M.Sc. - Electronics (Communication Science)

Structure of the course

(CBCS)- (w.e.f. 2016-17)

Semester - III

ECS IX: Digital Signal Processing -100 (70 + 30)

ECS X: Digital Communication - 100 (70 + 30)

ECS XI: Satellite Communication - 100 (70 + 30)

ECS XII: Internetworking & Data Communication - 100 (70 + 30)

Practical - P_5 - 100 (70 + 30)

Practical - P_6 - 100 (70 + 30)

Practical P_5 - will consists of two experiments of 35 marks each and an internal evaluation of 30 marks (70 + 30).

Practical P_6 - project presentation (70 + 30)

(Includes selection criteria of the project and its feasibility for desired applications)

Semester - IV

ECS XIII: VLSI Design - 100 (70 + 30)

ECS XIV: Mobile Communication - 100 (70 + 30)

ECS XV: Fiber Optic Communication - 100 (70 + 30)

ECS XVI: Communication Protocols - 100 (70 + 30)

Practical - P_7 - 100 (70 + 30)

Practical - P_8 - 100 (70 + 30)

Practical P_7 - will consists of two experiments of 35 marks each and an internal evaluation of 30 marks (70 + 30).

Practical P_8 - Project Performance (70 + 30)

(Includes performance with desired application and conclusions)

C → Indicates common paper.

M.SC-II, SEME. III, ELECTRONICS (Communication Science)

Paper – IX- ECS: DIGITAL SIGNAL PROCESSING

(Revised syllabus w. e. f. June 2016-2017)

Unit 1: Discrete Time Signals and Linear Systems [12]

Introduction of DSP system, Advantages, Applications, Discrete time signals classifications and representation, Operations on signals, Discrete time system, Classification, Impulse response and convolution sum, Convolution methods, Solution of Difference equations, Impulse and step responses, Analog to digital conversion: Sampling theorem, Aliasing effect, Quantization, Reconstruction of analog signal.

Unit 2: Z-Transform and Analysis of Discrete Time System [12]

Z-transform and ROC, Z-transform of Finite and Infinite sequences, Properties of Z-transform, Inverse Z transform, System Function of LTI system, Inverse Z-transform, Transient and Steady state responses, Causality and Stability of System, Solution of difference Equations, Realization of Discrete time system by Direct form-I and Direct form-II, Cascade and parallel forms.

Unit 3: Z-Transform and Analysis of Discrete Time System [12]

Discrete Fourier Transform, IDFT, Properties of the DFT, Circular shift of sequence, Circular convolution, Circular convolution methods, Linear convolution from circular convolution, DFT of long duration sequence by overlap-save and overlap-add methods, FFT Algorithms: Radix-2 DIT and DIF algorithms to compute DFT and IDFT.

Unit 4: Design and Realization of Digital Filters [12]

FIR Filter Structure and Design: Direct and cascade forms, frequency sampling and linear phase structure. Windowing method, Frequency sampling method of design, IIR Filter structure and Design: Direct form, Cascade form, Parallel form, Impulse invariance, Bilinear Transformation method of design.

Reference Books:

1.John G Prokis, Manolakis, “Digital Signal Processing-Principles, Algorithms and Application”, 4th Edition, Pearson Education Publication

2.Salivahanam, AVallavaraj, C. Guanapriya, “Digital Signal Processing”, 1st Edition, Tata McGrawHill, New Dehli

3.P.RameshBabu, “Digital Signal Processing”, 4th Edition, Scitech Publication.

4. P. Pirsch,“Architectures for Digital Signal Processing” John Wiley publication, New Delhi

5. B.Venkataramani, M. Bhaskar, “Digital Signal Processors”, Architecture programming & applications, TMH, New Dehli

M.SC-II, SEME. III, ELECTRONICS (Communication Science)

Paper – X- ECS: DIGITAL COMMUNICATION

(Revised syllabus w. e. f. June 2016-2017)

Unit 1. Random Signal Theory and Information & Channel Capacity: [16]

Random Signal Theory:

Probability, joint & conditional probability, probability mass functions, statistical average, continuous random variables – PDF and statistical averages, random processes- stationarity, time average & ergodicity, power spectral density of stationary random processes

Information & Channel Capacity:

Measure of information, Entropy, Information Rate, Shannon's encoding theorem, Communication channels – discrete & continuous, Rate of information transmission over a discrete channel, capacity of a discrete channel, Shannon- Hertly theorem for continuous channels, Implementation of Shannon's theorem , Huffman's coding technique

Unit 2. Waveform Coding and Digital Carrier Modulation Schemes: [16]

Waveform Coding:

Quantization – Uniform & Non uniform , Differential , PCM, ADPCM system, Bandwidth requirement, Noise in PCM , TDM-PCM Telephone system , PCM Vs. Analog modulation, Power bandwidth exchange, DPCM system, Delta Modulation – Noise in DM , Comparison with PCM, Q level DPCM system, ADM, CVSD. Equalization, Eye Diagrams, Synchronization, Scrambler, Scrambler, ISI.

Digital Carrier Modulation Schemes:

Binary ASK , PSK , FSK schemes , Probability of error , Coherent PSK & FSK, Differential coherent PSK, Non coherent FSK, `Comparison of digital modulation schemes–Bandwidth & power requirements, Equipment complexity , M-ary signaling schemes – M–ary coherent PSK , M-ary differential PSK , M-ary wideband FSK , Synchronization methods, QAM.

Unit 3. Optimum Receiver for Digital Modulation: [6]

Probability of error, Matched filter receiver, Correlation receiver, Synchronization, Symbol Synchronization, Frame synchronization, Carrier recovery circuits.

Unit 4. Error Control Coding: [10]

Types of error & codes, Linear Block Codes - Error Detection & Correction, Hamming codes, Table Lookup Decoding, Binary cyclic codes – Algebraic Structure, Encoding using (n-k) bit shift register, Syndrome Calculation, BCH code, Burst error & Random error correcting codes, Convolutional codes – Encoders & Decoders, Performance of block codes – error correction & detection.

Text/ Reference Books:

1.K.Sam Shanmugam : - Digital & analog Communications (John Wiley)

2. Siman Haykin :- Digital Communication (Wiley)

3. B.P. Lathi :- Modern Digital & Analog Communication System (Oxford)

4. Digital Communication Fundamentals & Applications :- Bernard Scalar

M.SC-II, SEME. III, ELECTRONICS (Communication Science)

Paper – XI- ECS: SATELLITE COMMUNICATION

(Revised syllabus w. e. f. June 2016-2017)

Unit 1. Satellite Orbital Mechanics and Launchers [8]

History, Overview: Satellite Communication in 2000.

Orbital Mechanics, Look angle determination, Orbital perturbations, Orbital determination, Launchers and Launch Vehicles, Orbital effects in communication system performance.

Unit 2. Satellites Subsystems and Satellite Link Design: [15]

Satellites Subsystems:

Satellite Subsystems, Attitude and control systems (AOCS), Telemetry, Tracking, Command and Monitoring, Power systems, Communication subsystems, Satellite antennas, Equipment reliability and space qualification.

Satellite Link Design:

Introduction, Basic transmission Theory, System Noise Temperature and G/T Ratio, Design of Downlinks, Satellite Systems using Small Earth Stations, Uplink Design, Design of Specified C/N : Combining C/N and C/I values in Satellite Links, System Design Examples, Multiple access schemes: TDMA, FDMA, CDMA.

Unit 3. VSAT, LEO and Non _Geo-Stationary Satellite Systems: [14]

Introduction, Overview of VSAT Systems, Network Architecture VSAT Earth Station Engineering

Low Earth Orbit and Non_Geo-Stationary Satellite Systems:

Introduction , Orbit considerations, Coverage and frequency Consideration, Delay and Throughput consideration, Operational NGSO constellation design: Irridium, Teledesic

Unit 4. DBS Television and Radio systems and Satellite Navigation, GPS Systems: [11]

C- Band and Ku- Band, Home Satellite TV, Digital DBS TV, Satellite Radio Broadcasting

Satellite Navigation and the Global Positioning System:

Introduction, Radio and Satellite Navigation, GPS Position Location Principles, GPS Recivers and codes.

Text/ Reference Books:

1. Satellite Communications – Timothy Pratt, Charles Bostian, Jeremy Allnutt

John Wiley & Sons (II Edition)

Reference Books:

1. Satellite Communications – Dennis Roody, McGraw Hill

M.SC-II, SEME. III, ELECTRONICS (Communication Science)

Paper – XII- ECS: INTERNETWORKING AND DATA COMMUNICATION

(Revised syllabus w. e. f. June 2016-2017)

Unit1. Introduction to computer networks: **[10]**

Need, applications, line configurations, topology, categories of networks and internetworks. Layered reference model – need of layers, design issues of layers, ISO-OSI Model, IEEE standard 802 for LANs and WANs, bridges, high speed LANs.

Unit 2. Physical & Data Link Layers and Medium Access Sublayer: [18]

Physical Layer:

Transmission media: – Guided media-twisted pair, coaxial cable, optical fiber. Unguided media – RF allocation, terrestrial microwave, satellite communication, cellular telephone. –Design issues for physical layer, EIA 232 D interface standard, Modems – types, block schematic.

Data Link Layer:

Design issues, error detection and correction, elementary data link protocols, sliding window protocols. HDLC – types of stations, modes of operation, HDLC frame formats, additional features.

Medium Access Sub layer**:** Channel allocation problem, multiple access protocols.

Unit 3. Network Layer: [08]

Design issues, Routing algorithms – shortest path, distance vector routing, link state routing, flow based routing, routing for mobile hosts, Congestion control – congestion prevention policies-leaky bucket algorithm, token bucket algorithm, congestion control in virtual circuit subnet and choke packets.

Unit 4. TCP/IP Protocol Suit Overview and Transport Layer: **[12]**

TCP/IP Protocol Suit Overview:

TCP/IP versus OSI model, TCP/IP and Internet, IP protocol and it's header format, addressing, subnetting, other network layer protocols – ARP, RARP, ICMP, IGMP.

Transport Layer:

TCP and its header format, congestion control in TCP, UDP and Domain name system (DNS).

Text/ Reference Books:

1. Data Communication and Networking Forouzan-IInd edition
2. Data Communication P.C. Gupta
3. Computer Networks Tanenbaum

M.SC-II, SEME. IV, ELECTRONICS (Communication Science)

Paper – XIII- ECS: VLSI DESIGN

(Revised syllabus w. e. f. June 2016-2017)

UNIT 1: Introduction to VLSI Design: [08]

Concept of design, design methodologies, semi-custom and custom design approaches. Types of ASICs - Design flow, Implementation strategies for digital ICs, hierarchy cell based design, array based implementation, building blocks, power speed tradeoff.

UNIT 2: Inverters and Logic Gates: [12]

NMOS and CMOS Inverters - Inverter ratio - DC and transient characteristics - switching times - Super buffers - Driving large capacitance loads - CMOS logic structures, basic operation of CMOS inverter, detailed analysis of its noise margin, propagation delay, power dissipation. Transmission gates - Static CMOS design - Dynamic CMOS design. Concept of layout & area, layout area estimation for a single as well as combinational logic circuits.

UNIT 3: Introduction to ASICS, CMOS LOGIC AND ASIC Library Design: [10]

Combinational Logic Cell – Sequential logic cell - Data path logic cell - Transistors as Resistors - Transistor Parasitic Capacitance- Logical effort –Library cell design, Multiplexers - Decoders - comparators - Priority encoders - Shift registers - Arithmetic circuits - Ripple carry adders - Carry look ahead adders - High-speed adders - Multipliers

UNIT 4: Programmable ASICS and analog and mixed signal ASIC Design: [18]

Programmable ASICS:

Anti fuse - static RAM - EPROM and EEPROM technology – FPGA/CPLD Examples from different vendors like, Actel, Xilinx, Altera, Cypress etc. Design systems - Logic Synthesis - Schematic entry – Introduction to Low level design language

Analog and mixed signal ASIC Design:

Mixed Signal VLSI Chips - Basic CMOS Circuits - Basic Gain Stage - Gain Boosting Techniques - Super MOS Transistor - Primitive Analog Cells - Linear Voltage - Current Converters - MOS Multipliers and Resistors – CMOS Op-Amp Design - Instrumentation Amplifier Design - Low Voltage Filters. Nyquist rate A/D Converters - Modulators for Over sampled A/D Conversion - First and Second Order and Multibit Sigma – Delta Modulators - Thermal - Humidity and Magnetic Sensors - Sensor Interfaces.

TEXT/REFERENCE BOOKS:

1. Essentials Of VLSI Circuits And Systems, Kamran Eshraghian, Eshraghian, PHI
2. Introduction to VLSI Circuits And Systems, John P. Uyemura, John Wiley & Sons
3. Principles of CMOS VLSI Design, Neil H.E. Weste, Kamran Eshraghian, Pearson
4. Basic VLSI Design, Pucknell, Prentice Hall of India Publication.
5. CMOS Logic Circuit Design, Uyemura, John P., Springer
6. D.D Gajski et al., High Level Synthesis: Introduction to Chip and System Design, Kluwer Academic Publishers.
7. Application Specific Integrated Circuits, Smith M.J.S ., Addison -Wesley Longman Inc.
8. FPGA-Based System Design, Wayne Wolf, Prentice Hall PTR.
9. Analog VLSI signal and Information Processing, Mohammed Ismail, Terri Fiez, McGraw Hill International Editons.
10. Analog VLSI Design NMOS and CMOS, Malcom R.Haskard, Lan C. May, Prentice Hall

M.SC-II, SEME. IV, ELECTRONICS (Communication Science)

Paper – XIV- ECS: MOBILE COMMUNICATION

(Revised syllabus w. e. f. June 2016-2017)

Unit 1. Introduction to Mobile Communication and cellular concept: (13)

Introduction to Mobile Communication:

Mobile and Personal Communication, Wireless Communication, Need and Application of Wireless Communication, Wireless data technologies, mobile and wireless devices

Cellular concepts:

The cellular concept, multiple access technologies for cellular systems, cellular system operation and planning

Unit 2. Digital cellular mobile systems and Data Communication: [11]

Digital cellular mobile systems:

GSM: The European TDMA digital cellular standards, IS –95-The North America CDMA digital cellular standards

Mobile Data Communication:

Introduction, Specialized packet and mobile radio networks, circuit switched data services on cellular networks, packet switched data services on cellular networks.

Unit3. Wireless LAN and Wireless ATM: [12]

Wireless LAN:

Introduction, Infrared radio transmission infrastructure and ad_hoc networks, IEEE 802.11, HIPER LAN, Bluetooth

Wireless ATM:

WATM services, Reference Model, Functions, Radio access Layer, handover, Location management, Addressing, Mobile QOS, Access point control protocol

Unit 4. Mobile Network Layer and Transport Layer: [12]

Mobile Network Layer:

Mobile IP, DHCP (Dynamic Host Control Protocol)

Mobile Transport Layer:

Traditional TCP, Indirect TCP, Snooping TCP, Mobile TCP, Fast and Selective retransmission and recovery, Transaction oriented TCP)

Text Book:

1. Mobile Communications: Jachen Schiller (Addison Westy)

Reference Book:

1. Mobile and Personal Communication systems and services : Raj Pandya (PHI)

M.SC-II, SEME. IV, ELECTRONICS (Communication Science)

Paper – XV- ECS: FIBER OPTIC COMMUNICATION

(Revised syllabus w. e. f. June 2016-2017)

Unit 1. Introduction and Transmission characteristics of optical fibers: [12]

The general optical communication system, Advantages and disadvantages, Ray theory of transmission, Mode theory, Types of optical Fibers

Transmission characteristics of optical fibers:

Attenuation, Material absorption, losses in fibers, Linear and Nonlinear scattering losses, fiber bend loss, Mid-infrared and Far-Infrared transmission. Dispersion: Intermodal and Intramodal dispersion, Dispersion modified Single mode fibers.

Unit 2. Optical fibers and cables, Joints and Couplers: [10]

Preparation of optical fibers, Liquid phase and vapour phase deposition techniques, Fluoride glass fibers. Cables: Fiber strength, durability and stability of fiber transmission characteristics, cable design

Optical Fiber Joints and Couplers:

Fibers alignment and joint loss. Fiber splices, connectors, Fiber couplers

Unit 3. Optical sources and Optical detectors: [15]

Optical sources:

LASERS basic concept, optical emission from semiconductors. Semiconductor Injection Laser, Injection laser structures and characteristics, Laser fiber coupling, Non-semiconductor Lasers, Laser Modulation. LED) LED power and efficiency, LED structures, characteristic and Modulation techniques

Optical detectors:

Introduction, device, types, optical detection principals, absorption, quantum efficiency Responsivity, Long wavelength Cutoff. Semiconductor photo diodes with and without internal gain. Mid-infrared and photoconductive detectors, PN, PIN, Avalanche Photo diodes, Phototransistors.

Unit 4: Optical fiber Measurements, Receiver performance considerations and Applications:

Optical fiber Measurements:

Attenuation, Dispersion, Refractive index profile, cutoff wavelength, Numerical aperture, fiber diameter and field measurements.

Receiver performance considerations: Noise, Receiver noise, Receiver structures, FET preamplifiers, High performance amplifiers.

Applications:

Public Network, Military, Civil, Consumer, Industrial and Computer applications. **[11]**

Reference:

1. Optical fiber communications – principles and practice. John. M. Senior
2 .Optical communications By David Gover
3. Optical communications By KEISER

M.SC-II, SEME. IV, ELECTRONICS (Communication Science)

Paper – XVI- ECS: COMMUNICATION PROTOCOLS

(Revised syllabus w. e. f. June 2016-2017)

Unit 1: Communication Protocols and 2G Network (GSM): [20]

Communication Protocols:

RS-232, RS 422, I2C, CAN, LIN, FlexRay, USB, IEEE 802.11, Bluetooth etc.

2G Network (GSM):

Architecture and Protocols ,Air Interface, GSM Multiple Access Scheme, GSM Channel Organization, Frames, Multi-frames, Super-frames and Hyper-frames, GSM location tracking and Call Set up Procedure, GSM Protocols and Signaling, Routing of a call to a Mobile Subscriber, Security GSM Operations, Mobile number portability – Fixed network number portability, Number portability for Mobile networks, Mobile number portability mechanism. VoIP Service for mobile networks – GSM on the Net, iGSM wireless VoIP solution, iGSM procedures and Message flows

Unit 2: 2.5G Networks: [12]

The General Packet Radio Services: (GPRS) -GPRS Networks Architecture, GPRS Interfaces and Reference Points, GPRS Logical Channel, GPRS Mobility Management Procedures, GPRS Attachment and Detachment Procedures, Session Management and PDP Context, Data Transfer Through GPRS Network and Rout, GPRS Location Management Procedures, GPRS Roaming, The IP Internetworking Model, GPRS Interfaces and Related Protocols, GPRS Applications Overview of CDMA systems: IS-95 Networks

Unit 3: 3G Network: [08]

W-CDMA, CDMA 2000, Improvements on core network, Quality of service in 3G, Wireless Operating System for 3G Handset. The Universal Mobile Telecommunication System (UMTS) – UMTS Network Architecture and Interfaces, UMTS Network Protocol Architecture, Mobility Management for UMTS Network

Unit 4:Mobile Ad-hoc Networks: **[08]**

Introductory concepts. Different models of operation. Various applications of MANET. Destination-Sequenced Distance Vector (DSDV) protocol. Dynamic Source Routing (DSR) protocol - overview and properties. Optimizations and Enhancements for preserving battery life of mobile nodes - Associativity based routing, effects of beaconing on battery life. Recent trends in MANET.

Text/ Reference Books:

1. Specification of the Bluetooth System, 2001, Bluetooth
2. Technology Trends in Wireless Communication, Ramjee Prasad, and Marina Ruggiere, Artech House,
3. Mobile Cellular Communications Principles and Practice, W.C.Y. Lee, 2nd Edition, MC Graw Hill
4. Wireless and Mobile Network Architecture, Yi-Bing Lin and Imrich Chlamtac, Wiley Publication
5. Wireless Communications Principles and Practice, Theodore S. Rappaport, Pearson Education,
6. Introduction to 3G Mobile Communications, Juha Korhonen, Second Edition, Artech House.
7. Computer Networks-Protocols, Standards and Interfaces, Black U, PHI
8. Computer Networks and Internets, Comer E. Doughlas, 2nd Ed., Pearson
9. 3G Networks: Architecture, Protocols and Procedures, Kasera Sumit, Narang Nishit, TMH
10. Data Communications and Networking (4th Edition). Behrouz A. Forouzan. McGraw Hill

Solapur University, Solapur

M.Sc. I , Semester – I - Electronics (Communication Science)

(Laboratory Exercises)

(w. e. f. June 2016-17)

1. MATLAB – I (Curve Tracings)
2. MATLAB – II (Matrix operations)
3. MATLAB – III (Solving Differential Equations)
4. MATLAB – IV (Fourier Series & Transform)
5. MATLAB – V (Laplace Transform)
6. MATLAB-VI(Bessel's Equation & Solution)
7. Study of A.M. Modulator(Balanced Modulator)
8. Data formatting ; RZ & NRZ
9. Manchester coding.
10. Measurement of Temperature (LM – 335 or AD 590)
11. Measurement of Temperature (Using Thermistor/thermocouple)
12. Measurement of Displacement (LVDT)
13. Strain gauge
14. Phase Locked Loop
15. Study of Instrumentation Amplifier(AD – 524)
16. F to V and V to F conversions
17. Waveform Generator (IC – 8038)
18. Study of Nyquist Criteria (Sampling & Construction)
19. Study of Nyquist Criteria (Aliasing signal on reconstruction)
20. Study of signals using MATLAB (continuous & Discrete)
21. Study of linear time invariant system(Using MATLAB Simulink)
22. Design of filter (IIR Using MATLAB)
23. Design filter (FIR using MATLAB)
24. Study of DSB & SSB modulation & demodulation techniques
25. Study of FM modulation and demodulation techniques

Solapur University, Solapur

M.Sc. I, Semester – II - Electronics (Communication Science)

(Laboratory Exercises)

(w. e. f. June 2016-17)

1. MATLAB – I (Partial differential equation)
2. MATLAB-II (Curve Fitting)
3. MATLAB – III (Eulers Method)
4. MATLAB – IV(Leap frog Method)
5. MATLAB – V(Runge Kutta method)
6. C – Programming – I (Eulers Method)
7. C – Programming – II (Leap frog method)
8. C – Programming – III (Runge Kutta method)
9. C – Programming – IV(Predictor corrector method)
10. C – Programming – V(Itterative method)
11. 8051 LED interface
12. 8051 LCD interface
13. 8051 DC- Motor interface
14. 8051 seven-segment interface
15. 8051 stepper interface
16. 8051 servo interface
17. Study of Klystron
18. Study of Gunn Diode
19. Addition of two numbers using different addressing modes (8086).
20. Block transfer using string instruction(8086)
21. Multiplication of two 16 bit number (16 x 16 bit numbers) (8086)
22. Password checking (Dos interrupt) (8086)
23. Interfacing LED to PIC
24. Interfacing LCD to PIC
25. Interfacing Relay to PIC
26. DC Motor Control Using PIC (PWM)

Solapur University, Solapur
M.Sc. II, Sem - III, - Electronics (Communication Science)
(Laboratory Exercises)
(w.e.f. June 2016 - 17)

1. Study of PAM, PPM, PWM modulation & demodulation .
2. Study of PCM .
3. Study of TD multiplexing & demultiplexing.
4. Study FD multiplexing & demultiplexing .
5. Study of ASK, FSK, PSK modulation & demodulation.
6. Study of Delta, adaptive, delta modulation & demodulation
7. Study of various antenna
8. Study of Antenna Gain, Beam width and its polarization
9. Transmission Lines (Characteristics)
10. VSWR
11. Interfacing ADC/DAC (8086)
12. Interfacing with stepper motor(8086)
13. Study of cable design and IEEE 802.3 networks
14. Study of network topology.
15. Study of Protocols & flow control
16. Study of wireless LAN.
17. Study of satellite communication.
18. To study CDMA – DSSS modulation and demodulation.
19. Study of modulation and demodulation [using MATLAB communication tool box & simulink].
20. Study of noise generation [using MATLAB communication tool box & simulink].
21. Error detection and correction [using MATLAB communication tool box & simulink].
22. Study of cryptographic Algorithm [using MATLAB communication tool box & simulink].
23. Study of Digital carrier modulation and data format
24. Creating GUI and standalone function using LabVIEW
25. LabVIEW DAQ card interfacing(CRO,DMM,FG)
26. LabVIEW DAQ card interfacing (Sensors LM 35, Therrmocouple, moisture sensor etc.)
27. Firing of SCR using AVR
28. Interfacing Graphic LCD to AVR
29. Interfacing RF Module to AVR

Solapur University, Solapur
M.Sc. II, SEM - IV, - Electronics (Communication Science)
(Laboratory Exercises)
(W.e.f. June 2016 - 17)

1. To study serial port and serial communication, parallel port and parallel communication.
2. Study of GSM standards technology and services.
3. Study of GSM commands.
4. Study of TCP IP commands.
5. Bit error rate measurement & signal capture
6. Spreading & dispreading with NRZ binary data.
7. Setting up fiber optic analog and digital link.
8. Study of propagation loss in optical fiber link.
9. Study of bending loss in optical fiber &Measurement of Numerical Aperture.
10. Characteristic of E – O convertor [LED/LASER].
11. Study of WDM.
12. Quadrature amplitude modulation. (QAM)
13. Program to demonstrate I^2C Protocol.
14. Program to demonstrate SPI Protocol.
15. Program to demonstrate CAN Protocol.
16. Program to implement AT commands and interface of GSM modem

19 Implementation of USB protocol and transferring data

20. GPRS data communication
21. 3G Demo
22. Study of GPS MODEM
23. Study of ZigBee networks using CC2530ZDK
24. Study of optical fiber communication and networks

26. Study of MSP430X2XX microcontroller
27. Interfacing LED to MSP430X2XX
28. Interfacing LCD to MSP430X2XX
29. Interfacing Relay to MSP430X2XX
30. Serial communication using MSP430X2XX