

SEC5634	SOFTWARE MODELLING FOR EMBEDDED SYSTEM (For EMB)	L	T	P	Credits	Total Marks
		4	0	0	4	100

COURSE OBJECTIVES

- Introduce the students to the issues and challenges in developing software for embedded systems.
- Educate the students in formal modeling, design and development methodologies.
- Expose the students to software tools and techniques used in the development process

UNIT 1 EMBEDDED PROGRAMMING 12 Hrs.

C and Assembly - Programming Style - Declarations and Expressions - Arrays, Qualifiers and Reading Numbers - Decision and Control Statements - Programming Process - More Control Statements - Variable Scope and Functions - C Preprocessor - Advanced Types - Simple Pointers - Debugging and Optimization – In-line Assembly.

UNIT 2 C PROGRAMMING TOOLCHAIN IN LINUX 12 Hrs.

C preprocessor - Stages of Compilation - Introduction to GCC - Debugging with GDB - The Make utility - GNU Configure and Build System - GNU Binary utilities - Profiling - using gprof -Memory Leak Detection with val grind - Introduction to GNU C Library

UNIT 3 EMBEDDED C AND EMBEDDED OS 12 Hrs.

Adding Structure to 'C' Code: Object oriented programming with C, Header files for Project and Port, Examples. Meeting Real-time constraints: Creating hardware delays - Need for timeout mechanism - Creating loop timeouts - Creating hardware timeouts. Creating embedded operating system: Basis of a simple embedded OS, Introduction to sEOS, Using Timer 0 and Timer 1, Portability issue, Alternative system architecture, Important design considerations when using sEOS.

UNIT 4 TIME-DRIVEN MULTI-STATE ARCHITECTURE AND HARDWARE 12 Hrs.

Multi-State systems and function sequences: Implementing multi-state (Timed) system -Implementing a Multi-state (Input/Timed) system. Using the Serial Interface: RS232 - The Basic RS-232 Protocol - Asynchronous data transmission and baud rates - Flow control - Software architecture - Using on-chip UART for RS-232 communication - Memory requirements - The serial menu architecture - Examples. Case study: Intruder alarm system.

UNIT 5 EMBEDDED JAVA 12 Hrs.

Introduction to Embedded Java and J2ME – Smart Card basics – Java card technology overview – Java card objects – Java card applets – working with APDUs – Web Technology for Embedded Systems.

Max. 60

Hours TEXT / REFERENCE BOOKS

1. Steve Oualline, 'Practical C Programming 3rd Edition', O'Reilly Media, Inc, 2006.
2. Stephen Kochan, "Programming in C", 3rd Edition, Sams Publishing, 2009.
3. Michael J Pont, "Embedded C", Pearson Education, 2007.
4. Zhiquan Chen, 'Java Card Technology for Smart Cards: Architecture and Programmer's Guide', Addison-Wesley Professional, 2000.

END SEMESTER EXAM QUESTION PAPER PATTERN:

Max. Marks : 100

Part A : 5 Questions of 6 Marks each – No choice

Part B : 2 Questions from each unit with internal choice, each carrying 14 Marks

Exam Duration : 3 Hrs.

30 Marks

70 Marks

SEC5101	TRANSFORMS AND RANDOM PROCESS FOR ELECTRONICS ENGINEERING (For AE, EMB & VLSI)			Credits	Total Marks
	L	T	P		
	4	0	0	4	100

COURSE OBJECTIVES

- x To reinforce the mathematical foundation with advanced topics
- x To enable the student to appreciate the engineering aspect of mathematics
- x To equip the student with tools to confront continual mathematical challenges

UNIT 1 2D TRANSFORMS**12 Hrs.**

Need for transform – Review of 1D Transform – 2D DFT – IDFT – properties – Image transforms – 2D Orthogonal and Unitary transform and its properties – Separable transforms – Walsh, Hadamard, Haar, DST, DCT, Slant, SVD & KL transforms.

UNIT 2 WAVELET TRANSFORMS & ITS APPLICATIONS**12Hrs.**

Wavelet transforms – 1D & 2D Wavelet transform – basis and orthogonal basis – Time and frequency decompositions – STFT – CWT, DWT, Haar wavelet and Shannon wavelet – MRA – Orthonormal Wavelets – Fast Wavelet transform – Wavelet Packets – Biorthogonal Wavelet Bases – SPIHT Algorithm – Wavelet Denoising – Wavelet based Signal Processing – Signal & Image compression.

UNIT 3 PROBABILITY & RANDOM VARIABLES**12 Hrs**

Probability concepts – Random variable – moment generating function – discrete types, continues types – Distributions – Binomial, Poisson, Geometric, Uniform, Normal and Exponential – Transformation of random variables-2D random variables – marginal, conditional, joint probability – Correlation – Regression – Central Limit Theorem.

UNIT 4 RANDOM PROCESS**12 Hrs.**

Notion of Stochastic processes – Stationary and Independence; WSS & Ergodicity – Correlation Functions; Auto Correlation, Cross Correlation & its properties – expectations – variance, co variance – Power Spectral Density – properties – energy spectral density – Parseval's theorem – Wiener Khintchine relation – Linear systems with Random inputs – response of linear systems to white noise – simulation of white noise – Noise Bandwidth – low pass filtering of white noise.

UNIT 5 QUEUING THEORY**12 Hrs.**

Introduction to queuing theory – Characteristics of Queuing Systems – Little's Law – Markovian Queues – Single server models – Multiple server models – Non-Markovian Queues – Pollaczek-Khinchine formula – Machine interference model – steady state analysis – self service queue – Priority Queues – Open and Closed Networks – queuing applications.

Max. 60 Hours**TEXT / REFERENCE BOOKS**

1. Rafael C.Gonzalez & Richard E Woods, Digital Image Processing, Third Edition, Pearson Prentice Hall, 2009.
2. Peyton Z.Peebles, Probability, Random Variables and random signal principles, 4th edition, TMH publication, 2001.
3. Anil K Jain, Fundamentals of Digital Image Processing, Prentice Hall, 1989.
4. Raghuvver M Rao & Ajit S Bopardikar, Wavelet Transform: Introduction to Theory & Applications, Pearson Education, 1998.
5. Donald Gross, John F. Shortle, James M. Thompson, and Carl W. Harris, Fundamentals of Queuing Thoery, 4th edition, Wiley 2008.

END SEMESTER EXAM QUESTION PAPER PATTERN**Max. Marks : 100****Exam Duration : 3 Hrs.****PART A : 5 Questions of 6 Marks each-No choice****30 Marks****PART B : 2 Questions from each unit with internal choice, each carrying 14 Marks****70 Marks**

SEC5104	ADVANCED DIGITAL SYSTEM DESIGN USING VHDL (For EMB & VLSI)	L	T	P	Credits	Total Marks
		1	0	0	1	100

COURSE OBJECTIVES

- x To explain how digital circuit of large complexity can be built in a methodological way
- x To illustrate how the concepts presented in the lectures are applied in practice, and how the need to accommodate different practically-motivated trade-offs can lead to alternative implementations
- x To teach fundamental concepts of hardware description languages

UNIT 1 SYNCHRONOUS SEQUENTIAL NETWORKS**12 Hrs.**

Structure and Operation of Synchronous Sequential Networks; Analysis of Clocked Synchronous Sequential Networks (CSSN); Modeling of CSSN Behavior; State Table Reduction; State Assignment; Design of CSSN – Realization using Programmable Logic Devices; Algorithmic state Machines – ASM Charts, ASM Tables, State Assignments, ASM Realizations.

UNIT 2 ASYNCHRONOUS SEQUENTIAL NETWORKS**12 Hrs.**

Structure and Operation of Asynchronous Sequential Networks (Fundamental and Pulse Mode); Analysis of Asynchronous Sequential Networks (ASN); Races in ASC; Primitive Flow Table; Flow Table Reduction; State Assignment; Transition Table; Design of ASN; Static and Dynamic Hazards; Essential Hazards; Data Synchronizers; Mixed Operating Mode Asynchronous Circuits.

UNIT 3 LOGIC DESIGN USING PROGRAMMABLE DEVICES**12 Hrs.**

Sequential Circuit Design Using ROMs, PLAs, CPLDs and FPGAs; Introduction to Field Programmable Gate Arrays; Types of FPGA; Xilinx FPGA – Architecture of Xilinx 3000, Xilinx 4000 families.

UNIT 4 INTRODUCTION TO VHDL**12 Hrs.**

Introduction to VHDL; Modeling Styles; Data Objects, Data Types, Delay Models; Concurrent Statements; Sequential Statements; Process Statements; Conditional & Selective Signal and Variable Assignments; Synthesis of Statements; Functions; IEEE Standard Logic Library; Test Bench; Component Declaration; Instantiation; Configuration- Declaration & Specification.

UNIT 5 LOGIC DESIGN USING VHDL**12 Hrs.**

Modeling Using VHDL Processes – Flip flops, Registers, Counters, Combinational Logic, Sequential Machine; Synthesis of VHDL code.

Max. 60 Hours**TEXT / REFERENCE BOOKS**

1. Donald G. Givone, Digital principles and Design, Tata McGraw Hill, 2002.
2. Stephen Brown and Zvonk Vranesic, Fundamentals of Digital Logic with VHDL Design, Tata McGraw Hill, 2002.
3. John M Yarbrough, Digital Logic applications and Design, Thomson Learning, 2001.
4. William I. Fletcher, An Engineering Approach to Digital Design, Prentice Hall of India, 1996.
5. Charles H Roth Jr., Digital System Design using VHDL, Thomson learning, 2004.
6. J. Bhasker, VHDL Primer, Pearson Education.

END SEMESTER EXAM QUESTION PAPER PATTERN**Max. Marks : 100****Exam Duration: 3 Hrs.****PART A : 5 Questions of 6 Marks each-No choice****30 Marks****PART B : 2 Questions from each unit with internal choice, each carrying 14 Marks****70 Marks**

SEC5108	ADVANCED DIGITAL SIGNAL AND IMAGE PROCESSING (Common to EMB, E&C)	L	T	P	Credits	Total Marks
		4	0	0	4	100

COURSE OBJECTIVES

- x To study the various filtering algorithms
- x To study the concept of multi rate signal processing, interpolation, application of sub-band coding
- x To explain the various operators, image restoration and enhancement techniques
- x To teach fundamental concepts of MATLAB with DSP applications.

UNIT 1 ADAPTIVE FILTERS**12 Hrs.**

FIR adaptive filter- Newton steepest descent method – Widrow-Hoff LMS adaptive algorithm- adaptive channel equalization- adaptive echo cancellation- adaptive noise cancellation- RLS adaptive filter- simplified IIR LMS adaptive filter.

UNIT 2 MULTI RATE SIGNAL PROCESSING**12 Hrs.**

Mathematical description of change of sampling rate- interpolation- decimation- continuous time model- direct digital domain approach- decimation by an integer factor- interpolation by an integer factor- single and multistage realization-poly phase realization- filter bank implementation- application to sub band coding .

UNIT 3 IMAGE ENHANCEMENT AND RESTORATION**12 Hrs.**

Point operators in enhancement, neighborhood operators, Average filters, weighted average filters, order statistics filters, gradient operators, Laplacian operators, edge crispening, image degradation/restoration model, Estimating the image degradation function, inverse filtering, Wiener filter, Homomorphic filtering, spatial and gray scale transformation (interpolation) for image restoration

UNIT 4 IMAGE SEGMENTATION AND COMPRESSION**12 Hrs.**

Need for image segmentation, discontinuity based segmentation, similarity based segmentation, thresholding, watershed segmentation, detection of motion from images, Need for compression, types of redundancies, Error free compression techniques, transform coding, Wavelet coding

UNIT 5 MATLAB PROGRAMMING**12 Hrs.**

MATLAB programs for solving the Toeplitz matrix, determining the co-efficients of adaptive Wiener filter, Realizing an adaptive IIR filter, Sub band coding and extracting features from speech signals, Image smoothing and sharpening in frequency domain, region growing based segmentation in images and generating Huffman codes and arithmetic coding for image compression

Max. 60 Hours**TEXT / REFERENCE BOOKS**

1. Monson H.Hayes "Statistical digital signal processing and modeling", John Wiley & Sons, 2002.
2. R.C. Gonzalez, R.E.Woods, "Digital image processing", Pearson Prentice Hall, 2008.
3. R.C. Gonzalez, R.E.Woods, "Digital image processing in MATLAB", Pearson Prentice Hall, 2008.
4. John G Proakis "Digital signal processing", Pearson Prentice Hall, 2007.
5. Simon Haykin "Adaptive filter theory", Prentice Hall, 2002.
6. Anil K Jain "Fundamental of Digital image processing", Prentice Hall, 1989.

END SEMESTER EXAM QUESTION PAPER PATTERN**Max. Marks : 100****Exam Duration: 3 Hrs.****PART A : 5 Questions of 6 Marks each-No choice****30 Marks****PART B : 2 Questions from each unit with internal choice, each carrying 14 Marks****70 Marks.**

SEC5116	MICROCONTROLLERS FOR EMBEDDED SYSTEM DESIGN (For AE & EMB)	L	T	P	Credits	Total Marks
		4	0	0	4	100

COURSE OBJECTIVES

- x To study the architecture of 8051 and 8 bit PIC Microcontrollers
- x To understand the concepts of Memory and Peripheral Interfacing with microcontrollers
- x To learn assembly language programming for microcontrollers
- x To learn about software design tools used for programming microcontrollers

UNIT 1 REVIEW OF 8051 ARCHITECTURE**12 Hrs.**

Architecture – memory organization – addressing modes – instruction set – Timers - Interrupts -I/O ports, Interfacing I/O Devices – Serial Communication- Assembly language programming – Arithmetic Instructions – Logical Instructions – Single bit Instructions – Timer Counter Programming – Serial Communication Programming- Interrupt Programming

UNIT 2 8 BIT PIC MICROCONTROLLER**12 Hrs.**

Architecture – memory organization – addressing modes – instruction set – PIC programming in Assembly & C –I/O port, Data Conversion, RAM & ROM Allocation, Timer programming

UNIT 3 PERIPHERALS OF PIC MICROCONTROLLER**12 Hrs.**

Timers – Interrupts, I/O ports- A/D converter-UART- I2C bus –SPI- CCP modules -Flash and EEPROM memories-ADC, DAC and Sensor Interfacing

UNIT 4 DEVELOPMENT TOOLS**12 Hrs.**

Host and Target Machines- Linker/Locators for Embedded Software, Debugging Techniques- MPLAB overview: Using MPLAB, Toolbars, Select Development Mode and Device Type, Project, Text Editor-Assembler, MPLAB Operations – Emulators.

UNIT 5 SYSTEM DESIGN – CASE STUDY**12 Hrs.**

Interfacing LCD Display – Keypad Interfacing – Servo motor Control – Controlling DC/ AC appliances – Measurement of frequency – Stand alone Data Acquisition System- Interfacing Wireless Communication modules - RF, Zigbee and GSM modules with microcontrollers

Max. 60 Hours**TEXT / REFERENCE BOOKS**

1. Muhammad Ali Mazidi, Rolin D. Mckinlay, Danny Causey ' PIC Microcontroller and Embedded Systems using Assembly and C for PIC18', Pearson Education 2008
2. John Iovine, 'PIC Microcontroller Project Book ', McGraw Hill 2000
3. MykePredko, "Programming and customizing the 8051 microcontroller", Tata McGraw Hill 2001.
4. Muhammad Ali Mazidi, Janice G. Mazidi and Rolin D. McKinlay, 'The 8051 Microcontroller and Embedded Systems' Prentice Hall, 2005.
5. Scott Mackenzie and Raphael C.W. Phan, "The Micro controller", Pearson, Fourth edition 2012

END SEMESTER EXAM QUESTION PAPER PATTERN**Max. Marks : 100****Exam Duration : 3 Hrs.****PART A :** 5 Questions of 6 Marks each-No choice**30 Marks****PART B :** 2 Questions from each unit with internal choice, each carrying 14 Marks**70 Marks**

SEC5118	EMBEDDED SYSTEM PROGRAMMING (For EMB)	L	T	P	Credits	Total Marks
		4	0	0	4	100

COURSE OBJECTIVES

- x To study the basic concepts of Embedded programming
- x To discuss the different embedded OS
- x To study the fundamental of LINUX
- x To understand the concept of embedded java and embedded linux

UNIT 1 EMBEDDED PROGRAMMING**12 Hrs.**

C and Assembly - Programming Style - Declarations and Expressions - Arrays, Qualifiers and Reading Numbers - Decision and Control Statements - Programming Process - More Control Statements - Variable Scope and Functions - C Preprocessor - Advanced Types - Simple Pointers - **Debugging and Optimization** - **In-line Assembly**

UNIT 2 EMBEDDED C AND EMBEDDED OS**12 Hrs.**

Adding Structure to 'C' Code: **Object oriented programming with C**, Header files for Project and Port, Examples. Meeting Real-time constraints: Creating hardware delays - Need for timeout mechanism - Creating loop timeouts - Creating hardware timeouts. Creating embedded operating system: Basis of a simple embedded OS, Introduction to sEOS, Using Timer 0 and Timer 1, Portability issue, Alternative system architecture, Important design considerations when using sEOS.

UNIT 3 LINUX FUNDAMENTALS**12 Hrs.**

Introduction to Linux - Basic Linux commands and concepts - Logging in - Shells - Basic text editing - **Advanced shells and shell scripting** - **Linux File System** - **Linux programming** - **Processes and threads in Linux** - **communication** - **Devices** - **Linux System calls**

UNIT 4 INTRODUCTION TO EMBEDDED LINUX**12 Hrs.**

Embedded Linux – Introduction – Advantages – Embedded Linux Distributions – Architecture – **Linux kernel architecture** – User Embedded Linux – Introduction – Advantages- Embedded Linux Distributions - Architecture - Linux kernel architecture - User space – linux startup sequence - GNU cross platform Tool chain.

UNIT 5 EMBEDDED JAVA**12 Hrs.**

Introduction to **Embedded Java and J2ME** – Smart Card basics – Java card technology overview – Java card objects – Java card applets – working with APDUs – Web Technology for Embedded Systems

Max. 60 Hours**TEXT / REFERENCE BOOKS**

1. Steve Oualline, 'Practical C Programming 3rd Edition', O'Reilly Media, Inc, 2006.
2. Michael J Pont, "Embedded C", Pearson Education, 2007.
3. Mark Mitchell, Jeffrey Oldham and Alex Samuel 'Advanced Linux Programming' New Riders Publications.
4. Zhiqun Chen, 'Java Card Technology for Smart Cards: Architecture and Programmer's Guide', Addison-Wesley Professional, 2000.
5. P. Raghavan, Amol Lad, Sriram Neelakandan, 'Embedded Linux System Design and Development', Auerbach Publications 2006
6. Stephen Kochan, "Programming in C", 3rd Edition, Sams Publishing, 2009.
7. KarimYaghmour, 'Building Embedded Linux Systems', O'Reilly Publications 2003

END SEMESTER EXAM QUESTION PAPER PATTERN**Max. Marks : 100****Exam Duration : 3 Hrs.****PART A : 5 Questions of 6 Marks each – No choice****30 Marks****PART B : 2 Questions from each unit with internal choice, each carrying 14 Marks -****70 Marks**

SEC5130	ADVANCED WIRELESS COMMUNICATIONS (For AE & EMB)	L	T	P	Credits	Total Marks
		4	0	0	4	100

COURSE OBJECTIVES

- x To introduce the student to the most recent techniques in the broad field of Wireless Communication
- x To learn an entire system as well as the sub-systems in wireless communication
- x To equip the student with basic skills required to design such systems as well as to work for future wireless systems

UNIT 1 MULTIPATH FADING CHANNELS AND DIVERSITY 12 Hrs.

Multipath Propagation-Fading-intersymbol Interference-Spectrum Limitations-Fast Fading Wireless Channel Modeling-Rayleigh and Ricean Fading Channels-BER Performance in Fading Channels - Frequency Selective and Frequency Nonselective Fading Channels - Examples of Multipath Fading Channels- Diversity modeling for Wireless Communications- BER Performance Improvement with diversity.

UNIT 2 OFDM SYSTEM 12 Hrs.

History of OFDM – Single carrier Vs Multi carrier transmission – Basic principles of OFDM – Block diagram of transmitter and receiver in OFDM system- Effect of multipath channel on OFDM symbols using without guard interval, cyclic prefix and zero padding – BER performance of OFDM scheme – Performance of Coded OFDM System - Synchronization for OFDM - Effect of CFO- Introduction to PAPR- PAPR Reduction Techniques.

UNIT 3 MC-CDMA AND OFDMA SYSTEMS 12 Hrs.

Introduction to MC-CDMA System – Block diagram of Transmitter and receiver of MC-CDMA -Bit Error Rate of MC-CDMA System- Variants Based on MC-CDMA Scheme.

Introduction to OFDMA - Block diagram of OFDMA uplink and downlink transmission- Resource Allocation-MA Optimization- RA Optimization- Resource Allocation Algorithms - Scheduling- Quality of Service- Adaptive Modulation Algorithms for OFDMA-OFDMA based Mobile WiMax (IEEE 802.16e) System Applications.

UNIT 4 MIMO AND LTE 12 Hrs.

Introduction to MIMO– Channel Capacity and Information rates of noisy, AWGN and fading channels – Capacity of MIMO channels – MIMO for multi-carrier systems (MIMO-OFDM) - MIMO Diversity (Alamouti, OSTBC)- Motivation and Targets for LTE- Overview of LTE- LTE network architecture – LTE Advanced- Architecture of LTE Radio Protocol Stacks.

UNIT 5 COGNITIVE RADIO AND ITS APPLICATIONS 12 Hrs.

Introduction to Cognitive Radio-Motivation and Purpose – Spectrum Allocation in Cognitive Radio Networks - Cognitive Transceiver architecture- Radio Resource Allocation for Cognitive Radio - Spectrum Sensing – Spectrum Sharing – Spectrum Mobility – Spectrum Management – Regulatory issues – Implications of Cognitive radio network- Emerging Cognitive Radio Applications in Cellular Networks.

Max. 60**Hours TEXT / REFERENCE BOOKS**

1. Andreas F. Molisch, Wireless Communications, 2nd Edition, John Wiley & Sons Ltd, 2011.
2. Yong Soo Cho, Jaekwon Kim, Won Young Yang and Chung G. Kang, MIMO-OFDM Wireless Communications with MATLAB, John Wiley & Sons (Asia) Pte Ltd, 2010.
3. Shinsuke Hara and Ramjee Prasad, Multicarrier Techniques for 4G Mobile Communications, 2003
4. Harri Holma and Antti Toskala, LTE for UMTS –OFDMA and SC-FDMA Based Radio Access, John Wiley & Sons Ltd., 2009.
5. Tao Jiang, Lingyang Song and Van Zhang, Orthogonal Frequency Division Multiple Access Fundamentals and Applications, Taylor and Francis Group, 2010.
6. Tolga M. Duman and Ali Ghrayeb, Coding for MIMO Communication Systems, John Wiley & Sons Ltd, 2007.

END SEMESTER EXAM QUESTION PAPER PATTERN**Max. Marks : 100****Exam Duration : 3 Hrs.****PART A : 5 Questions of 6 Marks each – No choice****30 Marks****PART B : 2 Questions from each unit with internal choice, each carrying 14 Marks****70 Marks**

SEC5119	REAL TIME OPERATING SYSTEMS (For AE & EMB)	L	T	P	Credits	Total Marks
		4	0	0	4	100

COURSE OBJECTIVES

- x To introduce the student to the fundamental problems and approaches in the design and analysis of real-time systems
- x To learn the fundamental differences between OS and RTOS
- x To develop skills necessary to develop software for embedded systems using a real-time operating system

UNIT 1 INTRODUCTION TO REAL TIME SYSTEMS 12 Hrs.

Introduction to real time systems- Hard Versus Soft Real-time Systems- Structure of a Real Time System – Typical Real-time systems Applications- Task Specification in RT system -Task States-Approaches to Real-time Task Scheduling-Cyclic Scheduling - Priority-Driven Scheduling of Periodic Tasks (RMA-DMA-EDF)- Scheduling Aperiodic and Sporadic Jobs - Critical Section - Scheduling of Periodic Tasks with Resource Constraints-Shared Data problem

UNIT 2 GENERAL PURPOSE OS 12 Hrs.

Operating system functions and services- architecture of Windows and Linux operating system—System Calls and APIs- OS kernel – File System – Processes – Design and Implementation of processes – Communication between processes : Message passing , shared memory-Remote procedure call-Sockets—Issues in distributed system

UNIT 3 REAL TIME KERNEL 12 Hrs.

Difference between general purpose OS and RTOS- Real time kernel architecture-Polled loop-cyclic executive - Interrupt service routine-function queue scheduling- RTOS based system design- RTOS Porting to Target – Features of freeware and commercial real time operating systems: Vxworks, Micrium OS, RTLinux, FreeRTOS and C Executive

UNIT 4 MICRIUM-OS AND RT LINUX APIS 12 Hrs.

Task Management– Inter task communication and Synchronization-semaphores-Mutex-Message queues– Mail box –Time Management-Event Management -Memory Management-Scheduling and Dispatching - POSIX Threads-Developing simple multitasking applications using ucos-II and RTLinux

UNIT 5 RTOS APPLICATION DOMAINS 12 Hrs.

Case studies-RTOS for Image Processing – Embedded RTOS for Network communication –RTOS for fault tolerant Applications – RTOS for Control Systems

Max. 60**Hours TEXT / REFERENCE BOOKS**

1. Jane W. S Liu, "Real Time Systems" Pearson Higher Education ,3rd Edition, 2000.
2. Philip.A. Laplante, "Real Time System Design and Analysis", Prentice Hall of India, 3rdEdition.2006
3. Raj Kamal, "Embedded Systems- Architecture, Programming and Design" Tata McGraw Hill, 2006.
4. Jean J. Labrosse, "Micro C/OS-II : The real time kernel" 2nd Edition,CMP Books
5. Li Q, Yao C: Real-Time Concepts for Embedded Systems. CMP Books, 1st Edition, 2003.
6. Doug Abbott, "Linux for Embedded and Real-time Applications", Newnes,3rd Edition, 2006

END SEMESTER EXAM QUESTION PAPER PATTERN**Max. Marks : 100****Exam Duration : 3 Hrs.****PART A : 5 Questions of 6 Marks each-No choice****30 Marks****PART B : 2 Questions from each unit with internal choice, each carrying 14 Marks****70 Marks**

SEC5121	EMBEDDED SYSTEM DESIGN USING ARM (For EMB)	L	T	P	Credits	Total Marks
		4	0	0	4	100

COURSE OBJECTIVES

- x To impart knowledge on Concepts of designing embedded systems
- x To teach the Fundamentals on embedded system and quality attributes of Embedded system
- x To discuss on architecture of ARM processor and C programming for ARM processor
- x To teach interfacing of ARM processor with other peripherals and system design using ARM processor

UNIT 1 INTRODUCTION TO EMBEDDED SYSTEM 12 Hrs.

Definition of Embedded system-Embedded System Vs General computing system-history of Embedded system-Classification of Embedded system-Major application of area embedded system- purpose of Embedded system-characteristics and quality attributes of Embedded system

UNIT 2 ARM PROCESSOR ARCHITECTURE 12 Hrs.

CISC & RISC Architecture - ARM: The ARM architecture-ARM organization and implementation-The ARM instruction set-The Thumb instruction set-Basic ARM assembly language program-ARM CPU cores.

UNIT 3 EMBEDDED C PROGRAMMING FOR ARM 12 Hrs.

Support for high-level language-review of C-Programming-c, program elements, Macros and functions-Use of pointers-NULL pointers-Use of function calls-Function queues and Interrupt service routines queue pointers-Concept of Embedded programming in C- "C" program compilers- Cross compilers.

UNIT 4 ARM INTERFACING WITH PERIPHERALS 12 Hrs.

Switches and LED interfacing-LCD display interfacing-Analog sensor interfacing for digital data conversion-Access control using analog keypad-Pulse width modulation technique for motor speed control.

UNIT 5 ARM APPLICATION DEVELOPMENT 12 Hrs.

Introduction to DSP on ARM –FIR Filter – IIR Filter – Discrete Fourier transform – Exception Handling – Interrupts – Interrupt handling schemes- Firmware and boot loader – Example: Standalone - Embedded Operating

Systems – Fundamental Components - Example Simple little Operating System.

**Max. 60
Hours**

TEXT / REFERENCE BOOKS

1. KVKK Prasad, Embedded / Real Time Systems –, Dreamtech Press, 2005.
2. David Simon, An Embedded Software Primer, Pearson Education Asia, 2000.
3. Raj Kamal, 'Embedded system-Architecture, Programming, Design', Tata McGraw Hill, 2011.
4. Wayne Wolf, "Computer as components principle of Embedded computing system Design" Harcourt India, Morgan Kaufman publisher, 2001
5. Jean J. Labrosse Micro C/OS-II The Real Time Kernel. Second Edition. CMP books
6. Steve Furber, ARM System on-chip Architecture, Addison Wesley IBN:0201 6751 96
7. Andrew N. Sloss, Dominic Symes, Chris Wright, John Rayfield 'ARM System Developer's Guide Designing and
8. Optimizing System Software', Elsevier 2007
9. William Hohl, 'ARM Assembly Language- Fundamentals and Techniques'.

END SEMESTER EXAM QUESTION PAPER PATTERN

Max. Marks : 100

Exam Duration : 3 Hrs.

PART A : 5 Questions of 6 Marks each – No choice

30 Marks

PART B : 2 Questions from each unit with internal choice, each carrying 14 Marks -

70 Marks

SEC5605	WIRELESS SENSOR NETWORKS (For AE, EMB, VLSI & CS)	L	T	P	Credits	Total Marks
		4	0	0	4	100

COURSE OBJECTIVES

- x To understand the basic concepts about wireless sensor networks.
- x To study the communication protocols, Addressing and synchronization
- x To learn concepts of localization, data storage and tools used for simulation

UNIT 1 OVERVIEW OF WIRELESS SENSOR NETWORKS 12 Hrs.

Characteristics of WSN, Challenges for Wireless Sensor Networks, Enabling Technologies For Wireless Sensor Networks, Single-Node Architecture - Hardware Components, Energy Consumption of Sensor Nodes , Operating Systems and Execution Environments, Network Architecture - **Sensor Network Scenarios, Optimization Goals and Figures of Merit, Gateway Concepts.**

UNIT 2 COMMUNICATION PROTOCOLS 12 Hrs.

Physical Layer and Transceiver Design Considerations, **MAC Protocols for Wireless Sensor Networks- contention-based protocols, schedule-based protocols- Link Layer protocols-Error control-ARQ techniques-FEC techniques-Framing-Link Management.**

UNIT 3 ADDRESSING & SYNCHRONISATION 12 Hrs.

Naming and addressing: Address and Name Management, Assignment of MAC Addresses- content- based Addressing -Geographic Addressing; Time synchronization: Sender/ receiver synchronization-receiver/ receiver synchronization.

UNIT 4 INFRASTRUCTURE ESTABLISHMENT 12 Hrs.

Localization and Positioning- Localization -Ranging Techniques -Time of Arrival - Time Difference of Arrival - Angle of Arrival - Received Signal Strength - Range-Based Localization - Triangulation -Range-Free Localization - Ad Hoc Positioning System (APS). Topology Control-Controlling topology in flat networks-Hierarchical networks; Routing: Geographic routing-Data centric routing-Qos Based protocols.

UNIT 5 SENSOR NETWORK PLATFORMS AND TOOLS 12 Hrs.

Deployment & Configuration - Sensor deployment, scheduling and coverage issues, self configuration- Congestion control- Security - Privacy issues - Attacks and countermeasures.

Max. 60

Hours TEXT / REFERENCE BOOKS

1. Holger Karl & Andreas Willig, Protocols and Architectures for Wireless Sensor Networks, John Wiley, 2005.
2. Kazem Sohraby, Daniel Minoli and Taieb Znati, Wireless Sensor Networks Technology- Protocols and Applications, John Wiley & Sons, 2007.
3. C.S.Raghavendra Krishna, M.Sivalingam and Tarib znati, Wireless Sensor Networks, Springer, 2006.
4. I.F. Akyildiz, W. Su, Sankarasubramaniam, E. Cayirci, Wireless sensor networks, Elsevier, 2010.
5. Feng Zhao & Leonidas J. Guibas, Wireless Sensor Networks- An Information Processing Approach, Elsevier, 2007.

END SEMESTER EXAM QUESTION PAPER PATTERN

Max Marks : 70

Exam Duration : 3 Hrs.

PART A : 5 Questions of 6 Marks each-No choice

30 Marks

PART B : 2 Questions from each unit with internal choice, each carrying 14 Marks

70 Marks

SEC5606	INTELLIGENT COMPUTING TECHNIQUES (For AE, EMB & VLSI)	L	T	P	Credits	Total Marks
		4	0	0	4	100

COURSE OBJECTIVES

- To comprehend the concepts of biological neuron and the learning algorithms
- To study the various methodologies to train the multi-hop network and to acquire knowledge about SOM and special networks
- To study the basic principles of fuzzy logic and fuzzy operators and to understand the concept of fuzzy logic controller and its applications

UNIT 1 INTRODUCTION TO FUZZY LOGIC 12 Hrs.

Classical set- operations and properties -Fuzzy Set-operations and properties-problems ,Classical Relations-Operations and Properties, Fuzzy Relations-Operations and Properties -Compositions-Max-min, Max-Product-Problems, Membership function-features of membership functions-types, α cuts, Linguistic Hedges.

UNIT 2 FUZZY LOGIC CONTROL SYSTEM 12 Hrs.

FLCS- Fuzzy logic control system-Need for FLCS-Assumptions in FLC design. Fuzzification – Defuzzification. Fuzzy decision making, Fuzzy Rule Based System- Knowledge Base System. Mamdani and sugeno FLC architectures, Introduction to ANFIS-Architecture. Fuzzy cognitive maps. Applications - speed control of induction motor, automatic train control.

UNIT 3 FUNDAMENTALS OF ANN 12 Hrs.

Fundamentals of ANN - - Features of ANN, Biological Neural Network – structure, Features ,Functions of Synaptic junction ,Comparison of BNN & ANN, Topology, Models of ANN - Mc Culloch – Pitts model, Adaline , Madaline. Basic learning laws, Activation Functions - Types , Learning strategy - Learning Rules, Perceptron Model-Training Algorithm –Limitation of single layer network, Multi Layer Perceptron n/w – Algorithm, Problems in perceptron N/W.

UNIT 4 MULTILAYER & ADAPTIVE ARCHITECTURES 12 Hrs.

BPN-Algorithm, Application, CPN-Training, Applications, Mexican Hat, Kohonon SOM, vector quantization, - Associate memory - Bidirectional Associative Memory (BAM) - Architecture – Hopfield – Discrete & Continuous types, Algorithm-Energy function, Adaptive Resonance Theory - ART1 ,ART2- training. Probabilistic neural network, Applications - Fault diagnosis, Motion control in robotics. Pattern Recognition.

UNIT 5 GENETIC ALGORITHMS 12 Hrs.

Introduction – Robustness of Traditional Optimization and Search Techniques – The goals of optimization - Evolutionary computation Vs Classical optimization –Fitness function, Reproduction Selection - Selective pressure, Random selection, Proportional, Tournament, Rank based, Boltzmann, Elitism, Hall of Fame – Stopping conditions - Cross over –Binary & Floating point representation, Mutation - Binary & Floating point representation & headless chicken method.

Max. 60 Hours

TEXT / REFERENCE BOOKS

1. James A Freeman and Davis Skapura, Neural Networks, Pearson.
2. Jacek M. Zurada, Introduction to Artificial Neural Systems, Jaico Publishing House, 1997.
3. Timothy J. Ross, Fuzzy Logic with Engineering Applications, MacGraw-Hill.
4. Jang JSR, Sun CT, Mizutani E, Neuro-Fuzzy and Soft Computing, PHI.
5. Kosko, Neural Networks and Fuzzy Systems, Pearson.
6. David E. Goldberg, Genetic Algorithms in Search, Optimization and Machine Learning, Addison Wesley, 1997.
7. Andries p Engelbrecht, Computaional intelligence An Introduction – 2 edition.
8. Laurene Fausett, Fundamentals of Neural Networks: Architecture, Algorithms and Applications, Pearson Education, 1994
9. Yadaiah and S. Bapi Raju, Neural and Fuzzy Systems: Foundation, Architectures and Applications, Pearson Education.
10. C.Eliasmith and CH.Anderson, Neural Engineering, PHI.
11. Shivanandam and Deepa, Principles of Soft Computing, Wiley series.
12. Rajasekharan and Rai, Neural Networks, Fuzzy logic, Genetic algorithms: synthesis and applications,PHI Publication.

END SEMESTER EXAM QUESTION PAPER PATTERN

Max Marks : 70

PART A : 5 Questions of 6 Marks each-No choice

PART B : 2 Questions from each unit with internal choice, each carrying 14 Marks

Exam Duration : 3 Hrs.

30 Marks

70 Marks

SEC5637	EMBEDDED SYSTEM PROGRAMMING IN JAVA (For EMB)	L	T	P	Credits	Total Marks
		4	0	0	4	100

COURSE OBJECTIVES

- × Introduction to computer programming and problem solving with the Java language
- × To discuss problems in Desktop java and the requirements for embedded java
- × To introduce to the student Embedded Java Application Environment

UNIT 1 INTRODUCTION 12 Hrs.

Introduction to Programming Languages, Evolution of Java, Object-Oriented Programming Concepts and Java, Differences between C++ and Java, The Primary Characteristics of Java, The Architecture, Programming with Java-Tokens, Expressions, Using Data Types, Declarations, Control Flow

UNIT 2 JAVA CLASSES, PACKAGES AND INTERFACES 12 Hrs.

Introduction, Classes, Working with Objects, Packages, Inheritance, Interfaces- Data Flow with Java Streams, Input Streams, Output Streams- **Exception Handling in JAVA- JAVA Threads**

UNIT 3 JAVA APPLETS 12 Hrs.

JAVA Applets- Applet Examples, Java.applet- Applet Class, The Five Stages of an Applet's Life Cycle, Methods for Adding UI Components, Methods for Drawing and Event Handling

UNIT 4 EMBEDDED JAVA 12 Hrs.

Introduction to Embedded Java and J2ME –Smart Card basics –Java card technology overview –Java card objects –Java card applets –working with APDUs - Developing J2ME applications- J2ME Configuration- J2ME Profiles,-Setting up development environment CLDC API- Development using K JAVA GUI Components, Development using K Java Event Handling, **MIDP API, CDS API.**

UNIT 5 APPLICATION DEVELOPMENT USING JAVA 12 Hrs.

J2ME for Mobile devices- **Set top box programming- Wireless communication-Network security- Medical client/server applications-Java Embedded Suite.**

Max. 60

Hours TEXT / REFERENCE BOOKS

- Herbert Schildt, "Java A Beginner's Guide", McGraw Hill , 6th Edition ,2014.
- Herbert Schildt, "Java: The Complete Reference", McGraw Hill , 8th Edition,201 1.
- Patrick Niemeyer and Jonathan Knudsen, " Learning Java", 3rd Edition, O'Reilly 2005.
- Zhiqun Chen, 'Java Card Technology for Smart Cards: Architecture and Programmer's Guide', Addison-Wesley Professional, 2000

END SEMESTER EXAM QUESTION PAPER PATTERN

Max. Marks : 100

Exam Duration : 3 Hrs.

Part A : 5 Questions of 6 Marks each – No choice

30 Marks

Part B : 2 Questions from each unit with internal choice, each carrying 14 Marks

70 Marks

SEC6535	RTOS PROGRAMMING LAB (For EMB)	L	T	P	Credits	Total Marks
		0	0	6	3	100

SUGGESTED LIST OF

EXPERIMENTS PROGRAMMING WITH ARM PROCESSORS

1. GPIO programming with ARM Controller
2. LCD interfacing with ARM Controller
3. SPI and I2C Communication with ARM Controller
4. ADC/DAC,
5. Timers and Interrupts, Watch Dog Timer, PWM
6. RTC Interfacing
7. Sensor Interfacing and I/O device control
8. Interfacing Wireless modules

APPLICATIONS DEVELOPMENT WITH SUPPORT OF RTOS

1. To Implement Multitasking using RTOS (Toggling LEDs and at different ports)
2. To Implement Priority Scheduling based application
3. GPIO port pin access for Input-Output interface
4. Webcam Interface, Image Acquisition and processing
5. Inter process communication using mailbox and message queues
6. Resource management with semaphores
7. Socket programming(Client server model)
8. Internet of Things (IOT) implementation

SEC5642	MOBILE APPLICATION DEVELOPMENT (For EMB)	L	T	P	Credits	Total Marks
		4	0	0	4	100

COURSE OBJECTIVES

- x To comprehend the concepts of mobile application development and its design constraints.
- x To acquire knowledge about Multimedia web Access
- x To study the basic principles of Android OS.
- x To understand the concept of IOS.

UNIT 1 INTRODUCTION 12 Hrs.

Introduction to mobile applications – Embedded systems - Market and business drivers for mobile applications – Publishing and delivery of mobile applications – Requirements gathering and validation for mobile applications

UNIT 2 BASIC DESIGN 12 Hrs.

Design constraints for mobile applications, both hardware and software related – Architecting mobile applications – User interfaces for mobile applications – touch events and gestures – Achieving quality constraints – performance, usability, security, availability and modifiability.

UNIT 3 ADVANCED DESIGN 12 Hrs.

Designing applications with multimedia and web access capabilities – Integration with GPS and social media networking applications – Accessing applications hosted in a cloud computing environment – Design patterns for mobile applications.

UNIT 4 ANDROID OS 12 Hrs.

Introduction – Establishing the development environment – Android architecture – Activities and views – Interacting with UI – Persisting data using SQLite – Packaging and deployment – Interaction with server side applications – Using Google Maps, GPS and WiFi – Integration with social media applications.

UNIT 5 IOS 12 Hrs.

Introduction to Objective C – iOS features – UI implementation – Touch frameworks – Data persistence using Core Data and SQLite – Location aware applications using Core Location and Map Kit – Integrating calendar and address book with social media application – Using Wifi- iPhone marketplace.

Max. 60

Hours TEXT / REFERENCE BOOKS

1. JefMcWherter and Scot Gowel, "Professional Mobile Application Development", Wrox, 2012
2. Charlie Colins, Michael Galpin and Mathias Kapler, "Android in Practice", DreamTech, 2012
3. James Dovey and Ash Furow, "Beginning Objective C", Apres, 2012
4. David Mark, Jack Nuting, JefLaMarche and Frederic Olson, "Beginning iOS 6 Development: Exploring the iOS SDK", Apres, 2013.
5. <http://developer.android.com/develop/index.html>

END SEMESTER EXAM QUESTION PAPER PATTERN

Max. Marks : 100

Exam Duration : 3 Hrs.

Part A : 5 Questions of 6 Marks each – No choice

30 Marks

Part B : 2 Questions from each unit with internal choice, each carrying 14 Marks

70 Marks

SEC5628	RF CIRCUIT DESIGN (For VLSI, EMB))	L	T	P	Credits	Total Marks
		4	0	0	4	100

COURSE OBJECTIVES

- × To understand the basics of RF circuit designing
- × To learn the RF front end subsystem designing
- × To learn and understand the issues in RF design and measurement techniques

UNIT 1 RF ELECTRONIC CONCEPTS

12 Hrs.

Importance of radio frequency design - materials used for different RF electronic devices - RF Microwave versus DC or AC signals — RF behavior of passive components: R, L, C transformer – Chip components: Circuit board consideration –Chip resistors-Chip capacitors-Surface mounted inductors- resonant circuits - RF behavior of active components: BJT - MOSFET- Basics of RF/Microwave antenna and array - Basics of smith chart calculations – Smith circle.

UNIT 2 MATCHING AND BIASING NETWORK

12 Hrs.

RF Impedance matching using discrete component – **Design of matching circuits using lumped and distributed elements** - Frequency response - Quality factor- T and Pi matching networks, micro-strip line matching network - BICMOS biasing networks – Impedance computing using Smith chart : From reflection coefficient to load impedance – Parametric reflection coefficient equation – Graphical representation – Impedance transformation – Admittance transformation

UNIT 3 DESIGN OF AMPLIFIERS AND MIXERS

12 Hrs.

Amplifier classes of operation and biasing networks-Stability and noise considerations in active network – Rollett's stability factor - Gain considerations in amplifiers – Linear and non linear design of RF amplifiers - **Design philosophy of Low noise amplifiers (Qualitative treatment only)** – Negative resistance oscillator – Conditions leading to oscillator's stable operation – Basics of mixer circuits and types.

UNIT 4 ELECTROMAGNETIC COMPATIBILITY, EMI AND NOISE

12 Hrs.

EMC definitions and units of parameters – EMI: Conducted and Radiated EMI emission and Susceptibility – transient EMI- ESD – **Radiation hazards** – Mismatch related concepts - Radiation losses - Noise: Thermal, shot, flicker, phase noise - IP2- IP3 - Sensitivity- Noise contributions of various structures on RFIC - Non linearities in circuits - Passive inter modulation distortion – Inter Symbol Interference.

UNIT 5 RF CIRCUITS MEASUREMENTS

12 Hrs.

RF performance metrics : **S Parameter Models** - Input and output VSWR – Noise Figure -Directivity - Insertion loss – Isolation loss – coupling factor - RF mismatch factor – Sources of Uncertainty — Considerations for attenuation measurements – **Noise measurements – Spectrum analyzer measurements - RF antenna measurements**

Max. 60

Hours TEXT / REFERENCE BOOKS

1. Matthew M. Radmanesh " Radio frequency & Microwave Electronics illustrated", Prentice Hall, 2001.
2. Reinhold Ludwig, Gene Bogdanov, "RF circuit design, theory and applications", Pearson Asia Education, 2nd edition, 2009.
3. RF Microelectronics by Behzad Razavi. Prentice Hall,1997.
4. Robbert J Webber"Radio frequency & design applications", IEEE Press, 2001
5. Jeremy Everard "Fundamentals of RF Circuit Design", John Wiley, 2001.
6. Thomas H.Lee, "The Design of RF Integrated Circuits",Cambridge university press, 2004.
7. D.Pozar, "Microwave Engineering", John Wiley & Sons, New York, 2008.
8. Bahil and P. Bhartia, "Microwave Solid State Circuit Design", Wiley-Interscience, 2003.
9. R.J. Collier, A.D. Skinner, "Microwave Measurements", 3rd Edition,2007
10. L.E. Larson, "RF & Microwave Circuit Design for Wireless Communication ", Artech House Publishers, 1997.

END SEMESTER EXAM QUESTION PAPER PATTERN

Max. Marks : 100

Exam Duration : 3 Hrs.

Part A : 5 Questions of 6 Marks each – No choice

30 Marks

Part B : 2 Questions from each unit with internal choice, each carrying 14 Marks

70 Marks

SEC5204	EMBEDDED NETWORKING (For EMB)	L	T	P	Credits	Total Marks
		4	0	0	4	100

COURSE OBJECTIVES

- x To expose the students to the fundamentals of embedded networking.
- x To impart knowledge on different communication protocols used in embedded systems
- x To enable the student to develop applications using USB and CAN bus

UNIT 1 EMBEDDED NETWORK REQUIREMENTS 12 Hrs.

Embedded networking – code requirements – Communication requirements – Introduction to CAN open – CAN open standard – Object directory – Electronic Data Sheets & Device – Configuration files – Service Data Objectives – Network management CAN open messages – Device profile encoder. Serial Peripheral Interface (SPI) – Inter Integrated Circuits (I2C) – PC Parallel port programming -ISA/PCI Bus protocols – Firewire

UNIT 2 CAN CONFIGURATION 12 Hrs.

CAN open configuration – CAN Bus – Introduction - Frames –Bit stuffing –Types of errors –Nominal Bit Timing Evaluating system requirements choosing devices and tools – Configuring single devices – Overall network configuration – Network simulation – Network Commissioning – Advanced features and testing.

UNIT 3 CONTROLLER AREA NETWORK 12 Hrs.

Controller Area Network – Underlying Technology CAN Overview – Selecting a CAN Controller – CAN development tools- Using the internet in local and internet communications – Inside the Internet protocol.

UNIT 4 MICRO CAN 12 Hrs.

Implementing CAN open Communication layout and requirements – Comparison of implementation methods – Micro CAN open – CAN open source code – Conformance test – Entire design life cycle. MICRO CAN- Implementing CAN open Communication layout and requirements – Comparison of implementation methods – Micro CAN open – CAN open source code – Conformance test – Entire design life cycle.

UNIT 5 IMPLEMENTATION 12 Hrs.

Implementation issues – Physical layer – Data types – Object dictionary – Wireless sensor networks – Introduction – Applications – Network Topology – Localization -Communication object identifiers –Emerging objects – Node states.

**Max. 60
Hours**

TEXT / REFERENCE BOOKS

1. GlafP.Feiffer, Andrew Ayre and Christian Keyold“ Embedded Networking with CAN and CAN Open” Embedded System Academy,1st edition, 2008.
- 2., Mohammad Farsi, Manuel Bernardo Barbosa, “CANopen: Implementation Made Simple”, Research Studies Press,1999.
3. Konrad Etschberger, “Controller area network : basics, protocols, chips and applications”, IXXAT Press,1st edition, 2001.
4. Wolfhard Lawrenz,“ CAN System Engineering: From Theory to Practical Applications”, Springer, 1st edition,1997.

END SEMESTER EXAM QUESTION PAPER PATTERN

Max. Marks : 100

PART A : 5 Questions of 6 Marks each – No choice

PART B : 2 Questions from each unit with internal choice, each carrying 14 Marks -

Exam Duration : 3 Hrs.

30 Marks

70 Marks

SEC5602	APPLIED CRYPTOGRAPHY AND DATA SECURITY (For AE, EMB, VLSI & CS)	L	T	P	Credits	Total Marks
		4	0	0	4	100

COURSE OBJECTIVES

- × To explain basic number theory concepts and algorithms related to cryptography
- × To understand both the importance of cryptographic key management
- × To provide a deeper understanding into cryptography, its application to network security, threats/vulnerabilities to networks and countermeasures

UNIT 1 CRYPTOGRAPHY BASICS

12 Hrs.

Terminologies of Cryptography; Principles of Security – Confidentiality, Authentication, Integrity, Non-repudiation, Access Control, Availability; Steganography. Steganalysis; Classic ciphers- Substitution ciphers-Caesar-Mono alphabetic, poly alphabetic, Hill, Vigenere, Playfair – Transposition ciphers- rail fence, One time pad; Types of Attacks – Cipher text-only-Known plaintext-Chosen plaintext- Chosen cipher text- Side channel attack; Protocols-secret splitting, Secret sharing, Time stamping services, subliminal channel, Digital signature, proxy signature, group signature, bit commitment.

UNIT 2 CRYPTOGRAPHIC ALGORITHMS & SYMMETRIC KEY CRYPTOGRAPHY

12 Hrs.

Algorithm types and modes-Stream ciphers-Block ciphers-Modes of operation-ECB-CBC-CFB-OFB-Counter mode-Over view of symmetric key cryptography-Fiestal structure-Data Encryption Standard (DES)-Blowfish-AES; Cryptanalysis of symmetric ciphers – Brute force attack-Differential cryptanalysis-Linear cryptanalysis.

UNIT 3 ASYMMETRIC / PUBLIC KEY CRYPTOGRAPHY

12 Hrs.

Number theory-Prime numbers-Fermat's and Euler's theorem – Testing for primality -The Chinese remainder theorem- Public key crypto systems- requirements – applications – The RSA algorithm- Key management – Diffie Hellman key exchange- Elliptic curve cryptography- EC group over real numbers- EC Addition of two points-doubling of point P- ECC key exchange.

UNIT 4 HASH FUNCTIONS AND DIGITAL SIGNATURE

12 Hrs.

Message authentication- requirements – functions – codes – Hash functions, Hash algorithms- MD5 message digest algorithm – Secure Hash algorithm= MAC – HMAC, Digital signature- Digital Signature Standard – DSS Approach – Digital Signature algorithm- RSA for digital signature.

UNIT 5 DATA SECURITY & CASE STUDIES ON CRYPTOGRAPHY AND SECURITY

12 Hrs.

Internet security protocols- basic concepts – Secure socket layer(SSL)- transport layer security(TLS) – Secure electronic transaction (SET)- SSL Versus SET- Email security – Bio metric authentication – Kerberos-Single sign on (SSO) approaches. Case studies on Denial of service attacks, IP spoofing attacks. Cookies and privacy.

Max. 60

Hours TEXT / REFERENCE BOOKS

1. Bruce Schneier, "Applied Cryptography", 2nd Edition, John Wiley & Sons.
2. Atul Kahate, "Cryptography and Network Security", 2nd Edition, Tata McGraw Hill, 2009.
3. William Stallings, "Cryptography and Network Security", 3rd Edition, Pearson Education, 2003.
4. Douglas R Stinson, "Cryptography – Theory and Practice", CRC press.

END SEMESTER EXAM QUESTION PAPER PATTERN

Max. Marks : 100

Exam Duration : 3 Hrs.

PART A : 5 Questions of 6 Marks each-No choice

30 Marks

PART B : 2 Questions from each unit with internal choice, each carrying 14 Marks

70 Marks

SEC5607	SOFTWARE TOOLS FOR TECHNICAL COMPUTING (For AE, EMB & CS)	L	T	P	Credits	Total Marks
		4	0	0	4	100

COURSE OBJECTIVES

- To introduce the MATLAB software for numerical computations
- To construct systems using Simulink
- To learn how to develop basic applications using LAB VIEW

UNIT 1 INTRODUCTION TO MATLAB 12 Hrs.

Matlab environment—types of files—constants and variables— Matrices and Vectors, matrix manipulations – Cell Array – Structure Array -Strings – function Script files - Input and Output statements – File input and output – Opening & Closing – Writing & Reading data from files.

UNIT 2 PROGRAMMING IN MATLAB 12 Hrs.

Arithmetic, Relational and logical operators - Control statements IF, SWITCH CASE, BREAK, CONTINUE – FOR loop – While loop – Matlab Debugger – polynomials.

UNIT 3 PLOTTING AND SIMULINK 12 Hrs.

Basic 2D plots – modifying line styles – markers and colors – grids – placing text on a plot – Various / SpecialMatLab 2D plot types – Semilogx – Semilogy – Log Log – Multiple Plots-Subplots- Simulink-Modelling,Simulating a Model, Data Import/Export, State Space Modeling, Creating Sub-Systems.

UNIT 4 INTRODUCTION TO LABVIEW 12 Hrs.

Introduction to Virtual Instrumentation- advantages- **architecture of a Virtual Instrument**-block diagram- front panel-VIs, loading and saving Vis-debugging techniques- creating sub Vis- loops and Charts-arrays- clusters and graphs.

UNIT 5 STRUCTURES, GRAPHS, FILE I/O AND INSTRUMENT CONTROL 12 Hrs.

Shift registers-Case structure- Sequence structures-Formula node- Expression node -Strings and file input output- **Data acquisition in Labview-Instrument control in Labview.**

Max. 60
Hours

TEXT / REFERENCE BOOKS

1. Raj kumar Bansal, Ashok kumarGoel, Manojkumar Sharma, Matlab and its applications in engineering, Pearson Education, 1st Edition, 2009.
2. Stephen J.Chapmen, Matlab Programming for Engineers, Thomson learning, 4thEdition, 2008.
3. RudraPratap, Getting Started with MATLAB, Oxford University press, 2nd Edition, 1999.
4. Jeffrey Travis, Jim Kring, Labview for Everyone: Graphical Programming Made Easy and Fun, 3rd Edition, 2009.
5. www.mathworks.com
6. www.ni.com

END SEMESTER EXAM QUESTION PAPER PATTERN

Max Marks : 70

Exam Duration : 3 Hrs.

PART A : 5 Questions of 6 Marks each-No choice

30 Marks

PART B : 2 Questions from each unit with internal choice, each carrying 14 Marks

70 Marks

SEC5640	PERVASIVE COMPUTING (For EMB)	L	T	P	Credits	Total Marks
		4	0	0	4	100

COURSE OBJECTIVES

× To learn the basics of pervasive computing.

× To acquire the knowledge of device connectivity. × To understand the basic concepts of WAP. × To be well known with the PDA devices.

UNIT 1 INTRODUCTION 12 Hrs.

Pervasive Computing: Past, Present and Future Pervasive Computing-Market-m-Business-Application examples: Retail, Airline check-in and booking-Sales force automation-Health care-Tracking-Car information system-E-mail access via WAP

UNIT 2 DEVICE TECHNOLOGY 12 Hrs

Device Technology: Hardware-Human Machine Interfaces-Biometrics-Operating Systems-Java for Pervasive devices

UNIT 3 DEVICE CONNECTIVITY 12 Hrs.

Device Connectivity: Protocols-Security-Device Management Web Application Concepts: WWW architecture-Protocols-Transcoding-Client authentication via internet

UNIT 4 WAP FUNCTIONALITIES 12 Hrs.

WAP and Beyond: Components of the WAP architecture-WAP infrastructure-WAP security issues-WML-WAP push-Products-i-Mode-Voice Technology: Basics of Speech recognition- Voice Standards-Speech applications-Speech and Pervasive Computing

UNIT 5 PDA FUNCTIONALITIES 12 Hrs.

PDA: Device Categories-PDA operation Systems-Device Characteristics-Software Components-Standards-Mobile Applications-PDA Browsers Pervasive Web Application architecture: Background-Scalability and availability-Development of Pervasive Computing web applications-Pervasive application architecture

Max. 60

Hours TEXT / REFERENCE BOOKS

1. Pervasive Computing, Technology and Architecture of Mobile Internet Applications, Jochen Burkhardt, Horst Henn, Stefan Hepper, Thomas Schaech & Klaus Rindtorff, Pearson Education, 2006
2. Fundamentals of Mobile and Pervasive Computing, Frank Adelstein, Sandeep KS Gupta, Golden Richard III, Loren Schwiebert, McGraw Hill edition, 2006
3. Stefan Poslad: Ubiquitous Computing: Smart Devices, Environments and Interactions, Wiley, Student Edition, 2010.
4. A. Genco, S. Sorce: Pervasive Systems and Ubiquitous Computing, WIT Press, 2012.
5. Ajith Abraham (Ed.): Pervasive Computing, Springer-Verlag, 2012.
6. Guruduth S. Banavar, Norman H. Cohen, Chandra Narayanaswami: Pervasive Computing: An Application-Based Approach, Wiley Interscience, 2012.
7. Frank Adelstein, S K S Gupta, GG Richard & L Schwiebert: Fundamentals of Mobile and Pervasive Computing, Tata McGraw-Hill, New Delhi, 2005.

END SEMESTER EXAM QUESTION PAPER PATTERN

Max. Marks : 100

Exam Duration : 3 Hrs.

Part A : 5 Questions of 6 Marks each – No choice

30 Marks

Part B : 2 Questions from each unit with internal choice, each carrying 14 Marks

70 Marks

SEC6534	EMBEDDED C PROGRAMMING LAB (For EMB)	L	T	P	Credits	Total Marks
		0	0	6	3	100

SUGGESTED LIST OF EXPERIMENTS INTERFACING EXPERIMENTS USING 8051 AND PIC

MICROCONTROLLER

7-segment LED and DOT Matrix display interfacing

Digital voltmeter and thermometer with LCD display

D/A Interfacing

Keypad interfacing

Serial communication between MCU and PC

Stepper Motor, DC Motor and Servo motor Control Real time clock

Timer and Counter programming

Interfacing Relays and Opto-Couplers

RF communication (Zigbee, FSK module and GSM modem)

EMBEDDED SYSTEM IMPLEMENTATION ON FPGA

ALU implementation

Traffic light controller

Finite state machine

