Adichunchanagiri Institute of Technology, Chikkamagaluru-2

DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

COURSE OBJECTIVES AND OUTCOMES-2021-22

Course Title : Control Systems | **Course Code : 18EC43**

No. of Lecture Hrs./Week : 03 | **Exam Hours : 03**

Total No. of Lecture Hrs. : 40 | **Exam Marks : 60**

Prerequisites

1. Linear differential equations, Laplace transforms.
2. Rotational motion, displacement, acceleration etc...
3. Network theory.

Course Learning Objectives

This course will help students to achieve the following objectives:

1. Understand the basic features, various terminologies, definitions and applications of control systems.
2. Learn to find mathematical model of electrical, mechanical and electromechanical systems.
3. Learn to find transfer function via mason's rule and also to find time response of a system from transfer function and the stability of the system from the transfer function using different methods.

Course Outcomes

At the end of the course students should be able to:

CO Number	Course Outcomes	Cognitive Level
CO1	Identify open and closed loop control system and Draw mathematical model for electrical, mechanical and electromechanical system.	L1 &L2
CO2	Find the transfer function of the system using block diagram reduction and signal flow graphs (mason's gain formula) methods.	L2
CO3	Find the response of first order and second-order systems under standard test signals.	L2
CO4	Find the stability of system using Routh stability criterion, root locus technique and Frequency response method(Bode plot).	L2
CO5	Find the stability of system using polar plots and nyquist stability criterion and obtain state model of a given system using state variable analysis	L2

CO-PO MAPPING-2021-22

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO11	PO12		PSO1	PSO2
CO1	2	2													2
CO2	2	3	1												2
CO3	2	2	1												2
CO4	2	1	1									1			2
CO5	2	1	1												2

CO-PO MAPPING JUSTIFICATION

CO,	PO,	Justification
CO1	PO1	Mapped moderately as all students will able to identify open and closed loop system and use concepts of engineering to find a mathematical model for mechanical, electrical and electromechanical system.
	PO2	Mapped moderately as all students will able to identify displacement, velocity, acceleration to find transfer function of the system.
CO2	PO1	Mapped moderately as all students will able to use mathematical models, block diagram reduction rules and mason's gain formula to find overall transfer function of the system.
	PO2	Mapped high as all students will able to formulate overall transfer function of control system using block diagram techniques and mason's gain formula.
	PO3	Mapped slightly as all students will able to formulate equivalent system using equations to obtain the overall transfer function.
CO3	PO1	Mapped moderately as all students will able to use fundamental concepts of closed loop systems to describe the transient and steady state response of first and second order system.
	PO2	Mapped moderately as all students will able to identify and formulate steady state errors, time domain specifications and damping ratio of first and second order control systems.
	PO3	Mapped slightly as all students will able to explain steady state errors, and order of the system to understand the transient response of first and second order control system for standard test signals
CO4	PO1	Mapped moderately as all students will able to use fundamental concepts of time domain response to describe RH criterion and Root Locus and frequency domain response to describe Bode plot.
	PO2	Mapped slightly as all students will able to identify frequency domain and time domain parameters to find the stability of a control system.
	PO3	Mapped slightly as all students will able to explain the stability of the control system by studying the location and movement of roots using various time and frequency domain technique.
	PO12	Mapped slightly as all students will able to apply the knowledge of frequency domain technique in automatic control, signal processing and in Hi-reliability applications.
CO5	PO1	Mapped moderately as all students will able to explain the fundamental concepts of state variables to analyze the performance of the system. And stability of the system using polar plots and nyquist stability criterion.
	PO2	Mapped slightly as all students will able to obtain state model and diagram of a system using state variables.
	PO3	Mapped slightly as all students will able to develop a process to find the performance of the system using state variable analysis

CO-PSO MAPPING JUSTIFICATION

CO	PSO	Justification
CO1	PSO2	Mapped moderately as all students will able to solve the problems of electrical mechanical and electro mechanical system. Identify displacement, velocity, acceleration to find transfer function of the system.
CO2	PSO2	Mapped moderately as all students will able to study mathematical models, block diagram reduction rules and mason's gain formula to find overall transfer function of the system.
CO3	PSO2	Mapped moderately as all students will able to identify and formulate steady state errors, time domain specifications and damping ratio of first and second order control systems.
CO4	PSO2	Mapped moderately as all students will able to study fundamental concepts of time domain response to describe RH criterion and Root Locus and frequency domain response to describe Bode plot. Identify frequency domain and time domain parameters to find the stability of a control system
CO5	PSO2	Mapped moderately as all students will able to study state model and diagram of a system using state variables.

Faculty In-charge

Module Coordinator 7/9/22

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DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

COURSE OBJECTIVES AND OUTCOMES-2021-22

Course Title : ANALOG CIRCUITS **Course Code : 18EC4 2**

No. of Lecture Hrs./Week : 3+2 (Tutorial) **Exam Hours : 03**

Total No. of Lecture Hrs. : 50 **Exam Marks : 100**

Prerequisites

1. Working of BJT and MOSFETs
2. KVL and KCL, Thevenin theorem

Course Learning Objectives

This course will help students to achieve the following objectives:

- Explain various BJT parameters, connections and configurations.
- Design and demonstrate the diode circuits and transistor amplifiers.
- Explain various types of FET biasing, and demonstrate the use of FET amplifiers.
- Construct frequency response of FET amplifiers at various frequencies.
- Analyze Power amplifier circuits in different modes of operation.
- Construct Feedback and Oscillator circuits using FET.

Course Outcomes

At the end of the course students should be able to:

CO Number	Course Outcomes	Cognitive Level
CO1	Understand BJT biasing, its small signal model, hybrid π model, FETs biasing and its small signal model.	L2
CO2	Understand MOSFET amplifier, its frequency response and FET based oscillator.	L2
CO3	Understand the operation of feedback amplifier and power amplifiers.	L2
CO4	Understand the functioning of Op-Amp and general application of Op-Amp.	L2
CO5	Understanding Op-Amp other application circuits such as ADC, rectifier, filter, and non-sinusoidal oscillator using 555 Timer.	L2

CO-PO MAPPING-2021-22

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	3										2	2
CO2	3	2	3										2	2
CO3	3	1	2										2	2
CO4	3	2	1										2	2
CO5	2	1	1										2	2

CO-PO MAPPING JUSTIFICATION

PO / CO		Justification
CO_1	PO_1	Mapped substantially as all students will able to apply the knowledge of engineering for biasing and modeling of BJT and FET circuits.
	PO_2	Mapped moderately as all the students will be able to analyze complex engineering problems in BJT and FET circuits using engineering sciences.
	PO_3	Mapped substantially as all students will able to apply the design solutions for complex engineering problems to meet the specified needs using BJT and FET circuits.
CO_2	PO_1	Mapped substantially as all the students will be able to apply the engineering knowledge for amplifier and oscillator circuits.
	PO_2	Mapped moderately as all the students will be able analyze complex engineering problems in MOSFETE amplifier and FET oscillator circuits using engineering sciences. .
	PO_3	Mapped substantially as all the students will be able use of semiconductor p-n junction with appropriate consideration for public utilization.
CO_3	PO_1	Mapped substantially as all students will able to apply the knowledge of engineering for feedback amplifier and power amplifier circuits.
	PO_2	Mapped slightly as all the students will be able to analyze complex engineering problems in feedback amplifier and power amplifier circuits using engineering sciences.
	PO_3	Mapped moderately as all students will able to apply the design solutions for complex engineering problems to meet the specified needs using feedback amplifier and power amplifier circuits.
CO_4	PO_1	Mapped substantially as all students will able to apply the knowledge of engineering for Op-Amp and its applications.
	PO_2	Mapped moderately as all the students will be able to analyze complex engineering problems in Op-Amp and its applications circuits using engineering sciences.
	PO_3	Mapped slightly as all students will able to apply the design solutions for complex engineering problems to meet the specified needs using Op-Amp and its applications circuits.
CO_5	PO_1	Mapped substantially as all students will able to apply the knowledge of engineering for sinusoidal oscillator, filter, ADC using Op-Amp and 555 timer applications.
	PO_2	Mapped moderately as all the students will be able to analyze complex engineering problems in sinusoidal oscillator, filter, ADC using Op-Amp and 555 timer circuits using engineering sciences.
	PO_3	Mapped slightly as all students will able to apply the design solutions for complex engineering problems to meet the specified needs using sinusoidal oscillator, filter, ADC using Op-Amp and 555 timer circuits.

CO-PSO MAPPING JUSTIFICATION

PSO / CO		Justification
CO_1	PSO_1	Mapped moderately as all students will able to analyze and design the systems in the fields related to VLSI and embedded systems based BJT and FET circuits.
	PSO_2	Mapped moderately as all students will able to identify the problems and sufficient solutions in the fields related to VLSI and embedded systems based BJT and FET circuits.
CO_2	PSO_1	Mapped moderately as all students will able to analyze and design the systems in the fields related to VLSI and embedded systems based on amplifier and oscillator circuits.
	PSO_2	Mapped moderately as all students will able to identify the problems and sufficient solutions in the fields related to VLSI and embedded systems based on amplifier and oscillator circuits.
CO_3	PSO_1	Mapped moderately as all students will able to analyze and design the systems in the fields related to VLSI and embedded systems based on feedback amplifier and power amplifier.
	PSO_2	Mapped moderately as all students will able to identify the problems and sufficient solutions in the fields related to VLSI and embedded systems based on feedback amplifier and power amplifier.
CO_4	PSO_1	Mapped moderately as all students will able to analyze and design the systems in the fields related to VLSI and embedded systems based on Op-Amp application circuit.
	PSO_2	Mapped moderately as all students will able to identify the problems and sufficient solutions in the fields related to VLSI and embedded systems based on Op-Amp application circuit.

Faculty In-charge

19/5/22
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DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

COURSE OBJECTIVES AND OUTCOMES-2021-22

Course Title : MICROCONTROLLER LABORATORY **Course Code : 18ECL47**

No. of Lecture Hrs./Week : 02Hr Tutorial (Instructions)
+ 02 Hours Laboratory

Exam Hours : 03

Exam Marks : 80

Prerequisites

1. Computer Architecture
2. Digital Electronics

Course Learning Objectives

This laboratory course enables students to

- Understand the basics of microcontroller and its applications.
- Have in-depth knowledge of 8051 assembly language programming.
- Understand serial communication through the devices using C programming.
- Understand the concepts of I/O interfacing for 8051.

Course Outcomes:

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

CO Number	Course Outcomes	RBT Level
18ECL47.1	Identify and state the instructions of 8051 for performing data transfer, arithmetic, Boolean, logical and interrupt operations.	L1
18ECL47.2	Write down assembly language programs using the instruction set of 8051 for manipulating the input data.	L1,L2
18ECL47.3	Demonstrate the interfacing of different peripheral devices to 8051 through I/O ports and control those using Assembly language programs.	L3
18ECL47.4	Demonstrate the interfacing of 8051 to perform the serial data transfer using C programming.	L3
18ECL47.5	Demonstrate the functionalities of on-chip peripherals such as timer/counter of microcontroller through assembly language programming.	L3

CO-PO MAPPING 2021-2022

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12		PSO1	PSO2
18ECL47.1	3	2	3											2	2
18ECL47.2	3	2	3		2									2	2
18ECL47.3	2	2	2		2									2	2
18ECL47.4	2	2	2		2									2	2
18ECL47.5	2	2	2		2									2	2

CO-PO MAPPING JUSTIFICATION

18ECL47	18ECL47.1	PO1	3	Apply the knowledge of fundamentals of digital electronics to provide the solution for the design of embedded system.
		PO2	2	Apply the knowledge to analyze the problem .
		PO3	3	Apply the knowledge for the design of embedded system.
	18ECL47.2	PO1	3	Apply the knowledge of instruction set to develop the assembly language program
		PO2	2	Apply the knowledge to write down the assembly language programs for solving problems.
		PO3	3	Apply the knowledge of ALP to develop solutions for problems.
		PO5	2	Assemblers and Compilers are used to write and execute ALPs.
	18ECL47.3	PO1	2	Apply the knowledge of peripheral devices so as to interface with the microcontroller.
		PO2	2	Apply the knowledge of microcontroller for analyzing the interfaced peripherals.
		PO3	2	Apply the knowledge of interfacing for the design of embedded system.
		PO5	2	Assemblers and Compilers are used to demonstrate the interfacing of the peripheral devices with microcontrollers and control them.
	18ECL47.4	PO1	2	Apply the knowledge of serial communication for data transfer through serial port of 8051.
		PO2	2	Apply the knowledge of C programming to solve the problems in serial communication.
		PO3	2	Apply the knowledge of serial communication for the design of embedded system.
		PO5	2	Assemblers and Compilers are used to perform the serial communication with microcontrollers.
	18ECL47.5	PO1	2	Apply the knowledge of assembly language and C programming to

				understand the features of microcontroller.
		PO2	2	Apply the knowledge to solve the problems of microcontroller based applications.
		PO3	2	Apply the knowledge of assembly language and C programming for the design of embedded system.
		PO5	2	Assemblers and Compilers are used to demonstrate the functionalities of microcontrollers.

CO-PSO MAPPING JUSTIFICATION

18ECL47	18ECL47.1	PSO1	2	Graduates are able to analyse the instruction set of microcontroller to develop the code for meeting the requirement specification of a embedded system.
		PSO2	2	Graduates are able to write an efficient program by minimizing the length of the ALP.
	18ECL47.2	PSO1	2	Graduates are able to develop the assembly language programs for embedded system according to required specifications .
		PSO2	2	Graduates are able to provide a solution by developing an efficient program for an embedded system
	18ECL47.3	PSO1	2	Graduates are able to demonstrate the interfacing of peripheral devices with microcontroller to build an embedded system
		PSO2	2	Graduates are able to identify the issues and resolve them while interfacing the peripheral devices with microcontroller.
	18ECL47.4	PSO1	2	Graduates are able to demonstrate the serial communication for data transfer between the devices in the development of an embedded system.
		PSO2	2	Graduates are able to identify the issues with the serial communication between the peripheral devices and microcomputer and resolve them.
	18ECL47.5	PSO1	2	Graduates are able to analyse the functionalities of timers/counters in an embedded system.
		PSO2	2	Graduates are able to provide a solution by programming the on-chip timers/counters according to the requirements for an embedded system.

Signature of the Lab co-ordinator

Signature of the Module Co-ordinator

Signature of the HOD

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DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

COURSE OBJECTIVES AND OUTCOMES 2021-22

Course Code : 18EC63

Course Title : Microwave and Antennas

No. of Lecture Hrs./Week : 04

Exam Hours : 03

Exam Marks : 60

Prerequisites

1. Fundamentals of Microwave and Antenna.
2. Application of Microwave and Antenna.

Course Learning Objectives

This course will help students to achieve the following objectives:

1. Describe the Microwave properties and its transmission media.
2. Describe the Microwave devices for several applications.
3. Understand the basics of Antenna theory.
4. Select Antennas for applications.

Course Outcomes

At the end of the course students should be able to:

CO Number	Course Outcomes	Cognitive Level
18EC63.1	Describe the use and advantages of microwave transmission. Identify various parameters related to transmission lines and waveguides.	L1,L2
18EC63.2	Identify microwave devices for several applications.	L2,L3
18EC63.3	Understand the basic antenna parameters and design of antennas.	L2,L3
18EC63.4	Study the different types of antennas and their applications.	L2,L3

CO-PO MAPPING-2020

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
18EC34.1	3	2											2	1
18EC34.2	3	2											2	
18EC34.3	3	2											2	
18EC34.4	3	2											2	

CO-PO justification

PO_1	CO_1	Apply knowledge to identify the parameters of transmission lines and waveguides
	CO_2	Identify various microwave properties and its applications
	CO_3	Analyze various antenna parameters
	CO_4	Analyze different types of antennas
PO_2	CO_1	Understand the parameters and advantages of transmission line.
	CO_2	Apply knowledge of microwave passive devices and strip lines
	CO_3	Identify the antenna design
	CO_4	Identify applications of various types of antenna

CO-PSO justification

CO_1	PSO_1	Graduate will have an ability to identify microwave transmission line and waveguide properties.
	PSO_2	Use smith chart to solve transmission line problems.
CO_2	PSO_1	Graduate will have knowledge of microwave device application.
CO_3	PSO_1	Graduate will have an ability to identify several parameters of antenna.
CO_4	PSO_1	Graduate will have an ability to illustrate different types of antennas and its applications.

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Department of electronics and communication

SEMESTER – IV MICROCONTROLLER LABORATORY

Laboratory Code	18ECL47	CIE Marks	40
Number of Lecture Hours/Week	02 Hr Tutorial (Instructions) + 02 Hours Laboratory	SEE Marks	60
RBT Level	L1, L2, L3	Exam Hours	03

Rubrics for lab-Evaluation

Parameters	*Good (7-8)*	*Satisfactory(4-6)*	*Poor(0-3)*
Pre-lab preparation (8)	Good Knowledge about the controller, experimemt to be conducted & prior write up.	Not much Knowledge & no proper prior write up.	No knowledge & no prior write up.
Conduction & results (8)	Analyzed the program and able to interpret the results well.	Analyzed the program partially and results not presented correctly.	Unable to analyze the program and results not presented.
Record write up & regular submission (8)	Program write up is presented well with appropriate comments. Regular in record submission.	Program write up is presented without appropriate comments. Not regular in record submission.	No record write up or record not submitted
Test(16)			
Total = 40 marks			

Lab Co-ordinator

Module Co-ordinator

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DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

COURSE OBJECTIVES AND OUTCOMES-2022

Course Title : Project work/Project Work Phase 2

Course Code : 18 ECP 83, 17 ECP 85, 1 5 ECP 85

No. of Lecture Hrs./Week : 06

Exam Hours : 03

Exam Marks : 100 ,

Total No. of Lecture Hrs. : 06

40:60 for 18 ECP 83 and for 18 ECP 83, 1 5 ECP 85 Internal Marks 100)

Prerequisites

1. Analog Electronics 15EC32, Digital Electronics 15EC33

Course Learning Objectives

The objective of this course is to make students to

1. To develop student's knowledge for solving technical problems through structure project research study in order to produce competent and sound engineers.
2. Identify and describe the problem and scope of project clearly, collect, analyze and present data into meaningful information using relevant tools, select, plan and execute a proper methodology in problem solving, work independently and ethically, present the results in written and oral format effectively and identify basic entrepreneurship skills in project management.

Course outcomes (2022)

At the end of the course students should be able to:

CO Number	*Course Outcome*	*Rubrics Marks statements*	*PO Mapped*
18 ECP 83.1	Ability to demonstrate compliance to the prescribed standards/ safety norms through responsibility of every member in the team	Project Scheduling and work delegation	PO 11
18 ECP 83.2	Ability to select the engineering tools/components for solving the identified engineering Problem	Preparing the equipment/ component list	PO 12 PO 5
18 ECP 83.3	Ability to select the engineering tools/components for solving the identified engineering problem	The Modern Tool	PO 5
18 ECP 83.4	Ability to apply the identified concepts and engineering tools to arrive at design solution(s) for the identified engineering problem	Design(s)	PO 1 PO 3
18 ECP 83.5	Ability to analyze and interpret results of experiments conducted on the designed solution(s) to arrive at valid conclusions	Analyze the results	PO 4
18 ECP 83.6	Ability to engage in independent study to identify the mathematical concepts, science responsibility of every member in the team	Identification of essential concepts	PO 12
18 ECP 83.7	Ability to engage in effective written communication through the project report, four-page IEEE paper format and the one-page poster	The Project Report	PO 10
18 ECP 83.8	Ability to abide by the norms of professional ethics	Originality score	PO 8
18 ECP 83.9	Ability to engage in effective written communication through four-page IEEE paper format and the one-page poster	The Poster and IEEE Paper Presentation	PO 10
18 ECP 83.10	Ability to engage in effective oral communication through presentation of the project work, demonstration of the project and preparation of the video about the project	Oral Presentation	PO 10
18 ECP 83.11	Ability to perform in the team, contribute to the team and mentor/lead the team	Performance in the Team	PO 9

CO-PO MAPPING-2022

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1											3		2	2
CO2					3							3	2	2
CO3					3								2	2
CO4	3		3											
CO5				3										
CO6												3	2	2
CO7										3				
CO8								3						
CO9										3				
CO10										3				
CO11									3					

CO-PO MAPPING JUSTIFICATION

18 ECP 83	18 ECP 83.1	PO 11	3	Able to engage in independent lifelong leering research literature in the identified domain
	18 ECP 83.2	PO 12 PO 5	3	Able to do problem analysis to identify and formulate the engineering problem
	18 ECP 83.3	PO 5	3	Able to identify engineering problem related to society and also demonstrate concern for environment
	18 ECP 83.4	PO 1 PO 3	3	Able to identify norms for engineering practice related to safety practice working as own and as team in multidisciplinary environments for lifelong learning need.
	18 ECP 83.5	PO 4	3	Able to demonstrate management principles as own and as team by scheduling the projects
	18 ECP 83.6	PO 12	3	Able to engage in independent and lifelong learning using basic the mathematical , science engineering concepts and management principles
	18 ECP 83.7	PO 10	3	Able to arrive at use of Modern tools and solve engineering problem with life long learning context.
	18 ECP 83.8	PO 8	3	For engineering problem solution using Modern tools.
	18 ECP 83.9	PO 10	3	Able to arrive at concepts using engineering knowledge and develop the solutions for design
	18 ECP 83.10	PO 10	3	Able to arrive results by conducting investigation
	18 ECP 83.11	PO 9	3	Able to do project management by budget analysis using resources as own and as team.

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DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

COURSE OBJECTIVES AND OUTCOMES-2021-2022

Course Title : Microcontroller | **Course Code : 18EC46**

No. of Lecture Hrs./Week : 03 | **Exam Hours : 03**

Total No. of Lecture Hrs. : 50 | **Exam Marks : 60**

Prerequisites

1. Digital Electronics.
2. Computer Organization
3. C programming language

Course Learning Objectives

This course will enable students to

1. Understand the difference between a Microprocessor and a Microcontroller and Embedded microcontrollers. Familiarize the basic architecture of 8051 microcontroller.
2. Write 8051 programme using Assembly Level Language and C.
3. Understand the interrupt system of 8051 and the use of interrupts.
4. Understand the operation and use of inbuilt Timers/Counters and Serial port of 8051.
5. Interface 8051 to external memory and I/O devices using its I/O ports.

COURSE OUTCOMES

At the end of the course, students should be

CO Number	Course Outcomes	Cognitive Level
18EC46.1	Able to list the difference between Microprocessors & Microcontrollers, and explain the Architecture of 8051 Microcontroller	L1,L2
18EC46.2	Able to Identify the various instructions, explain the operation performed by the instructions, stack and subroutines and write assembly language programmes. I/O port interfacing programmes	L1,L2

18EC46.3	Able to explain the working of 8051 On-chip peripherals like Interrupt system, Timers/Counters and Serial ports/ parallel ports and write 8051 Assembly language programs and C programs for their working.	L2
18EC46.4	Able to illustrate Interfacing of external memory ,simple switches, simple LEDs, ADC 0804, LCD and Stepper Motor to 8051, and write assembly programmes.	L2

CO-PO MAPPING 2021-2022

CO Number	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12		PSO1	PSO2
18EC46.1	2	1	1											2	
18EC46.2	2	2	1											2	1
18EC46.3	2	2	1											2	1
18EC46.4	2	2	2											2	1

CO-PO MAPPING JUSTIFICATION

18EC46	18EC46.1	PO1	2	Apply the knowledge of 8051 microcontroller for writing assembly programmes.
		PO2	1	Apply the basic knowledge of 8051 to analyze the programs
		PO3	1	Apply the basic knowledge of 8051 to solve simple problems.
	18EC46.2	PO1	2	Apply the knowledge of assembly and C programming of 8051 microcontroller for various embedded applications..
		PO2	2	Analyse the assembly and C programmes of 8051 microcontroller.
		PO3	1	Develop assembly and high level language programmes.
	18EC46.3	PO1	2	Apply knowledge of interrupts, timers/counters, serial I/O
		PO2	2	Analyze the problems by applying the programming knowledge.
		PO3	2	Develop programmes using on chip peripherals.
	18EC46.4	PO1	2	Apply the knowledge of 8051 programming for interfacing.
		PO2	2	Analyze the working of external devices interfaced to I/O ports
		PO3	2	Develop Interfacing programs

CO-PSO MAPPING JUSTIFICATION

15EC46	18EC46.1	PSO1	2	Graduates will be able to analyze the requirement of microcontroller in embedded systems.
	18EC46.2	PSO1	2	Graduates will be able to analyze the assembly language programs for designing an embedded system.
		PSO2	1	Graduates are able to provide solutions by identifying problems in assembly Languages programs,
	18EC46.3	PSO1	2	Graduates are able to analyze on-chip peripherals working & their requirements in embedded system design.
		PSO2	1	Graduates are able to identify problems of on-chip peripherals working and provide solutions by programming in assembly and C language.
	18EC46.4	PSO1	2	Graduates are able to interface input and Output devices to the Microcontroller and Write the interfacing programs.
		PSO2	1	Graduates are able to provide solutions, by identifying problems in connectivity of external devices to the microcontroller.

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DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

COURSE OBJECTIVES AND OUTCOMES-2019-20

Course Title : Python Application Programming **Course Code : 18EC646**

No. of Lecture Hrs./Week : 03 **Exam Hours : 03**

Total No. of Lecture Hrs. : 40 **Exam Marks : 80**

Prerequisites:

Course Learning Objectives

Course Learning Objectives: This course will enable students to:
1. Learn syntax & semantics and create functions in python.
2. Handle strings and files in python.
3. Understand Lists, Dictionaries and regular expressions in python .
4. Implement OOP concept in python

5. Build web services, Network & database programs in python

Course Outcomes

At the end of the course students should be able to:

CO Number	Course Outcomes	Cognitive Level
18EC646.1	Examine python syntax & semantics & be fluent in the use of python flow control and functions.	L1
18EC646.2	Demonstrate proficiency in handling strings and File systems	L2
18EC646.3	Create, run and manipulate python programs using core data structures like Lists, Dictionaries and regular expressions	L2
18EC646.4	Interpret the concepts of Object-Oriented programming as used in python	L2
18EC646.5	Implement exemplary applications related to network programming , web services and databases in python	L2

CO-PO MAPPING-2019-20

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12		PSO1	PSO2
18EC646.1	2	2			1									2	2
18EC646.2	2	2			1									2	2
18EC646.3	2	2			1									2	2
18EC646.4	2	2			1									2	2
18EC646.5	2	2												2	2

CO-PO MAPPING JUSTIFICATION

18EC646	18EC646.1	PO1	2	Apply the knowledge of fundamentals of engineering to understand python syntax and semantics
		PO2	2	Apply the knowledge to analyse flow control & functions in python
		PO5	1	Write the codes to solve questions in python and execute using Jupyter notebooks or other python compilers
	18EC646.2	PO1	2	Apply the knowledge of fundamentals of engineering in handling strings and file systems in python
		PO2	2	Apply the knowledge to analyze the problems on strings and files
		PO5	1	Write the codes to solve questions on strings and file systems in python and execute using Jupyter notebooks or other python compilers
	18EC646.3	PO1	2	Apply the knowledge fundamentals of Engineering to understand data structures in python
		PO2	2	Apply the knowledge to use the data structures for data analysis
		PO5	1	Write the codes to solve questions in python and execute using Jupyter notebooks or other python compilers
	18EC646.4	PO1		Apply the knowledge fundamentals of Engineering to interpret the OOPs concepts in python
		PO2		Apply the knowledge to analyse data analysis problems
		PO5		Write the codes to solve questions in python and execute using

				Jupyter notebooks or other python compilers
	18EC646.5	PO1		Apply the knowledge fundamentals of Engineering to understand networking , web services and databases
		PO2		Apply the knowledge to analyse the problems on networking, web services and databases
		PO5		Write the codes to solve questions on database, networking and web services using softwares like Mysql, python compilers and others

CO-PSO MAPPING JUSTIFICATION

18EC45	18EC646.1			
		PSO2	2	Graduates are able to create functions in python
	18EC646.2			
		PSO2	2	Graduates are able to handle strings and file systems in python
	18EC646.3			
		PSO2	2	Graduates will apply the knowledge to data structures in analyzing data
	18EC646.4	PSO2	2	Graduates are able to incorporate OOP concepts in software development
	18EC646.5	PSO2	2	Graduates are able to build databases with SQL and program simple networking applications

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DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

COURSE OBJECTIVES AND OUTCOMES 2021-22

B. E. (EC / TC) Choice Based Credit System (CBCS) and Outcome Based Education (OBE) SEMESTER – III			
DIGITAL SYSTEM DESIGN LABORATORY			
Laboratory Code	**18ECL38**	**IA Marks**	**40**
Number of Lecture Hours/Week	**02Hr Tutorial (Instructions) + 02 Hours Laboratory**	**Exam Mark**	**60**
		Exam Hour	**03**
CREDITS – 02			

Course objectives: This laboratory course enables students to get practical experience in design, realization and verification of

- Demorgan's Theorem, SOP, POS forms
- Full/Parallel Adders, Subtractors and Magnitude Comparator
- Multiplexer using logicgates
- Demultiplexers and Decoders
- Flip-Flops, Shift registers and Counters.

Course Outcomes

At the end of the course students should be able to:

CO Number	Course Outcomes	Cognitive Level
18ECL38.1	Verification of the truth table of various expressions and combinational circuits using logic gates.	L1,L2
18ECL38.2	Design various combinational circuits such as adders, subtractors, comparators, multiplexers and demultiplexers.	L2,L3
18ECL38.3	Construct flips-flops, counters and shift registers.	L2,L3
18ECL38.4	Simulate Serial adder and Binary Multiplier.	L2,L3

CO-PO MAPPING-2020

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12		PSO1	PSO
18ECL38.1	3	3												2	
18ECL38.2	3	3												2	
18ECL38.3	3	3												2	
18ECL38.4	3	2												2	

CO-PO MAPPING JUSTIFICATION

18ECL38	18ECL38.1	**PO1**	3	Apply knowledge of simplification techniques like K-Map & Quine-McClusky to solve digital Boolean functions.
		PO2	3	Solved Switching equations were designed & implemented using only universal gates.
	18ECL38.2	**PO1**	3	Design all combinational devices (like decoder, encoder)
		PO2	3	Analyse & Implement Mux and Demux's of different size.
	18ECL38.3	**PO1**	3	Analyze working concepts of Flip-Flops & Latches with excitation table.
		PO2	3	Analyze & design counters and shift registers. Verify the truth table..
	18ECL38.4	**PO1**	3	Apply the fundamental knowledge for r the implementation of circuits such as Serial adder.
		PO2	2	Analyze engineering problems and simulate complex circuits like Serial adder and Binary Multiplier

CO-PSO MAPPING JUSTIFICATION

18ECL38	18ECL38.1	**PSO1**	2	Graduates will have the ability to solve & design Boolean equation using simplification techniques and with minimum gates.
	18ECL38.2	**PSO1**	2	Graduates will gain the knowledge of basic digital electronic concepts to design all combinational logic devices
	18ECL38.3	**PSO1**	2	Seeking the knowledge of basic digital electronic concepts of Flip-Flops & latches graduates will be able to design & implement counters & registers.
	18ECL38.4	**PSO1**	2	Graduates will have an ability to analyze & design Serial adder and Binary Multiplier

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DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

COURSE OBJECTIVES AND OUTCOMES-2021-22

Course Title : Verilog HDL | **Course Code : 18EC56**

No. of Lecture Hrs./Week : 04 | **Exam Hours : 03**

Total No. of Lecture Hrs. : 50 | **Exam Marks : 80**

Prerequisites

1. Knowledge of Digital circuits.
2. Knowledge of C Programming language.

Course Outcomes

At the end of the course students should be able to:

CO Number	Course Outcomes	Cognitive Level
18EC56.1	Understanding the necessity of verilog HDL for digital design & design methodologies	L1, L2
18EC56.2	Learning basic concepts of verilog HDL.	L1, L2
18EC56.3	ability to choose different modeling styles, for digital system design..	L2
18EC56.4	Understand the concept of logic synthesis and its impact in verification of digital design.	L2

CO-PO MAPPING

CO Number	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
18EC56.1	2	1											2	1
18EC56.2	2	1			2								1	2
18EC56.3	2	2	1		1								1	2
18EC56.4	2	1	1		1								1	2

PO 1 Engineering knowledge
PO 2 Problem analysis
PO 3 Design/development of solutions
PO 4 Conduct investigations of complex problems
PO 5 Modern tool usage
PO 6 The engineer and society
PO 7 Environment and sustainability
PO 8 Ethics
PO 9 Individual and team work
PO 10 Communication
PO 11 Project management and finance
PO 12 Life-long learning

CO-PO MAPPING JUSTIFICATION

18EC56	18EC56.1	PO1	2	Graduates will be able to apply the knowledge of HDL for digital design.
		PO2	1	Graduates will be able to analyze the design of digital circuits.
	18EC56.2	PO1	2	Graduate will be able to aopply the concepts of verilog HDL for digital system design.
		PO2	1	Graduates will be able to identify the problems in designs.
		PO5	2	Graduates will be able to design and simulate the designs using modern tools.
	18EC56.3	PO1	2	Graduates will be able to write verilog code in different modeling styles for designing digital circuit.
		PO2	2	Graduates will be able to choose a modeling style for a given problem.
		PO3	1	Graduate will be able to write program in different styles
		PO5	1	Graduates will be abke to simulate the design using tools
	18EC56.4	PO1	2	Graduates will be able to apply the knowledge of logic synthesis in design verification
		PO2	1	Graduates will be able to analyze the synthesized netlist.
		PO3	1	Graduates will be able to write verilog code for digital circuit which can be synthesized.
		PO5	1	Graduates will be able to synthesize the design using tools

PSO 1: Professional Skills: Graduates are able to analyze and design systems in the fields related to Digital signal processing, communication and networking, VLSI and embedded systems.

PSO 2 : Problem-Solving Skills: Graduates are able to identify problems in the areas of Signal processing, communication and embedded systems and provide efficient solutions using computational tools and algorithms individually or working in a team.

CO-PSO MAPPING JUSTIFICATION

15CS72	15CS72.1	PSO1	2	Graduates will be able to design digital circuits ,using verilog hdl.
		PSO2	1	Graduates will be able to identify the methodology that suits the design.
	15CS72.2	PSO1	1	Graduates will be to analyze and design simple digital circuit using basic concepts of verilog
		PSO2	2	Graduates will be able to identify the problems and solve it using basic concepts.
	15CS72.3	PSO1	1	Graduates will be able to analyze different modeling styles, in digital design
		PSO2	2	Graduates will be able to identify suitable modeling style for a given circuit.
	15CS72.4	PSO1	1	Graduates will be able to analyze the design of a digital circuit considering the constraints.
		PSO2	2	Graduates will be able to identify the problems in the design through verification of synthesized netlist.

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DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

COURSE OBJECTIVES AND OUTCOMES 2020-2021

Course Title : PYTHON PPLICATION PROGRAMMING **Course Code : 18EC646**

No. of Lecture Hrs./Week : 03 **Exam Hours : 03**

Total No. of Lecture Hrs. : 40 **Exam Marks : 80**

Prerequisites: Basics of C and C++ Languages.

Course Learning Objectives:

1. Learn syntax and semantics and create functions in python.
2. Handle strings and files in python.
3. Understand lists, Dictionaries and Regular expressions in python.
4. Implement OOP concepts in python.
5. Build web services, Network and Database programs in python.

Course Outcomes

At the end of the course students should be able to:

CO Number	Course Outcomes	Cognitive Level
18EC646.1	Examine python syntax and semantics and be fluent in the use of python flow control and functions.	L1
18EC646.2	Demonstrate proficiency in handling strings and file systems	L2
18EC646.3	Able to create, run and manipulate python programs using core data structures like Lists, Dictionaries and regular expressions.	L2
18EC646.4	Able to interpret the concepts of Object-Oriented programming as used in python.	L2
18EC646.5	Implement exemplary applications related to network programming , web services and databases in python	L2

CO-PO MAPPING-2020-2021

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12		PSO1	PSO2
18EC646.1	2	2			1										2
18EC646.2	2	2			1										2
18EC646.3	2	2			1										2
18EC646.4	2	2			1										2
18EC646.5	2	2			1										2

CO-PO MAPPING JUSTIFICATION

18EC646	18EC646.1	PO1	2	Apply the knowledge of fundamentals of engineering to understand python syntax and semantics.
		PO2	2	Apply the knowledge of analyze flow control and functions in python.
		PO5	1	Write the codes to solve question in python and execute using Jupiter notebooks or other python compilers.
	18EC646.2	PO1	2	Apply the knowledge of fundamentals of engineering in handling strings and file systems in python.
		PO2	2	Apply the knowledge of analyze the problems on strings and files.
		PO5	1	Write the codes to solve questions on strings and file systems in python and execute using Jupiter notebooks or other python compilers.
	18EC646.3	PO1	2	Apply the knowledge of fundamentals of engineering to understand data structures in python.
		PO2	2	Apply the knowledge to use data structures for data analysis.
		PO5	1	Write the codes to solve questions in python and execute using Jupiter notebooks or other python compilers.
	18EC646.4	PO1	2	Apply the knowledge of fundamentals of engineering to interpret the OOPs concepts in python.
		PO2	2	Apply the knowledge to analyse data analysis problems.
		PO5	1	Write the codes to solve questions in python and execute using Jupiter notebooks or other python compilers
	18EC646.5	PO1	2	Apply the knowledge of fundamentals of engineering to understand networking, web services and databases.
		PO2	2	Apply the knowledge to analyse the problems on networking, web services and databases.
		PO5	1	Write the codes to solve questions in python and execute using Jupiter notebooks or other python compilers

CO-PSO MAPPING JUSTIFICATION

18EC646	18EC646.1	**PSO2**	**2**	Graduates are able to create functions in python.
	18EC646.2	**PSO2**	**2**	Graduates are able to handle strings and file systems in python.
	18EC646.3	**PSO2**	**2**	Graduates will apply the knowledge to data structures in analyzing the data.
	18EC646.4	**PSO2**	**2**	Graduates are able to incorporate OOP concepts in software development.
	18EC646.5	**PSO2**	**2**	Graduates are able to build database with SQL and program simple networking applications.

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DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

COURSE OBJECTIVES AND OUTCOMES-2020-2021

Course Title : Engineering Statistics and Linear Algebra **Course Code : 18EC44**

No. of Lecture Hrs./Week : 04 **Exam Hours : 03**

Total No. of Lecture Hrs. : 40 **Exam Marks : 80**

Prerequisites

1. Fundamentals of Probability theory

2. Basics of matrix Algebra

Course Learning Objectives

This course will help students to achieve the following objectives:

•Understand and analyze Single and Multiple Random variables, and their extension to Random Variables

• Familiarization with the concept of Vector spaces and orthogonality with a qualitative insight into applications in communication.

• Compute the quantitative parameters for functions of Single and Multiple Random Variables and Processes.

• Compute the quantitative parameters for Matrices and Linear Transformations.

Course Outcomes

At the end of the course students should be able to:

CO Number	Course Outcomes	Cognitive Level
18EC44.1	Identify and define the distribution and density function of random variables for different applications.	L1, L2
18EC44.2	Compute the density and distribution function for discrete and continuous random variable and to evaluate the statistical parameters.	L1, L2
18EC44.3	Associate the random process for communication application	L1, L2
18EC44.4	Model typical signal sets in terms of a basis function set of signal parameters	L1, L2
18EC44.5	Computation of Eigen Values and Eigen vector of matrices	L1, L2

CO-PO MAPPING-2019-20

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12		PSO1	PSO2
18EC44.1	2	2												1	1
18EC44.2	2	2												1	1
18EC44.3	2													1	
18EC44.4	3	2												1	1
18EC44.5	2	1												1	1

CO-PO MAPPING JUSTIFICATION

18EC44	18EC44.1	PO1	2	The concept of probability density function and cumulative distribution function is applied in various real worlds engineering problems.
		PO2	2	The knowledge of probability to distributions like uniform distribution, poison distribution and Binomial distribution in real time applications
	18EC44.2	PO1	2	Comparison of two parameters to know the advantage of one with respect to other using correlation function
		PO2	2	Statistical parameter evaluation of bivariant variables
	18EC44.3	PO1	2	Apply the knowledge of Random variables to study random processes for communication applications
	18EC44.4	PO1	2	To Model signal sets in terms of vector spaces and subspaces
		PO2	2	Familiarization of Orthogonal Vectors for insight into communication applications
	18EC44.5	PO1	2	Computing of Quantitative parameters for Determinants
		PO2	1	Demonstrate simulation of analysis employing Eigen values and Eigen vectors

CO-PSO MAPPING JUSTIFICATION

18EC44	18EC44.1	PSO1	1	Analyze and design single random variable like thermal noise and in signals and system
		PSO2	1	Are able to identify the problems in communication system
	18EC44.2	PSO1	1	Multivariant random variable can be analyzed
		PSO2	1	Are able to identify the problems in communication system related to multivariable
	18EC44.3	PSO1	1	Random process existing in communication process can be analyzed
	18EC44.4	PSO1	1	The Vector spaces and orthogonality concepts are used in solving linear equations
		PSO2	1	Gram – Schmidt orthogonalization procedure can be used to analyze linear dependence of vectors
	18EC44.4	PSO1	1	Properties of determinants are used in knowing how linear transformation change area and volume by changing the variable
		PSO2	1	Eigen values and vectors can be used to determine the theoretical limit of how much information can be transmitted through a communication system

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Program outcomes:

1. **Engineering knowledge:** Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution Of complex engineering problems.

2. **Problem analysis: Identify,** formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.

3. **Design/development of solutions**: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.

4. **Conduct investigations of complex problems:** Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.

5. **Modern tool usage:** Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.

6. **The engineer and society:** Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.

7. **Environment and sustainability:** Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.

8. **Ethics:** Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.

9. **Individual and team work:** Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

10. **Communication**: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.

11. **Project management and finance**: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.

12. **Life-long learning:** Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change

Program Specific Objectives:

PSO1: Professional Skills: Graduates are able to analyze and design systems in the fields related to Digital signal processing, communication and networking, VLSI and embedded systems

PSO2: Problem-Solving Skills: Graduates are able to identify problems in the areas of Signal processing, communication and embedded systems and provide efficient solutions using computational tools and algorithms individually or working in a team.

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DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERI

COURSE OBJECTIVES AND OUTCOMES-2021-22

Course Title : EMBEDDED SYSTEMS **Course Code : 18EC62**

No. of Lecture Hrs./Week : 03+2(tutorial) **Exam Hours : 03**

Total No. of Lecture Hrs. : 50 (10 hrs/module) **SEE Marks : 60**

Prerequisites

1. Should have basic knowledge of Micro controller
2. Should have knowledge of Operating System
3. Should have knowledge of C Programming

Course Learning Objectives

This course will help students to achieve the following objectives:

1. Explain the architectural features and instruction set of 32 bit microcontroller ARM Cortex M3.
2. Ability to write the programs using the various instructions of ARM Cortex M3 and language for different applications.
3. Understand the basic hardware components and their selection method based on the characteristics and attributes of an embedded system.
4. Able to co-design the hardware, software and firmware design approaches.
5. Explain the need of real time operating system for embedded system application.

Course Outcome At the end of the course Student should **able to** :

CO Number	Course Outcomes	Cognitive Level
18EC62.1	Understand the features of ARM Cortex M3 & its instructions.	L2
18EC62.2	Write the programs using various instructions of ARM Cortex M3 and C language for different applications.	L2
18EC62.3	Understand the basic hardware components required for an embedded system	L2
18EC62.4	Understand the hardware ,software co-design, firmware design approaches and need of real time operating system for embedded system applications	L2

CO Number	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
18EC62.1	2												2	
18EC622	2	2	2										2	1
18EC62.3	2	2	1										2	
18EC62.4	2	2	1			1						1	2	1

CO-PO MAPPING JUSTIFICATION

18EC62	18EC62.1	PO1	2	Understand the knowledge of ARM CORTEX M3 architecture and instructions for writing programs.
	18EC62.2	PO1	2	Learn the concepts of assembly and C programming of ARM CORTEX-M3 microcontroller for various embedded applications..
		PO2	2	Analyse the assembly and C programmes of ARM CORTEX-M3 microcontroller.
		PO3	2	Uses assembly and high level languages in programmes.
	18EC62.3	PO1	2	Understands the basic hardware components for an embedded system
		PO2	2	Analyzes the embedded system design.
		PO3	1	Designing of simple embedded system.
		PO1	2	Understand hardware /software co-design and firmware design approaches.

	18EC62.4	**PO2**	**2**	Study the working of real time systems
		PO3	**1**	Use the knowledge of hardware and software co-design for designing Embedded system
		PO6	**1**	Apply design knowledge for embedded systems
		PO12	**1**	Able to understand the technological changes

CO-PSO MAPPING JUSTIFICATION

18EC62	18EC62.1	**PSO1**	**2**	Able to analyze Architecture & features of ARM processors
	18EC62.2	**PSO1**	**2**	Able to analyze & design simple applications for ARM processors & CORTEX-M3 microcontroller.
		PSO2	**1**	Able to identify problems in programming and provide efficient solutions.
	18EC62.3	**PSO1**	**2**	Able to analyze the basic hardware components required for an embedded system
	18EC62.4	**PSO1**	**2**	Able to analyze hardware ,software co-design and firmware design approaches for different embedded application.
		PSO2	**1**	Able to identify problems and provide efficient solutions. in embedded systems

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DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

COURSE OBJECTIVES AND OUTCOMES-2021-2022

Course Title : Embedded controller Lab | **Course Code : 18ECL66**

No. of Lecture Hrs./Week : 03 | **Exam Hours : 03**

Exam Marks : 60

Prerequisites

1. Microcontroller Architecture.
2. Assembly and C programming

Course objectives: This course will enable students to:
1. Understand the software tool Keil µvision4 required for programming in C language , for different applications.

2. Study the assembly language Programs using ARM Cortex M3 instructions.

3.Write C language programs using library functions for embedded system Applications.

4. Interface external devices and I/O with ARM Cortex M3

Course Outcomes : At the end of the course students should be

CO Number	Course Outcomes	Cognitive Level
18ECL66.1	Understand the instruction set of 32 bit microcontroller and Able to use software tool Keil µvision4 and demonstrate C programs.	L2
18ECL66.2	Able to understand and demonstrate the assembly language Programs using ARM Cortex M3 instructions.	L2
18ECL66.3	Write C language programs using library functions and demonstrate the working of embedded system applications.	L2
18ECL66.4	Able to interface external devices and perform I/O with ARM Cortex M3.	L2

CO-PO MAPPING-2021-22

CO Number	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12		PSO1	PSO2
18ECL66.1	2	2			1									2	1
18ECL66.2	2	2												2	1
18ECL66.3	2	2												2	1
18ECL66.4	2	1												1	

CO-PO MAPPING JUSTIFICATION

18ECL66	18ECL66.1	PO1	2	Apply the knowledge of C programming language ,to write C programmes.
		PO2	2	Analyze the C Programmes.
		PO5	1	Apply knowledge of software tool keil µvision4,for different interface applications.
	18ECL66.2	PO1	2	Apply the knowledge of Assembly Language program for Embedded applications.
		PO2	2	Analyze Embedded system application Program in assembly language.
	18ECL66.3	PO1	2	Apply knowledge of C programming ,to develop programs for embedded applications.
		PO2	2	Applying the C programming knowledge,to analyse the problems of Embedded applications.
	18ECL66.4	PO1	2	Apply the knowledge of microcontroller Programming to Interface external devices and I/O.
		PO2	1	Analyze the working of I/O devices, interfaced with the controller.

CO-PSO MAPPING JUSTIFICATION

	18ECL66.1	PSO1	2	Graduates are able to analyze the working of C programmes using the software tool.
		PSO2	1	Graduates are able to identify the problems in C programmes and solve it.
	18ECL66.2	PSO1	2	Graduates are able to analyze the interfacing of external devices with ARM cortex M3 controller.
		PSO2	1	Graduates are able to identify the problems in data transfer between the peripherals and the controller and solve it.
	18ECL66.3	PSO1	2	Graduates are able to write and analyze C language programs for interfacing external devices to the controller.
		PSO2	1	Graduates are able to design Embedded system and analyze their performance .
	18ECL66.4	PSO1	1	Graduates are able to apply the knowledge of assembly language for embedded system development.

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DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

COURSE OBJECTIVES AND OUTCOMES-2021-2022

Course Title : SENSORS & SIGNAL CONDITIONING **Course Code : 18EC652**

No. of Lecture Hrs./Week : 03 **Exam Hours : 03**

Total No. of Lecture Hrs. : 50 **Exam Marks : 60**

Prerequisites

1. Basics of Physics
2. Basic Electronics

Course Learning Objectives

This course will enable students to

- Understand various technologies associated in manufacturing of sensors.
- Acquire knowledge about types of sensors used in modern digital systems.
- Get acquainted about material properties required to make sensors.

COURSE OUTCOMES

At the end of the course, students should be

CO Number	Course Outcomes	Cognitive Level
18EC652.1	Understand the properties of sensor materials, micro-sensor technology and signal conditioning process.	L1,L2
18EC652.2	Identify the sensors based on the electrical properties (Resistive and Reactive).	L1,L2
18EC652.3	Distinguish the self-generating sensors based on the material properties and energy conversions.	L2
18EC652.4	Illustrate the principle of operation of different digital sensors and sensors based on semiconductor junctions.	L2

CO-PO MAPPING 2021-2022

CO Number	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12		PSO1	PSO2	PSO3
18EC652.1	3		0									0			2	
18EC652.2	3		2									1			2	
18EC652.3	3		2									1			2	
18EC652.4	3		2									1			2	

CO-PO MAPPING JUSTIFICATION

18EC652	18EC652.1	PO1	3	Apply the knowledge of science for the development of sensor technology
	18EC652.2	PO1	3	Apply the knowledge of electrical properties to identify the sensors
		PO3	2	To develop solutions using Resistive sensors for public health and safety, and environmental considerations.
		PO12	1	Identify the need for resistive and reactive sensors in the wider technological changes.
	18EC652.3	PO1	3	Apply the knowledge of material properties and energy conversions to categorize the self-generating sensors
		PO3	2	To develop solutions using electrochemical sensors for public health and safety, and environmental considerations.
		PO12	1	Identify the need for self-generating sensors in the wider technological changes.
	18EC652.4	PO1	3	Apply the knowledge of semiconductor and digital principles for understanding the operation of sensors
		PO3	2	To develop solutions using semiconductor sensors for public health and safety, and environmental considerations.
		PO12	1	Identify the need for digital and semiconductor sensors in the wider technological changes.

CO-PSO MAPPING JUSTIFICATION

18EC652	18EC652.1	**PSO2**	**2**	Able to solve real world problems with technological concepts in the growing arena of sensor technology
	18EC652.2	**PSO2**	**2**	Able to solve real world problems with technological concepts of the Resistive and Reactive sensors.
	18EC652.3	**PSO2**	**2**	Able to solve real world problems with technological concepts of self-generating sensors .
	18EC652.4	**PSO2**	**2**	Able to solve real world problems with technological concepts of the digital and semiconductor sensors.

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DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

COURSE OBJECTIVES AND OUTCOMES-2021-22

Course Title : Digital Communication | **Course Code : 18EC61**

No. of Lecture Hrs./Week : 3+2 | **Exam Hours : 03**

Total No. of Lecture Hrs. : 50 | **Exam Marks : 100**

Prerequisites

1. Principles of Communication Systems
2. Information Theory & Coding
3. Engineering Mathematics

Course Learning Objectives

This course will help students to achieve the following objectives:

- Understand the mathematical representation of signal, symbol, noise and channels.
- Apply the concept of signal conversion to symbols and signal processing in transmitter and receiver functional blocks.
- Perform the mathematical analysis for transmitters and receivers of different digital modulation techniques.
- Understand the design principles for the transmission of signals through band limited channels
- Understand the principle of spread spectrum and its applications

Course Outcomes

At the end of the course students should be able to

CO Number	Course Outcomes	Cognitive Level
18EC61.1	Describe the concepts of bandpass signals related to digital modulation techniques using mathematical definitions and modelling.	L1,L2
18EC61.2	Define mathematical theory for signal representation and signal conversion to symbols in digital communication systems.	L1,L2
18EC61.3	Identify the coherent and noncoherent Digital Modulation Techniques and perform probability of error computations	L2,L3
18EC61.4	Identify the criteria and methods for distortionless signal transmission through bandlimited channels.	L2,L3
18EC61.5	Describe the principles, techniques, modulations schemes and applications in spread spectrum systems.	L2

CO-PO MAPPING

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12		PSO1	PSO2
18EC61.1	2	2												1	
18EC61.2	2	2												2	
18EC61.3	3	2												2	
18EC61.4	2	2												2	
18EC61.5	2	1												2	

CO-PO MAPPING JUSTIFICATION

18EC61	18EC61.1	PO1	2	Applying the knowledge of mathematics, science and engineering fundamentals in defining bandpass signals and digital modulation techniques.
		PO2	2	Formulate engineering problems associated with the digital communication systems and analyze the receiver performance using probability of bit error.
	18EC61.2	PO1	2	Applying the knowledge of mathematics, science and engineering fundamentals to represent a signal in to a vector space to model a receiver system in digital communication.
		PO2	2	Formulate engineering problems associated with the signal representation in vector spaces and to define detection theory.
	18EC61.3	PO1	3	Use mathematical models to define different types of digital

				modulation signals and derive the probability error expressions.
		PO2	2	Formulate engineering problems associated with the signal level in digital communication to attain required probability of error in additive white Gaussian channels.
	18EC61.4	PO1	2	Applying the knowledge of mathematics and engineering fundamentals to describe the transmission of signals through band limited channels.
		PO2	2	Formulate the transmission system models for distortion less baseband signal transmission.
	18EC61.5	PO1	2	Applying the knowledge of mathematics and engineering fundamentals to describe spread spectrum communication systems
		PO2	1	Identify the Spread spectrum applications in present day communication models.

CO-PSO MAPPING JUSTIFICATION

18EC61	18EC61.1	PSO1	1	Mathematical representation of band pass signals and systems used to describe digital modulation theory.
	18EC61.2	PSO1	2	Make use of mathematical theory for the signal estimation at communication receiver
	18EC61.3	PSO1	2	Ability to identify the specific digital modulation schemes for the required channel specifications
	18EC61.4	PSO1	2	Understands the signal shaping for baseband transmission of communication data without distortion.
	18EC61.5	PSO1	2	Studying about spread spectrum communication gives foundation for working with cellular communication.

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DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

COURSE OBJECTIVES AND OUTCOMES-2021

Course Title : BASIC ELECTRONICS & COMMUNICATION ENGINEERING
Course Code : 21ELN14/
No. of Lecture Hrs./Week : 05 **Exam Hours :** 03
Total No. of Lecture Hrs. : 40 (08 Hours / Module) **Exam Marks :** 100
Pre-requisites:

1. PN Junction
2. Amplifiers
3. Simple wireless network

Course Outcomes Expected

CO	At the end of the course the student will be able to	Levels
CO_1	Describe the concepts of electronic circuits encompassing power supplies, amplifiers and oscillators.	L2
CO_2	Present the basics of digital logic engineering including data representation, circuits and the microcontroller system with associated sensors and actuators.	L2
CO_3	Discuss the characteristics and technological advances of embedded systems.	L2
CO_4	Relate to the fundamentals of communication engineering spanning from the frequency spectrum to the various circuits involved including antennas.	L2
CO_5	Explain the different modes of communications from wired to wireless and the computing involved.	L2

CO –PO and CO –PSO Mapping

PO / CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO_1	2	2	-	-	-	-	-	-	-	-	-	1	2	1	-
CO_2	2	1	-	-	-	-	-	-	-	-	-	1	2	1	-
CO_3	2	-	-	-	-	-	-	-	-	-	-	1	2	1	-
CO4	2	-	-	-	-	-	-	-	-	-	-	1	2	1	-
CO5	2	-	-	-	-	-	-	-	-	-	-	1	2	1	-

CO-PO MAPPING JUSTIFICATION

CO	PO	Justification
CO1	PO1	Mapped moderately as all students will able to apply the knowledge of engineering for understanding the behavior of diodes, transistors, amplifiers and oscillators.
	PO2	Mapped moderately as all the students will be able to analyze the problems on voltage regulator, opamp parameter and oscillators.
	PO12	Mapped slightly as all the students will be able use modern engineering tool such as MULTISIM for analysis of voltage regulator and various applications of opamp.
CO_2	PO1	Mapped moderately as all students will able to apply the knowledge of engineering to understand the behaviors of various Logic circuits.
	PO2	Mapped slightly as all the students will be able to analyze the problems on data representation and types.
	PO12	Mapped slightly as all the students will be able use modern engineering tool such as MULTISIM for analysis the working of Flip-flops, registers and counters.
CO_3	PO1	Mapped moderately as all students will able to apply the knowledge of engineering for understanding the applications are of embedded system.
	PO12	Mapped slightly as all the students will be able use modern engineering tool such as MULTISIM for simple embedded applications.
CO_4	PO1	Mapped moderately as all students will able to apply the knowledge of engineering for understanding the analog and digital applications.
	PO12	Mapped slightly as all the students will be able use modern engineering tool such as MULTISIM for modulation and demodulation techniques.
CO5	PO1	Mapped moderately as all students will able to apply the knowledge of engineering for understanding different wireless network and communication systems.
	PO12	Mapped slightly as all the students will be able to learn the technological advances in cellular generation.

CO-PSO MAPPING JUSTIFICATION

CO	PSO	Justification
CO_1	PSO_1	Students will be able to analyze the source requirement for operating any devices within specific parameters like voltage, current and power.
	PSO_2	Students will be able to apply the knowledge to convert AC voltage to DC voltage while designing electronic devices.
CO_2	PSO_1	Students will be able to understand number system format used in the application to implement logic using appropriate circuits.
	PSO_2	Students will be able to apply the knowledge of logic devices while designing digital electronics circuits
CO_3	PSO_1	Students will be able to apply the knowledge of different communication interfaces to identify and to establish the embedded connection.
	PSO_2	Students will be able to apply the knowledge of communication interfaces to establish their carrier in embedded industries.
CO_4	PSO_1	Students will be able to apply the knowledge of error management to detect and correct the information data in modern communication system.
	PSO_2	Students will be able to understand multiplexing concepts in real time communication.
CO5	PSO_1	Students will be able to understand concept of cellular network to solve the signal interface problem.
	PSO_2	Students will be able to apply the knowledge of wireless communication in order ro design a sustainable network.

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DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

COURSE OBJECTIVES AND OUTCOMES 2021-2022

Course Title : Wireless and Cellular Communication **Course Code :** 18EC81

No. of Lecture Hrs./Week : 03 **Exam Hours : 03**

Total No. of Lecture Hrs. : 50 **Exam Marks : 60**

Prerequisites:

1. Principles of Communication system.
2. Computer communication networks.

Course Learning Objectives

- Understand concepts of propagation over wireless channels from a physical standpoint.

- Application of Communication theory both physical and networking to understand GSM systems that handle mobile telephony.

- Application of Communication theory both physical and networking to understand CDMA systems that handle mobile telephony.

- Application of Communication theory both physical and networking to understand LTE-4G systems .

	18EC81.3	PO1	2	Graduates are able to understand CDMA technology.
		PO6	3	Continuous improvements of CDMA technology can be implemented in wireless communication.
		PO12	2	Graduates are able to identify the developments in CDMA.
	18EC81.4	PO1	3	Improvement in the knowledge of LTE and OFDMA.
		PO6	3	Continuous development of LTE technology can be implemented in wireless communication..
		PO12	2	Improve the knowledge of uplink and downlink radio resources.

CO-PSO MAPPING JUSTIFICATION

18EC81	18EC81.1	PSO1	2	Graduates are able to analyse the wireless communication system.
		PSO2	1	Graduates are able to analyse the problems of propagation in communication system.
	18EC81.2	PSO1	2	Graduates are able to analyse the GSM applications in wireless communication system.
		PSO2	1	Graduates are able to identify the changes in GSM architecture.
	18EC81.3	PSO1	2	Graduates are able to analyse the CDMA applications in wireless communication system.
		PSO2	1	Graduates are able to identify the types of CDMA.
	18EC81.4	PSO1	2	Graduates are able to analyse the uses of LTE in wireless communication system.
		PSO2	1	Graduates are able to understand the radio resource management.

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DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

COURSE OBJECTIVES AND OUTCOMES-2022

Course Title : Fiber Optics and Networks **Course Code : 17EC82**

No. of Lecture Hrs./Week : 04 **Exam Hours : 03**

Total No. of Lecture Hrs. : 50(10 hours/module) **SEE Marks : 60**

Prerequisites

1. Should have knowledge of Electromagnetic spectrum used for radio and optical fiber communication
2. Should have knowledge of solid state devices

Course Learning Objectives

This course will help students to achieve the following objectives:

1. Understand the basic principle of optical fiber communication with different modes of light propagation.
2. Understand the transmission characteristics and losses in optical fiber.
3. Study of optical components and its applications in optical communication networks.
4. Learn the network standards in optical fiber and understand the network architectures along with its functionalities.

Course Outcome At the end of the course Student should:

CO	Course Outcomes	Cognitive Level
17EC82.1	Understand the working principle of optical propagation, different modes of signal propagation, transmission characteristics and losses in optical fiber communication.	L2
17EC82.2	Understand the working principle of optical fiber connectors, constructional features and the characteristics of optical sources, detectors and receivers.	L2
17EC82.3	Understand the concepts of WDM and learn different types of optical amplifiers.	L2
17EC82.4	Understand the networking concepts of optical fiber and different standards associated with it.	L2

CO-PO MAPPING-2021

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12		PSO1	PSO2
17EC82.1	3	1										1		2	
17EC82.2	2	1										1		2	
17EC82.3	2	2										1		2	
17EC82.4	2	1	1									1		2	

CO-PO MAPPING JUSTIFICATION

17EC82	17EC82.1	PO1	3	Apply the knowledge of mathematics, science, engineering fundamentals for ray theory, electromagnetic mode theory and to find transmission characteristics and losses in optical fiber communication.
	17EC82.1	PO2	1	Analysis of losses that occurs during the optical communication and finding a solution to reduce attenuation.
	17EC82.1	PO12	1	Life-long learning in the broadest context of technological change
	17EC82.2	PO1	1	Apply the knowledge of mathematics, science, engineering fundamentals for construction of optical sources, detectors and receivers
	17EC82.2	PO2	1	Analyze the working features of optical sources, detectors and receivers, also regarding the connectors.
	17EC82.2	PO12	1	Recognize the need for, and have the preparation and ability to engage in independent and life-long learning
	17EC82.3	PO1	2	Apply the knowledge of sciences and engineering fundamentals to learn the concepts of optical amplifiers and WDM.
	17EC82.3	PO2	2	Analyze the concepts of WDM and its operation using first principles of mathematics and engineering sciences.
	17EC82.3	PO12	2	Learn about wavelength division for optical communication
	17EC82.4	PO1	2	Apply the knowledge of engineering fundamentals for knowing different Optical network transmission modes, layers and protocols and Optical switching networks
	17EC82.4	PO2	1	Analyze the different optical networking structures using engineering sciences
	17EC82.4		1	By knowing the concepts of networking student can

		PO3		apply techniques to increase speed, scalability, parallelism and the low-power requirement
	17EC82.4	PO12	1	Networking concepts can be updated better.

CO-PSO MAPPING JUSTIFICATION

17EC82	17EC82.1	PSO1	2	Optical system requires devices which can handle both analog and digital information and compare the performance of various optical transmission schemes.
	17EC82.2	PSO1	2	To Students gains the ability to identify, formulate and analyze engineering problem
	17EC82.3	PSO1	2	Students will get idea about wavelength division for optical communication
	17EC82.4	PSO1	2	Students get idea of different communication techniques

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Program Outcomes (POs)

At the end of the B.E program, students are expected to have developed the following outcomes.
1.**Engineering Knowledge:** Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.

2.**Problem analysis:** Identify, formulate, research literature, and analyse complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.

3.**Design/development of solutions:** Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.

4.**Conduct investigations of complex problems:** Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.

5.**Modern Tool Usage:** Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modelling to complex engineering activities with an understanding of the limitations.

6.**The Engineer and Society:** Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal, and cultural issues and the consequent responsibilities relevant to the professional engineering practice.

7.**Environment and Sustainability:** Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of need for sustainable development.

8.**Ethics:** Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.

9. **Individual and Team Work:** Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

10.**Communication:** Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.

11.**Project Management and Finance:** Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.

12.**Life-long learning:** Recognise the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change

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DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

COURSE OBJECTIVES AND OUTCOMES-2022

Course Title : Micro Electro Mechanical Systems	**Course Code : 15EC822 / 17EC831,18EC822** SEE: **80:20 , 60:40**
No. of Lecture Hrs./Week : 03	**Exam Hours : 03**
Total No. of Lecture Hrs. : 40	**Exam Marks : 80, 60**

Prerequisites

1. Analog Electronics15EC32, Electronic Instrumentation 15EC35 , Linear Integrated Circuits 15EC46 ,VLSI Design

Course Learning Objectives

The objective of this course is to make students to

1. Gain basic knowledge on overview of MEMS (Micro electro Mechanical System) and various fabrication techniques.
2. This enables them to design, analysis, fabrication and testing the MEMS based components.
3. To introduce the students various opportunities in the emerging field of MEMS

Course Outcomes 15EC831/ 17EC831 (60: 40 Scheme)

At the end of the course students should be able to:

CO Number	Course Outcomes	Cognitive Level
15EC831 .1	Students will be able to Understand the technologies related to Micro Electro Mechanical Systems.	L1 ,L2
15EC831 .2	Students will be able to understand the design and fabrication processes involved with MEMS devices	L1,L2
15EC831 .3	Students will be able to analyze the MEMS devices and develop suitable mathematical models	L1,L2,L3
15EC831 .4	Students Will understand various application areas for MEMS device	L1,L2,L3

CO-PO MAPPING-2022

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO1 0	PO1 1	PO1 2	PSO 1	PSO 2
15EC831 .1	3												3	
15EC831 .2		3	3											3
15EC831 .3			2											3
15EC831 .4			2											3

CO-PO MAPPING JUSTIFICATION

15EC831 /17EC831	15EC831 .1	PO1	3	Understand the knowledge of fundamentals MEMS and Microsystems and Multidisciplinary Nature of Microsystems,.
	15EC831 .2	PO2	3	Identifies engineering problem in Micro sensors, Micro actuation, Microaccelerometer and Micro fluidics
		PO3	3	Perform basic design solutions in Molecular Theory of Matter and Inter- molecular Forces, Plasma Physics andElectrochemistry.
	115EC831 .3	PO3	2	Apply knowledge on the design in Engineering Mechanics for Microsystems and design solution in Rigid-Body Dynamics, Electrostatic Forces, Fluid Mechanics and Heat Transfer.
	115EC831 .4	PO3	2	Apply Knowledge for Design Process in LIGAProcess, SurfaceMicromachining and Micromanufacturing.

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Course Outcomes for 18EC 822 (80: 20 Scheme)

At the end of the course students should be able to:

CO Number	Course Outcomes	Cognitive Level
18EC822.1	Students will be able to Understand the technologies related to Micro Electro Mechanical Systems.	L1 ,L2
18EC822.2	Students will be able to understand the design and fabrication processes involved with MEMS devices	L1,L2
18EC822.3	Students will be able to analyze the MEMS devices and develop suitable mathematical models	L1,L2,L3
18EC822.4	Students Will understand various application areas for MEMS device	L1,L2,L3

CO-PO MAPPING-2022-

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO1 0	PO1 1	PO1 2	PSO 1	PSO 2
15/ EC831.1	3												3	
15/ EC831.2		3	3											3
15 /EC831. 3			2											3
15/ EC831. 4			2											3

CO-PO MAPPING JUSTIFICATION

18EC822	18EC822. 1	PO1	3	Understand the knowledge of fundamentals MEMS and Microsystems and Multidisciplinary Nature of Microsystems,.
	18EC822. 2	PO2	3	Identifies engineering problem in Micro sensors, Micro actuation, Microaccelerometer and Micro fluidics
		PO3	3	Perform basic design solutions in Molecular Theory of Matter and Inter- molecular Forces, Plasma Physics andElectrochemistry.
	18EC822. 3	PO3	2	Apply knowledge on the design in Engineering Mechanics for Microsystems and design solution in Rigid-Body Dynamics, Electrostatic Forces, Fluid Mechanics and Heat Transfer.
	18EC822. 4	PO3	2	Apply Knowledge for Design Process in LIGAProcess, SurfaceMicromachining and Micromanufacturing.

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Adichunchanagiri Institute of Technology, Chikkamagaluru

DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

COURSE OBJECTIVES AND OUTCOMES-2020

Course Title : Radar Engineering | **Course Code : 18EC823**

No. of Lecture Hrs./Week : 03 | **Exam Hours : 03**

Total No. of Lecture Hrs. : 40 (8 Hours / Module) | **Exam Marks : 60**

Prerequisites

1. Microwave and Antennas (18EC63)

Course Learning Objectives

This course will help students to achieve the following objectives:

1. Understand the Radar fundamentals and analyze the radar signals.
2. Understand the basic radar equation and its dependence on various parameters
3. Understand the working principle of MTI Radar, Pulse Doppler Radar and Digital MTI Processing
4. Understand Tracking with Radar and Sequential Lobing
5. Understand the function of Radar Antenna and its parameters

Course Outcomes

At the end of the course students should be able to:

CO Number	Course Outcomes	Cognitive Level
18EC823.1	Compute the performance parameter of a basic Radar system	L2
18EC823.2	Classify the types of Radar based on their application	L2
18EC823.3	Illustrate the tracking mechanism in Radar systems and compare.	L2
18EC823.4	Identify the antennas used in Radar systems and compute performance parameters	L2

CO-PO MAPPING: 2021

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
18EC823.1	2	2	1										2	2
18EC823.2	2	2											2	2
18EC823.3	2	2											2	2
18EC823.4	2	2	2										2	2

CO-PO MAPPING JUSTIFICATION

18EC833	18EC823.1	PO1	2	Apply the knowledge of fundamentals of Radar & engineering
		PO2	2	Apply the knowledge to analyze the problem and design the Radar system.
		PO3	1	Design the radar system by considering the required essential parameters
	18EC823.2	PO1	2	Apply the knowledge of radar equation to detect the target object.
		PO2	2	Analyse the performance of a radar depending on different parameters.
	18EC823.3	PO1	2	Apply the knowledge of tracking to detect the target object.
		PO2	2	Analyze sequential lobbing technique for tracking.
	18EC823.4	PO1	2	Apply knowledge of different types of radar that can be used depending on the requirement.
		PO2	2	Analyze the working of different types of radar.
		PO3		Design the different stages of radar system.

CO-PSO MAPPING JUSTIFICATION

18EC823	18EC823.1	PSO1	2	Graduates will apply the knowledge of Radar fundamentals to detect target
		PSO2	2	Graduates are able to design radar system to solve the real world problems
	18EC823.2	PSO1	2	Graduates will apply the knowledge to analyze radar equation to detect the target object
		PSO2	2	Graduates are able to design a radar depending on different parameters
	18EC823.3	PSO1	2	Graduates will apply the knowledge of tracking to detect the target object.
		PSO2	2	Graduates will apply the knowledge to analyze sequential lobbing technique for tracking.
	18EC823.4	PSO1	2	Graduates will apply the knowledge of different types of radar that can be used depending on the requirement.
		PSO2	2	Graduates are able to design the different stages of radar system

Faculty In-charge Course Coordinator Module Coordinator IQAC Programme Coordinator

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DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

COURSE OBJECTIVES AND OUTCOMES-2022

Course Title : Signals and systems **Course Code :** 18EC45

No. of Lecture Hrs./Week : 03 **Exam Hours :** 03

Total No. of Lecture Hrs. : 40 (08 Hours / Module) **Exam Marks :** 60

Course Outcomes Expected

CO	At the end of the course the student will be able to	Levels
CO_1	Classification of signals and system with mathematical representation.	L2
CO_2	Illustrate LTI system for inputs unit step, rectangular, exponential etc.	L2
CO_3	Illustration of periodic and a periodic signals using Fourier representation.	L2
CO_4	Illustrate discrete time signals and system using Z transforms.	L2

CO –PO and CO –PSO Mapping

PO / CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO_1	3	1	-	-	2	-	-	-	-	-	-	-	3	1
CO_2	3	1	-	-	2	-	-	-	-	-	-	-	3	1
CO_3	3	1	-	-	2	-	-	-	-	-	-	-	3	1
CO4	3	1	-	-	2	-	-	-	-	-	-	-	3	1

CO-PO MAPPING JUSTIFICATION

PO / CO		Justification
CO_1	PO_1	Mapped substantially as all students will able to apply the knowledge of engineering for the classification of signals and systems.
	PO_2	Mapped slightly as all the students will be able to identify the usage of first principles of mathematics for classification signals and systems.
	PO5	Mapped moderately as all the students will be able use modern engineering tool such as MatLab for classification of signals and systems.
CO_2	PO_1	Mapped substantially as all the students will be able to apply the engineering knowledge to analysis of signal and system in time domain
	PO_2	Mapped slightly as all the students will be able to identify the usage of first principles of mathematics for the analysis of system and signals in time domain
	PO_5	Mapped moderately as all the students will be able use modern engineering tool such as MatLab for analysis of system and signals in time domain.
CO_3	PO_1	Mapped substantially as all students will able to apply the knowledge of engineering for analysis and synthesis of continuous time systems in transform domain
	PO_2	Mapped slightly as all the students will be able to identify the usage of first principles of mathematics for the analysis and synthesis of continuous time systems in transform domain
	PO_5	Mapped moderately as all the students will be able use modern engineering tool such as MatLab for the analysis and synthesis of continuous time systems in transform domain
CO_4	PO_1	Mapped substantially as all students will able to apply the knowledge of engineering for analysis and synthesis of discrete time systems in transform domain
	PO_2	Mapped slightly as all the students will be able to identify the usage of first principles of mathematics for the analysis and synthesis of discrete time systems in transform domain
	PO_5	Mapped moderately as all the students will be able use modern engineering tool such as MatLab for the analysis and synthesis of discrete time systems in transform domain.

CO-PSO MAPPING JUSTIFICATION

PSO / CO		Justification
CO_1	PSO_1	Mapped substantially as all students will able to analyze and design the systems in the fields related to digital signal processing and communication systems based on classification of signals.
	PSO_2	Mapped slightly as all students will able to identify the problems and sufficient solutions in the fields related to digital signal processing and communication systems based on

		classification of signals.
CO_2	PSO_1	Mapped substantially as all students will able to analyze and design the systems in the fields related to digital signal processing and communication systems based of signal and system in time domain
	PSO_2	Mapped slightly as all students will able to identify the problems and sufficient solutions in the fields related to digital signal processing and communication systems based on system and signals in time domain
CO_3	PSO_1	Mapped substantially as all students will able to analyze and design the systems in the fields related to digital signal processing and communication systems based on analysis and synthesis of continuous time systems in transform domain
	PSO_2	Mapped slightly as all students will able to identify the problems and sufficient solutions in the fields related to digital signal processing and communication systems based on analysis and synthesis of continuous time systems in transform domain
CO_4	PSO_1	Mapped substantially as all students will able to analyze and design the systems in the fields related to digital signal processing based on analysis and synthesis of discrete time systems in transform domain
	PSO_2	Mapped slightly as all students will able to identify the problems and sufficient solutions in the fields related to digital signal processing and communication systems based on analysis and synthesis of discrete time systems in transform domain

Faculty In-charge

1) (Dr. Harish M-S) 20/5/22.

2) (RAGHUKUMAR.B.S) 20/05/22

Module Coordinator 21/5/22

HOD

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DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

COURSE OBJECTIVES AND OUTCOMES 2021-2022

Course Title : ANALOG CIRCUITS LABORATORY | **Course Code : 18ECL48**

No. of Lecture Hrs./Week : 03 | **Exam Hours : 03**

Total No. of Lecture Hrs. : 50 | **Exam Marks : 60**

Prerequisites:

1. Basics of Transistors Oscillators and Op AMPs.

Course Learning Objectives

- Understand the circuit configurations and connectivity of BJT and FET Amplifiers and Study of frequency response
- Design and test of analog circuits using OPAMPs
- Understand the feedback configurations of transistor and OPAMP circuits
- Use of circuit simulation for the analysis of electronic circuits.

CO Number	Course Outcomes	Cognitive Level
18ECL48.1	Illustrate the frequency response of BJT and FET single stage Amplifiers with and without feedback.	L2
18ECL48.2	Design BJT/FET Colpitts Oscillator and Crystal Oscillators for the given frequency	L2
18ECL48.3	Design analog circuits using OPAMPs and analog circuits using 555 Timer for different applications	L2
18ECL48.4	Simulate analog circuits for electronic applications: precision rectifier, oscillators, active filters and multivibrators.	L2

CO-PO MAPPING

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
18ECL48.1	2	1	2						1				2	1
18ECL48.2	2	1	2						1				2	1
18ECL48.3	2	1	2						1				2	1
18ECL48.4	2	1	2		1				1				2	1

CO-PO MAPPING JUSTIFICATION

18ECL48	18ECL48.1	PO1	2	Apply the Knowledge of BJT and FET's to design the electronic circuits.
		PO2	1	Analyze and identify the problems while designing the amplifiers.
		PO3	2	Graduates are able to design electronic circuits using BJT's and FET's.
		PO9	1	Graduates are able work individually and in team.
	18ECL48.2	PO1	2	Apply the Knowledge of oscillators to design the electronic circuits.
		PO2	1	Analyze and identify the problems while designing the oscillators.
		PO3	2	Graduates are able to design electronic circuits using oscillators.
		PO9	1	Graduates are able work individually and in team.
	18ECL48.3	PO1	2	Apply the Knowledge of operational amplifiers and timer circuits to design the electronic circuits.
		PO2	1	Analyze and identify the problems while designing the operational amplifiers and timer circuits.
		PO3	2	Graduates are able to design electronic circuits using operational amplifiers and timer circuits.
		PO9	1	Graduates are able work individually and in team.
	18ECL48.4	PO1	2	Apply the Knowledge of rectifier, oscillators, active filters and multivibrators to design the electronic circuits.
		PO2	1	Analyze and identify the problems while designing the rectifier, oscillators, active filters and multivibrators .
		PO3	2	Graduates are able to design electronic circuits using rectifier, oscillators, active filters and multivibrators .
		PO5	1	Graduates are able to use simulation tools.
		PO9	1	Graduates are able work individually and in team.

CO-PSO MAPPING JUSTIFICATION

18ECL48	18ECL48.1	PSO1	2	Graduates are able to design the electronic circuits by the knowledge of amplifiers.
		PSO2	1	Graduates are able to identify the problems while designing the amplifiers.
	18ECL48..2	PSO1	2	Graduates are able to design the electronic circuits by the knowledge of amplifiers.
		PSO2	1	Graduates are able to identify the problems while designing the amplifiers.
	18ECL48..3	PSO1	2	Graduates are able to design the electronic circuits by the knowledge of oscillators
		PSO2	1	Graduates are able to identify the problems while designing the oscillators.
	18ECL48..4	PSO1	2	Graduates are able to design the electronic circuits by the knowledge of rectifier, oscillators, active filters and multivibrators .
		PSO2	1	Graduates are able to identify the problems while designing the rectifier, oscillators, active filters and multivibrators .

Faculty In-charge Course Coordinator Module Coordinator IQAC Programme Coordinator

24/5/22

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DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

COURSE OBJECTIVES AND OUTCOMES-2022

Course Title : BASIC ELECTRONICS & COMMUNICATION ENGINEERING
Course Code : 21ELN /24
No. of Lecture Hrs./Week : 05 **Exam Hours : 03**
Total No. of Lecture Hrs. : 40 (08 Hours / Module) **Exam Marks : 100**
Pre-requisites:

1. PN Junction
2. Amplifiers
3. Simple wireless network

Course Outcomes Expected

CO	At the end of the course the student will be able to	Levels
CO_1	Describe the concepts of electronic circuits encompassing power supplies, amplifiers and oscillators.	L2
CO_2	Present the basics of digital logic engineering including data representation, circuits and the microcontroller system with associated sensors and actuators.	L2
CO_3	Discuss the characteristics and technological advances of embedded systems.	L2
CO_4	Relate to the fundamentals of communication engineering spanning from the frequency spectrum to the various circuits involved including antennas.	L2
CO_5	Explain the different modes of communications from wired to wireless and the computing involved.	L2

CO –PO and CO –PSO Mapping

PO / CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO_1	2	2	-	-	-	-	-	-	-	-	-	1	2	1	-
CO_2	2	1	-	-	-	-	-	-	-	-	-	1	2	1	-
CO_3	2	-	-	-	-	-	-	-	-	-	-	1	2	1	-
CO4	2	-	-	-	-	-	-	-	-	-	-	1	2	1	-
CO5	2	-	-	-	-	-	-	-	-	-	-	1	2	1	-

CO-PO MAPPING JUSTIFICATION

CO	PO	Justification
CO1	PO1	Mapped moderately as all students will able to apply the knowledge of engineering for understanding the behavior of diodes, transistors, amplifiers and oscillators.
	PO2	Mapped moderately as all the students will be able to analyze the problems on voltage regulator, opamp parameter and oscillators.
	PO12	Mapped slightly as all the students will be able use modern engineering tool such as MULTISIM for analysis of voltage regulator and various applications of opamp.
CO_2	PO1	Mapped moderately as all students will able to apply the knowledge of engineering to understand the behaviors of various Logic circuits.
	PO2	Mapped slightly as all the students will be able to analyze the problems on data representation and types.
	PO12	Mapped slightly as all the students will be able use modern engineering tool such as MULTISIM for analysis the working of Flip-flops, registers and counters.
CO_3	PO1	Mapped moderately as all students will able to apply the knowledge of engineering for understanding the applications are of embedded system.
	PO12	Mapped slightly as all the students will be able use modern engineering tool such as MULTISIM for simple embedded applications.
CO_4	PO1	Mapped moderately as all students will able to apply the knowledge of engineering for understanding the analog and digital applications.
	PO12	Mapped slightly as all the students will be able use modern engineering tool such as MULTISIM for modulation and demodulation techniques.
CO5	PO1	Mapped moderately as all students will able to apply the knowledge of engineering for understanding different wireless network and communication systems.
	PO12	Mapped slightly as all the students will be able to learn the technological advances in cellular generation.

CO-PSO MAPPING JUSTIFICATION

CO	PSO	Justification
CO_1	PSO_1	Students will be able to analyze the source requirement for operating any devices within specific parameters like voltage, current and power.
	PSO_2	Students will be able to apply the knowledge to convert AC voltage to DC voltage while designing electronic devices.
CO_2	PSO_1	Students will be able to understand number system format used in the application to implement logic using appropriate circuits.
	PSO_2	Students will be able to apply the knowledge of logic devices while designing digital electronics circuits
CO_3	PSO_1	Students will be able to apply the knowledge of different communication interfaces to identify and to establish the embedded connection.
	PSO_2	Students will be able to apply the knowledge of communication interfaces to establish their carrier in embedded industries.
CO_4	PSO_1	Students will be able to apply the knowledge of error management to detect and correct the information data in modern communication system.
	PSO_2	Students will be able to understand multiplexing concepts in real time communication.
CO5	PSO_1	Students will be able to understand concept of cellular network to solve the signal interface problem.
	PSO_2	Students will be able to apply the knowledge of wireless communication in order ro design a sustainable network.

Faculty In-charge Module Coordinator HOD

26/5/22

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DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

COURSE OBJECTIVES AND OUTCOMES-2020

Course Title : Basic Electronics | **Course Code : 18ELN24**

No. of Lecture Hrs./Week : 04 | **Exam Hours : 03**

Total No. of Lecture Hrs. : 50 | **Exam Marks : 60**

Prerequisites

Student should have basic knowledge of the following:

1. PN junction diodes
2. Transistors and Amplifiers

Course Learning Objectives

This course will help students to achieve the following objectives:

1. Understand characteristics operation and application of diodes, Bipolar junction transistors, Field effect transistors, SCRs and operational amplifiers in electronics circuits
2. Understand different number systems and working of fundamental building blocks of digital circuits
3. Understand the principle of basic communication system and mobile phones

Course Outcomes

At the end of the course students should be able to:

CO Number	Course Outcomes	Cognitive Level
18ELN24.1	Understand the operation of diodes, photo coupler and voltage regulator to demonstrate application of diode	L2
18ELN24.2	Understand the operation of JFET, MOSFET,CMOS and SCR	L2
18ELN24.3	Understand the operation of Operational amplifier to demonstrate its applications	L2
18ELN24.4	Understand the operation of BJT, Feedback amplifier and Oscillators to demonstrate oscillator application	L2
18ELN24.5	Understand the types number system, Combinational circuit, Sequential Circuits and working principle of communication system	L2

CO-PSO MAPPING JUSTIFICATION

18ELN24	18ELN24.1	**PSO1**	**2**	Students will be able to analyze the source requirement for operating any devices with specific parameter like voltage, current and power
		PSO2	**1**	Apply the knowledge to convert AC voltage into DC voltage for specific application according to the requirement
	18ELN24.2	**PSO1**	**2**	Able to analyze the circuit input power source and select appropriate component for switching according to the requirement
		PSO2	**1**	able to apply knowledge in industrial applications(converter, inverter, chopper)
	18ELN24.3	**PSO1**	**2**	Able to analyze the circuit for different applications like waveform generators, amplification, impedance matching
		PSO2	**1**	Able to apply knowledge of op amp to design simple circuits (Adder, Subtractor, Integrator, Differentiator)
	18ELN24.4	**PSO1**	**2**	Able to analyse voltage amplification, current amplification and control amplification using feedback amplifiers. Understand the operation of BJT to use it as a switch. Able to generate signal of different frequency using oscillators (RC phase shift oscillator- audio amplifier)
		PSO2	**1**	Able to apply knowledge of oscillator for generation of low frequency signals IC 555 to operate the loud speaker
	18ELN24.5	**PSO1**	**2**	Able to understand number system format used in the application and implement logic using appropriate circuits To make conversion between different number system
		PSO2	**1**	Able to apply knowledge of mobile network to Understand fundamental concept of cellular and mobile telephone

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Department of Electronics and Communication Engineering

Details of courses and module coordinator

EVEN Semester 2021 - 2022

Group #	Course Name	Module coordinator
1	Analog / Digital Circuit Design	Dr. Harish M.S
2	VLSI, and Embedded Systems	Prof Vani H R
3	Communication, Signal Processing and Networking	Dr. Jagadeesh Chandra A.P
4	Management, Project, Technical Seminar and	Dr. Anil Kumar C

II	**2021 Scheme**	Module Coordinator No.
21ELN24	Basic Electronics	1
IV	**2018 Scheme**	
18MAT41	Complex Analysis, Probability and Statistical Methods	3
18EC42	Analog Circuits	1
18EC43	Control Systems	1
18EC44	Engineering Statistics & Linear Algebra	3
18EC45	Signals & Systems	3
18EC46	Microcontroller	2
18CPC49	Constitution of India, Professional Ethics and Cyber Law	4
18ECL47	Microcontroller Laboratory	2
18ECL48	Analog Circuits Laboratory	1
VI	**2018 Scheme**	
18EC61	Digital Communication	3
18EC62	Embedded Systems	2
18EC63	Microwave & Antennas	3
18EC646	Python Application Programming	2
18EC652	Sensors & Signal Conditioning	3
18ECMP68	Mini-project	4
--	Internship	4
18ECL66	Embedded Systems Laboratory	2
18ECL67	Communication Laboratory	3
VIII	**2018 Scheme**	
18EC81	Wireless and cellular communication	3
18EC823	Radar Engineering	3
18EC822	Micro Electro Mechanical Systems	2
18ECP83	Project work Phase-2	4
18ECS84	Technical seminar	4
18ECI85	Internship	4
VIII	**2017 Scheme**	
17EC81	Wireless Cellular and LTE 4G Broadband	3
17EC82	Fiber Optics & Networks	3
17EC831	Micro Electro Mechanical Systems	2
17EC833	Radar Engineering	3
17EC84	Internship/Professional Practice	4
17ECP85	Project Work	4
17ECS86	Seminar	4