Walchand College of Engineering, Sangli

(Government Aided Autonomous Institute)

Course Contents (Syllabus) for

Second Year B. Tech.
(Electronics Engineering)
Sem – III to IV

AY 2020-21

Title of the Course: 5EN 202 Circuit Theory	L	T	P	Cr
	3	0	0	3

Pre-Requisite	Engineering Mathematics, Basic Electrical Engineering
Textbook:	1. Van Valkenburg, "Network Analysis", PHI publication, 3rd Edition, 1983. 2. Leonard S. Bobrow, " Fundamentals of Electrical Engineering, Oxford University Press, 1996
References:	1. L.P. Huelsman, "Basic Circuit Theory", PHI Publication, 3rd Edition, 2009. 2. C. K. Alexander, M. N. O. Sadiku, "Electrical Circuits", Tata McGraw-Hill, 2008. 3. Ravish R Singh, "Network Analysis and Synthesis", Tata McGraw-Hill, 2013
Course Objectives :	On completion of the course, students should be sufficiently familiar with the theoretical structure, formal representation, computational methods, notation, and vocabulary of linear models to be able to apply them to the analysis and design of digital and analog communications and control systems. The students will be able to perform signal analysis with reference to spectrum analysis of deterministic signals.

Course Learning Outcomes:

CO	After the completion of the course the student will be able to…..	**Bloom's Cognitive level**	**Descriptor**	**Assess ment Tool**
CO1	Work with basic fundamentals, theorems used in circuit's analysis	II	Understanding	ISE, MSE, ESE
CO2	Carry out transient and steady state analysis of different circuits	IV	Analyzing	
CO3	Do analysis and synthesis of circuit characteristics	V	Evaluating	
CO4	Design a circuit and network	VI	Creating	

Assessments :

Teacher Assessment:

Two components of In Semester Evaluation (ISE), One Mid Semester Examination (MSE) and one End Semester Examination (ESE) having 20%, 30% and 50% weights respectively.

Assessment	Marks
ISE 1	10
MSE	30
ISE 2	10
ESE	50

ISE 1 and ISE 2 are based on assignment/declared test/quiz/seminar etc.

MSE: Assessment is based on 50% of course content (Normally first three modules)

ESE: Assessment is based on 100% course content with 70-80% weightage for course content (normally last three modules) covered after MSE.

CO-PO Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	1	1												
CO2		1	2											
CO3		1		2									3	
CO4			1	2									3	

Course Contents:

1	**Module 1: Network Analysis**	**8 hrs**
	Review of fundamentals of circuit components ,complex numbers and phasors in circuits, applications to networks, graphs and trees, node and mesh analysis, matrix representations dual and inverse networks, admittance and impedance, state variable analysis, T-II transformations, bridged-T and lattice networks, Network Theorems: Superposition, Millman, Norton, Thevenin, Maximum power transfer, AC and DC analysis	
2	**Module 2: Transient Response of Circuits**	**8 hrs**
	RL and RC circuits, switching conditions, RLC circuits, Review of Laplace transform, important theorems and properties, application analysis of circuits in time domain, transfer function, Initial Conditions and Solutions to networks	
3	**Module 3: Sinusoidal Steady State Analysis**	**6 hrs.**
	The Sinusoidal Forcing Function, Phasor Concept, Average and Effective values of Voltage and Current, Instantaneous and Average Power, Complex Power, Steady State Analysis Using Mesh and Nodal Analysis, Application of Network Theorems to AC Circuits	
4	**Module 4: Resonance and Magnetically Coupled Circuits**	**6 hrs.**
	Series resonance, impedance and phase angle of series resonant circuit, voltage and current in series resonant circuit, effect of resistance on frequency response curve, bandwidth, selectivity and quality factor. Parallel resonance, resonant frequency for tank circuit, and variation of impedance with frequency factor of parallel resonant circuit, reactance curves. Magnetic coupled circuits: Mutual inductance, coefficient of coupling, single tuned and double tuned circuits	
5	**Module 5: Two Port Networks**	**8 hrs.**
	Open and short circuit parameters, transmission parameters, hybrid parameters, matrix form of input output relations, interaction of two four terminal networks, unsymmetrical networks, propagation functions, lattice networks, balanced and unbalanced networks, bisection theorem	
6	**Module 6: Network Functions**	**6 hrs.**
	Concept of complex frequency network functions for one port and two port network, poles and zeros of network functions, restrictions on poles and zeros location for driving point function and transfer function. Time domain behavior from poles and zero plot, stability of active network, Characteristics of RLC and LC high pass, low pass, band pass and band stop filter.	

Module wise Measurable Students Learning Outcomes	1. Apply circuit theorems to D.C. & A. C. Circuits. 2. Compute transient response of first order and second order systems. 3. Carry out steady state analysis of AC Circuits. 4. Carry out analysis of resonant and magnetically coupled circuits. 5. Determine parameters of two port electrical network. 6. Analyze the behavior of different types systems and filters.
Tutorial	The tutorials consist of Quiz, Tests, Assignments in addition to a mini project work based on circuit theory.

Title of the Course: 5EN203 **Digital Electronics**	L	T	P	Cr
	3	0	0	3

Pre-Requisite Courses: Engineering Physics

Textbooks:

1. John F. Wakerly, *"Digital Design",* Pearson Education Publication, 4th edition, 2008.
2. Anand Kumar, "*Fundamentals of Digital Circuits*", PHI, 2ndEdition, 2009.
3. MandalS.K , "*Digital Electronics*" 1stEdiction.Mc-Graw-Hill, 2009.
4. Douglas Perry , *"VHDL-Programming by Example"* TMH, 4th Edition, 2002.

References:

1. R..P.Jain, "*Modern Digital Design",* Mc-Graw-Hill, 4th edition, 2010.
2. Morris Manno, "Digital Logic and Computer Design", Prentice-Hall India, 4th edition, 2014.

Course Objectives :

1. To develop the fundamental concepts in digital design.
2. To make differences between combinational and sequential circuits evident to students.
3. To motivate students learn implementation of digital circuits using HDL and PLD.
4. To teach students to develop digital design using VHDL code.

Course Learning Outcomes:

CO	**After the completion of the course the student should be able to**	Bloom's Cognitive	
		Level	Descriptor
CO1	**Conversion** of number system and arithmetic operations	II	Understanding
CO2	**Design** combinational and sequential digital circuits	III	Applying
CO3	**Analysis** the sequential circuits using state diagram	IV	Analyzing
CO4	**Classify** PAL, PLA, PLD and their architecture	VI	Evaluating

CO-PO Mapping :

PO	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**PSO1**	**PSO2**
CO1	1	1												
CO2		1	1	2										2
CO3			1	2										2
CO4	2	2												

Assessments :

Teacher Assessment:

Two components of In Semester Evaluation (ISE), One Mid Semester Examination (MSE) and one End Semester Examination (ESE) having 20%, 30% and 50% weights respectively.

Assessment	Marks

ISE 1	10
MSE	30
ISE 2	10
ESE	50

ISE 1 and ISE 2 are based on assignment/declared test/quiz/seminar etc.

MSE: Assessment is based on 50% of course content (Normally first three modules)

ESE: Assessment is based on 100% course content with 70-80% weightage for course content (normally last three modules) covered after MSE.

Course Contents:

Module 1: Number system	**Hrs.**
Introduction, Revise of Decimal, Binary, Octal & Hex number system. Interconversion of number system, Arithmetic operations, Addition, Subtraction on binary, Octal, Hex, BCD numbers. Review of logic gates, NAND/NOR as universal gates, tri-state logic, Review of Boolean algebra, converting AOI to NAND/NOR	**8**
Module 2: Combinational Circuit	**Hrs.**
Review of Digital circuits, algebraic minimization (min-terms, max- terms), K-map minimization, Realization using gates, Quine: Mc-cluskey method for logic minimization, Designs using MUX and Demux, Priority Encoder, Priority decoder, Parity Generator and Checker, Carry look ahead adder, ALU , tristate buffers, Shifter, Static and Dynamic timing Hazards,. Hazard removal, Code converter	**8**
Module 3: Sequential Circuits	**Hrs.**
Latches & Flip Flop (S-R Latch, D Latch, D FF, J-K FF, T FF, Conversion of any FF to any other FF, Switch Denouncing, Synchronous Counters, Mod-N Counter,	**7**
Module 4 :Shift Registers & parameters	**Hrs.**
Shift register, SISO, SIPO, PISO, PIPO, Bidirectional shift resistor, universal shift register, Johnson counter, universal shift resistor, Ring Counter. twisted ring counters, Setup time, hold time, timing parameters of flip flop Clock Skew, Clock jitter, Meta stability	**7**
Module 5: State Diagram	**Hrs.**
Mealy and Moore machines, State diagram, State assignment, Clocked Synchronous State Machines Design using J-K, D, T FF (sequence detector, counters, priority resolver) , decoding counter state , ASM Chart **Logic Families** TTL,CMOS, and their characteristics,	**6**
Module 6 :PLD	**Hrs.**
Programmable Logic Devices, Design Using PLA & PAL, CPLD architectures, Generic, Xilnx & Altera family	**3**

Module wise Measurable Students Learning Outcomes :

After the completion of the course the student should be able to:

1. Perform the arithmetic operations, convert the numbers

2. Design the Combinational circuits and analyze the operations
3. Design sequential circuits and analyze the operations
4. Know the various parameters and operations of other sequential circuits
5. Design sequential circuits with state diagram and state table using FSM methodology.
6. Illustrate the application of PLDs (PLA and CPLD) in designing digital circuits

Title of the Course: 5EN 201 Electronics Circuit Analysis and Design-I	L	T	P	Cr
	3	0	0	3

Pre-Requisite Courses: Engineering Physics

Textbooks:

1. D. A. Neaman, "*Electronic Circuit Design and Analysis*", McGraw Hill Education (India) Private Limited, New Delhi, 3rd Edition, 2007.
2. A. S. Sedra and K. C. Smith, "*Microelectronic Circuits*", Oxford University Press, 5th Edition, 2004.
3. Allen Mottershed , "*Electronic Devices and Cir*cuits", PHI, 2nd Edition, 1979.

References:

1. R. Boylestad and L. Nashelsky, "*Electronic Devices and Circuit Theory*", PHI, 9th Edition, 2009.
2. Millman and Halkias, "*Electronic devices and Circuits*", Tata McGraw Hill, 1st Edition, 1991.
3. Gerald E. Williams, "*Practical Transistor Circuit Design and Analysis*", Tata McGraw Hill, New Delhi, 1st Edition, 1973.

Course Objectives :

1. To **explain** the working of electronic circuits: rectifiers, Zener diode voltage regulator, amplifiers using BJT and MOSFETs and feedback amplifiers.
2. To **illustrate** the small signal models used for analysis of electronic circuits.
3. To **illustrate** the methods of designing the electronic circuits using discrete components.

Course Learning Outcomes:

COs	After the completion of the course the student should be able to	Bloom's Cognitive	
		Level	Descriptor
CO1	**Analyze** the performance of diode circuits.	IV	Analyzing
CO2	**Analyze** the performance of electronic circuits (amplifiers) using small signal models such as hybrid-π, r_e and h-parameter model.	IV	Analyzing
CO3	**Evaluate** the performance of feedback amplifiers, oscillators and power amplifiers.	V	Evaluating
CO4	**Design** the electronic circuits (amplifiers) for given specifications using discrete components such as BJT, FET and MOSFET.	VI	Creating

CO-PO Mapping :

POs	1	2	3	4	5	6	7	8	9	10	11	12	PSO1	PSO2
CO1	2	3												
CO2	2	3												
CO3		3	3											

CO4			3											2

3-H, 2-M, 1-L

Assessments :

Teacher Assessment:

Two components of In Semester Evaluation (ISE), One Mid Semester Examination (MSE) and one End Semester Examination (ESE) having 20%, 30% and 50% weights respectively.

Assessment	Marks
ISE 1	10
MSE	30
ISE 2	10
ESE	50

ISE 1 and ISE 2 are based on assignment/declared test/quiz/seminar etc.

MSE: Assessment is based on 50% of course content (Normally first three modules)

ESE: Assessment is based on 100% course content with60-70% weightage for course content (normally last three modules) covered after MSE.

Course Contents:

Module 1: Semiconductor Diode and its Applications	**4 Hrs.**
Types of diode, diode circuits: half-wave and full-wave rectifier, clippers and clampers; Zener diode voltage regulator.	
Module 2: BJT Amplifiers	**8 Hrs.**
BJTs and its biasing methods considering stability factor; Basic BJT amplifier: DC and AC load line analysis, small signal hybrid-π model: analysis of common emitter (CE), common collector (emitter follower) amplifier and common base (CB) amplifier.	
Module 3: JFET Amplifiers	**5 Hrs.**
JFET (Junction Field Effect Transistor): operation, characteristics, biasing methods for JFET: self bias, voltage divider bias; small signal equivalent circuit, JFET common source amplifier, JFET common drain amplifier.	
Module 4: MOSFET Amplifiers	**8 Hrs.**
Two terminal MOS structure, enhancement-mode MOSFET, ideal current-voltage characteristics, biasing in MOSFET amplifiers, small-signal equivalent circuit, common source (CS) amplifier, common drain (source follower) amplifier and common gate configuration; MOSFET as a switch.	
Module 5: Feedback Amplifiers and Oscillators	**9 Hrs.**

Multistage amplifiers, Darlington pair, general feedback structure, amplifiers with negative feedback, properties of negative feedback, four basic feedback topologies; Oscillators: basic principle of oscillation, Phase-Shift oscillator; frequency response of amplifiers.	
Module 6: Power Amplifiers	**6 Hrs.**
Classification of power amplifiers: class-A, class-B, class-AB, class-C power amplifiers; transformer-coupled amplifiers, class-AB push-pull complementary output stage.	

Module wise Measurable Students Learning Outcomes :

1. **Examine** the performance of diode circuits.
2. **Apply** the small signal models (tools) to **compare** the performance of voltage and current amplifiers built using BJT.
3. **Illustrate** the performance of JFET amplifiers in terms voltage gain.
4. **Analyze** and **design** MOSFET amplifiers.
5. **Analyze** the performance of feedback amplifiers and **design** a two-stage amplifier with feedback.
6. **Evaluate** the performance of power amplifiers in terms of efficiency and harmonic distortion.

S.Y. Electronics Engineering				
Title of the Course:5EN204 Data Structure and Algorithm	**L- 3**	**T-**	**P-**	**Cr- 3**

Pre-Requisite Courses:	Programming basics, C programming
Textbook:	1. *"C The Programming language",* Kernigham & Ritchie 2. *"Object Oriented Programming",* Lafore, Tata McGraw-Hill 3. *"Fundamentals of Data structures in C++",* S.Sahni and D.Mehta, Galgotia Book Source
References:	1. *"Data structures via C++"*, A. Michael Berman, Oxford University Press, 2002 2. *"Data Structures and Algorithm Analysis in C++"* M.Weiss, Pearson Education, 2002.
Course Objectives :	The important objectives are: • An ability to describe basic concepts of Data structures • To apply knowledge of engineering, information technology, mathematics, and science • An ability to design a system or component, or process to meet stated specifications • An ability to identify, formulate and solve engineering problems

Course Learning Outcomes:

CO	After the completion of the course the student should be able to	Bloom's Cognitive	
		Level	Descriptor
CO 1	**Discuss** the basic concept of data structure	2	Understanding
CO 2	**Illustrate** programming skills with various data structures	3	Applying
CO 3	**Apply** the knowledge in applications like RDBMS, Network data models, Hierarchical data model	3	Applying

CO-PO Mapping :

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO 11	PO 12	PS O1	PS O2
CO1	**1**	**1**												**1**
CO2	**2**				2									**2**
CO3	**3**	**1**			2									**2**

Assessments	Two components of In Semester Evaluation (ISE), One Mid Semester Examination (MSE) and one End Semester Examination (ESE) having 20%, 30% and 50% weights

	respectively. Assessment / Marks: ISE 1 – 10; MSE – 30; ISE 2 – 10; ESE – 50

Assessment	Marks
ISE 1	10
MSE	30
ISE 2	10
ESE	50

ISE 1 and ISE 2 are based on assignment/declared test/quiz/seminar etc.

MSE: Assessment is based on 50% of course content (Normally first three modules)

ESE: Assessment is based on 100% course content with 60-70% weightage for course con last three modules) covered after MSE.

Course Contents:		
	Module 1 Introduction Basic Concepts: Algorithm, Pseudo code, ADT, Data Structure, Algorithmic Efficiency Recursion: Direct and Indirect recursion, analysis of recursive functions e.g. Towers of Hanoi, etc.	6 Hrs
	Module 2 Linked Lists Concept of linked organization, Singly linked list, doubly linked list and dynamic storage management, circular linked list, Operations such as insertion, deletion, inversion, concatenation, computation of length, traversal on linked list, Representation and manipulations of polynomials using linked lists	7 Hrs
	Module 3 Stacks and Queues Fundamentals stack and queue as ADT, Representation and Implementation of stack and queue using sequential and linked organization, Circular queue: representation and implementation, Application of stack for expression evaluation and for expression conversion, Backtracking, Stacks and Recursion, Priority queue Doubly Ended Queue	7 Hrs
	Module 4 Trees & Graphs Tree: Basic terminology, binary trees and its representation, binary tree traversals (recursive and non-recursive), operations such as copy, equal on binary tree, expression trees, General Trees, Binary Search Trees, Heaps and its operations, Introduction to Multiway Trees Graphs : Terminology and Representation of graphs using adjacency matrix,	8 Hrs

	adjacency list and adjacency Multilist, Traversals Depth First and Breadth First, Minimum Spanning Tree	
	Module 5 Searching & Sorting Search: Importance of searching, Sequential, Binary, Fibonacci search algorithms Sorting: Internal and External Sorts, Insertion, Shell, Heap, Quick sort, Merge sort, Radix sort, Two-way merge sort	6 Hrs
	Module 6 Hashing and Indexing Technique Hashing: Hashing functions, overflow handling with and without chaining, open addressing: linear, quadratic, double, rehashing Files and Indexes: Indexing Techniques: hashed indexes, Tree indexing - B-trees (concept only implementation not expected), File Organizations: Sequential, Random and Linked organizations, Storage Management	6 Hrs

Module wise Measurable Students Learning Outcomes:

After the completion of the course the student should be able to:

Module 1

Discuss Basic Concepts of Algorithm, Pseudo code, ADT, Data Structure, Algorithmic Efficiency Recursion etc.

Module 2

Illustrate singly linked list, doubly linked list and dynamic storage management, circular linked list etc.

Module 3

Illustrate Representation and Implementation of stack and queue using sequential and linked organization

Module 4

Examine use of Trees and Graphs

Module 5

Examine application of Searching and Sorting

Module 6

Illustrate use of Hashing and Indexing Techniques.

Title of the Course: 5EN205 Sensors and actuators	L	T	P	Cr
	2	0	0	2

Pre-Requisite Courses:

Textbooks:

1. Clarence W. de Silva, Sensors and Actuators: Control System Instrumentation, CRC Press 2007.
2. Patranabis D.," **Sensor and Actuators**", Prentice Hall of India (Pvt) Ltd., 2005

References:

1. Pawlak, Andrzej M.,Sensors and actuators in mechatronics : design and applications, CRC Press, Taylor & Francis Group, 2007.
2. Renganathan S.," **Transducer Engineering**", Allied Publishers (P) Ltd., 2003

Course Objectives : Students will able to

1. Understand the required sensor and actuator criteria for a mechatronic system.
2. Understand the operation of commonly employed sensors and actuators.
3. Analyze and select the most appropriate sensors or actuator for an application.
4. Construct the appropriate interface circuits for the sensors and actuators.

Course Learning Outcomes:

CO	After the completion of the course the student should be able to	Bloom's Cognitive	
		level	Descriptor
CO1	Explain fundamental physical and technical base of sensors and actuators,	II	**Understanding**
CO2	Identify the acquired data and measured results,	III	**Applying**
CO3	Analyse the required sensors and actuators for their design	VI	**Analyzing**

CO-PO Mapping :

PO	1	2	3	4	5	6	7	8	9	10	11	12
CO1		3										
CO2			3									
CO3				3								

Assessments :

Teacher Assessment:

Two components of In Semester Evaluation (ISE), One Mid Semester Examination (MSE) and one End Semester Examination (ESE) having 20%, 30% and 50% weights respectively.

Assessment	Marks

ISE 1	10
MSE	30
ISE 2	10
ESE	50

ISE 1 and ISE 2 are based on assignment/declared test/quiz/seminar etc.

MSE: Assessment is based on 50% of course content (Normally first three modules)

ESE: Assessment is based on 100% course content with 70-80% weightage for course content (normally last three modules) covered after MSE.

Course Contents:

Module 1: Instrumentation of an Engineering System	**Hrs.**
Instrumentation of an Engineering System: Role of Sensors and Actuators, Human Sensory System, Mechatronic Engineering, Control System Architectures , Instrumentation Process Component Interconnection and Signal Conditioning: Signal Modification and Conditioning, Impedance Matching Methods, Data Acquisition Hardware, Bridge Circuits, Linearizing Devices, Signal-Modification Hardware	**4**
Module 2: Performance Specification and Instrument Rating Parameters	**Hrs.**
Performance Specification, Time-Domain Specifications, Frequency-Domain Specifications, Linearity, Instrument Ratings, Bandwidth Analysis, Aliasing Distortion Due to Signal Sampling, Instrument Error Considerations, Estimation from Measurements, Sensing and Estimation, Least-Squares Estimation, Maximum Likelihood Estimation, Scalar Static Kalman Filter., Linear Multivariable Dynamic Kalman Filter, Kalman Filter	**4**
Module 3: Analog Sensors and Transducers	**Hrs.**
Sensors and Transducers, Sensors for Electromechanical Applications, Potentiometer, Variable-Inductance Transducers, Permanent-Magnet and Eddy Current Transducers, Variable-Capacitance Transducers., Piezoelectric Sensors, Strain Gauges , Torque Sensors, Gyroscopic Sensors, Thermo-Fluid Sensors.	**4**
Module 4: Digital and Innovative Sensing	**Hrs.**
Innovative Sensor Technologies, Shaft Encoders, Incremental Optical Encoder, Motion Sensing by Encoder, Encoder Data Acquisition and Processing, Absolute Optical Encoders, Encoder Error, Optical Sensors, Lasers, and Cameras, Miscellaneous Sensor Technologies, Tactile Sensing, MEMS Sensors, Sensor Fusion, Wireless Sensor Networks	**4**
Module 5: Mechanical Transmission Components	**Hrs.**
Actuator–Load Matching, Mechanical Components., Lead Screw and Nut, Harmonic Drives, Continuously Variable Transmission, Load Matching for	**5**

	Actuators **Stepper Motors:** Principle of Operation, Stepper Motor Classification, Driver and Controller, Torque Motion Characteristics, Static Position Error, Damping of Stepper Motors, Stepper Motor Models, Control of Stepper Motors, Stepper Motor Selection and Applications	
	Module 6: Continuous-Drive Actuators	**Hrs.**
	Actuator Classification, Actuator Requirements, DC Motors, DC Motor Equations, Control of DC Motors, Motor Driver and Feedback Control, DC Motor Selection, Induction Motors, Induction Motor Control, Synchronous Motors, Linear Actuators, Hydraulic Actuators, Hydraulic Control Systems, Pneumatic Control Systems, Fluidics.	**5**

Module wise Measurable Students Learning Outcomes :

After the completion of the course the student should be able to:

Module 1: Develop their signal conditioning circuit for their application

Module 2: Understands instrument rating and filtering technique

Module 3: Study various analog sensors

Module 4: understand principle of digital sensing technique

Module 5: Explain various mechanical components and stepper motor operation

Module 6: Study various actuators for their applications

Tutorial:

Professional Core (Lab)

Title of the Course: 5EN 251 ECAD-I Laboratory	L	T	P	Cr

	0	0	2	1

Pre-Requisite Courses: Engineering Physics

Textbooks:

1. D. A. Neaman, "*Electronic Circuit Design and Analysis*", McGraw Hill Education (India) Private Limited, New Delhi, 3^{rd} Edition, 2007.
2. A. S. Sedra and K. C. Smith, "*Microelectronic Circuits*", Oxford University Press, 5^{th} Edition, 2004.
3. Allen Mottershed , "*Electronic Devices and Cir*cuits", PHI, 2^{nd} Edition, 1979.

References:

1. R. Boylestad and L. Nashelsky, "*Electronic Devices and Circuit Theory*", PHI, 9^{th} Edition, 2009.
2. Millman and Halkias, "*Electronic devices and Circuits*", Tata McGraw Hill, 1^{st} Edition, 1991.
3. Gerald E. Williams, "*Practical Transistor Circuit Design and Analysis*", Tata McGraw Hill, New Delhi, 1^{st} Edition, 1973.

Course Objectives :

1. To **explain** the working of electronic circuits like rectifiers, amplifiers (voltage and current), power amplifiers and feedback amplifiers using BJT, FET and MOSFETs.
2. To **illustrate** the methods of designing the electronic circuits using discrete components.
3. To **explain** the practical ways of **measuring** AC and DC parameters of electronic circuits like amplifiers for their performance analysis.

Course Learning Outcomes:

COs	After the completion of the course the student should be able to	Bloom's Cognitive	
		Level	Descriptor
CO1	**Demonstrate** the working of electronic circuits: rectifiers, Zener diode voltage regulator, and amplifiers built using BJT, JFET and MOSFET.	III	Applying
CO2	**Test** and **analyze** the performance of amplifiers built using BJT, JFET and MOSFET.	IV	Analyzing
CO3	**Evaluate** the performance of voltage, current, power and feedback amplifiers.	V	Evaluating
CO4	**Design** the electronic circuits (amplifiers) for given specifications using discrete components such as BJT, FET and MOSFET.	VI	Creating

CO-PO Mapping :

POs	1	2	3	4	5	6	7	8	9	10	11	12	PSO1	PSO2
CO1										3				1
CO2				2										
CO3					2									
CO4				2										2

3-H, 2-M, 1-L

Assessments :

Teacher Assessment:

Title of the Course: 5EN253 Digital Electronics Lab	L	T	P	Cr
	0	0	2	1

Pre-Requisite Courses: Engineering Physics

Textbooks:

5. John F. Wakerly, *"Digital Design",* Pearson Education Publication, 5th edition, 2018.
6. Anand Kumar, "*Fundamentals of Digital Circuits*", PHI, 2ndEdition, 2009.
7. MandalS.K , "*Digital Electronics*" Mc-Graw-Hill, 1stEdiction., 2009
8. Douglas Perry, *"VHDL-Programming by Example"* TMH, 4th Edition, 2012.

References:

3. R..P.Jain, "*Modern Digital Design",* Mc-Graw-Hill, 4th edition, 2010.
4. Morris Manno, "Digital Logic and Computer Design", Prentice-Hall India, 1st edition 1979.

Course Objectives :

5. To explain the importance of the HDL for Digital Design
6. To demonstrate the complete flow of EDA tool for implementing digital designs
7. To explain the concepts involved in simulation and synthesis of digital circuits using EDA tool

Course Learning Outcomes:

CO	After the completion of the course the student should be able to	Bloom's Cognitive	
		Level	Descriptor
CO1	Able to write the & debug the VHDL code	II	Understanding
CO2	Able to implement on kits	III	Applying

CO-PO Mapping :

PO	1	2	3	4	5	6	7	8	9	10	11	12	PSO1	PSO2
CO1	1	1		2	2									1
CO2		1	1											1

Assessments :

Teacher Assessment:

Lab Assessment:

There are four components of lab assessment, LA1, LA2, LA3 and Lab ESE.

IMP: Lab ESE is a separate head of passing.

Assessment	Based on	Conducted by	Conduction and Marks Submission	Marks
LA1	Lab activities, attendance, journal	Lab Course Faculty	During Week 1 to Week 4 Submission at the end of Week 5	25
LA2	Lab activities, attendance, journal	Lab Course Faculty	During Week 5 to Week 8 Submission at the end of Week 9	25
LA3	Lab activities, attendance, journal	Lab Course Faculty	During Week 10 to Week 14 Submission at the end of Week 14	25
Lab ESE	Lab Performance and related documentation	Lab Course faculty	During Week 15 to Week 18 Submission at the end of Week 18	25

Course Contents:

List of Experiments:

A. Verification of Truth table one or two expt**.**

B. VHDL based practical followed by downloading on kit.

Introduction to Xilinx with sample experiment
1 bit full adder using 1 bit half adder as a component
4 bit full adder using 1 bit full adder as a component.
1 bit full adder using 8:1 multiplexer as component
1 bit full adder using 1:8 demux as component
Implementation of 4:1 mux using 2:1 mux as a component
Implementation of demultiplexer IC 74138
4 bit comparator
Implementation of flip flops
UP counter and DOWN counter
MODN counter
UP-DOWN counter
Shift registers
Universal shift register
Parallel loading shift register
Sequence detector
Creation of project in Quartus-II & download

Module wise Measurable Students Learning Outcomes :

After the completion of the course the student should be able to:

7. Know the difference in HDL language and other high level language.
8. Capable to write, execute and debug the code

Course Name: 5EN254 Data Structure and Algorithm Laboratory	L	T	P	Cr
	0	0	2	1

Pre-Requisite Courses: Programming basics and Computer Programming for Electronics Engineering

Textbooks:

1. Richard F. Gilberg, Behrouz A. Forouzan, "Data Structures A pseudo code approach with C", Cengage Learning, second edition, 2005.
2. Horowitz, Sahni, "Fundamentals of Data structures in C", 2nd edition, 2008.

References:

1. Yashavant Kanetkar, "Understanding pointers in C", BPB Publication, 2009
2. N. B. Venkateshwarlu, E. V. Prasad, C and Data Structures, S. Chand and Company, 2010

Course Objectives:

- To develop and improve skills in programming in a systematic way and preparing the students for advanced programming courses.
- To make the students understand static and dynamic implementation of data structures like stack and queue.
- To analyze and compare various methods to solve the problem and to use various searching and sorting techniques.
- To select particular algorithm according to application and compare its performance

Course Learning Outcomes:

COs	After the completion of the course the student should be able to	Bloom's Cognitive	
		Level	Descriptor
CO1	**Demonstrate** different data structures and need of searching and sorting techniques.	*III*	Applying
CO2	**Implement** and **analyze** Static and dynamic data structures stack and queue, searching and sorting algorithms.	*IV*	Analyzing
CO3	**Measure** the complexity of data structures, searching and sorting algorithms.	*V*	Evaluating

CO-PO Mapping:

PO	1	2	3	4	5	6	7	8	9	10	11	12	PSO1	PSO2
CO1			**2**	**2**	**2**				**2**					
CO2			**2**	**2**	**2**				**2**				**2**	
CO3			**2**	**2**	**2**				**2**				**2**	

1 - H, 2 - M, 3 - L

Assessments:

Teacher Assessment:

Lab Assessment:

There are four components of lab assessment, LA1, LA2, LA3 and Lab ESE.

IMP: Lab ESE is a separate head of passing.

Assessment	Based on	Conducted by	Conduction and Marks Submission	Marks
LA1	Lab activities, attendance, journal	Lab Course Faculty	During Week 1 to Week 4 Submission at the end of Week 5	25
LA2	Lab activities, attendance, journal	Lab Course Faculty	During Week 5 to Week 8 Submission at the end of Week 9	25
LA3	Lab activities, attendance, journal	Lab Course Faculty	During Week 10 to Week 14 Submission at the end of Week 14	25
Lab ESE	Lab Performance and related documentation	Lab Course faculty	During Week 15 to Week 18 Submission at the end of Week 18	25

Course Contents:

Module 1:Review of C programming, File handling	**Hours**
Review of C programming concepts: loops, functions, decision making blocks, array, structure and pointers. Concept of a file: FILE, text and binary files, opening files, closing files, writing a file, reading file, file pointer, inbuilt file functions, standard files.	**5**
Lab session: Programs to revise arrays, structures and pointers Programs to study different file operations opening files, closing files, writing a file, reading file	**4**
Module 2: Introduction to data structure and algorithm	
Algorithm, pseudo code, ADT, data structure, algorithmic efficiency. Recursion: Direct and Indirect recursion, analysis of recursive functions	**4**
Lab session: Program to implement algorithm and observing complexity measures	**2**
Module 3: Linked Lists	
Concept of linked organization, singly linked list, doubly linked list and dynamic storage management, circular linked list, operations such as insertion, deletion, inversion, concatenation, computation of length, traversal on linked list	**5**

Lab session: Program to implement singly linked list with all operations Program to implement doubly linked list with all operations Program to implement circular linked list with all operations	**6**
Module 4: Stacks and Queues	
Fundamentals stack and queue as ADT, representation and implementation of stack and queue using sequential and linked organization. Circular queue: representation and implementation, applications of stack	**5**
Lab session: Program to implement Stack (Static and Dynamic) Program to implement Queue (Static and Dynamic) Program to implement applications of Stack (Expression evaluation and string reversing)	**6**
Module 5: Searching & Sorting Technique	
Search: Importance of searching, linear, binary, Fibonacci search algorithms with complexity measure Sorting: Internal and External Sorts, insertion sort, quick sort, merge sort, selection sort, bubble sort, shell sort with complexity measure	**5**
Lab Session : Programs to Search the data with complexity measure Programs to Sort the data with complexity measure	**4**
Module 6: Trees and Graphs	
Basic terminology, binary trees and its representation, binary tree traversals (recursive and non-recursive), terminology and representation of graphs	**4**
Lab sessions: Implementation of binary search tree	**2**

Computer Usage / Lab Tool: Windows / Linux based system, Turbo C++ compiler / Dev C++ compiler / Code blocks / visual studio

Module wise Measurable Students Learning Outcomes:
After the completion of the course the student should be able to
Module 1: **write** systematic code of C using structures, pointers, File handling.
Module 2: **demonstrate** different data structures.
Module 3: **implement** linked list.
Module 4: **implement** stack and queue.
Module 5: **write** programs for searching and sorting.
Module 6: **explain** graph and tree.

Title of the Course: 5EN252 Simulation Tools Laboratory	L	T	P	Cr
	1	0	0	1

Pre-Requisite Courses:

Computer Programming for Electronics Engineers 4EN152

Textbooks:

(Online books available through internet)

http://ngspice.sourceforge.net/docs.html

Scilab Help

MatLab Documentation

References:

https://spoken-tutorial.org/tutorial-search/?search_foss=eSim&search_language=English

https://spoken-tutorial.org/tutorial-search/?search_foss=KiCad&search_language=English

https://spoken-tutorial.org/tutorial-search/?search_foss=Ngspice&search_language=English

https://spoken-tutorial.org/tutorial-search/?search_foss=Scilab&search_language=English

Course Objectives :

1. To explain simulation of electronic circuit and creating its PCB layout using eSim.
2. To explain ngspice statements for describing and analyzing an electronic circuit.
3. To explain ngspice statements for modeling electronic devices.
4. To explain statements for programming in SciLab or MatLab.
5. To explain built in functions in SciLab or MatLab .
6. To explain creation of GUI and modeling of system in SciLab or MatLab

Course Learning Outcomes:

CO	After the completion of the course the student should be able to	Bloom's Cognitive	
		level	Descriptor
CO1	**Use** ngspice for analyzing electronic circuits and SciLab or MatLab for processing large data.	III	Applying
CO2	**Employ** ngspice for modeling electronic devices and SciLab or MatLab for visualizing complex equations.	III	Applying
CO3	**Evaluate** operating parameters of an electronic circuit using eSim and system performance using SciLab or MatLab	V	Evaluating

CO-PO Mapping :

PO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO1	PSO2
CO1					1									
CO2					1									
CO3					1									

1- High, 2-Medium, 3- Low

Assessments :

Teacher Assessment:

Lab Assessment:

There are four components of lab assessment, LA1, LA2, LA3 and Lab ESE.

IMP: Lab ESE is a separate head of passing.

Assessment	Based on	Conducted by	Conduction and Marks Submission	Marks
LA1	Lab activities, attendance, journal	Lab Course Faculty	During Week 1 to Week 4 Submission at the end of Week 5	25
LA2	Lab activities, attendance, journal	Lab Course Faculty	During Week 5 to Week 8 Submission at the end of Week 9	25
LA3	Lab activities, attendance, journal	Lab Course Faculty	During Week 10 to Week 14 Submission at the end of Week 14	25
Lab ESE	Lab Performance and related documentation	Lab Course faculty	During Week 15 to Week 18 Submission at the end of Week 18	25

Course Contents:

Module 1	**Hrs.**
PCB layout eSim environment; using KiCad for creating schematic, placing components, wiring, annotating schematic, creating netlist; netlisting to ngspice, setting analysis parameters; simulating circuit; creating PCB layout using KiCad	**2**
Module 2	**Hrs.**
Circuit Analysis Ngspice statements for describing independent voltage and current sources, dependent voltage and current sources, resistor, inductor and capacitor; ground node; ngpice statements for performing DC, transient and AC analysis; writing circuit file to perform an analysis and simulating it in ngspice	**3**

Module 3	Hrs.
Device Modeling Subcircuit; Ngspice statements for modeling PN junction diode, bipolar junction transistor, junction field effect transistor and metal oxide semiconductor field effect transistor; writing circuit file using device model and simulating it in ngspice	**2**
Module 4	**Hrs.**
Operations and Statements SciLab or MatLab environment; data types supported; predefined, scalar and vector variables; scalar, vector and matrix operations; if, switch, try-catch, while, for statements; creating sci or m file	**2**
Module 5	**Hrs.**
Functions Built in functions for interaction with user, mathematical operations, rounding operations, plotting 2D and 3D graphs, string conversion, file handling; writing user defined function	**3**
Module 6	**Hrs.**
GUI Object handles; Graphics object property; GUI components and their properties; dialog boxes; menus; creating GUI; using Xcos or simulink for creating system model and simulating system	**2**

Module wise Measurable Students Learning Outcomes :

After the completion of the course the student should be able to:

1. Use eSim for simulation of electronic circuit and creating PCB layout.
2. Use ngspice statements for describing and analyzing an electronic circuit.
3. Use ngspice statements for modeling electronic devices.
4. Write SciLab or MatLab programs for performing mathematical and logical operations.
5. Use built in functions in SciLab or MatLab for plotting graphs and file management.
6. Create GUI and model a system in SciLab or MatLab

List of Experiements:

1. Simulating an Electronic circuit using KiCAD
2. Creating PCB layout of an Electronic circuit using KiCAD
3. DC Analysis of an Electronic circuit using ngspice
4. AC Analysis of an Electronic circuit using ngspice
5. Modeling an Electronic device using ngspice
6. Solving simultaneous equations using SciLab or MatLab
7. Plotting 2D graph using SciLab or MatLab
8. Ploting 3D graph using SciLab or MatLab
9. Creating GUI using SciLab or MatLab
10. Modeling a system in SciLab or MatLab

S. Y. B. Tech. (Electronics Engineering) Sem IV AY 2020-21

Professional Core (Theory)

Title of the Course: 5EN221 Electronic Circuit Analysis and Design–II	L	T	P	Cr
	3	0	0	3

Pre-Requisite Courses:

Electronic Circuit Analysis and Design-I

Textbooks:

1. Sergio Franco, *"Design with op-amp and analog integrated circuits",* Tata McGraw Hill, 3rd edition, 2009.

2. Ramakant Gaikwad, *"Op-amp and Linear Integrated Circuits",* PHI, 4th edition 2008.

References:

1. Robert F.Coughlin, Frederick F.Driscoll, "Operational Amplifiers and Linear Integrated Circuits", Sixth Edition, PHI, 2001.

2. D. Roy Choudhury and S. B. Jain, "*Linear Integrated Circuits*", New Age International Publishers, 2nd Edition, 2003.

Course Objectives :

1. To explain the importance of the course, (along with COs, POs, Course Plan etc.)
2. To illustrate the working of differential amplifier and operational amplifier.
3. To illustrate the methods used for analysis of op-amp based circuits (useful for GATE)
4. To illustrate the practical aspects of op-amp in analog signal processing.
5. To illustrate the working of and design methods of important opamp based circuits (useful for industry, mini-projects and projects)

Course Learning Outcomes:

CO	After the completion of the course the student should be able to	Bloom's Cognitive	
		level	Descriptor
CO1	**Illustrate and Apply** the understanding of various op-amp based linear and nonlinear circuits, such as amplifiers, waveform generators, active filters, PLL etc., to solve related problems.	III	Applying
CO2	**Analyze** the ideal opamp based circuits such as various amplifiers, filters, waveform generators, precision rectifiers, voltage regulators etc.	IV	Analyzing
CO3	**Analyze** the electronic circuits considering practical limitations of opamp, for amplifiers and related linear circuits, applications of adder, subtractors, waveform generator etc.	IV	Analyzing
CO4	**Design** the circuits like Instrumentation amplifier, V-I,	VI	Creating

	I-V, Precision Rectifier, Linear voltage regulator etc.		

CO-PO Mapping : Use 3: High **2:** Moderate **1:**Low **for mapping;**

	1	2	3	4	5	6	7	8	9	10	11	12	PSO1	PSO2
CO1	3													3
CO2		3												3
CO3		3												3
CO4			3											3

Assessments:

Two components of In Semester Evaluation (ISE), One Mid Semester Examination (MSE) and one End Semester Examination (ESE) having 20%, 30% and 50% weights respectively.

ISE 1: 10 Marks to be submitted before MSE marks. It is open to students.

ISE 2: 10 Marks to be submitted before ESE. It is hidden component for students.

MSE: 30 Marks to be submitted within 10 days after MSE examination is over (Generally on module 1-3)

ESE: 50 Marks to be submitted within 10 days after ESE examination (60-70% weight for module 4-6 and 30-40% on module 1-3)

Course Contents:

Module 1: Operational Amplifier (5)

Amplifier fundamentals, differential amplifier, basic op-amp configuration, op-amp powering, feedback in op-amp circuits, ideal op-amp circuits analysis.

Module 2: Basic Opamp Circuits (8)

Inverting and Non-inverting amplifiers, adder, subtractor, voltage to current converters, current to voltage converters, instrumentation amplifier, transducer bridge amplifier, Log/Antilog amplifier.

Module 3: Opamp Practical Limitations (6)

Simplified op-amp internal circuit diagram, input bias current, input offset voltage, input offset error compensation, low input bias/offset voltage op-amps, open loop response, closed loop response, transient response; sources of noise, stability in op-amp circuits, frequency compensation.

Module 4: Opamp based Filter Circuits (5)

Opamp as Integrator and Differentiator, Advantage of active filters, First order active filter, standard second order active filters. Design of simple active filters.

Module 5: Comparator and Waveform Generators (8)

Voltage Comparator, Schmitt triggers and applications, peak detector, sample and hold circuit, Sine wave generators, square/triangular wave generators, waveform generator ICs, V to F, F to V converter, Precision rectifier.

Module 6: Voltage Regulator and PLL (7)

Linear regulators and applications, three pin regulators, switching regulators, phase locked loop and applications, monolithic PLLs: NE565, CD4046.

Module wise Measurable Students Learning Outcomes

Module 1: Illustrate the basics of differential amplifier, opamp powering, ideal opamp characterisitics, opamp internal circuit basics etc.

Module 2: Illustrate, Analyse the basic opamp amplifier circuits

Module 3: Illustrate the practical limitations of opamp and Analyse their effect on the circuit performance

Module 4: Illustrate, Design the analog signal processing circuits and basic active filters

Module 5: Illustrate, Design Comparator, Schmitt trigger, waveform generators, precision rectifier.

Module 6: Design of Linear voltage regulator using opamp. Illustrate the operation of switched regulators and PLL.

Title of the Course: 5EN222 Signals and Systems	L	T	P	Cr
	3	1	0	4

Pre-Requisite	Engineering Mathematics, Basic Electrical Engineering
Textbook:	1 .A.V. Oppenheim, A.S. Willsky, S.H. Nawab, Signals and Systems, Prentice Hall, 1997. 2. Ashok Ambardar, Analog and Digital Signal Processing, CL Engineering, 1999
References:	1.B. P. Lathi, Linear systems and signals ,Oxford University press, 2005 2. M. J. Roberts , Signals and Systems, Tata McGraw-Hill, 2005 3. Simon Haykin, Barry Van Veen, Signals and systems ,Wiley, 2003 4. Hwei P Hsu, Schaum's Outline Signals and Systems, Tata McGraw-Hill, 1995
Course Objectives :	On completion of the course, students should be sufficiently familiar with the theoretical structure, formal representation, computational methods, notation, and vocabulary of linear models to be able to apply them to the analysis and design of digital and analog communications and control systems. The students will be able to perform signal analysis with reference to spectrum analysis of deterministic signals.
Course Learning Outcomes:	(see below)

CO	After the completion of the course the student will be able to…..	**Bloom's Cognitive level**	**Descriptor**	**Assessment Tool**
CO1	Demonstrate the concept of signals and systems	II	Understanding	ISE, MSE, ESE
CO2	Examine the response of linear systems in the time domain	IV	Analyzing	
CO3	Evaluate systems in the frequency domain	V	Evaluating	
CO4	Use frequency domain techniques to solve input/output problems for linear time invariant systems.	VI	Creating	

Assessments :

Teacher Assessment:

Two components of In Semester Evaluation (ISE), One Mid Semester Examination (MSE) and one End Semester Examination (ESE) having 20%, 30% and 50% weights respectively.

Assessment	Marks

ISE 1	10
MSE	30
ISE 2	10
ESE	50

ISE 1 and ISE 2 are based on assignment/declared test/quiz/seminar etc.

MSE: Assessment is based on 50% of course content (Normally first three modules)

ESE: Assessment is based on 100% course content with 70-80% weightage for course content last three modules) covered after MSE.

CO-PO Mapping	(see table below)

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO1 0	PO11	PO1 2	PSO 1	PSO 2
CO1	1	1											1	
CO2		1	1										1	
CO3					2								1	
CO4		2	2										1	

Course Contents:

1	**Module 1: Introduction to Signals and Systems – Continuous and Discrete**	**8 hrs**
	Introduction, standard signals, signal representation, classification of signals, systems – representation, classification, Linear, Time invariant, causal, BIBO stable, Static, dynamic.	
2	**Module 2: Time Domain Analysis of Continuous and Discrete Time Systems**	**7 hrs**
	Zero state and Zero input response, Impulse response, Convolution integral and convolution sum, graphical representation of convolution.	
3	**Module 3: Fourier Domain Analysis of Continuous Time Signal**	**6 hrs.**
	Trigonometric Fourier series, Compact Trigonometric Fourier series, Exponential form, Dirichlet Conditions, Frequency domain representation of periodic signals, Fourier Transform representation of aperiodic signals, Properties of CFT duality, time reversal, Convolution – time and frequency domain, etc.	
4	**Module 4: Laplace Transform Analysis of Signals and System**	**4 hrs.**
	Definition, Properties, Solution of differential equation. Transfer function, Poles and Zeroes, System analysis using Laplace Transform, min-max phase systems	
5	**Module 5: Fourier Domain Analysis of Discrete Time Signal**	**8 hrs.**
	Representation of CT signals using Samples, Nyquist Sampling Theorem Discrete time Fourier Transform, Representation of aperiodic sequence, Properties of DTFT: time reversal, Linear Convolution – time and frequency domain, conjugate symmetry. Discrete Fourier Transform: Definition and Properties	
6	**Module 6: Z Transform Analysis of Discrete Time Signals and Systems**	**7 hrs.**
	Definition, Properties, Solution of difference equation. Transfer function, Poles and Zeroes, System analysis using Z-Transform, Minimum phase – maximum phase system, FIR, IIR systems, All pass systems, Zero phase systems, Chirp-Z Transform	

Module wise Measurable Students Learning Outcomes	1. Understand fundamental characteristics of Signals and Systems. 2. Analyze response of linear continuous-time and discrete-time signals and systems. Use MATLAB to simulate and to analyze signals and systems of these cases. 3. Apply time-domain and frequency-domain analysis tools to linear continuous systems. 4. Analyze continuous-time signals and system responses using the concepts of transfer function representation by use of Laplace and inverse Laplace transforms. Use MATLAB to simulate and analyze signals and systems using these transforms. 5. Apply time-domain and frequency-domain analysis tools to linear discrete systems. Explore sampling concepts that link continuous-time and discrete-time signals and systems. Use MATLAB to simulate and to analyze signals and systems for this situation. 6. Analyze discrete-time signals and system responses using the concepts of transfer function representation by use of Z and inverse-Z transforms. Use MATLAB to simulate and analyze signals and systems using these transforms.
Tutorial	Elaborating various fields of Signals and System

Title of the Course: 5EN223 Communication Engineering	L-3	T-0	P-0	Cr-3

Pre-Requisite Courses: Basic Electronics Engineering, Engineering Mathematics

Textbooks:

1. T.L. Singal, "Analog and Digital Communication",6th Edition, Mc Graw Hill, 2012
2. Roy Blake , "Electronic Communication System", Thomson Publications, 2nd Edition,2002
3. Taub Schilling, "Principle of communication system", TMH publication, 4th Edition, 2013

References:

1. Simon Hykin, "Communication System", 4th Edition, John Wiley & Sons, 2000
2. B. P. Lathi, "Modern Digital and Analog Communication Systems", Oxford Publications, 3rd Edition, 1998
3. George Kennedy, "Electronic Communication System", McGraw Hill, 4th Edition, 2009

Course Objectives :

1. To introduce the techniques of transmitting and receiving information signals using analog carrier modulation techniques and evaluate their performance levels (SNR) in the presence of channel noise.
2. To establish foundation for understanding the relationship among various technical factors useful for designing communication system.

Course Learning Outcomes:

CO	**After the completion of the course the student should be able to**	Bloom's Cognitive	
		level	Descriptor
CO1	Analyze different components of analog and digitalcommunication systems such as modulator, demodulator, mixer, receiver etc. in time and frequency domain.	IV	Analyzing
CO2	Compare analog and digital communication systems on the basis of bandwidth, power requirement and the performance in the presence of noise.	II	Understanding
CO3	Discuss the performance of communication system in presence of noise.	II	Understanding

CO-PO Mapping :

PO	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**PSO1**	**PSO2**
CO1		3											2	
CO2		2	2										3	
CO3			2										2	

Assessments :

Teacher Assessment:

Two components of In Semester Evaluation (ISE), One Mid Semester Examination (MSE) and one End Semester Examination (ESE) having 20%, 30% and 50% weights respectively.

Assessment	Marks
ISE 1	10
MSE	30
ISE 2	10
ESE	50

ISE 1 and ISE 2 are based on assignment/declared test/quiz/seminar etc.

MSE: Assessment is based on 50% of course content (Normally first three modules)

ESE: Assessment is based on 100% course content with 70-80% weightage for course content (normally last three modules) covered after MSE.

Course Contents:

Module 1 : Amplitude Modulation and Demodulation	**Hrs.**
DSB-FC, DSB-SC, SSB, VSB and ISB transmissions: mathematical Analysis-time and frequency domain analysis, modulation index, generation and detection methods, power requirement of these systems, Comparison of AM modulation schemes, Quadrature Carrier Multiplexing(QAM), frequency division Multiplexing, AM detection : envelope detection, Demodulation of DSBSC : synchronous detection	**9**
Module 2: Frequency Modulation and Demodulation	**Hrs.**
Frequency Modulation (FM),: Single Tone Frequency Modulation, Spectrum Analysis, Narrowband FM, Wideband FM, Transmission Bandwidth of FM Waves, Generation of FM waves: Direct and Indirect Methods, Demodulation of FM, Phase Locked Loops, Limiting of FM waves, comparison between AM & FM, Phase Modulation, Relation between FM and PM.	**9**
Module 3: Sampling theorem and Pulse Modulation Techniques	**Hrs.**
Sampling theorem, Types of sampling, Inter symbol interferences, Modulation & Demodulation of PAM, PWM, PPM, merits & demerits, Introduction to PCM system, quantization of signals, Differential PCM, Delta Modulation, Adaptive Delta Modulation.	**4**
Module 4: Digital Data Transmission	**Hrs.**
Definition of Line Coding, various line codes, unipolar, bipolar RZ and NRZ techniques, split phase manchester formats	**5**
Module 5: Digital Modulation Techniques	**Hrs.**
Coherent Quadrature Modulation Techniques, Non Coherent Binary Modulation Techniques,	**6**

Comparison of Binary and Quaternary Modulation Techniques; M array modulation Techniques, Power spectra, Bandwidth efficiency, M array Modulation formats Viewed in the light of channel Capacity theorem, Effect of inters symbol interference**.**	
Module 6: Noise	**Hrs.**
Classification and sources of noise, signal to noise ratio (SNR), noise analysis and measurements, equivalent noise bandwidth, noise figure, noise temperature, AWGN	**6**

Module wise Measurable Students Learning Outcomes :

After the completion of the course the student should be able :

Module 1, 2: To analyze, compare the performance of various analog modulation and demodulation in terms of power, S/N ratio, and bandwidth.

Module 3, 4, 5: To evaluate performance of digital modulation system in terms of different performance measure.

Module 6: To evaluate performance of analog and digital systems in terms of noise.

Tutorial: N/A

Title of the Course: 5EN224 Microcontrollers and Peripherals Interfacing	L	T	P	Cr
	3	0	0	3

Pre-Requisite Courses: Digital Electronics 4EN203

Textbooks:

1. Kenneth J. Ayala,The 8051 Microcontroller Architecture, Programming and Applications, 2nd Edition, Penram International Publication, revised edition 2009
2. Mohammad Ali Mazidi, The 8051 Microcontroller and Embedded Systems, Pearson Education, 2nd edition, 2010.
3. John B. Peatman, Design with PIC microcontrollers, Pearson Education, 1st edition, 2003
4. Mohammad Ali Mazidi, PIC Microcontroller and Embedded Systems, Pearson Education, 1st edition, 2008.

References:

1. Intel 8085 and 8051 datasheet (www.intel.com)
2. Keil A51 and C51 manuals
3. PIC16F877A datasheet (www.microchip.com)
4. Hi-Tech C Compiler manual

Course Objectives :

1. To explain design of Intel 8085 microprocessor based small microcomputer.
2. To explain Intel 8051 microcontroller and its programming in assembly and C language.
3. To explain interfacing of external devices with Intel 8051 and programming in C.
4. To explain Intel 8051 peripherals and their programming in C.
5. To explain PIC16F877A microcontroller, its peripherals and programing in C.
6. To explain design of Intel 8051 and PIC16F877A microcontroller based system.

Course Learning Outcomes:

CO	After the completion of the course the student should be able to	Bloom's Cognitive	
		level	Descriptor
CO1	**Demonstrate** situation based interfacing of external devices with Intel 8085, Intel 8051 and PIC16F877A.	III	Applying
CO2	**Write** assembly and C language programs for Intel 8051 and PIC16F877A to meet given system requirements.	IV	Analyzing
CO3	**Design** Intel 8051 and PIC16F877A microcontroller based system.	VI	Creating

CO-PO Mapping :

PO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO1	PSO2
CO1	1													
CO2		1												

CO3			**1**											

1- High, 2-Medium, 3- Low

Assessments :

Teacher Assessment:

Two components of In Semester Evaluation (ISE), One Mid Semester Examination (MSE) and one End Semester Examination (ESE) having 20%, 30% and 50% weights respectively.

Assessment	Marks
ISE 1	10
MSE	30
ISE 2	10
ESE	50

ISE 1 and ISE 2 are based on assignment/declared test/quiz/seminar etc.

MSE: Assessment is based on 50% of course content (Normally first three modules)

ESE: Assessment is based on 100% course content with 70-80% weightage for course content (normally last three modules) covered after MSE.

Course Contents:

Module 1: 8 bit Microprocessor	**Hrs.**
Block diagram of Intel 8085; function of each pin; Demultiplexing the multiplexed address data bus; Generating read and write control signals for memory and I/O; Interfacing memory; Memory map; I/O map; Simple microcomputer system; Opcode fetch cycle; Memory read cycle; Memory write cycle; Machine cycle of some instructions.	**5**
Module 2: 8 bit Microcontroller	**Hrs.**
Block diagram of Intel 8051; function of each pin; Interfacing memory (ROM and RAM); Machine cycle; Instruction set; Addressing modes; MCS51 family; Assembler directives; Writing assembly language programs; Development tools for Intel 8051; C language for Intel 8051.	**7**
Module 3 :Interfacing Devices	**Hrs.**
Logic structure of Intel 8051 ports; Interfacing devices like relay, unipolar stepper motor, seven segment display (Static and Dynamic), character LCD, thumbwheel, array keyboard, matrix keyboard, ADC0808 and DAC0808 with Intel 8051 microcontroller and writing corresponding C programs.	**8**
Module 4: Peripherals	**Hrs.**
Operation of Timer in Intel 8051, Timer modes, Programming timer as timer in C, Programming timer as counter in C; Operation of UART in Intel 8051, Serial communication modes, Programming UART in C; Intel HEX file format; ISP; Interrupt sources, Interrupt flags,	**8**

Vector addresses, Interrupt structure of Intel 8051, Interrupt blocking conditions, Interrupt priorities, Interrupt latency, Writing an Interrupt Service Routine in C.	
Module 5 : RISC Microcontrollers	**Hrs.**
Block diagram of PIC microcontroller; configuration word, oscillator configurations, power up timer, oscillator startup timer, brown out reset; operation of on chip reset circuit, Timer 0, Watchdog timer; Interfacing devices like relay, unipolar stepper motor, seven segment display (Static and Dynamic) with PIC microcontroller and writing corresponding C programs.	**7**
Module 6: System Design	**Hrs.**
System requirements; Interface design; Implementing state machine in C; Design of digital voltmeter, temperature indicator, ON OFF temperature controller, Mains frequency meter and Multiprocessor communication system using Intel 8051 and PIC microcontroller; compare Intel 8051 and PIC microcontroller.	**5**

Module wise Measurable Students Learning Outcomes :

After the completion of the course the student should be able to:

1. Design Intel 8085 microprocessor based small microcomputer.
2. Write assembly language programs for Intel 8051 microcontroller.
3. Illustrate interfacing of external devices with Intel 8051 and write C programs.
4. Use Intel 8051 peripherals for various applications.
5. Illustrate interfacing of external devices with PIC16F877A and write C programs.
6. Design Intel 8051 and PIC16F877A microcontroller based system.

S.Y. Electronics Engineering				
Title of the Course: 5 EN 225 Control Systems	**L- 3**	**T-**	**P-**	**Cr- 3**

Pre-Requisite Courses:	--------
Textbook:	1. *"Modern Electronic Instrumentation and Measurement Techniques",* A.D. Helfrick and W.D. Copper, 5^{th} Edition, Pearson Education, 2002. 2. *"*Control System Engineering*",* I.J. Nagrath, M. Gopal, 5^{th} Edition, New Age International Publications, 2008 3. "Modern Control Engineering", Katsuhiko Ogata, 5^{th} Edition, Prentice Hall, 2015.
References :	1. *"Electronic Measurement and Instrumentation",* Oliver Cage, Tata McGraw Hill Publication. 2. *"*Modern Control System*",* Dorf, Bishop, 12^{th} Edition, Prentice Hall, 2013 3. *"Feedback and Control Systems",* Schaum's Outlines Series book, 2nd Edition, McGraw Hill Education, 2012.
Course Objectives :	This course is designed as fundamentals of control systems. The important objectives are: 1. To provide with the necessary information regarding sensing of various parameters, Data Acquisition System required in the industries. 2. To provide fundamentals of Control systems such as open loop and closed loop systems, Block diagram, Signal flow graph etc. 3. To introduce fundamentals of time and frequency domain analysis. 4. To develop concept of stability in time and frequency domain.

Course Learning Outcomes:

CO	**After the completion of the course the student should be able to**	Bloom's Cognitive Level	Bloom's Cognitive Descriptor
CO 1	**Discuss** characteristics of various types of sensors, open and closed loop systems, Mathematical models, Error constants, Design specifications for second order system, stability, etc	2	Understanding
CO 2	**Illustrate** measurement of temp, pressure circuits, mathematical models, transfer function using Block diagram and signal flow graph, Compensating networks, State space model	3	Applying
CO 3	**Examine** time response analysis**,** stability using Routh-Hurwitz criteria, Nyquist criteria, Root locus, Bode plots, Controllability and Observability etc.	3	Applying

CO-PO Mapping :

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2													2
CO2	1													2
CO3		1	2											2

Assessments

Two components of In Semester Evaluation (ISE), One Mid Semester Examination (MSE) and one End Semester Examination (ESE) having 20%, 30% and 50% weights respectively.

Assessment	Marks
ISE 1	10
MSE	30
ISE 2	10
ESE	50

ISE 1 and ISE 2 are based on assignment/declared test/quiz/seminar etc.

MSE: Assessment is based on 50% of course content (Normally first three modules)

ESE: Assessment is based on 100% course content with 60-70% weightage for course conte
last three modules) covered after MSE.

Course Contents:

Module 1. Introduction Different types of Transducers, Transducer selection factors, Types of errors and sources of errors, Mathematical models of physical system, Open loop and closed loop systems, regenerative feedback, Transfer function, Block diagrams and	9 Hrs

reduction techniques including signal flow graphics, deriving transfer function, control system components	
Module 2 Time response Analysis Standard test signals, time response of second order system, steady state errors and error constants, design specifications of second order system. Preliminary design considerations of Compensators need of compensation, lead compensations, lag compensation, lag-lead compensation.	7 Hrs
Module 3 Stability Analysis in Time Domain Concept of stability, condition of stability, characteristic equation, relative stability, Routh-Hurwitz criterion, special cases for determining relative stability	6 Hrs
Module 4 Root locus techniques	6 Hrs
Basic concept, rules of root locus, application of root locus technique for control systems.	
Module 5 Frequency Response Analysis Polar plots, Bode plots, Nyquist stability criterion, gain margin, phase margin, effect of addition of poles and zeros on bode plots	6 Hrs
Module 6 Analysis of Control Systems in State – Space Basic concepts of state, state variable and state models, transfer matrix, Controllability, observability, obtaining state space equations in canonical form.	7 Hrs

Module wise Measurable Students Learning Outcomes:

After the completion of the course the student should be able to:

Module 1

Discuss characteristics of transducers for sensing of different parameters, open loop, closed loop systems, mathematical models, Block diagram, Signal flow graph etc.

Module 2

Illustrate time response of second order system, will get familiar with Error constants, Compensators

Module 3

Illustrate stability of system in time Domain using Routh-Hurwitz criteria

Module 4

Examine root locus and analyze it

Module 5

Examine stability of system in frequency Domain using Polar plots and Bode Plots

Module 6

Illustrate circuits in state space.

Professional Core (Lab)

Title of the Course: 5EN 271 ECAD-II LAB	L	T	P	Cr
	0	0	2	1

Pre-Requisite Courses:

Electronic Circuit Analysis and Design-I Theory and Lab courses

Textbooks:

1. Sergio Franco, *"Design with op-amp and analog integrated circuits",* Tata McGraw Hill, 3rd edition, 2009.

2. Ramakant Gaikwad, *"Op-amp and Linear Integrated Circuits",* PHI, 4th edition 2008.

References:

1. Robert F.Coughlin, Frederick F.Driscoll, " Operational Amplifiers and Linear Integrated Circuits" , Sixth Edition, PHI, 2001.

2. B.S.Sonde, " System design using Integrated Circuits " , 2 nd Edition, New Age Pub, 2001

Course Objectives :

The primary objective of this lab is to give the students experience of working on the opamp based circuits.

1. To **illustrate demonstrate,** proper use of instruments and simulator software

2. To **explain** the process of constructing a circuit and verifying working of circuits mentioned in the experiment list.

3. To **illustrate** the methods used for analysis and design of op-amp based circuits.

4. To **Illustrate** process of performing the experiment and documenting the results.

Course Learning Outcomes:

CO	After the completion of the course the student should be able to	Bloom's Cognitive	
		level	Descriptor
CO1	**Use** the required instruments, with proper theoretical understanding of the instruments and modern tools such as circuit simulation software	III	Applying
CO2	**Examine practically** the performance of a given opamp based circuit, do correct calculations and properly write the conclusions.	IV	Analyzing
CO3	**Design** simple opamp based applications using the circuits studied in related theory course, and as per given problems.	VI	Creating
CO4	**Prepare the documentation** of proper observations, neat graphs, writing conclusion in grammatically and technically correct language, explain orally the circuit operation and process of performing the experiments in correct technical language.	V	Evaluating

CO-PO Mapping : Use 3: High **2:** Moderate **1:**Low **for mapping;**

	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**
CO1					3							
CO2		**3**										
CO3			3									
CO4										2		

Assessments

Lab Assessment:

There are four components of lab assessment, LA1, LA2, LA3 and Lab ESE.

IMP: Lab ESE is a separate head of passing.

Assessment	Based on	Conducted by	Conduction and Marks Submission	Marks
LA1	Lab activities, attendance, journal	Lab Course Faculty	During Week 1 to Week 4 Submission at the end of Week 5	25
LA2	Lab activities, attendance, journal	Lab Course Faculty	During Week 5 to Week 8 Submission at the end of Week 9	25
LA3	Lab activities, attendance, journal	Lab Course Faculty	During Week 10 to Week 14 Submission at the end of Week 14	25
Lab ESE	Lab Performance and related documentation	Lab Course faculty	During Week 15 to Week 18 Submission at the end of Week 18	25

List of Experiments:

1. Design of Inverting and Non-inverting amplifier
2. Design of Inverting Adder circuit
3. Design of Opamp based subtractor / difference amplifier
4. Design Instrumentation Amplifier
5. Measurement of input offset voltage, input bias current and slew rate
6. Effect of offset voltage and bias current of opamp on circuit output voltage
7. Effect of circuit gain on circuit frequency response for non-inverting amplifier
8. Design of Schmitt trigger
9. Active differentiator/ Integrator
10. Second order Butterworth low pass filter/ high pass filter
11. Square and triangular waveform generator
12. Design of Precision rectifier

Title of the Course: 5EN 273 Communication Engineering and Control System Lab (PART A)	L-0	T-0	P-2	Cr-1

Pre-Requisite Courses: Basic Electronics Engineering, Engineering Mathematics

Textbooks:

1. George Kennedy , "Electronic Communication System", McGraw Hill, 4th Edition, 2009
2. Roy Blake , "Electronic Communication System", Thomson Publications, 2nd Edition,2002
3. Taub Schilling, "Principle of communication system", TMH publication, 4th Edition, 2013

References:

4. Wayne Tomasi ,"Adavnced Electronic Communications Systems", Pearson education, 5th Edition, 2014
5. Simon Hykin, "Communication System", 4th Edition, John Wiley & Sons, 2000
6. B. P. Lathi, "Modern Digital and Analog Communication Systems", Oxford Publications, 3rd Edition, 1998

Course Objectives :

3. To illustrate different components of analog communication systems such as modulation, demodulation, sampling, antenna etc.
4. To enable the students for design and development of applications of communication system

Course Learning Outcomes:

CO	After the completion of the course the student should be able to	Bloom's Cognitive	
		level	Descriptor
CO1	Analyze the performance of different modulation and demodulation schemes in terms of bandwidth, power requirement presence of noise.	IV	Analyzing
CO2	Compare the performance of different sampling methods, antenna.	II	Understanding
CO3	Demonstrate a small communication system using software packages (MATLAB, Emona Datex board)	III	Applying

CO-PO Mapping :

PO	1	2	3	4	5	6	7	8	9	10	11	12	PSO1	PSO2
CO1					2								2	
CO2					2									2
CO3					3				2				2	

Assessments :

Teacher Assessment:

There are four components of lab assessment, LA1, LA2, LA3 and Lab ESE.

IMP: Lab ESE is a separate head of passing.

Assessment	Based on	Conducted by	Conduction and Marks Submission	Marks
LA1	Lab activities, attendance, journal	Lab Course Faculty	During Week 1 to Week 4 Submission at the end of Week 5	25
LA2	Lab activities, attendance, journal	Lab Course Faculty	During Week 5 to Week 8 Submission at the end of Week 9	25
LA3	Lab activities, attendance, journal	Lab Course Faculty	During Week 10 to Week 14 Submission at the end of Week 14	25
Lab ESE	Lab Performance and related documentation	Lab Course faculty	During Week 15 to Week 18 Submission at the end of Week 18	25

List of Experiments :

1. Spectrum analyzer

2. AM Transmitter/ Receiver

   2.1 DSB-FC system

   2.2 DSB – SC system

3. FM Transmitter/ Receiver

   3.1 Reactance and varactor modulator

   3.2 PLL, quadrature, Foster- Seeley and detuned resonance detectors

4. Sampling theorem and reconstruction

5. Pulse Modulation and demodulation

   5.1 PAM, PWM,PPM techniques

6. PCM Modulation and Demodulation

7. Digital Data Transmission Techniques

8. Digital Modulation Techniques

9. Experiments on MATLAB

10. Experiments on National Instrument’s Emona Datex Board

Title of the Course: 5EN 273 Communication Engineering and Control System Lab (PART B)	**L-0**	**T- 0**	**P- 2**	**Cr- 1**
Pre-Requisite Courses: --				

Textbook:

1. *"*Control System Engineering*",* I.J. Nagrath, M. Gopal, 5th Edition, New Age International Publications, 2008.

2. *"*Modern Control Engineering*",* Katsuhiko Ogata, 5th Edition, Prentice Hall, 2015.

3. *"*Modern Control System*",* Dorf, Bishop, 12th Edition, Prentice Hall, 2013.

References:

1. *"Feedback and Control Systems",* Schaum's Outlines Series book, 2nd Edition, McGraw Hill Education, 2012.

2. *"Automatic Control Systems",* Bejamin C. Kuo, 7th Edition, Wiley Publications, 1995.

Course Objectives :

This course is designed as first course in control systems. The important objectives are:

1 To introduce open and closed loop systems, transfer function, block diagram and signal flow graphs.

2. To provide fundamentals of sensors, time and frequency domain analysis.

3. To provide the necessary concept of stability in time and frequency domain.

4. To introduce concepts of state space models and its analysis.

Course Learning Outcomes:

CO	**After the completion of the course the student should be able to**	Bloom's Cognitive	
		Level	Descriptor
CO 1	**Discuss** open and closed loop systems, state space models, Error constants, Design specifications for second order system, stability, etc	2	Understanding
CO 2	**Illustrate** mathematical models, transfer function using Block diagram and signal flow graph, Compensating	3	Applying

	networks, State space models		
CO 3	**Execute** stability analysis using Routh-Hurwitz criteria, Nyquist criteria, Root locus, Bode plots etc. using Matlab Programs	3	Applying
CO 4	**Solve** PD, PI and PID controllers using Matlab	3	Applying

CO-PO Mapping :

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1				**2**									**2**	
CO2				**1**										**2**
CO3					**2**								**2**	
CO4				**2**	**1**									**2**

Assessments:

Lab Assessment:

There are four components of lab assessment, LA1, LA2, LA3 and Lab ESE.

IMP: Lab ESE is a separate head of passing.

sessment	Based on	Conducted by	Conduction and Marks Submission	Mar
LA1	Lab activities, attendance, journal	Lab Course Faculty	During Week 1 to Week 4 Submission at the end of Week 5	25
LA2	Lab activities, attendance, journal	Lab Course Faculty	During Week 5 to Week 8 Submission at the end of Week 9	25
LA3	Lab activities, attendance, journal	Lab Course Faculty	During Week 10 to Week 14 Submission at the end of Week 14	25
ab ESE	Lab Performance and related documentation	Lab Course faculty	During Week 15 to Week 18 Submission at the end of Week 18	25

Course Contents:

List of Experiments:

1. Potentiometer as transducer and error detector. 2. Synchros as transmitter and error detector. 3. Effect of negative feedback and Speed control of DC motor. 4. DC position Control system (P, PI controller) 5. Time response of second order system. 6. Selection of kp, ki and kd in PID controller 7. To draw Root locus and comment on stability. 8. To draw Bode plots and comment on stability. 9. Conversion of TF model to state space model

Title of the Course: 5EN274 Microcontrollers and Peripherals Interfacing Lab	L	T	P	Cr
	0	0	2	1

Pre-Requisite Courses:

Digital Electronics Lab 4EN252

Data Structures and Algorithm Lab 4EN253

Textbooks:

5. Kenneth J. Ayala,The 8051 Microcontroller Architecture, Programming and Applications, 2nd Edition, Penram International Publication, revised edition 2009
6. Mohammad Ali Mazidi, The 8051 Microcontroller and Embedded Systems, Pearson Education, 2nd edition, 2010.
7. John B. Peatman, Design with PIC microcontrollers, Pearson Education, 1st edition, 2003
8. Mohammad Ali Mazidi, PIC Microcontroller and Embedded Systems, Pearson Education, 1st edition, 2008.

References:

5. Intel 8085 and 8051 datasheet (www.intel.com)
6. Keil A51 and C51 manuals
7. PIC16F877A datasheet (www.microchip.com)
8. Hi-Tech C Compiler manual

Course Objectives :

1. To explain debugging of a C program for AT89C51ED2 and PIC16F877A in uV4 and MPLAB IDE respectively.
2. To show downloading and testing of C program for AT89C51ED2 and PIC16F877A in AT89C51ED2 and PIC16F877A development board respectively.
3. To explain development of C program for implementing given system requirements using AT89C51ED2 or PIC16F877A microcontroller.

Course Learning Outcomes:

CO	After the completion of the course the student should be able to	Bloom's Cognitive	
		level	Descriptor
CO1	**Use** uV4 and MPLAB IDE to debug a C program for AT89C51ED2 and PIC16F877A microcontroller respectively.	III	Applying
CO2	**Test** a C program written for AT89C51ED2 using AT89C51ED2 development board and for PIC16F877A microcontroller using PIC16F877A development board.	IV	Analyzing
CO3	**Develop** C program for implementing a given system using AT89C51ED2 and PIC16F877A microcontroller.	VI	Creating

CO-PO Mapping :

PO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO1	PSO2
CO1					1									
CO2				1	2									
CO3			1	2	3									

1- High , 2-Medium, 3- Low

Assessments :

Lab Assessment:

There are four components of lab assessment, LA1, LA2, LA3 and Lab ESE.

IMP: Lab ESE is a separate head of passing.

Assessment	Based on	Conducted by	Conduction and Marks Submission	Marks
LA1	Lab activities, attendance, journal	Lab Course Faculty	During Week 1 to Week 4 Submission at the end of Week 5	25
LA2	Lab activities, attendance, journal	Lab Course Faculty	During Week 5 to Week 8 Submission at the end of Week 9	25
LA3	Lab activities, attendance, journal	Lab Course Faculty	During Week 10 to Week 14 Submission at the end of Week 14	25
Lab ESE	Lab Performance and related documentation	Lab Course faculty	During Week 15 to Week 18 Submission at the end of Week 18	25

Course Contents:

1. Conversion of if and for C statements into 8051 instructions
2. Interfacing Unipolar Stepper Motor with 8051 microcontroller.
3. Interfacing 4 digit Multiplexed Display with 8051 microcontroller.
4. Interfacing 16x2 character LCD with 8051 microcontroller.
5. Interfacing 4x4 Matrix Keyboard with 8051 microcontroller.
6. Interfacing DAC0800 with 8051 microcontroller.
7. Interfacing ADC0809 with 8051 microcontroller.
8. Handling External Interrupts
9. Using Timer as Timer
10. Using Timer as Counter
11. Serial communication (Hardware control through PC keyboard)
12. Multiprocessor communication (Using Proteus)
13. Interfacing Unipolar Stepper Motor with PIC16F877A microcontroller.
14. Interfacing 4 digit Multiplexed Display with PIC16F877A microcontroller.

Module wise Measurable Students Learning Outcomes :

After the completion of the course the student should be able to:

1. Develop a C program for using external devices or peripherals.
2. Use development tools for simulating and debugging C program.
3. Use development tools for download and test a C program.

5EN 276 : Presentation and Report writing