

**MANONMANIAM SUNDARANAR UNIVERSITY  
TIRUNELVELI**

**UG COURSES – AFFILIATED COLLEGES**

**B.Sc. Electronics and Communication  
(Choice Based Credit System)**

**(with effect from the academic year 2016-2017 onwards)**

**(45<sup>th</sup> SCAA meeting held on 09.02.2017)**

Se m.	Pt. I /II/II I/IV/ V	Sub. No.	Subject status	Subject Title	Hrs./ Week	Cre- dits	Marks				
							Maximum			Passing minimum	
							Int.	Ext.	Tot.	Ext.	Tot.
V	III	29	Core - 6	Microprocessors and Microcontrollers	4	4	25	75	100	30	40
		30	Core – 7	Communication System	4	4	25	75	100	30	40
		31	Core - 8	Mathematics for Electronics	4	4	25	75	100	30	40
		32	Major Practical -5	Microprocessors and Microcontrollers Lab	8	4	50	50	100	20	40
		33	Major Elective –II (Select any one)	A)Semiconductor fabrication technology B) Digital Communication	6	5	25	75	100	30	40
	IV	34	Skill Based subject (Common)	Personality Development/ Effective Communication/ Youth Leadership	4	4	25	75	100	30	40
				Subtotal	30	25					

Se m.	Pt. I /II/II I/IV/ V	Sub. No.	Subject status	Subject Title	Hrs./ Week	Cre- dits	Marks				
							Maximum			Passing minimum	
							Int.	Ext.	Tot.	Ext.	Tot.
VI	III	35	Core - 9	Antennas	4	4	25	75	100	30	40
		36	Core - 10	Optical Fibre Communication	4	4	25	75	100	30	40
		37	Core - 11	Advanced Communication System	4	4	25	75	100	30	40
		38	Core - 12	Mobile Communication	4	4	25	75	100	30	40
		39	Major Practical -6	Communication and System Design Lab	8	4	50	50	100	20	40
		40	Major Elective -III	A) Hardware Development B) Embedded System & RTO'S	6	5	25	75	100	30	40
				Subtotal	30	25					

## **MICROPROCESSORS AND MICROCONTROLLERS**

### **UNIT I**

Architecture of 8085 -Instruction set – Data Transfer, Arithmetic, Logical, Branching and I/O Instruction, Instruction types- various Addressing Modes. Different 8 bit & 16 bit processors Z80, MC 6800 & INTEL 8086, Timing sequence- Instruction cycle- Machine cycle- Halt wait state-. ALP- Mnemonic - simple Assembly language program flow chart stack and subroutines- Interrupts.

### **UNIT II**

Peripheral device – Programmable peripheral Interface (8255 A) - Programmable Interrupt controller (8259 A) - USART- Serial Communication Interface. Programmable DMA Controller (8257), Interfacing –Analog to Digital Converter- Digital to Analog Converter-Traffic Light Controller- Stepper Motor – Key Board & Display Interface.

### **UNIT III**

Intel 8051 microcontroller – Block Diagram, pin out – oscillator and clock – Program Counter and Data pointer, A and B registers, flags and program status word – Internal RAM – the Stack and Stack pointer –special functions registers – Internal ROM – I/O Pins, ports and circuits – External memory. Counters, Timers and Addressing Modes  
Timer counter interrupts – Timing – Timer – Modes of operation – Counting – Addressing.

### **UNIT IV**

Data exchanges – Logical operations – Byte level operation – Bit level logical operations – Rotate and swap operations – Arithmetic operations – Jump and call instructions – Jump and call program range – Jumps – Calls and subroutines – Interrupts and return.

### **UNIT V**

Assembly Language programming for 8051 Micro controller family – Programs 8–Bit addition – 8–Bit subtraction – 8–Bit Multiplication – 8–Bit Division - Greatest and smallest number in an array – ascending and Descending – Delay –Routines – Calculation of Time delay – Block data transfer. Interfacing Keyboard –Scanning programs for small keyboards – Interfacing LED, LCD Display – Pulse measurement and pulse width measurement – A/D and D/A Interfacing.

## REFERENCE BOOKS

1. Microprocessor and Interfacing: Programming and Hard ware, Douglas V.Hall,Mc GrawHill, New York (1988)
2. Microprocessor Architecture Programming and applications with 8085/ 8080A. S.Ramesh Goankar, Wiley Eastern Limited(1986)
3. Digital systems & Microprocessor Douglas V.Hall, Mcgraw Hill.
4. Microprocessor- Srinath, PHI Ltd.
5. 8051 Micro controller Architecture, Kennath J. Ayala, Programming and applications, Penram International Publishing
6. Microprocessor Principles and Applications – 2<sup>nd</sup> Edition, Gilmore – Tata McGraw Hill.

## **COMMUNICATION SYSTEM**

### **UNIT I**

Introduction: communication systems – Modulation - need for modulation- bandwidth- Amplitude modulation - theory- mathematical representation- frequency spectrum - USB & LSB- power relation- Frequency modulation - theory- mathematical representation- frequency spectrum- Phase modulation- comparison of AM- FM- PM.

### **UNIT II**

Radio transmitters: AM transmitter - block diagram - Solid state modulators - circuit explanation- FM transmitter - reactance modulator- varactor diode modulator- Amstrong modulator.

### **UNIT III**

Radio receivers: Tuned radio frequency receiver- superheterodyne receiver - block schematic- selectivity- sensitivity- importance of IF - image frequency rejection - AM receivers - schematic explanation - RF amplifiers - circuit explanation - Mixer circuits - IF amplifiers - circuit explanation- simple diode detector - Automatic gain control circuit - simple and delayed AGC - FM receivers - block schematic explanation - amplitude limiting - FM demodulators: slope detectors- phase discriminator- ratio detectors.

### **UNIT IV**

Side band communication: Single side band transmission - suppression of carrier - balanced modulator - filtering of unwanted sideband - SSB receivers - block schematic explanation - pilot carrier receiver - suppressed carrier receiver - Vestigial side band transmission - transmitter and receiver responses - advantages of VSB in television.

### **UNIT V**

Telephone Systems - Telephone subscribers loop circuit - subscribers line interface circuit - Pulse and tone signaling - Frequency assignments - Electronic telephone - block schematic of a telephone set- block schematic of single line analog SLIC board - two wire repeaters - Electronic private automatic branching exchange - basic block schematic- Power line communication: block schematic explanation- Facsimile - FAX transmitter and receiver.

## REFERENCES

1. Electronic communication Systems: Wayne Tomasi- Pearson Edn.
2. Electronic communication: Roody and Coolen- PHI.
3. Electronic Communication systems: George Kennedy- Mc Graw Hill.
4. Electronic and radio engineering: A P Mathur.
5. Telephony and Carrier current engineering: P N Das.
6. Modern communication Systems: Couch- PHI.

## **MATHEMATICS FOR ELECTRONICS**

### **UNIT I**

Finite differences-difference table operator  $E$ ,  $\Delta$ ,  $D$ -Relations between these operators-  
Difference equations- Linear difference equation Homogeneous linear difference equation with constant  
coefficients

### **UNIT II**

Interpolation using finite differences-Newton Gregory formula for forward interpolation-Divided  
differences-properties-Newtons formula for unequal intervals-Lagranges formula-Relation between  
ordinary differences and divided differences

### **UNIT III**

Solutions of algebraic and Transcendental equation iterative method, Bisection method, Newton  
raphson method. Solution of simultaneous Linear equations-Gauss method-Gauss Jordan method –  
Iteration method-Gauss Seidel method

### **UNIT IV**

Theory of equation-relation between roots and coefficients-Transformation of equation

### **UNIT V**

Reciprocal equation –approximate solution of equation-Newton's method and Horner's method

### **BOOKS FOR REFERENCE**

1. Mathematics For Electronics-K.C Pillai
2. Numerical analysis-Armugam and Isaac
3. Numerical analysis-Gupta and Kapoor
4. Theory of equation-Armugam and Isaac
5. Algebra-Manikavasagam pillai

## **MICROPROCESSOR AND MICROCONTROLLER LAB**

**All experiments have to be carried out compulsorily from A and B**

### **A. Microprocessor Lab**

1. Program for 8 Bit Addition and Subtraction
2. Program for 16 Bit Addition and subtraction
3. Program for 8 Bit Multiplication and division
4. Program for 16 Bit Multiplication and Division
5. Program for Square and Square root of a number
6. Program for Sorting and Searching
7. Program for Smallest and Largest number in a array.
8. Program for Reversing a String
9. Program for Fibonacci series.
10. Program for Factorial of a number
11. Program for B.C.D to Binary, Binary to B.C.D, A S C I I to Binary,
12. Binary to ASCII Conversion
13. Six letter word display.
14. Rolling display
15. Interfacing seven segment display to display any character.
16. Program to display Time(Hours and Minutes)
17. Program for 1's complement and 2's complement of 8 bit and 16 bit data
18. Interfacing Traffic light controller
19. Interfacing Stepper motor control
20. Interfacing Matrix Keyboard
21. Interfacing A.D.C
22. Interfacing D.A.C
23. Study of 8255 chip and generation of
  1. Square wave
  2. Triangular wave
  3. Saw Tooth wave



## **B. Microcontroller 8051 Lab**

1. Addition – 8 bit, 16 bit.
2. Subtraction – 8 bit, 16 bit.
3. Multiplication 8 bit
4. Division 8 bit
5. Array addition (multibyte)
6. Logical Operations – AND, OR, NOT
7. Decimal to ASCII and ASCII to Decimal.
8. Decimal to Hexa and Hexa to Decimal.
9. Ascending Order.
10. Descending Order
11. Up/down Counter
12. Block data transfer
13. Interfacing with LCD.
14. Interfacing with Matrix Keypad.
15. Square wave generator
16. Interfacing with ADC.
17. Interfacing with DAC.
18. Digital Clock.
19. Interfacing with Stepper Motor.

## **SEMICONDUCTOR FABRICATION TECHNOLOGY**

### **UNIT I**

Introduction: General classification of integrated circuits – Scale of integration – Advantages over discrete components.

### **UNIT II**

Thick film technology: Features of hybrid IC technology – Thick film conductors – Dielectric – Resistors – Thick film processing – Thick film substrate – Design ideas – Advantages and applications.

### **UNIT III**

Thin film technology : Thin film conductors – resistors – dielectric – substrates – thin film processing – Advantages and applications – Monolithic IC process : Growth and refining of Si crystals – Substrate slicing and polishing – Wafer preparation – Diffusion – Ion implantation – Oxidation – Photolithography – CVD – Epitaxial grown – Metallization – Monolithic resistors and capacitors.

### **UNIT IV**

Introduction – Modern VLSI devices – High field effect – MOSFET devices – long channel & short channel MOSFET.

### **UNIT V**

Bipolar devices – n.p.n. transistor – characteristics of typical n.p.n. transistor – Bipolar device design – Design of emitter, base and collector region – concept of HDL.

### **TEXT BOOKS**

1. Integrated Circuits (K.R. Botkar) . Unit (i, ii, iii).
2. Fundamentals of Modern VLSI Devices by Yuan Taur and Tak H. NING  
Cambridge Publishers. unit (iv and v)

### **BOOKS FOR REFERENCE**

1. Basic VLSI Design Systems and Circuits by Douglas A. Pucknell and Kamran Eshragian, PHI.
2. Device Electronics for Integrated Circuits – Richard Maller.
3. Integrated Electronics – Millman & Halkars.
4. VLSI Technology – S.M. Sze.

**MSU/2016-17/UG-Colleges/Part-IV (B.SC.ELECTRONICS AND COMMUNICATION) /  
Semester-V/ Ppr.no.33(B)/ Elective –II (B)**

**DIGITAL COMMUNICATION**

**UNIT I**

Sampling process –PAM- other forms of pulse modulation –Bandwidth –Noise trade off – Quantization – PCM- Noise considerations in PCM Systems-TDM- Digital multiplexers-Virtues, Limitation and modification of PCM-Delta modulation –Linear prediction –differential pulse code modulation – Adaptive Delta Modulation.

**UNIT II**

Matched Filter- Error Rate due to noise –Intersymbol Interference- Nyquist’s criterion for Distortionless Base band Binary Transmission- Correlative level coding –Baseb and M-ary PAM transmission –Adaptive Equalization –Eye patterns

**UNIT III**

Introduction – Pass band Transmission model- Generation, Detection, Signal space diagram, bit error probability and Power spectra of BPSK, QPSK, FSK and MSK schemes –Differential phase shift keying – Comparison of Digital modulation systems using a single carrier – Carrier and symbol synchronization.

**UNIT IV**

Discrete memoryless channels – Linear block codes - Cyclic codes - Convolutional codes – Maximum likelihood decoding of convolutional codes-Viterbi Algorithm, Trellis coded Modulation, Turbo codes.

**UNIT V**

Pseudo- noise sequences –a notion of spread spectrum – Direct sequence spread spectrum with coherent binary phase shift keying – Signal space Dimensionality and processing gain –Probability of error – Frequency –hop spread spectrum –Maximum length and Gold codes.

**TEXT BOOK**

1. Simon Haykins, “Communication Systems” John Wiley, 4th Edition, 2001

**BOOKS FOR REFERENCE**

1. Sam K.Shanmugam “Analog & Digital Communication” John Wiley.
2. John G.Proakis, “Digital Communication” McGraw Hill 3rd Edition, 1995
3. Taub & Schilling , “Principles of Digital Communication “ Tata McGraw-Hill”  
28<sup>th</sup> reprint, 2003

**MSU/2016-17/UG-Colleges/Part-IV (B.SC.ELECTRONICS AND COMMUNICATION) /  
Semester-VI/ Ppr.no.35/ Core - 9**

**ANTENNAS**

**UNIT 1**

Antenna Basics: Introduction, basic Antenna parameters, patterns, beam area, radiation intensity, beam efficiency, diversity and gain, antenna apertures, effective height, bandwidth, radiation, efficiency, antenna temperature and antenna field zones.

**UNIT II**

Point Sources and Arrays: Introduction, point sources, power patterns, power theorem, radiation intensity, field patterns, phase patterns. Array of two isotropic point sources, non-isotropic but similar point sources, principles of pattern multiplication, examples of pattern synthesis by pattern multiplication, non-isotropic point sources, broad side array with non unipolar amplitude distribution, broad side versus end fire array, direction of maxima fire arrays of n isotropic point sources of equal amplitude and spacing.

**UNIT III**

Electric dipoles and thin linear antennas: Introduction, short electric dipole, fields of a short dipole, radiation resistance of short dipole, radiation resistances of  $\lambda/2$  Antenna, thin linear antenna, micro strip arrays, low side lobe arrays, long wire antenna, folded dipole antennas.

**UNIT IV**

Loop, slot, patch and horn antenna: Introduction, small loop, comparison of far fields of small loop and short dipole, loop antenna general case, far field patterns of circular loop, radiation resistance, directivity, slot antenna, Balinet's principle and complementary antennas, impedance of complementary and slot antennas, patch antennas, horn antennas, rectangular horn antennas.

**UNIT V**

Antenna Types: Helical Antenna, Yagi-Uda array, corner reflectors, parabolic reflectors, log periodic antenna, lens antenna, antenna for special applications – sleeve antenna, turnstile antenna, omni directional antennas, antennas for satellite antennas for ground penetrating radars, embedded antennas, ultra wide band antennas, plasma antenna.

**TEXT BOOK**

1. John D.Krauss, Antennas, III (SEI) edition, McGraw-Hill International edition, 2006
2. Harish and Sachidananda: Antennas and Wave Propagation Oxford Press 2007

**BOOKS FOR REFERENCE**

1. C A Balanis, Antenna Theory Analysis and Design 2nd ED, John Wiley, 1997
2. Sineon R Saunders, Antennas and Propagation for Wireless Communication Systems, John Wiley, 2003.
3. G SN Raju: Antennas and wave propagation , Pearson Education 2005

## **OPTICAL FIBRE COMMUNICATION**

### **UNIT I**

Recollection of basic principles of optics: ray theory- reflections at boundary- critical angle- total internal reflection - Optical wave guides - Propagation in fibre- expression for acceptance angle- acceptance cone – numerical aperture- V number - Index profile-effect of index profile on propagation.

### **UNIT II**

SI fibre and GI fibre - Brief description of modes in SI fibre and GI fibre- Pulse dispersion and Band Width limitation- Mode coupling – Attenuation in single mode and multimode fibres- Optic fibre cables- characteristics of cables- Optic fibre couplers: types of coupling – fibre to fibre joints- splicing techniques- optical fibre connectors.

### **UNIT III**

Optical sources- LEDs, LASER diodes- operating characteristics- photo-detectors-principles of photo detection – PIN diode – APD – operating principles – photo-multiplier tubes- source to fibre power launching – lensing schemes- modulation circuits.

### **UNIT IV**

Basic optical communication systems- point-to-point link- rise time budget- protection techniques- WDM – transceiver requirements-TDM- optical amplifiers- SOAs – EDFAs- optical receivers- Introduction to optical fibre networks.

### **UNIT V**

OTDR - Measurements- numerical aperture- dispersion measurements- refractive index profile measurements- band width measurements- fibre attenuation measurements- cutoff wave length measurements- applications of fibre optic systems- future developments

### **BOOKS FOR REFERENCE**

1. Fibre optic communication technology: Djafer K Mynbaev, Pearson Education.
2. Electronic communication: Dennis Roddy & John coolen, PHI.
3. Optic fibre communication: John M senior, PHI.
4. Telecommunication principle circuits Systems and experiments: S.Ramabhadran, Khanna.
5. Optical communication system: John Gower, PHI
6. Fibre optics in tele communication:Sharma, Mc Graw Hill
7. Optical fibre and fibre optic communication: Subir Kumar Sarkar, S Chand & co. Ltd
8. Optical communication: M Mukund Rao , Universities press.
9. Fiber Optic Communication: Palais, Pearson Education.

## **ADVANCED COMMUNICATION SYSTEMS**

### **UNIT I**

Satellite Communication - Satellite orbits – Geo synchronous orbit –orbital velocity – Round trip time delay - Antenna look angles - Satellite classifications - spacing - frequency allocation- System parameters analysis - link equations- Link Budget - Spacecraft subsystem (block schematic). Tracking and telecommand - Earth stations – Antenna systems – receiver subsystems (block) - functioning LNA – LNB - down converter - channel filters - demodulators- INTELSAT/INMARSAT –Overview of INSAT.

### **UNIT II**

Types of satellite communication system-FSS, DSS-Direct broadcasting and community broadcast - Multiple Access Techniques– Introduction- FDM-FM-FDMA, PSK-TDMA, SSMA, CDMA - Switching techniques – circuit – message - packet switching- Packet satellite network-domestic satellite system.

### **UNIT III**

The cellular concept – Introduction - Frequency reuse –channel assignment – Hand off strategies – prioritizing handoff –practical handoff – Co-channel interface and system capacity – channel planning – adjacent channel interference –Cell splitting – sectoring – repeaters – micro-cell concept- Blue tooth technology- Fundamentals and Applications.

### **UNIT IV**

Wireless communication system-paging-cordless & cellular system –comparison-Second generation cellular networks-third generation cellular networks - Global System for Mobile – services and features – Architecture – Radio subsystem – channel types – frame structure - Global positioning Systems - basic concepts- system block - positioning – Applications.

### **UNIT V**

Spread spectrum Techniques and remote sensing- Pseudo noise sequences –time hopping-frequency Hopping – Robustness – Fast and Slow hopping – Hybrid & Chirp spread spectrum-Synchronization – acquisition – Tracking - Concepts of Jamming -Analysis of DS/SS – Analysis of avoidance-generation of signals-detection –Applications.

## **BOOKS FOR REFERENCE**

1. Electronic communication system fundamentals: Wayne Tomasi, Pearson Education.
2. Wireless communication principles and practice: T S Rappaport, Pearson Education.
3. Satellite communication: Gagliardi.
4. Digital Communication Fundamentals and Applications: B Sklar, Pearson Education.
5. Digital communication: Simon Haykin, John Wiley&Sons.
6. Space communication System: Filipowasky, McGrawHill.

## **MOBILE COMMUNICATION**

### **UNIT I**

Introduction to Cellular Mobile System, Performance criteria, uniqueness of mobile radio environment, operation of cellular systems, Hexagonal shaped cells, Analog and Digital Cellular systems, General description of the problem, concept of frequency channels, Co-channel Interference Reduction Factor, desired C/I from a normal case in a omni directional Antenna system, Cell splitting, consideration of the components of Cellular system.

### **UNIT II**

Introduction to Co-Channel Interference, real time Co-Channel interference, Co-Channel measurement, design of Antenna system, Antenna parameters and their effects, diversity receiver, non-co channel interference-different types, Signal reflections in flat and hilly terrain, effect of human made structures, phase difference between direct and reflected paths, constant standard deviation, straight line path loss slope, general formula for mobile propagation over water and flat open area, near and long distance propagation antenna height gain, form of a point to point model.

### **UNIT III**

Sum and difference patterns and their synthesis, omni directional antennas, directional antennas for interference reduction, space diversity antennas, umbrella pattern antennas, minimum separation of cell site antennas, high gain antennas, Numbering and grouping, setup access and paging channels channel assignments to cell sites and mobile units, channel sharing and borrowing, sectorization, overlaid cells, non fixed channelassignment, Handoff, dropped calls and cell splitting, types of handoff, handoff invitation, delaying handoff, forced handoff, mobile assigned handoff. Intersystem handoff, cell splitting, micro cells, vehicle locating methods, dropped call rates and their evaluation.

### **UNIT IV**

Second generation and Third generation Wireless Networks and Standards, WLL, Bluetooth, GSM, IS-95, DECT, GSM architecture, GSM channels, multiplex access scheme, TDMA, CDMA.

### **UNIT V**

Intelligent Cell Concept, Advanced Intelligent Network, SS7 Network and ISDN for AIN, AIN for Mobile communication, Asynchronous TransferMode Technology, Future Public Land Mobile Telecommunication System, Wireless Information Superhighway.

### **BOOKS FOR REFERENCE**

1. W.C.Y. Lee, "Mobile Cellular Telecommunications", 2nd Edition, Tata McGraw Hill, 2006.
2. Gordon L. Stuber, "Principles of Mobile Communications", 2nd Edition, Springer International, 2007.
3. Theodore. S. Rapport, "Wireless Communications", 3rd Edition, Pearson Education, 2003.
4. Lee, "Wireless and Mobile Communications", 3rd Edition, McGraw Hill, 2006.
5. Jon W. Mark and Weihua Zhqung, "Wireless Communication and Networking", PHI, 2005.
6. R. Blake, "Wireless Communication Technology", Thompson Asia Pvt. Ltd., 2004.

**MSU/2016-17/UG-Colleges/Part-IV (B.SC.ELECTRONICS AND COMMUNICATION) /  
Semester-VI/ Ppr.no.39/Major Practical -VI**

**COMMUNICATION AND SYSTEM DESIGN LAB**

**All experiments have to be carried out compulsorily from A and B**

**A.Communication Lab**

1. Amplitude modulation and Demodulation.
2. Frequency Modulation and Demodulation
3. Pulse Modulation – PAM / PWM / PPM
4. Pulse Code Modulation
5. Delta Modulation, Adaptive Delta Modulation.
6. Digital Modulation & Demodulation – ASK, PSK, QPSK, FSK
7. Designing, Assembling and Testing of Pre-Emphasis / De-emphasis Circuits.
8. PLL and Frequency Synthesizer
9. Line Coding
10. Error Control Coding using MATLAB.
11. Sampling & Time Division Multiplexing.
12. Frequency Division Multiplexing

**B. Electronics Design Lab Practical**

Students must use dotted boards or Group boards and interconnect the joints by soldering.

Soldering Practice

- 1.Design and construction of fixed voltage power supply
2. Design and construction of Dual power supply
- 2.Design and construction of switching power supply
- 3.Design and construction of 1.5 to 12 V power supply using multi tap transformer.
- 4.Design and construction of Burglar alarm using L.D.R
- 5.Design and construction of Temperature switch using Thermistor
- 6.Design and construction of Light sensitive switch using Photo diode
- 7.Design and construction of Audio amplifier using LM 380
- 8.Design and construction of Timer circuit
- 9.Design and construction of Decade counter/ Seven segment decoder
- 10.Design and construction of Logic probe



## **HARDWARE DEVELOPMENT**

### **Suggestions for Hardware skill development areas**

#### **1. Design of a 4-20 mA transmitter for a bridge type transducer.**

Design the Instrumentation amplifier with the bridge type transducer (Thermistor or any resistance variation transducers) and convert the amplified voltage from the instrumentation amplifier to 4 – 20 mA current using op-amp. Plot the variation of the temperature Vs output current.

#### **2. Design of AC/DC voltage regulator using SCR**

Design a phase controlled voltage regulator using full wave rectifier and SCR, vary the conduction angle and plot the output voltage.

#### **3. Design of process control timer**

Design a sequential timer to switch on & off at least 3 relays in a particular sequence using timer IC.

#### **4. Design of AM / FM modulator / demodulator**

Design AM signal using multiplier IC for the given carrier frequency and modulation index and demodulate the AM signal using envelope detector. Design FM signal using VCO IC NE566 for the given carrier frequency and demodulate the same using PLL NE 565.

#### **5. Design of Wireless data modem.**

Design a FSK modulator using 555/XR 2206 and convert it to sine wave using filter and transmit the same using IR LED and demodulate the same PLL NE 565/XR 2212.

#### **6. PCB layout design using CAD**

Drawing the schematic of simple electronic circuit and design of PCB layout using CAD

#### **7. Microcontroller based systems design**

Design of microcontroller based system for simple applications like security systems combination lock.

#### **8. DSP based system design**

Design a DSP based system for echo cancellation, using TMS/ADSP DSP kit.

## **EMBEDDED SYSTEM AND RTOS**

### **UNIT I**

Introduction to Embedded systems: Embedded systems - Application of Embedded Systems - processors in the system - Other Hardware units - software embedded to a system - Exemplar embedded system - Embedded system – on - chip (SOC) and in VLSI circuit

### **UNIT II**

Devices and Buses for device network: I/O Device - timer and counting devices - serial communication using I<sup>2</sup>C, CAN and USB. Parallel communication using PCI, PCIX and advanced parallel High Speed Buses.

### **UNIT III**

Device drivers for device and interrupts serving mechanism: Device drives-parallel port devices drive in a system, serial port Device Drivers in a system, Drivers for internal programmable timing Devices – Interrupt servicing Mechanism – Context and the periods for context switching, Deadline and Interrupt Latency.

### **UNIT IV**

Embedded Software Delopment using IDE: Introduction to Integrated development environment (IDE) – programming concepts and embedded programming in Assembly and C – creating a New project – Adding Files to a project – Building a project – Debugging and simulating the application – Getting Embedded software into the Target system.

### **UNIT V**

Real Time Operating System (RTOS): Introduction to basic concepts of RTOS, Basics of real time& embedded system operating systems, RTOS-Interrupt handling, task scheduling; embedded system design issues in system development process-Action plan, use of target system, emulator,use of software tools.

### **TEXT BOOKS**

1. Rajkamal, "Embedded System-Architecture, Programming, Design" Tata Mc Graw Hill 2006.
2. Daniel W.Lewis "Fundamentals of Embedded Software" Prentice Hall of India, 2004.

## REFERENCE BOOKS

1. David E Simon, "An Embedded Software Primer" person Education Asia, 2006.
2. Frank Vahid, Embedded System Design – A Unified hardware & Software Introduction John Wiley, 2002.
3. Sriram V. Iyer, Pankaj Gupte, Embedded Real Time Systems Programming "Tata McGraw Hill, 2004.
4. Steve Heath, "Embedded System Design" II edition, Elsevier, 2003.
5. Arnold Berger, "Embedded System Design: An Introduction to processes, Tools, and Techniques", CMP Books, 2001.
6. Wayne Wolf, "Computers as components" Morgan Kaufmann Publishers, 2005.
7. Douglas V Hall, "Microprocessors and Interfacing: Programming and Hardware", Tata McGraw – Hill, Second Edition, 2001.