report, Techno-economic feasibility report, Project viability. Case studies examples **10 hours**

EC820: COMPUTER NETWORKS

Unit 1:

Layered tasks, OSI Model, Layers in OSI model, TCP/IP Suite, Addressing, Telephone and cable networks for data transmission, Dial-Up Modems, DSL Data link control: Framing, Flow and error control, Protocols for Noiseless channels and noisy channels **10 hours**

Unit 2:

Multiple Accesses: Random access, Controlled access, Channelization Wired LAN, Ethernet, IEEE standards, Standard Ethernet. Changes in the standards, Fast Ethernet, Gigabit Ethernet,
Wireless LAN IEEE 802.11 **10 hours**

Unit 3:

Network Layer, Logical addressing, IPv4 addresses, IPv6 addresses, Address allocation, NAT, IPv4 and IPv6 Datagram formats, Inter-networking, Transition from IPv4 to IPv6 **10 hours**

Unit 4:

Delivery, Forwarding, Unicast Routing Protocols, Multicast Routing Protocols **10 hours**

Unit 5:

Transport layer: Process to process Delivery, UDP, TCP, Domain Name System(DNS), Resolution **10 hours**

Lab Activities:

1. Experiments based on CISCO Packet Tracer for network configurations; Network addressing, Subnetting and super netting, Routing protocols, and Router configurations

2. VLANs, wireless LANs, Programming exercises on networking algorithms

3. Subnetting experiments on Qualnet software

EC842: MOBILE COMPUTING

Unit 1:

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:

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

Unit 3:

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:

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:

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

EC845: COMPRESSION TECHNIQUES

Unit 1

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. **8 hours**

Unit 2

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. **8 hours**

Unit 3

Dictionary techniques: static/adaptive dictionary, Applications: UNIX compress, GIF image compression, JPEG, JPEG-LS *lossless* compression techniques, Mathematical preliminaries for *Lossy* Compression techniques: Distortion criteria, conditional entropy, differential entropy, Models: physical, probabilistic, linear system models. **8 hours**

Unit 4

Scalar quantization, uniform, Adaptive quantizer, 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. **8 hours**

Unit 5

Sub band coding algorithm: analysis, quantization, coding, synthesis, Wavelets: Multi-resolution analysis and scaling function, implementation using filters, image compression using wavelets, Embedded Zerotree Coder, Set partitioning in Hierarchical tress, JPEG 2000. **8 hours**