Scheme & Syllabus of UG Engineering Program

Bachelor of Technology

(B.Tech.)

Electronics & Communication Engineering

2021-22

IPS ACADEMY

INSTITUTE OF ENGINEERING & SCIENCE, INDORE

(A UGC Autonomous Institute affiliated to RGPV)

IPS Academy, Institute of Engineering & Science

(A UGC Autonomous Institute, Affiliated to RGPV, Bhopal)

Scheme Based on AICTE Flexible Curriculum

Department of Electronics & Communication Engineering

Bachelor of Technology (B.Tech.) V Semester

S.No.	Subject Code	Category	Subject Name	Maximum Marks Allotted					Total Marks	Contact Hours per week			Total Credits
				Theory			Practical						
				End Sem.	Mid Sem. Exam	Quiz/ Assignment	End Sem	Term work: Lab Work & Sessional		L	T	P	
1.	PCC-EC501	PCC	Microprocessor & Microcontroller	70	20	10	30	20	150	3	0	2	4
2.	PCC-EC502	PCC	Digital Communication	70	20	10	30	20	150	3	0	2	4
3.	PCC-EC503	PCC	Digital Signal Processing	70	20	10	30	20	150	2	1	2	4
4.	PCC-EC504	PCC	CNTL Lab	-	-	-	30	20	50	0	0	2	1
5.	PEC-EC501	PEC	Professional Elective Courses-1	70	20	10	-	-	100	3	0	0	3
6.	OEC-EC501	OEC	Open Elective Course-1	70	20	10	-	-	100	3	0	0	3
7.	PCC-EC505	PCC	Electronics Workshop-III (IoT & Embedded System Design)	-	-	-	30	20	50	0	0	4	2
8.	PCC-EC506	PCC	Java Lab	-	-	-	30	20	50	0	0	2	1
			Total	350	100	50	180	120	800	14	1	14	22

Departmental Electives	Open Electives
PCE-EC501 (A) Electro Magnetic Theory & CNTL	OEC-EC501 (A) Foreign language (German/French)
PCE-EC501 (B) Information Theory and Coding	OEC-EC501 (B) Soft Skill & Interpersonal Communication
PCE-EC501 (C) Data Communication	OEC-EC501 (C) Business Communication
	OEC-EC501 (D) Stress Management

1 Hr Lecture	1 Hr Tutorial	2 Hr Practical
1 Credit	**1 Credit**	**1 Credit**

PCC-EC501	**Microprocessor & Microcontroller**	**3L: 0T: 2P (04 hrs.)**	**Credits: 04**

Prerequisite: - Digital electronics, basics of computer architecture, buses & instructions cycle.

Course Objective: The objective of this course is that students can learn fundamental architectural & programming concepts of basic processors like 8085, 8086 and 8051 microcontroller, their interfacing with peripherals to design real life applications.

MODULE I **(8 hrs.)**
Microprocessor & Microcontroller history, evolution, applications, 8 bit processor 8085 Architecture, Instruction set, Addressing modes, Interrupts, Timing Diagrams, Memory & I/O interfacing, Assembly Language Programming with 8085.

MODULE II **(8 hrs.)**
Introduction to 16/32 bit microprocessors (8086, 8088, 68000 etc.), Architecture of 8086, instruction set, Minimum and Maximum mode configurations, Assembly Language Programming with 8086.

MODULE III **(8 hrs.)**
Peripherals & Interfacing- RAM, ROM, Programmable Peripheral Interface (8255), Programmable Interval Timer (8253/54), Interrupt Controller (8259), DMA controller 8257, USART. Interfacing of 8/16 bit processor & designing of Applications using RS232, A/D, D/A converter, external memory, LCD, keyboard and stepper motor.

MODULE IV **(8 hrs.)**
Overview of architecture of microcontroller 8051, SFRs, instruction set of 8051, timers and counters, Interrupts, Serial communication in 8051.

MODULE V **(8 hrs.)**
Assembly language programming of 8051, 8051 Interfacing, Applications, ADC and DAC, Stepper motor interfacing, 8051 connections to RS-232, Study of Von Neumann v/s Harvard architecture, CISC and RISC instructions set architecture, serial peripheral buses (UART, I2C, SPI), Introduction to Real time systems.

List of Experiments:

1. Write a program to add/ subtract two 8 bit numbers in 8085 and check for carry/ burrow
2. Write a program using 8086 for division of a defined double word by another word and verify
3. To add two binary numbers each 8 byte long in 8086.
4. To find the maximum number in a given string (16 bytes long) and store it in location 0310 in 8086
5. To sort a string of 8 bit numbers in descending order in 8086
6. To multiply an ASCII string of eight numbers by a string ASCII digit. The result is a string of unpacked BCD digits.
7. Write an ALP in 8051 to add/subtract/multiply/divide two 8 bit no's available at register R0 & R1 of bank 0 and store the result in register R0/R1/R2/R3 of bank 1 and display the same on LED one by one.
8. Write an ALP in 8051 to transfer a block of data from one location (00H-07H) to another location (08H-0FH).
9. Write an ALP in 8051 to run timer 0, timer1 for 1 msec. & 5msec. to generate square wave on P 0.0 & P 0.1.
10. Write an ALP in 8051 to design pulse counter on 3.4 using counter 0 and give output on P2.
11. Write an ALP in 8051 to generate square wave on P1.2 using timer 0 interrupt and frequency can be controlled with input data on P2.
12. Write an ALP in 8051 to display IES IPS on 16*2 LCD.

Assessment: Internal viva, Continuous evolution of experiments, Journal write-up, Quiz and End semester exam.

Course Outcome: -
Students earning credits will develop ability to:

1. Understand architecture & programming of 8 bit microprocessors.
2. Understand architecture & programming of 16 bit microprocessors.
3. Design and analyze various peripheral interfacing required for microprocessor and microcontroller based circuits.
4. Understand architecture & programming of 8 bit microcontroller.
5. Design and analyze microprocessor based circuits.

Text/ Reference Book:

1. Rey Bhurchandi, "Advanced Microprocessor Architecture", 2nd edition, TMH, 2001.
2. Bray, "The Intel Microprocessors: Architecture, Programming and Interfacing", 2nd edition, PHI, 2003.
3. Soumitra Kumar Mandal, "Microprocessors And Microcontrollers Architecture, Programming & Interfacing Using 8085, 8086 And 8051", 1st edition, Mc Graw Hill India, 2011.
4. Muhammad Ali Mazidi, "The 8051 Microcontroller and Embedded Systems using Assembly and C", 2nd edition, Pearson, 2012.

PEC-EC501 (A)	**Electromagnetic Theory& CNTL**	**3L: 0T: 0P (03 hrs.)**	**Credits: 03**

Recommended Prerequisite: Engineering, Physics, and Mathematics.

Course Objective: The purpose of this subject is to cover the underlying concepts and techniques used in EMT & also how EM-waves travel in the medium. In this subject we discuss various principles, standards and modes for propagation of waves. Also fundamentals of transmission lines theory are studied in the subjects.

MODULE I **(8 hrs.)**
Transmission line fundamentals: Transmission line fundamentals: Voltage and current on a transmission line, infinite line, characteristic impedance and propagation constant, waveform distortion, attenuation and phase equalizers, reflection coefficient, standing wave ratio, open and short circuit lines. Smith chart and impedance matching using transmission lines.

MODULE II **(12 hrs.)**
Electromagnetism and Maxwell's Equations: Basic of vector calculus, Basics of electrostatics Gauss law, Boundary relations. Electric field in dielectric and conductor, continuity equation, methods of images. Basic laws of magnetostatics, Ampere's law, Boundary conditions, vector magnetic potential, magnetization vector and its relation to magnetic field. Development of Maxwell's Equation

MODULE III **(6 hrs.)**
Uniform plane waves: Wave equations and their solutions, wave polarization, Poynting vector, phase and group velocity, Plane electromagnetic waves in free space, dielectric medium and conducting medium, Skin depth.

MODULE IV **(6 hrs.)**
Waves at interface of different mediums: Waves propagation in lossy dielectrics, plane waves in lossless dielectrics, reflection of a plane wave at normal incidence, reflection of a plane wave at oblique incidence, Brewster's angle.

MODULE V **(8 hrs.)**
Radio wave propagation: Ground wave propagation- Introduction, plane earth reflection, space wave and surface wave, transition between surface and space wave, tilt of wave front due to ground losses. Space wave propagation- Introduction, field strength relation, effects of imperfect earth, curvature of earth and interference zone, shadowing effect of hills and buildings, absorption by atmospheric phenomena, variation of field strength with height, super refraction, scattering, tropospheric propagation, fading, path loss calculations. Sky wave propagation- Introduction, structural details of the ionosphere, wave propagation mechanism, refraction and reflection of sky waves by ionosphere, ray path, critical frequency, MUF, LUF, OF, virtual height, skip distance, relation between MUF and skip distance.

Assessment: Mid-term test, Assignment, Tutorial, Quiz and End semester exam.

Course outcome:

Students earning credits will develop ability to:

1. Analyze transmission line and find the line parameter at various points in different load conditions.
2. Apply various principles related to EM field to real life problems.
3. Analyze plane wave as solution to specific application and can find the effect of medium on wave propagation.
4. Analyze the EM wave propagation to real life mediums which can be classified as lossy and lossless mediums.
5. Understand the effects and parameters associated with different layers of atmosphere affecting the propagation of EM waves.

Text/Reference Books:

1. R. K. Shevgaonkar, "Electromagnetic waves", 2nd Edition, Tata McGraw Hill, 2001.
2. W. Hayt, "Engineering Electromagnetics", 4th Edition,Tata McGraw Hill, 1999.
3. David K. Cheng, "Field and Wave Electromagnetics", 2nd Edition, Pearson, 2003.
4. Matthew N.O. Sadiku, "Elements of Electromagnetics", 4th Edition, Oxford University Press, 2017.
5. B. Singh, H. Hiziroglu, "Electromagnetic field theory fundamentals", 2nd Edition, Oxford Press, 2005.
6. E. Jordan, K. G. Balman, "Electromagnetic waves and radiating system", 2nd Edition, Prentice Hall India, 2002.

PEC-EC501 (B)	**Information Theory and Coding**	**3L: 0T: 0P (03 hrs.)**	**Credits: 03**

Prerequisite: Mathematics, Digital communication and its applications, Probability Theory

Course objective: To make the students understand the fundamental concepts of information theory and coding, that provides quantitative measures of information and allows us to analyze and characterize the fundamental limits of communication systems.

MODULE I **(6 hrs.)**

Information Theory: Introduction to uncertainty, entropy and its properties, entropy of binary memory less source and its extension to discrete memory-less source, Measure of information, Information content of message, Average Information content of symbols. Self information, Mutual information and its properties.

MODULE II **(8 hrs.)**

Coding theorem: Source coding theorem, prefix coding, Shannon's Encoding Algorithm, Shannon Fano Encoding Algorithm, Huffman coding, Extended Huffman coding, Arithmetic Coding, Lempel-Ziv Coding, Run Length Encoding.

MODULE III **(8 hrs.)**

Information Channels: Communication Channels, Channel Models, Channel Matrix, Joint probability Matrix, Discrete memory less channels, Binary symmetric channel and its channel capacity, channel coding theorem, and its application to Binary Erasure Channel, Shannon's theorem on channel capacity, capacity of channel of infinite bandwidth, Continuous Channels.

MODULE IV **(12 hrs.)**

Error Control Coding: Introduction, Examples of Error control coding, methods of Controlling Errors, Types of Errors, types of Codes, Linear Block Codes: matrix description of Linear Block Codes, Error Detection and Error Correction Capabilities of Linear Block Codes, Probability of undetected error for linear block code in BSC, hamming Codes and their applications, Cyclic Codes: Cyclic codes and its basic properties, Encoding using an (n-k) Bit Shift register, Generator & parity check matrix of cyclic codes, encoding & decoding circuits, syndrome computation, error detection and correction.

MODULE V **(6 hrs.)**

Introduction to BCH codes, its encoding & decoding, error location & correction. Convolution Codes: Introduction to convolution codes, its construction, Convolution Encoder, Time domain approach, Transform domain approach, Code Tree, Trellis and State Diagram, Viterbi algorithm: Introduction of theorem for maximum likelihood decoding.

Assessment: Mid-term test, Assignment, Quiz and End semester exam.

Course outcome:

Students earning credits will develop ability to:

1. Acquire the knowledge in measurement of information and errors.
2. Know the application of coding theorem for efficient utilization of communication resources.
3. Understand the utilization of various communication channels for communication system.
4. Design the block and cyclic codes for error correction and detection in communication systems
5. Know the significance of source and channel codes in various applications.

Text/Reference Books:

1. Simon Haykin, “Communication Systems”, 4th edition, John Wiley and Sons, 2001.
2. Peterson W., “Error Correcting Codes”, 2th edition, MIT Press, 1991.
3. John G. Proakis, “Digital Communication”, 5th edition, TMH, 2016.
4. Ranjan Bose, “Information Theory, Coding and Cryptography”, 2th edition, TMH, 2008.
5. Singh and Sapre, “Communication Systems”, 2nd edition, TMH, 2007
6. A.Thomas, Thomas M. Cover, “Elements of information theory”, 2nd edition Wiley-Interscience, 2006.
7. S. Gravano, “Introduction to Error Control Codes” OUP Oxford, 2001

PEC-EC501 (C)	**Data Communication**	**3L: 0T: 0P (03 hrs.)**	**Credits: 03**

Prerequisite: - Communication System, Digital Communication

Course Objective: The course is designed to understand the basic technologies used in data communication like mode of communication, interfacing of devices, medium of communication and detection and correction of errors occurs during data transmission.

MODULE I **(8 hrs.)**
Introduction to data communication: Components, data representation, data flow and basic model, data representation, Serial & Parallel transmission, Modes of data transmission, Encoding: Unipolar, Polar, Bipolar line & block codes, Data compression, Frequency dependent codes, Run length encoding, Relative encoding, LZ Compression, Image and multimedia compression. Review of analog & digital transmission methods

MODULE II **(8 hrs.)**
Multiplexing: FDM, TDM, WDM, Synchronous & Statistical TDM, North American digital multiplexing hierarchy, European TDM, Spread spectrum: Frequency Hopping & Direct Sequence spread spectrum, terminal handling & polling. Switched Communication Networks: Circuit, Message, Packet & Hybrid Switching, Soft switch Architecture with their comparative study, X.25, ISDN, OFDM.

MODULE III **(8 hrs.)**
Physical Layer: Introduction, Interface, Standards, EIA-232-D, RJ-45, RJ-11, BNC connector & EIA-449 digital Interface: Connection, specifications & configuration, X.21 Modem: Types, features, signal constellation, block schematic, limited distance, dial up, baseband, line driver, Group Band and Null modems etc., ITU-T V-series modem standards Connecting Devices: Active and Passive Hubs, Repeaters, Bridges, Two & Three layer switches & Gateway. Study of various types of topology and their comparative study

MODULE IV **(8 hrs.)**
Transmission Media: Transmission line characteristics, Guided Media: Unguided media, Telephone Network, Digital Subscriber Line: ADSL, HDSL, SDSL, VDSL, and Cable TV network for data transfer.

MODULE V **(8 hrs.)**
Transmission Errors: Content Error, flow integrity error, methods of error control, Error detection, Error correction, Bit error rate, Error detection methods: Parity checking, Checksum Error Detection, Cyclic Redundancy Check, Hamming code, Interleaved codes, Block Parity, Convolution code, Hardware Implementation, Checksum.

Course Outcomes:

Students earned credits will develop ability to

1. Illustrate the different modes of data transmission, encoding techniques.
2. Illustrate the different types of multiplexing technique and switching techniques.
3. Illustrate the interfacing and connecting devices and standards used in communication.
4. Summarize the Different types of media of transmission and networks.
5. Analyze the problem of errors in communication and technique of error detection and corrections in transmission.

Text/Reference Books:

1. Behrouz A Forouzan, "Data communication and networking", 4th edition, McGrawHill Education, 2017.
2. Tanenbaum A. S., "Computer Networks", Pearson Education, 5th edition, 2011.
3. William Stallings, "Data & Computer Communication", Pearson Education, 8th edition, 2006.
4. Comer, "Internetworking with TCP/ IP Vol-1", Pearson education, 6th edition, 2015.

PCC-EC502	Digital Communication	3:0:2 (04 hrs.)	Credits: 04

Recommended Prerequisite: Engineering Mathematics, Electronics

Course Objective: To understand the key Modules of digital communication systems with emphasis on digital modulation techniques. To get introduced to the concept and basics of information theory and the basics of source and channel coding/decoding.

MODULE I **(8 hrs.)**
Cumulative distribution function, Probability density function, Mean, Variance and standard Deviations of random variable, Gaussian distribution, Error function, Correlation and Autocorrelation, Central-limit theorem, Error probability, Power Spectral density of digital data.

MODULE II **(8 hrs.)**
Sampling theorem, sampling of band pass signals, Pulse Amplitude Modulation (PAM), types of Sampling (natural, flat-top), equalization, signal reconstruction and reconstruction filters, aliasing and anti-aliasing filter, Pulse Width Modulation (PWM), Pulse Position Modulation (PPM).Quantization, quantization error, Pulse Code Modulation (PCM), commanding, scrambling, TDM-PCM, Differential PCM, Delta modulation, Adaptive Delta modulation, vocoders, bit rate & baud rate & bandwidth requirements, introduction to MIMO

MODULE III **(8 hrs.)**
Phase shift Keying (PSK)- Binary PSK, differential PSK, differentially encoded PSK, Quadrature PSK, M-arry PSK. Frequency Shift Keying (FSK)- Binary FSK (orthogonal and no orthogonal), M-arry FSK. Comparison of BPSK and BFSK, Quadrature Amplitude Shift Keying (QASK), Minimum Shift Keying (MSK), GMSK.

MODULE IV **(8 hrs.)**
Pulse shaping to reduce inter channel and inter symbol interference- Duobinary encoding, Nyquist criterion and partial response signaling, Quadrature Partial Response (QPR) encoder decoder. Regenerative Repeater, eye pattern, equalizers. Baseband signal receiver, probability of error, maximum likelihood detector, Bayes theorem, optimum receiver for both baseband and passband receiver- matched filter and correlates, probability of error calculation for BPSK and BFSK.

MODULE V **(8 hrs.)**
Introduction to information theory, uncertainty and information, average mutual Information and entropy, source coding theorem, Huffman coding, Shannon-Fano-Elias coding, Introduction, channel models, channel capacity, channel coding, Information Capacity theorem, Shannon limit.

Assessment: Mid-term test, Assignment, Tutorial, Quiz and End semester exam.

List of Experiments:

1. Study of Sampling Process and Signal Reconstruction and Aliasing.
2. Study of PAM, PPM and PDM.
3. Study of PCM Transmitter and Receiver.
4. Time Division Multiplexing (TDM) and Demultiplexing.
5. Study of ASK, PSK and FSK Transmitter and Receiver.

Assessment: Internal Viva, continuous evaluation of experiments, journal write up, Quiz and End semester exam.

Course Outcomes:

Students earning credits will develop ability to:

1. To know the basics of random variable and distribution functions in digital Communications
2. To understand how the signal is converted from analog to digital signals
3. To learn the digital modulation techniques
4. To know how the signal is received and demodulation techniques
5. To understand the information theory used for channel coding

Text/ Reference Books:

1. Taub and Schilling, “Principles of Communication Systems”, 2^{ed} Edition, TMH, 2007.
2. Lathi, “Modern Digital and Analog Communication Systems”, 4^{th} Edition, Oxford University Press, 2010.
3. Simon Haykins, “Communication Systems”, 5^{th} Edition, John Wiley, 2009.
4. Ranjan Bose, “Information TheoryCoding and Cryptography”, 2^{th} Edition, TMH, 2008.
5. Skylar and Ray, “Digital Communications”, 2th Edition, Pearson Education, 2001.
6. Rao, “Digital Communications”, 2^{th} Edition, TMH, 2017.

PCC-EC503	**Digital Signal Processing**	**2L: 1T: 2P (40 hrs.)**	**Credits: 04**

Recommended Prerequisite: Mathematics

Course Objective: The purpose of this subject is to make the students learn about theoretical basis of DSP, with the method of description of discrete and digital signals and systems in the domain-and transform domain, including discrete and Fast Fourier Transform and also learn the different DSP processor.

MODULE I **(10 hrs.)**
Discrete-time signals, discrete-time systems, the z-Transform, Analysis of linear time-invariant systems in the z- domain, Analysis of stability and causality in z domain, block diagrams and signal flow graph representation of digital network, matrix representation.

MODULE II **(9 hrs.)**
Discrete Fourier transform (DFT), properties of DFT, circular convolution. FFT, Efficient Computation of the DFT FFT algorithms, decimation in time algorithm, decimation in frequency algorithm, decomposition for N" composite number.

MODULE III **(8 hrs.)**
Digital filters Design Techniques Design of IIR and FIR digital filters, Butterworth, Chebyshev and Elliptic Approximations, impulse invariant and bilinear transformation, windowing techniques rectangular and other windows, examples of FIR filters, design using windowing.

MODULE IV **(6 hrs.)**
Fundamentals of DSP: Multiplier and Multiplier accumulator, Modified Bus Structures and Memory access in P-DSPs, Multiple access memory , Multi-ported memory , VLIW architecture, Pipelining , Special Addressing modes in P- DSPs , On chip Peripherals, Computational accuracy in DSP processor, Von Neumann and Harvard Architecture, MAC.

MODULE V **(7 hrs.)**
DSP Architecture, compare with other processor, architecture of TMS320C 5416/6713 /DSP56374 architecture, Bus Structure & memory, CPU, addresses modes.

Assessment: Mid-term test, Assignment, Tutorial, Quiz and End semester exam.

List of Experiments:

1. Write a MATLAB program for Addition, Subtraction, Multiplication & Division operation.
2. Generation, analysis and plots of discrete-time signals (Module impulse, Module step, Ramp).
3. Generation, analysis and plots of discrete-time signals (Sine, Cosine).
4. Implementation the scaling, shifting and folding operations on discrete time sequences.
5. Computation and plot of DFT of sequences.
6. Computation and plot of IDFT of sequences.
7. Computation and plots circular convolution of two sequences.
8. Compute the DFT & IDFT of sequences using FFT Algorithm.
9. Computation and plot poles and zeros of Z-transform.
10. IIR filter design using bilinear transformation

Assessment: Internal viva, Continuous evolution of experiments, Journal write-up, Quiz and End semester exam.

Course outcome:

Students earning credits will develop ability to:

1. Analyze and Implement the discrete time LTI system, Z-Transform to realize the digital network and evaluate ROC.
2. Compute DFT by using FFT algorithm to analyze the complex discrete sequence.
3. Design IIR and FIR filters and evaluate the performance of digital filters.
4. Understanding the fundamentals of DSP Processors.
5. Understanding the different architecture of DSP Processor.

Text/Reference Books:

1. Oppenheim and Schafer: Digital Signal Processing, PHI Learning.1975.
2. Proakis: Digital Signal Processing, Pearson Education.2009
3. Sanjay Sharma, “Digital Signal Processing” 5th Edition, S. K. Kataria & Sons. 2009.
4. Ingle and Proakis, “Digital Signal Processing- A MATLAB based Approach, Thompson, Cengage Learning.2012.
5. S .Salivahanan, “Digital signal processing”: Tata McGraw-Hill Education. 2011.

PCC-EC504	**Communication Networks and Transmission Lines Lab**	**0L: 0T: 2P (01hrs.)**	**Credits: 01**

Prerequisite: Engineering Mathematics, Electromagnetic theory.

Lab Objective: The main objective of CNTL lab is to understand the fundamentals of communication networks and their relation with transmission lines. Study of characteristic impedance, input impedance, attenuators, filters and various types of transmission lines using kits comes under laboratory practical of CNTL.

List of Experiments:

1. To measure the characteristic impedance of a transmission line.
2. To measure the input impedance of a transmission line.
3. To measure the Attenuation of a transmission line.
4. To measure the phase difference between the current and voltage at the input of a transmission line.
5. To draw frequency characteristic of a line.
6. To Study of stationary waves.
7. To plot phase shift along line.
8. To locate the fault within the transmission line.
9. To study transmission line under pulsed condition.

Experiments on virtual labs:

10. Observe the transient phenomenon of terminated coaxial transmission lines in order to study their time domain behavior.
11. Study the behavior of terminated coaxial transmission lines in frequency domain.
12. Introduction to Smith chart and its application for the unknown impedance measurement.
13. Find the change in characteristics impedance and reflection coefficients of the transmission line by changing the dielectric properties of materials embedded between two conductors.

Assessment: Internal viva, Continuous evolution of experiments, Journal write-up, Quiz and End semester exam.

Text/ Reference Books:

1. Umesh Sinha, "Transmission lines and networks", 2nd Edition, SatyaPrakashan, 2016.
2. B. R. Gupta, "Networks filters and transmission lines", 2nd Edition, S. K. Kataria Publication, 2001.
3. J. D. Ryder,"Networks, Lines and Fields", 2nd Edition, Prentice Hall of India, 2008.

PCC-EC505	**Electronics Workshop-III (IOT & Embedded System Design)**	**0L: 0T: 4P (hrs.)**	**Credits: 02**

Course Objective: The purpose of this lab is to learn, implement and simulation of various embedded system using different controllers.

List of Experiments:

1. Write a program in embedded c to blink LED on PORT1 of 8051.
2. Write a program in embedded c to transfer one byte of data on serial port of 8051.
3. Write a program in embedded c for 8051 to control motor speed using PWM.
4. Write a program in embedded c to blink LED on PORTA of pic16f877a.
5. Write a program in embedded c to transfer one byte of data on serial port of pic16f877a.
6. Write a program in embedded c for pic16f877a to control motor speed using PWM.
7. Write a program in embedded c to blink LED using AVR controller.
8. Write a program in embedded c to transfer one byte of data on serial port of AVR controller.
9. Write a program in embedded c for pic16f877a to control motor speed using AVR controller.
10. Write a program in embedded c to blink LED using ARM controller.
11. Write a program in embedded c to sense obstacle using Arduino UNO.
12. Write a program in embedded c to sense different type of gases using Arduino UNO.
13. Write a program in embedded c for Arduino UNO to control motor speed using PWM.

Assessment: Internal viva, Continuous evolution of experiments, Quiz and End semester exam.

Course outcome:

1. The students will be able to analyze the mathematical and physical foundations of embedded c programming on different controllers.
2. The students will be able to critically evaluate alternate assumptions, approaches, Procedures, tradeoffs, and results during embedded system design.
3. The students will be able to design variety of electronic circuits using embedded systems.
4. The students will be able to demonstrate their design and able to present views.
5. The students will be able to get skilled and deliver technical presentation.

PCC-EC506	Java Lab	0L: 0T: 2P (hrs.)	Credits: 01

Prerequisite: Computer Programming

Course Objectives:

1. Understand fundamentals of programming such as variables, conditional and iterative execution, methods, etc.
2. Understand fundamentals of object-oriented programming in Java and be familiar of the important concepts like class, inheritance and multithreading, AWT and JDBC.
3. Students will able to use the Java SDK environment to create, debug and run simple Java programs.

PRACTICALS

List of Experiments:

1. Write a program that accepts two numbers from the user and print their sum.
2. Write a program to calculate addition of two number using prototyping of methods.
3. Program to demonstrate function overloading for calculation of average.
4. Program to demonstrating overloaded constructor for calculating box volume.
5. Program to show the detail of students using concept of inheritance.
6. Program to demonstrate package concept.
7. Program to demonstrate implementation of an interface which contains two methods declaration square and cube.
8. Program to demonstrate exception handling in case of division by zero error.
9. Program to demonstrate multithreading.
10. Program to demonstrate JDBC concept using create a GUI based application for student information.
11. Program to display “Hello World” in web browser using applet.
12. Program to add user controls to applets.
13. Write a program to create an application using concept of swing.
14. Program to demonstrate student registration functionality using servlets with session management.

Course Outcomes:

On the completion of this course students will be able to understand:

1. Understand concepts of Java programming
2. The basic terminology used in computer programming and write, compile and debug programs in JAVA language.

3. Analyze different data types, decision structures, loops, functions to design Java programs.
4. Develop program using the java collection API as well as the java standard class library.
5. Develop Java applets