Syllabus

Choice Based Credit System (CBCS)

in

M. Sc. Electronics

(Under the Faculty of Science and Technology)

Approved by the Board of Studies in Electronics

Scheme of teaching and examination under semester pattern Choice Based Credit System (CBCS) for M. Sc. Electronics

Semester I for M. Sc. Electronics											
Code	Theory / Practical	Teaching scheme (Hours / Week)			Credits	Examination Scheme					
						Duration in hrs.	Max. Marks		Total Marks	Minimum Passing Marks	
		Th	Pract	Total			External Marks	Internal Ass		Th	Pract
Paper 1	1T1 Fundamentals of Semiconductor Devices	4	-	4	4	3	80	20	100	40	
Paper 2	1T2 Digital Design and Applications	4	-	4	4	3	80	20	100	40	
Paper 3	**1T3** Advanced Microprocessors	4	-	4	4	3	80	20	100	40	
Paper 4	**1T4** Programming in C	4	-	4	4	3	80	20	100	40	
Practical 1	**1P1 based on theory paper-1T1 and 1T2**	-	8	8	4	3-8*	100 **	-	100		40
Practical 2	**1P2 based on theory paper-1T3 and 1T4**	-	8	8	4	3-8*	100 **	-	100		40
Seminar 1	Seminar 1	2	-	2	1			25	25	10	
	TOTAL	**18**	**16**	**34**	**25**		**520**	**105**	**625**	**170**	**80**

Semester II for M.Sc. Electronics											
Code	Theory / Practical	Teaching scheme (Hours / Week)			Credits	Examination Scheme					
						Duration in hrs.	Max. Marks		Total Marks	Minimum Passing Marks	
		Th	Pract	Total			External Marks	Internal Ass		Th	Pract
Paper 1	**2T1** Embedded Systems and Applications	4	-	4	4	3	80	20	100	40	
Paper 2	**2T2** Biomedical Instrumentation	4	-	4	4	3	80	20	100	40	
Paper 3	**2T3** Computer Organisation and Interfacing	4	-	4	4	3	80	20	100	40	
Paper 4	2T4 Virtual Instrumentation and Programming in LabVIEW	4	-	4	4	3	80	20	100	40	
Practical 1	**2P1 based on theory paper- 2T1 and 2T2**	-	8	8	4	3-8*	100 **	-	100		40
Practical 2	**2P2 based on theory paper- 2T3 and 2T4**	-	8	8	4	3-8*	100 **	-	100		40
Seminar 2	Seminar 2	2	-	2	1			25	25	10	
	TOTAL	**18**	**16**	**34**	**25**		**520**	**105**	**625**	**170**	**80**

Semester III for M.Sc. Electronics											
Code	Theory / Practical	Teaching scheme (Hours / Week)			Credits	Examination Scheme					
						Duration in hrs.	Max. Marks		Total Marks	Minimum Passing Marks	
		Th	Pract	Total			External Marks	Internal Ass		Th	Pract
Paper 1	**3T1** Network Analysis and Synthesis	4	-	4	4	3	80	20	100	40	
Paper 2	**3T2** Fuzzy Logic and Artificial Neural Networks	4	-	4	4	3	80	20	100	40	
Paper 3 (Core Elective 1)	**3T3** Digital signal Processing **CE1-2** Digital Image Processing	4	-	4	4	3	80	20	100	40	
Paper 4 (Foundation Course 1/ Core(Discipline Centric)1)	**3T4** **FC1** Basic Electronics **CDC1** Mechatronics	4	-	4	4	3	80	20	100	40	
Practical 1	**3P1 based on theory paper- 3T1 and 3T2**	-	8	8	4	3-8*	100 **	-	100		40
Practical 2	**3P2 based on theory paper 3T3**	-	8	8	4	3-8*	100 **	-	100		40
Seminar 3	Seminar 3	2	-	2	1			25	25	10	
	TOTAL	**18**	**16**	**34**	**25**		**520**	**105**	**625**	**170**	**80**

Semester IV for M.Sc. Electronics											
Code	Theory / Practical	Teaching scheme (Hours / Week)			Credits	Examination Scheme					
						Duration in hrs.	Max. Marks		Total Marks	Minimum Passing Marks	
		Th	Pract	Total			External	Internal Ass		Th	Pract
Paper 1	**4T1** Electromagnetic Fields and Antennas	4	-	4	4	3	80	20	100	40	
Paper 2	**4T2** Digital Communication	4	-	4	4	3	80	20	100	40	
Paper 3 (Core Elective 2)	**4T3** **CE2-1** Microwave and Optical Communication **CE2-2** Computer Communication	4	-	4	4	3	80	20	100	40	
Paper 4 (Foundation Course 2/ Core(Discipline Centric)2)	**4T4** **FC2** PC and PC Interfacing **CDC2** Mobile and Satellite Communication	4	-	4	4	3	80	20	100	40	
Practical 1	4P1 **based on theory paper 4T1, 4T2 and 4T3.**	-	8	8	4	3-8*	100 **	-	100		40
Project	Project		8	8	4		100 **	-	100		40
Seminar 4	Seminar 4	2	-	2	1			25	25	10	
	TOTAL	**18**	**16**	**34**	**25**		**520**	**105**	**625**	**170**	**80**

Note: Th = Theory; Pr = Practical/lab, * = If required, for two days.

** = The Practical and Project shall be evaluated by both External and Internal Examiner in the respective Department / Center / Affiliated College as per guidelines appended with this direction.

Syllabus

M. Sc. Electronics
Semester I

Code	Paper
EC 1T1	Fundamentals of Semiconductor Devices
EC 1T2	Digital Design and Applications
EC 1T3	Advanced Microprocessors
EC 1T4	Programming in C

Practicals

Code	Practical
EC 1P1	Lab Course I- Analog and Digital Electronics Lab
EC 1P2	Lab Course II- Computer Interfacing and Programming in C
EC 1S1	Seminar

Semester II

Code	Paper
EC 2T1	Embedded Systems and Applications
EC 2T2	Biomedical Instrumentation
EC 2T3	Computer Organisation and Interfacing
EC 2T4	Virtual Instrumentation and Programming in LabVIEW

Practicals

Code	Practical
EC 2P1	Lab Course III – Embedded Systems and Applications; and Biomedical Instrumentation
EC 2P2	Lab Course IV- Advanced PC Interfacing; and Virtual instrumentation & Programming in Lab VIEW
EC 2S2	Seminar

Semester III

Code	Paper
EC 3T1	Network Analysis and Synthesis
EC 3T2	Fuzzy Logic and Artificial Neural Networks
EC 3T3-1	Digital signal Processing
EC 3T3-2	Digital Image Processing
EC 3TF1	Basic Electronics
EC 3TSC1	Mechatronics

Practicals

Code	Practical
EC 3P1	Lab Course V- Network Analysis; Fuzzy Logic and Artificial Neural Network using MATLAB
EC 3P2	Lab Course VI- Digital Signal Processing using MATLAB
EC 3S2	Seminar

Semester IV

Code	Paper
EC 4T1	Electromagnetic Fields and Antennas
EC 4T2	Digital Communication
EC 4T3-1	Microwave and Optical Communication
EC 4T3-2	Computer Communication
EC 4TF2	PC and PC Interfacing
EC 4TSC2	Mobile and Satellite Communication

Practicals

Code	Practical
EC 4P1	Lab Course VII – Antenna and Digital Communication Lab; and Microwave & Optical Communication/ Mobile and Satellite Communication
EC 4P2	Project and Seminar
4S2	Seminar

M. Sc. Semester I (Electronics)

Paper I (EC 1T1): Fundamentals of Semiconductor Devices

Unit I: Semiconductors

Valence bond model of semiconductor- intrinsic and extrinsic semiconductors, the energy band model; p-n junction, depletion region and capacitance; the diode equation, I-V characteristics, temperature dependence, electrical breakdown in p-n junctions, Zener and avalanche breakdowns; IMPATT, TRAPATT, PIN diode

Unit II: Bi-polar Junction Transistors

Transistor action, the Ebres-Moll equations, CB, CE, CC configurations and characteristics, high frequency performance of transistor, alpha and beta cut-off frequencies, microwave transistor, switching transistor

Unit III: Unipolar Devices

Metal-semiconductor contacts, the Schottky effect, JFET and MESFET, device characteristics, MOSFET, basic characteristics, charge-coupled devices (CCD)

Unit IV: Optoelectronic Devices

Photovoltaic effect, the p-n junction solar cell, I-V characteristics, photo-detectors: photoconductor, photodiode, avalanche photodiode;

LEDs: radiative and non-radiative transitions; semiconductor LASERS, population inversion

Books:

1. Introduction to Semiconductor Materials and Devices: M. S. Tyagi, Wiley India Ltd, New Delhi
2. Physics of Semiconductor Devices: Shur, Prentice Hall India, New Delhi

References:

1. Physics of Semiconductor Devices: S. M. Sze, Wiley eastern Publ.
2. Solid State Electronic Devices: Ben G. Streetman

M. Sc. Semester I (Electronics)

Paper II (EC 1T2): Digital Design and Applications

Unit I: Combinational Logic Design

Simplification of logic functions using K-maps, don't care conditions, realization of Boolean functions using two level NAND-NAND, NOR-NOR logic, multiplexers, decoders, ROM, PLA; Interfacing of logic families: open- collector, totem-pole and tri-state outputs, TTL-CMOS interfacing, CMOS-TTL interfacing, loading rules, fan-out

Unit II: Analysis and Design of Sequential circuits:

State diagrams, characteristic equations of different flip-flops, conversion from one type to another type of flip flops, Mealy and Moore models, design of a sequence detector, minimization of states, design of counters with lockout prevention; Asynchronous sequential circuits; ripple counters, detection and removal of races and hazards

Unit III: VHDL: Implementation of Logic circuits

VHDL: capabilities, hardware abstraction; basic terminologies: primary constructs: entity declaration, architecture body, configuration declaration, package declaration, package body; model analysis, simulation; basic language elements: identifiers, data objects, data types, operators; behavioral modeling, dataflow modeling, structural modeling, generics and configurations; VHDL codes for logic gates: NOT, NAND, NOR, AND, OR, EXOR, EXNOR; flip-flops: RSFF, clocked RSFF, DFF, TFF, JKFF, JKMSFF; combinational logic circuits: half adder, full adder and subtractor, decoder, encoder, MUX, DEMUX

Unit IV: CPLD and FPGA

Architectures of ROM, PLA, PAL; CPLD: block diagram, macrocell, logic array blocks (LAB), in-system programming (ISP), Joint Test Action Group (JTAG) port; packaging of CPLDs, Applications of CPLD; CPLD families: Altera (MAX 3000A), Cool Runner (XC2C32A); FPGA: architecture, configurable logic block (CLB), logic modules, look-up table (LUT); FPGA cores; FPGA process technology; Xilinx Virtex FPGAs, Altera Stratix FPGAs, logic array block (LAB), Adaptive Logic Modules (ALM), operating modes of ALM; design of simple reconfigurable digital systems;

Practicals:

1. Design of some combinational circuits using NAND and NOR gates
2. Design of circuits using multiplexers
3. Design of circuits using a decoder and gates
4. Design of circuits using PLA
5. Design of binary comparator circuit
6. Design of UP/DN synchronous counter using DFFs
7. Design of Ripple counter using TFFs
8. Design of sequence detector circuits
9. Design of pulse gulper circuit

10. Digital System Design Experiments based on CLPD kits
11. Digital System Design Experiments based on FPGA

Books:

1. Logic Design : Charles Roth, Jaico Publications, New Delhi
2. Digital Design : Morris Mano, Prentice Hall India, New Delhi
3. Digital Principles and Applications : A. P. Malvino, MGH
4. Digital System Design using VHDL: Charles H. Roth, Jaico Publishers, New Delhi
5. Fundamentals of Digital Logic with VHDL Design: Stephen Brown, TMH, New Delhi

References:

1. Modern Digital Electronics: R. P. Jain, Tata McGraw Hill, New Delhi
2. VHDL : Douglas Perry, Tata McGraw Hill, New Delhi
3. VHDL Primer: J. Bhaskar, Pearson Education, New Delhi

M. Sc. Semester I (Electronics)

Paper III (EC 1T3): Advanced Microprocessors

Unit I: Microprocessor Architecture

Introduction to 16-bit microprocessors, 8086/8088 CPU architecture, memory segmentation, physical address generation, addressing modes, Instruction set: data transfer, arithmetic, logical, string manipulation, control transfer, unconditional branch, conditional branch, flag, processor control, 8087 coprocessor, data formats

Unit II: Assembly Language Programming

Assembler organization, assembler directives and operators, Assembly language programs, MASM and DEBUG utility, stack structure, PUSH and POP instructions, subroutine, procedure and macros, timing and delays

Unit III: Interfacing of Peripherals

Programmable peripheral interface 8255, internal architecture, control word register, operating modes; Timer/counter 8253/8254: functional block diagram, control word register, modes of operation, timing diagrams; keyboard interface/display controller 8279: internal architecture, 8279 commands, operating modes; programmable interrupt controller 8259A: architectural block diagram, command words

Unit IV: Architectures of 80x86 processors

Protected mode memory addressing, protected virtual addressing mode (PVAM), architecture, special features and overview of 80286, 80386 and 80486, Pentium Pro processors, superscalar architecture, MMX (Multimedia Extension) and SIMD (Single Instruction Multiple Data) technology

Books:

1. Advanced Microprocessors & Peripherals: A. K. Ray & Bhurchandi, TMH, New Delhi
2. Microprocessor based Systems: N. G. Palan, Tech-Max Publication, Pune
3. Assembly Language Programming: Peter Abel, PHI, New Delhi
4. 8086/8088 Family: Design, Programming and Interfacing: John Uffenbeck, Pearson Education
5. Intel Microprocessors 8086, 80286, 80386, 80486, Pentium Pro Programming and Interfacing: Barry and Brey, PHI, New Delhi

References:

1. Modern Digital Electronics: R. P. Jain, TMH, New Delhi
2. The 80x86 Family : Design, Programming and Interfacing: John Uffenbeck, Pearson Education

M. Sc. Semester I (Electronics)

Paper IV (EC 1T4): Programming in C

Unit I: Data types

Basics of programming – algorithms, flow charts, pseudo codes; Structure of a C program, compilers, assembler, interpreters; C character set, constants, variables and keywords, types of constants and variables; type declaration and arithmetic instructions, Integer and float conversions; operators in C , hierarchy of operators, Input-Output statements in C (Formatted and Unformatted), tools for programming in C – data types, data storage, data access, operators, associativity of operators, operator precedence

Unit II: Control structure

Decision control structures- if, if-else, nested if, nested if-else, else-if ladder, switch-case; Loop control structures –while, do-while, for loop, Break statement, Continue statement

Unit III: Arrays, functions, Structures and Unions

Arrays and strings; One- dimensional, Two dimensional and multidimensional array, various string operations; Function definition and prototyping, types of functions, type of arguments, recursion, passing arrays to functions, passing structures to functions, storage class in C;
Structure and union: structure variable, accessing structure member, arrays of structure, union, bit fields

Unit IV: Pointers and file handling

Pointers: declaration of pointers, chain of pointers, pointer expression, pointer arrays, pointer to array, pointer to function; File handling- File opening modes, Text and Binary files, High level and Low level operations on files; pointers, file handling in C; linked list; hardware access using C program- serial and parallel port; limitations of C programming

Practicals:

Minimum 20 practicals covering file handling for various data types, sorting and searching, printer port access for input-output, serial port access, interfacing of character display (5x7)

Books:

1. C Programming - C. Balaguruswamy, TMH, New Delhi
2. Let Us C: Yashwant Kanetkar, BPB Publications, New Delhi
3. C Programming: Gottfried, Schaum Outline Series, MGH
4. Programming Languages: Concepts and Constructs: Ravi Sethi, Addison Wesley Publishers

Reference:

1. The ANSI 'C' Language: Kernighan and Ritchie, PHI, New Delhi, 1996

M. Sc. Semester II (Electronics)

Paper I (EC 2T1): Embedded Systems and Applications

Unit I: Microcontrollers

Introduction to embedded systems, classifications, processor in the system, microcontroller, introduction: 8051 architecture, features of 8051, basic assembly language programming concepts, instruction set, data transfer, logical operations, arithmetic operations, jump/call instructions, interrupt handler, addressing modes, an 8051 microcontroller design & testing

Unit II: Interfacing

Interfacing with microcontroller: keyboard, displays, ADC, DAC, RTC, stepper motor, dc motor, relay, opto-coupler; serial communication between microcontroller and PC, between two microcontrollers using RS232; Serial Peripheral Interface (SPI), Inter-Integrated Circuit (I2C), USB; design of simple microcontroller based systems: digital multimeter, digital thermometer, speedometer, frequency meter, traffic light controller

Unit III: Other Microcontrollers

ATmega 16/32: General architecture, salient features, clocking unit, reset circuitry, ADC, USART, timer/counter, PWM, watchdog timer, SPI; PIC 16f8xx: General architecture, salient features, clocking unit, reset circuitry, ADC, USART, timer/counter, PWM, watchdog timer, SPI; Integrated Development Environment (IDE); Editor, assembler and simulator, Keil, MPLAB, AVR studio

Unit IV: Programmable Logic Controller

Basic functions of PLC, advantages over microcontroller, basic architecture, register basics, timer functions, counter function, ladder diagram, overview of PLC systems, I/O modules, power supplies, isolators, programming PLC, Alarm signal generation for a process (e.g. heating, cooling or threshold of a process etc.), direct digital control (DDC) algorithm

Practicals:

1. Interfacing of keyboard with microcontroller (8051)
2. Interfacing of LCD (16x2)
3. Interfacing of I^2C clock IC (DS1307)
4. Interfacing of stepper motor
5. Interfacing of ADC (0808)
6. Interfacing of DAC (0809)
7. Design of temperature data logger interfaced with PC through serial port
8. Interfacing of 2 microcontrollers using serial port
9. Design of simple microcontroller based systems: digital multimeter, digital thermometer, speedometer, frequency meter, traffic light controller

Books:

1. Embedded Systems: Architecture, programming and Design: Raj Kamal, TMH New Delhi
2. The 8051 microcontroller : Kenneth Ayala, Thomson Delmar Learning, New Delhi
3. 8051 Microcontroller and Embedded Systems: Mazidi & Mazidi, Pearson Publishers, New Delhi
4. AVR Microcontroller and Embedded Systems: Mazidi & Mazidi, Pearson Publishers, New Delhi
5. PIC Microcontroller and Embedded Systems: Mazidi & Mazidi, Pearson Publishers, New Delhi, 2008
6. PIC Microcontroller: Myke Predko, Tata McGraw Hill, New Delhi, 2012
7. Programmable Logic Controllers- Principles & Applications: John W. Webb & Ronald A. Reis, Prentice Hall Inc. New Jersey
8. Datasheet and user manuals of AVR and PIC microcontrollers

References:

1. Programming & Customizing the 8051 Microcontroller: Myke Predko, TMH, New Delhi
2. PIC Controllers: Mike Predko, MGH
3. Robotic Engineering: Richard D. Klafter, Thomas A. Chmielewski, Michael Negin TMH, New Delhi
4. Embedded System Design: F. Vahid & T. Gargivis, John Wiley and Sons
5. Embedded System Design: An Introduction to Process Tools and Techniques: A. S. Berger, CMP Books
6. Intelligent Robotic Systems: Spyros G. Tzafestas, Marcel Dekkar Inc. New York
7. Robotics: Control, Sensing, Vision and Intelligence : K. S. Fu, R. C. Gonzalez, C. S. G. Lee : MGH, Singapore
8. Mechatronics: Electronic Control Systems in Mechanical and Electrical Engineering: William Bolton, Pearson Education Publishers, New Delhi

M. Sc. Semester II (Electronics)

Paper II (EC 2T2): Biomedical Instrumentation

Unit I: Basic Principles of Biomedical Electronics

Bioelectrical signals, distribution of electrical potentials in different parts of the body, their magnitude and relationship to the physical status, processing of bio-electronic signals, different transducers for data acquisition; man-instrument system, biometrics, smart sensors

Unit II: Recording Systems

General consideration of electronic recording: preamplifier, main amplifier and driver amplifier; considerations of noise; display systems: Oscilloscopes- long persistence, memory facility, multi-channel displays, flat panel displays, LCD, TFT, OLED, AMOLED, touch screens

Unit III: Patient Safety and imaging techniques

Electronic shock hazards in biomedical instrumentation, Leakage current; grounding techniques; patient monitoring systems: foetus monitoring system and ICU; Need for imaging human body, imaging techniques: NMR, MRI, ultrasonic, X-ray tomography, endoscope, flexible bronchoscope and gastro scope, ventilators

Unit IV: Biomedical Instruments

Electro-encephalography (EEG), Electrocardiography (ECG), Electromyography (EMG), hemo-dialysis machine, traction, cardiac pacemakers, cardiac defibrillators; use of telemetry in diagnosis, Lasers in biomedical field

Practicals:

1. Design and study of op-amp based EEG signal amplifier.(input through simulation)
2. Design and study of electronic stethoscope
3. Design and study of body temperature measuring system
4. Design and study of respiratory rate measuring system
5. Design and study of arm pressure measuring system
6. Design of digital heart rate measuring system

Books:

1. Handbook of Biomedical Instrumentation –R. S. Khandpur, TMH, New Delhi
2. Biomedical Instrumentation – Leslie Cromwell, PHI Publication, New Delhi
3. Biomedical Engineering System – Leslie Cromwell, PHI Publication, New Delhi
4. Biomedical Phenomenon – Robert Plonsay, John Wiley & Sons
5. Computers in medicine – R. D. Lele, TMH, New Delhi
6. Introduction to Biomedical Equipment Technology: J. J. Carr and J. M. Brown, Pearson Education Asia Publication, Singapore

M. Sc. Semester II (Electronics)

Paper III (EC 2T3): Computer Organisation and Interfacing

Unit I: Computer Organisation

A functional view of the computer, Structural components of the computer, Concepts of embedded systems, ARM evolution, Computer function, basic instruction cycle, Pentium and power PC evolution, PCI bus structure

Unit II: Computer Memory System:

Characteristics of memory systems, cache/main memory structure, typical cache organisation, ARM cache organisation, Direct memory access, DMA module, 8237 DMA controller, the external interfaces, fire wire serial bus, infini Band interface, infiniband operation

Unit III: RISC and Superscalar Processors:

Comparison of CISC and RISC computers, Instruction pipelining, RISC pipelining, optimization of pipelining, features of MIPS-R4000 processor, general superscalar architecture organisation, comparison of super-scalar and super-pipelined approaches, architecture of the ARM CORTEX-A8 processor, organizations

Unit IV: Hardware Organisation and PC interfacing:

Features of Personal Computers, system and peripheral control chips, BIOS services; Expansion buses, ISA buses, 8-bit ISA bus signals and their functions, timing diagrams of ISA bus cycles, interfacing to 8-bit ISA bus, interrupt handling, PCI system, standard parallel port (SPP), centronics, interfacing to parallel port and serial ports, features of USB interface, USB system

Practicals

1. Study of expansion buses ISA, EISA, PCI and USB ports
2. Study of parallel port interfacing accessing
3. Study of serial/com port accessing
4. Interfacing of 5x7 display for character display
5. Interfacing of ADC 0808/DAC 0800
6. Interfacing of stepper motor to parallel port

References:

1. Computer Organisation and Architecture: William Stallings, Pearson Education Eight Edition, New Delhi
2. PC based Instrumentation: Concepts and Practice: N. Mathivanan, PHI, New Delhi

M. Sc. Semester II (Electronics)

Paper IV (EC 2T4): Virtual Instrumentation & Programming in Lab VIEW

Unit I: Virtual Instrument (VI)

Traditional instruments: basic block diagram, disadvantages; virtual instruments: basic block diagram (architecture), advantages, applications; text based programming language; graphical programming language; Lab VIEW programming concepts: data flow, polymorphism; introduction to Lab VIEW: advantages, front panel window, block diagram windows, icon/connector pane, palettes, data types

Unit II: Programming using Lab VIEW

Modular programming: build a VI front panel & block diagram, icon and connector pane, creating subVI; repetition and loops: for loop, while loop, shift registers, feedback nodes; control timing, communicating among multiple loops, local and global variables; array: one dimensional, two dimensional, multidimensional, array control, array indicators, array constants; cluster: creating cluster control, creating cluster indicators, order of cluster elements, assembling clusters, disassembling clusters, conversion between arrays and clusters, error handling, error cluster; plotting data: types of waveforms, graphs, charts and their types; structures: case, sequence, timed, events, formula nodes, math script; strings and file I/o; creating string controls and indicators, string function, formatting strings, basics of file I/o, choosing a file I/o format

Unit III: Instrument Control

Instrument control: Instrument I/o Assistant, VISA, instrument drivers, serial port communication, serial port standard RS-232; other interfaces: GPIB, USB, firewire, IEEE-1394 controllers and ethernet

Unit IV: Processing and Tool Kits in Lab VIEW

IMAQ vision: vision basics, image processing and analysis, particle analysis, machine vision, machine vision application areas; motion control: components of motion control system, motion controller, move type, motor amplifiers and drivers, motor fundamentals; Control design and simulation tools: Design of temperature and pressure controller using PID controller, light intensity measurement system, digital filter design and modulation tool kits, simulation of ECG signal, power spectrum analysis, FFT analysis, wavelet transform

Books:

1. Virtual Instrumentation using Lab VIEW : Jovitha Jerome, PHI Learning Pvt. Ltd., New Delhi
2. Virtual Instrumentation using Lab VIEW : Sanjay Gupta and Joseph John, TMH, New Delhi

References:

1. Lab VIEW for Everyone: Jeffrey Travis and Jim Kring, Pearson Education, New Delhi
2. NI Lab VIEW user manual

M. Sc. Semester III (Electronics)

Paper I (EC 3T1): Network Analysis and Synthesis

Unit I: Network Analysis

Mesh analysis, mesh equations, super-mesh analysis; nodal analysis, nodal equations; source transformation technique; graph theory and network equations: graph of a network, trees and co-trees, twigs and links, incidence matrix, tie set matrix, cut set matrix; state variable analysis; time domain analysis: steady state and transient response, DC response of RL, RC and RLC circuit, sinusoidal response of RL, RC and RLC circuit

Unit II: Network Theorems and Applications

Star-delta transformations; network theorems: superposition, maximum power transfer, Thevenin's, Norton's and reciprocity, duals and duality, Tellegen's and Millman's theorem with suitable examples

Unit III: Laplace Transform and Properties

Laplace transformation, properties of Laplace transforms, partial fraction expansion, Inverse Laplace transforms, Heaviside's expansion theorem: illustrative examples, application of the Laplace transform in circuit analysis

Unit IV: Network Functions and synthesis Techniques

One-port and two-port networks, of synthesis of RC and LC networks two-port network parameters: open circuit impedance, short circuit admittance, transmission, inverse transmission, hybrid, inverse hybrid parameters, interrelationship of different parameters, interconnection of two port networks; poles and zeors of network functions, time domain behavior from the pole zero plot; stability of active networks, Hurwitz polynomials, positive real functions, Ruth-Hurwitz array and R-H criteria, Foster and Cauer methods, frequency response plots: magnitude and phase, polar plot, root loci, Nyquist stability criterion

Books:

1. Network Analysis: M. E. Van Valkenberg, PHI, New Delhi
2. Circuits and Networks: Analysis and Synthesis: A. Sudhakar and S. P. Shyammohan, Tata McGraw Hill, New Delhi
3. Networks and Systems: D. Roy Choudhuri, New Age International (P) Limited, Publishers, New Delhi

M. Sc. Semester III (Electronics)

Paper II (EC 3T2): Fuzzy Logic and Artificial Neural Networks

Unit- I: Fuzzy sets and Membership functions

Fuzzy set operations, properties of fuzzy sets, fuzzy relations, features of the membership function, Lambda – cuts, De-Fuzzification methods

Unit - II: Extension principle, Approximate reasoning, Representing set of rules, fuzzy rule-based systems. Graphical techniques of inference; Fuzzy classification, Fuzzy c-means clustering (FCM)

Unit- III: Fundamental concepts of ANN

Model of an artificial neural network (ANN), Network architectures, feed forward networks, Learning processes, Delta learning rules for multi-perception layer, back propagation algorithm

Unit- IV: Associative memories and self organizing networks:

Basic concepts and performance analysis of recurrent associative memory, bidirectional associative memory (BAM); the counter-propagation network (CPN), self-organising feature maps, Adoptive Resonance Theory (ART-I)

References:

1. Fuzzy Logic with Engineering Applications: Timothy J. Ross, McGraw Hill, Inc.
2. Neural Networks, A comprehensive Foundation: Simon Haykin, Pearson Education, Asia

Other Books:

1. Neural networks: Algorithms, applications & Programming Techniques: J.A. Freeman & D. M. Skapura, Pearson Education Asia
2. Artificial Neural Networks: K. Mehrotra, C. K. Mohan & Sanjay Ranka, Penram International Publications, New Delhi
3. Introduction to Artificial Neural Systems: J. M. Zurada, Jaico Publishing House, New Delhi
4. Neural Network with MATLAB: Sivanandan
5. Fuzzy Logic with MATLAB: Sivanandan, Springer Verlag
6. Neuro-Fuzzy and Soft Computing: A Computational Approach to Learning and Machine Intelligence: Jyh-Shing Roger Jang, Chuen-Tsai Sun & Eiji Mizutani, Pearson Education, New Delhi

M. Sc. Semester III (Electronics)

Paper III (EC 3T3-1): Digital signal Processing

Unit I: Discrete-time Signals and Systems

Discrete time signals: types, operations, D-T system classification; linear time-invariant systems: convolution, linear constant-coefficient difference equations, correlation functions

Unit II: Transform methods

Introduction to Fourier series and Fourier transform, properties of Fourier transform, discrete Fourier transform and its properties, inverse Fourier transform, twiddle factor, circular convolution, z-transform: definition, region of convergence (RoC), pole zero plot, the inverse z-transform and its methods

Unit III: Digital Filter Design

FIR filter structures, IIR filter structures, IIR filter design: impulsive invariance method, bilinear transformation method and matched z-transform method, FIR filter design: Fourier series method, windowing technique, Kaiser window filter design method, frequency sampling method

Unit IV: DSP Chips and Applications

Introduction to DSP processors, types of DSP processors and architecture, general purpose DSP processors; implementation of noise removal techniques, echo, chorus and flange effects introduced in music

Practicals:

1. Study of some discrete- time signals
2. Design and study of some FIR filters
3. Study of triangular and Blackman windows
4. Design of FIR filters using windowing technique
5. Design of filters based on pole-zero placements
6. Study of linear convolution
7. Design and study of FFT using programming
8. Design and study of digital filters (HF and LF) using programming
9. Study of experiments based on DSP chips

Books:

1. Digital Signal Processing: N. G. Palan (Tech Max Publications, Pune)
2. DSP Processor Fundamentals: Architectures and Features: Phil Lapsley, Jeff Bier, Amit Shoham & Edward A. Lee
3. Discrete Time Signal Processing: Allen V. Oppeheim & Ronal W. Schafer (PHI, New Delhi)
4. Introduction to Digital Signal Processing: Roman Kuc (MGH)
5. Digital Signal Processing- Principles, Algorithms and Applications: J. G. Proakis and D. G. Manolakis (PHI, New Delhi)

References:

1. Introduction to Digital Signal Processing: Johny R. Johnson (PHI, New Delhi)
2. Digital Signal Processing: Sanjit K. Mitra (TMH, New Delhi)
3. Signal Processing using MATLAB: C. Sidney Burrus, J. K. Mc Clellan, A. V. Oppenheim, R. W. Schafer and H. W. Schuessler
4. Digital Filtering: An Introduction – Edward P. Cunningham

M. Sc. Semester III (Electronics)

Paper III (EC 3T3-2): Digital Image Processing

Unit-1: Introduction to Digital Image Processing

Basic components of image processing system, image sensing and acquisition, digital camera working principle; image sampling and quantization; representation of digital images, matrix, pyramid, quad-tree; elements of color image processing, hue, saturation and intensity, chromaticity diagram

Unit-2: Image Enhancement, Filtering and restoration

Enhancement in spatial domain; pixel grey level transformation, image negatives, logarithmic transformation; bit-plane slicing, histogram processing; enhancement in frequency domain; image smoothing (low pass filter), image sharpening (high pass filter), selective filtering (band pass and band reject filters); noise models for images, signal-to-noise ratio, image restoration in the presence of noise using spatial filtering, periodic noise reduction by frequency domain filtering; estimating the degradation function, inverse filtering

Unit-3: Color Image Processing and Image Segmentation

Color fundamentals, color models, RGB, CMY and CMYK color models, HSI model; pseudo-color image processing, basics of full color processing, color transformations, smoothing and sharpening; noise in color images, grey level to color transformation;

Image Segmentation: fundamentals, edge-based segmentation; image thresholding, intensity thresholding; basic global thresholding, multi-variable thresholding

Unit-4: Image compression and Digital Image Watermarking

Pixel and data redundancy, fidelity criteria, image compression models; Image file formats and compression standards, BMP, GIF, TIFF, JPEG, CDR; types of compression, lossless coding techniques, LZW coding, Lossy transform coding, DCT

Wavelet coding, discrete wavelet transform, Haar wavelets, digital image watermarking, need for image watermarking; visible and invisible watermarks, a typical watermarking system, watermark insertion and extraction methods

Text / Reference Books:

1. Rafel C. Gonzalez and Richard .E. Woods, *Digital Image Processing*, Third Edition, Pearson (2008)
2. Malay K. Pakhira: Digital Image Processing and Pattern Recognition. PHI (2011)
3. Rafel C. Gonzalez, Richard .E. Woods and Steven L. Eddins, *Digital Image Processing using MATLAB*, Pearson 2004
4. Anil K. Jain, *Fundamentals of Digital Image Processing*, Pearson, 2002
5. Keenneth R Castleman, *Digital Image Processing*, Pearson Education, 1995
6. Soman K. P. and Ramachandran K. I., *Wavelet Transform: From Theory to Practice, PHI, 2008*

M. Sc. Semester III (Electronics)

Paper IV (EC 3TF1): Basic Electronics

Unit I: Circuit Variables and network theorems

Circuit variables: Circuit concepts, units, standards and dimensions; electric current, electric charge, potential difference, electric power; circuit elements: passive and active; network Laws: Ohm's law, application of network laws to simple dc networks; junction laws- Kirchoff's current law (KCL), Mesh law (KVL); network theorems: superposition, maximum power transfer, Thevenin, Norton, Millman; application of network theorems to simple electronic circuits

Unit II: Semiconductor devices

Semiconductor, conductor, Insulator and their energy band diagrams; Intrinsic and extrinsic semiconductors, effect of temperature on extrinsic semiconductors and mechanism of current conduction; junction diodes: p-n junction, forward and reverse biased p-n junction, energy band structure of unbiased p-n junction, biased p-n junction; V-I characteristics of p-n junction; special p-n junctions: avalanche, Zener, Schottky, photodiode, LED, PIN, IR, solar cells, Laser diode; junction transistor: UJT and BJT, transistor characteristics in CB, CE and CC mode; hybrid parameters, JFET and MOSFETs, static characteristics

Unit III: Digital Electronics

Introduction to digital electronics: number system, digital codes: BCD ASCII; logic gates: AND, OR, NOT/Inverter, NAND, NOR, EXOR, XNOR - truth table and symbols; combinational and sequential logic circuits: adder, subtractor, flip-flops: RSFF, Clocked RSFF, DFF, TFF, JKFF, JKMSFF; counters: asynchronous, synchronous, applications of counters

Unit IV: Op-amp and Special ICs

Op-Amp: difference amplifier, op-amp configuration, ideal op-amp characteristics, applications of op-amp: inverting, non-inverting, adder, subtractor, integrator, differentiator, peak detector, clipper, clamper, instrumentation amplifier, waveform generators- sine, triangular and saw tooth; voltage comparator, window detector, Schmitt trigger, precision rectifier, peak detector, sample-hold circuits, and log/antilog amplifiers, first order low pass, high pass filters; 555 timer applications- monostable and astable multivibrator, monolithic waveform generators, V-F and F-V converters; analog multipliers, PLL, voltage regulator ICs: LM 317, 78xx, 79xx series

Reference Books

1. Basic Electronics: Grob, McGraw Hills Publishers Ltd.
2. Basic Electronics: Mitchel E. Schultz
3. Basic Electronics: B. L. Theraja, S. Chand & Co. Ltd. New Delhi
4. Monograph of Electronic Design Principle: Goel and Khaitan
5. Network Analysis: Van Valkenburg, Prentice Hall of India Pvt. Ltd. New Delhi
6. Textbook of Electronic Circuit: R. S. Sedha
7. Electronic Devices and Circuits: J. Jimmi, Schaum Series
8. Circuit Fundamental and Basic Electronics: J. P Agrawal
9. Digital Principles and Applications: A. P. Malvino, Tata McGraw Hills Publishers Ltd. New Delhi
10. Modern Digital Electronics: R. P. Jain, Tata McGraw Hills Publishers Ltd. New Delhi
11. Electronic Principle: Malvino Bates, Tata McGraw Hills Publishers Ltd. New Delhi
12. Electronic Devices: D. C. Floyd
13. Fundamentals of Digital Circuits: A. Anand Kumar, Prentice Hall of India Pvt. Ltd. New Delhi, 2001
14. Op-amp: Ramakant Gaykwad
15. Digital Electronics: Malvino and Leach

M. Sc. Semester III (Electronics)
Paper IV (EC 3TSC1): Mechatronics

Unit I: Basic Elements of a mechatronic system

General introduction to mechatronic systems, traditional and mechatronics designs, control systems, open and closed-loop systems, sensors and transducers; performance parameters of transducers, static and dynamic characteristics, potentiometer sensor, LVDT, push-pull displacement sensor, eddy current proximity sensors, optical encoders

Unit II: Basic System Models

A mathematical model of a system, elements in mechanical system, mass, moment of intertia, elements in electrical systems, resistors, capacitors, inductors, comparison of elements in these systems and their defining equations, dynamic responses of systems: examples of first and second order systems

Unit III: System transfer Functions

Conversion of differential equation into Laplace transform, transfer function of R-C series circuit, first order system with step input: illustrative examples, systems with negative feedback, location of poles on the s-plane, poles of stable and unstable systems, frequency response of a system of sinusoidal input, phasor equations, frequency response for a first-order system, Bode plots

Unit IV: Closed-loop controllers

Lag, steady-state error, control modes, op-amps as signal conditioners, electronic proportional controller, system response, PD and PI control, PID controller, digital controllers, controller tuning, process reaction method, ultimate cycle method, Ziegler and Nichols criterion, adaptive control, self-tuning

Reference:

1. Mechatronics: Electronic Control Systems in Mechanical and Electrical Engineering: William Bolton, Pearson Education Publishers, New Delhi

M. Sc. Semester IV (Electronics)

Paper I (EC 4T1): Electromagnetic Fields and Antennas

Unit I: Electromagnetic waves

The equation of continuity for time varying fields, Maxwell's equations, EM waves in a homogeneous medium, wave equations for a conducting medium, conductors and dielectrics, Poynting's theorem, interpretation of E x H, complex Poynting vector

Unit II: Antenna Basics

Basic radiation equation, radiation resistance, antenna patterns, half-power bandwidth, radiation intensity, directivity and gain, resolution, apertures, effective heights, Frii's transmission formula, field zones, linear, elliptical and circular polarization

Unit III: Antenna types

The antenna family, short dipole antenna, antenna arrays, broad-side and end-fire arrays, linear arrays, folded dipole, Yagi-Uda array, helical beam antenna, horn antenna, rhombic antenna, parabolic reflectors

Unit IV: Antennas for mobile communications and antenna measurements

Antennas for terrestrial mobile communications, base station antennas, switched beam and beam forming antennas, antennas on cellular handsets, micro-strip lines and antenna

Antenna measurements: The reciprocity theorem, antenna ranges, compact antenna test ranges (CATR), instrumentation for measurement of radiation properties of antenna under test (AUT)

References:

1. Electromagnetic waves and Radiating Systems: E. C. Jordan and R. E. Balmain, PHI, New Delhi
2. Antennas: For All Applications: John D. Kraus and R. J. Marhefka, TMH, New Delhi
3. Antennas and Radiowave Propagation: R. E. Collin, MGH, International Edition

M. Sc. Semester IV (Electronics)

Paper II (EC 4T2): Digital Communication

Unit I: Signals and spectra

Classification of signals, energy and power signals, energy spectral density, power spectral density, unit impulse function, sifting property of the Dirac delta function, Fourier series, Parseval's theorem, Fourier transforms, properties of Fourier transforms, convolution properties, graphical convolution

Unit II: Digital Communication system

Elements of digital communication system, the sampling theorem, aliasing error, PAM, PPM & PWM signals generation and detection

Pulse code modulation, uniform and non-uniform quantization, SNR, companding characteristics, Inter-symbol interference, Nyquist criteria of zero ISI, eye pattern

Unit III: Digital Modulation Techniques

Coherent binary modulation techniques, PSK, FSK, QPSK, MSK differential pulse code modulation, predictor, delta modulation, adaptive delta modulation, slope overload and granular noise, M-ary signaling

Unit IV: Information Coding

Measure of information, entropy, mutual information, Shannon's coding theorem, channel capacity, capacity of Gaussian channel, source coding, Huffman code, channel coding, block codes, syndrome decoding, convolutional coding, code tree, spread spectrum communication: PN sequences, direct sequence and frequency hopping spread spectrum systems

Practicals:

1. Study of PCM circuit and quantization
2. Study of PAM, PWM and PPM circuits and detection of these signals
3. Study of a Delta modulator
4. Study of a DBPSK communication system
5. Study of an adaptive Delta modulator
6. Study of a convolutional encoder
7. study of a PN sequence generator
8. Study of a spread spectrum direct sequence communication system

Books:

1. Digital communications: Bernard Sklar (Pearson Education, Asia Publ)
2. Modern Digital and Analog Communications Systems: B. P. Lathi (Oxford Univ. Press)
3. Analog and Digital Communications: Hwei Hsu (Schaum Outline MGH)

References:

1. Digital communications: Symon Haykin (John Wiley & Sons)
2. Modern Digital communications Systems : Leon W. Couch (PHI, New Delhi)
3. Digital communications: J. G. Proakis (MGH)

M. Sc. Semester IV (Electronics)

Paper III (EC 4T3-1): Microwave and Optical Communication

Unit I: Microwave Generators and wave guides

Failure of vacuum tubes at high frequency, Two cavity klystron, reflex klystron oscillator, magnetron oscillator, TWT amplifier, backward wave oscillator, GaAs oscillator;

Propagation of EM waves through wave guide, TE, TM and TEM waves

Unit II: Microwave components and Measurements

Microwave components: scattering matrix, attenuators, Tees, directional couplers, circulators, isolators, phase shifters, cavity resonators

Microwave measurements: Measurement of VSWR, phase shift, frequency, power, attenuation, dielectric constants of liquids and solids, Q of cavity

Unit III: Fiber optics

Principles of optical communication, single mode and multi mode fibers, step index, graded index, ray model, multi path dispersion, material dispersion, optical fiber as wave guide, fiber sources and detectors,

Unit IV: Manufacture and Measurements of fibers

Optical fiber cable, fiber joints, splices, couplers and connectors, measurement in optical fibers, attenuation measurement, dispersion measurement, refractive index profile measurement, transmission links, optical transmitters and receivers

Practicals:

Practicals on X-band test bench

1. Characteristics of reflex Klystron
2. Attenuation Measurement
3. Coupling and directivity of a directional coupler
4. Standing wave plotting and measurement of guide wavelength
5. Measurement of low VSWR and high VSWR
6. Measurement of unknown impedance using Smith chart

Practicals on optical fiber

1. Transmission characteristics of optical fiber link
2. Attenuation measurement
3. Dispersion measurement
4. Refractive index profile measurements

Books:

1. Microwave devices and Circuits: Liao
2. Microwave Engineering: David Pozar
3. Electronics and Radio Engineering: Terman
4. Introduction to Microwave Theory and Measurement: A. L .Lance
5. Optical Fiber Communication : B. Keiser, McGraw Hills
6. Optical Communication Systems: J. Gower, Prentice Hall Publ.
7. Optical Fiber Systems: Kao (MGH)
8. Fiber Optic Communication: D. C. Agrawal, A. H. Wheeler Co., New Delhi

M. Sc. Semester IV (Electronics)

Paper III (EC 4T3-2): Computer Communication

Unit I : Introduction

Computer networks, uses of computer networks, Network hardware: Personal Area Networks, Local Area Networks, Metropolitan Area Networks, Wide Area Networks; network software: Protocol hierarchies, design issues for the layers, connection oriented and connectionless services; services and protocols; OSI reference model, TCP/IP reference model, Network Standardization, example networks: Internet, ARPANET, NSFNET; Mobile phone networks

Unit II : **Physical Layer Transmission and Switching:**

Frequency and time division multiplexing, circuit switching, Packet Switching Hybrid Switching ISDN-Integrated services digital network, ISDN services, Evolution of ISDN, ISDN system architecture, The digital PBX, ISDN interface, ISDN signaling Perspective on ISDN, Terminal, handling: Polling, Multiplexing versus concentration

Unit III: The Medium Access Sub-layer

The local and metropolitan area networks, ALOHA protocols, IEEE standard 802 for LAN, Fiber optic networks, satellite networks, pocket radio networks. The Data Link Layer: Data Link Layer design issues, Error detection and correction, Elementary data link protocols, sliding window protocols performance, Protocol specification and verification

Unit IV: The Network Layer

Network layer design issue, Routine algorithms, Congestion control algorithms, Internet Working, Network layer in the Internet and ATM networks; Transport Layer: Transport service, transport protocols, Internet transport protocol (TCP & UDP)

Reference books:

1. *Computer Networks,* Tanenbaum, Prentice Hall of India Pub. New Delhi
2. *Computer Networks, Protocols, Standard and Interfaces*, Ulyses Black, Prentice Hall of India Pub. New Delhi
3. Computer *Networks,* Andrew S. Tanenbaum and David J. Wetherall, Pearson Pub. Thomson Press (India) Pvt. Ltd. New Delhi (2011)

M. Sc. Semester IV (Electronics)
Paper IV (EC 4TF2): PC and PC Interfacing

Unit I: Introduction to Personal Computers

Architecture: pipeline, super scalar architecture; motherboard components: CPU-microprocessors (8086/8088, 80186, 80286, 80386, 80486, Pentium, Pentium MMX, PI, PII, PIII, PIV); memory organisation, I/O ports, plug in slots, operator interface; Need for interfacing: characteristics of an interface: electrical and mechanical, data transfer schemes: programmed data transfer- synchronous, asynchronous, interrupt driven; DMA mode of transfer

Unit II: Standard Peripheral Devices

System and Standard peripheral interfaces: Programmable Peripheral Interface (8255A), Priority Interrupt Controller (8259A), DMA controller (8237), Programmable Interval Timer (8254), serial I/O, UART (PC 16550D), video controller, AGP card, keyboard controller

Unit III: Data Acquisition

Data acquisition basics- sampling concepts, Shannon sampling theorem, aliasing, over-sampling, interpolation, characteristics; ADC: Integrating type, successive approximation, parallel/flash, sigma- delta converter, characteristics of ADC; DAC: weighted resistor network, R-2R ladder network, characteristics of DACs; Data acquisition systems: microprocessor, PC based, GPIB based data acquisitions, standard data acquisition cards (DAQ)

Unit IV: I/O Buses and Ports

Expansion buses: ISA, EISA, PCI; parallel port: standard parallel port, enhanced parallel port, enhanced capabilities port; serial port: serial communication format, error checking, encoding, compression, serial communication modes, transmission medium; Bus standards-RS232, RS422, RS485; USB: features of USB, USB system, USB transfer, USB microcontrollers, SPI, I2C, CAN buses

Practicals:

1. printer port access for input-output
2. interfacing of character display (5x7) to the printer port of IBM PC
3. Interfacing of Stepper motor to the printer port of IBM PC
4. Interfacing of DAC to the printer port of IBM PC for generation of various waveforms
5. Interfacing of ADC to the printer port of IBM PC
6. Development of Graphical User Interface (GUI) using suitable programming language
7. Serial port access
8. Design of simple PC based DAS

Books:

1. PC based Instrumentation: Concepts & Practice: N. Mathivanan, PHI, New Delhi, 2007
2. Microprocessors and Interfacing; D.V. Hall, MGH International Publication
3. Computer Control of Processes : M. Chidambaram, Narosa Publishers, New Delhi, 2003

Reference:

2. Microprocessors, PC Hardware and Interfacing: N. Mathivanan, PHI, New Delhi, 2003
3. PC Interfacing and Data Acquisition: Kevin James, Elsevier Publication

M. Sc. Semester IV (Electronics)

Paper IV (4TSC2): Mobile and Satellite Communication

Unit I: Cellular Concepts and Equalization

Cellular telephone system, frequency reuse, channel assignment and land off strategies, elements of cellular radio system design, switching and traffic, data links and microwaves, system evaluation, interference and system capacity, Improving coverage capacity; Fundamentals of equalization, space polarization

Unit II: Diversity, channel coding and GSM system for Mobile

Frequency and time diversity techniques, channel coding; service and features, GSM system architecture, GSM channel types, GSM frame structure, intelligent cell concept and applications; Features of handset, SMS, security; Interfacing of mobile with computer, application of mobile handset as modem, data storage device, multimedia device; Measurement of signal strength; Introduction to CDMA digital cellular standard

Unit III: Satellite Communication

Satellite orbits, frequencies, stabilization, orbital parameters, coverage area, work angle, Attitude and orbit control system, telemetry tracking and command power system; Satellite Link design: system noise temperature and G*/*T ratio, down link design, domestic satellite system; eclipse on satellite

Unit IV: Multiple Access Techniques

FDMA and TDMA, TDMA synchronization and timing, code division multiple access. Applicability of CDMA to commercial system, Earth's path propagation effects; satellite services for communication – Weather forecasting, remote sensing, direct to home (DTH) TV

Practicals:

1. Measurement of field strength – mobile towers
2. Any suitable practicals on the above topics

Books:

1. Mobile Cellular Telecommunication: William C. Y. Lee, MGH Inc., 1995
2. Mobile communication : Jochen Schiller, Pearson Education, 2nd Edition, 2004
3. Satellite Communication: T. Pratt, Wiley Eastern Publication
4. Satellite Communication: D. C. Agrawal, Khanna Publications, New Delhi
5. Mobile Communication: Rappaport