M.Sc. ELECTRONICS

Semester – I		
Code	**Course Title**	**Credits**
EL511	Mathematics Foundation for Electronics	**4**
EL512	Signals & Systems	**4**
EL513	C Programming and Data Structure	**4**
EL514	Network and Circuit Theory	**4**
EL515	Electronics Devices and Circuits	**4**
EL516	C Programming and Data Structure Lab.	**2**
EL517	Electronics Devices and Circuits Lab	**2**
	Total Credit:	**24**

Semester – II		
Code	**Course Title**	**Credits**
EL521	Digital Circuits and Systems	**4**
EL522	Analog and Digital Communication Techniques	**4**
EL523	Electromagnetic Field Theory and Antenna	**4**
EL524	Computer Organization and Architecture	**4**
EL525	Professional Elective – I	**4**
EL526	Digital Circuit Lab	**2**
EL527	Communication Lab	**2**
	Total Credit:	**24**

Semester – III		
Code	**Course Title**	**Credits**
EL531	VLSI Design	**4**
EL532	Biomedical Instrumentation	**4**
EL533	Microprocessor and Microcontroller	**4**
EL534	Instrumentation and Control System	**4**
EL535	Professional Elective-II	**4**
EL536	VLSI Design Lab	**2**
EL537	Microprocessor and Microcontroller Lab	**2**
	Total Credit:	**24**

Semester – IV		
Code	**Course Title**	**Credits**
EL541	Laser and Opto-Electronics	**4**
EL542	Professional Elective-III	**3**
EL543	Professional Elective-IV	**4**
EL544	Opto- Electronics Lab	**2**
EL545	Major Project	**10**
	Total Credit:	**23**

LIST OF PROFESSIONAL ELECTIVES	
Code	**Course Title**
	Basics of IC Design
	Artificial Intelligence
	Digital design with VHDL
	Digital Image Processing
	Computer Vision & Image Processing
	Wired and Wireless Communication
	Wireless Sensor Networks
	Mobile Communication
	Mobile Computing
	Microwave and Antenna Theory
	Optical Communication

Programme Outcome

PO-1	**Critical Thinking:** Take informed actions after identifying the assumptions that frame our thinking and actions
PO-2	**Effective Communication:** Will be able to speak, read, write and listen clearly in person and through electronic media in English and in one Indian Language
PO-3	**Social Interaction (Interpersonal Relation):** Elicit views of others, mediate disagreements and prepared to work in team
PO-4	Entrepreneurship Capability: Demonstrate qualities to be prepared to become an entrepreneurship
PO-5	Ethics: Recognize different value systems including your own, understand the moral dimensions and accept responsibility for them
PO-6	Environment and Sustainability: Understand the issues of environmental contexts and sustainable development
PO-7	Life-Long Learning: Acquire the ability to engage in independent and life-long learning in the context of socio-technological changes

SEMESTER – I

MATHEMATICS FOUNDATION FOR ELECTRONICS

Course Objective: To provide the background of mathematics and to analyze the structure of different shapes for application in M.Sc. Electronics courses in light of mathematically oriented topics.

Course Outcome:

CO1: Remember and understand the basic concepts/Principles of Mathematics
CO2: Analyze the Various Concepts to understand them through case studies
CO3: Apply the knowledge in understanding practical problems
CO4: Execute/Create the Project or field assignment as per the knowledge gained in the course

UNIT – I: FUNCTION OF A COMPLEX VARIABLE (10 Hours)

Analyticity, C-R equation, harmonic conjugate, Power series and Laurent series expansion, Complex integration: line integral, Cauchy's integration rules, Singularity, Residue, Residue theorem, evaluation of integrals by the method of residues, multi-valued function-branch point and branch cut, contour integration involving branch point.

UNIT – II: LINEAR VECTOR SPACE AND MATRICES (12 Hours)

Definition, linear independence, basis and dimension, scalar product, dual vector, Cauchy-Schwarz inequality, orthonormal basis, Schmidt orthogonalisation process.
Matrix operations, conjugate of a matrix, Inverse of a matrix, orthogonal matrix, rotation, similarity transformation, Eigen values and Eigenvectors, secular equation, Cayley- Hamilton theorem, matrix diagonalisation.

UNIT – III: PARTIAL DIFFERENTIAL EQUATIONS (10 Hours)

1storder Differential equation, separation of variable-ordinary differential equations, singular points, series solutions – frobenius' method, a second solution, non-homogenous equation – greens' function, legendre's polynomial equation, introduction to 2ndorder differential equation.

UNIT – IV: INTEGRAL TRANSFORMATION (12 Hours)

Development of Fourier series, integral, Fourier transforms – inversion theorem & derivatives, convolution theorem, momentum representation, transfer functions, Laplace transform– derivatives, properties, inverse Laplace transform and applications to solution of differential equation, Z transform.

[TOTAL: 44 Hrs.]

TEXT BOOKS:

1. Higher Engineering Mathematics – BS Grewal
2. Higher Engineering Mathematics, B.V. Ramana

REFERENCE BOOKS:

1. Arfken: Mathematical Physics (Academic)
2. Dennery and Krzywicki: Mathematics for Physicists (Harper and Row)
3. Joshi: Matrices and Tensors in Physics (Wiley - Eastern)
4. Chattopadhyay: Mathematical physics (Wiley- Eastern)
5. Potter and Goldberg: Methods of Mathematical physics (Prentice Hall)

SIGNALS & SYSTEMS

Course Objective: Understanding the fundamental characteristics of signals and systems. Understanding the concepts of vector space, inner product space and orthogonal series. Understanding signals and systems in terms of both the time and transform domains, taking advantage of the complementary insights and tools that these different perspectives provide. Development of the mathematical skills to solve problems involving convolution, filtering, modulation and sampling.

Course Outcome:

CO1: Remember and understand the basic concept of linear algebra topics like vector space, basis, dimension, inner product, norm and orthogonal basis to signals

CO2: Analyse the system properties based on impulse response and the spectral characteristics of continuous-time periodic and a periodic signal using Fourier analysis

CO3: Apply the Laplace transform and Z- transform for analysis of continuous-time and discrete-time signals and systems.

C04: Assignments as well as projects are executed to apply knowledge gained in the course.

UNIT-I (12 Hours)

Introduction to Signals & Systems: Definition of signals, system, overview of specific systems: control systems, communication systems, automatic speech recognition systems, classification of signals, basic operations on signals, elementary signals: exponential, sinusoidal, unit impulse, unit step, properties of systems, systems viewed as interconnections of operations. Linear Time Invariant Systems: Discrete time LTI systems: the convolution sum, Continuous Time LTI systems: The convolution integral, properties of LTI systems, interconnection of LTI systems, differential and difference equation representations of LTI systems, Block diagram representations, state variable descriptions of LTI systems.

UNIT-II (14 Hours)

Fourier representations of signals and linear Time-Invariant systems: complex sinusoids and frequency response of LTI systems, Discrete time periodic signals(DTFS), Continuous time periodic signals(FS), Discrete time non-periodic signals (DTFT), Continuous time Non-Periodic Signals(FT), properties of Fourier representations: linearity and symmetry properties, convolution property, differentiation and integration properties, time and frequency shift properties, Multiplication property, scaling property, parseval relationships, time bandwidth product, duality. Sampling: sampling theorem: representation of Continuous time signal by its samples, reconstruction of Continuous time signals from samples, the effect of under sampling: aliasing.

UNIT-III (14 Hours)

Representing signals by using Continuous time complex exponentials: The Laplace transform, ROC, Properties of Laplace Transform, inverse Laplace transform, analysis and characterization of LTI systems using Laplace Transform: causality, stability, system functions for interconnections of LTI systems. Representing signals by using Discrete Time complex exponentials: The z-transform, ROC, properties of ROC, properties of z-transform, analysis and characterization of LTI systems using z-transform: -causality,

stability, system functions for interconnections of LTI systems, block Diagram representations for causal LTI systems.

UNIT-IV (10 Hours)
Design of Filters, passive filters, digital filters, linear distortion and equalization. Linear Feedback Systems: feedback, basic feedback concepts, effect of feedback on disturbance or noise, introduction to Routh-Hurwitz criteria, Root Locus analysis of linear feedback systems and Nyquist stability criteria.

[TOTAL: 48 Hrs.]

TEXT BOOKS:

1. Signals and Systems, Alan S. Willsky, Alan V. Oppenheim, S. Hamid Nawab, PHI Learning, 2nd edition.
2. Signals and Systems, Simon Haykin, Barry Van Veen, Wiley India, 2nd edition
3. Schaum's outlines of 'Theory and problems of Signals and Systems", Hwei P. Hsu, McGraw Hill

REFERENCE BOOKS:

1. Principles of Signal Processing & Linear Systems, B.P Lathi, Oxford University Press.

C PROGRAMMING AND DATA STRUCTURE

Course Objective: To understand clearly about the C programming & basic data structures with their operations and concepts of algorithms. Provide adequate knowledge to develop a program and/ or algorithm to solve a problem.

Course Outcome:
CO1: Remember and understand the basic concept of C programming & basic data structures
CO2: Analyse the logical skills to programming in C language for various types of data and different types of structures
CO3: Different types practical problems are executed
C04: Assignments and projects are executed in the C- programming and Data structures.

UNIT – I: COMPUTER FUNDAMENTALS AND INTRODUCTION TO C (9 Hours)
Computer Fundamentals, Structure of C program, A Simple C program, identifiers, basic data types and sizes, Constants, variables, arithmetic, relational and logical operators, increment and decrement operators, conditional operator, bit-wise operators, assignment operators, expressions, type conversions, conditional expressions, precedence and order of evaluation.
Input-output statements, statements and blocks, if and switch statements, loops- while, do-while and for statements, break, continue, C program examples.

UNIT – II: ARRAYS AND POINTERS (10 Hours)
Arrays- concepts, declaration, definition, accessing elements, storing elements, arrays and functions, two-dimensional and multi-dimensional arrays, applications of arrays. pointers- concepts, initialization of pointer variables, pointers and function arguments, address arithmetic, Character pointers and functions, pointers to pointers, pointers and multidimensional arrays.

UNIT – III: FUNCTIONS AND DERIVED DATA TYPES (10 Hours)
Designing structured programs, Functions, basics, parameter passing, storage classes- extern, auto, register, static, scope rules, block structure, user defined functions.

Derived types- structures- declaration, definition and initialization of structures, accessing structures, nested structures, arrays of structures, structures and functions, pointers to structures, self-referential structures, unions.

UNIT – IV: FILE HANDLING AND DATA STRUCTURE (16 Hours)

Input and output - concept of a file, text files and binary files, streams, standard I/O, Formatted I/O, file I/o operations.
Searching - Linear and binary search methods.
Sorting - Bubble sort, selection sort, Insertion sort.
Dynamic memory managements functions, Introduction to Linked List.
Stack, Queue and their implementation using array.
Overview of non-linear data structures, Tree and Graph.

[TOTAL: 45 Hrs.]

TEXT BOOKS

1. E. Balaguruswami, The C Programming Language, TMH.
2. Fundamentals of Data structure using C, Ellis Horowitz, Sartaj Sahni, and Susan Anderson-Freed, University Press
3. P.K. Sinha, Computer Fundamentals.

REFERENCE BOOKS:

1. B.W. Kernighan, Dennis M. Ritchie, The C Programming Language, PHI/Pearson Education
2. Data Structure using C, Yashwant Kanetkar, BPB

NETWORK AND CIRCUIT THEORY

Course Objective: To make the students capable of understanding electrical circuits and analysing any given electrical network.

Course Outcome:

CO1: Understand the basic principle of circuital laws and networks.

CO2: Analyse the various transient response, Steady state response, network functions

CO3: Apply the knowledge in reduction of networks, evaluate two-port network parameters and Fourier transfer is used to filter for bandwidth consideration.

C04: Assignments to design and optimization of circuits using laws is done and projects are executed.

UNIT-I (12 Hours)

Basic Circuit Analysis

Ohm's law, Kirchhoff's law, RLC Series and parallel circuits, mesh current and nodal analysis.
Network Reduction: voltage & current division, source transformation, star-delta conversion.
Network Topology: Graph of network, concept of tree, Tie-set & cut-set matrix.
Theorems- (both DC & AC): Thevenin, Norton, Superposition, Maximum power transform, Reciprocity, Compensation, Milliman, Tellegen's Theorem.

UNIT-II (10 Hours)

Resonance & coupled circuit: series & parallel resonance-their frequency response, Q-factor & bandwidth, self & mutual inductance, coefficient of coupling, tuned circuit.
Transient response: Transient response of RL, RC, RLC using Laplace transform

UNIT-III (12 Hours)

Two port Network function & Response: z, y, ABCD and **h**-parameters, Reciprocity and Symmetry, Interrelation of two-port parameters, Interconnection of two-port networks, Network Functions,

Significance of Poles and Zeros, Restriction on location of Poles and Zeros, Time domain behaviour from Pole-Zero plots.
Filter Design by co-efficient matching: Brief idea about network filters (Low pass, High pass, Band pass and Band elimination) and their frequency response.

UNIT-IV (12 Hours)
FOURIER SERIES & ITS APPLICATION: Fourier series, Fourier analysis and evaluation of coefficients, Steady state response of network to periodic signals, Fourier transform and convergence, Fourier transform of some functions, Brief idea about network filters (Low pass, High pass, Band pass and Band elimination) and their frequency response
Network synthesis: Hurwitz polynomial, Properties of Hurwitz polynomial, Positive real functions and their properties, Concepts of network synthesis, Realization of simple R-L, R-C and L-C functions in Cauer-I, Cauer-II, Foster-I and Foster-II forms.

[TOTAL: 46 Hrs.]

TEXT BOOKS

1. Network Theory- AK Chakraborty-Tata McGraw Hill, New Delhi.
2. William H. Hayat, "Engineering circuit analysis" Tata McGraw Hill, New Delhi.

REFERENCE BOOKS

1. Network analysis and synthesis- Valkenburg-Pearson publication.

ELECTRONICS DEVICES AND CIRCUITS

Course Objective: To provide basic knowledge and concepts of the characteristics and principles of operation of semiconductor devices and their circuital application.

Course Outcome:
CO1: Understand the basic concepts of semiconductor devices.
CO2: Analyse the various semiconductor devices for application in circuit.
CO3: Use of various solid-state devices and their application in different circuits in modern electronic instruments
C04: The assignment and project are carried out on application of various semiconductor devices in different circuits.

UNIT – I: INTRODUCTION TO ELECTRONICS (10 Hours)
Electronic devices and their applications: signals, Analog & Digital signals, Amplifiers. Linear wave shaping circuits: RC LPF, Integrator, RC HPF, Differentiator. Energy band in Silicon, Properties of semiconductor; intrinsic& extrinsic semiconductors, Carrier transport in Silicon, diffusion current, drift current, mobility & resistivity. Generation and recombination of carriers, Hall effect.

UNIT – II: SEMICONDUCTOR DIODES (10Hours)
Electronic Transport in semiconductor, p-n junction, V–I characteristics, load line analysis, equivalent circuit of diode, analysis of diode circuit, Break-down in diode, transition capacitance & diffusion capacitance. Applications of diode circuits: Rectifiers, clippers, clampers. Filter circuits, Special purpose diodes: Zener diode, LED, Photo diode, avalanche photo diode, p-i-n diode, tunnel diode, Varactor diode, Shockley diode. LASER.

UNIT – III: BJTs AND FETs (10 Hours)

BJT: structure & operation, different transistor configurations & their characteristics, DC analysis of BJT, quiescent point and load line analysis, transistor as a switch, single stage and multistage transistor amplifiers, BJT RC coupled amplifier. Field effect transistors (FETs): Types, structure & operation of JFET and MOSFET, Depletion mode & Enhancement mode MOSFET, FET as an amplifier. JFET characteristics and applications

UNIT – IV: FEEDBACK AMPLIFIERS & OSCILLATORS (12 Hours)

General principles of feedback amplifier, topologies, properties of negative feedback, Oscillators: principles of oscillations, Bark hausen criteria for oscillation, types of oscillator circuits and their operations. Operational amplifiers (OP-AMPs): Ideal op-amp, inverting & non inverting amplifier, adder, integrator & differentiator.

Introduction to power amplifiers: classifications, class A, class B, class C power amplifiers. Conversion efficiency of series fed class A power amplifier, class B push pull power amplifier.

[TOTAL: 42 Hrs.]

TEXT BOOKS:

1. Electronic Devices & Circuit Theory, R.L Boylestad and L. Nashelsky, Pearson Education
2. Electronics Fundamentals and Applications, D Chattopadhyay and P. C Rakshit, New Age International Publications.

REFERENCE BOOKS:

1. Integrated Electronics, Millman and Halkias, Mc. Graw Hill Publications.
2. Electronics Devices and Circuits, Sanjeev Gupta, Dhanpat Rai, Publications.
3. Digital Logic and Computer Design, Morris Mano, PHI, EEE

C PROGRAMMING AND DATA STRUCTURE LAB.

Course Objective: To introduce students to the basic knowledge of programming fundamentals of C language and to impart writing skill of programming.

Course Outcome: CO1: Remember and understand the basic concepts/Principles DATA STRUCTURE USING C LAB

CO2: Analyze the Various Concepts to understand them through case studies

CO3: Apply the knowledge in understanding practical problems

CO4: Execute/Create the Project or field assignment as per the knowledge gained in the course

Recommended Systems/Software Requirements:

Desktop PC with Linux OS, GNU C Compiler or Window, Turbo C/C++ compiler.

Instruction to Instructors:

At the beginning of the session instructors should give a brief idea about the working platform (both OS and compilers). During different Lab. session he/she should introduce different required in-built library functions.

List of topics for writing C-programs:

1. Print statements, variables and simple arithmetic operations, mathematical series, Conditional statements.
2. Loops, Arrays, Strings, Pointers
3. User defined Functions, Structures and Unions, Files
4. Linked List, Stack, Queue
5. Tree, and Graph
6. Sorting and Searching algorithms

ELECTRONICS DEVICES AND CIRCUITS LAB.

Course Objective: To understand and analyze the different biasing techniques used in BJTs and FETs and analysis of amplifier circuits.

Course Outcome:

CO1: Remember and understand the basic concepts/ Principles of Basic Electronics Lab

CO2: Analysis of various Analog circuits their design and implantation.

CO3: The working various Analog circuits in practical problems.

C04: Execution of modern project and Design assignments.

Basic Knowledge-

1. To study Electronics Symbols.
2. To Study of Active Components such as (Transistors, Integrated Circuit, etc.)
3. To Study of Passive Components such as (Resistor, Capacitor, Diode, Inductor etc.).
4. To Study Electronic Devices such as (Multi-meter, Bread-Board, Power Supply, Digital Storage oscilloscope and Function Generator.)

Experiment List-

1. To obtain V-I characteristics of PN junction diode. (For Forward as well as Reverse Bias configuration).
2. To obtain the VI characteristics of Zener Diode in reverse bias.
3. Design of Clipping and Clamping Circuits.
4. To Study High Pass and Low Pass Filters.
5. To observe waveform at the output of half wave, Full Wave and Bridge Rectifier and measure DC voltage, DC current, ripple factor with & without filter capacitor.
6. To Study Zener Diode as Voltage Regulator.
7. To Study the Voltage Regulator using IC LM7805, LM7812 and LM317.
8. Transistor I/P, O/P Characteristics of NPN transistor in CE Configuration.
9. Common Emitter Transistor Amplifier of NPN Transistor.
10. Design and test the Performance of RC Phase-shift Oscillator.
11. Design and test Hartley and Colpitt`s Oscillator.
12. Study of Operational Amplifier, knowledge of
    a. CMRR
    b. Slew Rate
    c. Differential Amplifier
    (Mathematical Operations will be done in DCS Lab in 2nd Semester)
13. Verification of Mesh Analysis and Nodal Analysis.

14. Verification of Super position Theorem.
15. Verification of Thevenin`s Theorem.
16. Verification of Norton's Theorem.
17. Maximum Power Transfer Theorem.

A minimum of 12(Twelve) Experiments has to be performed and recorded by the Candidate to attain eligibility for University Practical Examination.

All the experiments above may also be performed in the simulation software

SEMESTER – II

DIGITAL CIRCUITS AND SYSTEMS

Course Objective: To understand digital circuits, digital ICs and the basic building blocks of modern digital instruments

Course Outcome:
CO1: Understanding of the basic Principle of digitalization
CO2: Analysis of various Digital circuits their design and implantation.
CO3: The working various Digital circuits in practical problems.
C04: Execution of modern project and Design assignments.

UNIT – I: (12 HOURS)

Number systems: binary, octal, decimal and hexadecimal number system. 1's complements, 2'complement, binary addition, subtraction, multiplication & division. Binary codes-BCD codes, Gray codes, Excess-3 code. Logic gates: AND, OR, NOT, EX-OR, EX-NOR, Universal gates like NAND, NOR. NAND & NOR Implementation, AND-OR invert, OR-AND invert implementation.

Gate level Minimization: Boolean functions, Canonical & standard form; min terms & max term, Digital Logic Gates for Multiple inputs. The Map Method: K Map for two, three, four variables. Product of Sum (POS), Sum of product (SOP) simplification, don't care conditions.

Error detection& correction: Parity Generator and Checker Circuit.

UNIT – II: (12 HOURS)

Combinational Logic: Analysis & Design of Binary Half Adder & Full Adder circuit, Carry Look Ahead adder. Half and Full-subtractor circuit, Binary Multiplier, Decoders, Encoders, Multiplexers and Demultiplexers, seven segment display. Priority encoder Digital Integrated logic Circuits: RTL, DTL, TTL, ECL, MOS & C-MOS Logic circuits. code converters: Analog to digital converter, Digital to analog converters, Magnitude Comparator.

UNIT – III: (10 HOURS)

Synchronous Sequential Logic: Sequential Circuit, Latches, Flip-flop (S-R, J-K, D, T, M/S), edge triggering and level triggering. Analysis of Clocked Sequential circuits, State Reduction & Assignment, Design procedure.

Register &Counters: Universal Shift Register (SISO, SIPO, PISO, PIPO), Synchronous Counter, Modulo-n Counter, Up-Down Counter, Asynchronous Counter, Ripple Counters, Ring Counters.

UNIT – IV: (10 HOURS)

Memory & Programmable Logic: Classification of memories–ROM, ROM organization, PROM, EPROM, EEPROM, EAPROM, RAM, RAM organization.

Programmable Logic Devices, Programmable Logic Array (PLA), Programmable Array Logic (PAL), Field Programmable Gate Arrays (FPGA). Resister Transfer Levels: Register transfer Level notion, Algorithm State machine, Design Example.

[TOTAL: 44 Hrs.]

TEXT BOOKS:

1. Digital Design, 3rd edition by M. Morris Mano, PHI
2. Digital Principles & Applications – Malvino, Leach &Saha, 6th Edition, Tata McGraw Hill

REFERENCE BOOKS

1. Switching Theory & Digital Electronics – V. K. Jain, Khanna Publishers
2. Digital Fundamentals – Floyd & Jain, Pearson education

ANALOG AND DIGITAL COMMUNICATION TECHNIQUES

Course Objective: Introduction to communication systems and techniques with concept of how information flows from one point to another at the most basic level. Provide knowledge about analog and pulse modulation and demodulation techniques including AM, FM, PM, PAM, PPM and PWM. Provide knowledge about digital communication systems, including MPSK, MQAM, and FSK. Provide knowledge about advanced techniques to mitigate channel impairments, including multicarrier modulation and spread spectrum CDMA. At each level, system design is given primary importance by using examples from practical systems.

Course Outcome:
CO1: Understand the basic principle of modern communication system-
CO2: Analyse the various concepts signal conversion and propagation Techniques
CO3: Be able to design a practical communication system at the block diagram level under certain constraints and requirements
C04: Execution and Design of the signal transmission project and assignment on Trans-receiver system with mathematical modelling.

UNIT – I: AMPLITUDE AND ANGLE MODULATION (12 Hours)

Amplitude modulation: Block diagram of Electrical communication system, Radio communication, Need for modulation, Types of Amplitude modulation, AM, DSB SC, SSB SC, VSB, Power and BW requirements, Generation of AM, DSB SC, SSB SC, Demodulation of AM: Diode detector, Product demodulation for DSB SC & SSB SC.

Angle Modulation: Frequency & Phase modulations, advantages of FM over AM, Bandwidth consideration, Narrow band and Wide band FM, Comparison of FM & PM, FM modulators and FM demodulators, Armstrong method of generation, necessity of pre-emphasis and de-emphasis.

UNIT – II: (12 Hours)

Pulse Modulations: Sampling, Nyquist rate of sampling, Sampling theorem for Band limited signals, PAM, regeneration of base band signal, PWM and PPM, Time Divison Multiplexing, Frequency Divison Multiplexing, Asynchronous Multiplexing.

Digital Communication: Advantages, Block diagram of PCM, Quantization, effect of quantization, quantization error, Base band digital signal, DM, ADM, ADPCM and comparison.

UNIT – III:(12 Hours)

Digital Modulation: ASK, FSK, PSK, and DPSK, QPSK demodulation, coherent and incoherent reception, Comparison of binary and quaternary modulation schemes, M-ary modulation techniques.

Information Theory and Coding: Discrete messages and information content, source coding, Shanon ‘s theorem, channel capacity, Block codes- coding and decoding, burst error correction

(BRC), Convolutional coding, decoding convolutional code, comparison of error rates in coded and uncoded transmission, turbo codes.

UNIT – IV:(10 Hours)

Spread Spectrum Modulation: Use of spread spectrum, direct sequence spread spectrum, spread spectrum and CDMA, ranging using DS spread spectrum, frequency hopping spread spectrum, Pseudo random sequences – generation and characteristics, synchronization in spread spectrum systems.

Advanced Communication Systems: Telephone switching, Computer communication, Optical communications, Mobile telephone communication- the Cellular concept, Satellite communications, RADAR systems.

[TOTAL: 46 Hrs.]

TEXT BOOKS:

1. Communication Systems – Simon Haykin, John Wiley, 3rd edition.
2. Principles of Communications – H. Taub and D. Schilling, Gouthamsaha, TMH, Third edition,2nd reprint,2008.

REFERENCE BOOKS:

1. Communication Systems Analog and Digital – R.P. Singh and S D Sapre, TMH, 2nd Edition, 2008.
2. Electronic &Communication Systems – Kennedy and Davis, TMH, 4th edition, 2004.
3. Modern Digital and Analog communication Systems – B.P Lathi, Oxford 3rd edition

ELECTRO-MAGNETIC FIELD THEORY AND ANTENNA

Course Objective: To develop understanding electromagnetic wave and wave propagation using Maxwell's equations in different shape. Transmission and receiving of EM-wave using antennas.

Course Outcome:

CO1: Understand to Optimize different phenomena and power of EM wave,

CO2: Analysis of field at different boundaries and propagation of wave in different medium

CO3: Develop an understanding of material and wave interaction and EM power radiation from and to a system using antennas.

CO4: Execution of signal transmission and radiation effect project

UNIT I: (10 Hours)

Introduction, basic antenna parameters, Radiation pattern, radiation power density, radiation intensity, directivity, beam efficiency, aperture concept, effective height, polarization, input impedance, gain ,radiation efficiency, beam width, bandwidth, beam efficiency, FRIIS, transmission equation, Basic concepts of Maxwell's equation, vector potential, wave equation, near field and far field radiation, dual equations for electric and magnetic current sources.

UNIT II: (10 Hours)

Linear wire antennas: Infinitesimal dipole its radiation field, radiation, resistance, radiation sphere, ear field, far field directivity, small dipole, finite length dipole, half wave length dipole, linear elements near or on infinite perfect conductors, ground effects and their application, Folded dipole, sleeve dipole and their applications

Loop Antenna: Small loop comparison of small loop with short dipole, radiation pattern its parameters and their application.

UNIT III: (16 Hours)

Arrays: Linear arrays, planner arrays and circular arrays. Array of two isotropic point sources, non-isotropic sources, principle of pattern multiplication linear arrays of n elements, broadside, End fire radiation pattern, directivity, Beam width and null directions, array factor. Antenna analysis using Dolph-Tschebyscheff.

Frequency Independent Antennas: Log periodic and Helical antennas.

Micro-strip antennas: Rectangular & circular patch applications and feed network.

Reflector antennas: Plane reflector, corner reflector, procedures, Radiation mechanisms Dielectric waveguide, dielectric resonator, dielectric horn antenna.

UNIT IV: (08 Hours)

Antenna Measurement: Antenna Ranges, Radiation Pattern, Gain and directivity, Polarization.

Radio wave propagation Ground wave propagation, Ionospheric- propagation, Propagation losses.

[TOTAL: 44 Hrs.]

TEXT BOOKS:

1. Antenna Theory analysis and design, Costantine A. Balanis, John Wiley publication
2. Electromagnetic, Jordan Balmann, Prentice Hall of India publication

REFERENCE BOOKS:

1. Antennas-John D. Kraus, Tata McGraw Hill publication
2. Harish A. R., Antenna and wave propagation, Oxford University Press.

COMPUTER ORGANIZATION AND ARCHITECTURE

Course Objective: The objective is to analyse the designing process of combinational and sequential circuits, express arithmetic logic and shift micro-operations in symbolic form at a register transfer level, identify the addressing modes used in macro instructions, apply algorithms for arithmetic operations and implementation for ALU design, and develop micro code for typical instructions in symbolic form.

Course Outcome:

CO1: To understand the designing process of combinational and sequential circuits

CO2: Express arithmetic logic and shift micro-operations in symbolic form at a register transfer level.

CO3: Identify the addressing modes used in macro instructions practically

CO4: Project and assignment of different algorithms techniques for arithmetic operations, micro code for typical instructions in symbolic form and implementation and design of ALU and memory organization.

UNIT I: (10 Hours)

Introduction:

Basic Organization of Computers, Classification Micro, Mini, Mainframe and Super Computer. System Bus and Interconnection: Single and multi-bus, Computer Function Von-Neumann M/c: Structure of IAS.

Computer Arithmetic:

Data Representation: Fixed Point Representation, Floating Point Representation. Addition and Subtraction, Multiplication (Booth Algorithm), Division Algorithm, Floating Point Arithmetic Operation, Decimal Arithmetic Operation.

UNIT II: (10 Hours)

Instruction Set Architecture:

Instruction Format: Three Address, Two Address, One Address and Zero Address Instruction, Addressing Modes: Types of Addressing modes, Numerical Examples, Program Relocation, Compaction, Data Transfer & Manipulation: Data transfer, Data Manipulation, Arithmetic, Logical & Bit Manipulation Instruction, Program Control: Conditional Branch Instruction,
CPU Organization:
Fundamental Concepts: Instruction-cycle, Fetching and storing a word in Memory, Register Transfer, Performing an Arithmetic & Logic Operation, Branching. Control word, Stack Organization, Register Stack, Memory Stack, RPN, Evaluation of Arithmetic Expression using RPN, Subroutine, Control Unit Operation: Hardware Control & Micro Programmed Control.

UNIT III: (10 Hours)

Memory Organization:
Computers Memory System Overview, Characteristics of Memory System, The Memory Hierarchy, Semi-Conductor Main Memory types, Organisation, Memory cell Operation. Cache Memory: Cache Principles, Elements of Cache Design, Cache Size, Cache Mapping function, Replacement Algorithm, LRU, FIFO, LFU, Write policy. Number of Caches: Single versus two level caches, Pentium Cache Organisation. Associative Memory: Hardware Organisation, Match Logic. Read Operation, Write Operation, Auxiliary Memory: Magnetic Disks, Magnetic Tape. Virtual Memory: Paging, paging h/w, Address Mapping using pages, Segmentation h/w, Demand Paging, Memory Management h/w.

UNIT IV: (12 Hours)

Input/Output Organization:
Peripheral Devices, Input – output Interface, I/O Bus, Interface Module, Asynchronous Data Transfer, Strobe Control, Handshaking, Asynchronous Serial Transfer, Asynchronous Communication Interface, Modes of Transfer: Programmed I/O, Interrupt Driven I/O, Direct Memory Access (DMA), DMA Controller, I/O Channel & Processor.
Interrupt:
Class of interrupt, Priority Interrupt: Daisy Chaining Priority, Parallel Priority Interrupt. Program Interrupt, Types of Interrupts, RISC & CISC Characteristic.
Parallel Processing:
Flynn's Classification, Introduction to Pipelining and hazards, Speedup, Efficiency, Throughput.

[TOTAL: 42 Hrs.]

TEXT BOOKS:

1.Computer Organization & Architecture – William Stallings, 7th Edition, PHI
2. Computer Organization – by Carl Hamacher, Z. Vranesic, and S. Zaky, 5th Edition. McGraw Hill.

REFERENCE BOOKS:

1. Computer System Architecture: Morris Mano, 3rd Edition, PHI
2. Computer Architecture and Organization, by - John P. Hayes, 3rd Edition, McGraw Hill International Editions.
3. Computer Organization & Design, (3rd Edition) by – D. A. Patterson & J. L. Hennessy – Morgan Kaufmann Publishers (Elsevier).

DIGITAL CIRCUITS LAB.

Course Objective: To learn and understand the working of different combinational and sequential logic circuits.

Course Outcome:
CO1: Remember and understand the basic concepts/Principles of DIGITAL CIRCUITS LABS
CO2: Analyze the Various Concepts to understand them through case studies
CO3: Apply the knowledge in understanding practical problems
C04: Execute/Create the Project or field assignment as per the knowledge gained in the course.

Experiment List:

1. Study of Basic of Logic GATE IC manufacture.
2. Study of basics of Timer IC Manufacture.
3. Study of Multivibrators using NE555 [Astable, stable and Bistable].
4. Verification and Realization of AND, OR, NOT, NOR, XOR and XNOR Gates using NAND Gates.
5. Verification of Demorgans Theorem using Universal Gates.
6. Half Adder/ Full Adder using Universal Gates.
7. Summer [Voltage Doubler, Voltage Tripler] using Universal Gates.
8. Half Subtractor/ Full Subtractor using NAND Gates.
9. BCD to seven LED Display using IC.
10. Multiplexer/ De-Multiplexer.
11. Encoder/Decoder.
12. Flip-Flops
    a. RS, T, D, JK using NAND Gate.
    b. JK Master Slave Flip Flop using IC.
13. Shift Register.
14. Counters [Module 2/5/10 counters any one].
15. UP/ DOWN Counter.
16. Analog to Digital converter using IC 0804/ 0808.
17. Digital to Analog converter using IC 0800/0808.
18. Designing of Memory.

A minimum of 12 (Twelve) Experiments has to be performed and recorded.

COMMUNICATION LAB.

Course Objective: To impart knowledge about Analog and Digital communication systems, including system design at each level is given primary importance by using examples from practical systems.

Course Outcome:

CO1: Remember and understand the basic concepts/ Principles of Analog and Digital Communication

CO2: Analyse the various concepts signal conversion and propagation Techniques through case studies

CO3: Apply the knowledge in understanding practical problems

C04: Execution and Design of the signal transmission project and assignment on Trans-receiver system with mathematical modelling.

Fundamental Knowledge Based Experiments:

a. Pulse Generation using Timer IC 555.
b. OPAMP IC 741 Basics.
c. Frequency to Voltage Conversion.
   Voltage to Frequency Conversion.

Experiment List:

1. Study of Amplitude Modulation and Demodulation.
2. Study of Frequency Modulation and Demodulation.
3. Time Division Multiplexing.
4. Frequency Division Multiplexing.
5. Designing of PLL Circuits.
6. Verification of Sampling Theorem and PAM Generation and Detection.
7. Pulse Position Modulation and De-Modulation.
8. Pulse Width Modulation and De-Modulation.
9. Quantization and Pulse Code Modulation.
10. ASK Generation and De-Modulation.
11. FSK Generation and De-Modulation.
12. PSK Generation and De-Modulation.
13. QPSK Modulation and De-Modulation.
14. Data Formatting and Carrier Modulation.
15. Measurement of Numerical aperture of a given optical fiber.
16. Spot size calculation of supplied laser light.
17. Optical signal transmission using LED & Photo Detector.
18. IR Transmission and Detection.

A minimum of 12(Twelve) Experiments has to be performed and recorded by the Candidate to attain eligibility for University Practical Examination.

ALL THE EXPERIMENTS ABOVE MAY ALSO BE PERFORMED IN THE SIMULATION SOFTWARE**.**

SEMESTER – III

VLSI DESIGN

Course Objective: To learn different types of VLSI Design methodologies, VLSI design Styles and fabrication process of MOS transistors, MOS inverter, combinational and sequential logic circuits using MOS and VHDL programming.

Course Outcome: CO1: Remember and understand the basic concepts/ Principles of VLSI Engineering
CO2: Analyse the various concepts to understand them through case studies
CO3: Apply the knowledge in understanding practical problems
CO4: Execute / Create the project or field assignment as per the knowledge gained in the course

UNIT – I: INTRODUCTION TO VLSI (12 Hours)

Introduction, historical perspective, VLSI Design methodologies, VLSI Design flow, Design hierarchy, Design styles, CAD Technology. Fabrication of MOSFETS, Fabrication processes, NMOS Fabrication, CMOS n-well process, Layout Design rules, Full Custom Mask Layout Design, MOS Transistor, Review of structure and operation of MOSFET (n-MOS enhancement type), CMOS, MOSFET V-I characteristics, MOSFET scaling and small geometry effects, MOSFET capacitances, Modelling of MOS transistors using SPICE- Basic concept, SPICE level – 1 models, level – 2 and level – 3 model equations.

UNIT – II: MOS INVERTERS (10 Hours)

Basic NMOS inverters, characteristics, inverters with resistive load and with n-type MOSFET LOAD, CMOS Inverter and characteristics. MOS Inverters: switching characteristics and interconnect effects: Delay time definitions and calculation, inverter design with delay constraints, estimation of parasitic switching power dissipation of CMOS inverters.

UNIT – III: COMBINATIONAL AND SEQUENTIAL MOS LOGIC CIRCUITS (10 Hours)

Combinational MOS logic circuits: CMOS logic circuits, complex logic circuits, pass transistor logic. Sequential MOS logic circuits: introduction, SR latch, clocked latch & flip-flop circuits, CMOS D latch and edge triggered flip-flop. Dynamic logic circuits: Dynamic logic, basic principles, high performance dynamics CMOS circuits, Dynamic RAM, Static RAM, Flash memory.

UNIT – IV: INTRODUCTION TO VHDL (10 Hours)

Introduction to VHDL, Behavioural modelling, sequential processing, Data types, IEEE std logic, VHDL operators, arrays, Modules, packages, libraries. VHDL description of combinational logic circuits, VHDL description of sequential logic circuits. Modelling of flip-flops, registers, and counters using VHDL.VHDL code for serial adder, and binary multiplier.

[TOTAL: 42 Hrs.]

TEXT BOOKS:

1. CMOS Digital Integrated Circuits – Analysis & Design – Sung -Mo Kang &Yussuf Leblebici, TMH.
2. Basic VLSI Design by Douglas A Pucknell and Kamran Eshraghian, PHI, 3rd edition.

3. VHDL Programming by example – Perry TMH.

REFERENCE BOOKS:

1. Digital Integrated Circuits: A Design Perspective – Rabey et.al. Pearson Education.
2. VLSI Design Techniques for analog and digital circuits – Geiger et. Al. McGrawHill.

BIO-MEDICAL INSTRUMENTATION

Course Objective: To develop understanding of human body parts, involvement of potential and current and diseases prevailing in them, Diagnosis of diseases, calibration of intensities of effected part using statistical approach, Electronics instruments used for detection, diagnosis and therapeutic purposes.

Course Outcome:

CO1: Understand the basic of Electronics instruments for detection, diagnosis and therapeutic purposes

CO2: Analysis and uses of ECG, EEG, EMG, ERG, PLESYTHMOGRAPH, OXIMETER, DIALYSER for working easily.

CO3: CT SCAN, MRI, BLOOD GAS ANALYSER, ULTRASOUND ANDENDOSCOPES can be operated and the out-put is easily studied by practical knowledge of these.

C04: Assignment to Execute the above devices and field knowledge of patient monitoring is developed.

UNIT I: PHYSIOLOGY AND TRANSDUCERS (10 Hours)

Cell and its structure – Resting and Action Potential – Nervous system: Functional organisation of the nervous system – Structure of nervous system, neurons - synapse –transmitters and neural communication – Cardiovascular system – respiratory system – Basic components of a biomedical system - Transducers – selection criteria – Piezo electric, ultrasonic transducers – Temperature measurements - Fibre optic temperature sensors.

UNIT II: ELECTRO – PHYSIOLOGICAL MEASUREMENTS (12 Hours)

Electrodes –Limb electrodes –floating electrodes – pregelled disposable electrodes - Micro, needle and surface electrodes – Amplifiers: Preamplifiers, differential amplifiers, chopper amplifiers – Isolation amplifier.
ECG – EEG – EMG – ERG – Lead systems and recording methods – Typical waveforms.
Electrical safety in medical environment: shock hazards – leakage current-Instruments for checking safety parameters of biomedical equipment's.

UNIT III; NON-ELECTRICAL PARAMETER MEASUREMENTS (10 Hours)

Measurement of blood pressure – Cardiac output – Heart rate – Heart sound –Pulmonary function measurements – spirometer – Photo Plethysmography, Body Plethysmography – Blood Gas-analysers: pH of blood –measurement of blood pCO2, pO2, finger-tip oxymeter - ESR, GSR measurements.

UNIT IV: MEDICAL IMAGING (10 Hours)

Radio graphic and fluoroscopic techniques – Computer tomography – MRI – Ultrasonography – Endoscopy – Thermography – Different types of biotelemetry systems and patient monitoring – Introduction to Biometric systems

Assisting and therapeutic equipment:

Pacemakers – Defibrillators – Ventilators – Nerve and muscle stimulators – Diathermy – Heart – Lung machine – Audio meters – Dialysers – Lithotripsy.

[TOTAL: 42 Hrs.]

TEXT BOOKS:

1. R.S.Khandpur, 'Hand Book of Bio-Medical instrumentation', Tata McGraw Hill Publishing Co Ltd.,
2003.
2. Leslie Cromwell, Fred J. Weibell, Erich A. Pfeiffer, 'Bio-Medical Instrumentation and Measurements', II edition, Pearson Education, 2002 / PHI.

REFERENCE BOOKS:

1. M. Arumugam, 'Bio-Medical Instrumentation', Anuradha Agencies, 2003.
2. L.A. Geddes and L.E.Baker, 'Principles of Applied Bio-Medical Instrumentation', John Wiley & Sons, 1975.
3. J.Webster, 'Medical Instrumentation', John Wiley & Sons, 1995.
4. C. Rajarao and S.K. Guha, 'Principles of Medical Electronics and Bio-medical Instrumentation', Universities press (India) Ltd, Orient Longman ltd, 2000.

MICROPROCESSOR AND MICRO CONTROLLER

Course Objective: To provide fundamental idea about architecture and functionality of microprocessor, its interfacing with peripheral devices and machine label programming language.

Course Outcome:

1. Understand the Intel 8085 and 8086 Microprocessor and their application
2. Analyses the Interfacing of microprocessor with peripheral devices
3. Application of Microprocessor and Microcontroller in industrial application easily implemented.
4. Execution of Project and assignment to instal modern microprocessor based automation and robotic instrumentation.

UNIT – I: 8085 AND 8086MICROPROCESSORS (12 Hours)

8085 Microprocessor: Architecture, Pin diagram, Physical memory organization, Timing diagrams, Interrupts of 8085, Instruction set and Assembly Language Programming of 8085.

8086 Microprocessor: Architecture, signal descriptions, common function signals, Minimum and Maximum mode signals, addressing modes, interrupt structure.

UNIT – II: I/O INTERFACING (12 Hours)

Interfacing with 8086/ 8085: Interfacing with RAMs, ROMs along with the explanation of timing diagrams. Interfacing with peripheral ICs like 8255, 8254, 8279, 8259, 8259 etc. Interfacing with key boards, LEDs, LCDs, ADCs, and DACs etc.

Introduction to microprocessors like 80386, 80486.

UNIT – III: 8051 MICROCONTROLLER (10 Hours)

Overview of 8051 microcontroller Architecture I/O Ports. Memory organization, addressing modes and instruction set of 8051, Interrupts, timer/Counter and serial communication, programming Timer Interrupts, programming external hardware interrupts, programming of serial communication interrupts, programming 8051 timers and counters, Introduction to other micro controllers.

UNIT – IV: REAL WORLD INTERFACE DESIGN WITH 8051 (11 Hours)

Real world interface design: LED, SWITCH, keyboard, LCD, ADC, DAC, UART, RTC, PWM, Watch Dog Timer, DC Motor, Stepper Motors.

[TOTAL: 45 Hrs.]

TEXT BOOKS:

1. Microprocessor Architecture, Programming and Applications with the 8085, Ramesh Gaonkar, Penram International Publishing
2. Advance Microprocessor and Peripherals, By, A.K. Roy and K.M. Bhurchandi, Tata McGraw-Hill Education
3. Mazidi and Mazidi, The 8051 Micro controller and Embedded Systems, pearson Education.

REFERENCE BOOKS:

1. The 8088 and 8086 Microprocessors: Programming, Interfacing, Software, Hardware, and Applications, by Walter A. Triebel & Avtar Singh
2. Microprocessors and Interfacing, D. V. Hall, TMGH.
   The 8051 microcontrollers, Kenneth. J. Ayala. Cengage learning.
3. Microcontrollers and application, Ajay. V. Deshmukh, TMGH.
4. Micro Computer System 8086/8088 Family Architecture. Programming and Design - By Liu and GA Gibson, PHI.

INSTRUMENTATION AND CONTROL SYSTEM

Course Objective: To develop understanding of Electronics instruments using statistical approach, used for generation, analysis and measurement of electronic parameters.

Course Outcome:

CO1: Understand about the Electronic instruments

CO2: Analysis and measurement of electronic parameters and controlling technology can be done.

CO3: Design and modelling of instruments using stability criterion can be done with Data acquisition technique is easier to use practically.

CO4: Project of designing and working of newer electronic instruments with control mechanism is developed.

UNIT – I: (12 Hours)

Basics of Measurements: Accuracy, Precision, resolution, reliability, repeatability, validity, Errors and their analysis, Standards of measurement, Torque expression, Galvanometer, Voltmeter, Ammeter, meter protection Bridge Measurement: DC bridges- wheat stone bridge, AC bridges - Kelvin, Maxwell and Wien bridges, Electronic Instruments for Measuring Basic Parameters: Amplified DC meter, True- RMS responding Voltmeter, Electronic multi-meter.

UNIT – II: (10 Hours)

Cathode Ray Tube fundamentals, Sensitivity Expression, Signal Generators: Sine wave generator, Signal Analysis: Wave Analyzer, THD Analyzer, Spectrum Analyzer (brief idea only) Frequency Counters: Simple Frequency Counter.

UNIT – III: (10 Hours)

Transducers: Types, Strain Gages, Displacement Transducers, Digital Data Acquisition System, an Introduction to Computer-Controlled Test Systems.IEEE-488 GPIB Bus.

UNIT – IV: (10Hours)

Introduction, System Modeling, Transfer function, Block Diagram & Reduction Techniques, Signal Flow Graphs, Physical Systems, Feedback Control System. Stability criterion, State Space analysis, PD, PI and PID controller.

[TOTAL: 42 Hrs.]

TEXT BOOKS:

1. Modern Electronics Instrumentation & Measurement Techniques, by Albert D. Hclstrick and William D. Cooper, Pearson Education.
2. Control Systems Engineering, New Age Publication, Nagrath & Gopal

REFERENCE BOOKS:

1. Electrical and Electronics Instrumentation, A.K Shawney
2. Control Systems, Schum series

VLSI DESIGN LAB

Course Objective: To study and implement different types of VLSI Design methodologies in fabrication process of combinational and sequential logic circuits through VHDL programming.

Course Outcome:

CO1: Remember and understand the basic concepts/ Principles of VLSI Lab.

CO2: Analyse the various concepts to understand them through case studies

CO3: Apply the knowledge in understanding practical problems

CO4: Execute / Create the project or field assignment as per the knowledge gained in the course

List of Experiments:

1. (i) VHDL implementation of logic gates (and, or, not, nor, nand, exor, ex-nor).

   (ii) VHDL implementation of logic gates using universal gates (nor, nand).

2. (i) VHDL implementation of half adder.

   (ii) VHDL implementation of full adder.

3. VHDL implementation of binary-to-gray and gray-to-binary code converter.
4. VHDL implementation of multiplexer & demultiplexer.
5. VHDL implementation of decoder & encoder.
6. VHDL implementation of comparator.
7. VHDL implementation of alu.
8. VHDL implementation of n-bit adder.
9. VHDL implementation of j-k, d, t flip-flops.
10. VHDL implementation of siso, pipo shift register.
11. VHDL implementation of counter.
12. VHDL implementation 1-bit memory.

MICROPROCESSOR AND MICROCONTROLLER LAB.

Course Objective:

- To provide practical exposure to the students on microprocessors, design and coding knowledge on 80x86 family/ARM.
- To give the knowledge and practical exposure on connectivity and execute of interfacing devices with 8086/ARM kit like LED displays, Keyboards, DAC/ADC, and various other devices.

Course Outcome:

CO1: Remember and understand the basic concepts/Principles of MICROPROCESSOR & MICROCONTROLLER LAB.

CO2: Analyze the Various Concepts to understand them through case studies

CO3: Apply the knowledge in understanding practical problems

CO4: Execute / Create the project or field assignment as per the knowledge gained in the course

LIST OF EXPERIMENTS:

* Introduction to 8085 microprocessor (architecture, addressing modes, instruction set)

1. Addition of two 8-bit numbers, result is 8-bits and 16-bits.
2. Subtraction of two 8-bit numbers using sub instruction and without using sub instruction.
3. Addition of two 16-bit numbers.
4. (i) decimal addition of two 8-bit numbers.
   (ii) decimal addition of two 16-bit numbers.
5. (i) find the multiplication of two 8-bit numbers.
   (ii)find the divison of two 8-bit numbers.

5. (i) 1's and 2's complement of an 8-bit number.
   (ii) 1's and 2's complement of a 16-bit number.
6. (i) find the largest number in an array of 8-bit numbers.
   (ii) find the smallest number in the array of 8-bit numbers.
7. (i) arrange the array of 8-bit numbers in ascending order.
   (ii) arrange the array of 8-bit numbers in descending order.
8. Find the square of an 8-bit number using look-up table.
9. Find the factorial of an 8-bit number.
10. Move a block of data from one section of memory to another section of memory.
11. Fibonacci series.
12. (i) binary to bcd code conversion.
    (ii) bcd to binary code conversions.
13. Speed control of dc motor.
14. (i) square wave generator.
    (ii) sawtooth wave generator.
15. Analog to digital conversions.
16. Microcontroller- addition, subtraction, division, multiplication
17. Basic Operation of Arduino Uno or Other microcontrollers

SEMESTER – IV

LASER AND OPTO-ELECTRONICS

Course Objective: To develop understanding of different modern lasers and optical communication are used for generation, analysis and transmission along with effect and effects of light.

Course Outcome:

CO1: Understand the basic of photonic devices like laser, LED, photodiode and Optical fiber for generation, transmission.

CO2: Analyses the effects and affects of light avoiding drawbacks using optical amplifiers

CO3: Practically design of connection layout using DCF for loss less transmission can be done

C04: Execute the project of noise free optical communication answer different optical sensors with assignment of noise reduction techniques.

UNIT I (14 Hours)

Quantum Theory of Atomic Energy Levels: Radiative and Non-radiative decay of excited state atoms –Emission Broadening and linewidth, Radiation and Thermal equilibrium.

Conditions for laser action, Laser Oscillation above threshold, Laser Amplifiers, Requirements for obtaining population inversion, Rate Equations for three and four level systems, Laser pumping requirements, Laser Cavity modes, Stable resonators, Gaussian beams, Special Laser Cavities, Q-switching and Mode locking, Generation of ultrafast Optical pulses, Pulse compression. Examples of various types of Lasers.

UNIT II (08 Hours)

Detection of Optical radiations – Basic Principle, Thermal detectors, Photo multipliers, photo-conductive detectors, Photo diodes, Avalanche photodiodes, CCDs, Image Intensifiers, Diode Arrays, Solar Cells.

Noise Considerations Optoelectronic Modulators – Basic principle, Birefringence, Optical Activity, EO, AO and MO Effects and modulators.

UNIT III (10 Hours)

Basic characteristic of Optical Fiber Waveguides – Ray theory- Acceptance angle, Numerical aperture, skew rays - Electromagnetic Modes in Planar waveguides and Cylindrical Waveguides, Goos-Haenchen shift - Step index and Graded index Fibers- Single Mode and multimode fibers, modes and mode propagation in Fibres.

Dispersion in single mode fibers- dispersion induced limitations- dispersion management, Fiber losses-attenuation coefficient, Nonlinear optical effects-SRS, SBS, SPM - modal birefringence and polarization maintaining fibers.

UNIT IV (12 Hours)

Measurement Methods in Optical Fibers – attenuation, refractive index profile, numerical aperture, pulse dispersion and bandwidth, cut-off wavelength, bending loss, mode field diameter birefringence measurements, OTDR.

Coupled mode theory and applications- coupling equations, degenerate and non-degenerate mode coupling, coupling between optical source to waveguide, fiber to fiber joints, fiber splicing, optical fiber connector between waveguides Optical Fiber Amplifiers- Optical amplification, Erbium doped Fiber Amplifier, Fiber Raman Amplifier, Wide band amplifiers. Optical integrated circuits.

[TOTAL: 44 Hrs.]

TEXT BOOKS:

1. Introduction to Fiber Optics, Ghatak and Thyagarajan, Cambridge University Press (2009)
2. Foundations for Guided wave Optics, Chin-Lin Chen, John Wiley and Sons (2007)
3. Optical Fiber Communications, Gerd Keiser, Fourth Edition, Tata McGraw Hill (2008)

REFERENCE BOOKS:

1. Optical Fiber communications, J M Senior, Prentice Hall of India (1994)
2. Fiber Optic communications systems, G P Agrawal, Third Edition, Wiley Interscience (2002)
3. Integrated Optics-Theory and Technology, R G Hunsperger, Sixth edition, Springer (2009)
4. Photonics-Optical Electronics in Modern communications, A Yariv and P Yeh, Sixth edition, Oxford University Press (2007)

Semiconductor Optoelectronics – Jasprit Singh, Tata McGraw Hill, 1995

OPTICAL ELECTRONICS LAB.

Course Objective: To understand modern optical communication used for generation, analysis and transmission of Optical signals.

Course Outcome:

CO1: To understands techniques and instruments for generation, analysis

CO2: Analyses the transmission along with effect of light.

CO3: Practical knowledge of avoiding drawbacks using Advanced techniques

CO4: Design of system and conceptual project of noise free Modern high speed data transmission.

LIST OF EXPERIMENTS:

1. E-H field Polarization using Optical Polarizer.
2. Finding Numerical Aperture of SMF 28 Fiber.
3. Spot size calculation of given He-Ne Laser.
4. Study the characteristics of LED, the relationship between LED voltage and current and the Wavelength of Light Emitted.
5. Study the characteristics of LED & Opto coupler, the relationship between LED voltage and current and the Current Transfer Ratio (CRT) between Output current and Input current.
6. Familiarize with the construction and operation of Photo Detectors, using Infrared LED and photo Diode, to couple them and then finding their voltage and current also record and describe how Radiated light affects the current flow in photo Diode.
7. Familiarize with the construction and operation of photo Transistors, using Infrared LED and photo Diode, and Transistor, we can make a photo Transistor also plot Voltage and Current relationship.
8. Familiarize with the construction and operation of Light Dependent Resistors (LDR) or Photo Resistor; use Light Dependent Resistor (LDR) as a Photo Voltaic Detector and finding output Voltage and LDR Current relationship.
9. A. Evaluate the frequency response of IR LED using Opto Coupler IC (4N25), estimating 3db response.

B. Study the Characteristics of IR LED and Blue LED, the relation between voltage and current and the wavelength and compare it.

10. Understanding the principles of light transmission in optical fiber, measure critical angle and calculate Refractive Index (R.I) of the material of optical waveguide provided.
11. To determine the transmission loss due to bending of fiber cable using Opto Training Kit.
12. Determine the Transmission loss due to connectors (used) length and area of cross-section of fiber optic cable using Opto Training Kit.
13. To transfer data between Modules over optical fiber.
14. Splicing of the Single Mode Fiber (SMF) by using fusion splicer
15. Signal Interfacing to computers using optical fibre and optical signal.

MAJOR PROJECT:

(i) Final Seminar and Project Report: 6 (2+4)

(ii) Internal Assessments: 2+2 = 4

PROFESSIONAL ELECTIVE COURSES:

BASICS OF IC DESIGN

Course Objective: To provide basic knowledge and concepts of the characteristics and principle of semiconductor materials chip developments and the techniques to design and fabricates ICs and increase their throughput.

Course Outcome:

CO1: understand the basic concepts of IC design

CO2: Analyses the Fabrication for modern VLSI Technology

CO3: Materials identification for different types of IC making and design of different circuits in modern electronic instruments can be done practically.

CO4: Project on different NexGen technology to increase throughput of IC and assignment of Fabrication laboratory for future design.

UNIT-I (06 Hours)

Introduction: Introduction to IC Technology: Basic fabrication steps and their Importance. Environment of IC Technology: Concepts of Clean room and safety requirements,

UNIT-II (14 Hours)

Processes used in fabrication of modern integrated circuits: Process steps for crystal growth, Concepts of Wafer cleaning processes and wet chemical etching techniques.
Impurity Incorporation: Solid State diffusion modelling and technology; Ion Implantation modelling, technology and damage annealing, characterization of Impurity profiles Oxidation: Kinetics of Silicon dioxide growth both for thick, thin and ultra-thin films, Oxidation technologies in VLSI and ULSI, Characterization of oxide films, High k and low k dielectrics for ULSI.

UNIT-III (12 Hours)
Lithography: Photolithography, E-beam lithography and newer lithography techniques for VLSI/ULSI, Mask generation. Chemical Vapour Deposition Techniques: CVD techniques for deposition of poly-silicon, silicon dioxide, silicon nitride and metal films; Epitaxial growth of silicon: modelling and technology.

UNIT-IV (10 Hours)
Metal Film Deposition: Evaporation and sputtering techniques, Failure mechanisms in metal interconnects multi-level metallization schemes. Plasma and Rapid Thermal Processing: PECVD, Plasma etching and RIE techniques; RTP techniques for annealing, growth and deposition of various films for use in ULSI.

[TOTAL: 42 Hrs.]

TEXT BOOKS:

1. Semiconductor Devices (Physics and Technology), S. M. Sze (2nd Edition) Wiley
2. S. M. Sze (2nd Edition)" VLSI Technology", McGraw Hill Companies Inc,2003
3. C.Y. Chang and S.M. Sze, "ULSI Technology", McGraw Hill Companies Inc, 1996.

REFERENCES BOOKS:

1. Stephena, Campbell, "The Science and Engineering of Microelectronic Fabrication", Second Edition, Oxford University Press, 2005.
2. James D. Plummer, Michael D. Deal, "Silicon VLSI Technology" Pearson Education

ARTIFICIAL INTELLIGENCE

Course Objective: The primary objective of this course is to introduce the basic principles, techniques, and applications of Machine Learning, Deep Learning and Artificial Intelligence. Investigate applications of AI techniques in intelligent agents, expert systems, artificial neural networks and other machine learning models.

Course Outcome:

CO1: Understand the basic principles of AI in solutions that require problem solving, inference, perception, knowledge representation, and learning

CO2: Analyses fundamental understanding of the history of artificial intelligence (AI) and its foundations.

CO3: Demonstrate awareness and a fundamental understanding of various applications of AI techniques in intelligent agents, expert systems, artificial neural networks and other machine learning models.

CO4: Assignment of Demonstration proficiency in applying scientific method to models of machine learning. Project Execution of an ability to connect to instruments using AI, with state-of-the-art technology.

UNIT – I: INTRODUCTION (8 Hours)

Intelligent Agents: Agents and environments, Good behavior, The nature of environments, structure of agents, Problem Solving: problem solving agents, example problems, searching for solutions, uniformed search strategies - avoiding repeated states – searching with partial information.

UNIT – II: SEARCHING TECHNIQUES (10 Hours)

Informed search and exploration: Informed search strategies, heuristic function, local search algorithms and optimistic problems, local search in continuous spaces, online search agents and unknown environments, Constraint satisfaction problems (CSP): Backtracking search and Local search for CSP, Structure of problems, Adversarial Search: Games, Optimal decisions in games, Alpha, Beta Pruning, imperfect real-time decision, games that include an element of chance.

UNIT – III: KNOWLEDGE REPRESENTATION (10Hours)

First order logic: representation revisited, Syntax and semantics for first order logic, Using first order logic, Knowledge engineering in first order logic, Inference in First order logic, prepositional versus first order logic, unification and lifting, forward chaining, backward chaining, Resolution Knowledge representation : Ontological Engineering, Categories and objects, Actions, Simulation and events: Mental events and mental objects.

UNIT – IV: LEARNING AND APPLICATIONS (17Hours)

Learning from observations: forms of learning, Inductive learning, Learning decision trees, Ensemble learning - Knowledge in learning – Logical formulation of learning – Explanation based learning – Learning using relevant information – Inductive logic programming - Statistical learning methods - Learning with complete data - Learning with hidden variable - EM algorithm - Instance based learning - Neural networks - Reinforcement learning – Passive reinforcement learning - Active reinforcement learning - Generalization in reinforcement learning.

Communication – Communication as action – Formal grammar for a fragment of English – Syntactic analysis – Augmented grammars – Semantic interpretation – Ambiguity and disambiguation – Discourse understanding – Grammar induction - Probabilistic language processing - Probabilistic language models – Information retrieval – Information Extraction – Machine translation.

[TOTAL: 45 Hrs.]

TEXT BOOKS:

1. Stuart Russell, Peter Norvig, “Artificial Intelligence – A Modern Approach”, Pearson Education/ Prentice Hall of India, 2004.

REFERENCES BOOKS:

2. Nils J. Nilsson, "Artificial Intelligence: A new Synthesis", Harcourt Asia Pvt. Ltd., 2000.
3. Elaine Rich and Kevin Knight, "Artificial Intelligence", 2nd Edition, Tata McGraw-Hill, 2003.
4. George F. Luger, "Artificial Intelligence-Structures And Strategies For Complex Problem Solving", Pearson Education / PHI, 2002.

DIGITAL DESIGN WITH VHDL

Course Objective: To provide basic knowledge and concepts of design digital systems using a hardware description language, VHDL.

Course Outcome:

CO1: Understand the fabrication process of high dense IC technology.

CO2: Analysis of the operation of different MOS technology for less device requirement in small space.

CO3: Practically to measure performance and testing of VHDL and Xilinx tools.

CO4: Assignment of packaging of large-scale integration of embedded systems and project of ultra-high speed throughput of VHDL system of embedded integration.

UNIT I: (08 Hours)

Introduction to the course: Design of digital systems using a hardware description language, VHDL

UNIT II: (12 Hours)

Logic Synthesis: basics of number representation and conversion, Boolean algebra, combinational circuit design and sequential circuit design with VHDL
Clocked Circuits in VHDL: synchronous /asynchronous finite state machines

UNIT III: (12 Hours)

Behavioral VHDL: measurement of performance, and testing, of digital systems
Hardware simulation & synthesis in VHDL: Introduction to a Simulation Tool (Modelsim),Xilinx ISE Webpack software tools,Delay Models

UNIT IV: (12 Hours)

Arithmetic Packages & types in VHDL: Arrays in VHDL, FSMs in VHDL
Advanced Topics, Synthesis & Optimization, Testbench Design. Verification Methodology: File access in VHDL, Important HDLs & CAD Tools, Design styles, Programmable Logic Devices

[TOTAL: 44 Hrs.]

TEXT BOOKS:

1. Fundamentals of Digital Logic with VHDL Design. Stephen Brown, ZvonkoVranesic-McGraw-Hill, 2000.
2. VHDL for Logic Synthesis.-Andrew Rushton John Wiley & Sons

DIGITAL IMAGE PROCESSING

Course Objective: The objective of the course is to understand a digital image and different processing techniques for the better analysis of an image.

Course Outcome:

CO1: Understand the need for image transforms different types of images transforms and their properties.

CO2: Analyses image processing techniques for application.

CO3: Practicality of the rapid advances in Machine vision with NexGen technology and different techniques employed for the enhancement of images

CO4: Execution of assignment of image segmentation and differentiation. Project of image enhancement and clarity in imaging can be done.

UNIT – I: DIGITAL IMAGE FUNDAMENTALS AND TRANSFORMS (10 Hours)

Elements of visual perception: Light, Brightness adaption and discrimination, Pixels, coordinate conventions, Imaging Geometry, Image sampling and quantization Basic relationship between pixels: Basic geometric transformations-Introduction to Fourier Transform and DFT: Properties of 2D Fourier Transform, FFT, Separable Image Transforms, Walsh – Hadamard – Discrete Cosine Transform, Haar, Slant – Karhunen – Loeve transforms. Perspective Projection, Spatial Domain Filtering, sampling and quantization.

UNIT – II: IMAGE ENHANCEMENT TECHNIQUES (8 Hours)

Spatial Domain methods: Basic grey level transformation, Histogram equalization, Image subtraction, Image averaging, Spatial filtering: Smoothing, sharpening filters, Laplacian filters, Frequency domain filters: Smoothing, Sharpening filters, Homomorphic filtering.

UNIT – III: IMAGE RESTORATIONAND IMAGE COMPRESSION (16 Hours)

Model of Image Degradation/restoration process: Noise models, inverse filtering, least mean square filtering, constrained least mean square filtering, blind image restoration, Pseudo inverse, Singular value decomposition.

Lossless compression: Variable length coding: LZW coding, Bit plane coding- predictive coding, DPCM.

Lossy Compression: Transform coding – Wavelet coding – Basics of Image compression standards: JPEG, MPEG, Basics of Vector quantization

UNIT – IV: IMAGE SEGMENTATION AND REPRESENTATION (10 Hours)

Edge detection: Thresholding, Region Based segmentation, Boundary representation: chair codes, Polygonal approximation, Boundary segments: boundary descriptors: Simple descriptors, Fourier descriptors, Regional descriptors, Simple descriptors, Texture

[TOTAL: 44 Hrs.]

TEXT BOOKS:

1. Digital Image Processing, 3rd Edition, by Rafael C Gonzalez and Richard E Woods. Publisher: Pearson Education.

REFERENCE BOOKS:

1. Fundamentals of Digital Image Processing, By Anil K Jain
2. Digital Image Processing, By William K Pratt, John Willey (2001)
3. Image Processing Analysis and Machine Vision, By Millman Sonka, Vaclav hlavac, Roger Boyle, Broos/colic, Thompson Learniy (1999).
4. Digital Image Processing and Applications, By, B. Chanda, D. Dutta Magundar, Prentice Hall of India, 2000

COMPUTER VISION & IMAGE PROCESSING

Course Objective: This course introduces fundamental concepts and techniques for image processing and computer vision. Topics to be covered include image formation, image filtering, edge detection and segmentation, morphological processing, registration, object recognition, object detection and tracking, 3D vision, etc.

Course Outcome:

CO1: Understand the major concepts and techniques in computer vision and image processing

CO2: Analyses to understand state of the art technology in research in the field's computer vision and image processing.

CO3: Computer vision and image processing knowledge by designing and implementing algorithms to solve practical problems.

CO4: Project to prepare for research in computer vision and image processing and assignments to develop algorithms.

UNIT -I (10 Hrs.):

What Is Digital Image Processing? Application of Digital Image Processing. Fundamental Steps in Digital Image Processing. Components of an Image Processing System. Human Visual System, Image Sensing and Acquisition, Digital Image Representation: Image Sampling, Quantization. Image size, Image Resolution, Some Basic Relationships between Pixels. Linear and Nonlinear Operations. Low level and High level Image Processing,

UNIT -II (10 Hrs.):

Image Enhancement in Spatial Domain: Some Basic Gray Level Transformations. Histogram Processing. Enhancement Using Arithmetic/Logic Operations. Basics of Spatial Filtering. Smoothing Spatial Filters. Sharpening Spatial Filters.

Image Enhancement in Frequency Domain: Introduction to the Fourier Transform and the Frequency Domain. Smoothing Frequency- Domain Filters. Sharpening Frequency Domain Filters. Homomorphic Filtering.

UNIT -III (12 Hrs.):

Morphological Image Processing: Dilation and erosion, opening and closing, Hit-or-Miss transformations, basic morphological algorithms,

Image Segmentation: Application of image segmentation, Edge Based Segmentation, Threshold Based Segmentation, Detection of discontinues, Edge linking and boundary detection, thresh holding, Region – based segmentation.

UNIT -IV (10 Hrs.):

Computer Vision: Camera Calibration, Patterns, Features Extraction, Statistical Methods for Classification, Clustering, Scene Matching and Analysis, Bidirectional Reflection Distribution Function, Optical Flow, Shape from Shading, Structure from Motion, Three Dimensional Structure Representation.

[TOTAL: 42 Hrs.]

Text Books:

1. Rafael C. Gonzales and Richard E. Woods, "Digital Image Processing", Pearson Education, Reprint 2004
2. Anil K. Jain, "Fundamental of Digital Image Processing", PHI, EEE, 3rd reprint 1997

References:

1. David A. Forsyth and Jean Ponce,"Computer Vision: A Modern Approach", Prentice -Hall, 2004
2. J. R. Parker, "Algorithms for Image Processing and Computer Vision", Wiley ,1996
3. Robert M. Haralick and Linda G. Shapiro, "Computer and Robot Vision**",** Addison Wesley, 1992

WIRED AND WIRELESS COMMUNICATION

Course Objective: To develop understanding of modern digital communication Techniques using different Transmission and receiving system and the the power involved.

Course Outcome:

CO1: Understand Data transmission at high speed in different medium using hybrid Techniques

CO2: Able to Optimize different modern digital communication Techniques and the power consumption

CO3: Data transmission at high speed in different medium using hybrid Techniques such as 3G,4G,5G.

CO4: Projects to develop noise free communication of signal as well as data.

Assignments of visiting Service providers establishment for applicative ideas.

UNIT I: (10 Hours)

Introduction to exclusive growth of Telecommunication: Wired Telephone system, PSTN, Cellular telephony and Techniques: GSM, GPRS, GPS, 3G&4G, CDMA, TDMA, FDMA, OFDM.

UNIT II: (10 Hours)

Local Area Network, IEEE LAN Standards, Wireless LAN, world wide web and related technology, Digital Subscriber line and ISDN.

Television system: Standard for TV and CATV system, Digital TV, HDTV transmission.

UNIT III: (12 Hours)

Satellite Communication System: Digital and analog Television transmission, Data and telephone signal multiple access, Satellite phone system

Fiber optics system: introduction to high speed data transmission using fiber cables, structure of optical and electronics linking, Data transmission techniques, ATM, SONET

UNIT IV: 4 (10 Hours)

Link Budget Analysis: Signal power, noise characterization, Link budget evaluation, Eb/N0 link budget for Digital system. Path loss for wireless environment. Effective transmission using noise reduction techniques.

[TOTAL: 42 Hrs.]

TEXT BOOKS:

1. Digital and Analog Communication system by Leon.W.Couch II, Pearson Publication.

REFERENCES:

1. Computer Networking. By Keneth C. Mafield and etal.
2. Communication by Taub Schilling.
3. Optical Fiber communication by G.Keiser.

WIRELESS SENSOR NETWORKS

Course Objective: The purpose of this course is to introduce students to

Obtain a broad understanding about the network architecture of wireless sensor network.Understand all basic characteristics of wireless sensor networks and sensor nodes.The principles of data transmission, clustering algorithm and routing protocols.Design and development of new network architecture and MAC protocols.

Course Outcome:

CO1: Understand the concepts of wireless sensor network.

CO2: Analysis of Scheduling of medium.

CO3: Practical of data routing and networking

CO4: Assignment of schedule of acess of medium and project on the data enrooting to different location depending speed and use.

UNIT – I: (10 Hours)

Networked wireless sensor devices, Applications, Key design challenges.
Network deployment: Structured versus randomized deployment, Network topology, Connectivity, Connectivity using power control, Coverage metrics, Mobile deployment.

UNIT – II: (10 Hours)

Localization: issues & approaches, Coarse-grained & Fine-grained node localization, Network-wide localization, Theoretical analysis of localization techniques.
Synchronization: Issues & Traditional approaches, Fine-grained clock synchronization, and Coarse-grained data synchronization.

UNIT – III: (10 Hours)

Wireless characteristics: Basics, Wireless link quality, Radio energy considerations, SINR capture model for interference.
Medium-access and sleep scheduling: Traditional MAC protocols, Energy efficiency in MAC protocols, Asynchronous sleep techniques, Sleep-scheduled techniques, and Contention-free protocols.
Sleep-based topology control: Constructing topologies for connectivity, constructing topologies for coverage

UNIT – IV: (12 Hours)

Routing: Metric-based approaches, Routing with diversity, Multi-path routing, Lifetime-maximizing energy-aware routing techniques, Geographic routing, Routing to mobile sinks.
Data-centric networking: Data-centric routing, Data-gathering with compression, Querying, Data-centric storage and retrieval, The database perspective on sensor networks.

Introduction to Tiny OS, NesC, Sensor Simulator,

[TOTAL: 42 Hrs.]

TEXT BOOKS:

1. Wireless Sensor Networks: Technology, Protocols, and Applications: KazemSohraby, Daniel Minoli, TaiebZnati , Wiley Inter Science.
2. Wireless Sensor Networks: Architectures and Protocols: Edgar H. Callaway, Jr. Auerbach Publications, CRC Press.
3. Wireless Sensor Networks: Edited by C.S Raghavendra, Krishna M, Sivalingam, TaiebZnati , Springer.

REFERENCE BOOKS:

1. Networking Wireless Sensors: BhaskarKrismachari, Cambridge University Press
2. Distributed Sensor Networks: A Multiagent Perspective, Victor Lesser, Charles L. Ortiz, and MilindTambe , Kluwer Publications.
3. Wireless Sensor Networks: An Information Processing Approach- by Feng Zhao, Leonidas Guibas , Morgan Kaufmann Series in Networking 2004.

MOBILE COMMUNICATIONS

Course Objective: To impart the new concepts in Mobile communications.

Course Outcome:

CO1: Remember and understand the basic concepts/ Principles of Wireless Communication

CO2: Analyse the various concepts to understand them through case studies

CO3: Apply the knowledge in understanding practical problems

CO4: Execute / Create the project or field assignment as per the knowledge gained in the course

UNIT – I: (14 Hours)

An Overview of Wireless Systems: Introduction, First- and Second-Generation Cellular Systems, Cellular Communications from 1G to 3G, Wireless 4G Systems, Future Wireless Networks

Cellular Concept – System Design: Fundamentals: Frequency reuse, Channel Assignment, Handoff Strategies, Interferences and System Capacity, Trunking and Grade of Service; Improving coverage and capacity in Cellular Systems – Cell Splitting, Sectoring, Repeaters and Range Extension, Microcell & Picocell Zone Concept. Antennas for Base Station and hand held Cellular phone.

UNIT – II: (12 Hours)

Mobile Radio Propagation: Large –Scale path loss, Ground Reflection Model, Diffraction, Scattering. Outdoor propagation Model – Okumura Model; Indoor Propagation Model: Partition loses, Log distance Path loss Model.

Small Scale Fading and Multipath propagation, Dopper' Shift. Types of Small Scale Fading and their effect on received signal.

UNIT – III: (10 Hours)

Modulation schemes: Introduction, Introduction to modulation, Phase Shift Keying, Quadrature Amplitude Modulation, M-ary Frequency Shift Keying, Synchronization, Equalization

Spread Spectrum(SS) and CDMA Systems: Introduction, Concept of Spread Spectrum, System Processing Gain, Requirements of Direct-Sequence Spread Spectrum, Frequency-Hopping Spread Spectrum Systems

UNIT – IV: (10 Hours)

Wireless Networking: Various Generations of Wireless Networks, Fixed Network Transmission Hierarchy, Traffic Routing in Wireless Networks – Circuit Switching, Packet Switching. The X. 25 Protocol.

Global System for Mobile (GSM): features, architecture, channel types, Frame Structure in GSM. Signal processing in GSM

[TOTAL: 46 Hrs.]

TEXT BOOKS:

1. Wireless Communication, 2nd Edition by Theodore S. Rappaport , Pearson Publication.
2. Mobile Communication Engg., 2nd Edition by William C. Y. Lee McGraw Hill International Edition.

REFERENCE BOOKS:

1. Mobile Cellular Communications, 2nd Edition by William C. Y. Lee McGraw Hill International Edition.
2. Mobile Communication, 2nd Edition by Jocken Schiller, Pearson Education.
3. Wideband Wireless Digital Communication by Andreas F. Molisch Editor Pearson Education.

MOBILE COMPUTING

Course Objective: Describe wireless and mobile communications systems and be able to choose an appropriate mobile system from a set of requirements.

Course Outcome:

CO1: Understands the cellular networks and its areas of working.

CO2: Analysis to avoid or work around the weaknesses of mobile computing, or to reject mobile computing as a solution.

CO3: Practically Interface a mobile computing system to hardware and networks and Program applications on a mobile computing system and interact with servers and database systems

CO4: Assignments of visiting mobile service centers and project of giving ideas netwok protocol linking to different systems.

UNIT – I: (10 Hours)

A brief introduction to Mobile Telephony:

Cellular Concept, Frequency reuse, Channel Assignment, Handoff Strategies, Interferences and System Capacity, Improving coverage and capacity in Cellular Systems – Cell Splitting, Sectoring, Repeaters and Range Extension, Microcell &Picocell Zone Concept. Antennas for Base Station and hand held Cellular phone.

UNIT – II: (12 Hours)

Introduction to Personal Communications Services (PCS): PCS Architecture, mobility management, Networks signalling, Global System for Mobile Communication (GSM). System overview: GSM Architecture, Mobile management, Network signalling. General Packet Radio Services (GPRS): GPRS Architecture, GPRS Network Nodes.

UNIT – III: (10 Hours)

Wireless Application Protocol (WAP): The Mobile Internet standard, WAP Gateway and Protocols, wireless mark up Languages (WML), Wireless Local Loop (WLL): Introduction to WLL Architecture, wireless Local Loop Technologies.

Third Generation (3G) Mobile Services: Introduction to International Mobile Telecommunications 2000 (IMT 2000) Vision, Wideband Code Division Multiple Access (W-CDMA), and CDMA 2000.

UNIT – IV: (10 Hours)

Mobile Data Communication: WLANs (Wireless LANs), IEEE 802.11 standards, Mobile IP.

Global Mobile Satellite Systems: case studies of the IRIDIUM and GLOBALSTAR systems. Wireless Enterprise Networks: Introduction to Virtual Networks,VPN, Blue tooth technology, Blue tooth Protocols, Mobile Adhocnetworks, 4G Technology.

[TOTAL: 42 Hrs.]

Text Book:

1. Mobile computing, Talukder, TMH, 2010.
2. Mobile Communication,J.Schiller, Pearson, 2010.
3. Wireless Communication, T. S Rappaport, Pearson.

Reference Book:

1. Guide to Designing and Implementing Wireless LANs, Mark Ciampa, Thomson Learning, Vikas Publishing House, 2001
2. Wireless Web Development, Ray Rischpater, Springer Publishing
3. The Wireless Application Protocol, SandeepSinghal, Pearson
4. Third Generation Mobile Telecommunication Systems, by P.Stavronlakis, Springer Publishers.
5. Pervasive Computing, Burkhardt, Pearson

MICROWAVE AND ANTENNA THEORY

Course Objective: To develop understanding microwave generation and propagation using Maxwell's equations in different waveguide. Transmission and receiving of EM-wave using different types antennas.

Course Outcome:

CO1: Students will able to understand different Electromagnetic phenomenon

CO2: Students will able to analyse and calculate power of microwave

CO3: Practically calculate field at different boundaries and propagation of wave in different waveguide and,

CO4: Assignment of developing an understanding of material and wave interaction along with project of radiation from and to a system using antennas and its effect and affects.

Unit I: (10 Hours)

Introduction to Transmission line, Transmission line equations and solution, Reflection coefficient and Transmission equation, standing wave ratio standing wave ratio. Line impedance and admittance. Smith chart, Impedance matching, Micro strip lines. Parallel strip lines.

Unit II: (12 Hours)

Parallel plate Waveguide, Rectangular Wave Guide: Field Components, TE, TM Modes, Dominant TE_{10} mode, Field Distribution, Power, Attenuation. Circular Waveguides: TE, TM modes. Wave Velocities, Microwave Cavities, Scattering Matrix, Passive microwave devices: Microwave Hybrid Circuits, Terminations, Attenuators, Phase Shifters, Directional Couplers: Two Hole directional couplers, S Matrix of a Directional coupler, Hybrid Couplers, Microwave Propagation in ferrites, Faraday Rotation, Isolators, Circulators. S parameter analysis of all components.

Unit III: (12 Hours)

Microwave Tubes: Limitation of Conventional Active Devices at Microwave frequency, Two Cavity Klystron, Reflex Klystron, Magnetron, Traveling Wave Tube, Backward Wave Oscillators: Their Schematic, Principle of Operation, Performance Characteristic and their applications. Microwave Solid state devices: Microwave Bipolar Transistor, Microwave tunnel diode, Microwave Field-effect Transistor, transferred electron devices, Avalanche Transit -time devices: IMP ATT Diode, TRAPPAT Diode.

Unit IV: (12 Hours)

Basics of Antenna: Power radiated by a current element, Application to short antenna, Radiation from a quarter wave monopole and half wave dipole, Introduction to antenna arrays: Horizontal pattern in Broadcast arrays, Linear arrays. Multiplication of patterns, Antenna gain, Effective area.

Examples of Types of Antenna: Yagi-Uda Antenna Design, Long-Wire Antennas, folded Dipole Antennas. Characteristic Properties of Loop Antenna, Application of Loop Antennas, Far Field Patterns of Circular Loop Antennas with Uniform Current, Slot Antennas, Horn Antennas, Helical Antennas, The Log-Periodic Antenna, Micro strip Antennas, Reflector Antennas.

[TOTAL: 46 Hrs.]

Text Books:

1. Microwave Engineering, David M. Pozar, 4thEdition , John wiley& sons.

2. Antenna and Radiowave Propagation, Robert E Collin, Mcgraw-Hill,

Reference Books:

1. Elements of Electro Magnetics, Matthew N.O.Sadiku, Oxford Univ. Press.

2. Microwave Devices and Circuits Samuel Y.Lio. 3rd Edition Prentice Hall

3. Antenna Theory and Design, Warren L. Strutzmanetal., Eiley and Sons

4. Radio frequency and Microwave Communication Circuit: Analysis and Design, Devendra K. Mishra, John wiley and Sons.

OPTICAL COMMUNICATION

Course Objective: To develop understanding of modern optical communication and the techniques used for generation, analysis and transmission along with effect and affects of light.

Course Outcome:

CO5: Able to understands techniques and instruments for generation, analysis

CO6: Analyses the transmission along with effect and affects of light.

CO7: Practical knowledge of avoiding drawbacks using Advanced techniques

CO8: Assignment of Design of system and conceptual project to design noise free Modern high speed data transmission.

UNIT –I: (10 Hours)

Signal propagation in Optical Fibers: Geometrical Optics approach and Wave Theory approach, Loss and Bandwidth, Chromatic Dispersion, Non-Linear effects- Stimulated Brillouin and Stimulated Raman Scattering, Propagation in a Non-Linear Medium, Self-Phase Modulation and Cross Phase Modulation, Four Wave Mixing, Principle of Solitons.

UNIT –II: (10 Hours)

Fiber Optic Components for Communication & Networking: Couplers, Isolators and Circulators, Multiplexers, Bragg Gratings, Fabry-Perot Filters, Mach Zender Interferometers, Arrayed Waveguide Grating, Tunable Filters, High Channel Count Multiplexer Architectures, Optical Amplifiers, Direct and External Modulation Transmitters, Pump Sources for Amplifiers, Optical Switches and Wavelength Converters.

UNIT –III: (10 Hours)

Modulation and Demodulation: Signal formats for Modulation, Subcarrier Modulation and Multiplexing, Optical Modulations – Duobinary, Single Side Band and Multilevel Schemes, Ideal and Practical receivers for Demodulation, Bit Error Rates, Timing Recovery and Equalization, Reed-Solomon Codes for Error Detection and Correction.

UNIT -IV: (10 Hours)

Transmission System Engineering: System Model, Power Penalty in Transmitter and Receiver, Optical Amplifiers, Crosstalk and Reduction of Crosstalk, Cascaded Filters, Dispersion Limitations and Compensation Techniques.

UNIT –V: (08 Hours)

Fiber Non-linearities and System Design Considerations: Limitation in High Speed and WDM Systems due to Non-linearities in Fibers, Wavelength Stabilization against Temperature Variations, Overall System Design considerations – Fiber Dispersion, Modulation, Non-Linear Effects, Wavelengths, All Optical Networks.

[TOTAL: 48 Hrs.]

TEXT BOOKS:

1. Optical Networks: A Practical Perspective - Rajiv Ramaswami and Kumar N. Sivarajan, 2nd Ed., 2004, Elsevier Morgan Kaufmann Publishers (An Imprint of Elsevier).
2. Optical Fiber Communications – Gerd Keiser, 3rd Ed., 2000, McGraw Hill.

REFERENCE BOOKS:

1. Optical Fiber Communications: Principles and Practice – John.M.Senior, 2nd Ed., 2000, PE.

2. Fiber Optics Communication – Harold Kolimbris, 2nd Ed., 2004, PEI
3. Optical Networks: Third Generation Transport Systems – Uyless Black, 2nd Ed., 2009, PEI
4. Optical Fiber Communications – GovindAgarwal, 2nd Ed., 2004, TMH.
5. Optical Fiber Communications and Its Applications – S.C.Gupta, 2004, PHI.