B.TECH – ELECTRONICS & COMMUNICATION ENGINEERING

Course Structure R-20

SEMESTER VII

S.No.	Class	Course Code	Name of the Subject	L	T	P	C
1	PC	C47PC1	Microwave Engineering	3	0	0	3
2	PE	C47PE2	Professional Elective-III 1. Analog IC Design 2. Computer Vision 3. Embedded System Design 4. Cellular Mobile Communications	3	0	0	3
3	OE	C47OE3	OE-III	3	0	0	3
4	OE	C47OE4	OE-IV	3	0	0	3
5	PC	C47PC5	Microwave Engineering Lab	0	0	2	1.0
6	PC	C47PC6	Advanced Technology Lab	0	0	2	1.0
7	PW	C47PW7	Major Project Phase I	0	0	18	5
8	MC	MC007	Competitive Exams	0	0	0	Satisfactory
Total Credits				12	0	22	**19**

Major Project Phase I: Students can form a group of minimum of two or maximum of four under the allocated guide, students group should choose a project title, for the chosen project title carryout a detailed literature survey, problem formulation, planning higher level design. The project evaluation will be Continuous Internal Evaluation will be made by the PRC Committee. The PRC committee consists of Head, Project Coordinator, One Senior Professor, One Associate Professor, and guide.

Mandatory Course:

Competitive Exams: For completion of this course the student can submit the proof of appearing the competitive exams like, GATE, IELTES, GRE, TOEFL, CDAC, CDS, CAT, or any examination organized by NATIONAL TESTING AGENCY (NTA), or college in the level of NTA.

or

The student should request for the provision of conducting Technical Seminar by the department. The topic of seminar should be the current technology of respective Engineering Branch. The evaluation will be done by the Departmental Academic Committee (DAC) based on rubrics framed.

B.TECH – ELECTRONICS & COMMUNICATION ENGINEERING
Course Structure R-20

SEMESTER VIII

<table>
<tr><th>S.No.</th><th>Class</th><th>Course Code</th><th>Name of the Subject</th><th>L</th><th>T</th><th>P</th><th>C</th></tr>
<tr><td>1</td><td>PE</td><td>C48PE1</td><td>Professional Elective-III
1. Low Power VLSI Design
2. Digital Signal Processing and Architecture
3. Programming 8051 Microcontroller using Assembly Language
4. Radar Engineering</td><td>3</td><td>0</td><td>0</td><td>3</td></tr>
<tr><td>2</td><td>PE</td><td>C48PE2</td><td>Professional Elective-IV
1. Memory Technologies
2. Neural Networks
3. Embedded Real Time Operating Systems
4. Satellite Communications</td><td>3</td><td>0</td><td>0</td><td>3</td></tr>
<tr><td>3</td><td>PE</td><td>C48PE3</td><td>Professional Elective-V
1. CPLD & FPGA architecture and applications
2. Biomedical Signal Processing
3. Embedded C
4. Wireless Communications and Networks</td><td>3</td><td>0</td><td>0</td><td>3</td></tr>
<tr><td>4</td><td>PW</td><td>C48PW4</td><td>Comprehensive Viva</td><td rowspan="2">9</td><td rowspan="2">0</td><td rowspan="2">27</td><td>2</td></tr>
<tr><td>5</td><td>PW</td><td>C48PW5</td><td>Major Project Phase II</td><td>8</td></tr>
<tr><td colspan="4">Total Credits</td><td>18</td><td>0</td><td>27</td><td>19</td></tr>
</table>

Major Project Phase II: The approved project in Major Project Phase 1 should be implemented, student should submit the progress of his implementation work in 2 phases, to the PRC (Project Review Committee). The PRC consists of Head, Project Coordinator, One Senior Professor, One Associate Professor, and guide. Upon approval in both the phases, the student is eligible to submit the final project report by completing proper documentation to the external viva voce.

B.TECH. ELECTRONICS & COMMUNICATION ENGINEERING

MICROWAVE ENGINEERING

B.Tech. VII semester **L/T/P/C**

3/0/0/ 3

Pre-Requisites: AWP

COURSE OBJECTIVES:

This is a core course in Microwave Communications domain, and covers contents related to Microwave theory and techniques. The main objectives of the course are:

1. To get familiarized with microwave frequency bands, their applications and to understand the limitations and losses of conventional tubes at these frequencies.
2. To develop the theory related to microwave transmission lines, and to determine the characteristics of rectangular waveguides, micro strip lines, and different types of waveguide components and ferrite devices.
3. To distinguish between different types of microwave tubes, their structures and principles of microwave power generation, and to characterize their performance features and applications - at tube levels as well as with solid state devices.
4. To impart the knowledge of Scattering Matrix, its formulation and utility, and establish the S- Matrix for various types of microwave junctions.
5. To understand the concepts of microwave measurements, identify the equipment required and precautions to be taken, and get familiarized with the methods of measurement of microwave power and various other microwave parameters.

COURSE OUTCOMES:

Having gone through this course covering different aspects of microwave theory and techniques, the students would be able to

1. Analyze completely the rectangular waveguides, their mode characteristics, and design waveguides for solving practical microwave transmission line problems.
2. Distinguish between the different types of waveguide and ferrite components, explain their functioning and select proper components for engineering applications.
3. Distinguish between the methods of power generation at microwave frequencies, derive the performance characteristics of 2-Cavity and Reflex Klystrons, Magnetrons, TWTs and estimate their efficiency levels, and solve related numerical problems.
4. Realize the need for solid state microwave sources, understand the concepts of TEDs, RWH Theory and explain the salient features of Gunn Diodes and ATT Devices.
5. Establish the properties of Scattering Matrix, formulate the S-Matrix for various microwave junctions, and understand the utility of S-parameters in microwave component design.

UNIT – I:

Microwave Transmission Lines - I: Introduction, Microwave Spectrum and Bands, Applications of Microwaves. Rectangular Waveguides – Solution of Wave Equations in Rectangular Coordinates, TE/TM mode analysis, Expressions for Fields, Characteristic Equation and Cut-off Frequencies, Filter Characteristics, Dominant and Degenerate Modes, Sketches of TE and TM mode fields in the cross-section, Mode Characteristics – Phase and Group Velocities, Wavelengths and Impedance Relations, Power Transmission, Impossibility of TEM Mode. Illustrative Problems, Micro strip Lines– Introduction, Z_o Relations, and Effective Dielectric Constant.

UNIT – II:

Cavity Resonators– Introduction, Rectangular Cavities, Dominant Modes and Resonant Frequencies, Q Factor and Coupling Coefficients, Illustrative Problems

Waveguide Components and Applications: Coupling Mechanisms – Probe, Loop, Aperture types. Waveguide Discontinuities – Waveguide Windows, Tuning Screws and Posts, Matched Loads. Waveguide Attenuators – Different Types, Resistive Cardand Rotary Vane Attenuators;

Waveguide Phase Shifters – Types, Dielectric and Rotary Vane Phase Shifters, Waveguide Multiport Junctions – E plane and H plane Tees, Magic Tee. Directional Couplers – 2 Hole, Bethe Hole types, Illustrative Problems

Ferrites– Composition and Characteristics, Faraday Rotation, Ferrite Components – Gyrator, Isolator, Circulator.

UNIT – III:

Microwave Tubes: Limitations and Losses of conventional Tubes at Microwave Frequencies, Microwave Tubes – O Type and M Type Classifications, O-type Tubes : 2 Cavity Klystrons – Structure, Reentrant Cavities, Velocity Modulation Process and Applegate Diagram, Bunching Process and Small Signal Theory – Expressions for O/P Power and Efficiency. Reflex Klystrons – Structure, Velocity Modulation and Applegate Diagram, Mathematical Theory of Bunching, Power Output, Efficiency, Oscillating Modes and O/P Characteristics, Illustrative Problems.

Helix TWTs: Significance, Types and Characteristics of Slow Wave Structures; Structure of TWT and Amplification Process (qualitative treatment), Suppression of Oscillations, Gain Considerations.

UNIT – IV:

M-Type Tubes: Introduction, Cross-field Effects, Magnetrons – Different Types, Cylindrical Traveling Wave Magnetron –Modes of Resonance and PI-Mode Operation, Separation of PI-Mode, o/p characteristics, Illustrative Problems.

Microwave Solid State Devices: Introduction, Classification, Applications.TEDs – Introduction, Gunn Diodes – Principle, RWH Theory, Characteristics, Modes of Operation - Gunn Oscillation Modes, Introduction to Avalanche Transit Time Devices.

UNIT –V:

Scattering Matrix– Significance, Formulation and Properties, E plane and H plane Tees, Magic Tee, Circulator and Isolator, Illustrative Problems. Microwave Antennas-Fundamental Parameters, Definitions for Antennas, and Radiation from Rectangular Antennas.

Microwave Measurements: Description of Microwave Bench – Different Blocks and their Features, Errors and Precautions, Microwave Power Measurement, Bolometer. Measurement of Attenuation, Frequency, Standing Wave Measurements – Measurement of Low and High VSWR, Cavity Q, Impedance Measurements.

TEXT BOOKS

1. Microwave Devices and Circuits – Samuel Y. Liao, Pearson, 3rd Edition, 2003.
2. Microwave Principles – Herbert J. Reich, J.G. Skalnik, P.F. Ordung and H.L. Krauss, CBS Publishers and Distributors, NewDelhi,2004.

REFERENCE BOOKS

1. Foundations for Microwave Engineering – R.E. Collin, IEEE Press, John Wiley, 2nd Edition, 2002.
2. Microwave Engineering - G. S. Raghuvanshi, Cengage Learning India Pvt. Ltd. 2012.
3. Microwave Engineering Passive Circuits – Peter A. Rizzi, PHI, 1999.
4. Microwave Engineering - David M. Pozar, John Wiley & Sons (Asia) Pvt Ltd., 1989, 3r ed., 2011Reprint.

B.TECH. ELECTRONICS & COMMUNICATION ENGINEERING

ANALOG IC DESIGN

-

B.Tech. VII semester **L/T/P/C**

3/0/0/ 3

Pre-Requisite: Analog Electronics

Course Objectives: Analog circuits play a very crucial role in all electronic systems and due to continued miniaturization; many of the analog blocks are not getting realized in CMOS technology.

1. To understand most important building blocks of all CMOS analog Ics.
2. To study the basic principle of operation, the circuit choices and the tradeoffs involved in the MOS transistor level design common to all analog CMOS ICs.
3. To understand specific design issues related to single and multistage voltage, current and differential amplifiers, their output and impedance issues, bandwidth, feedback and stability.
4. To understand the design of differential amplifiers, current amplifiers and OP AMPs.

Course Outcomes: After studying the course, each student is expected to be able to

1. Design basic building blocks of CMOS analog ICs.
2. Design of single and two stage operational amplifiers and voltage references.
3. Determine the device dimensions of each MOSFET's involved.
4. Design various amplifiers like differential, current and operational amplifiers.
5. Design of different type of comparators using Op-Amp circuits for the given specifications.

UNIT - I

MOS Devices and Modeling

The MOS Transistor, Passive Components- Capacitor & Resistor, Integrated circuit Layout, CMOS Device Modeling - Simple MOS Large-Signal Model, Other Model Parameters, Small-Signal Model for the MOS Transistor, Computer Simulation Models, Sub-threshold MOS Model.

UNIT - II

Analog CMOS Sub-Circuits

MOS Switch, MOS Diode, MOS Active Resistor, Current Sinks and Sources, Current Mirrors-Current mirror with Beta Helper, Degeneration, Cascode current Mirror and Wilson Current Mirror, Current and Voltage References, Band gap Reference.

UNIT - III
CMOS Amplifiers
Inverters, Differential Amplifiers, Cascode Amplifiers, Current Amplifiers, Output Amplifiers, High Gain Amplifiers Architectures.

UNIT - IV
CMOS Operational Amplifiers
Design of CMOS Op Amps, Compensation of Op Amps, Design of Two-Stage Op Amps, Power- Supply Rejection Ratio of Two-Stage Op Amps, Cascode Op Amps, Measurement Techniques of OP Amp.

UNIT - V
Comparators
Characterization of Comparator, Two-Stage, Open-Loop Comparators, Other Open-Loop Comparators, Improving the Performance of Open-Loop Comparators, Discrete-Time Comparators.

TEXT BOOKS

1. CMOS Analog Circuit Design - Philip E. Allen and Douglas R. Holberg, Oxford University Press, International Second Edition/Indian Edition, 2010.
2. Analysis and Design of Analog Integrated Circuits- Paul R. Gray, Paul J. Hurst, S. Lewis and R. G. Meyer, Wiley India, Fifth Edition, 2010.

REFERENCES

1. Analog Integrated Circuit Design- David A. Johns, Ken Martin, Wiley Student Edn, 2013.
2. Design of Analog CMOS Integrated Circuits- Behzad Razavi, TMH Edition.
3. CMOS: Circuit Design, Layout and Simulation-Baker, Li and Boyce, PHI.

B.TECH. ELECTRONICS & COMMUNICATION ENGINEERING

COMPUTER VISION

B.Tech. VII semester **L/T/P/C**

3/0/0/ 3

Prerequisite: Signals and Systems, Digital Image Processing, Digital Signal Processing, Knowledge of mathematics and matrices.

Course Objectives:
The objectives of this course are to make the student
1. To review image processing techniques for computer vision.
2. To understand shape and region analysis.
3. To understand Hough Transform and its applications to detect lines, circles, ellipses.
4. To understand three-dimensional image analysis techniques.
5. To understand motion analysis.

Course Outcomes:
Upon completion of this course, the students should be able to
1. Implement fundamental image processing techniques required for computer vision.
2. Perform shape analysis & Implement boundary tracking techniques.
3. Apply chain codes and other region descriptors & Apply 3D vision techniques.
4. Apply Hough Transform for line, circle, and ellipse detections & Implement motion related techniques.
5. Develop applications using computer vision techniques.

UNIT - I
Image Processing Foundations: Review of image processing techniques – classical filtering Operations – thresholding techniques – edge detection techniques – corner and interest point Detection – mathematical morphology – texture.

UNIT - II
Shapes and Regions: Binary shape analysis – connectedness – object labeling and counting – Size filtering – distance functions – skeletons and thinning – deformable shape analysis – Boundary tracking procedures – active contours – shape models and shape recognition – Centroidal profiles – handling occlusion –boundary length measures – boundary descriptors – Chain codes – Fourier descriptors – region descriptors – moments.

UNIT - III

Hough Transform: Line detection – Hough Transform (HT) for line detection – foot-of normal Method – line localization – line fitting – RANSAC for straight line detection – HT based circular object detection– accurate center location – speed problem – ellipse detection – Case study: Human Iris location– hole detection – generalized Hough Transform (GHT) – Spatial matched filtering – GHT for ellipse detection – object location – GHT for feature Collation.

UNIT - IV

3D Vision and Motion: Methods for 3D vision – projection schemes – shape from shading – Photometric stereo – shape from texture – shape from focus – active range finding –surface Representations –point-based representation –volumetric representations –3D object recognition – 3D reconstruction – introduction to motion – triangulation – bundle adjustment– translational alignment – parametric motion – spline-based motion – optical flow – layered motion.

UNIT - V

Applications: Application: Photo album – Face detection – Face recognition – Eigen faces – Active appearance and 3D shape models of faces Application: Surveillance – foreground background separation – particle filters – Chamfer matching, tracking, and occlusion – Combining views from multiple cameras – human gait analysis Application: In-vehicle vision System: locating roadway – road markings – identifying road signs – locating pedestrians.

TEXT BOOKS:

1. Simon J. D. Prince, ―Computer Vision: Models, Learning, and Inference‖,
2. Cambridge University Press, 2012.
3. Mark Nixon and Alberto S. Aquado, ―Feature Extraction & Image Processing for
4. Computer Vision‖, Third Edition, Academic Press, 2012.
5. E. R. Davies, ―Computer & Machine Vision, Fourth Edition, Academic Press, 2012.

REFERENCES:

1. D. L. Baggio et al., ―Mastering OpenCV with Practical Computer Vision Projects‖,
2. Packt Publishing, 2012.
3. Jan Erik Solem, ―Programming Computer Vision with Python: Tools and algorithms
4. for analyzing images, O'Reilly Media, 2012.
5. R. Szeliski, ―Computer Vision: Algorithms and Applications‖, Springer 2011.

B.TECH. ELECTRONICS & COMMUNICATION ENGINEERING

EMBEDDED SYSTEM DESIGN

B.Tech. VII semester **L/T/P/C**
3/0/0/3

Pre-Requisite: Fundamentals of Microcontrollers and Embedded Concepts

Course Objectives: The objective of this course is to enable the students to

1. Understand the basics of an embedded system
2. Learn the method of designing an Embedded System for any type of applications.

Course Outcomes: On completion of the course, student will able to

1. Un Outline the basics of an embedded system
2. Understand types of processors, memory, various circuits and their interfacing
3. Acquire knowledge about devices and buses used in embedded networking
4. Formulate embedded firmware design approaches and development languages
5. Acquire knowledge about Life cycle of embedded design and identify the design constraints and challenges of an embedded system with case studies.

UNIT -I

Introduction To Embedded Systems: Definition of Embedded System, Embedded Systems Vs General Computing Systems, History of Embedded Systems, Classification, Major Application Areas, Purpose of Embedded Systems, Characteristics and Quality Attributes of Embedded Systems.

UNIT -II

Typical Embedded System: Core of the Embedded System: General Purpose and Domain Specific Processors, ASICs, PLDs, Commercial Off-The-Shelf Components (COTS), Memory: ROM, RAM, Memory according to the type of Interface, Memory Shadowing, Memory selection for Embedded Systems, Sensors and Actuators.
Other System Components: Reset Circuit, Brown-out Protection Circuit, Oscillator Unit, Real Time Clock, Watchdog Timer.

UNIT -III

I/O Subsystem: LED, 7-Segment LED Display, Optocoupler, Stepper Motor, Relay, Piezo Buzzer, Push Button Switch, Keyboard, PPI.
Communication Interface: Onboard Communication Interface - I2C Bus, SPI Bus, UART, 1-Wire Interface, Parallel Interface, External Communication Interface - RS-232C & RS-485, USB, IEEE 1394, Infrared, Bluetooth, Wi-Fi, ZigBee, GPRS.

UNIT IV

Embedded Firmware Design and Development: Embedded Firmware Design Approaches – The Super Loop based Approach, The Embedded Operating System (OS) based Approach, Embedded Firmware Development Languages - Assembly Language based Development, High level language based Development, Mixing Assembly and High Level Language.

Integration and Testing of Embedded Hardware and Firmware: Out-of-Circuit Programming, In System Programming, In Application Programming, Use of Factory Programmed Chip, Firmware Loading for Operating System based Devices, Board Bring Up.

UNIT -V

The Embedded Product Development Life Cycle (Edlc): What is EDLC, Why EDLC, Objectives of EDLC, Different Phases of EDLC, and EDLC Approaches.

Design Case Studies: Battery-Operated Smart Card Reader Automated Meter Reading (AMR) System.

TEXT BOOKS:

1. Shibu K.V, "Introduction to Embedded Systems", McGraw Hill.

REFERENCE BOOKS:

1. Raj Kamal, "Embedded Systems", TMH.
2. Frank Vahid, Tony Givargis, "Embedded System Design", John Wiley.
3. Lyla, "Embedded Systems", Pearson, 2013
4. David E. Simon, "An Embedded Software Primer", Pearson Education.

B.TECH. ELECTRONICS & COMMUNICATION ENGINEERING
CELLULAR AND MOBILE COMMUNICATIONS

B.Tech. VII Semester **L/T/P/C**
3/ 0 /0/ 3

Pre-Requisite: Antennas and Communications

COURSE OBJECTIVES:

1. To provide the student with an understanding of the Cellular concept, Frequency reuse, Hand- off strategies.
2. To enable the student to analyze and understand wireless and mobile cellular communication systems over a stochastic fading channel.
3. To provide the student with an understanding of Co-channel and Non Co-channel interferences.
4. To give the student an understanding of cell coverage for signal and traffic, diversity techniques and mobile antennas.
5. To give the student an understanding of frequency management, Channel assignment and types of handoff.

COURSE OUTCOMES:

By the end of the course, the student will be able to:

1. Understand mobile cellular system and impairments due to multipath fading channel.
2. Understand the fundamental techniques to overcome the different fading effects.
3. Understand Co-channel and Non Co-channel interferences
4. Familiar with cell coverage for signal and traffic, diversity techniques and mobile antennas.
5. Understand of frequency management, Channel assignment, and types of handoff.

UNIT – I:

Introduction to Cellular Mobile Radio Systems: Limitations of Conventional Mobile Telephone Systems, Basic Cellular Mobile System, First, Second, Third and Fourth Generation Cellular Wireless Systems, Performance Criteria, Uniqueness of Mobile Radio Environment-Fading - Time Dispersion Parameters, Coherence Bandwidth, Doppler Spread and Coherence Time, Operation Of Cellular Systems & Hexagonal Shaped Cells.

Fundamentals of Cellular Radio System Design: Concept of Frequency Reuse, Co- Channel Interference, Co-Channel Interference Reduction Factor, Desired C/I From a Normal Case in a Omni Directional Antenna System, System Capacity, Trunking and Grade of Service, Improving Coverage and Capacity in Cellular Systems- Cell Splitting, Sectoring, Microcell Zone Concept, Umbrella Cell Approach.

UNIT – II:

Co-Channel Interference: Introduction to Co-Channel Interference, Measurement Of Real Time Co-Channel Interference, Design of Antenna System, Diversity Techniques-Space Diversity, Polarization Diversity, Frequency Diversity, Time Diversity.

Non-Co-Channel Interference: Adjacent Channel Interference, Near End Far End Interference, Cross Talk, Effects on Coverage and Interference by Power Decrease, Antenna Height Decrease, Effects of Cell Site Components.

UNIT – III:

Cell Coverage for Signal and Traffic: 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, Path Loss From a Point to Point Prediction Model in Different Conditions, Merits of Lee Model.

Cell Site and Mobile Antennas: Omni Directional and Directional Antennas, Space Diversity Antennas, Umbrella Pattern Antennas, Minimum Separation of Cell Site Antennas, Mobile Antennas, High Gain Antennas.

UNIT – IV:

Frequency Management and Channel Assignment: 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 Channel Assignment.

UNIT – V:

Handoffs and Dropped Calls: Handoff Initiation, Types of Handoff, Delaying Handoff, Advantages of Handoff, Power Difference Handoff, Forced Handoff, Mobile Assisted and Soft Handoff, Intersystem Handoff, Introduction to Dropped Call Rates and their Evaluation.

TEXT BOOKS

1. Mobile Cellular Telecommunications – W.C.Y. Lee, Mc Graw Hill, 2ndEdn. 1989.
2. Wireless Communications - Theodore. S. Rapport, Pearson Education, 2nd Edn., 2002.
3. Wireless communication and networks - Dalal, oxford university press.

REFERENCE BOOKS

1. Principles of Mobile Communications – Gordon L. Stuber, Springer International, 2ndEdn. 2001.
2. Modern Wireless Communications - Simon Haykin, Michael Moher, Pearson Education, 2005.
3. Wireless Communications Theory and Techniques, Asrar U. H .Sheikh, Springer, 2004.
4. Wireless Communications and Networking, Vijay Garg, Elsevier Publications, 2007.
5. Wireless Communications – Andrea Goldsmith, Cambridge University Press, 2005.

B.TECH. ELECTRONICS & COMMUNICATION ENGINEERING

MICROWAVE LAB

B.Tech. VII semester **L/T/P/C**
0/0/2/ 1.0

Course Objectives

1. The goal of this course is to introduce students to the concepts and principles of the advanced microwave engineering
2. To understand the operation of different types of Microwave sources.
3. Scattering parameters are defined and used to characterize devices and system behavior

1. **Course Outcomes**
   1. Gain knowledge and understanding of microwave analysis methods.
   2. Be able to apply analysis methods to determine circuit properties of passive/active microwave devices.
   3. Know how to model and determine the performance characteristics of a microwave circuit or system using computer aided design methods.
   4. Have knowledge of how transmission and waveguide structures and how they are used as elements in impedance matching and filter circuits.

Note: Minimum of 12 experiments to be conducted

1. Reflex Klystron Characteristics
2. Gunn Diode Characteristics
3. Directional Coupler Characteristics
4. VSWR Measurement of Matched load
5. VSWR measurement of with open and short circuit loads
6. Measurement of Waveguide Parameters
7. Measurement of Impedance of a given Load
8. Measurement of Scattering Parameters of a E plane Tee
9. Measurement of Scattering Parameters of a H plane Tee
10. Measurement of Scattering Parameters of a Magic Tee
11. Measurement of Scattering Parameters of an Isolator
12. Measurement of Scattering Parameters of a Circulator
13. Attenuation Measurement
14. Microwave Frequency Measurement

B.TECH. ELECTRONICS & COMMUNICATION ENGINEERING

ADVANCED TECHNOLOGY LAB

B.Tech. VII semester **L/T/P/C**
. **0/0/2/ 1.0**

LIST OF EXPERIMENTS

Pre-Requisite: Python Basics, Raspberry Pi

Course Objectives

1. The goal of this course is to introduce students to the concepts and Principles of the advance of embedded technologies
2. To understand the operation of different types of hardware like Raspberry Pi, Node MCU etc
3. To Perform various real time application based on python using IOT

Course Outcomes

1. Understanding and learning of basic Linux commands.
2. Able to learn different programs using python
3. Develop applications using basic sensors
4. Design various IOT applications using Raspberry Pi and Node MCU

LIST OF EXPERIMENTS

Following are some of the programs that a student should be able to write and test on Raspberry Pi, but not limited to this only.

Cycle -1

1. Start Raspberry Pi and try various Linux commands in command terminal window: ls, cd, touch, mv, rm, man, mkdir, rmdir, tar, gzip, cat, more, less, ps, sudo, cron, chown, chgrp, ping etc.
2. Run some python programs on Pi like:
   a. Read your name and print Hello message with name.
   b. Read two numbers and print their sum, difference, product and division.
   c. Word and character count of a given string.
   d. Area of a given shape (rectangle, triangle and circle) reading shape and appropriate values from standard input
   e. Print a name 'n' times, where name and n are read from standard input, using for and while loops.
   f. Handle Divided by Zero Exception.

g. Print current time for 10 times with an interval of 10 seconds.
h. Read a file line by line and print the word count of each line.

3. Light an LED through Python program.
4. Get input from two switches and switch on corresponding LEDs.
5. Flash an LED at a given on time and off time cycle, where the two times are taken from a file.
6. Flash an LED based on cron output (acts as an alarm).
7. Switch on a relay at a given time using cron, where the relay's contact terminals are connected to a load.
8. Get the status of a bulb at a remote place (on the LAN) through web.
9. The student should have hands on experience in using various sensors like temperature, humidity, smoke, light, etc. and should be able to use control web camera, network, and relays connected to the Pi.

Cycle -2

Following are some of the programs that a student should be able to write and test using Node MCU/ESP32

10. Controlling devices like LED on/off from HTML Webpage/or IoT cloud using Node MCU
11. Distance measurement using Node MCU and Ultrasonic sensor
12. Reading the temperature & humidity at a remote place using cloud/web

B.TECH. ELECTRONICS & COMMUNICATION ENGINEERING

LOW POWER VLSI DESIGN

B.Tech. VIII semester **L/T/P/C**

3/0/0/3

Pre-Requisites: VLSI Design, EDC, DICA

OBJECTIVES

1. The student will be able to understand the Fundamentals of Low Power VLSI Design.
2. In this course, students can study low-Power Design Approaches, Power estimation and analysis.
3. Another main object of this course is to motivate the graduate students to study and to analyze the Low-Voltage Low-Power Adders, Multipliers.
4. The concepts of Low-Voltage Low-Power Memories and Future Trend and Development of DRAM

COURSE OUTCOMES: On Completion of course students are able to

1. Infer about the second order effects of MOS transistor characteristics.
2. Analyse and implement various CMOS static logic circuits.
3. Learn the design techniques low voltage and low power CMOS circuits for various applications.
4. Learn the different types of memory circuits and their design.
5. Design and implementation of various structures for low power applications

UNIT – I:

Fundamentals: Need for Low Power Circuit Design, Sources of Power Dissipation – Switching Power Dissipation, Short Circuit Power Dissipation, Leakage Power Dissipation, Glitching Power Dissipation, Short Channel Effects –Drain Induced Barrier Lowering and Punch Through, Surface Scattering, Velocity Saturation, Impact Ionization, Hot Electron Effect.

UNIT – II:

Low-Power Design Approaches: Low-Power Design through Voltage Scaling: VTCMOS circuits, MTCMOS circuits, Architectural Level Approach –Pipelining and Parallel Processing Approaches. Switched Capacitance Minimization Approaches: System Level Measures, Circuit Level Measures and Mask level Measures

UNIT – III:

Low-Voltage Low-Power Adders: Introduction, Standard Adder Cells, CMOS Adder's Architectures – Ripple Carry Adders, Carry Look-Ahead Adders, Carry Select Adders, Carry Save Adders, Low Voltage Low-Power Design Techniques –Trends of Technology and Power Supply Voltage, Low Voltage Low-Power Logic Styles.

UNIT – IV:

Low-Voltage Low-Power Multipliers: Introduction, Overview of Multiplication, Types of Multiplier Architectures, Braun Multiplier, Baugh-Wooley Multiplier, Booth Multiplier, Introduction to Wallace Tree Multiplier.

UNIT – V:

Low-Voltage Low-Power Memories: Basics of ROM, Low-Power ROM Technology, Future Trend and Development of ROMs, Basics of SRAM, Memory Cell, Precharge and Equalization Circuit, Low Power SRAM Technologies, Basics of DRAM, Self-Refresh Circuit, Future Trend and Development of DRAM.

TEXT BOOKS:

1. Sung-Mo Kang, Yusuf Leblebici, "CMOS Digital Integrated Circuits – Analysis and Design", TMH, 2011.
2. Kiat-Seng Yeo, Kaushik Roy, "Low-Voltage, Low-Power VLSI Subsystems", TMH Professional Engineering.

REFERENCE BOOKS:

1. Ming-BO Lin, "Introduction to VLSI Systems: A Logic, Circuit and System Perspective", CRC Press
2. Anantha Chandrakasan, "Low Power CMOS Design", IEEE Press, /Wiley International, 1998.
3. Kaushik Roy, Sharat C. Prasad, "Low Power CMOS VLSI Circuit Design", John Wiley, & Sons, 2000.
4. Gary K. Yeap, "Practical Low Power Digital VLSI Design", Kluwer Academic Press, 2002.
5. Bellamour, M. I. Elamasri, "Low Power CMOS VLSI Circuit Design", A Kluwer Academic Press.
6. Siva G. Narendran, Anatha Chandrakasan, "Leakage in Nanometer CMOS Technologies", Springer, 2005.

B.TECH. ELECTRONICS & COMMUNICATION ENGINEERING
DIGITAL SIGNAL PROCESSING & ACHITECTURE

B.Tech. VIII semester **L/T/P/C**

3/0/0/3

Prerequisite: Signals and Systems, Digital Signal Processing, Knowledge of mathematics and matrices.

Course Objectives:

The objectives of this course are to make the student

1. Understand the design of various types of digital filters and implement them using
2. various implementation structures
3. Understand the concept and need for Multirate signal Processing and their applications in
4. various fields of Communication & Signal Processing
5. Understand difference between estimation & Computation of Power spectrum and the
6. need for Power Spectrum estimation.
7. Study various Parametric & Non parametric methods of Power spectrum estimation
8. techniques and their advantages & disadvantages
9. Understand the effects of finite word/register length used in hardware in implementation
10. of various filters and transforms using finite precision processors.

Course Outcomes:

On completion of this course student will be able to

1. Design and implement a filter which is optimum for the given specifications.
2. Design a Mutirate system for the needed sampling rate and can implement the same using Polyphase filter structures of the needed order.
3. Estimate the power spectrum of signal corrupted by noise through a choice of estimation methods: Parametric or Non Parametric.
4. Can calculate the output Noise power of different filters.
5. Also they can decide the stability of the system by studying the effect due to coefficient quantization while implementing different filters and transforms.

UNIT I:

INTORODUCTION TO DIGITAL SIGNAL PROCESING:

Introduction, A Digital signal-processing system, The sampling process, Discrete time sequences. Discrete Fourier Transform (DFT) and Fast Fourier Transform (FFT), Linear time-invariant systems, Digital filters, Decimation and interpolation, Analysis and Design tool for DSP Systems MATLAB, DSP using MATLAB.

COMPUTATIONAL ACCURACY IN DSP IMPLEMENTATIONS:

Number formats for signals and coefficients in DSP systems, Dynamic Range and Precision, Sources of error in DSP implementations, A/D Conversion errors, DSP Computational errors, D/A Conversion Errors, Compensating filter.

UNIT II:

ARCHITECTURES FOR PROGRAMMABLE DSP DEVICES:

Basic Architectural features, DSP Computational Building Blocks, Bus Architecture and Memory, Data Addressing Capabilities, Address Generation Unit, Programmability and Program Execution, Speed Issues, Features for External interfacing.

EXECUTION CONTROL AND PIPELINING :

Hardware looping, Interrupts, Stacks, Relative Branch support, Pipelining and Performance, Pipeline Depth, Interlocking, Branching effects, Interrupt effects, Pipeline Programming models.

UNIT III: PROGRAMMABLE DIGITAL SIGNAL PROCESSORS :

Commercial Digital signal-processing Devices, Data Addressing modes of TMS320C54XX DSPs, Data Addressing modes of TMS320C54XX Processors, Memory space of TMS320C54XX Processors, Program Control, TMS320C54XX instructions and Programming, On-Chip Peripherals, Interrupts of TMS320C54XX processors, Pipeline Operation of TMS320C54XX Processors.

UNIT IV: IMPLEMENTATIONS OF BASIC DSP ALGORITHMS :

The Q-notation, FIR Filters, IIR Filters, Interpolation Filters, Decimation Filters, PID Controller, Adaptive Filters, 2-D Signal Processing.

IMPLEMENTATION OF FFT ALGORITHMS :

An FFT Algorithm for DFT Computation, A Butterfly Computation, Overflow and scaling, Bit-Reversed index generation, An 8-Point FFT implementation on the TMS320C54XX, Computation of the signal spectrum.

UNIT V:

INTERFACING MEMORY AND I/O PERIPHERALS TO PROGRAMMABLE DSP DEVICES :

Memory space organization, External bus interfacing signals, Memory interface, Parallel I/O interface, Programmed I/O, Interrupts and I/O, Direct memory access (DMA). A Multichannel buffered serial port (Mc BSP), Mc BSP Programming, a CODEC interface circuit, CODEC programming, A CODEC-DSP interface example.

TEXT BOOKS:

1. Digital Signal Processing – Avtar Singh and S. Srinivasan, Thomson Publications, 2004.
2. DSP Processor Fundamentals, Architectures & Features – Lapsley et al. S. Chand & Co, 2000.

REFERENCE BOOKS:

1. Digital Signal Processors, Architecture, Programming and Applications – B. Venkata Ramani and M. Bhaskar, TMH, 2004.
2. Digital Signal Processing – Jonatham Stein, John Wiley, 2005

B.TECH. ELECTRONICS & COMMUNICATION ENGINEERING

PROGRAMMING 8051 MICROCONTROLLER USING ASSEMBLY LANGUAGE

B.Tech. VIII semester **L/T/P/C**

3/0/0/3

Pre-Requisite: Fundamentals of Microprocessors and Microcontrollers

Course Objectives: The objective of this course is to enable the students to understand and implement various interfacings of I/O and Peripherals using Assembly language programming

Course Outcomes: On completion of the course, student will able to understand

1. Outline the 8051 architecture, assembly language programming concepts
2. Understand implementation of Timers, Serial port and Interrupts using Assembly language programming
3. Formulate programming memory interfacing and 8051 interfacing with the 8255
4. Cognize implementation of LCD, Keyboard, ADC and DAC using Assembly language programming
5. Understand Assembly language programming for Relays and Stepper motor

UNIT I

Introduction To 8051 Microcontroller: Factors to be considered in selecting a Controller, Why 8051 microcontroller, 8051 Microcontroller Architecture, Pin Diagram, Addressing Modes, Instruction Set, Basic Assembly Language Programming Concepts.

UNIT II

Programming Timers: Basics of Timers, Programming 8051 Timers, Counter Programming.
Programming serial Port: Basics of Serial Communication, 8051 Connection to RS232, and 8051 Serial Port Programming.
Programming Interrupts: Basics of Interrupts, Programming Timer Interrupts, Programming External Hardware Interrupts, Programming Serial Communication Interrupts, and Interrupt Priority.

UNIT III

Programming Memory Interfacing: Semiconductor Memory, Memory Address Decoding, Interfacing with External ROM, 8051 Data Memory Space.
8051 Interfacing With 8255: Programming the 8255, 8255 Interfacing.

UNIT IV

Programming Peripheral Devices-I: LCD Interfacing, Keyboard Interfacing, ADC Interfacing, DAC Interfacing, Sensor Interfacing and Signal Conditioning.

UNIT V

Programming Peripheral Devices-Ii: RTC interfacing and Programming, Relays, Opt isolators, Stepper Motor Interfacing, DC Motor Interfacing and PWM.

TEXT BOOKS:

1. Muhammad Ali Mazidi, Janice Mazidi, RolinMcKinlay, “8051 Microcontroller and Embedded Systems”, Pearson Education,2nd Edition, 2005

REFERENCE BOOKS:

1. Raj Kamal, “Microcontrollers - Architecture, Programming, Interfacing and System Design”, Pearson Education, 2009.
2. Ajay V. Deshmukh, “Microcontrollers - Theory and Applications”,Tata McGraw Hill, 2010.

TKR COLLEGE OF ENGINEERING AND TECHNOLOGY
(AUTONOMOUS)
(Sponsored by TKR Educational Society , Approved by AICTE, Affiliated by JNTUH, Accredited by NBA & NAAC with 'A' Grade)

B.TECH. ELECTRONICS & COMMUNICATION ENGINEERING

RADAR ENGINEERING

B.Tech. VIII semester **L/T/P/C**

. **3/0/0/3**

Pre-Requisites: Antenna theory, Analog Communications

COURSE OBJECTIVES:

The main objectives of this course are:

1. To understand the working principle of radar, identify the frequency bands, and formulate the complete radar range equation, listing out all the losses to be accounted for.
2. To identify the need for modulation and Doppler Effect; to get acquainted with the working principles of CW radar, FM-CWradar.
3. To impart the knowledge of functioning of MTI radar and its variants; to establish the DLC features and to bring out the MTI radar performance limitations.
4. To establish the principle of Tracking Radar and differentiate between different types of tracking radars, identifying their principle of operation with necessary schematics.
5. To explain the concept of a Matched Filter in radar receiver, and to configure its response characteristics; to impart the working knowledge of different receiver blocks – duplexers, displays, phased array antennas, their requirements and utilities.

COURSE OUTCOMES:

Upon the completion of course the students would be able to:

1. Explain the working principle of a pulse radar and establish the complete radar range equation, identifying the significance and choice of all parameters involved, and solve numerical problems to establish the radar characteristics.
2. Account for the need and functioning of CW, FM-CW and MTI radars, identifying the complete block diagrams and establishing their characteristics.
3. Illustrate the DLC characteristics, account for the range gated Doppler filter bank, and estimate the MTI radar performance characteristics and limitations.
4. Distinguish between Sequential Lobing, Conical Scan, and Monopoles type of Tracking Radars, specify their requirements and compare their characteristic features.
5. Derive the matched filter response characteristics for radar applications and account for correlation receivers; to distinguish between different radar displays and duplexers.

UNIT – I:

Basics of Radar : Introduction, Maximum Unambiguous Range, Simple form of Radar Equation, Radar Block Diagram and Operation, Radar Frequencies and Applications. Prediction of Range Performance, Minimum Detectable Signal, Receiver Noise, Modified Radar Range Equation, Illustrative Problems.

Radar Equation: SNR, Envelope Detector – False Alarm Time and Probability, Integration of Radar Pulses, Radar Cross Section of Targets , Transmitter Power, PRF and Range Ambiguities, System Losses (qualitative treatment), Illustrative Problem

UNIT – II:

CW and Frequency Modulated Radar : Doppler Effect, CW Radar – Block Diagram, Isolation between Transmitter and Receiver, Non-zero IF Receiver, Receiver Bandwidth Requirements, Applications of CW radar.

FM-CW Radar: Range and Doppler Measurement, Block Diagram and Characteristics, FM-CW altimeter.

UNIT – III:

MTI and Pulse Doppler radar: Principle, MTI Radar with - Power Amplifier Transmitter and Power Oscillator Transmitter, Delay Line Cancellers – Filter Characteristics, Blind Speeds, Double Cancellation, Staggered PRFs. Range Gated Doppler Filters. MTI Radar Parameters, Limitations to MTI Performance, MTI versus Pulse Doppler Radar. Digital MTI Processing.

UNIT – IV:

Tracking Radar: Tracking with Radar, Sequential Lobing, Conical Scan, Mono pulse Tracking Radar – Amplitude Comparison Mono pulse (one- and two- coordinates), Phase Comparison Mono pulse, Tracking in Range, Acquisition and Scanning Patterns, Comparison of Trackers.

Introduction to Pulse Compression Radar: Air Traffic Control.

UNIT – V:

Detection of Radar Signals in Noise : Introduction, Matched Filter Receiver – Response Characteristics and Derivation, Correlation Function and Cross-correlation Receiver, Efficiency of Non-matched Filters, Matched Filter with Non-white Noise.

Radar Receivers –Displays – types. Duplexers – Branch type and balanced type.

Introduction to Phased Array Antennas – Basic Concepts, Radiation Pattern, Beam Steering and Beam Width changes, Applications, Advantages and Limitations.

TEXT BOOKS

1. Introduction to Radar Systems – Merrill I. Skolnik, McGraw Hill Education Special Indian Edition, 2nd Ed. 2007.

REFERENCE BOOKS

1. Radar: Principles, Technology, Applications – Byron Edde, Pearson Education, 2004.
2. Radar Principles – Peebles, Jr., P.Z., Wiley, New York, 1998.

MEMORY TECHNOLOGIES

B.Tech. VIII semester **L/T/P/C**

3/0/0/3

Pre-Requisites: VLSI Design,

COURSE OBJECTIVES:

1. This course gives an idea about different types of memories, its architecture and technologies used in the industry.
2. How to design for testing and to create a good fault model for successful testing is looked into.
3. The course also takes one through reliability and effect of radiation and the advanced memory technologies and packaging.

COURSE OBJECTIVES:

Upon the completion of this course, students will demonstrate the ability to:

1. Apprehend SRAM, DRAM and Nonvolatile Memory Architectures
2. Understand Memory Fault Modeling, Testing, and Memory Design for Testability.
3. Understand design trade-off in Memory design.
4. Summarize RAM Failure Modes and Mechanism.
5. Demonstrate Experimental Memory Devices.

Unit-I

Random Access Memory Technologies-Static Random Access Memories (SRAMs): SRAM Cell Structures-MOS SRAM Architecture-MOS SRAM Cell and Peripheral Circuit Operation-Bipolar, SRAM Technologies-Silicon On Insulator (SOl) Technology-Advanced SRAM Architectures and Technologies- Application Specific SRAMs. Dynamic Random Access Memories (DRAMs): DRAM Technology Development-CMOS DRAMs-DRAMs Cell Theory and Advanced Cell Structures- BiCMOS DRAMs-Soft Error Failures in DRAMs-Advanced DRAM Designs and Architecture- Application Specific DRAMs.

Unit-II

Non-Volatile Memories-Masked Read-Only Memories (ROMs)- High Density ROMs-Programmable Read-Only Memories (PROMs)- Bipolar PROMs-CMOS PROMs-Erasable (UV) - Programmable Road-Only Memories (EPROMs)-Floating- Gate EPROM Cell-One-Time Programmable(OTP) EPROMS-Electrically Erasable PROMs(EEPROMs) - EEPROM Technology And Architecture-Nonvolatile SRAM-Flash Memories(EPROMs or EEPROM)-Advanced Flash Memory Architecture.

Unit-III

Memory Fault Modeling, Testing, And Memory Design For Testability And Fault Tolerance-RAM Fault Modeling, Electrical Testing, Pseudo Random Testing-Megabit DRAM Testing-Nonvolatile Memory Modeling and Testing- IDDQ Fault Modeling and Testing-Application Specific Memory Testing.

UNIT-IV

Semiconductor Memory Reliability And Radiation Effects-General Reliability Issues-RAM Failure Modes and Mechanism-Nonvolatile Memory Reliability-Reliability Modeling and Failure Rate Prediction- Design for Reliability-Reliability Test Structures-Reliability Screening and Qualification. Radiation Effects-Single Event Phenomenon (SEP)-Radiation Hardening Techniques-Radiation Hardening Process and Design Issues-Radiation Hardened Memory Characteristics-Radiation Hardness Assurance and Testing - Radiation Dosimeter-Water Level Radiation Testing and Test Structures.

Unit-V

Advanced Memory Technologies and High-Density Memory Packaging Technologies-Ferroelectric Random Access Memories (FRAMs)-Gallium Arsenide (GaAs) FRAMs-Analog Memories-Magneto resistive Random Access Memories (MRAMs)-Experimental Memory Devices. Memory Hybrids and MCMs (2D)-Memory Stacks and MCMs (3D)-Memory MCM Testing and Reliability Issues-Memory Cards-High Density Memory Packaging Future Directions.

Text Book

1. Ashok K.Sharma, "Semiconductor Memories Technology, Testing and Reliability “, Prentice-Hall of India Private Limited, New Delhi, 1997.

Reference Books

1. Luecke Mize Care, “Semiconductor Memory design & application”, Mc-Graw Hill.
2. 2.Belty Prince, “ Semiconductor Memory DesignHandbook”.
3. Memory Technology design and testing 1999 IEEE International Workshop on: IEEE Computer Society Sponsor (S).

B.TECH. ELECTRONICS & COMMUNICATION ENGINEERING

NEURAL NETWORKS

B.Tech. VIII semester **L/T/P/C**
3/0/0/3

Pre-Requisites: Calculus, Linear Algebra, Probability, Statistics

Course Objectives:

1. To understand the biological neural network and to model equivalent neuron models.
2. To understand the architecture, learning algorithm and issues of various feed forward and feedback neural networks.

Course Outcomes: By completing this course the student will be able to:

1. Create different neural networks of various architectures both feed forward and feed backward.
2. Perform the training of neural networks using various learning rules.
3. Perform the testing of neural networks and do the perform analysis of these networks for various pattern recognition applications.

UNIT–I:

Introduction to Neural Networks: Introduction, Humans and Computers, Organization of the Brain, Biological Neuron, Biological and Artificial Neuron Models, Characteristics of ANN, McCulloch-Pitts Model, Historical Developments, Potential Applications of ANN

UNIT – II

Essentials Of Artificial Neural Networks: Artificial Neuron Model, Operations of Artificial Neuron, Types of Neuron Activation Function, ANN Architectures, Classification Taxonomy of ANN –Connectivity, Learning Strategy (Supervised, Unsupervised, Reinforcement),Boltzmann Learning, Error Correction Learning, Memory Based Learning, Learning Rules.

UNIT – III

Single Layer Feed Forward Networks: Introduction, Perception Models: Discrete, Continuous and Multi-Category, Training Algorithms: Discrete and Continuous Perceptron Networks, Limitations of the Perceptron Model.

UNIT – IVI

Multi- Layer Feed Forward Networks: Credit Assignment Problem, Generalized Delta Rule, Derivation of Back propagation (BP) Training, Summary of Back propagation Algorithm, Kolmogorov Theorem, Learning Difficulties and Improvements, Output Representation and Decision Rule, Computer Experiment, Feature Detection.

UNIT - V

Associative Memories: Paradigms of Associative Memory, Pattern Mathematics, Hebbian Learning, General Concepts of Associative Memory, Bidirectional Associative Memory(BAM) Architecture, BAM Training Algorithms: Storage and Recall Algorithm, BAM Energy Function. Architecture of Hopfield Network: Discrete and Continuous versions, Storage and Recall Algorithm, Stability Analysis. Neural network applications: Process identification, control, fault diagnosis.

TEXT BOOK:

1. LaureneFausett, "Fundamentals of Neural Networks" , Pearson Education, 2004.
2. SimonHaykin, "Neural Networks- A comprehensive foundation", Pearson Education, 2003.

REFERENCES

1. Neural Networks -James A Freeman David M S Kapura Pearson Education 2004. S.N.Sivanandam, S.Sumathi,S. N. Deepa "Introduction to Neural Networks using MATLAB 6.0", TATA McGraw Hill, 2006.
2. S. Rajasekharan and G. A. Vijayalakshmipai, "Neural Networks, Fuzzy logic, Genetic algorithms: synthesis and applications", PHI Publication, 2004. Timothy J. Ross, " Fuzzy Logic With Engineering Applications", Tata McGraw-Hill Inc. 2000.

B.TECH. ELECTRONICS & COMMUNICATION ENGINEERING

EMBEDDED REAL TIME OPERATING SYSTEMS

B.Tech.VIII semester **L/T/P/C**
3/0/0/3

Pre-Requisite: Fundamentals of Embedded and Operating System concepts

Course Objectives: The objective of this course is to enable the students to understand contemporary techniques of embedded systems for Real time applications using RTOS

Course Outcomes: On completion of the course, student will able to

1. Outline the basics of Embedded systems, OS and RTOS
2. Imparts knowledge in various processor scheduling algorithms
3. Understands the key concepts of Inter Process Communication
4. Analyze the practical aspects of embedded systems in industry
5. Construe Embedded System Design case studies

UNIT I

Introduction to Embedded System: Overview, System Design Process - Requirements, Specifications, Architecture design, Designing Hardware and Software Components, System Integration.

Introduction To RTOs: Operating System Basics, Types of Operating Systems, Typical real time applications, Hard Vs Soft real-time systems, Tasks, Process and Threads, Multiprocessing and Multitasking, How to Choose an RTOS.

UNIT II

Scheduling Algorithms: Task Scheduling, Non-preemptive scheduling - FIFO/FCFS scheduling, LIFO/LCFS scheduling, SJF scheduling, Priority based scheduling; Preemptive scheduling - SJF/SRT scheduling, Round Robin scheduling, Priority based scheduling.

UNIT III

Inter Process Communication: Task Communication, Shared Memory, Message Passing, Remote Procedure Call and Sockets, Task Communication/Synchronization Issues – Racing, Deadlock, The Dining Philosopher's Problem, Producer-Consumer/Bounded Buffer Problem, Readers-Writers Problem, Priority inversion, Task Synchronization Techniques – Mutex, Semaphore, Events, Device Drivers.

UNIT IV

Embedded System Design With RTOs: An introduction to vx Works, Micro C/OS-II.

Trends In Embedded Industry: Processor Trends in Embedded Systems Embedded OS Trends, Development Language Trends, Open Standards, Frameworks & Alliances, and Bottlenecks.

UNIT V

Design Examples And Case Studies Of Programming Modeling And Programming With RTOs: Case Study of Embedded System Design for an Automatic Chocolate Vending Machine using MUCOS RTOS, Case Study of a Digital Camera Hardware and Software Architecture, Case study of sending application Layer byte Streams on a TCP/IP network.

TEXT BOOKS:

1. Wayne Wolf, "Computer as Components: Principles of Embedded Computing System Design",2nd Edition.,Elseiver, 2008.
2. Shibu K.V, "Introduction to Embedded Systems", McGraw Hill.
3. Raj Kamal, "Embedded Systems - Architecture, Programming and Design", 2nd Edition, McGraw Hill, 2008.

REFERENCE BOOKS:

1. Jane W. S. Liu, "Real Time Systems", PHI.
2. C.M.Krishna, Kang G. Shin, "Real Time Systems", TMH, 1996.
3. "VX Works Programmers Guide"

B.TECH. ELECTRONICS & COMMUNICATION ENGINEERING
SATELLITE COMMUNICATIONS

B.Tech. VIII semester **L/T/P/C**
3/0/0/3

Pre-Requisites: Digital Communications

Course Objectives:

The course objectives are:

1. To prepare students to excel in basic knowledge of satellite communication principles
2. To provide students with solid foundation in orbital mechanics and launches for the satellite communication
3. To train the students with a basic knowledge of link design of satellite with a design examples.
4. To provide better understanding of multiple access systems and earth station technology
5. To prepare students with knowledge in satellite navigation and GPS & and satellite packet communications.

Course Outcomes:

At the end of the course, Students will be able to

1. Understand the historical background, basic concepts and frequency allocations for satellite communication
2. Demonstrate orbital mechanics, launch vehicles and launchers
3. Demonstrate the design of satellite links for specified C/N with system design examples.
4. Visualize satellite sub systems like Telemetry, tracking, command and monitoring power systems etc.
5. Understand the various multiple access systems for satellite communication systems and satellite packet communications.

UNIT – I:

Introduction: Origin of Satellite Communications, Historical Back-ground, Basic Concepts of Satellite Communications, Frequency Allocations for Satellite Services, Applications, Future Trends of Satellite Communications, Advantages of Satellite Communications,.

Orbital Mechanics and Launchers: Kepler's law, Orbital Mechanics, Orbital Period and Velocity, Look Angle determination, Orbital Perturbations, Orbit determination, Launches and Launch vehicles, Orbital Effects in Communication Systems Performance, Orbital Elements.

UNIT – II:

Satellite Subsystems: Attitude and Orbit Control System, Telemetry, Tracking, Command and Monitoring, Power Systems, Communication Subsystems, Satellite Antennas, Equipment Reliability and Space Qualification, Redundancy.

UNIT – III:

Satellite Link Design: Basic Transmission Theory, System Noise Temperature and G/T Ratio, Design of Down Links, Up Link Design, Design Of Satellite Links For Specified C/N, System Design Examples.

Multiple Access: Frequency Division Multiple Access (FDMA), Inter modulation, Calculation of C/N, Time Division Multiple Access (TDMA), Frame Structure, Examples, Satellite Switched TDMA Onboard Processing, DAMA, Code Division Multiple Access (CDMA), Spread Spectrum Transmission and Reception.

UNIT – IV:

Earth Station Technology: Introduction, Transmitters, Receivers, Antennas, Tracking Systems, Terrestrial Interface, Primary Power Test Methods.

UNIT – V:

Low Earth Orbit and Geo-Stationary Satellite Systems: Orbit Considerations, Coverage and Frequency Consideration, Delay & Throughput Considerations, System Considerations, Operational NGSO Constellation Designs.

Satellite Navigation & Global Positioning System : Radio and Satellite Navigation, GPS Position Location Principles, GPS Receivers and Codes, Satellite Signal Acquisition, GPS Navigation Message, GPS Signal Levels, GPS Receiver Operation, GPS C/A Code Accuracy, Differential GPS.

TEXTBOOKS

1. Satellite Communications - Timothy Pratt, Charles Bostian and Jeremy Allnutt, WSE, Wiley Publications, 2nd Edition,2003.
2. Satellite Communications Engineering - Wilbur L. Pritchard, Robert A Nelson and Henri G.Suyderhoud, 2nd Edition, Pearson Publications, 2003.

REFERENCE BOOKS

1. Satellite Communications: Design Principles - M. Richharia, BS Publications, 2nd Edition,2003.
2. Satellite Communication - D.C Agarwal, Khanna Publications, 5thEdition.
3. Fundamentals of Satellite Communications - K.N. Raja Rao, PHI, 2004 Satellite Communications - Dennis Roddy, McGraw Hill, 4th Edition,2009

B.TECH. ELECTRONICS & COMMUNICATION ENGINEERING
CPLD AND FPGA ARCHITECTURES AND APPLICATIONS

B.Tech. VIII semester **L/T/P/C**
3/0/0/3

Pre-Requisites: Programmable logic devices, combinational and sequential logic circuit design.

Course Objectives:

1. To understand the types of programmable logic devices and what are the differences between these devices. What are the different complex programmable logic devices with examples
2. To know the types of FPGA's and their programming technologies. What are the programmable logic block architectures, their inter connects and what are applications of FPGA's.
3. To understand about the SRAM programmable FPGA's and their programming technology. What are examples of SRAM programmable FPGA's i.e. Xilinx FPGA's with block diagrams.

Course Outcomes: After completion of course the student will be able to

1. Understand the concept of programming logic devices and its applications.
2. Acquire knowledge of various programming methods in FPGA.
3. Design anti-fuse FPGA based architectures.
4. Familiarize with SRAM based FPGA architectures.
5. Design CPLD and FPGA architectures for real time applications

UNIT-I

Introduction to Programmable Logic Devices: Introduction, Simple Programmable Logic Devices – Read Only Memories, Programmable Logic Arrays, Programmable Array Logic, Programmable Logic Devices/Generic Array Logic; Complex Programmable Logic Devices – Architecture of Xilinx Cool Runner XCR3064XL CPLD, CPLD Implementation of a Parallel Adder with Accumulation.

UNIT-II

Field Programmable Gate Arrays: Organization of FPGAs, FPGA Programming Technologies, and Programmable Logic Block Architectures, Programmable Interconnects, and Programmable I/O blocks in FPGAs, Dedicated Specialized Components of FPGAs, and Applications of FPGAs.

UNIT -III
SRAM Programmable FPGAs: Introduction, Programming Technology, Device Architecture, the Xilinx XC2000, XC3000 and XC4000 Architectures.

UNIT -IV
Anti-Fuse Programmed FPGAs: Introduction, Programming Technology, Device Architecture, the Actel ACT1, ACT2 and ACT3 Architectures.

UNIT -V
Design Applications: General Design Issues, Counter Examples, A Fast Video Controller, A Position Tracker for a Robot Manipulator, A Fast DMA Controller, Designing Counters with ACT devices, Designing Adders and Accumulators with the ACT Architecture.

TEXT BOOKS:

1. Stephen M. Trimberger, "Field Programmable Gate Array Technology", Springer International Edition.
2. Charles H. Roth Jr, Lizy Kurian John, "Digital Systems Design", Cengage Learning.

REFERENCE BOOKS:

1. John V. Oldfield, Richard C. Dorf, "Field Programmable Gate Arrays", Wiley India.
2. Pak K. Chan/Samiha Mourad, "Digital Design Using Field Programmable Gate Arrays", Pearson Low Price Edition.
3. Ian Grout, "Digital Systems Design with FPGAs and CPLDs", Elsevier, Newnes.
4. Wayne Wolf, "Modern Semiconductor Design Series", Prentice Hall.

B.TECH. ELECTRONICS & COMMUNICATION ENGINEERING
BIOMEDICAL SIGNAL PROCESSING

B.Tech. VIII semester **L/T/P/C**

3/0/0/3

Pre-Requisite: Signals and Systems, Digital Signal Processing, Knowledge of mathematics and matrices.

Course Objective

The course objective is to make the learner understand

1. The fundamental concepts of a basic signal processing.
2. The key components of a biomedical signal processing.
3. Analysis tools for biological signals.
4. The various biological phenomena.

Course Outcomes:

By the end of this course, students should be able to:

1. Explain the basic signal processing techniques.
2. Develop basic mathematical, scientific and computational skills necessary to analyze Biomedical signals.
3. Formulate problems in biomedical signals.
4. Design analysis tools for biological signals.
5. Explain the complexity of biological signals and the impact, promise of biomedical Engineering in understanding these signals.

UNIT-I

Discrete and continuous Random variables, Probability distribution and density functions. Gaussian and Rayleigh density functions, Correlation between random variables, Stationary random process, Ergodicity, Power spectral density and autocorrelation function of random processes. Noise power spectral density analysis, Noise bandwidth, Noise figure of systems.

UNIT-II

Data Compression Techniques: Lossy and Lossless data reduction Algorithms. ECG data compression using Turning point, AZTEC, CORTES, Huffman coding, vector quantization, DCT and the K L transform.

Cardiological Signal Processing: Pre-processing. QRS Detection Methods. Rhythm analysis. Arrhythmia detection Algorithms. Automated ECG Analysis.

ECG Pattern Recognition. Heart rate variability analysis.

UNIT-III

Adaptive Noise Canceling: Principles of Adaptive Noise Canceling. Adaptive Noise Canceling with the LMS adaptation Algorithm. Noise Canceling Method to Enhance ECG Monitoring. Fetal ECG Monitoring.

UNIT-IV

Signal Averaging, polishing–mean and trend removal, linear prediction. Yule– walker(Y–W) equations. Their applications in ECG and EEG.

UNIT-V

Neurological Signal Processing: Modeling of EEG Signals. Detection of spikes and spindles Detection of Alpha, Beta and Gamma Waves. Auto Regressive (A.R.) modeling of seizure EEG. Sleep Stage analysis. Inverse Filtering. Least squares and polynomial modeling. Original Prony's Method. Prony's Method based on the Least Squares Estimate. Analysis of Evoked Potentials and PCG.

TEXT BOOKS

1. Rangaraj M. Rangayyan – Biomedical Signal Analysis. IEEE Press,
2. 2001.
3. D.C.Reddy, Biomedical Signal Processing- principles and techniques,
4. Tata McGraw-Hill, 2005.
5. Biomedical Digital Signal Processing, Willis J.Tompkins, PHI.

REFERENCE:

1. Weitkunat R, Digital Bio signal Processing, Elsevier, 1991.
2. Akay M , Biomedical Signal Processing, Academic: Press 1994.
3. Cohen.A, Biomedical Signal Processing -Vol. I Time & Frequency Analysis, CRC Press, 1986.

B.TECH. ELECTRONICS & COMMUNICATION ENGINEERING

EMBEDDED C

B.Tech.VIII semester | **L/T/P/C 3/0/0/3**

Pre-Requisite: Fundamentals of Embedded Concepts and C Programming

Course Objectives: The objective of this course is to enable the students to understand the significance of programming embedded C in real time applications and to use it for specific applications.

Course Outcomes: On completion of the course, student will able to

1. Outlines the significance of Programming using Embedded C and to gain knowledge on 8051 microcontroller
2. Understands programming the integrated peripherals using Keil software
3. Analyze adding structure to code
4. Design of real time timers with various constraints
5. Gains knowledge on Intruder Alarm System.

UNIT I

PROGRAMMING EMBEDDED SYSTEMS IN C: Introduction, What is an embedded system, which processor should you use, which programming language should you use, which operating system should you use, how do you develop embedded software.

INTRODUCING THE 8051 MICROCONTROLLER FAMILY: Introduction, The external interface of the Standard 8051, Reset requirements , Clock frequency and performance, Memory issues, I/O pins, Timers, Interrupts, Serial interface, Power consumption.

UNIT II

HELLO EMBEEDED WORLD: Introduction, Installing the Keil software and loading the project, configuring the simulator, Building the target, running the simulation, dissecting the program.

READING SWITCHES: Introduction, Basic Techniques for Reading from Port Pins, Example: Reading and writing bytes, Example: Reading and writing bits (simple version), Example: Reading and writing bits (generic version), The need for pull-up resistors, Dealing with switch bounce, Example: Reading switch inputs (basic code), Example: Counting goats.

UNIT III

ADDING STRUCTURE TO THE CODE: Introduction, Object-oriented programming with C, The Project Header (MAIN.H), The Port Header (PORT.H), Example: Restructuring the Hello Embedded World example, Example: Restructuring the goat-counting example.

UNIT IV

MEETING REAL-TIME CONSTRAINTS: Introduction, Creating hardware delays using Timer 0 and Timer 1,Example: Generating a precise50 ms delay, Example: Creating a portable hardware delay, Why not use Timer 2,The need for timeout mechanisms, Creating loop timeouts, Example: Testing loop timeouts, Example: A more reliable switch interface, Creating hardware timeouts, Example: Testing a hardware timeout.

UNIT V

CASE STUDY: INTRUDER ALARM SYSTEM: Introduction, The software Architecture, Key Software Components used in this Example, Running the Program, The Software.

TEXT BOOKS:

1. Michael J. Pont, "Embedded C", Pearson Education, 2002.

REFERENCE BOOKS:

1. Michael Barr, "Programming Embedded Systems in C and C++", O'reilly, 1999.
2. Richard H. Barnett, Sarah Cox, Larry O'Cull, "Embedded C Programming and the Atmel AVR", Cengage Learning India Private Limited, 2007.
3. Mark Siegesmund, "Embedded C Programming: Techniques and Applications of C and PIC MCUS", Newnes Publisher, 2014.

B.TECH. ELECTRONICS & COMMUNICATION ENGINEERING
WIRELESS COMMUNICATIONS AND NETWORKS

B.Tech. VIII Semester **L/T/P/C**
3/0/0/3

Pre-Requisites: Physics and Maths

Course objectives:

1. To understand the examples of wireless communication systems, paging systems, cordless telephone systems and to study the different generations of mobile networks.
2. To understand the concepts of basic cellular system, TDMA, FDMA, CDMA, spread spectrum multiple access
3. To study the Wireless Networking: Difference between wireless and fixed telephone networks, development of wireless networks.
4. To understand the evolution of the WAN industry, wireless home networking IEEE 802.11 the PHY layer.
5. To study the concepts of Bluetooth technology and IEEE 802.15.

Course outcomes: Upon Completion of course the student will be able to

1. Understand the examples of wireless communication systems, wireless local area networks.
2. Understand the concepts of frequency reuse, channel assignment strategies, handoff strategies, Improving coverage and capacity, cell splitting, TDMA, FDMA, CDMA, SDMA.
3. Understand the difference between wireless and fixed telephone networks, development of wireless networks.
4. Understand the wireless home networking IEEE 802.11 the physical layer, MAC layer
5. Understand the concepts of Bluetooth technology and IEEE 802.15.

UNIT I

Introduction to wireless communication systems: Evaluation of mobile radio communications, examples of wireless communication systems, paging systems, cordless telephone systems, cellular telephone systems, comparison of common wireless communication systems.

Modern wireless communication systems: second generation cellular networks, evolution for 2.5G TDMA standards, third generation wireless networks, 3G W-CDMA 3G TD-SCDMA, wireless in local loop(WLL) and LMDS, wireless local area networks-WLANs, Bluetooth and personal area networks-PANs.

UNIT II

Cellular system design fundamentals: frequency reuse, channel assignment strategies, handoff strategies, interference and system capacity, trucking and grade off service, improving coverage and capacity in cellular systems, cell splitting, sectoring, repeaters for range extension, a microcell zone concept.

Multiple access techniques for wireless communications: introduction to multiple access, frequency division multiple access -FDMA, time division multiple access -TDMA, spread spectrum multiple access, frequency hopped multiple access-FHMA, code division multiple access-CDMA, space division multiple access -SDMA, packet radio, packet radio protocols, reservation protocols, capture effect in packet radio, capacity of cellular systems.

UNIT III

Wireless Networking: Differences between wireless and fixed telephone networks, public switched telephone networks PSTN, limitations, development of wireless networks-first generation, second generation and third generation, fixed network transmission hierarchy, traffic routing in warless networks, circuit switching, packet switching, X.25 protocol, wireless data services, CDPD, common channel signaling CCS, integrated services digital network ISDN, signaling system no.7 SS7, network services part of SS7, message transfer part of SS7, SS7 user part.

UNIT IV

Wireless LAN Technology: Overview, infrared LANs, spread spectrum LANs, narrowband microwave LANs

Wi-Fi and the IEEE 802.11 wireless LAN: IEEE 802 architecture, IEEE 802.11 architecture services, IEEE 802.11 medium access control, IEEE 802.11 physical layer.

UNIT V

Bluetooth and IEEE 802.15: Introduction, radio specification, baseband specification, link manager specification, logical link control and adaptation protocol, IEEE 802.15

TEXT BOOKS:

1 Wireless Communications, Principles, Practice – Theodore, S. Rappaport, PHI, 2nd Edn., 2002.

2. Wireless Communication and Networking – William Stallings, PHI, 2003.

REFERENCES:

1. Wireless Digital Communications – Kamilo Feher, PHI, 1999.
2. Principles of Wireless Networks – Kaveh Pah Laven and P. Krishna Murthy, Pearson Education, 2002.
3. Wireless Communications – Andreaws F. Molisch, Wiley India, 2006.
4. Introduction to Wireless and Mobile Systems – Dharma Prakash Agarwal, Qing-An Zeng,
5. Thomson 2nd Edition, 2006.