17ECP101	ADVANCED ELECTRONIC CIRCUIT THEORY	Semester-I			
		L	T	P	C
		4	-	-	4

COURSE OBJECTIVES

➢ Ability to design different types of Electronic Circuits such as Amplifiers and Oscillators.
➢ To understand and implement the advanced electronic circuits such as amplifiers etc with the help of theoretical and practical problem solving.
➢ Ability to analyze the different types of configurations and applications of Transistor.
➢ Ability to determine the stability of feedback amplifiers and their steady state performance.
➢ To analyze the Circuits in time and frequency domain
➢ Calculation and measurement of parameters for electronic circuits, to introduce the students to the advanced concepts of electronics.

COURSE OUTCOMES

➢ Know the characteristics of diodes and transistors
➢ Design simple circuits and know the benefits of feedback in amplifier
➢ Apply their knowledge in analyzing Circuits by using network theorems.
➢ Measure the characteristics of electronic circuits and present experimental results
➢ Compare and classify oscillators
➢ Analyze electrical circuits and calculate the main parameters

UNIT I - Semiconductor Devices

Conductor – Semiconductor – Intrinsic Semiconductor – Extrinsic Semiconductor – P Type and N Type Semiconductor – PN Junction Diode – V-I Characteristics - Zener Diode – V-I Characteristics Construction of NPN and PNP Transistors – Operation of NPN, PNP Transistors – Characteristics of CE and CB Transistor Configurations

UNIT II - Circuit Analysis

Mesh Analysis - Mesh Equation by Inspection Method - Nodal Analysis – Source Transformation Technique – Star to Delta Transformation. Network Theorems: Superposition Theorem - Thevenis's Theorem - Norton's Theorem – Reciprocity Theorem – Maximum Power Transfer Theorem – Millman's Theorem.

UNIT III - Analog Electronics

Detailed Analysis of BJT and FET Biasing Circuits - Stability Considerations - Analysis of Single and Multistage Amplifiers - Amplifier with Different types of Feedbacks - Power Amplifiers - Tuned Amplifiers and Oscillators - Linear Integrated Circuits - Process Technology - Differential Amplifiers and Current Mirrors - Op-Amp Details. Op-Amp Circuits and Applications - Active Filters - Functional Amplifiers.

UNIT IV - Thyristors and Special diodes

SCR - Construction – Characteristics – Two Transistor Version – Thyristor ratings -LASER – TRIAC – DIAC - Zener Diode - Avalanche Break Down – Zener Breakdown – Application of Zener -

Varactor Diode – Schotty Diode - Tunnel Diode - Gunn Diode – IMPATT Diode - PIN Diode – LASER Diode.

UNIT V - AC Fundamentals

Electrical Sources - AC Waveforms - Frequency, Phase, Amplitude, Peak, RMS, Calculation of Power, Response of Passive Components on AC Waveforms – Impedance in RLC Circuit - Transient Analysis of Electric Circuits - Steady State Analysis of Circuits - Network Theorems(Ac Circuits) - Two Port Networks – Resonance.

SUGGESTED READINGS

1. Electronic Devices and Circuits, David.A. Bell, Oxford University Press Sixth Edition, 2010.
2. Circuit Theory : Analysis and Synthesis, Abhijit Chakrabarti, Dhanpat Rai & Co. Sixth Edition, 2014
3. Electronic Devices and Circuits, S.Salivahanan, N.Suresh Kumar & A.Vallavaraj, Tata Mc Graw-Hill publishing Company Limited, Fourth Edition, 2013.

17ECP102	MODERN COMMUNICATION SYSTEMS	Semester-I			
		L	T	P	C
		4	-	-	4

COURSE OBJECTIVES
➤ To learn the designing procedure and operation of circuits used for communication.
➤ To understand the basic concepts of AM, FM, and PM transmission and reception.
➤ To assess and evaluate different modulation and demodulation techniques.
➤ To evaluate the influence of noise on communications signals.
➤ To introduce students to various modulation and demodulation techniques of analog communication
➤ To analyze different parameters of analog communication techniques.

COURSE OUTCOMES
➤ Apply or a create suitable algorithm to solve a particular problem
➤ Understand and identify the fundamental concepts and various components of analog communication systems
➤ Explain signal to noise ratio, noise figure and noise temperature for single and cascaded stages in a communication system.
➤ Describe analog pulse modulation techniques and digital modulation technique
➤ Develop the ability to compare and contrast the strengths and weaknesses of various communication systems.
➤ Use of different modulation and demodulation techniques used in analog communication

UNIT I -Wave Propagation
EM Waves – Free Space Propagation – Surface Wave Propagation – Sky Wave Propagation – Space Wave Propagation – Trophospheric Scatter Propagation – Structure of Atmosphere – Characteristics of Ionized Regions – Virtual Height – Maximum Usable Frequency - Lowest Usable Frequency – Skip Distance – Optimum Working Frequency – Ionospheric Abnormalities – Duct Propagation.

UNIT II - Satellite Communication
System Description – Telemetry, Tracking and Command – Communication Space Craft – Satellite Orbit – GEO – LEO – MEO – Satellite Position – Linkage – Frequencies – Inside the Satellite: Transponder – Antenna Systems – Power Packages – Station Keeping – Ground Station – Aligning the Satellite Dish.

UNIT III - Optical Fiber Communication
Basic Fiber Optic System – Frequencies – Fiber Optic Cables – Refraction – Numerical Aperture – Graded Index Cables – Single Mode – Multimode – Cable Constructions – Cable Losses – Connecter – Light Sources – Light Detector - System Components – Advantages And Disadvantages.

UNIT IV - Digital Cellular Systems
GSM Architecture – Layer Modeling – Transmission – Data Service – Multiple Access Scheme – Channel Coding Interleaving – Radio Resource Management – Mobility Management – Communication Management – Network Management – TDMA Architecture – Transmission and

Modulation – CDMA – Terms of CDMA Systems – Call Processing – Handover Procedures.

UNIT V - Intelligent Network for Wireless Communication

Intelligent Cell Concept – Intelligent Micro Cell Operation – Applications – Advanced Intelligent Network (AIN): Evaluation – Architecture – ISDN for AIN – AIN for Mobile – Asynchronous Transfer Mode (ATM) Technology: TM Network Concept – Applications – Wireless Information Super Highway.

SUGGESTED READINGS

1. Electronic Communication Systems, Kennedy and Davis,Tata McGraw Hill, Fifth Edition, 2012.
2. Mobile Cellular Telecommunications, Willian C.Y.Lee,McGraw Hill,Second Edition ,2012
3. Electronic Communications Modulation and Transmission, Robert J Schoenbeck, PHI, Second Edition, 2011.

17ECP103	EMBEDDED SYSTEMS	Semester-I			
		L	**T**	**P**	**C**
		4	**-**	**-**	**4**

COURSE OBJECTIVES
- Ability to design an Embedded System, component or process to meet desired needs within realistic constraints.
- To develop the next generation technologies, methods and tools for modeling, design, implementation and operation of hardware/software systems embedded in intelligent devices
- To understand the need and applications of Microcontrollers n embedded system.
- To understand architecture and features of typical Microcontroller.
- Learn interfacing of real world input and output devices
- To study various hardware and software tools for developing applications embedded systems

COURSE OUTCOMES
- Understand hardware and software design requirements of embedded systems.
- Acquire knowledge about embedded processors and their applications
- Analyze the embedded systems specification and develop software programs.
- Ability to design an Embedded System, component or process to meet desired needs within realistic constraint
- Evaluate the requirements of programming embedded systems and tool chain for embedded systems.
- Explore the features of the microcontroller and provide solutions for embedded applications

UNIT I- Embedded Design Process
Embedded Design Life Cycle – Product Specification – Hardware / Software Partitioning – Detailed Hardware and Software Design – Integration – Product Testing – Selection Processes – Microprocessor Vs Micro Controller – Performance Tools – Bench Marking –RTOS Micro Controller Tool Chain Availability – Other Issues in Selection Processes.

UNIT II - PIC 18F Microcontroller
Introduction to Microcontroller: Brief History of The PIC Microcontroller – PIC18 Features and Block Diagram – PIC18 Architecture - Addressing Modes – Instruction Set – PIC I/O Port Programming.

UNIT III – Embedded C Programming
Introduction to C Programming: Data Types in C - I/O Port Programming in C - Bit-Addressable I/O Programming - Logic Operations in C - Data Conversion Programs in C.

UNIT IV - PIC Peripherals and Interfacing
Introduction to PIC Peripherals and Interfacing: PIC18 Timer Programming in Assembly and C - Serial Port Programming in Assembly and C - Interrupt Programming in Assembly and C - ADC and DAC Interfacing - CCP and ECCP Programming - DC Motor Interfacing and PWM.

UNIT V - Introduction to Embedded Systems

Introduction to Embedded Systems Characteristics of Embedded Systems - Software Embedded into a Systems - Device Drivers and Interrupt Servicing Mechanisms - Inter-Process Communication and Synchronization of Process - Tasks and Threads: Multiple Processes in an Application – Data Sharing by Multiple Tasks and Routines – Inter Process Communication.

SUGGESTED READINGS

1. Programming and Customizing the PIC Microcontroller, Myke Predko, Tata McGraw - Hill Education, Third Edition, 2010.
2. Embedded Systems Architecture Programming and Design, Rajkamal, Tata McGraw Hill Publications. Third Edition, 2014.
3. PIC Microcontroller and Embedded Systems using assembly and C for PIC18 –Muhammad Ali Mazidi, Roind D. Mckinay, Danny Causey, Pearson Education, First Edition,2010.

17ECP104	ADVANCED DIGITAL SYSTEM DESIGN	Semester-I			
		L	T	P	C
		4	-	-	4

COURSE OBJECTIVES
- ➢ To provide strong knowledge on Programmable Logic Devices and its usage in industrial automation.
- ➢ To understand number representation and conversion between different representation in digital electronic circuits.
- ➢ To analyze logic processes and implement logical operations using combinational logic circuits.
- ➢ To understand concepts of sequential circuits and to analyze sequential systems in terms of state machines
- ➢ To understand concept of Programmable Devices, PLA, PAL, CPLD and FPGA and implement digital system using VHDL
- ➢ To implement combinational and sequential circuits using VHDL

COURSE OUTCOMES
- ➢ Develop a digital logic and apply it to solve circuit problems
- ➢ Analyze, design and implement combinational logic circuits
- ➢ Classify different semiconductor memories
- ➢ Analyze, design and implement sequential logic circuits
- ➢ Analyze digital system design using PLD
- ➢ Simulate and implement combinational and sequential circuits using VHDL systems
.

UNIT I - Sequential Logic Circuits
Introduction to Sequential Logic Circuits - Mealy Machine- Moore Machine - State Diagrams - State Table Minimization - Incompletely Specified Sequential Machines - State Assignments - Design of Synchronous and Asynchronous Sequential Logic Circuits - Working in Fundamental and Pulse Mode.

UNIT II - Synchronous Sequential Circuit Design
Introduction of Clocked Synchronous Sequential Networks (CSSN) - Modeling of CSSN - State Table Assignment and Reduction – Design of CSSN - ASM Chart - ASM Realization.

UNIT III - Asynchronous Sequential Circuit Design
Introduction of Asynchronous Sequential Circuits (ASC)-Flow Table Reduction - Races in ASC - State Assignment - Problem and the Transition Table - Design of ASC - Static and Dynamic Hazards -Mixed Operating Mode Asynchronous Circuits.

UNIT IV - Programmable Logic Devices
Basic Concepts - Programming Technologies - Programmable Logic Element(PLE), Programmable Logic Array(PLA) - Programmable Array Logic(PAL) - Complex PLD's(CPLD) - System Design using PLD's - Design of Combinational and Sequential Circuits using PLD's.

UNIT V - Study of FPGA and XILINX

　　　　Introduction to Field Programmable Gate Arrays - Types of FPGA – Xilinx XC3000 Series - Logic Cell Array (LCA) - Configurable Logic Blocks (CLB) - Input/Output Block (IOB) - Programmable Interconnect Point (PIP).

SUGGESTED READINGS

1. Digital Principles and Design, Donald G.Givone, Tata McGraw Hill, First Edition, 2012.
2. Digital Systems: Principles and Applications, Gregory L. Moss, Ronald J. Tocci, Neal S. Widmer, Pearson Education, Tenth Edition, 2013
3. Logic Design Theory, Nripendra N Biswas Prentice Hall of India, First Edition.2013.

17ECP105A	MEMS AND CONTROL ENGINEERING	Semester-II			
		L	T	P	C
		4	-	-	4

COURSE OBJECTIVES

- ➢ To learn the various micro fabrication technologies for MEMS
- ➢ To understand unique requirements for MEMS fabrication
- ➢ To know about the current trends and future technology for MEMS
- ➢ To employ time domain analysis to predict and diagnose transient performance parameters of the system for standard input functions
- ➢ Identify the needs of different types of controllers and compensator to ascertain the required dynamic response from the system
- ➢ Formulate different types of analysis in frequency domain to explain the nature of stability of the system

COURSE OUTCOMES

- ➢ Ability to describe MEMS fabrication technologies
- ➢ Apply fundamental concepts of MEMS to solve real life engineering problems
- ➢ Identify problems and suggest suitable MEMS material/ Devices/Process to get the Requisite Solution for a given application
- ➢ Apply advanced MEMS techniques to solve future engineering problems. Capability to critically analyze microsystems technology for technical feasibility as well as practicality Understand the concept of time response and frequency response of the system.
- ➢ Analyze feedback characteristics of linear control systems to reduced the disturbance
- ➢ Perform frequency domain analysis of linear control system using nyquist stability criterion

UNIT I - Overview and Working Principles of MEMS

MEMS and Microsystems – Typical MEMS and Microsystems Products – Microsystems and Microelectronics – Miniaturization – Applications of Microsystems – Micro Sensors, Micro Actuation, Micro Grippers, Micro Motors, Micro Accelerometer.

UNIT II - Fabrication and Microsystems Design

Ions and Ionization – Doping – Diffusion Process – Scaling Laws For Electrical Design – Substrate and Wafers – Silicon as a Substrate – Silicon Compounds – Piezo Resistors – Piezo Crystals - Photolithography – Ion Implantation – Diffusion – Oxidation – PVD – Etching – Surface Micro Matching – LIGA Process – Micro System Design Considerations

UNIT III - Concepts of Control System

Introduction – Open and Closed Loop Systems – Examples – Elements of Closed Loop Systems – Linear and Nonlinear System - Effect of Feedback on Overall Gain, Stability, Sensitivity and Noise – Transfer Function of Closed Loop System – Block Diagram Algebra and Reduction – Mason's Gain Formula.

UNIT IV -Time Response Analysis and Stability in Time and Frequency Domain

First Order System: Impulse and Step Input Analysis – Second Order System Analysis – Steady State Error – Stability Analysis: Routh Hurwitz Criterion – Root Locus Method – Construction

and Application - Nyquist Stability Criterion – Bode Diagrams – Polar Plot.

UNIT V - Design of Digital Control System
        Z Plane Specifications of Control System Design – Digital Compensator Design – Frequency Response Method - State Feedback – Pole Placement Design – State Observers – Digital Filter Properties – Frequency Response – Kalman's Filter.

SUGGESTED READINGS
1. MEMS & Microsystems Design & Manufacture and Nano Scale Engineering, Tai-Ran Hsu, Wiley Publications, Second Edition, 2011.
2. Control Systems Engineering, R.Ananada Natrajan, P. Ramesh Babu, SCITECH Publications, Fifth Edition, 2012
3. Digital Control Engineering, M.Gopal, New age International (p) Ltd, Fifth Edition, 2012

17ECP105 B	ARDUINO AND ITS APPLICATIONS	Semester-II			
		L	T	P	C
		4	-	-	4

COURSE OBJECTIVES
➢ Ability to design an Embedded System, component or process to meet desired needs within realistic constraints.
➢ To develop the next generation technologies, methods and tools for modeling, design, implementation and operation of hardware/software systems embedded in intelligent devices.
➢ To provide a broad overview of both theoretical and practical aspects of a design flow for embedded systems.
➢ To learn the basics of electronics, including reading schematics (electronics diagrams)
➢ To learn how to prototype circuits with a breadboard
➢ To learn the Arduino programming language and IDE

COURSE OUTCOMES
➢ Program the Arduino microcontroller to make the circuits work
➢ Understand the value and importance of learning a coding language
➢ Transform a physical input into a digital input and analyze it
➢ Connect the Arduino microcontroller to a serial terminal
➢ To understand communication and stand-alone use Program basic Arduino examples
➢ Explore the provided example code and online resources for extending knowledge about the capabilities of the Arduino microcontroller

UNIT I - Introduction to Embedded System
Definition of Embedded System – Features of Embedded System – Introduction to Arduino Microcontroller-Architecture of ATmega 328 Microcontroller- Features- Memory- ports

UNIT II - Embedded C basics, Timer and Interrupts
Embedded C Basics : Operators – Functions – Header files -Timer/Counter – Program for Time Delay and Counter –Interrupts

UNIT III - Interfacing Concepts
PWM generation - ADC Interfacing - Program for Temperature Sensor LM 35 Interface – DAC Interfacing Output - RTC Interfacing – Program for displaying the Time in LCD Display.

UNIT IV – Communication Protocols
Serial Communication Interface – USART – SPI – TWI – I2C- Bluetooth Interface.

UNIT V – Applications
LED Interfacing – Key Interfacing – DC Motor Interfacing – Stepper Motor Interfacing – LCD Interfacing – GPS interfacing.

SUGGESTED READINGS
1. Arduino Microcontroller: Processing for Everyone, Steven F. Barrett,Morgan & Clay Pool Publishers, Second Edition 2014

2. 30 Arduino Projects for the Evil Genius, Simon Monk, McGraw Hill Publishing Company Limited, Second Edition, 2013.

17ECP105 C	REAL TIME OPERATING SYSTEMS	Semester-II			
		L	T	P	C
		4	-	-	4

COURSE OBJECTIVES
- ➢ To know the Fundamental elements of real-time multitasking embedded application software design and development. Processor and operating system concepts
- ➢ To provides a broad introduction to real time systems and their programming.
- ➢ To make the students to understand the fundamental problems, concepts, and approaches in the design and analysis of real-time systems
- ➢ To provides a broad introduction to real time systems and their programming.
- ➢ To make the students to understand the fundamental problems, concepts, and approaches in the design and analysis of real-time systems.
- ➢ To study issues related to the design and analysis of systems with real-time constraints.

COURSE OUTCOMES
- ➢ Program the Arduino microcontroller to make the circuits work
- ➢ Compare different scheduling algorithms and the schedulability criteria.
- ➢ Determine schedulability of a set of periodic tasks given a scheduling algorithm.
- ➢ Develop algorithms to decide the admission criterion of sporadic jobs
- ➢ To know the schedule of aperiodic jobs.
- ➢ Integrate resource access mechanisms with the scheduling techniques and develop integrated schedulibility criteria.
- ➢ Enumerate the need and the challenges in the design of hard and soft real time systems.

UNIT I - Introduction
Real-Time Computation – Structure of A Real-Time System – Task Classes – Performance Measures For Real-Time Systems – Estimating Program Run Times – Task Assignment and Scheduling – Classical UniProcessor Scheduling Algorithms – Uniprocessor Scheduling of IRIS Tasks – Task Assignment – Mode Changes – Fault Tolerant Scheduling

UNIT II - Real-Time Models
Event-Based, Process-Based and Graph-Based Models – Pertinent Models –Real-Time Languages – System Performance Analysis – Optimization of Time Loading and Memory Loading Models of Multiprocessor Systems and Distributed Systems – Task Assignment – End to End Tasks in Heterogeneous Systems – Temporal Distance Constraints – Resource Contention – Resource Access Control – Priority Ceiling – Multiple Unit Resource Access.

UNIT III - RTOS Concepts
Foreground and Background Process – Resources – Tasks–Multitasking – Priorities – Schedulers – Kernel – Exclusion – Inter-Task Communication – Interrupts – Clock Tick – Micro C/OS II Kernel Structure – Micro C/OS II Initialization – Starting Micro C/OS II

UNIT IV - RTOS Functions
Task Management – Time Management – Semaphore Management – Mutual Exclusion - Semaphore – Event Management – Message Management – Memory Management – Porting Micro C/OS II

UNIT V - Real-Time Kernel and RTOS Applications

Principles – Design Issues – Polled Loop Systems – RTOS Porting to a Target – Comparison and Study of QNX, Vx works and PSOS – RTOS for Image Processing – Embedded RTOS for VOIP – RTOS for Fault - Tolerant Applications .

SUGGESTED READINGS

1. Real-Time Systems, Krishna, and Kang Shin, McGraw Hill, Second Edition , 2013.
2. Real-Time Systems: Theory and Practice, Rajib Mall, Pearson Education, First Edition, 2009.
3. Real-Time Design and Analysis – An Engineer's Handbook, Philip Laplante, John Wiley Publications, 2003
4. Micro C/OS II - The Real-Time Kernel, Jean Labrosse, CMP Books, Second Edition, 2011.

17ECP111	ADVANCED ELECTRONIC CIRCUITS AND COMMUNICATION - PRACTICAL	Semester-I			
		L	T	P	C
		-	-	4	2

COURSE OBJECTIVES
- ➢ To identify and test various electronic components
- ➢ To use DSO for various measurements
- ➢ To plot the characteristics of diode and transistor
- ➢ To design and implement feedback amplifier circuits
- ➢ To measure the frequency of oscillators.
- ➢ To design and test regulated power supplies

COURSE OUTCOMES
- ➢ Verify the rectifier circuits using diodes and implement them using hardware
- ➢ Design the biasing circuits like self biasing
- ➢ Understand the construction, operation and characteristics of FET which can be used in the design of amplifiers
- ➢ Design simple circuits
- ➢ Know the benefits of feedback in amplifier
- ➢ Compare and classify oscillators.

(Any 10 Experiments)

1. Design of Double stage RC coupled amplifier
2. Design of Common Source FET Amplifier
3. Design of Feedback amplifier
4. Design of Wein bridge oscillator
5. Design of Phase shift oscillator
6. Design of Colpitts and Hartley oscillator
7. Design of Schmitt trigger
8. Design of AM Modulation
9. Design of FM Modulation
10. Design of PAM Modulation
11. Design of PPM Modulation
12. Design of PWM Modulation

17ECP112	EMBEDDED SYSTEMS - PRACTICAL	Semester-I			
		L	T	P	C
		-		4	2

COURSE OBJECTIVES
- ➢ Demonstrate the sensing of different physical parameters
- ➢ Explain the calibration of parameters measured and displayed
- ➢ Evaluate the data transfer
- ➢ To understand the need and applications of Microcontrollers and ARM Processors in embedded system.
- ➢ To understand architecture and features of typical Microcontroller
- ➢ To learn interfacing of real world input and output devices

COURSE OUTCOMES
- ➢ Define the arithmetical and logical assembly language for microcontroller
- ➢ Know the downloading procedure on hardware into flash ROM and show the testing data on defined port wish board
- ➢ Competent to evaluate the data transfer response
- ➢ Able to describe the microcontroller and ARM Processor Architecture and its Features
- ➢ Learn importance of microcontroller and ARM Processor in designing embedded applications
- ➢ Learn use of hardware and software tools.

(Any 10 Experiments)

1. LED interfacing
2. Data transfer program with parallel port and External Memory Interfacing
3. Key interfacing and Seven segment display interface
4. Stepper motor controller interface
5. Speed control of DC motor
6. PWM generation
7. Temperature monitoring and control
8. A/D converter interface
9. D/A converter
10. LCD interface
11. Bluetooth Interface
12. GSM/GPS interface

17ECP201	VHDL PROGRAMMING	Semester-II			
		L	T	P	C
		-	-	4	

COURSE OBJECTIVES
- ➢ To learn the basics of language elements.
- ➢ To provide a strong knowledge about the VHDL Modeling.
- ➢ To introduce a hardware description language (HDL) for the specification, simulation, synthesis
- ➢ Implementation of digital logic systems.
- ➢ Design practice sessions and implementing digital logic systems with commercial electronic design (EDA) tools
- ➢ To know the features of programming and simulation techniques.

COURSE OUTCOMES
- ➢ Building simulation module as per system specification for e.g. VHDL model for ASIC design
- ➢ Understanding types of design such as high level design, operative part design, control part design, memory design etc
- ➢ Functioning and specifying the tools used for design as per requirement
- ➢ Creation of code, verification, testing software
- ➢ Testing various examples on the system
- ➢ Understanding the synthesis and simulation process of code

UNIT I - Introduction and Basic Concepts of VHDL
History of VHDL – Capabilities of VHDL – Hardware Abstraction – Basic Terminology – Entity Declaration - Architecture Body Declaration – Basic Language Elements – Identifiers – Data Objects – Data Type Operators.

UNIT II - Behavioral Modeling Techniques of VHDL
Behavioral Modeling: Entity Declaration – Architecture Declaration – Process Statements Variable Assignment Statements – Signal Assignments Statements – Wait Statement – IF Statement – Case Statement – Null Statement – Loop Statement – Exit Statement – Next Statement – Assertion Statement – Report Statements – More On Signal Assignment Statement – Multiple Process – Postponed Process.

UNIT III - Data Flow Modeling Techniques of VHDL
Data Flow Style of Modeling: Concurrent Signal Assignment Statement versus Signal Assignment – Delta Delay Revisited – Multiple Drivers – Conditional Signal Assignment Statement – Selected Signal Assignment Statement – Unaffected Value – Block Statement - Concurrent Assertion Statement.

UNIT IV - Structural Modeling
Component Declaration – Component Instantiation – Resolving Signal Value – Examples – Half Adder – Full Adder – Four to One Multiplexers – Decoders and Encoders.

UNIT V - Advanced Features in VHDL
Generics – Configuration – Configuration Specification – Configuration Declaration – Default

Rules – Conversion Functions – Direct Instantiation – Incremental Binding – Sub Programs – Sub Program Overloading - Operator Overloading – Signatures.

SUGGESTED READINGS

1. A VHDL Primer, J. Bhasker, Pearson Education. Third Edition, 2015.
2. VHDL: Programming by Examples, Douglas.P.Perry,Mc Graw Hill Publications, Fourth Edition,2014.
3. HDL Programming VHDL and Verilog, Nazeih M. Botros, Wiley India Pvt. Ltd, First Edition, 2012
4. Introductory VHDL: From Simulation to Synthesis, Yalamanchili, 1st Edition, 2011.

17ECP202	ARM MICROCONTROLLER	Semester-II			
		L	**T**	**P**	**C**
		4	-	-	4

COURSE OBJECTIVES
- ➢ Demonstrate the sensing of different physical parameters
- ➢ Explain the calibration of parameters measured and displayed
- ➢ Evaluate the data transfer
- ➢ To understand the need and applications of Microcontrollers and ARM Processors in embedded system.
- ➢ To understand architecture and features of typical Microcontroller
- ➢ To learn interfacing of real world input and output devices

COURSE OUTCOMES
- ➢ Define the arithmetical and logical assembly language for microcontroller
- ➢ Know the downloading procedure on hardware into flash ROM and show the testing data on defined port wish board
- ➢ Able to describe the microcontroller and ARM Processor Architecture and its Features
- ➢ Learn importance of microcontroller and ARM Processor in designing embedded applications
- ➢ Learn use of hardware and software tools.
- ➢ Develop interfacing to real world devices.

UNIT I - Introduction to Embedded System and LPC 2148 ARM Controller
Definition of Embedded System – Features of Embedded System – Types of Embedded System - LPC 2148 ARM Controller – Block Diagram – Memory and On Chip Peripheral Devices – ARM 7 TDMI - S CPU Registers – Modes of Operation – PSW.

UNIT II - Embedded C basics, GPIO (Slow), Timer and Interrupts
Embedded C Basics – GPIO (Slow) Register Map - Pin Connect Block - 8 Bit LED'S – 8 Bit Switches – Buzzer – Relay – Stepper Motor Interfaces -Timer/Counter – Block Diagram – Register Map – Program for Time Delay and Counter Operation - Register Map – External Interrupts - Timer/Counter based Interrupt.

UNIT III - PWM, ADC, DAC and RTC
PWM Features – Block Diagram – Register Map – Program for Generating Single Ended PWM - ADC Feature – Block Diagram – Register Map – Program for ADC and Temperature Sensor LM 35 Interface - DAC Feature – Block Diagram – Register Map – Program for Generating Analog Output - RTC Feature – Block Diagram – Register Map – Program for displaying the Time in LCD Display.

UNIT IV - Serial and Parallel Communication
UART Feature – UART0 Block Diagram – Register Map – Transmission and Reception of Messages for PC – SSP Feature – Register Map.

UNIT V - I2C
Introduction to I2C – I2C Feature in LPC 2148 – Block Diagram – Register Map – I2C Master

Mode Operation – Interfacing I2C based I/O Expander PCF 8574 – Interfacing LED – 7 Segment Display – Interfacing I2C based EEPROM – Programs.

SUGGESTED READINGS

1. ARM Microcontroller Interfacing: Hardware and Software, Warwick A. Smith, Gazelle Books Services, Second Edition, 2010.
2. ARM Microcontroller, B. Shantha Kumar Naik, Sapna Books House, First Edition, 2013.

17ECP203	TELECOMMUNICATION SYSTEMS	Semester-II			
		L	T	P	C
		4	-	-	4

COURSE OBJECTIVES
- ➤ To learn the designing procedure and operation of circuits used for communication.
- ➤ To understand the basic concepts of AM, FM, and PM transmission and reception.
- ➤ To assess and evaluate different modulation and demodulation techniques.
- ➤ To evaluate the influence of noise on communications signals.
- ➤ To introduce students to various modulation and demodulation techniques of analog communication
- ➤ To analyze different parameters of analog communication techniques.

COURSE OUTCOMES
- ➤ Apply or a create suitable algorithm to solve a particular problem
- ➤ Understand and identify the fundamental concepts and various components of analog communication systems
- ➤ Explain signal to noise ratio, noise figure and noise temperature for single and cascaded stages in a communication system.
- ➤ Describe analog pulse modulation techniques and digital modulation technique
- ➤ Develop the ability to compare and contrast the strengths and weaknesses of various communication systems.
- ➤ Use of different modulation and demodulation techniques used in analog communication

UNIT I - **Overview of Telecommunication**
Introduction-History of Telecommunication-Telecommunication Network Internet - Classification of Data Network-Telecommunication Standards.

UNIT II - **Electronics for Telecommunication**
Introduction - Communication System Parameters - FDM – TDM - WDM. Transmission Media: Introduction – Fiber Optic Cables - Cabling Architecture.

UNIT III - Voice Communication
Introduction - Public Telephone Network - Telephone Types - Circuit – Out Going – Incoming Calls - Line Signaling – Intelligent Network Services - Business Telephone Systems.

UNIT IV - Wide Area Network and Broad Band Technologies
Introduction – Packet Switching Network - X.25 Frame Relay – SMDS – ISDN – SONET – ATM – POS – DTM - DSL – CM's - PON.

UNIT V - Network Management
Introduction - Policy Management - Evolution of Network Hardware and Software - Network Administration and Maintenance - Network Security Configuration Management – Telecommunication Management Network.

SUGGESTED READINGS

1. Introduction to Telecommunication, Gokhale, Delmar Publications, First Edition, 2011.
2. Telecommunication Switching, Traffic Networks, JE Flood, Pearson Education, Tenth Edition, 2011.
3. Telecommunication Switching Systems and Networks, Thiyagarajan Viswanath, Prentice Hall of India, Second Edition, 2010.

17ECP204	SIGNALS AND SYSTEMS	Semester-I			
		L	T	P	C
		4	-	-	4

COURSE OBJECTIVES
- ➢ To understand the process of convolution between signals and able to solve differential equation using Laplace transform techniques.
- ➢ To understand the intuitive meaning of frequency domain and the importance of analyzing and processing signals in the frequency domain.
- ➢ Able to compute the Fourier series or Fourier transform Z-transform
- ➢ To introduce students the concept and theory of signals and systems needed in electronics and telecommunication engineering fields
- ➢ Knowledge about basic signal and system modeling concept and definitions
- ➢ Knowledge about the application and use of mathematical transforms and state-variables in order to solve electrical engineering problems

COURSE OUTCOMES
- ➢ Understand about various types of signals and systems, classify them, analyze them and perform various operations.
- ➢ Understand the use of transform to analysis of signals and systems in continuous and discrete time domain
- ➢ Implement the concept and theory of signals and systems in electronics and communication field.
- ➢ Ability to have idea of signal and system analysis and its characterization in time and frequency domain
- ➢ Students can perform mathematical and graphical convolution of signals and systems.
- ➢ Compute the Fourier series or Fourier transform Z-transform

UNIT I - Signals and systems
        Introduction - CT and DT Signals – Transformation of the Independent Variable – CT and DT Systems – Basic System Properties. LTI System: - Introduction – DT LTI Systems – CT LTI Systems – Properties of LTI System.

UNIT II - Fourier series representation of Periodic signals
        Introduction – Fourier Series Representation of CT Periodic Signals – Properties of CT Fourier Series – Fourier Series Representation of DT Periodic Signals – Properties of DT Fourier Series – Fourier Series and LTI System – Filtering.

UNIT III - CT and DT Fourier Transform
        Introduction – Representation of Periodic Signals in Continues Time Fourier Transform – Fourier Transforms for Periodic Signals - Properties of the CT Fourier Transform – Convolution Property – Multiplication Property - Discrete Time Fourier Transform - Introduction – Representation of Periodic Signals in DT Fourier Transform – Fourier Transform for Period Signals – Properties of Discrete Time Fourier Transform - Convolution Property – Multiplication Property – Duality.

UNIT IV - Sampling

Introduction - Sampling Theorem – Reconstruction of a Signal From its Samples using Interpolation – Aliasing – DT Processing of a CT Signals – Sampling of DT Signals.

UNIT V - Laplace and Z transform

Introduction – Laplace Transform – Region of Convergence For LT – Inverse Laplace Transform – Properties of Laplace Transform - Z-Transform:- Introduction – Z-Transform – Region of Convergence for Z-Transform – Inverse Z–Transform – Properties of Z-Transform.

SUGGESTED READINGS
1. Signals and Systems, Alen V. Oppenheim Alan S. Wilsky and Hamid Nawab S, PHI, Second Edition, 2012.
2. Signals and Systems, Simon Haykin and Barry Van Veen,John Wiley & sons Inc.Second Edition,2012
3. Signals and Systems, Anand Kumar.A, PHI Learning Press, Third Edition, 2013.

17ECP205 A	HIGH PERFORMANCE COMMUNICATION NETWORKS	Semester-III			
		L	**T**	**P**	**C**
		4	**-**	**-**	**4**

COURSE OBJECTIVES
➢To develop a comprehensive understanding of multimedia networking.
➢To know the various types of Networks.
➢To provide strong knowledge in ultra wideband networks and other types of UWB.
➢To have knowledge on broadband networks, ATM networks and high performance networks.
➢Understand the overview of Communication Networks, Network Services and layered Architecture.
➢Understand the ATM and Wireless Networks.

COURSE OUTCOMES
➢ Know the communication networks principles and future networks.
➢ Know the network services and layered architectures.
➢ Explain the wireless networks, Internet and different protocols.
➢ Understand the circuit switched networks and ATM.
➢ Apply the concepts of Random Process to the design of Communication systems
➢ Gain knowledge in sampling and quantization

UNIT I - Introduction
Networking Principles - Digitalization Service and Layered Architecture - Traffic Characterization and QOS - Network Services - Network Elements - Network Monitoring - Network Control-Network Mechanisms - Network Element Management

UNIT II - Broadband Networks
Introduction – Multi-hop Wireless Broadband Networks-Mesh Networks - Importance of Routing Protocols - Routing Metrics - Packet Scheduling-Admission Control - Classification of Routing - Protocols - MANET Routing Protocols .

UNIT III - IP Networks
Technology Trends in IP Networks- Internet Protocol- IP Packet Communications in Mobile Communication Networks -TCP and VDP- Performance of TCP/IP Networks- Circuits Switched Networks- SONET-DWDM-DSL-Intelligent Network (IN) Scheme-Comparison with Conventional Systems -Merits of the IN Scheme -CATV.

UNIT IV - ATM Networks
Introduction to ATM- Reference Model - ATM Layer- ATM Adaptation Layer (AAL) - AAL1 - AAL2 - AAL3/4 - AAL5 -Traffic Classes - Traffic Management and Quality of Service - Traffic Descriptor - Traffic Shaping-ABR and Traffic Congestion -Network Management - Layer Management- ATM Signaling-ATM Addressing Format-Connection Establishment - IP/ATM Internetworking - IP Multicast over ATM

UNIT V - High Performance Networking With WIMAX and Ultra Wideband (WPAN)

Introduction - WIMAX Overview - Competing Technologies - Overview of The Physical Layer - PMP Mode - Mesh Mode -Multihop Relay Mode- Introduction- Time-Hopping Ultra wideband - Direct Sequence Ultra wideband – Multiband- Other Types Of UWB.

SUGGESTED READINGS

1. High Performance Communication Networks, Jean warland and Pravin Varaiya, , Morgan Kanffman Publishers, London, 2nd Edition ,2010.
2. ATM Networks, Sumit Kasera and Pankaj Sethi, Tata McGraw Hill Publications, Second Edition, 2006.

17ECP205 B	NANO ELECTRONICS	Semester-III			
		L	T	P	C
		4	-	-	4

COURSE OBJECTIVES
➢ To discuss about the latest technology on nano systems based Nanoelectronics.
➢ To know the various methods to fabricate and measure Nanoscale features.
➢ To identify the critical parameters that one must evaluate when considering any new Nanoelectronics device.
➢ Know the types of nanotechnology, atomic structure, molecular technology and• preparation of nano materials
➢ Understand the fundamentals of nano electronics and its properties.
➢ Know the Silicon MOSFET's, QTD and carbon nano tubes

COURSE OUTCOMES
➢ Understand the fundamentals of Nano Electronics and its properties.
➢ Gain the concepts of quantum theory.
➢ Understand the latest technology on nano systems based Nano electronics
➢ Identify the various methods to fabricate and measure Nanoscale features.
➢ Evaluate the critical parameters when considering any new Nano electronics device.
➢ Understand the applications of Nano Electronics

UNIT I - Introduction
        The Development of Microelectronics – The Region of Nanoelectronics - The Complexity Problem – The Challenge Initiated by Nanoelectronics. Basics of Nanoelectronics: Electromagnetic Fields and Photons – Quantization of Action, Charge, and Flux – Electrons Behaving as Waves – Electrons in Potential Wells – Diffusion Process.

UNIT II - Biochemical and Quantum-Mechanical Computers
        DNA Computer – Information Processing with Chemical Reactions – Nanomachines – Parallel Processing - Quantum Computers – Bit and Q bit – Coherence and Entanglement – Quantum Parallelism.

UNIT III - Parallel Architectures for Nanosystems
        Mono and Multiprocessor Systems – Some Considerations to Parallel Processing – Influence of Delay Time – Power Dissipation - Architecture for Processing in Nanosystems: Classic Systolic Arrays – Processor with Large Memory – Processor Array with SIMD and PIP Architectures.

UNIT IV - Soft Computing and Nanoelectronics
        Methods of Soft Computing – Fuzzy Systems – Evolutionary Algorithms – Connectionist Systems – Computationally Intelligent Systems – Characteristics of Neural Networks in Nanoelectronics - Local Processing – Distributed and Fault-Tolerant Storage – Self-Organization.

UNIT V - Nanosystems as Information Processing Machines
        Nanosystems as Functional Machines – Information Processing as Information Modification – System Design and its Interfaces – Requirements of Nanosystems - Uncertainties: Removal of

Uncertainties by Nanomachines – Uncertainties in Nanosystems – Uncertainties in the development of Nanoelectronics.

SUGGESTED READINGS

1. Basics of Nano Electronics, G. P. Singh, Animol Publications Pvt. Ltd., First Edition,2011
2. Nanoelectronics and Nanosystems: From Transistors to Molecular and Quantum devices, Karl Goser Springer, New Delhi, First Edition Reprint, 2013.

17ECP205 C	BIOMEDICAL INSTRUMENTATION	Semester-III			
		L	**T**	**P**	**C**
		4	**-**	**-**	**4**

COURSE OBJECTIVES

- ➢ To know the fundamental concept of origin of Bio-electric signals and recording it with highly precision equipment.
- ➢ To learn the various medical equipment used for diagnosis and therapeutic purpose.
- ➢ To provide a large number of quality trained Medical Electronics professionals for preventive and maintenance work needed to maintain hi-tech medical equipments in hospitals to ensure good health care.
- ➢ To explore the human body parameter measurements setups
- ➢ To give basic ideas about how multimedia evidences are useful in crime investigation.
- ➢ Understanding basic principles and phenomena in the area of medical diagnostic instrumentation, theoretical and practical preparation enabling students to maintain medical instrumentation.

COURSE OUTCOMES

- ➢ Understand the fundamental concept of origin of Bio-electric signals and recording it with highly precision equipment.
- ➢ Differentiate and analyze the biomedical signal sources.
- ➢ Identify common biomedical signals and distinguish characteristic features.
- ➢ Ability to study various transducers
- ➢ Identify common signal artifacts, their sources and formulate strategies for their suppression.
- ➢ Familiarize with patient safety issues related to biomedical instrumentation.

UNIT I - Human Body and Bio Sensors

The cell - Body Fluids - Musculoskeletal System - Respiratory System – Gastrointestinal System - Nerves System -Endocrine System - Circulatory system - The Body as a Control System-Electrodes for Biophysical Sensing - Medical Surface Electrodes - Micro Electrodes-Bioelectric amplifiers - Basic Amplifiers Configuration -Multiple Input Circuits Differential Amplifiers-Isolation Amplifiers.

UNIT II – Electrocardiography

The Heart as Potential Source - ECG waveform - Standard Lead System – Other ECG Signals - ECG Preamplifier - ECG Readout Devices ECG Machine Maintenance and Troubleshooting - Blood Pressure Measurements - Blood Flow Measurement Phonocardiography – Defibrillator Circuit - Pacemaker

UNIT III - Brain Function Measurement

Brain Scan - Electro Encephalograph - ECG Block Diagram - Preamplifier and ECG System Specifications

UNIT IV - Medical Laboratory Instruments

Blood - Blood Tests - Colorimeter - Flame photometer- Blood Cell Counter -PH/ Blood gas Analyzer - Chromatography - Hem Dialysis and Machine

UNIT V - Medical Ultra Sonography

   What is ultra sound -- Physics of Sound and Waves - Reflection - Refraction, Diffraction and Scattering - Diffuse Reflection and Scattering - Ultra Sound Transducers -Absorption and Attenuation of Ultrasound Energy - Scan Modes and Scanning Systems -Electronically Scan Phase Array Transducers.

SUGGESTED READINGS

1. Introduction to Biomedical Instrumentation, Mandeep Singh, PHI Learning Private Limited, 2010.
2. Electronics and Medicine and Biomedical Instrumentation, Nandini.K.Jog, Prentice Hall of India, Private Limited, 1st Edition, 2013
3. Biomedical Instrumentation and Measurements, Leslie Cromwell, Fred. J. Weibell, Erich A. P. Feiffer, Prentice Hall of India,2nd Edition,2010

		Semester-II			
17ECP211	**VLSI - PRACTICAL**	**L**	**T**	**P**	**C**
		-	**-**	**4**	**2**

COURSE OBJECTIVES
- ➢ Introduced digital integrated circuits
- ➢ Introduce CMOS devices and manufacturing technology.
- ➢ Introduce CMOS logic gates and their layout.
- ➢ Ability to find Propagation delay, noise margins, and power dissipation in the digital VLSI circuits.
- ➢ Ability to design Combinational (e.g., arithmetic) and sequential circuit.
- ➢ Ability to design Memory in VLSI circuits.

COURSE OUTCOMES
- ➢ Analyze the CMOS layout levels, how the design layers are used in the process sequence, and resulting device structures (i.e. cross-sectional views).
- ➢ Implement digital logic designs of various types (i.e. combinational logic, multiplexers).
- ➢ Analyze performance issues and the inherent trade-offs involved in system design (i.e. power vs. speed).
- ➢ Complete a moderately complex design project involved with data path operators, data registers, serial/parallel conversion, clocking/timing details and feedback.
- ➢ Identify the interactions between process parameters, device structures, circuit performance, and system design.

(Any 10 Experiments)
1. Design and implementation of logic gates
2. Design and implementation of half adder & full adder
3. Design and implementation of half Subtractor & full Subtractor
4. Design and implementation of Encoder & decoder
5. Design and implementation of 4 bit & 8 bit multiplexer
6. Design and implementation of flip flops
7. Design and implementation of up/down counters
8. Design and implementation of shift register
9. Design and implementation of ALU
10. Design and simulation of Programmable Logic Array
11. Design and simulation of Traffic light Controller
12. Design and simulation of Real time clock

17ECP212	ARM MICROCONTROLLER - PRACTICAL	Semester-II			
		L	T	P	C
		-	-	4	2

COURSE OBJECTIVES

➢ Demonstrate the sensing of different physical parameters
➢ Explain the calibration of parameters measured and displayed
➢ Evaluate the data transfer
➢ To understand the need and applications of Microcontrollers and ARM Processors in embedded system.
➢ To understand architecture and features of typical Microcontroller
➢ To learn interfacing of real world input and output devices

COURSE OUTCOMES

➢ Define the arithmetical and logical assembly language for microcontroller
➢ Know the downloading procedure on hardware into flash ROM and show the testing data on defined port wish board
➢ Able to describe the microcontroller and ARM Processor Architecture and its Features
➢ Learn importance of microcontroller and ARM Processor in designing embedded applications
➢ Learn use of hardware and software tools.
➢ Develop interfacing to real world devices.

(Any 10
Experiments)

1. LED Interfacing
2. LCD Interfacing.
3. Stepper Motor Interfacing.
4. PWM generation.
5. ADC interface.
6. DAC interface
7. Digital Clock
8. LCD Interfacing
9. A/D converter interface
10. Interfacing PWM
11. Interfacing serial port
12. I^2C Interface.

17ECP301	DIGITAL SIGNAL PROCESSING	Semester-III			
		L	T	P	C
		4		-	4

COURSE OBJECTIVES
- ➢ To understand the fundamental concepts and theory of Discrete Fourier Series and Discrete Fourier Transform.
- ➢ To get an exposure on Discrete Fourier Transforms (DFT), its applications and implementation by FFT techniques.
- ➢ To apply design technique for FIR type digital filters
- ➢ Understand fundamentals of Digital Signal Processing
- ➢ Analyze & compare different signal processing strategies.
- ➢ Become aware of some applications of DSP.

COURSE OUTCOMES
- ➢ Understand the fundamental concepts and theory of Discrete Fourier Series and Discrete Fourier Transform
- ➢ Ability to compute various transform analysis of Linear Time Invariant Systems.
- ➢ Implement problem solving strategies to DSP Problems.
- ➢ Able to test signal processing algorithms for various applications
- ➢ Ability to understand Various applications of DSP such as signal processing and telecommunication.
- ➢ Apply design techniques for FIR type digital filters

UNIT I - Structures For Discrete Time Systems
Introduction – Block Diagram and Signal Flow Graph Representation of Linear Co-Efficient Difference Equation – Basic Structures for IIR Systems – Basic Network Structures for FIR Systems – Lattice Structures – Zero Input Cycles in Fixed Point Realization of IIR Digital Filters.

UNIT II - Filter Design Techniques
Introduction – Design of Discrete Time IIR Filters from Continuous Time Filters – Frequency Transformation of Low Pass IIR Filters – Design of FIR Filters by Windowing - Comments on IIR and FIR Digital Filters.

UNIT III - Computation of Discrete Fourier Transform
Introduction – Efficient Computation of DFT – Decimation in Time FFT Algorithms – Decimation in Frequency Algorithms – Implementations of FFT Algorithms – FFT Algorithms for Composite N.

UNIT IV - TMS 320 C 6713 Overview
Introduction – TMS320C6713 Overview – Key Features – Architectural Overview – Functional Block Diagram - Internal Memory Organization – CALU – System Control – PLU – Interrupts – Addressing Modes – Instruction Set.

UNIT V - Introduction to MATLAB
Introduction To M-Files – Inline Functions – Control Flow – Relations & Logical Operators – Strings – Cell Arrays – Functions – MATLAB Graphics: - 2d Graphics – 3d Graphics – Animations.

SUGGESTED READINGS

1. Discrete Time Signal Processing, Oppenheim A.V and Schaffer RW, Buck .C, Prentice Hall India, Second Edition, 2013.
2. Digital Signal Processing – A computer Based Approach, Sanjith K.Mitra, McGraw Hill, Fourth Edition, 2013.
3. Digital Signal Processing, Nagoor Kani.A, Tata McGraw Hill Pvt Ltd, Second Edition, 2012.

17ECP302	DIGITAL IMAGE PROCESSING	Semester-III			
		L	T	P	C
		4		-	4

COURSE OBJECTIVES
➢ To get an exposure on Discrete Fourier Transforms (DFT), its applications and implementation by FFT techniques.
➢ To understand the fundamental concepts and theory of Discrete Fourier Series and Discrete Fourier Transform.
➢ To acquire the fundamental concepts of a digital image processing system
➢ To identify and exploit analogies between the mathematical tools.
➢ To design and implement with MATLAB algorithms for digital image process.
➢ Discuss techniques specific to 2D system

COURSE OUTCOMES
➢ Understand the need for image transforms different types of image transforms and their properties.
➢ Develop any image processing application.
➢ Learn different techniques employed for the enhancement of images.
➢ Learn different causes for image degradation and overview of image restoration techniques.
➢ Understand the need for image compression and to learn the spatial and frequency
➢ Apply design techniques for FIR type digital filters

UNIT I - Digital Image Fundamentals
Introduction to Elements of A Digital Image Processing System – Structure of the Human Eye – Image Formation and Contrast Sensitivity – Sampling and Quantization – Neighbors of Pixel – Distance Measure – Photographic Film Structure and Exposure – Film Characteristics – Image Processing Applications.

UNIT II - Image Transforms
Introduction to Fourier Transform – DFT – Properties of Two-Dimensional FT – Separability, Translation, Periodicity, Rotation, Average Value – FFT Algorithm – Walsh Transform – Hadamard Transform – Discrete Cosine Transform.

UNIT III - Image Enhancement
Definition – Spatial Domain Methods – Frequency Domain Methods – Histogram – Modification Techniques – Neighborhood Averaging – Median Filtering – Low Pass Filtering – Averaging of Multiple Images – Image Sharpening by Differentiation and High Pass Filtering.

UNIT IV - Image Encoding
Introduction to Image Encoding - Objective and Subjective Fidelity Criteria – Basic Encoding Process – Mapping – Quantizer – Coder – Encoding – Contour Encoding – Run Length Encoding - Image Encoding – Relative to Fidelity Criterion – Differential Pulse Code Modulation.

UNIT V - Application of Image Processing

Introduction to Image Classification – Image Recognition – Image Understanding – Image Fusion – Image Compression - Colour Image Processing.

SUGGESTED READINGS
1. Digital Image Processing, Rafael C. Gonzalez, Richard E Woods, Pearson Education, Third Edition, 2014.
2. Fundamentals of Digital Image Processing, Anil K.Jain, Pearson Education, Second Edition, 2010.
3. Digital Image Processing, S. Sridhar, Oxford University Press, First Edition, 2011

17ECP303	PROGRAMMABLE LOGIC CONTROLLER	Semester-III			
		L	T	P	C
		4		-	4

COURSE OBJECTIVES

- To identify logical process control in automation
- To connect PLC peripherals with PLC for logical functioning.
- To get strong knowledge in the developing of basic PLC programs
- To understand the components of a PLC system To understand how PLCs are used
- To understand the H&S requirements of a PLC- controlled system
- To understand different methods of interfacing with a PLC

COURSE OUTCOMES

- Identify the main parts of programmable logic controller
- Develop logic gate circuits for Boolean expressions
- Able to state basic PLC Terminology
- Identify logical process control, in automation.
- Describe how a programmable logic controller is programmed.
- Describe switching elements on input/output modules.
  .

UNIT I - Introduction to Programmable Logic Controller

PLC Evolution – Hardwire Control System Compared with PLC System - Advantages of PLC's – Criteria for Selection of Suitable PLC - Block Diagram of PLC – Principle of Operation – CPU – Memory Organization – I/O Modules – Input Types – Logic, Analog – Pulse Train – Expansion Modules – Power Supplies to PLC – Modular PLC's .

UNIT II - Input Modules

Discrete Input Module – AC Input Module – DC Input Module – Sinking and Sourcing – Sensor Input – Special Input Modules – Sensors – Limit Switch, Reed Switch, Photo Electric Sensor, and Inductive Proximity Sensor – Input Addressing Scheme in Important Commercial PLC's.
Output Modules Discrete Output Module – TTL Output Module – Relay Output – Isolated Output Module – Surge Suppression in Output – Analog Outputs – Open Collector Output.

UNIT III - PLC Programming

Symbols Used – Relays and Logic Functions – OR, AND, Comparator - Programming Devices – Programming Methods – STL and CSF, FBD and Ladder Methods – Simple Instructions – Programming NC and NO Contacts - EXAMINE ON and EXAMINE OFF Instructions - Online, Offline Methods – Latch and Unlatch Outputs – Pulse Edge Evaluation – Timer Instructions – ON Delay and OFF-Delay Timer-Counter Instructions – UP / DOWN Counters – Timer and Counter Applications- Program Control Instructions – Data Manipulating Instructions – Math Instructions - Converting Simple Relay Ladder Diagram into PLC Relay Ladder Diagram – PID and PWM Functions.

UNIT IV - Networking

Levels of Industrial Control – Types of Networking – Network Communications – Principles – Transmission Media – Field Bus – Introduction, Concepts, International Field Bus Standards – Networking with TCP / IP Protocol – Network Architecture – Physical Addressing – LAN Technologies – Ethernet – Token Ring – Sub-Netting – Subnet Mask – Transport Layer – Ports – Sockets Network Services – File Transfer Protocol.

UNIT V - Data Acquisition Systems

Computers in Process Control – Data Loggers – Data Acquisition Systems (DAS) – Alarms – Direct Digital Control (DDC) - Characteristics of Digital Data – Controller Software – Computer Process Interface for Data Acquisition and Control –Supervisory Digital Control (SCADA) - Introduction and Brief History of SCADA – SCADA Hardware and Software.

SUGGESTED READINGS

1. Introduction to Programmable Logic Controllers, Gary Dunning, Thomson Delmar Learning, Third Edition, 2007.
2. Programmable Logic Controllers: Principles and Applications, Webb John W , A, Prentice Hall of India, Fifth Edition, 2009

17ECP304	MOBILE COMPUTING	Semester-III			
		L	T	P	C
		4		-	4

COURSE OBJECTIVES
- To build knowledge on various Mobile Computing algorithms.
- To provide application skills in working with Wireless Application Protocols to develop mobile content applications.
- To explore the characteristics of different types of mobile networks on the performance of a pervasive computing system
- To develop applications that are mobile-device specific and demonstrate current practice in mobile computing
- To have knowledge in the comprehension and appreciation of the design and development of context-aware solutions for mobile devices.
- To enable students to compare and contrast multiple division techniques, mobile communication systems, and existing wireless networks.

COURSE OUTCOMES
- Understand fundamentals of wireless communications.
- Know the various terminology, principles, devices, schemes, concepts, algorithms and different methodologies used in Wireless Communication Networks.
- Analyze security, energy efficiency, mobility, scalability, and their unique characteristics in wireless networks.
- Demonstrate basic skills for cellular networks design.
- Apply knowledge of TCP/IP extensions for mobile and wireless networking.
- Analyze different parameters of wireless communication techniques

UNIT I -Wireless Communication
Introduction – Wireless transmission – Frequencies for radio transmission – Signals – Antennas – Signal Propagation – Multiplexing – Modulations – Cellular Wireless Networks.

UNIT II - Satellite Systems and Broadcast Systems
Introduction – Applications – Basics –Routing –Localization – Handover – Examples – Cyclic repetition of data - Digital audio broadcasting - Digital video broadcasting - Convergence of Broadcasting and mobile

UNIT III - Wireless LAN
Infrared vs. Radio Transmission - Infrastructure and Adhoc Network – IEEE 802.11 – HYPERLAN – Bluetooth.

UNIT IV - Mobile Network Layer
Mobile Network layer - Mobile IP – Dynamic Host Configuration Protocol – Mobile Adhoc Networks.

UNIT V - Mobile Transport Layer
Traditional TCP - Classical TCP Improvements – TCP over 2.5/3G Wireless Networks -3G NETWORKS: Introduction-Principles of WCDMA - UMTS Network Architecture and Protocols.

SUGGESTED READINGS

1. Mobile Computing, Hasan Ahmed , Roopa Yavagal , Asoke K, McGraw Hill Education (India) Private Limited, 2nd Edition, 2011
2. Mobile communications, Jochen Schiller, Pearson Education, New Delhi, Second Edition, 2008.
3. 3G Networks, Architecture, Protocols and Procedures, SumitKasera and NishitNarang, Tata McGraw Hill Professional networks Series, New Delhi, 2008.

17ECP305A	CRYPTOGRAPHY AND NETWORK SECURITY	Semester-III			
		L	**T**	**P**	**C**
		4		**-**	**4**

COURSE OBJECTIVES
- ➢ To describe and analyze existing authentication protocols.
- ➢ To analyze key agreement algorithms to identify their weakness
- ➢ To develop knowledge on system level security and misuse of computer security
- ➢ Acquire background on well known network security protocols
- ➢ Learn fundamentals of cryptography and its application to network security
- ➢ Acquire background on hash functions; authentication; firewalls; intrusion• detection techniques

COURSE OUTCOMES
- ➢ Understand various Cryptographic Techniques
- ➢ Apply various public key cryptography techniques
- ➢ Implement Hashing and Digital Signature techniques
- ➢ Understand the various Security Applications
- ➢ Implement system level security applications
- ➢ Understand network security threats, security services, and countermeasures

UNIT II - Public Key Cryptography
Key Management – Diffie-Hellman Key Exchange – Elliptic Curve Architecture and Cryptography - Introduction To Number Theory – Confidentiality Using Symmetric Encryption – Public Key Cryptography and RSA.

UNIT III - Authentication and Hash Function
Authentication Requirements – Authentication Functions – Message Authentication Code - Hash Functions – Security of Hash Functions and MAC's – MD5 Message Digest Algorithm - Secure Hash Algorithm – RIPEMD – HMAC Digital Signatures – Authentication Protocols.

UNIT IV - Network Security
Authentication Applications: Kerberos – X.509 Authentication Service – Electronic Mail Security – PGP – S/MIME - IP Security – Web Security.

UNIT V - System Level Security
Intrusion Detection – Password Management – Viruses and Related Threats – Virus Counter Measures – Firewall Design Principles – Trusted Systems.

SUGGESTED READINGS

1. Cryptography and Network Security – Principles and Practices, William Stallings, Pearson Education, Sixth Edition, 2013
2. Cryptography and Network Security, Behrouz A. Foruzan, Tata McGraw-Hill Publications, Second Edition, 2011.
3. Applied Cryptography, Bruce Schneier, John Wiley & Sons Inc, Second Edition, 2010.

17ECP305B	PRINCIPLES OF ROBOTICS	Semester-III			
		L	**T**	**P**	**C**
		4	-	-	4

COURSE OBJECTIVES
- ➢ To learn the basic configuration of Robotics
- ➢ To understand the various types of Robots.
- ➢ To get an exposure in Robot control systems
- ➢ To acquire the knowledge on advanced algebraic tools for the description of motion
- ➢ To develop the ability to analyze and design the motion for articulated systems.
- ➢ To develop an ability to use software tools for analysis and design of robotic systems

COURSE OUTCOMES
- ➢ Understand the relationship between mechanical structures of industrial robots and their operational workspace characteristics.
- ➢ Illustrate the kinematics and dynamics of robotics.
- ➢ Implementation of related instrumentation and control in robotics
- ➢ Ability to solve inverse kinematics of simple robot manipulators
- ➢ Able to do the path planning for a robotic system
- ➢ Identify a Robot for a specific application

UNIT I - Introduction and Terminologies

Definition-Classification- History - Robots Components - Degrees of Freedom-Robot Joints-Coordinates- Reference Frames-Workspace-Robot Languages-Actuators-Sensors- Position, Velocity and Acceleration Sensors-Torque Sensors-Tactile and Touch Sensors-Proximity and Range Sensors-Social Issues

UNIT II - Kinematics

Mechanism - Matrix Representation - Homogenous Transformation - Inverse Kinematics-Solution and Programming - Degeneracy and Dexterity

UNIT III - Differential Motion & Velocities

Jacobian - Differential Motion of Frames - Interpretation - Calculation of Jacobian - Inverse Jacobian – Design - Lagrangian Mechanics - Dynamic Equations - Static Force Analysis

UNIT IV - Robot Control System

Sensor Characteristics- Hydraulic, Pneumatic and Electric Actuators - Trajectory Planning-Decentralized PID Control - Non-Linear Decoupling Control

UNIT V - Image Processing & Vision Systems

Two and Three Dimensional Images - Spatial and Frequency Domain Representation - Noise and Edges - Convolution Masks - Processing Techniques – Thersholding - Noise Reduction - Edge Detection-Segmentation - Image Analysis and Object Recognition

SUGGESTED READINGS

1. Introduction to Robotics: Analysis, Control, Applications, Saeed B. Niku, Wiley India Pvt Ltd, Second Edition, 2012.
2. Introduction to Robotics Mechanics and Control, John J. Craig, Tata McGraw Hill Publishing Company Limited. Third Edition, 2008.
3. Industrial Robotics: Technology, Programming, and Applications, Mikell P Groover, Tata McGraw Hill Publishing Company Limited, Second Edition, 2012.

17ECP305C	MATLAB AND SIMULINK PROGRAMMING	Semester-III			
		L	T	P	C
		4	-	-	4

COURSE OBJECTIVES
- ➢ To introduce the MATLAB for numerical computations to know the basic concepts.
- ➢ To familiarize basic commands through the Command window and output through the Graph window
- ➢ Introduce the MATLAB software environment
- ➢ Apply a variety of common numeric techniques to solve and visualize engineering-related computational problems
- ➢ To program scripts and functions using the Matlab development environment.
- ➢ To use basic flow controls (if-else, for, while).

COURSE OUTCOMES
- ➢ Understand the concept of time response and frequency response of the system
- ➢ Use MATLAB effectively to analyze and visualize data
- ➢ Apply numeric techniques and computer simulations to solve engineering-related problems
- ➢ Apply a top-down, modular, and systematic approach to design, write, test, and debug sequential MATLAB programs to achieve computational objectives
- ➢ Design and document computer programs and analyses in a careful and complete manner so as to effectively communicate results,
- ➢ Demonstrate understanding and use of fundamental data structures (classes). 6. Create and control simple plot and user-interface graphics objects in MATLAB.

UNIT I

MATLAB Basics – Variables - Arrays - Multidimensional Sub Arrays - Special Values - Displaying Output Data-Data Files- Scalar and Array Operations - Hierarchy of Operations -Built-In MATLAB Functions- Introduction to Plotting- Debugging MATLAB Programs.

UNIT II

Branching Statements - Logical Data type - Vectorization.

UNIT III

User-Defined & I/O Functions-Introduction to MATLAB Functions- Variable Passing in MATLAB-Three Optional Arguments- Sharing Data Using Global Memory- Preserving Data Between Calls to a Function- Sub Functions-Private Functions-Nested Functions- Complex Data- String Functions-Text Read Function-Load And Save Commands- MATLAB File Processing-File Opening and Closing- Binary I/O Functions-Formatted I/O Functions- Comparing Formatted and Binary I/O Function- File Positioning and Status Functions.

UNIT IV

Handle Graphics & GUI - Graphics System-Object Handles-Examining and Changing Object Properties- User-Defined Data- Finding Objects- Selecting Objects -Object Properties-Graphical User Interface Components-Dialog Boxes- Menus.

UNIT V

Simulink Basics: Introduction-Simulink Modeling-Solvers- Simulating Model Using Variables from MATLAB-Data Import/Export - State – Space Modeling & Simulation- Creation of Subsystems-Mass Subsystem.

SUGGESTED READING

1. MATLAB programming for Engineers, Stephen J. Chapman, Cengage Learning Fourth Edition, 2014.
2. MATLAB & its Application in Engineering, Rajkumar Bansal, Ashokkumar Good, Manoj kumar Sharma, Person Education. First Edition, 2010.
3. MATLAB and Simulink – Introduction to Applications, Partha S.Mallick, Scitech Publications, Fourth Edition, 2011.

17ECP311	DIGITAL SIGNAL PROCESSING - PRACTICAL	Semester-III			
		L	T	P	C
		-	-	4	2

COURSE OBJECTIVES
- ➢ To implement Linear and Circular Convolution
- ➢ To implement FIR and IIR filters
- ➢ Familiar with the most important methods in DSP, including digital filter design, transform-domain processing and importance of Signal Processors.
- ➢ Aware about implications of the properties of systems and signals
- ➢ To design FIR filters and IIR Filters
- ➢ Analyze discrete-time filter banks and multi-rate signal processing system

COURSE OUTCOMES
- ➢ Analyze the CMOS layout levels, how the design layers are used in the process sequence, and
- ➢ Understand the handling of discrete/digital signals using MATLAB
- ➢ Understand the basic operations of Signal processing
- ➢ Analyze the spectral parameter of window functions
- ➢ Design IIR, and FIR filters for band pass, band stop, low pass and high pass filters
- ➢ Design the signal processing algorithm using MATLAB

(Any 10 Experiments)

USING TMS320C5X/TMS320C54XX/TMS320C67XX/MATLAB

1. Study of addressing Modes of DSP using simple examples
2. Arithmetic operations
3. DFT computations
4. FFT Computations
5. Convolution of two discrete signals
6. Correlation of two discrete signals
7. Quantization noise
8. Waveform generation
9. FIR Filter design
10. IIR filter design
11. Discrete Cosine Transform
12. Kalman filter

		Semester-III			
17ECP312	**DIGITAL IMAGE PROCESSING - PRACTICAL**	**L**	**T**	**P**	**C**
		-	**-**	**4**	**2**

COURSE OBJECTIVES
- ➢ To get an exposure on Discrete Fourier Transforms (DFT), its applications and implementation by FFT techniques.
- ➢ To understand the fundamental concepts and theory of Discrete Fourier Series and Discrete Fourier Transform.
- ➢ To acquire the fundamental concepts of a digital image processing system
- ➢ To identify and exploit analogies between the mathematical tools.
- ➢ To design and implement with MATLAB algorithms for digital image process.
- ➢ To treat the 2D systems as an extension of 1D system design
- ➢ Discuss techniques specific to 2D system

COURSE OUTCOMES
- ➢ Understand the need for image transforms different types of image transforms and their properties.
- ➢ Develop any image processing application.
- ➢ Learn different techniques employed for the enhancement of images.
- ➢ Learn different causes for image degradation and overview of image restoration techniques.
- ➢ Understand the need for image compression and to learn the spatial and frequency
- ➢ Apply design techniques for FIR type digital filters

(Any 10 Experiments)

1. Generation of Signals
2. Amplitude Modulation & FFT response
3. Image Sampling – Zooming & Shrinking Operations
4. Basic Gray Level Transformations: Image Negative, Power law and log transforms
5. 2-D Discrete Fourier Transform
6. Walsh Transform
7. Image Contrast Enhancement by Histogram Equalization Technique
8. Spatial Image Filtering: Low pass and high pass filtering
9. 2-D Wavelet Transform
10. Image Compression.
11. Segmentation using watershed transform
12. Edge detection using Operators

17ECP491	Project and Viva-voce	Semester-VI			
		L	T	P	C
		-	-	-	15

The students are expected to do project in one of the thrust areas of Electronics like Embedded Systems, VLSI, Power Electronics, and Communication Systems. The topic can be chosen in the concerned area in consultation with the guide. The work can be carried out either in the department itself, or in some reputed institutions of the country. The work must be related to leading research areas in Electronics. A detailed report of the work done and the results and analysis must be submitted to Head of the Department. The report should contain an introduction regarding the work, the importance and application of the work and the contribution of the student, in detail.

Those who are doing project outside the University must send report of the progress of the work at least once in a week by e-mail, to the guide. They have to report to the college physically at least once in a month and present the progress of the work. At the end of the semester, the student has to give a presentation (with the help of OHP or LCD projector) for 20 to 40 minutes in the department, in addition to the external viva voce.