Criterion – 2

2.6.1 Programme Outcomes (POs) and Course Outcomes (COs) for all Programmes offered by the institution are stated and displayed on website and attainment of POs and COs are evaluated

DEPARTMENT OF ELECTRONICS AND COMPUTER ENGINEERING

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MAT 101	LINEAR ALGEBRA AND CALCULUS	L	T	P	CREDIT	Year of Introduction
		3	1	0	4	2019

Prerequisite: A basic course in one-variable calculus and matrix theory.

Course Outcomes: After completion of the course the student will be able to:

CO 1	Solve systems of linear equations, diagonalize matrices and characterize quadraticforms
CO2	Compute the partial and total derivatives and maxima and minima of multivariable functions.
CO3	Compute multiple integrals and apply them to find areas and volumes of geometrical shapes, mass and center of gravity of plane laminas
CO4	Perform various tests to determine whether a given series is convergent, absolutely convergent or conditionally convergent
CO5	Determine the Taylor and Fourier series expansion of functions and learn their applications.

Mapping of course outcomes with program outcomes (Minimum requirement):

	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	PSO 3
CO1	3	3	3	3	2	1	-	-	1	2	-	2	1	-	-
CO2	3	3	3	3	2	1	-	-	1	2	-	2	1	-	-
CO3	3	3	3	3	2	1	-	-	1	2	-	2	1	-	-
CO4	3	2	3	2	1	1	-	-	1	2	-	2	1	-	-
CO5	3	3	3	3	2	1	-	-	1	2	-	2	1	-	-
Avg	3	2.8	3	2.8	1.8	1	-	-	1	2	-	2	1.6	-	-

Justification for CO-PO Mapping:

CO	PO	LEVEL	REMARKS
CO1	PO 1	3	By understanding the concept of matrix theory, the students will beable to apply the knowledge in complex engineering problems.
	PO 2	3	By understanding the fundamental concept of matrix, the students will be able to identify, formulate and analyze simple engineering problems.
	PO 3	3	By understanding the fundamental concept of diagonalization of matrices and quadratic forms the helps the student in lifelong learning in the context of technology change.
	PO4	3	By understanding the fundamental concept of matrix theory, the students will be able to do analysis and interpretation of data
	PO5	2	By understanding the fundamental concept of linear equationsand matrix theory the students will be able to apply appropriatetechniques in complex engineering activities.
	PO6	1	The knowledge of fundamental concept of matrix theory help to communicate effectively on complex engineering activities with the engineering community and with society at large.
	PO9	1	By understanding the concept of matrix theory, the students will beable to engage in continuous learning.
	PO10	2	Understanding matrices helps students for writing effective reports.
	PO12	2	The matrix theory concepts help students to adapt emerging Information and Communication Technologies by providing innovative ideas and solutions to novel problems that is identified.
	PSO1	1	The matrix theory concepts help students to apply fundamental knowledge in Electronics and Computer Engineering to analyse and design hardware and software systems so as to understand and solve engineering problems. .

CO2	PO 1	3	By understanding the fundamental concept of differential calculus of functions the students will be able to apply the knowledge in complex engineering problems.
	PO 2	3	By understanding the fundamental concept of differential calculusof functions the students will be able to apply the knowledge for analysis and interpretation of data.
	PO3	3	By understanding multivariable calculus, the students will be able to model and study 3 dimensional systems.
	PO4	3	By understanding the multivariable calculus and differential equations the students will be able to explain natural phenomenon in good manner.
	PO5	2	By understanding the modern multivariable calculus, the students will be able to apply appropriate techniques in complexengineering activities.
	PO6	1	By understanding the concept of differential equations, the studentswill be able to engage in continuous learning.
	PO9	1	The knowledge of fundamental concept of differential equation help to communicate effectively on complex engineering activities
	PO10	2	The concept of multivariable calculus helps students to adapt emerging Information and Communication Technologies by providing innovative ideas and solutions to novel problems that is identified.
	PO12	2	The knowledge of multi variable calculus and differential equations help in designing solutions to complex problems
	PSO1	2	The knowledge of multi variable calculus and differential equations help students to apply fundamental knowledge in Electronics and Computer Engineering to analyse and design hardware and software systems so as to understand and solve engineering problems.

CO3	PO 1	3	By understanding the fundamental concept of multiple integrals can be used to create mathematical models in order to arrive into an optimal solution.
	PO 2	3	By understanding the fundamental concept of multiple integrals, the students will be able to apply the knowledge for analysis and interpretation of data.
	PO 3	3	By understanding the concept of the double integrals helps in designingsolutions for engineering problems
	PO 4	3	The knowledge of double integrals concepts helps the student in lifelong learning in the context of technology change.
	PO 5	2	By understanding the concept of integration can be used to create andapply appropriate techniques in solving engineering problems.
	PO 6	1	By understanding the concept of integration, the students will be able to engage in continuous learning
	PO9	1	The knowledge of fundamental concept of integration helps to communicate effectively on complex engineering activities
	PO10	2	Understanding integration helps students for writing effective reports.
	PO12	2	The concept of double integration helps students to adapt emerging Information and Communication Technologies by providing innovative ideas and solutions to novel problems that is identified.
	PSO1	1	The concept of double integration helps students to apply fundamental knowledge in Electronics and Computer Engineering to analyse and design hardware and software systems so as to understand and solve engineering problems. .
	PO 1	3	By understanding the infinite series, the student will be able to applythe knowledge on complex engineering problems.
CO4	PO 2	2	By understanding infinite series, the student will be able to identify formulate and analyze simple engineering problems.
	PO 3	3	By understanding the evaluation of definite integrals and interpolationon given numerical data using standard numerical techniques, the student will be able to design solutions for simple engineering problems.

	PO4	2	The knowledge of infinite series provides technique for solving simple engineering problems.
	PO 5	1	The knowledge of fundamental concept of infinite series helps to communicate effectively on complex engineering activities
	PO 6	1	By understanding various tests can be applied to assess societal,legal and cultural issues.
	PO 9	1	By understanding infinite series, the student will be able to engage in continuous learning.
	PO10	2	Understanding infinite series helps students for writing effective reports.
	PO12	2	By understanding the concept of infinite series will enable students to engage in lifelong learning.
	PSO1	2	By understanding the concept of infinite series will enable students to apply fundamental knowledge in Electronics and Computer Engineering to analyse and design hardware and software systemsso as to understand and solve engineering problems.
CO5	PO 1	3	By understanding the concept of Taylor series providesdifferent techniques in solving engineering problems.
	PO 2	3	By understanding the fundamental concept of Taylor series thestudents will be able to apply the knowledge for analysis and interpretation of data.
	PO 3	3	By understanding the concept of Fourier series, the studentswill be able to design system components.
	PO 4	3	By understanding the concept of series helps the students to draw valid conclusions from the data
	PO 5	2	Understanding the concept of series can be used to create and applyappropriate techniques in solving engineering problems.

	PO 6	1	By understanding the concept of series make students to prepare effective reports and to make effective presentation
	PO 9	1	By understanding the concept of Fourier series, the students will be able to engage in continuous learning
	PO10	2	Modern techniques are used in understanding the problems in the society
	PO12	2	By understanding the concept of Fourier series, the students will be able to cop- up with the technology change
	PSO1	2	By understanding the concept of Fourier series will enable students in apply fundamental knowledge in Electronics and Computer Engineering to analyse and design hardware and software systems so as to understand and solve engineering problems.

HUN 101	LIFE SKILLS	L	T	P	CREDIT	Year of Introduction
		2	0	2	-	2019

Course Outcomes (CO)

After the successful completion of this course, students will able to

No.	Course outcomes	Knowledge Level
HUN101.1	Define and Identify different life skills required in personal and professional life	**K_3**
HUN101.2	Develop an awareness of the self and apply well-defined techniques to cope with emotions and stress.	**K_3**
HUN101.3	Explain the basic mechanics of effective communication and demonstrate these through presentations	**K_2**
HUN101.4	Take part in group discussions	**K_5**
HUN101.5	Use appropriate thinking and problem solving techniques to solve new problems	**K_3**
HUN101.6	Understand the basics of teamwork and leadership	**K_6**

CO – PO Matrix

	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
HUN101.1	-	-	-	-	-	-	-	1	-	3	-	2	-	1
HUN101.2	-	-	-	-	-	-	-	-	-	1	-	3	-	-
HUN101.3	-	-	1	-	-	1	-	-	1	3	-	-	-	3
HUN101.4	-	-	-	-	-	-	-	-	-	3	-	1	1	2
HUN101.5	-	-	1	-	-	-	-	-	2	3	-	-	1	-
HUN101.6	1	-	-	-	-	1	-	-	1	3	-	-	1	-
	1	-	1	-	-	1	-	1	1	3	-	2	1	1

JUSTIFICATIONS FOR CO-PO MAPPING

Mapping	Mapping Level (3/2/1)	Justifications
CO6 – PO1	1	Graduate will be able to understand the significance of teamwork in bringing solutions to complex engineering problems
CO3 – PO3	1	Graduate will be able to comprehend the need for effective communication and its significance in understanding the specified needs in designing a system with needed consideration
CO5 – PO3	1	Graduates will be able to apply the appropriate approach in developing novel solutions to engineering problems taking into account the cultural, societal and environmental considerations.
CO3 – PO6	1	Graduate will be able to develop effective presentation based on the reasoning applied on information obtained from contextual knowledge
CO6- PO6	1	Graduates will be able to understand the implications of teamwork and effective leadership to help in reaching plausible conclusions taking appropriate considerations
CO1-PO8	1	Graduates will be able to the right moral and ethical values that are close to their core values to help develop themselves as better professionals
CO3 – PO9	1	Graduates will understand the need for effective communication to work effectively in a team.
CO5- PO9	2	Graduate will able to apply the techniques required as an individual or as a team member to create effective presentation
CO6-PO9	1	Graduate will understand the need for teamwork and leadership skills to effectively work in a team or as an individual
CO1-PO10	3	Graduate will be able to identify the right skill that needs to be developed in communicating effectively in complex engineering problems
CO2-PO10	1	Graduate will be able to develop the skills needed to understand the way in communicating and comprehending to the other member in his/her team
CO3-PO10	3	Graduate will be able to communicate effectively in engineering activities by developing the needed understanding to set up an effective presentation
CO4-PO10	3	Graduate will be able to display healthy participation in group discussions in developing effective solution

CO5-PO10	3	Graduate will be able to apply appropriate thinking technique to develop design documentation and reports
CO6-PO10	3	Graduate able to understand the basic function of team/group and how effective communications plays a part in it
CO1-PO12	2	Graduates will be able to recognize the need for developing life skills in their life that would culminate to importance of life-long learning for their professional life
CO2-PO12	3	Graduates will be able to understand the methods of self-awareness and managing of stress to help him/her better equip for independent and life –long learning
CO4-PO12	1	Graduate will be able to discuss his/her ideas related to technology and its advancement effectively that would channel towards the right direction for research
CO1-PSO2	1	Graduates will be able to define and Identify different life skills in professional life to communicate various technical information.
CO3-PSO2	3	Graduates will be able to explain the basic mechanics of effective communication and demonstrate these through presentations, which will aid in communicating technical information effectively.
CO4-PSO1	1	Graduates will understand the significance of effective group discussion which will aid in the design of various hardware and software systems.
CO4-PSO2	2	Graduates will be able to take part in an effective group discussion which will help in communicating technical information.
CO5-PSO1	1	Graduates will be able to use appropriate thinking and problem solving techniques to analyze and design various hardware and software systems.
CO6-PSO1	1	Graduates will understand the need for teamwork and leadership in design of hardware and software systems.

EST 110	ENGINEERING GRAPHICS	L	T	P	CREDIT	Year of Introduction
		2	0	2	3	2019

Course Outcomes (CO)

After the successful completion of this course, students will able to

No.	Course outcomes	Knowledge Level
EST 110.1	CO1: Draw the projection of points and lines located in different quadrants	**K3**
EST 110.2	CO2: Prepare Multiview orthographic projections of objects by visualizing them in different positions	**K3**
EST 110.3	CO3: Draw sectional views and develop surfaces of a given object	**K3**
EST 110.4	CO4: Prepare pictorial drawings using the principles of isometric and perspective projections to visualize objects in three dimensions.	**K3**
EST 110.5	CO5: Convert 3D views to orthographic views	**K3**
EST 110.6	CO6**:** Obtain Multiview projections and solid models of objects using CAD tools	**K3**

CO – PO Matrix

	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
EST110.1	3	-	-	-	-	-	-	-	-	-	-	-	2	-
EST110.2	3	-	-	-	-	-	-	-	-	-	-	-	3	-
EST110.3	3	1	-	-	-	-	-	-	-	-	-	-	3	-
EST110.4	3	-	-	-	-	-	-	-	-	1	-	-	2	-
EST110.5	3	-	-	-	-	-	-	-	-	2	-	-	3	-
EST110.6	3	-	-	-	3	-	-	-	-	3	-	-	3	3
EST 110	3	1	-	-	3	-	-	-	-	2	-	-	2.5	3

JUSTIFICATIONS FOR CO-PO MAPPING

Mapping	Mapping Level (3/2/1)	Justifications
CO1 - PO1	3	Graduates are able to apply Engineering fundamentals related to 2D orthographic projection of lines to develop Engineering drawings related to complex design problems.
CO2-PO1	3	Graduates are able to apply Engineering fundamentals related to 2D orthographic projection of solids to develop Engineering drawings related to complex design problems.
CO3- PO1	3	Graduates will be able to apply the concept of section to describe the concealed features of parts designed as a part of solution to Engineering problems.
CO3 –PO2	1	To an extend graduates will be able to analysis and infer 3 Dimensional Models related to complex problems.
CO4 – PO1	3	Graduates will be able to apply knowledge related to isometric projection to develop 3 Dimensional models as a part of solution related to design problems.
CO4 – PO10	1	To an extend graduates will be able to convey solutions for complex engineering problems in a better way using 3 dimensional models developed using the concept of perspective projection and isometric projection.
CO5 – PO1	3	Graduates will be able to convert 3 Dimensional models to 2 dimensional orthographic views for simplified solutions for design problems
CO5 – PO10	2	Graduates will be able to use simplified orthogonal views to describe delicate and complex features of a 3-Dimensional models.
CO6 - PO1	3	Usage of CAD software package will help graduates apply the Engineering knowledge related to orthographic projection to 2 Dimensional drawing sand 3 Dimensional models as a part of solutions to complex problems.
CO6-PO5	3	Use of Cad Software helps graduate to become familiar with the usage of modern IT tools for modeling solutions of complex Engineering Problems.
CO6-PO10	3	The exploded views of 3D models developed using a Cad software helps graduate to effectively convey order of assembly of different parts.

CO1-PSO1	2	concept of projection of points and lines are the foundation for developing 3D models as a part of solutions for problems in the different areas of Mechanical engineering.
CO2-PSO1	3	The concept of 2D orthographic projection of solids help in developing engineering drawings related to complex design problems
CO3-PSO1	3	concept of section helps to describe the concealed features of designed components.
CO4-PSO1	2	The concept of isometric projection will help graduates to develop 3 Dimensional models as a part of solution related to design problems.
CO5-PSO1	3	Graduates will be able to convert 3 Dimensional models to 2 dimensional orthographic views for simplified solutions for design problems.
CO6-PSO1	3	Usage of CAD software package will help graduates develop optimum solutions for design problems.
CO6-PSO2	3	Use of Cad Software helps graduate to become familiar with the usage of modern IT tools for modeling solutions of complex Engineering Problems

EST 120	BASICS OF CIVIL & MECHANICAL ENGINEERING	L	T	P	CREDIT	Year of Introduction
		4	0	0	4	2019

Pre-requisite: NIL

Course Outcome: After the successful completion of this course, the student will be able to:

EST120.1	Recall the role of civil engineer in society and to relate the various disciplines of civil engineering
EST 120.2	Explain different types of buildings, building components, building materials and building construction
EST 120.3	Describe the importance, objectives and principles of surveying
EST 120.4	Summarize the basic infrastructure services MEP, HVAC, elevators, escalators and ramps
EST 120.5	Discuss the materials, energy systems, water management and environment for green buildings
EST 120.6	Analyse thermodynamic cycles and calculate its efficiency
EST 120.7	Illustrate the working and features of IC Engines.
EST 120.8	Explain the basic principles of Refrigeration and Air Conditioning.
EST 120.9	Describe the working of hydraulic machines
EST 120.10	Explain the working of power transmission elements.
EST 120.11	Describe the basic manufacturing, metal joining and machining processes

CO-PO matrices of courses selected

CO	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
EST120.1	3	-	-	-	-	3	2	2	-	-	-	-	-	-
EST120.2	3	2	-	1	3	-	-	3	-	-	-	-	-	-
EST120.3	3	2	-	-	3	-	-	-	2	-	-	-	-	-

EST120.4	3	2	-	-	3	-	-	-	2	-	-	-	-	-
EST120.5	3	2	-	-	3	2	3	-	2	-	-	-	-	-
EST120.6	3	2	-	-	-	-	-	-	-	-	-	-	-	-
EST120.7	3	1	-	-	-	-	-	-	-	-	-	-	-	-
EST120.8	3	1	-	-	-	-	-	-	-	-	-	-	-	-
EST120.9	3	2	-	-	-	-	-	-	-	-	-	-	-	-
EST120.10	3	1	-	-	-	-	-	-	-	-	-	-	-	-
EST120.11	3	-	-	-	-	-	-	-	-	-	-	-	-	-
AVG.	**3**	**1.67**	**-**	**1**	**3**	**2.5**	**2.5**	**2.5**	**2**	**-**	**-**	**-**	**-**	**-**

JUSTIFICATION FOR CO-PO MAPPING:

BRANCH: ELECTRONICS AND COMPUTER SCIENCE ENGINEERING

CO	PO	LEVEL	REMARKS
EST120.1	PO1	3	Students will be able to know the role of a civil engineer in a society and understand the various fields of civil engineering such as structural, transportation, water resources, environmental engineering
	PO6	3	Students will be able to apply their knowledge to the society with respect to certain standards
	PO7	2	Students will be able to consider environmental impacts for a sustainable development

	PO8	2	Students can apply professional ethics and standards in the field of civil engineering
EST120.2	PO1	3	Students will be able to know the various types of buildings, components, materials and construction methods
	PO2	2	Students will be able to analyse engineering problems related to buildings, components, materials and construction methods
	PO4	1	Students will be able to carry research/ field studies, experimental analysis on various types of buildings and its components
	PO5	3	Students will be able to apply appropriate techniques, modern technologies with the support of IT in designing, planning and implementation of a building project
	PO8	3	Students can apply professional ethics and mandatory standards in all phases of a civil engineering project to ensure the compliance on quality
EST120.3	PO1	3	Students will be able to know the various importance and objectives of surveying for a civil engineering project
	PO2	2	Students will be able to do preliminary survey in prior to the implementation of a civil engineering project
	PO5	3	Students will be able to apply appropriate techniques (Total station, Dumpy level), modern technologies with the support of IT, GIS, GPS platforms for surveying
	PO9	2	Students can adopt a participatory approach with good teamwork for effective surveying to minimize the errors
	PO1	3	Students will be able to apply the basic engineering knowledge to select infrastructure services, HVAC, elevators, escalators and ramps

EST120.4	PO2	2	Students will be able to analyse the need, location and implementation of infrastructure services, HVAC, elevators, escalators and ramps in a building
	PO5	3	Students will be able to apply appropriate techniques, modern technologies with the support of IT for all indoor and outdoor infrastructure services
	PO9	2	Students can adopt a participatory approach for the planning and selection of basic infrastructure services
EST120.5	PO1	3	Students will be able to apply the basic engineering knowledge to design a green building by considering social, environmental aspects
	PO2	2	Students will be able to analyse the importance of green building concept to conserve energy, water etc.
	PO5	3	Students will be able to apply appropriate techniques, modern technologies with the support of IT for energy and water management aspects of green building
	PO6	2	Students will be able to contribute the concept of green building, energy conservation, water conservation and apply their knowledge to the society with respect to certain standards
	PO7	3	Students will be able to consider environmental benefits for a sustainable development with respect to green building concept
	PO9	2	Students can adopt a participatory approach to give awareness on green buildings, energy conservation and water management practices
EST120.6	PO1	3	Graduates can apply engineering fundamentals related to thermodynamics to understand the thermodynamics problems
	PO2	2	Graduates can identify the different thermodynamic devices based on thermodynamic laws

EST120.7	PO1	3	Graduates able to apply engineering fundamentals to understand the classification of engines and distinguish them based on their respective working principles
	PO2	1	Graduate will be able to identify the constraints associated with effectiveness of different engines
EST120.8	PO1	3	Graduate will be able to apply the engineering fundamentals to explain the type of refrigeration process and evaluate them based on their applications
	PO2	1	Graduate will be able to identify the thermodynamic applications specific to provide comfort conditions to industries and humans
EST120.9	PO1	3	Graduate will be able to apply the engineering fundamentals to explain working of hydraulic machines
	PO2	2	Graduate will be able to identify the hydraulic applications specific to industries and small scale .
EST120.10	PO1	3	Graduate will be able to apply the engineering fundamentals to explain different power transmission devices.
	PO2	1	Graduates can identify the different power transmission devices based on application.
EST120.11	PO1	3	Graduates will be able to interpret the application of different manufacturing processes used in the engineering field.

CYT 100	ENGINEERING CHEMISTRY	CATEGORY	L	T	P	CREDIT	YEAR OF INTRODUCTION
		BSC	3	1	0	4	2019

Prerequisite: Concepts of chemistry introduced at the plus two levels in schools

Course outcomes: After the completion of the course the students will be able to

CO 1	Apply the basic concepts of electrochemistry and corrosion to explore its possible applications in various engineering fields.
CO 2	Understand various spectroscopic techniques like UV-Visible, IR, NMR and its applications.
CO 3	Apply the knowledge of analytical method for characterizing a chemical mixture or a compound. Understand the basic concept of SEM for surface characterization of nanomaterials.
CO 4	Learn about the basics of stereochemistry and its application. Apply the knowledge of conducting polymers and advanced polymers in engineering.
CO 5	Study various types of water treatment methods to develop skills for treating wastewater.

Mapping of course outcomes with program outcomes

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

Justification for CO-PO Mapping.

CO	PO	LEVEL	REMARKS
CO 1	PO 1	1	Information gathered on electrochemistry and corrosion can be used to elucidate of various Engineeringproblems
	PO 2	2	Understanding the basic principles of electrochemistry and corrosion helps to assess recent research literature and also to scrutinize the issues related to the area of electrochemical engineering.
	PO 3	1	Knowledge on Electrochemical basis of corrosion and its prevention method can be utilized in solving problems related to material corrosion and also help to design various energy storage systems.
CO 2	PO 1	1	Knowledge on spectroche mical techniques helps to find solution to engineeringproblems like structure analysis of materials
	PO 2	1	Understanding the basic concepts of spectroscopic techniques can be utilized for the analysis of the structural identification of the materials of importance
	PO 4	1	Information acquired on structural identification of compounds can be used to perform studies to solve complex problems
	PO 5	2	Spectroscopy can use as a modern tool to for the prediction and design of materials having applications in the field of modern engineering materials
CO 3	PO 1	1	Understanding the basic principle of chromatography and thermal characterization techniques can be used to solve problems related to these fields in engineering stream
	PO 2	1	Analytical techniques help to design and select resources for various engineeringactivities.
	PO 4	1	Research based on thermo analytical technique such as TGA, DTA and SEM etc. helps to design and reinforce the properties of engineering polymers
	PO 5	2	Knowledge on update analytical techniques provide an effective route for the prediction and implementation of complex engineering accomplishments

CO 4	PO 1	2	Solve engineering problems by apply knowledge on engineering materials like polymers and its stereochemistry.
	PO 2	1	Study of engineering materials used to identify materials for engineering constructions and modeling.
CO 5	PO 1	1	Knowledge on water treatment methods can be used to solve environmental related problems
	PO 4	1	By utilizing the principles of water treatment methods students will be able to design novel water treatment plants.
	PO 7	3	Knowledge on various water treatment methods can be utilized for the sustainable development based on societal, health and environmental context.

ESL 120	CIVIL & MECHANICAL WORKSHOP	L	T	P	CREDIT	YEAR OF INTRODUCTION
		0	0	2	1	2019

Civil Engineering Workshop

Course Outcomes (CO)

After the successful completion of this course, students will able to

No.	Course outcomes
CO 1	Name different devices and tools used for civil engineering measurements
CO 2	Explain the use of various tools and devices for various field measurements
CO 3	Demonstrate the steps involved in basic civil engineering activities like plot measurement, setting out operation, evaluating the natural profile of land, plumbing and undertaking simple construction work.
CO 4	Choose materials and methods required for basic civil engineering activities like field measurements, masonry work and plumbing.
CO 5	Compare different techniques and devices used in civil engineering measurements

CO – PO Matrix

CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO011	PO12	PSO 1	PSO 2
ESL120.1	1	-	-	-	1	1	-	-	2	2	-	-	-	-
ESL120.2	1	-	-	-	1	1	-	-	2	2	-	-	-	-
ESL120.3	1	-	-	-	1	1	-	2	2	2	-	-	-	-
ESL120.4	1	-	-	-	1	1	-	2	2	2	-	-	-	-
ESL120.5	1	-	-	-	1	1	-	-	2	2	-	-	-	-
Average	1	-	-	-	1	1	-	2	2	2	-	-	-	-

JUSTIFICATIONS FOR CO-PO MAPPING

CO	PO	LEVEL	REMARKS
ESL120.1	PO1	1	Enumerate the various tools and devices used in Civil Engineering measurements
	PO5	1	Understand the advanced surveying equipment used in Civil Engineering
	PO6	1	Define the various civil engineering tools and equipment used in real-life construction practices.
	PO9	2	Work effectively as individual or team while handling the different Civil Engineering tools and measuring devices
	PO10	2	Illustrate the measurements and readings obtained from the Civil Engineering equipment for the study of construction site and for further site plan.
ESL120.2	PO1	1	Enumerate the various tools and devices used in Civil Engineering measurements
	PO5	1	Understand the advanced surveying equipment used in Civil Engineering
	PO6	1	Apply the comprehension of civil engineering tools and equipment in real-life construction practices.
	PO9	2	Work effectively as individual or team while handling the different Civil Engineering tools and measuring devices
	PO10	2	Illustrate the measurements and readings obtained from the Civil Engineering equipment for the study of construction site and for further site plan.
	PO1	1	Understand the steps involved in various Civil Engineering practices
	PO5	1	Operate various civil engineering tools used in basic civil engineering activities like setting out.
	PO6	1	Apply the knowledge of basic civil engineering in real-life construction practices
	PO8	2	Apply ethical principles in the Construction field activities by fol1ing the building construction norms and regulations.

ESL120.3	PO9	2	Work effectively as individual or team while carrying out basic civil engineering experiments
	PO10	2	Illustrate the measurements and readings obtained from the Civil Engineering equipment for the study of construction site and for further site plan.
ESL120.4	PO1	1	Understand the various materials and methods used in Construction practices
	PO5	1	Apply the most appropriate construction practices and desired tools for basic civil engineering activities.
	PO6	1	Apply the comprehension of civil engineering tools and methods in real-life construction practices.
	PO8	2	Apply ethical principles in the Construction field activities by fol1ing the building construction norms and regulations.
	PO9	2	Work effectively as individual or team while handling the different Civil Engineering tools and measuring devices
	PO10	2	Illustrate the measurements and readings obtained from the Civil Engineering equipment for the study of construction site and for further site plan.
ESL120.5	PO1	1	Understand the various materials and methods used in Construction practices
	PO5	1	Compare the various construction practices and tools used in basic civil engineering activities.
	PO6	1	Apply the best civil engineering tools and methods in real-life construction practices.
	PO9	2	Work effectively as individual or team while handling the different Civil Engineering tools and measuring devices
	PO10	2	Illustrate the measurements and readings obtained from the Civil Engineering equipment for the study of construction site and for further site plan.

Mechanical Engineering Workshop

Course Outcomes (CO)

After the successful completion of this course, students will able to

No.	Course outcomes	Knowledge Level
CO 1	Identify Basic Mechanical Workshop operations in accordance with the materials and objects	**K_1**
CO 2	Apply appropriate Tools and Instruments with respect to the mechanical workshop trades	**K_3**
CO 3	Apply appropriate safety measures with respect to the mechanical workshop trades	**K_3**

CO – PO Matrix

CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO011	PO12	PSO 1	PSO 2
CO 1	2	-	-	-	-	-	-	-	-	-	-	-	-	1
CO 2	2	-	-	-	-	-	-	-	-	-	-	-	-	1
CO 3	2	-	-	-	-	-	-	-	-	-	-	-	-	1
Average	2	-	-	-	-	-	-	-	-	-	-	-	-	1

JUSTIFICATIONS FOR CO-PO MAPPING

Mapping	Mapping Level (3/2/1)	Justifications
CO1 – PO1	2	Graduates are able to identify and select machines and methods for mechanical engineering operations and problems by applying fundamentals in material science and engineering.
CO1-PSO2	2	Students are equipped to identify and adopt latest trends in mechanical engineering for industrial and social application and to communicate the technical information in both oral and written formats
CO2-PO1	2	Graduates are able to identify and select mechanical tools and instruments to deal with engineering problems by applying fundamentals in mathematics , material science and engineering.
CO2-PSO2	2	Students are equipped to evolve creative methods and adopt advancement in mechanical engineering for industrial and social application and to communicate the technical information in both oral and written formats
CO3 – PO1	2	Graduate will be able to apply necessary considerations in operations to ensure safety ,use of PPE and can assess the risk involved when indulging in various manufacturing methods
CO3-PSO2	2	Graduates will be able to identify and adopt safety measures at all levels of mechanical engineering for industrial and social applications and to communicate the technical information in both oral and written formats

CYL 120	ENGINEERING CHEMISTRY LAB	L	T	P	CREDIT	YEAR OF INTRODUCTION
		0	0	2	1	2019

Prerequisite: Concepts of chemistry introduced at the plus two levels in schools

Course outcomes: After the completion of the course the students will be able to

CO 1	Understand and practice different techniques of quantitative chemical analysis to generate experimental skills and apply these skills to various analyses.
CO 2	Develop skills relevant to synthesize organic polymers and acquire the practical skill to use TLC for the identification of drugs
CO 3	Develop the ability to understand and explain the use of modern spectroscopic techniques for analysing and interpreting the IR spectra and NMR spectra of some organic compounds.
CO 4	Acquire the ability to understand, explain and use instrumental techniques for chemical analysis.
CO 5	Learn to design and carry out scientific experiments as well as accurately record and analyze the results of such experiments.
CO 6	Function as a member of team, communicate effectively and engage in future learning. Also understand how chemistry addresses social, economical, and environmental problems and why it is an integral part of curriculum.

Mapping of course outcomes with program outcomes

	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
CO 1	3	-	-	-	2	-	-	-	-	-	-	3	-	1
CO 2	3	-	-	-	3	-	-	-	-	-	-	3	1	-
CO 3	3	-	-	-	3	-	-	-	-	-	-	3	1	-
CO 4	3	-	-	-	3	-	-	-	-	-	-	3	-	-
CO 5	3	-	-	-	1	-	-	-	-	-	-	3	-	-
CO 6	3	-	-	-	1	-	-	-	-	-	-	3	-	-
Avg.	3	-	-	-	2	-	-	-	-	-	-	3	1	1

Justification for CO-PO Mapping.

CO	PO	LEVEL	REMARKS
CO 1	PO 1	3	Basic knowledge on quantitative chemical analysis is very useful for the successful conduct of technical works related to engineering chemistry
	PO 5	2	A deep understanding of quantitative chemistry will help the engineering graduate to address the quantification of chemical errors in diverse engineering fields
	PO 12	3	Student will be able to apply the basic quantitative chemical analysis techniques in various studies.
	PSO2	1	For the immediate identification and calculation of chemical errors elementary understanding in quantitative chemical analysis is very needful
CO 2	PO 1	3	Understanding the basic principle of chromatography techniques can be used to solve problems related to these fields in engineering stream
	PO 2	3	Basic knowledge on chromatography and organic polymers help to design and select resources for various engineering activities
	PO 12	3	Research based on chromatography and synthesis of organic polymers helps to design and reinforce the properties of engineering polymers
	PSO1	1	The chromatographic techniques can be used as a device for the forecast, design and enactment of modern engineering materials
CO 3	PO 1	3	Knowledge on spectrochemical techniques such as IR and NMR help to find solutions to engineering problems like structure analysis of materials
	PO 2	3	Understanding the basic concepts of spectroscopic techniques can be utilized for the analysis of the structural identification of the materials of importance.
	PO 12	3	Information acquired on the structural identification of compounds can be used to perform studies to solve complex problems
	PSO1	1	The spectroscopic techniques can be used as a tool for the prediction, structural elucidation, designing and synthesizing of modern engineering materials
CO 4	PO 1	3	To study the basic ideas of instrumental techniques for chemical analysis help to bridge the concept of theory of chemistry to practical applications in engineering fields
	PO 2	3	Students will be able to solve engineering problems related to instrumentational chemistry

	PO12	3	Gathered Information on the instrumental analysis in chemistry can be utilized to conduct studies to solve problems in modern engineering materials
CO 5	PO 1	3	With the basic information in chemical reactions, reaction conditions and safety of chemicals students can successfully design and conduct a chemical reaction of specific importance
	PO 2	1	By using the knowledge on chemical reagents and solvents efficacious design of an object or process in engineering field if possible.
	PO 12	3	Can Solve chemical engineering problems by the acquaintance of theories of basic chemical reactions
CO6	PO1	3	Doing lab experiments as a member of team help the students to communicate effectively and engage actively in future learning
	PO2	1	Team works during lab experiments facilitates students sharing attitude and helping mentality
	PO 12	3	With the help of basic knowledge in experiments on water chemistry can effectively use to solve problems related to waste water management and environmental pollution

MAT 102	Vector calculus, Differential equation and Transforms	L	T	P	CREDIT	Year of Introduction
		3	1	0	4	2019

Prerequisite: Calculus of single and multi- variable functions

Course Outcomes: After completion of the course the student will be able to:

CO 1	Compute the derivatives and line integrals of vector functions and learn their applications
CO 2	Evaluate surface and volume integrals and learn their inter relations and application
CO 3	Solve homogeneous and non- homogeneous linear differential equation with constant coefficient
CO 4	Compute Laplace transform and apply them to solve ODEs arising in engineering
CO 5	Determine the Fourier transform of functions and apply them to solve problems arising in engineering

Mapping of course outcomes with program outcomes

	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	PSO 3
CO 1	3	3	3	3	2	1	-	-	1	2	-	2	1		
CO 2	3	3	3	3	2	1	-	-	1	2	-	2	1		
CO 3	3	3	3	3	2	1	-	-	1	2	-	2	1		
CO 4	3	3	3	3	2	1	-	-	1	2	-	2	1		
CO 5	3	3	3	3	2	1	-	-	1	2	-	2	1		

Justification for CO-PO Mapping.

CO	PO	LEVEL	REMARKS
CO 1	PO 1	3	By understanding the modern theory of vector calculus students will be able to apply the knowledge in complex engineering problems.
	PO 2	3	By understanding the vector calculus students will be able to identify, formulate and analyze simple engineering problems.
	PO 3	3	By understanding the differential equation students will be able to design solutions for very simple engineering problems.
	PO4	3	By understanding the vector calculus students will be able to use research knowledge for the analysis and interpretation of data.
	PO5	2	By understanding the vector calculus students will be able to use modern tools
	PO6	1	By understanding derivatives students will be able to communicate on complex engineering activities with the engineering community.
	PO9	1	By understanding derivatives students will be able to engage in continuous learning.
	PO10	2	By understanding vector calculus and derivatives the student will be able to communicate effectively on complex engineering activities with the engineering community.
	PO12	2	By understanding derivatives the student will be able to engage in continuous learning.
	PSO1	1	By understanding vector calculus and derivatives the student will be able to apply knowledge of mathematics ,science and engineering to design hardware and software systems in a 1 level so as to understand and solve engineering problems.
CO 2	PO 1	3	By understanding surface and volume integrals the students will be able to apply the knowledge in complex engineering problems.
	PO 2	3	By understanding the surface and volume integrals the students will be able to apply identify, formulate and analyze simple engineering problems.

	PO3	3	By understanding the surface and volume integrals students will be able to design solutions for very simple engineering problems.
	PO4	3	By understanding the volume and surface integrals students will be able to use research knowledge for the analysis and interpretation of data.
	PO5	2	By understanding the volume and surface integrals students will be able to use modern tools
	PO6	1	By understanding the volume and surface integrals students will be able to communicate on complex engineering activities with the engineering community and with the society.
	PO9	1	By understanding the volume and surface integrals students will be able to engage in continuous learning.
	PO10	2	By understanding the surface and volume integrals and learn their inter relations and application the student will be able to communicate effectively on complex engineering activities with the engineering community.
	PO12	2	By understanding the surface and volume integrals the students will be able to engage in continuous learning
	PSO1	1	By understanding the surface and volume integrals derivatives the student will be able to apply knowledge of mathematics, science and engineering to design hardware and software systems in a 1 level so as to understand and solve engineering problems.
CO 3	PO 1	3	By understanding homogeneous and non- homogeneous linear differential equation with constant coefficient the student will be able to apply the knowledge to find solution of complex engineering problems.
	PO 2	3	By understanding homogeneous and non- homogeneous linear differential equation with constant coefficient the student will be able to identify, analyze and make conclusions of simple engineering problems.
	PO 3	3	By understanding homogeneous and non- homogeneous linear differential equation with constant coefficient the student will be able to design solutions for simple engineering problems.

PO 4	3	By understanding homogeneous and non- homogeneous linear differential equation with constant coefficient the student will be able to conduct investigations of complex problems and provide valid conclusions.
PO 5	2	By understanding homogeneous and non- homogeneous linear differential equation with constant coefficient the student will be able to use modern tools like R for the implementation of concepts.
PO 6	1	By understanding homogeneous and non- homogeneous linear differential equation with constant coefficient the student will be able to communicate effectively on complex engineering activities with the engineering community.
PO9	1	By understanding homogeneous and non- homogeneous linear differential equation with constant coefficient the student will be able to engage in continuous learning.
PO10	2	By understanding homogeneous and non- homogeneous linear differential equation with constant coefficient the student will be able to communicate effectively about the numerical methods to the engineering community.
PO12	2	By understanding the homogeneous and non- homogeneous linear differential equation with constant coefficient the student will be able to engage in continuous learning.
PSO1	1	By understanding the homogeneous and non- homogeneous linear differential equation with constant derivatives the student will be able to apply knowledge of mathematics, science and engineering to design hardware and software systems in a 1 level so as to understand and solve engineering problems.

CO 4	PO 1	3	By understanding the Laplace transform the student will be able to apply the knowledge on complex engineering problems.
	PO 2	3	By understanding the Laplace transform the student will be able to identify formulate and analyze simple engineering problems.
	PO 3	3	By understanding the Laplace transform the student will be able to design solutions for simple engineering problems.
	PO4	3	By understanding the Laplace transform the student will be able to use research knowledge for the analysis and interpretation of data.
	PO 5	2	By understanding the Laplace transform, the student will be able to use modern tools like Matlab, Mathematica, Maple etc. for the implementation of concepts.
	PO 6	1	By understanding the Laplace transform the student will be able to communicate effectively about the numerical methods to the engineering community.
	PO 9	1	By understanding the Laplace transform the student will be able to engage in continuous learning.
	PO10	2	By understanding the Laplace transform the students will be able to communicate effectively on complex engineering activities with the engineering community.
	PO12	2	By understanding the Laplace transform the students will be able to the student will be able to engage in continuous learning.
	PSO1	1	By understanding the Laplace transform the student will be able to apply knowledge of mathematics, science and engineering to design hardware and software systems in a 1 level so as to understand and solve engineering problems.
CO 5	PO 1	3	By understanding the Fourier transform and functions the students will be able to apply the knowledge on complex engineering problems..
	PO 2	3	By understanding the Fourier transform and functions the students will be able to the student will be able to identify formulate and analyze simple engineering problems.
	PO 3	3	By understanding the Fourier transform and functions the students will be able to the student will be able to design solutions for simple engineering problems.

PO 4	3	By understanding the Fourier transform and functions the students will be able to the student will be able to use research knowledge for the analysis and interpretation of data.
PO 5	2	By understanding the Fourier transform and functions the students will be able to the student will be able to use modern tools for the implementation of concepts.
PO 6	1	By understanding the Fourier transform and functions the students will be able to the student will be able to communicate effectively on complex engineering activities with the engineering community.
PO 9	1	By understanding the Fourier transform and functions the students will be able to the student will be able to engage in continuous learning.
PO10	2	By understanding the Fourier transform and functions the students will be able to communicate effectively on complex engineering activities with the engineering community.
PO12	2	By understanding the Fourier transform and functions the student will be able to engage in continuous learning.
PSO1	1	By understanding the Fourier transform and functions the student will be able to apply knowledge of mathematics, science and engineering to design hardware and software systems in a 1 level so as to understand and solve engineering problems.

PHT 100	ENGINEERING PHYSICS A	L	T	P	CREDIT	Year of Introduction
		3	1	0	4	2019

After the successful completion of this course, students will able to

No.	Course outcomes	Knowledge Level
CO 1	Compute the quantitative aspects of waves and oscillations in engineering systems.	**K3**
CO 2	Apply the interaction of light with matter through interference, diffraction and identify these phenomena in different natural optical processes and optical instruments.	**K3**
CO 3	Analyze the behaviour of matter in the atomic and subatomic level through the principles ofquantum mechanics to perceive the microscopic processes in electronic devices.	**K2**
CO 4	Classify the properties of magnetic materials and apply vector calculus to static magnetic fields and use Maxwell's equations to diverse engineering problems	**K3**
CO 5	Analyze the principles behind various superconducting applications, explain the working of solid state lighting devices and fibre optic communication system	**K2**

Mapping of course outcomes with program outcomes

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO 1	3	2	-	-	-	-	-	1	2	-	-	1	-	-	-
CO 2	3	2	-	-	-	-	-	1	2	-	-	1	-	-	-
CO 3	3	2	-	-	-	-	-	1	2	-	-	1	-	-	-
CO 4	3	1	-	-	-	-	-	1	2	-	-	1	-	-	-
CO 5	3	1	-	-	-	-	-	1	2	-	-	1	-	-	-
Avg	3	1.6	-	-	-	-	-	1	2	-	-	1	-	-	-

Justification

Mapping	1/ 2/ 3	Justification
CO1-PO1	3	Compute the qualitative aspects of waves and oscillations in engineering systems like natural frequency, damped frequency, forced frequency, resonant frequency, Q-factor, frequency etc.
CO1-PO2	2	To identify the physics behind the f1 of current and relevant innovations in the respective branches.
CO1-PO8	1	Apply the principles of professional ethics by understanding the norms of engineering practice.
CO1-PO9	2	To practice team work by combining individual responsibilities in various class room activities.
CO1-PO12	1	To understand the use of new technologies and relevant innovations in the respective branches.
CO2-PO1	3	Apply the interaction of light with matter through interference and diffraction and to identify these phenomena in different natural optical processes and optical instruments. E.g.: Measurement of refractive index of materials, path difference and phase difference between waves, dispersive power and resolving power of plane transmission grating.
CO2-PO2	2	Use the first principles of interaction of light with matter and apply this to different optical processes and optical devices.
CO2-PO8	1	Apply the principles of professional ethics to various fields of engineering practice.
CO2-PO9	2	To practice team work by combining individual responsibilities in various class room activities.
CO2-PO12	1	To understand the use of new technologies and relevant innovations in the respective branches.
CO3 -PO1	3	Analyze the behaviour of matter in the atomic and subatomic level through the principles of quantum mechanics to perceive the microscopic processes in electronic devices. E.g.: Wave-function and it's physical significance, Schrodinger equations and application to particle in a one-dimensional box, tunnelling, Quantum confinement, properties of nanomaterials.
CO3-PO2	2	Use the principles of behaviour of matter in the atomic and sub atomic level and analyse the various microscopic processes in scientific devices and Nano structures.

CO3-PO8	1	Apply the principles of professional ethics to various fields of engineering practice.
CO3-PO9	2	To practice team work by combining individual responsibilities in various class room activities.
CO3-PO12	1	To understand the use of new technologies and relevant innovations in the respective branches.
CO4-PO1	3	Classify the properties of magnetic materials and apply vector calculus to static magnetic fields and use Maxwell's equations to diverse engineering problems. E.g.: Faraday's Laws, Para, dia, ferromagnetism, Physical significance of gradient, divergence and curl and its applications, displacement current and propagation of electromagnetic waves.
CO4-PO2	1	To identify the physics behind the properties of magnetic materials and apply vector calculus in analysing problems related to engineering practice.
CO4-PO8	1	Apply the principles of professional ethics by understanding the norms of engineering practice.
CO4-PO9	2	To practice team work by combining individual responsibilities in various class room activities.
CO4-PO12	1	To understand the use of new technologies and relevant innovations in the respective branches.
CO5-PO1	3	Analyse the principles behind various superconducting applications, explain the working of solid-state lighting devices and fibre optic communication system. E.g.: Meissner effect, classification of superconducting materials, Qualitative idea of BCS theory. Working of various photonic devices like LED, various Photo detectors, Solar cell, Classification of Optical fibre cable based on refractive index, significance of Numerical aperture, fibre optic communication system and fibre optic sensors.
CO5-PO2	1	To identify the physics behind the Superconducting phenomenon and fibre optics and relevant innovations in the respective branches.
CO5-PO8	1	Apply the principles of professional ethics by understanding the norms of engineering practice.
CO5-PO9	2	To practice team work by combining individual responsibilities in various class room activities.
CO5-PO12	1	To understand the use of new technologies and relevant innovations in the respective branches.

EST 100	ENGINEERING MECHANICS	L	T	P	CREDIT	Year of Introduction
		2	1	0	3	2019

Prerequisite: Nil

Course Outcomes: After completion of the course the student will be able to:

EST100.1	Recall principles and theorems related to rigid body mechanics
EST100.2	Identify and describe the components of system of forces acting on the rigid body.
EST100.3	Apply the conditions of equilibrium to various practical problems involving different force system
EST100.4	Choose appropriate theorems, principles or formulae to solve problems of mechanics
EST100.5	Solve problems involving rigid bodies, applying the properties of distributed areas and masses

Mapping of course outcomes with program outcomes

	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
EST100.1	2	2	-	-	-	-	-	-	-	-	-	-		
EST100.2	3	3	-	-	-	-	-	-	-	-	-	-		
EST100.3	3	3	-	-	-	-	-	-	-	-	-	-		
EST100.4	3	3	-	-	-	-	-	-	-	-	-	-	1	
EST100.5	3	3	-	-	-	-	-	-	-	-	-	-	1	
EST100	2.80	2.80	-	-	-	-	-	-	-	-	-	-	1	

Justification

CO	PO	LEVEL	REMARKS
EST100.1	PO 1	2	The student will be able to solve complex engineering problems.
	PO 2	2	The student will be able to solve complex engineering problems.
EST100.2	PO 1	3	The Knowledge of representing and solving problems in three dimensions.
	PO 2	3	The knowledge of representing and solving problems in three dimensions.
EST100.3	PO 1	3	The idea of properties of different cross sections that an engineer has to encounter in professional life is an important engineering knowledge.
	PO 2	3	The idea of properties of different cross sections that an engineer has to encounter in professional life is an important engineering knowledge.
EST100.4	PO 1	3	Students will be able to apply appropriate theorems to solve the problems.
	PO 2	3	Students will be able to apply the principles or formulae for solving the problems
	PSO 1	3	Students will be able to gain analytical skills which helps them to solve engineering problems.
EST100.5	PO 1	3	Students will be able to solve problems on rigid bodies.
	PO 2	3	Students will be able to solve problems by applying the properties of distributed areas and masses.
	PSO 1	3	Students will be able to arrive solutions to physical problems from mathematical modelling.

EST 130	BASICS OF ELECTRICAL & ELECTRONICS ENGINEERING	L	T	P	CREDIT	Year of Introduction
		4	0	0	3	2019

Course Outcomes (CO)

After the successful completion of this course, students will able to

No.	Course outcomes	Knowledge Level
CO 1	Apply fundamental concepts and circuit laws to solve simple DC electric circuits.	K1
CO 2	Develop and solve models of magnetic circuits.	K2
CO 3	Apply the fundamental laws of electrical engineering to solve simple ac circuits in steady state.	K2
CO 4	Describe working of a voltage amplifier	K2
CO 5	Outline the principle of an electronic instrumentation system	K2
CO 6	Explain the principle of radio and cellular communication	K2

CO – PO Matrix

	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
CO 1	3	1	-	-	-	-	-	-	-	-	-	2	-	-
CO 2	3	1	-	-	-	-	-	-	-	-	-	2	-	-
CO 3	3	1	-	-	-	-	-	-	-	-	-	2	-	-
CO 4	2	-	-	-	-	-	-	-	-	-	-	-	-	2
CO 5	2	-	-	-	-	-	-	-	-	-	-	2	-	2
CO 6	2	-	-	-	-	-	-	-	-	-	-	2	-	2
EST 130														

JUSTIFICATIONS FOR CO-PO MAPPING

Mapping	Mapping Level (3/2/1)	Justifications
CO1 -PO1	3	Completely compatible with CO1, so that complex engineering problems can be solved.
CO1 –PO2	1	Used the principles of basic electric circuits.
CO1 -PO12	2	Prepare the student to solve electrical based problems in their carrier.
CO2 -PO1	3	Completely compatible with CO2, so that complex engineering problems can be solved.
CO2 –PO2	1	Used the principles of magnetic circuits.
CO2 -PO12	2	Prepare the student to solve magnetism based problems in their carrier.
CO3 -PO1	3	Completely compatible with CO3, so that electrical engineering problems in construction sites can be mitigated.
CO3 –PO2	1	Used the principles of ac circuits.
CO3 -PO12	2	Knowledge of single phase & three phase electrical systems help in industries.
CO4 – PO1	2	Knowledge in the working of a voltage amplifier will improve engineering skills.
CO5 – PO1	2	The principle of an electronic instrumentation system Will help to finding solutions for complex engineering problems.
CO6 – PO1	2	Knowledge in the principle of radio and cellular communication will improve engineering skills.
CO5 – PO12	2	The principle of an electronic instrumentation system can motivate the students to improve their knowledge to adapt technological changes.
CO6 – PO12	2	Knowledge in the principle of radio and cellular communication will motivate the students to improve their knowledge to adapt technological changes.
CO4 – PSO2	2	Knowledge in the working of a voltage will provide ability to communicate technical information in both oral and written formats effectively.

CO5 – PSO2	2	The principle of an electronic instrumentation system Will help to get the ability to communicate technical information in both oral and written formats effectively.
CO6 – PSO2	2	Knowledge in the principle of radio and cellular communication Will help to get the ability to communicate technical information in both oral and written formats effectively.

EST 102	PROGRAMMING IN C	L	T	P	CREDIT	Year of Introduction
		2	1	2	4	2019

After the successful completion of the course students will be able to

CO.1	Analyze a computational problem and develop an algorithm/flowchart to find its solution
CO.2	Develop readable C programs with branching and looping statements, which uses Arithmetic, Logical, Relational or Bitwise operators.
CO.3	Write readable C programs with arrays, structure or union for storing the data to be processed
CO.4	Divide a given computational problem into a number of modules and develop a readable multi-function C program by using recursion if required, to find the solution to the computational problem
CO.5	Write readable C programs which use pointers for array processing and parameter passin
CO.6	Develop readable C programs with files for reading input and storing output

CO-PO Matrix

	PO1 (K3)	PO2 (K4)	PO3 (K5)	PO4 (K5)	PO5 (K6)	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1 (K3)	PSO2 (K3)
CO.1	3	3	3	2	-	2	-	-	-	3	3	3	3	-
CO.2	3	3	3	2	2	-	-	-	-	2	-	3	3	2
CO.3	3	3	3	1	2	-	-	-	-	2	-	3	3	2
CO.4	3	3	3	1	2	-	-	-	-	2	3	3	3	2
CO.5	3	3	-	-	2	-	-	-	-	1	-	3	3	2
CO.6	3	3	-	-	2	-	-	-	-	1	-	3	3	2

Justification

Mapping	Low/Medium/ High	Justification
CO1-PO1	3	Students will be able to use Engineering knowledge by Analyzing a computational problem and develop an algorithm/flowchart.
CO1-PO2	3	With analyzing a computational problem and develop an algorithm/flowchart, the students are able to analyze complex engineering problems.

Mapping	Low/Medium/ High	Justification
CO1-PO3	3	By analyzing a computational problem and develop an algorithm/flowchart, the students are able to design solutions for complex engineering problems.
CO1-PO4	2	Through analyzing a computational problem and develop an algorithm/flowchart, the students are able to conduct investigations of complex problems.
CO1-PO6	2	Students will be able to apply knowledge to assess social issues and responsibilities relevant to the professional engineering practice through analyzing a computational problem and developing solutions for that.
CO1-PO10	3	With analyzing a computational problem and develop an algorithm/flowchart, the students are able to communicate effectively on complex engineering activities with the engineering community.
CO1-PO11	3	The students will be able to demonstrate knowledge and understanding of the engineering principles and apply them in multi-disciplinary environments with the knowledge of analyzing a computational problem and developing an algorithm/flowchart.
CO1-PO12	3	By analyzing a computational problem and develop an algorithm/flowchart, the students are able to recognize the need for and to engage in independent and life-long learning in the broadest context of technological change.
CO1-PSO1	3	Students will be able to use Engineering knowledge by Analyzing a computational problem and develop an algorithm/flowchart.
CO2-PO1	3	With the knowledge of different Arithmetic, Logical, Relational or Bitwise operators, the students will be able to use Engineering knowledge.
CO2-PO2	3	With developing programs using branching and looping statements, which uses Arithmetic, Logical, Relational or Bitwise operators, the students are able to analyze complex engineering problems.
CO2-PO3	3	With the knowledge of branching and looping statements and operators and by developing programs using them, the students are able to design solutions for complex engineering problems.
CO2-PO4	2	The students are able to conduct investigations of complex problems with the knowledge of programming using branching and looping statements and operators.
CO2-PO5	2	With the knowledge of programming using branching and looping statements and operators, students will be able to select and apply

Mapping	Low/Medium/ High	Justification
		appropriate techniques and IT tools like prediction and modelling to complex problems.
CO2-PO10	2	The students are able to communicate effectively on complex engineering activities with the engineering community with the knowledge of programming using branching and looping statements.
CO2-PO12	3	With the knowledge of different programming using branching and looping statements, the students are able to recognize the need for and to engage in independent and life-long learning in the broadest context of technological change.
CO2-PSO1	3	With the knowledge of different Arithmetic, Logical, Relational or Bitwise operators, the students will be able to use Engineering knowledge.
CO2-PSO2	2	With the knowledge of programming using branching and looping statements and operators, students will be able communicate technical information effectively.
CO3-PO1	3	By examining how arrays, structure or union are used for storing data to be processed, the Students will be able to apply knowledge in fundamentals of engineering and mathematics.
CO3-PO2	3	Students will be able to perform analysis of complex engineering problems by examining how arrays, structure or union are used for storing data to be processed
CO3-PO3	3	With the knowledge of how arrays, structure or union are used for storing data to be processed, the Students will be able to design solutions for complex engineering problems.
CO3-PO4	1	With the knowledge of how arrays, structure or union are used for storing data to be processed, the Students will be able to conduct investigations of complex problems.
CO3-PO5	2	With the knowledge of how arrays, structure or union are used for storing data to be processed, students will be able to select and apply appropriate techniques and IT tools like prediction and modelling to complex problems.
CO3-PO10	2	Students will be able to communicate effectively on complex engineering activities with the engineering community with the knowledge of how arrays, structure or union are used for storing data to be processed.
CO3-PO12	3	With the knowledge of how arrays, structure or union are used for storing data to be processed, the Students will be able to recognize

Mapping	Low/Medium/ High	Justification
		the need for and to engage in independent and life-long learning in the broadest context of technological change
CO3-PSO1	3	By examining how arrays, structure or union are used for storing data to be processed, the Students able communicate technical information effectively.
CO3-PSO2	2	With the knowledge of how arrays, structure or union are used for storing data to be processed, students will be able to select and apply appropriate techniques and IT tools like prediction and modelling to complex problems.
CO4-PO1	3	Students will be able to use Engineering knowledge with developing readable multi-function C programs to find the solution to the computational problem.
CO4-PO2	3	Students will be able to perform analysis of complex engineering problems with developing readable multi-function C programs to find the solution to the computational problem.
CO4-PO3	3	Students will be able to design solutions for complex engineering problems by dividing a problem into modules and developing readable multi-function C programs to find the solution to the computational problem
CO4-PO4	1	With the knowledge of sub modules and by developing readable multi-function C programs to find the solution to the computational problem, the Students will be able to conduct investigations of complex problems.
CO4-PO5	2	With the knowledge of Identifying Subtasks and developing readable multi-function C programs to find the solution to the computational problem, students will be able to select and apply appropriate techniques and IT tools like prediction and modelling to complex problems.
CO4-PO10	2	Students will be able to communicate effectively on complex engineering activities with the engineering community with the knowledge of Identifying Subtasks and developing readable multi-function C programs to find the solution to the computational problem.
CO4-PO11	3	The students will be able to demonstrate knowledge and understanding of the engineering principles and apply them in multi-disciplinary environments with the knowledge of Identifying Subtasks and developing readable multi-function C programs to find the solution to the computational problem
CO4-PO12	3	With the knowledge of Identifying Subtasks and developing readable multi-function C programs to find the solution to the

Mapping	Low/Medium/ High	Justification
		computational problem, the Students will be able to recognize the need for and to engage in independent and life-long learning in the broadest context of technological change
CO4-PSO1	3	Students will be able to use Engineering knowledge with developing readable multi-function C programs to find the solution to the computational problem.
CO4-PSO2	2	With the knowledge of Identifying Subtasks and developing readable multi-function C programs to find the solution to the computational problem, students will able communicate technical information effectively.
CO5-PO1	3	Students will be able to use fundamental Engineering knowledge by writing readable C programs which use pointers for array processing and parameter passing.
CO5-PO2	3	Students will be able to perform analysis of complex engineering problems with the knowledge of C programs which use pointers for array processing and parameter passing.
CO5-PO5	2	By writing readable C programs which use pointers for array processing and parameter passing, students will be able to select and apply appropriate techniques and IT tools like prediction and modelling to complex problems.
CO5-PO10	1	With writing C programs which use pointers for array processing and parameter passing, the Students will be able to communicate effectively on complex engineering activities with the engineering community
CO5-PO12	3	With the knowledge of programs which use pointers for array processing and parameter passing., the Students will be able to recognize the need for and to engage in independent and life-long learning in the broadest context of technological change
CO5-PSO1	3	Students will be able to use fundamental Engineering knowledge by writing readable C programs which use pointers for array processing and parameter passing.
CO5-PSO2	2	By writing readable C programs which use pointers for array processing and parameter passing, students will able communicate technical information effectively.
CO6-PO1	3	Students will be able to use Engineering knowledge with developing readable C programs with files for reading input and storing output.
CO6-PO2	3	Students will be able to perform analysis of complex engineering problems with the knowledge of developing C programs with files for reading input and storing output.
CO6-PO5	2	With developing readable C programs with files for reading input and storing output, the Students will be able to conduct investigations of complex problems.

Mapping	Low/Medium/ High	Justification
CO6-PO10	1	Through developing readable C programs with files for reading input and storing output, the Students will be able to communicate effectively on complex engineering activities with the engineering community.
CO6-PO12	3	With the knowledge of the concept of File system for handling data storage and developing readable C programs with files, the Students will be able to recognize the need for and to engage in independent and life-long learning in the broadest context of technological change.
CO6-PSO1	3	Students will be able to use Engineering knowledge with developing readable C programs with files for reading input and storing output.
CO6-PSO2	2	With developing readable C programs with files for reading input and storing output, the Students will able communicate technical information effectively.

HUN 102	PROFESSIONAL COMMUNICATION	L	T	P	CREDIT	Year of Introduction
		2	0	2	-	2019

After the successful completion of this course, students will able to

No.	Course outcomes	Knowledge Level
HUN102.1	Develop vocabulary and language skills relevant to engineering as a professional	K3
HUN102.2	Analyze , interpret & effectively summarize a variety of textual content	K3
HUN102.3	Create effective technical presentation	K3
HUN102.4	Discuss a given technical /non-technical topics in a group setting and arrive at generalization /consensus	K3
HUN102.5	Identify drawbacks in listening patterns and apply listening techniques for specificneeds	K3
HUN102.6	Create professional & technical document that are clear and adhering to all the necessary conventions	K3

CO – PO Matrix

	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
HUN102.1	-	-	-	-	-	2	-	-	2	2	1	3	-	
HUN102.2	1	1	-	-	-	-	-	-	3	-	-	3	1	-
HUN102.3	-	-	-	-	-	1	-	-	1	3	1	-	1	-
HUN102.4	1	2	-	-	-	-	-	-	-	2	1	1	1	-
HUN102.5	-	3	2	1	-	-	-	-	-	1	-	1	-	-
HUN102.6	-	-	-	-	-	1	-	-	2	3	-	1	-	-
Avg	1	2	2	1	-	1.33	-	-	2	2.2	1	1.8	1	-

JUSTIFICATIONS FOR CO-PO MAPPING

Mapping	Mapping Level (L/M/H)	Justifications
CO2-PO1	1	Graduate will be able to apply different reading styles to analyze , interpret& effectively summarize a variety of textual content
CO4-PO1	1	Graduate need to effectively conduct healthy group discussion to analyses ,understand and learn various methodologies towards efficient electronic system design
CO2-PO2	1	Graduate need to develop reading skills in order to develop sustained conclusions to complex engineering problems
CO4-PO2	2	Graduate need to actively involve in group discussions to able to arriveat optimal conclusion towards development of electronics system
CO5 – PO2	3	Graduate need to apply proper listening skills and analyze them to constructively contribute to sustained conclusions to complex engineering problems
CO5 – PO3	2	Graduate need to implement appropriate listening skills to understandthe specified needs to find solution for complex engineering problems
CO5 – PO4	1	Graduate need to apply listening skills for synthesis of information to provide valid conclusion
CO1 – PO6	2	Graduate should be able to understand the textual content given to assess societal, health and legal issues
CO3- PO6	1	Graduate should be able to create technical presentation based on contextual knowledge to convey societal, health and legal issues
CO6- PO6	1	Graduate need to create technical document that convey the textual knowledge associated to an engineering system
CO1 – PO9	2	Graduate need to effectively communicate as a member or leader of a team to constructively work towards providing solution for engineering problems
CO2- PO9	3	Graduate need to effectively summarize ,analyses and interpret the textual content in order to function effectively in a team
CO3-PO9	1	Graduate need to effectively create technical presentation to conveyideas and solutions in a team
CO6-PO9	3	Graduates need to create professional & technical document that will help the team or indiviual work effectively
CO1-PO10	2	Graduate need to effectively communicate using language effectively to comprehend and write effective report
CO3-PO10	3	Graduate need to effectively create technical presentation to conveyideas
CO4-PO10	1	Graduate need to discuss technical solution related to complex engineering topics in a group setting and arrive at generalization /consensus

CO1-PO11	1	Graduate needs to communicate effectively knowledge and understanding of engineering principles in order to manage projects
CO2-PO11	1	Graduate should able to utilize various reading skills to demonstrate knowledge and understanding of engineering principles
CO3-PO11	1	Graduate need to effectively create technical presentation to demonstrate their acquired knowledge through effective presentation
CO1-PO12	3	Graduate need to develop vocabulary and language skills relevant to engineering as a professional to engage in lifelong learning
CO2-PO12	3	Graduate need to analyze, interpret & effectively summarize a variety of textual content to effectively engage in lifelong learning
CO4-PO12	1	Graduate need to discuss technical solution related to complex engineering problems to advance in research and development
CO2-PSO1	1	Graduate need to apply reading techniques to analyze and interpret textual content for computing solutions for engineering problems.
CO3-PSO1	1	Graduate need to effectively create technical presentation to convey ideas for computing solutions for engineering problems.
CO4-PSO1	1	Graduate need to conduct effective group discussion for solutionsfor engineering problems.

PHL 120	ENGINEERING PHYSICS LAB	L	T	P	CREDIT	Year of Introduction
		0	0	2	1	2019

After the successful completion of this course, students will able to:

No.	Course outcomes	Knowledge Level
CO 1	Develop analytical/experimental skills and impart prerequisite hands on experience for engineering laboratories	**K3**
CO 2	Understand the need for precise measurement practices for data recording	**K3**
CO 3	Understand the principle, concept, working and applications of relevant technologies and comparison of results with theoretical calculations	**K3**
CO 4	Analyze the techniques and skills associated with modern scientific tools such as lasers and fiber optics	**K3**
CO 5	Develop basic communication skills through working in groups in performing the laboratory experiments and by interpreting the results	**K2**

Mapping of course outcomes with program outcomes

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO 1	3	-	-	-	3	-	-	1	2	-	-	1	-	-	-
CO 2	3	-	-	-	3	-	-	1	2	-	-	1	-	-	-
CO 3	3	-	-	-	3	-	-	1	2	-	-	1	-	-	-
CO 4	3	-	-	-	3	-	-	1	2	-	-	1	-	-	-
CO 5	3	-	-	-	3	-	-	1	2	-	-	1	-	-	-
Avg	3	-	-	-	3	-	-	1	2	-	-	1	-	-	-

Justification

Mapping	1/ 2/ 3	Justification
CO1-PO1	3	Designing of instruments, structures and analysis using tools requires fundamentals of oscillations, resonance and waves.
CO1-PO5	3	Applying the theoretical knowledge of resonance and waves to design an conduct experiments for data interpretation.
CO1-PO8	1	Apply the principles of professional ethics by understanding the norms of engineering practice.
CO1-PO9	2	To practice team work by combining individual responsibilities in various class room activities.
CO1-PO12	1	To understand the use of new technologies and relevant innovations in the respective branches.
CO2-PO1	3	Designing of instruments, structures and analysis tools require fundamentals of interference and diffraction engineering problems.
CO2-PO5	3	Applying the theoretical knowledge of interference and diffraction to design and conduct experiments for data interpretation.
CO2-PO8	1	Apply the principles of professional ethics to various fields of engineering practice.
CO2-PO9	2	To practice team work by combining individual responsibilities in various class room activities.
CO2-PO12	1	To understand the use of new technologies and relevant innovations in the respective branches.
CO3 -PO1	3	Analyse the behaviour of matter in the atomic and subatomic level through the principles of quantum mechanics to perceive the microscopic processes in electronic devices. E.g.: Wave-function and it's physical significance, Schrodinger equations and application to particle in a one-dimensional box, tunnelling, Quantum confinement, properties of nanomaterials.
CO3-PO5	3	Use the principles of behaviour of matter in the atomic and sub atomic level and analyse the various microscopic processes in scientific devices and Nano structures.

CO3-PO8	1	Apply the principles of professional ethics to various fields of engineering practice.
CO3-PO9	2	To practice team work by combining individual responsibilities in various class room activities.
CO3-PO12	1	To understand the use of new technologies and relevant innovations in the respective branches.
CO4-PO1	3	Apply the fundamental knowledge of electricity and magnetism for solving various engineering problems.
CO4-PO5	3	To practice effective communication by various presentations in class and laboratory sessions.
CO4-PO8	1	Apply the principles of professional ethics to various fields of engineering practice.
CO4-PO9	2	To practice team work by combining individual responsibilities in various class room activities.
CO4-PO12	1	To understand the use of new technologies and relevant innovations in the respective branches.
CO5-PO1	3	Application of photonics and fiber optics in various branches of engineering.
CO5-PO5	3	Applying the theoretical knowledge of laser, photonics and fiber optics for data interpretation.
CO5-PO8	1	Apply the principles of professional ethics to various fields of engineering practice.
CO5-PO9	2	To practice team work by combining individual responsibilities in various class room activities.
CO5-PO12	1	To understand the use of new technologies and relevant innovations in the respective branches.

PHL 120	ELECTRICAL & ELECTRONICS WORKSHOP	L	T	P	CREDIT	Year of Introduction
		0	0	2	1	2019

ELECTRICAL WORKSHOP

After the successful completion of this course, students will able to:

CO1	Demonstrate safety measures against electric shocks
CO2	Identify the tools used for electrical wiring, electrical accessories, wires, cables, batteries and standard symbols
CO3	Develop the connection diagram, identify the suitable accessories and materials necessary for wiring simple lighting circuits for domestic buildings

Mapping of course outcomes with program outcomes

COs/POs		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	K2	-	-	-	-	-	3	-	-	-	-	-	1	-	-
CO2	K2	2	-	-	-	-	-	-	-	-	1	-	-	-	-
CO3	K2	2	-	-	1	-	1	-	1	2	2	-	2	-	-
Average		1.33	-	-	.33	-	1.33	-	.33	.67	1	-	1	-	-

JUSTIFICATION FOR CO-PO MAPPING

CO	PO	MAPPING	JUSTIFICATION
CO1	PO6	3	Completely compatible with CO1,because students are using contextual knowledge to safeguard one's life.
	PO12	1	It leads to lifelong learning for students
CO2	PO1	2	Applying practical knowledge in engineering, so that complex engineering problems can be solved.
	PO10	1	Communicate effectively on complex engineering activities
CO3	PO1	2	Applying practical knowledge in engineering, so that complex engineering problems can be solved.
	PO4	1	Helps students to conduct investigations of complex problems by practicing it by themselves.
	PO6	1	Students are getting responsibilities relevant to the professional engineering practice
	PO8	1	Appling ethical principles
	PO9	2	Functioning effectively as an individual, and as a member, leader in diverse teams etc.
	PO10	2	Communicate effectively on complex engineering activities
	PO12	2	It leads to lifelong learning for students

ELECTRONICS WORKSHOP

Course Outcomes (CO)

After the successful completion of this course, students will able to

No.	Course outcomes	Knowledge Level
ESL130.4	Identify and test various electronic components	K_2
ESL130.5	Draw circuit schematics with EDA tools	K_2
ESL130.6	Assemble and test electronic circuits on boards	K_2

CO – PO – PSO Mapping Matrix

	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
ESL130.4	3				1				2			2	2	
ESL130.5	3				2			2	2			2	2	
ESL130.6	3				2				2			1	3	

JUSTIFICATIONS FOR CO-PO-PSO MAPPING

Mapping	Mapping Level (3/2/1)	Justifications
CO4 - PO1	3	Students are expected to utilize engineering knowledge for the identification and testing of various electronic components
CO4 - PO5	1	Students are expected to identify certain problems by understanding the testing of various electronic components
CO4 - PO9	2	Students are expected to function effectively as an individual and in a team during the identification and testing of various electronic components

CO4 – PO12	2	Identification and testing of various electronic components will help the students to develop the ability to engage in independent and lifelong learning, in the broadest context of technological change.
CO4 – PSO1	2	The usage of various instruments for testing the components will familiarize the students to use certain hardware tools
CO5 - PO1	3	Students are expected to apply the electronic circuit knowledge to draw the circuit schematic
CO5 - PO5	2	Students are expected to utilize the appropriate EDA software effectively to draw the circuit schematic.
CO5 - PO8	2	Students are expected to apply the ethical rules and commit to professional ethics in the laboratory.
CO5 - PO9	2	Students are expected to function effectively as an individual to obtain the expected outcome
CO5 - PO12	2	The use of the software tools enables the students to engage in independent and lifelong learning
CO4 – PSO1	2	Drawing of circuit schematics with EDA tools will help the students to analyse and design hardware systems so as to understand and solve engineering problems.
CO6 - PO1	3	Students are expected to apply knowledge of Electronic circuits to rectify problems while assembling and testing electronic circuits on board.
CO6 - PO5	2	Students are expected to create, select, and apply appropriate techniques and resources, to assemble and test electronic circuits on board.
CO6 – PO9	2	Students are expected to design documentation of the various electronic circuit experiments, effectively as an individual and in a team.
CO6 - PO12	1	Students are expected to recognize the need for and have the preparation and ability to engage in independent and life-long learning in the area of electronic circuits.
CO6 – PSO1	3	Assembling and testing electronic circuits on boards will help the students to design hardware systems so as to understand and solve engineering problems.

MAT 203	DISCRETE MATHEMATICAL STRUCTURES	L	T	P	CREDIT	Year of Introduction
		3	1	0	4	2019

The Students will be able to

CO	Course outcome	Knowledge level
CO1	Check the validity of predicates in propositional and quantified propositional logic using truth tables, deductive reasoning and inference theory on propositional logic	K3
CO2	Solve counting problems by applying elementary counting techniques rule of sum, rule of product, permutation, combination, binomial theorem, pigeonhole principle and principle of inclusion and exclusion principle	K3
CO3	Classify binary relations into various types and illustrate an application for each type of binary relation in computer science	K3
CO4	Illustrate an application for partially ordered sets and complete lattices in computer science	K3
CO5	Explain the generating functions and solve first order and second order linear recurrence relations with constant coefficients	K3
CO6	Illustrate abstract algebraic system - semigroups, monoids, groups homomorphisms and isomorphisms of monoids and groups	K3

CO-PO MAPPING

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	2	2	-	-	-	-	-	-	-	2	1	-	-
CO2	3	2	2	2	-	-	-	-	-	-	-	2	1	-	-
CO3	3	2	2	2	-	2	-	-	-	-	-	2	1	-	-
CO4	3	2	2	2	-	2	-	-	-	-	-	2	1	-	-
CO5	3	2	2	2	-	-	-	-	-	-	-	2	1	-	-
CO6	3	2	2	2	-	-	-	-	-	-	-	2	1	-	-
AVG	3	2	2	2	-	2	-	-	-	-	-	2	1	-	-

Justification

Mapping	LOW/ MEDIUM/ HIGH	Justification
CO1-PO1	3	This knowledge of propositional and predicate logic helps in analysis of performance of solutions to complex problems
CO1-PO2	2	The real-life events can be represented and verified using Mathematical logic.
CO1-PO3	2	Reasoning is made possible for engineering problems
CO1-PO4	2	Data analysis and verification can be done by using propositional logic
CO1-PO12	1	By learning the propositional logic, the students are able to 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
CO2-PO1	3	Counting techniques can be used to reach conclusions in the problems involving huge data.
CO2-PO2	2	The arrangement and combinations of data to be taken for different problems can be identified.
CO2-PO3	2	The Knowledge on Counting techniques will help to solve problems related to large data sets.
CO2-PO4	2	The study of counting techniques and combinatorics helps to analyse and verify research data.
CO2-PO12	1	By learning counting principles and combinatorics, the students are able to 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.
CO3 -PO1	3	Study of binary relations acquire the knowledge of applications for each type of binary relation in computer science
CO3-PO2	2	By learning binary relations helps in problem analysis in computer science
CO3-PO3	2	Study of binary relations develop the ideas in design and development of solutions.
CO3-PO4	2	Study of binary relations helps in developing solutions of complex problems
CO3-PO6	2	By learning binary relations students can be able to find the one to one correspondence between various attributes in society
CO3-PO12	1	By learning binary relations, the students are able to 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.
CO4-PO1	3	Study of posets and lattices acquire the knowledge of applications for each type of structures of information f1 in computer science

CO4-PO2	2	By learning posets and lattices helps in problem analysis in computer science
CO4-PO3	2	Study of posest and lattices develop the ideas in design and development of solutions.
CO4-PO4	2	Study of posets and lattices helps in developing solutions of complex problems
CO4-PO6	2	Applications of partially ordered sets and complete lattices helps in applying 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.
CO4-PO12	1	By learning posets and lattices, the students are able to 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
CO5-PO1	3	The knowledge of recurrence relation and generating functions helps in analysis of performance of solutions to complex problems
CO5-PO2	2	The knowledge of recurrence relation and generating functions will help the students to apply the same to identify and analyse engineering problems
CO5-PO3	2	The knowledge of recurrence relation and generating functions will help in the design and development of abstract models for computational problems
CO5-PO4	2	The knowledge of recurrence relation and generating functions help in designing solutions to complex problems.
CO5-PO12	1	By learning recurrence relations, the students are able to 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.
CO6-PO1	3	Algebraic structures can be used to visualize the complex engineering problems involving sets of data.
CO6-PO2	2	The similarity and characteristics of data can be analysed using algebraic principles
CO6-PO3	2	The study of algebraic structures helps to design complex engineering problems
CO6-PO4	2	The study of algebraic structures helps to analyse and verify research data
CO 6-PO12	1	By learning algebraic structures, the students are able to 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.
CO1-PSO1	2	The knowledge of propositional and predicate logic will be useful in applying fundamental knowledge in Electronics and Computer Engineering to analyse and design hardware and software systems so as to understand and solve engineering problems.
CO2-PSO1	2	The knowledge on counting techniques will help the students to apply fundamental knowledge in Electronics and Computer Engineering to analyse

		and design hardware and software systems so as to understand and solve engineering problems.
CO3-PSO1	2	The knowledge of binary relations will help to apply fundamental knowledge in Electronics and Computer Engineering to analyse and design hardware and software systems so as to understand and solve engineering problems.
CO4-PSO1	2	The knowledge of partially ordered sets will make the students to apply fundamental knowledge in Electronics and Computer Engineering to analyse and design hardware and software systems so as to understand and solve engineering problems.
CO5-PSO1	2	The knowledge of recurrence will help to apply fundamental knowledge in Electronics and Computer Engineering to analyse and design hardware and software systems so as to understand and solve engineering problems.
CO6-PSO1	2	The knowledge of Algebraic structures will be useful to apply fundamental knowledge in Electronics and Computer Engineering to analyse and design hardware and software systems so as to understand and solve engineering problems.

CST 201	DATA STRUCTURES	L	T	P	CREDIT	Year of Introduction
		3	1	0	4	2019

The students will be able to:

CO	Course outcome	Knowledge level
CST201.CO1	Design an algorithm for a computational task and calculate the time/space complexities of that algorithm (Cognitive Knowledge Level: Apply)	K3
CST201.CO2	Identify the suitable data structure (array or linked list) to represent a data item required to be processed to solve a given computational problem and write an algorithm to find the solution of the computational problem (Cognitive Knowledge Level: Apply)	K3
CST201.CO3	Write an algorithm to find the solution of a computational problem by selecting an appropriate data structure (binary tree/graph) to represent a data item to be processed (Cognitive Knowledge Level: Apply)	K3
CST201.CO4	Store a given dataset using an appropriate Hash Function to enable efficient access of data in the given set (Cognitive Knowledge Level: Apply)	K3
CST201.CO5	Select appropriate sorting algorithms to be used in specific circumstances (Cognitive Knowledge Level: Analyze)	K4
CST201.CO6	Design and implement Data Structures for solving real world problems efficiently (Cognitive Knowledge Level: Apply)	K3

CO - PO - PSO MAPPING

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	1	1	-	1	-	-	-	-	-	3	3	2
CO2	3	3	3	2	-	1	-	-	-	-	-	3	3	2
CO3	3	3	3	2	-	1	-	-	-	-	-	3	3	2
CO4	3	3	3	1	-	1	-	-	-	-	-	3	3	2
CO5	2	2	2	1	-	1	-	-	-	-	-	3	3	2
CO6	3	3	3	2	-	1	-	-	-	-	-	3	3	2

AVG	2.83	2.67	2.5	1.5	-	1	-	-	-	-	-	3	3	2

JUSTIFICATION

CO-PO	LEVEL	JUSTIFICATION
CST 201 CO1-PO1	2	Learning to design an algorithm for a computational task and calculate the time/space complexities of that algorithm helps the students in the solutions for complex engineering problems.
CST 201 CO1-PO2	2	Learning to design an algorithm for a computational task and calculate the time/space complexities of that algorithm helps the students to identify and formulate solutions of complex engineering problem.
CST 201 CO1-PO3	1	Learning to design an algorithm for a computational task and calculate the time/space complexities of that algorithm helps the students to design solution to an engineering problem.
CST 201 CO1-PO4	1	Learning to design an algorithm for a computational task and calculate the time/space complexities of that algorithm, helps the students to investigate and analyze complex problems.
CST 201 CO1-PO6	1	Learning to design an algorithm for a computational task and calculate the time/space complexities of that algorithm, helps the students to solve health, safety and legal servicing problems efficiently.
CST 201 CO1-PO12	3	Learning to design an algorithm for a computational task and calculate the time/space complexities of that algorithm, helps to learn many other topics of engineering and help for a lifelong learning.
CST 201 CO1-PSO1	3	Learning to design an algorithm for a computational task and calculate the time/space complexities of that algorithm, helps the students to analyze and design hardware and software systems so as to understand and solve engineering problems.
CS 201 CO1-PSO2	2	Learning to design an algorithm for a computational task and calculate the time/space complexities of that algorithm help the students to adapt to modern information and communication technologies
CST 201 CO2-PO1	3	By identifying the suitable data structure like array or linked list to represent a data item required to be processed to solve a given computational problem and write an algorithm to find the solution of

		the computational problem, the students will be able to solve complex engineering problems.
CST 201 CO2-PO2	3	By identifying the suitable data structure like array or linked list to represent a data item required to be processed to solve a given computational problem and write an algorithm to find the solution of the computational problem, the students will be able to identify and formulate complex engineering problems.
CST 201 CO2-PO3	3	By identifying the suitable data structure like array or linked list to represent a data item required to be processed to solve a given computational problem and write an algorithm to find the solution of the computational problem, the students will be able to design of solutions to complex engineering problems.
CST 201 CO2-PO4	2	By identifying the suitable data structure like array or linked list to represent a data item required to be processed to solve a given computational problem and write an algorithm to find the solution of the computational problem, helps the students to investigate and analyze complex problems.
CST 201 CO2-PO6	1	By identifying the suitable data structure like array or linked list to represent a data item required to be processed to solve a given computational problem and write an algorithm to find the solution of the computational problem, helps the students to solve health, safety and legal servicing problems efficiently.
CST 201 CO2-PO12	3	By identifying the suitable data structure like array or linked list to represent a data item required to be processed to solve a given computational problem and write an algorithm to find the solution of the computational problem, helps the students to learn many other topics of engineering and help for a lifelong learning.
CST 201 CO2-PSO1	3	By identifying the suitable data structure like array or linked list to represent a data item required to be processed to solve a given computational problem and write an algorithm to find the solution of the computational problem, helps the students to analyze and design hardware and software systems so as to understand and solve engineering problems.
CST 201 CO2-PSO2	2	By identifying the suitable data structure like array or linked list to represent a data item required to be processed to solve a given computational problem and write an algorithm to find the solution of

		the computational problem, helps the students to adapt to modern information and communication technologies
CST 201 CO3-PO1	3	By learning to write an algorithm to find the solution of a computational problem by selecting an appropriate non-linear data structure to represent a data item to be processed, helps the students to solve complex engineering problems
CST 201 CO3-PO2	3	By learning to write an algorithm to find the solution of a computational problem by selecting an appropriate non-linear data structure to represent a data item to be processed, helps the students to identify and formulate complex engineering problems
CST 201 CO3-PO3	3	By learning to write an algorithm to find the solution of a computational problem by selecting an appropriate non-linear data structure to represent a data item to be processed, helps the students to design solutions to complex engineering problems
CST 201 CO3-PO4	2	By learning to write an algorithm to find the solution of a computational problem by selecting an appropriate non-linear data structure to represent a data item to be processed, helps the students to solve complex engineering problems.
CST 201 CO3-PO6	1	By learning to write an algorithm to find the solution of a computational problem by selecting an appropriate non-linear data structure to represent a data item to be processed, helps the students to solve safety and legal servicing problems efficiently
CST 201 CO3-PO12	3	By learning to write an algorithm to find the solution of a computational problem by selecting an appropriate non-linear data structure to represent a data item to be processed, helps the students to learn many other topics of engineering and help for a lifelong learning.
CST 201 CO3-PSO1	3	By learning to write an algorithm to find the solution of a computational problem by selecting an appropriate non-linear data structure to represent a data item to be processed, helps the students to analyze and design hardware and software systems so as to understand and solve engineering problems.
CST 201 CO3-PSO2	2	By learning to write an algorithm to find the solution of a computational problem by selecting an appropriate non-linear data structure to represent a data item to be processed, helps the students to adapt to modern information and communication technologies

CST 201 CO4-PO1	3	By learning to store a given dataset using an appropriate Hash Function to enable efficient access of data in the given set, help the students to solve complex engineering problems
CST 201 CO4-PO2	3	By learning to store a given dataset using an appropriate Hash Function to enable efficient access of data in the given set, helps the students to identify and formulate complex engineering problems
CST 201 CO4-PO3	3	By learning to store a given dataset using an appropriate Hash Function to enable efficient access of data in the given set, helps the students to design solutions to complex engineering problems
CST 201 CO4-PO4	1	By learning to store a given dataset using an appropriate Hash Function to enable efficient access of data in the given set, helps the students to analyze and interpret data.
CST 201 CO4-PO6	1	By learning to store a given dataset using an appropriate Hash Function to enable efficient access of data in the given set, help to solve health, safety and legal servicing problems efficiently
CST 201 CO4-PO12	3	By learning to store a given dataset using an appropriate Hash Function to enable efficient access of data in the given set helps to learn many other topics of engineering and help for a lifelong learning.
CST 201 CO4-PSO1	3	By learning to store a given dataset using an appropriate Hash Function to enable efficient access of data in the given set , helps the students to analyze and design hardware and software systems so as to understand and solve engineering problems.
CST 201 CO4-PSO2	2	By learning to store a given dataset using an appropriate Hash Function to enable efficient access of data in the given set can be used to help to adapt to modern information and communication technologies
CST 201 CO5-PO1	2	By learning to select appropriate sorting algorithms to be used in specific circumstances, students will be able to solve complex engineering problems
CST 201 CO5-PO2	2	By learning to select appropriate sorting algorithms to be used in specific circumstances, students will be able to identify and formulate complex engineering problems

CST 201 CO5-PO3	2	By learning to select appropriate sorting algorithms to be used in specific circumstances, students will be able to design solutions to complex engineering problems
CST 201 CO5-PO4	1	By learning to select appropriate sorting algorithms to be used in specific circumstances, the students will be able to conduct investigation on large set of data to analyze the performance on different set of data
CST 201 CO5-PO6	1	By learning to select appropriate sorting algorithms to be used in specific circumstances helps to solve health, safety and legal servicing problems efficiently
CST 201 CO5-PO12	3	By learning to select appropriate sorting algorithms to be used in specific circumstances helps to learn many other topics of engineering and help for a lifelong learning.
CST 201 CO5-PSO1	3	By learning to select appropriate sorting algorithms to be used in specific circumstances, the students will be able to analyze and design hardware and software systems so as to understand and solve engineering problems.
CST 201 CO5-PSO2	2	By learning to select appropriate sorting algorithms to be used in specific circumstances, the students will be able to use modern information and communication technologies
CST 201 CO6-PO1	3	Learning to design and implement Data Structures for solving real world problems efficiently, helps to find solutions for various complex engineering problems.
CST 201 CO6-PO2	3	Learning to design and implement Data Structures for solving real world problems efficiently, helps to find identify and formulate solutions for various complex engineering problems.
CST 201 CO6-PO3	3	Learning to design and implement Data Structures for solving real world problems efficiently, helps to design solutions for various complex engineering problems.
CST 201 CO6-PO4	2	Learning to design and implement Data Structures for solving real world problems efficiently, helps to conduct investigation on large set of data to analyze the performance on different set of data
CST 201 CO6-PO6	1	Learning to design and implement Data Structures for solving real world problems efficiently help to solve health, safety and legal servicing problems efficiently

CST 201 CO6-PO12	3	Learning to design and implement Data Structures for solving real world problems efficiently helps to learn many other topics of engineering and help for a lifelong learning.
CST 201 CO6-PSO1	3	Learning to design and implement Data Structures for solving real world problems efficiently help in designing solutions to complex multidisciplinary engineering problems.
CST 201 CO6-PSO2	2	Learning to design and implement Data Structures for solving real world problems efficiently help to adapt to modern information and communication technologies

ERT 203	DIGITAL SYSTEMS AND VLSI DESIGN	L	T	P	CREDIT	Year of Introduction
		3	1	0	4	2019

Course Outcomes (CO)

After the successful completion of this course, students will able to

No.	Course outcomes	Knowledge Level
CO1	Understand the basic concepts of number systems and its conversions	K2
CO2	Apply the Boolean Functions to design, simplify and realize digital circuits with Logic Gates and Hardware Description Language (HDL)	K3
CO3	Apply the design procedures of combinational circuits and implement them with Logic Gates and HDL	K3
CO4	Apply the design procedures of sequential circuits and implement them with Logic Gates and HDL	K3
CO5	Understand the basic concepts of MOS devices	K2

CO – PO Matrix

	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	1	-	-	-	-	-	-	-	-	-	-	3	2
CO2	3	2	2	-	3	-	-	-	-	-	-	-	3	2
CO3	3	2	2	-	3	-	-	-	-	-	-	-	3	2
CO4	3	2	2	-	3	-	-	-	-	-	-	-	3	2
CO5	3	2	1	-	-	-	-	-	-	-	-	-	3	2
ERT 203	3	1.8	1.7	-	3	-	-	-	-	-	-	-	3	2

JUSTIFICATIONS FOR CO-PO MAPPING

Mapping	Mapping Level (3/2/1)	Justifications
CO1 - PO1	3	Students are expected to apply the knowledge of mathematics and engineering fundamentals to understand the basic concepts of number systems and its conversions
CO1 - PO2	1	Students are equipped to identify and formulate problems based on the basic concepts of number systems and its conversions
CO1 - PSO1	3	Students are expected to apply the fundamental knowledge of digital circuits for the development of various electronic hardware systems
CO1 – PSO2	2	Students are expected to apply the fundamental knowledge of digital circuits and to communicate the technical information in both oral and written formats.
CO2 - PO1	3	Students are expected to apply the knowledge of mathematics and engineering fundamentals to apply the Boolean Functions to design, simplify and realize digital circuits with Logic Gates and Hardware Description Language
CO2 - PO2	2	Students are equipped to identify and formulate problems based on Boolean Functions to design, simplify and realize digital circuits with Logic Gates and Hardware Description Language
CO2 - PO3	2	Students are expected to design solutions for engineering problems using Boolean Functions to design, simplify and realize digital circuits with Logic Gates and HDL
CO2 - PO5	3	Students are expected to be familiar with modern tool usage while realizing digital circuits with HDL.
CO2 - PSO1	3	Students are equipped to apply Boolean Functions to design, simplify and realize digital circuits with Logic Gates and HDL for the development of various electronic hardware systems
CO2 – PSO2	2	Students are equipped to apply Boolean Functions to design, simplify and realize digital circuits with Logic Gates and HDL and to communicate the technical information in both oral and written formats

CO3 - PO1	3	Students are expected to apply the engineering fundamentals and mathematics to create an implementation of a combinational logic function
CO3 - PO2	2	Students are equipped to identify, formulate and analyze the problems that can occur during the implementation of combinational logic circuits using gates.
CO3– PO3	2	Students are expected to design solutions for engineering problems using combinational logic circuits that meet the specified needs
CO3 - PO5	3	Students are expected to be familiar with modern tool usage while realizing combinational logic circuits with HDL
CO3 - PSO1	3	Students are expected to apply the fundamental knowledge of combinational logic circuits for the development of various electronic systems
CO3 - PSO2	2	Students are expected to analyze and model various combinational logic circuits using gates and to communicate the technical information in both oral and written formats
CO4- PO1	3	Students are expected to apply the engineering fundamentals and mathematics to design a sequential logic circuit using basic building blocks like flip-flops
CO4- PO2	2	Students are equipped to identify, formulate and analyze the problems that can occur during the design of sequential logic circuit using basic building blocks like flip-flops
CO4– PO3	2	Students are expected to design solutions for engineering problems using sequential logic circuits that meet the specified needs
CO4– PO5	3	Students are expected to be familiar with modern tool usage while realizing sequential logic circuits with HDL
CO4 - PSO1	3	Students are expected to apply the fundamental knowledge of digital circuits for the design of sequential logic circuit using basic building blocks like flip-flops
CO4 – PSO2	2	Students are expected to analyze and model various sequential logic circuits using gates and to communicate the technical information in both oral and written formats

CO5- PO1	3	Students are expected to apply the engineering fundamentals and mathematics to understand the basic concepts of MOS devices
CO5 - PO2	2	Students are equipped to identify, formulate and analyze the problems that can occur during the design and analysis of MOS devices & circuits
CO5 – PO3	1	Students are expected to design solutions for engineering problems by modeling the digital circuits using the basic concepts of MOS devices that meet the specified needs for the public.
CO5 - PSO1	3	Students are expected to apply the fundamental knowledge of MOS devices for the development of various electronic systems
CO5– PSO2	2	Students are expected to apply the fundamental knowledge of MOS devices and to communicate the technical information in both oral and written formats

ERT 205	ELECTRONIC DEVICES AND CIRCUITS	L	T	P	CREDIT	Year of Introduction
		3	1	0	4	2019

Course Outcomes (CO)

After the successful completion of this course, students will able to

No.	Course outcomes	Knowledge Level
CO1	Design analog signal processing circuits using diodes and first order RC circuits. (Apply)	K_3
CO2	Analyze various transistor biasing circuits and BJT amplifier circuits. (Apply)	K_3
CO3	Identify a power amplifier with appropriate specifications for electronic circuit applications. (Understand)	K_2
CO4	Design and analyze the wave shaping multivibrator and oscillator circuits using BJT. (Apply)	K_3
CO5	Design and develop feedback amplifiers and regulated power supply. (Apply)	K_3

CO – PO Matrix

	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	-	-	-	3	-	-	-	-	-	-	3	3	-
CO2	3	3	-	-	3	-	-	-	-	-	-	3	3	-
CO3	3	2	-	-	3	-	-	-	-	-	-	3	3	-
CO4	3	2	-	-	3	-	-	-	-	-	-	3	3	-
CO5	3	2	-	-	3	-	-	-	-	-	-	3	3	-
CO205	3	2.25	-	-	3	-	-	-	-	-	-	3	3	-

JUSTIFICATIONS FOR CO-PO MAPPING

Mapping	Mapping Level (3/2/1)	Justifications
CO1 - PO1	3	Knowledge in diodes and first order RC circuits will help to develop solutions for many engineering problems.
CO1 – PO5	3	Knowledge in diodes and first order RC circuits will help for modeling engineering activities
CO1 – PO12	3	Graduate will recognize the need for ability to engage in independent and life-long learning of technological change
CO1 – PSO1	3	Graduate will be able to apply fundamentals of engineering knowledge to solve engineering problems.
CO2 – PO1	3	Knowledge in various transistor biasing circuits and BJT amplifier circuits will help to identify and formulate engineering problems.
CO2 – PO2	2	Knowledge in various transistor biasing circuits and BJT amplifier circuits will help to formulate and analyze engineering problems.
CO2 – PO5	2	Knowledge in analyzing various transistor biasing circuits and BJT amplifier circuits will help for modeling engineering activities
CO2 - PO12	2	Graduate will be able to analyze fundamentals of engineering knowledge to solve engineering problems.
CO2 – PSO1	3	Knowledge in analyzing various transistor biasing circuits and BJT amplifier circuits will help in the design, analysis and development of various electronic systems.
CO3 – PO1	3	Knowledge in power amplifier with appropriate specifications for electronic circuit applications can be applied to the solution of various engineering problems.
CO3 – PO2	3	Knowledge in power amplifier with appropriate specifications for electronic circuit applications will help to formulate and analyze engineering problems.
CO3 – PO5	3	Knowledge in power amplifier with appropriate specifications for electronic circuit applications will help for modeling engineering activities

CO3 – PO12	3	Graduate will be able to identify fundamentals of engineering knowledge to solve engineering problems.
CO3 – PSO1	3	Knowledge in power amplifier with appropriate specifications for electronic circuit applications will help in the design, analysis and development of various electronic systems.
CO4 – PO1	3	Knowledge in wave shaping multivibrator and oscillator circuits can be applied to the solution of various engineering problems.
CO4 – PO2	3	Knowledge in wave shaping multivibrator and oscillator circuits will help to formulate and analyze engineering problems.
CO4 – PO5	3	Knowledge in wave shaping multivibrator and oscillator circuits will help for modeling engineering activities
CO4 – PO12	3	Graduate will be able to analyze and design the wave shaping multivibrator and oscillator circuits to solve engineering problems.
CO4 – PSO1	3	Knowledge in wave shaping multivibrator and oscillator circuits will help in the design, analysis and development of various electronic systems.
CO5 – PO1	3	Knowledge in design and developing feedback amplifiers and regulated power supply can be applied to the solution of various engineering problems.
CO5 – PO2	3	Knowledge in design and develop feedback amplifiers and regulated power supply will help to formulate and analyze engineering problems.
CO5 – PO5	3	Knowledge in design and develop feedback amplifiers and regulated power supply will help for modeling engineering activities
CO5 – PO12	3	Graduate will be able to recognize the need for design and develop feedback amplifiers and regulated power supply to solve engineering problems.
CO5 – PSO1	3	Knowledge in design and develop feedback amplifiers and regulated power supply will help in the design, analysis and development of various electronic systems.

CO	Course outcome	Knowledge level
HUT200.1	Understand the core values that shape the ethical behaviour of a professional.	K2
HUT200.2	Adopt a good character and follow an ethical life.	K3
HUT200.3	Explain the role and responsibility in technological development by keeping personal ethics and legal ethics.	K2
HUT200.4	Solve moral and ethical problems through exploration and assessment by established experiments.	K2
HUT200.5	Apply the knowledge of human values and social values to contemporary ethical values and global issues.	K3

HUT 200	**PROFESSIONAL ETHICS**	**L**	**T**	**P**	**CREDIT**	**Year of Introduction**
		2	0	0	2	2019

The students will be able to:

CO - PO - PSO MAPPING

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	-	-	-	-	-	-	-	2	-	-	2	-	-	-
CO2	-	-	-	-	-	-	-	2	-	-	2	-	-	-
CO3	-	-	-	-	-	-	-	3	-	-	2	-	-	-
CO4	-	-	-	-	-	-	-	3	-	-	2	-	-	-
CO5	-	-	-	-	-	-	-	3	-	-	2	-	-	-
AVG	-	-	-	-	-	-	-	2.6	-	-	2	-	-	-

JUSTIFICATION

CO-PO-PSO	LEVEL (Low/Moderate/High)	JUSTIFICATION
CO1-PO8	2	By understanding the core values that shape the ethical behavior of a professional, the student will be able to apply ethical norms into engineering practices.
CO2-PO8	2	By applying ethical principles, students will be able to shoulder responsibilities with professional commitment.
CO3-PO8	3	By keeping personal ethics and legal ethics, students will be able to put ethical principles in engineering practices.
CO4-PO8	3	By following ethical and moral assessment, students will be able to develop responsible norms in engineering practices.
CO5-PO8	3	The student can adopt human and social values in solving contemporary global issues confronting and engineer.
CO1-PO11	2	By understanding the core values that shape ethical behavior of an individual, the student will be able to demonstrate engineering and management principles in teamwork in multidisciplinary environments
CO2-PO11	2	By adopting good character based on ethical values , students will be able to perform well as team leaders in engineering and management responsibilities.
CO3- PO11	2	By following personal ethics and legal ethics, students will be able to become successful engineer and management professionals..
CO4-PO11	2	Through exploration and assessment by established experiments, students will be able to excel in project management and finance.
CO5- PO11	2	By applying knowledge of human values and social values, students will be able to apply them in his / her own work either as a team leader or as a team member.

MCN 201	SUSTAINABLE ENGINEERING	L	T	P	CREDIT	Year of Introduction
		2	0	0	-	2019

Course Outcomes (CO)

After the successful completion of this course, students will able to

No.	Course outcomes	Knowledge Level
CO1	Understand the relevance and the concept of sustainability and the global initiatives in this direction	K2
CO2	Explain the different types of environmental pollution problems and their sustainable solutions	K2
CO3	Discuss the environmental regulations and standards	K2
CO4	Outline the concepts related to conventional and non-conventional energy	K2
CO5	Demonstrate the broad perspective of sustainable practices by utilizing engineering knowledge and principles	K3

CO – PO Matrix

	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	-	-	-	-	-	2	3	-	-	-	-	2	-	-
CO2	-	-	-	-	-	2	3	-	-	-	-	2	-	-
CO3	-	-	-	-	-	2	3	-	-	-	-	2	-	-
CO4	-	-	-	-	-	2	3	-	-	-	-	2	-	-
CO5	-	-	-	-	-	2	3	-	-	-	-	2	-	-

JUSTIFICATIONS FOR CO-PO MAPPING

Mapping	Mapping Level 3/2/1	JUSTIFICATION
CO1-PO6	2	The knowledge about the concept and importance of sustainability will help the student to focus better on societal, health, safety and cultural aspects of his/her profession
CO1-PO7	3	The course entirely deals with environment and sustainability, and thus all the course outcomes fully contributes to this program outcome
CO1-PO12	2	Sustainable engineering is one of the elements of ethical engineering practices.
CO2-PO6	2	Student's understanding of causes, effects and control of pollution contributes to making him/her a responsible engineer
CO2-PO7	3	The course entirely deals with environment and sustainability, and thus all the course outcomes fully contributes to this program outcome
CO2-PO12	2	Provides scope for implementation of strategies to curb environmental pollution
CO3-PO6	2	Student's basic knowledge of environmental standards and environmental impact assessment will guide him/her in the assessment of his/her engineering practice.
CO3-PO7	3	The course entirely deals with environment and sustainability, and thus all the course outcomes fully contributes to this program outcome
CO3-PO12	2	Leads to more efficient energy management systems based on EIA
CO4-PO6	2	The understanding of basic concepts on conventional and non-conventional energy sources will enable the student to understand importance of energy efficient systems
CO4-PO7	3	The course entirely deals with environment and sustainability, and thus all the course outcomes fully contributes to this program outcome
CO4-PO12	2	Leads to more efficient utilization of resource and energy consumption
CO5-PO6	2	The student's understanding of sustainable development will help him be a responsible engineer working for the benefit of the society.
CO5-PO7	3	The course entirely deals with environment and sustainability, and thus all the course outcomes fully contributes to this program outcome
CO5-PO12	2	Helps the student to opt for sustainable energy resources where applicable in the project.

CSL 201	DATA STRUCTURES LAB	L	T	P	CREDIT	Year of Introduction
		0	0	3	2	2019

The students will be able to:

CO	Course outcome	K-level
CSL201.CO1	Write a time/space efficient program using arrays/linked lists/trees/graphs to provide necessary functionalities meeting a given set of user requirements (Cognitive Knowledge Level: Analyse)	K4
CSL201.CO2	Write a time/space efficient program to sort a list of records based on a given key in the record (Cognitive Knowledge Level: Apply)	K3
CSL201.CO3	Examine a given Data Structure to determine its space complexity and time complexities of operations on it (Cognitive Knowledge Level: Apply)	K3
CSL201.CO4	Design and implement an efficient data structure to represent given data (Cognitive Knowledge Level: Apply)	K3
CSL201.CO5	Write a time/space efficient program to convert an arithmetic expression from one notation to another (Cognitive Knowledge Level: Apply)	K3
CSL201.CO6	Write a program using linked lists to simulate Memory Allocation and Garbage Collection (Cognitive Knowledge Level: Apply)	K3

CO - PO - PSO MAPPING

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CSL201.CO1	3	3	3	2	-	1	-	2	-	2	-	3	3	2
CSL201.CO2	3	3	3	2	-	-	-	2	-	2	-	3	3	2
CSL201.CO3	3	3	3	2	-	-	-	2	-	2	-	3	3	2
CSL201.CO4	3	3	3	2	-	-	-	2	-	2	-	3	3	2
CSL201.CO5	3	3	3	-	-	-	-	2	-	2	-	3	3	-
CSL201.CO6	3	3	3	-	-	-	-	2	-	2	-	3	3	-
AVG	3	3	3	2	-	0.16	-	2	-	2	-	3	3	2

JUSTIFICATION

CO-PO	LEVEL (1/ 2/ 3)	JUSTIFICATION
CSL201.CO1 – PO1	3	By learning to write a time/space efficient program using arrays/linked lists/trees/graphs to provide necessary functionalities meeting a given set of user requirements, the students will be able to solve complex engineering problems.
CSL201.CO2– PO1	3	By learning to write a time/space efficient program to sort a list of records based on a given key in the record, the students will be able to solve complex engineering problems.
CSL201.CO3– PO1	3	By examining a given Data Structure to determine its space complexity and time complexities of operations on it, the students will be able to solve complex engineering problems.
CSL201.CO4– PO1	3	By designing and implement an efficient data structure to represent given data, the students will be able to solve complex engineering problems.
CSL201.CO5– PO1	3	By writing a time/space efficient program to convert an arithmetic expression from one notation to another, the students will be able to solve complex engineering problems.
CSL201.CO6– PO1	3	By writing a program using linked lists to simulate Memory Allocation and Garbage Collection, the students will be able to solve complex engineering problems.
CSL201.CO1 – PO2	3	By learning to write a time/space efficient program using arrays/linked lists/trees/graphs to provide necessary functionalities meeting a given set of user requirements, the students will be able to identify and formulate complex engineering problems.
CSL201.CO2– PO2	3	By learning to write a time/space efficient program to sort a list of records based on a given key in the record, the students will be able to identify and formulate complex engineering problems.
CSL201.CO3– PO2	3	By examining a given Data Structure to determine its space complexity and time complexities of operations on it the students will be able to identify and formulate complex engineering problems.
CSL201.CO4– PO2	3	By designing and implement an efficient data structure to represent given data, the students will be able to identify and formulate complex engineering problems.

CSL201.CO5–PO2	3	By writing a time/space efficient program to convert an arithmetic expression from one notation to another, the students will be able to the students will be able to identify and formulate complex engineering problems.
CSL201.CO6–PO2	3	By writing a program using linked lists to simulate Memory Allocation and Garbage Collection, the students will be able to identify and formulate complex engineering problems.
CSL201.CO1 –PO3	3	By learning to write a time/space efficient program using arrays/linked lists/trees/graphs to provide necessary functionalities meeting a given set of user requirements, the students will be able to design solutions for complex engineering problems.
CSL201.CO2–PO3	3	By learning to write a time/space efficient program to sort a list of records based on a given key in the record, the students will be able to the students will be able to design solutions for complex engineering problems.
CSL201.CO3–PO3	3	By examining a given Data Structure to determine its space complexity and time complexities of operations on it, the students will be able to the students will be able design solutions for complex engineering problems.
CSL201.CO4–PO3	3	By designing and implement an efficient data structure to represent given data, the students will be able to design solutions for complex engineering problems.
CSL201.CO5–PO3	3	By writing a time/space efficient program to convert an arithmetic expression from one notation to another, the students will be able to design solutions for complex engineering problems.
CSL201.CO6–PO3	3	By writing a program using linked lists to simulate Memory Allocation and Garbage Collection, to the students will be able to design solutions for complex engineering problems.
CSL201.CO1 –PO4	2	By learning to write a time/space efficient program using arrays/linked lists/trees/graphs to provide necessary functionalities meeting a given set of user requirements, the students will be able to use research-based knowledge to provide valid conclusions.
CSL201.CO2–PO4	2	By learning to write a time/space efficient program to sort a list of records based on a given key in the record, the students will be able to use research-based knowledge to provide valid conclusions.

CSL201.CO3–PO4	2	By examining a given Data Structure to determine its space complexity and time complexities of operations on it the students will be able to use research-based knowledge to provide valid conclusions.
CSL201.CO4–PO4	2	By designing and implement an efficient data structure to represent given data, the students will be able to use research-based knowledge to provide valid conclusions.
CSL201.CO1 –PO6	1	By learning to write a time/space efficient program using arrays/linked lists/trees/graphs to provide necessary functionalities meeting a given set of user requirements, the students will be able to apply reasoning to assess issues in different areas of life.
CSL201.CO1 –PO8	2	By learning to write a time/space efficient program using arrays/linked lists/trees/graphs to provide necessary functionalities meeting a given set of user requirements, the students will be able to apply ethical principles while doing programs.
CSL201.CO2–PO8	2	By learning to write a time/space efficient program to sort a list of records based on a given key in the record, the students will be able to apply ethical principles while doing programs.
CSL201.CO3–PO8	2	By examining a given Data Structure to determine its space complexity and time complexities of operations on it the the students will be able to apply ethical principles while doing programs.
CSL201.CO4–PO8	2	By designing and implement an efficient data structure to represent given data, the students will be able to apply ethical principles while doing programs.
CSL201.CO5–PO8	2	By writing a time/space efficient program to convert an arithmetic expression from one notation to another, the students will be able to the students will be able to apply ethical principles while doing programs.
CSL201.CO6–PO8	2	By writing a program using linked lists to simulate Memory Allocation and Garbage Collection, the students will be able to apply ethical principles while doing programs.
CSL201.CO1 –PO10	2	By learning to write a time/space efficient program using arrays/linked lists/trees/graphs to provide necessary functionalities meeting a given set of user requirements, the students will be able to communicate effectively on complex engineering problems.
CSL201.CO2–PO10	2	By learning to write a time/space efficient program to sort a list of records based on a given key in the record, the students will be able to

		the students will be able to communicate effectively on complex engineering problems
CSL201.CO3–PO10	2	By examining a given Data Structure to determine its space complexity and time complexities of operations on it, the students will be able to communicate effectively on complex engineering problems
CSL201.CO4–PO10	2	By designing and implement an efficient data structure to represent given data, the students will be able to communicate effectively on complex engineering problems
CSL201.CO5–PO10	2	By writing a time/space efficient program to convert an arithmetic expression from one notation to another, the students will be able to communicate effectively on complex engineering problems
CSL201.CO6–PO10	2	By writing a program using linked lists to simulate Memory Allocation and Garbage Collection, the students will be able to communicate effectively on complex engineering problems
CSL201.CO1 –PO12	3	By learning to write a time/space efficient program using arrays/linked lists/trees/graphs to provide necessary functionalities meeting a given set of user requirements, the students will be able to engage in continuous learning.
CSL201.CO2–PO12	3	By learning to write a time/space efficient program to sort a list of records based on a given key in the record, the students will be able to engage in continuous learning.
CSL201.CO3–PO12	3	By examining a given Data Structure to determine its space complexity and time complexities of operations on it the students will be able to engage in continuous learning.
CSL201.CO4–PO12	3	By designing and implement an efficient data structure to represent given data, the students will be able to engage in continuous learning.
CSL201.CO5–PO12	3	By writing a time/space efficient program to convert an arithmetic expression from one notation to another, the students will be able to engage in continuous learning.
CSL201.CO6–PO12	3	By writing a program using linked lists to simulate Memory Allocation and Garbage Collection, the students will be able to engage in continuous learning.
CSL201.CO1 –PSO1	3	By learning to write a time/space efficient program using arrays/linked lists/trees/graphs to provide necessary functionalities meeting a given set of user requirements, the students will be able to analyze and

		design hardware and software systems so as to understand and solve engineering problems.
CSL201.CO2–PSO1	3	By learning to write a time/space efficient program to sort a list of records based on a given key in the record, the students will be able to analyze and design hardware and software systems so as to understand and solve engineering problems.
CSL201.CO3–PSO1	3	By examining a given Data Structure to determine its space complexity and time complexities of operations on it the students will be able to analyze and design hardware and software systems so as to understand and solve engineering problems.
CSL201.CO4–PSO1	3	By designing and implement an efficient data structure to represent given data, the students will be able to analyze and design hardware and software systems so as to understand and solve engineering problems.
CSL201.CO5–PSO1	3	By writing a time/space efficient program to convert an arithmetic expression from one notation to another, the students will be able to analyze and design hardware and software systems so as to understand and solve engineering problems.
CSL201.CO6–PSO1	3	By writing a program using linked lists to simulate Memory Allocation and Garbage Collection, the students will be able to analyze and design hardware and software systems so as to understand and solve engineering problems.
CSL201.CO1 –PSO2	2	By learning to write a time/space efficient program using arrays/linked lists/trees/graphs to provide necessary functionalities meeting a given set of user requirements, the students will be able to adapt to emerging information and communication technologies.
CSL201.CO2–PSO2	2	By learning to write a time/space efficient program to sort a list of records based on a given key in the record, the students will be able to adapt to emerging information and communication technologies.
CSL201.CO3–PSO2	2	By examining a given Data Structure to determine its space complexity and time complexities of operations on it the students will be able to adapt to emerging information and communication technologies.
CSL201.CO4–PSO2	2	By designing and implement an efficient data structure to represent given data, the students will be able to adapt to emerging information and communication technologies.

ERL 201	DIGITAL SYSTEMS AND VLSI DESIGN LAB	L	T	P	CREDIT	Year of Introduction
		0	0	3	2	2019

Course Outcomes (CO)

After the successful completion of this course, students will able to

No.	Course outcomes	Knowledge Level
CO.1	Realize digital circuits with Logic Gates and Hardware Description Language.	K_3
CO.2	Design and implement combinational logic circuits.	K_3
CO.3	Design and implement sequential logic circuits.	K_3

CO – PO Matrix

	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
CO.1	3	2	2	1	3	-	-	1	3	-	-	-	3	2
CO.2	3	3	2	2	3	-	-	1	3	-	-	-	3	2
CO.3	3	3	2	2	3	-	-	1	3	-	-	-	3	2
ERL 201	3	2.6	2	1.6	3	-	-	1	3	-	-	-	3	2

JUSTIFICATIONS FOR CO-PO MAPPING

Mapping	Mapping Level (3/2/1)	Justifications
CO1 -PO1	3	Knowledge in realizing digital circuits with Logic Gates and Hardware Description Language will help the students to find solutions for complex problems in digital circuits.
CO1 -PO2	2	Graduate will be able to analyze complex engineering problems in digital circuits with the knowledge in realizing digital circuits with Logic Gates and Hardware Description Language
CO1 -PO3	2	Students will be able to acquire knowledge in realizing digital circuits with Logic Gates and Hardware Description Language to design solutions for complex engineering problems and processes to meet the specific needs with appropriate considerations.
CO1 -PO4	1	Knowledge in realizing digital circuits with Logic Gates and Hardware Description Language will help the students to synthesize various information regarding digital circuits to provide valid conclusions
CO1 -PO5	3	Graduate will be able to be use modern tools with the knowledge in realizing digital circuits using HDL
CO1-PO8	1	Graduates will be able to design and implement digital systems by applying ethical principles, with commitment to professional engineering practice.
CO1-PO9	3	Students will be able to accomplish tasks in diverse teams individually or as a group.
CO1-PSO1	3	Applying engineering knowledge can help the student to develop and implement simple digital systems
CO1-PSO2	2	Students will be able to communicate technical information regarding the design and implementation of logic gates and Hardware Description Language in both oral and written formats effectively
CO2 -PO1	3	Graduates will be able to develop solutions to complex problems in digital electronics by designing and implementing combinational logic circuits
CO2 -PO2	3	Graduate will be able to analyze complex engineering problems in digital circuits with the knowledge in designing and implementing combinational logic circuits

CO2 -PO3	2	Knowledge in designing combinational circuits helps to design solutions to digital electronics engineering problems and processes with appropriate considerations.
CO2 -PO4	2	Knowledge in realizing combinational circuits will help the students to synthesize various information regarding digital circuits to provide valid conclusions
CO2 -PO5	3	Graduate will be able to be use modern tools with the knowledge in realizing combinational digital circuits using HDL
CO2-PO8	1	Graduates will be able to design combinational circuits by applying ethical principles ,with commitment to professional engineering practice.
CO2-PO9	3	Knowledge in designing combinational circuits helps students to accomplish tasks in diverse teams individually or as a group.
CO2-PSO1	3	Applying engineering knowledge can help the student to develop combinational circuits.
CO2-PSO2	2	Students will be able to communicate technical information regarding the design and implementation of combinational circuits in both oral and written formats effectively
CO3 -PO1	3	Knowledge in designing and implementing sequential logic circuits. will help the students to find solutions for complex engineering problems in digital electronics
CO3 -PO2	3	Graduate will be able to able to identify and analyze engineering problems with the knowledge in designing sequential circuits
CO3 -PO3	2	Knowledge in designing sequential circuits helps to design engineering problems and processes with appropriate considerations.
CO3 -PO4	2	Knowledge in realizing sequential circuits will help the students to synthesize various information regarding digital circuits to provide valid conclusions
CO3 -PO5	3	Graduate will be able to be use modern tools with the knowledge in realizing sequential digital circuits using HDL
CO3-PO8	1	Graduates will be able to design sequential circuits by applying ethical principles ,with commitment to professional engineering practice.
CO3-PO9	3	Knowledge in designing sequential circuits helps students to accomplish tasks in diverse teams individually or as a group.

CO3-PSO1	3	Applying engineering knowledge can help the student to develop sequential circuits
CO3-PSO2	2	Students will be able to communicate technical information regarding the design and implementation of sequential circuits in both oral and written formats effectively

MAT 204	PROBABILITY, RANDOM PROCESS AND NUMERICAL METHODS	L	T	P	CREDIT	Year of Introduction
		3	1	0	4	2019

Course Outcomes: After completion of the course the student will be able to:

CO 1	Understand the concept , properties and important models of discrete random variables and using them analyze suitable random phenomenon
CO 2	Understand the concept , properties and important models of continuous random variables and using them analyze suitable random phenomena.
CO 3	Analyse random processes using autocorrelation, power spectrum and Poisson process model as appropriate
CO 4	Compute roots of equations evaluate definite integrals and perform interpolation on given numerical data using standard numerical techniques.
CO 5	Apply standard numerical techniques for solving systems of equations, fitting curves on given numerical data and solving ordinary differential equations.

Mapping of course outcomes with program outcomes (Minimum requirement)

	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
CO 1	3	2	2	2	2	-	-	-	-	2	-	1	1	-
CO 2	3	2	2	2	2	-	-	-	-	2	-	1	1	-
CO 3	3	2	2	2	2	-	-	-	-	2	-	1	1	-
CO 4	3	2	2	2	2	-	-	-	-	2	-	1	1	-
CO 5	3	2	2	2	2	-	-	-	-	2	-	1	1	-
Avg	3	2	2	2	2					2		1	1	

Justification for CO-PO Mapping.

CO	PO	LEVEL	REMARKS
CO 1	PO 1	3	By understanding the modern theory of discrete probability distribution students will be able to apply the knowledge in complex engineering problems.
	PO 2	2	By understanding the modern theory of discrete probability distribution students will be able to identify,formulate and analyse engineering problems.
	PO 3	2	By understanding the modern theory of discrete probability distribution students will be able to design solutions for very simple engineering problems.
	PO4	2	By understanding the modern theory of discrete probability distribution students will be able to use research knowledge for the analysis and interpretation of data.
	PO5	2	By understanding the modern theory of discrete probability distribution students will be able to use modern tools like R for the implementation of concepts.
	PO10	2	By understanding the modern theory of discrete probability distribution students will be able to communicate on complex engineering activities with the engineering community.
	PO12	1	By understanding the modern theory of discrete probability distribution students will be able to engage in continuous learning.
	PSO 1	1	By understanding the modern theory of discrete probability distribution students will be able to apply fundamental knowledge in Electronics and Computer Engineering to analyse and design hardware and software systems so as to understand and solve engineering problems.
	PO 1	3	By understanding the modern theory of continuous probability distribution the students will be able to apply the knowledge in complex engineering problems.

CO 2	PO 2	2	By understanding the modern theory of continuous probability distribution the students will be able to apply identify, formulate and analyze simple engineering problems.
	PO3	2	By understanding the modern theory of continuous probability distribution students will be able to design solutions for very simple engineering problems.
	PO4	2	By understanding the modern theory of continuous probability distribution students will be able to use research knowledge for the analysis and interpretation of data.
	PO5	2	By understanding the modern theory of continuous probability distribution students will be able to use modern tools like R for the implementation of concepts
	PO10	2	By understanding the modern theory of continuous probability distribution students will be able to communicate on complex engineering activities with the engineering community and with the society.
	PO12	1	By understanding the modern theory of continuous probability distribution students will be able to engage in continuous learning.
	PSO1	1	By understanding the modern theory of continuous probability distribution students will be able to to apply fundamental knowledge in Electronics and Computer Engineering to analyse and design hardware and software systems so as to understand and solve engineering problems
	PO 1	3	By analysing random processes using autocorrelation, power spectrum and Poisson process model , the student will be able to apply the knowledge to find solution of complex engineering problems.
	PO 2	2	By analysing random processes using autocorrelation, power spectrum and Poisson process model , the student will be able to identify, analyze and make conclusions of simple engineering problems.
	PO 3	2	By analysing random processes using autocorrelation, power spectrum and Poisson process model ,, the student will be able to design solutions for simple engineering problems.

CO 3	PO 4	2	By analysing random processes using autocorrelation, power spectrum and Poisson process model , the student will be able to conduct investigations of complex problems and provide valid conclusions.
	PO 5	2	By analysing random processes using autocorrelation, power spectrum and Poisson process model , the student will be able to use modern tools for the implementation of concepts.
	PO 10	2	By analysing random processes using autocorrelation, power spectrum and Poisson process model ,, the student will be able to communicate effectively on complex engineering activities with the engineering community.
	PO12	1	By analysing random processes using autocorrelation, power spectrum and Poisson process model , the student will be able to engage in continuous learning.
	PSO1	1	By analysing random processes using autocorrelation, power spectrum and Poisson process model, the student will be able to apply fundamental knowledge in Electronics and Computer Engineering to analyse and design hardware and software systems so as to understand and solve engineering problems
CO 4	PO 1	3	By understanding the evaluation of definite integrals and interpolation on given numerical data using standard numerical techniques, the student will be able to apply the knowledge on complex engineering problems.
	PO 2	2	By understanding the evaluation of definite integrals and interpolation on given numerical data using standard numerical techniques, the student will be able to identify formulate and analyze simple engineering problems.
	PO 3	2	By understanding the evaluation of definite integrals and interpolation on given numerical data using standard numerical techniques, the student will be able to design solutions for simple engineering problems.
	PO4	2	By understanding the evaluation of definite integrals and interpolation on given numerical data using standard numerical techniques, the student will be able to use research knowledge for the analysis and interpretation of data.

	PO 5	2	By understanding the evaluation of definite integrals and interpolation on given numerical data using standard numerical techniques, the student will be able to use modern tools like Matlab, Mathematica, Maple etc. for the implementation of concepts.
	PO 10	2	By understanding the evaluation of definite integrals and interpolation on given numerical data using standard numerical techniques, the student will be able to communicate effectively about the numerical methods to the engineering community.
	PO 12	1	By understanding the evaluation of definite integrals and interpolation on given numerical data using standard numerical techniques, the student will be able to engage in continuous learning.
	PSO 1	1	By understanding the evaluation of definite integrals and interpolation on given numerical data using standard numerical techniques, the student will be able to apply fundamental knowledge in Electronics and Computer Engineering to analyse and design hardware and software systems so as to understand and solve engineering problems
CO 5	PO 1	3	By understanding standard numerical techniques for solving systems of equations, fitting curves on given numerical data and solving ordinary differential equations the students will be able to apply the knowledge on complex engineering problems..
	PO 2	2	By understanding standard numerical techniques for solving systems of equations, fitting curves on given numerical data and solving ordinary differential equations the students will be able to the student will be able to identify formulate and analyze simple engineering problems.
	PO 3	2	By understanding standard numerical techniques for solving systems of equations, fitting curves on given numerical data and solving ordinary differential equations the students will be able to the student will be able to design solutions for simple engineering problems.
	PO 4	2	By understanding standard numerical techniques for solving systems of equations, fitting curves on given numerical data and solving ordinary differential equations the students will be able to the student will be able to use research knowledge for the analysis and interpretation of data.

	PO 5	2	By understanding standard numerical techniques for solving systems of equations, fitting curves on given numerical data and solving ordinary differential equations the students will be able to the student will be able to use modern tools like Matlab, Mathematica, Maple etc. for the implementation of concepts.
	PO 10	2	By understanding standard numerical techniques for solving systems of equations, fitting curves on given numerical data and solving ordinary differential equations the students will be able to the student will be able to communicate effectively on complex engineering activities with the engineering community.
	PO 12	1	By understanding standard numerical techniques for solving systems of equations, fitting curves on given numerical data and solving ordinary differential equations the students will be able to the student will be able to engage in continuous learning.
	PSO 1	1	By understanding standard numerical techniques for solving systems of equations the student will be able to apply fundamental knowledge in Electronics and Computer Engineering to analyse and design hardware and software systems so as to understand and solve engineering problems

CST 202	COMPUTER ORGANIZATION AND ARCHITECTURE	L	T	P	CREDIT	Year of Introduction
		3	1	0	4	2019

Course Outcomes (CO)

After the successful completion of this course, students will able to

No.	Course outcomes	Knowledge Level
CO 1	Recognize and express the relevance of basic components, I/O organization and pipelining schemes in a digital computer	K2
CO 2	Explain the types of memory systems and mapping functions used in memory systems	K2
CO 3	Demonstrate the control signals required for the execution of a given instruction	K3
CO 4	Illustrate the design of Arithmetic Logic Unit and explain the usage of registers in it	K3
CO 5	Explain the implementation aspects of arithmetic algorithms in a digital computer	K3
CO 6	Develop the control logic for a given arithmetic problem	K3

CO – PO Matrix

	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
CO 1	3	2	2	2	-	-	-	-	-	-	-	3	2	1
CO 2	3	3	2	1	-	-	-	-	-	1	-	3	2	1
CO 3	3	3	3	1	-	-	-	-	-	1	-	3	2	1
CO 4	3	3	3	1	-	-	-	-	-	1	-	3	3	1
CO 5	3	3	3	-	-	-	-	-	-	1	-	3	3	1
CO 6	3	2	2	1	-	-	-	-	-	-	-	3	3	1
CST 202	3	3	3	1	-	-	-	-	-	1	-	3	3	1

JUSTIFICATIONS FOR CO-PO MAPPING

Mapping	Mapping Level (3/2/1)	Justifications
CST202.CO1-PO1	3	Students have ability to apply the knowledge of engineering fundamentals to identify the basic structure and functional units of a digital computer and for the development of supporting software and applications.
CST202.CO1-PO2	2	Students are able to identify the basic structure and functional units of a digital computer and also they can analyse the units of a digital computer.
CST202.CO1-PO3	2	Students are able to apply reasoning informed by the contextual knowledge to assess the functions and structure of functional units of a digital computer using engineering science.
CST202.CO1-PO4	2	Students can communicate effectively by presenting the functionalities of a digital computer.
CST202.CO1 - PO12	3	Students can recognize the need for the digital computer and gain the ability to engage in independent and lifelong learning in the functionalities of a digital computer.
CST202.CO1-PSO1	2	Students can develop computing solutions in functionality of a digital computer by applying foundational concepts of Electronics & Computer Engineering.
CST202.CO1-PSO2	1	Students are able to communicate technical information related to assessing the functions and structure of digital computer.
CST202.CO2-PO1	3	Students have ability to apply the knowledge of engineering fundamentals to relate the effect of addressing modes and identify the role of various functional units of a computer.
CST202.CO2-PO2	3	Students are able to formulate the effect of addressing modes and identify the role of various functional units of a computer using engineering science.
CST202.CO2-PO3	2	Students are able to find solutions to meet specific needs in the effect of addressing modes.
CST202.CO2-PO4	1	Students can experiment and analyse data to relate the effect of addressing modes and identify the role of various functional units of a computer.

CST202.CO2-PO10	1	Students are able to apply reasoning informed by the contextual knowledge to relate the effect of addressing modes and identify the role of various functional units of a computer.
CST202.CO2-PO12	3	Students can communicate effectively by presenting the effect of addressing modes and the role of various functional units of a computer.
CST202.CO2-PSO1	2	Students can recognize the effect of addressing modes and gain the ability to engage in independent and lifelong learning in the role of various functional units of a computer.
CST202.CO2-PSO2	1	Students can adapt to emerging information in functional units of a computer by providing innovative ideas and solutions to problems in functional units of a digital computer.
CST202.CO3-PO1	3	Students have ability to apply the knowledge of engineering fundamentals to design processing unit using the concepts of ALU and control logic design.
CST202.CO3-PO2	3	Students are able to formulate and design basic structure processing unit using the concepts of ALU and control logic design using engineering science
CST202.CO3-PO3	3	Students can adapt to emerging information in designing processing unit by providing innovative ideas and solutions to problems in ALU and control logic design.
CST202.CO3-PO4	1	Students can experiment and analyse data to relate the ALU and control logic
CST202.CO3-PO10	1	Students are able to apply reasoning informed by the contextual knowledge to design the basic structure of processing unit using the concepts of ALU and control logic design.
CST202.CO3-PO12	3	Students are able to apply ethical principles while designing the basic structure of processing unit using the concepts of ALU.
CST202.CO3-PSO1	2	Students can recognize the need for designing processing unit using the concepts of ALU and control logic design, using the fundamental knowledge in Electronics & Computer Engineering.
CST202.CO3-PS02	1	Students can communicate technical information effectively while designing the basic structure of processing unit using the concepts of ALU.

CST202.CO4-PO1	3	Students have ability to apply the knowledge of engineering fundamentals to identify the features of various types of memory unit and identify pros and cons of different types of control logic design in processors.
CST202.CO4-PO2	3	Students are able to identify the features of various types of memory unit and identify pros and cons of different types of control logic design in processors using engineering science.
CST202.CO4-PO3	3	Students can adapt to emerging information in the identifying the features of various types of memory unit and identify pros and cons of different types of control logic design in processors using engineering science.
CST202.CO4-PO4	1	Students can experiment and analyse the features of various types of memory unit and identify pros and cons of different types of control logic design in processors using engineering science and synthesis information.
CST202.CO4-PO10	1	Students are able to identify the features of various types of memory unit and identify pros and cons of different types of control logic design in processors.
CS202.CO4-PO12	3	Students can communicate effectively while identifying the features of various types of memory unit and identifying pros and cons of different types of control logic design in processors.
CS202.CO4-PSO1	3	Students can recognize the need of various types of memory unit using the fundamental knowledge in Electronics & Computer Engineering
CST202.CO4-PSO2	1	Students can identify the features of various types of memory unit and identifying pros and cons of different types of control logic design in processors and communicate the related technical information
CST202.CO5-PO1	3	Students have ability to apply the knowledge of engineering fundamentals to outline appropriate interfacing standards for I/O devices.
CST202.CO5-PO2	3	Students are able to apply the knowledge of engineering fundamentals to outline appropriate interfacing standards for I/O devices using engineering science
CST202.CO5-PO3	3	Students can adapt to apply the knowledge of engineering fundamentals to outline appropriate interfacing standards for I/O device

CST202.CO5-PO10	1	Students can experiment and appropriate interfacing standards for I/O devices and synthesis information.
CST202.CO5-PO12	3	Students are able to apply reasoning informed by the contextual knowledge to outline appropriate interfacing standards for I/O devices.
CST202.CO5-PSO1	3	Students can recognize appropriate interfacing standards for I/O devices, using the basic concepts of Electronics & Computer Engineering.
CST202.CO5-PSO2	1	Students can communicate effectively while defining appropriate interfacing standards for I/O devices
CST202.CO6-PO1	3	Students can adapt to emerging information in designing processing unit by providing innovative ideas and solutions to problems in ALU.
CST202.CO5-PO2	2	Students are able to apply ethical principles while designing the basic structure of processing unit using the concepts of ALU
CST202.CO5-PO3	2	Students can recognize the need for designing processing unit using the concepts of ALU and control logic design via lifelong learning.
CST202.CO5-PO10	1	Students can adapt to emerging information in functional units of a computer by providing innovative ideas and solutions to problems in functional units of a digital computer.
CST202.CO5-PO12	3	Students can adapt to emerging information in designing processing unit by providing innovative ideas to problems in ALU.
CST202.CO5-PSO1	3	Students have ability to apply the basic concepts of Electronics & Computer Engineering. fundamentals to design processing unit.
CST202.CO5-PSO3	1	Students can communicate effectively while designing the basic structure of processing unit using the concepts arithmetic circuits.
CST202.CO6-PO1	3	Students will be able to develop control logic for a given arithmetic problem by applying the engineering knowledge.
CST202.CO6-PO2	2	Students will be able to analyze problems in developing control logic for a given arithmetic problem
CST202.CO6-PO3	2	Students will be able to design solutions for problems occurring in the development of control logic for a given arithmetic problem
CST202.CO6-PO4	1	Students will be able to conduct investigations of complex issues occurring in the development of control logic for a given arithmetic problem

CST202.CO6-PO12	3	Students will be able to adapt to lifelong learning by development of control logic for a given arithmetic problem
CST202.CO6-PSO1	3	Students will be able to apply the fundamental knowledge in Electronics & Computer Engineering in the development of control logic for a given arithmetic problem
CST202.CO6-PSO2	1	Students will be able to communicate technical information effectively during the development of control logic for a given arithmetic problem

ERT 204	OBJECT ORIENTED PROGRAMMING USING JAVA	L	T	P	CREDIT	Year of Introduction
		3	1	0	4	2019

After the completion of the course the student will be able to

CO	Statement
ERT204.1	Write Java programs using the object oriented concepts - classes, objects, constructors, data hiding, inheritance and polymorphism (Cognitive Knowledge Level: Apply)
ERT204.2	Utilize datatypes, operators, control statements, built in packages & interfaces, Input/ Output Streams and Files in Java to develop programs (Cognitive Knowledge Level: Apply)
ERT204.3	Illustrate how robust programs can be written in Java using exception handling mechanism (Cognitive Knowledge Level: Understand)
ERT204.4	Write application programs in Java using multithreading and database connectivity (Cognitive Knowledge Level: Apply)
ERT204.5	Write Graphical User Interface based application programs by utilizing event handling features and Swing in Java (Cognitive Knowledge Level: Apply)

CO - PO - PSO MAPPING

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO11	PO12	PSO 1	PSO 2
ERT204.CO1	1	2	2	1	-	-	-	-	-	-	-	3	3	-
ERT204.CO2	1	2	2	1	-	-	-	-	-	-	-	3	3	-
ERT204.CO3	1	1	2	1	-	-	-	-	-	1		3	1	-
ERT204.CO4	2	2	3	1	-	-	-	-	-	-	-	3	3	2
ERT204.CO5	2	2	3	1								3	3	2
AVG	1.4	1.8	2.4	1						1		3	2.6	2

JUSTIFICATION

Mapping	Level (L/M/H)	Justification
ERT204.CO1-PO1	1	By understanding the object oriented features of java, the students will be able to apply the knowledge in java to derive solutions to basic computing problems.
ERT204. CO1-PO2	2	By gaining the ability to apply object oriented principles in software design process, the students will be able to analyze various engineering problems in the domain of software development with better effectiveness.
ERT204. CO1-PO3	2	The students will get an insight into software design process and they would be able to apply standard practices in software project development to an extent
ERT204. CO1-PO4	1	Java programming helps in finding solutions for complex engineering problems, but more training would be required to develop the ability
ERT204. CO1-PO	3	The knowledge of Object oriented concepts learned in this course will help the students during their career.
ERT204. CO1-PSO1	3	Students will be able to apply the foundational concepts in objected oriented deign to develop computing solutions for the real world engineering problems.
ERT204. CO2-PO1	1	By understanding lexical issues and basic programing constructs of java, the students will be able to derive solutions to computing problems
ERT204. CO2-PO2	2	Students will be able to analyze basic problems and implement solutions using lexical issues and programing constructs of java.
ERT204. CO2-PO3	2	By understanding lexical issues and programing constructs of java, the students will be able to design/develop solutions to basic problems
ERT204. CO2-PO4	1	By understanding java features like inheritance, packages and interface, the students will be able to find solutions for complex engineering problems, but more training would be required to develop the ability.
ERT204. CO2-PO12	3	The knowledge of basic programing concepts learned in this course will help the students during their career.

ERT204.CO2-PSO1	3	Students will be able to apply the foundational concepts in java to analyze and design hardware and software systems so as to understand and solve engineering problems.
ERT204.CO3-PO1	1	Students will be able to apply the knowledge of exception handing to handle errors in the programs.
ERT204.CO3-PO2	1	Students will be able to analyze the errors in the program by exception handling techniques.
ERT204.CO3-PO3	2	Exception handling will help the students to design reliable and quality software solutions.
ERT204.CO3-PO4	1	Students will investigate on the possibilities of the errors and find reliable solutions using exception handling techniques.
ERT204.CO3-PO1	1	The reasons for the exceptions will be effectively communicated to the user.
ERT204. CO3-PO12	3	Students will be able to develop Robust solutions in their career
ERT204. CO3-PSO1	1	Students will be able to apply the exception handling techniques in java to develop error free hardware and software systems so as to understand and solve engineering problems.
ERT204. CO4-PO1	2	Students will be able to apply the knowledge of multi-threading and thread synchronization concepts to solve complex software problems, but require more training in advanced Java .
ERT204. CO4-PO2	2	Students will be able to analyse complex problems to some extend and implement it by using the concepts of multi-threading and JDBC.
ERT204. CO4-PO3	3	Students will be able to design and develop problems using multi-threading and JDBC concepts in Java.
ERT204. CO4-PO4	1	Innovative products can be developed by conducting investigations on real world problems.
ERT204. CO4-PO12	3	The knowledge of advanced concepts in this course will help the students in their lifelong learning .
ERT204. CO4-PSO1	3	Multi-threading and JDBC techniques in java helps the students to analyze and design hardware and software systems so as to understand and solve engineering problems.

ERT204. CO4-PSO2	2	During the development of solutions, , the students will be able to adapt to emerging information and communication technologies.
ERT204. CO5-PO1	2	Students will be able to apply the knowledge of GUI based event handling and JDBC concepts to solve complex software problems, but require more training in advanced Java
ERT204. CO5-PO2	2	Students will be able to solve complex problems to some extend and implement it by using the concepts of GUI driven event handling and JDBC operations.
ERT204. CO5-PO3	3	Students will be able to design and develop event driven problems using Swing and AWT packages in Java.
ERT204. CO5-PO4	1	Innovative products can be developed by conducting investigations on real world problems. More knowledge in Advanced java and study of modern tools are required.
ERT204. CO5-PO12	3	The knowledge of advanced concepts in this course will help the students in their lifelong learning.
ERT204. CO5-PSO1	3	JDBC techniques in java helps the students to design, develop and analyze computing solutions for engineering problems.
ERT204. CO5-PSO2	2	During the development of GUI based engineering solutions, the students will be able to adapt to emerging information and communication technologies.

ERT 206	INTEGRATED CIRCUITS	L	T	P	CREDIT	Year of Introduction
		3	1	0	4	2019

Course Outcomes (CO)

After the completion of the course, the students will able to

No.	Course outcomes	Knowledge Level
CO1	Discuss about basics of operational amplifier and characteristics (DC and AC) of op amps. (Cognitive Knowledge Level: Understand)	K_2
CO2	Design linear and nonlinear circuits using op-amp. (Cognitive Knowledge Level: Apply)	K_3
CO3	Deign op-amp oscillators, waveform generators and voltage regulators (Cognitive Knowledge Level: Apply)	K_3
CO4	Design circuits using PLL and discuss about DAC and ADC. (Cognitive Knowledge Level: Apply)	K_3
CO5	Design active filters and analyze the characteristics of active filters (Cognitive Knowledge Level: Apply)	K_3

CO – PO Matrix

	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
CO 1	3	3	-	-	2	-	-	-	-	-	-	1	1	1
CO 2	3	3	-	-	2	-	-	-	-	-	-	1	3	3
CO 3	3	3	-	-	2	-	-	-	-	-	-	1	3	3
CO 4	3	3	-	-	2	-	-	-	-	-	-	1	2	2
CO 5	3	3	-	-	2	-	-	-	-	-	-	1	3	3
CO	3	3	-	-	2	-	-	-	-	-	-	1	2.33	2.33

JUSTIFICATIONS FOR CO-PO MAPPING

Mapping	Mapping Level (3/2/1)	Justifications
CO1 - PO1	3	Analog circuits can be designed and modified to provide solutions to real-life problems
CO1 – PO2	3	Design & demonstration of experiments will help to identify the problems and lead to modifications
CO1 – PO5	2	Analog circuits can be designed and modified using model simulation tools to provide solutions to different applications.
CO1 – PO12	1	With prior knowledge of op-amp fundamentals, students can use their knowledge to simulate experiment & develop newer applications in real life.
CO1 – PSO1	3	Basics of operational amplifier can be used to analyze and design hardware to understand and design problems in electronics.
CO1 – PSO2	3	Students will be able to communicate technical details of design and analysis of hardware using operational amplifier
CO2 - PO1	3	Design & demonstration of experiments will help to identify the problems and lead to modifications
CO2 – PO2	3	Analog circuits can be designed and modified to provide solutions to real-life problems
CO2 – PO5	2	Analog circuits can be designed and modified using model simulation tools to provide solutions to different applications.
CO2 – PO12	1	With prior knowledge of op-amp basics, students can use their knowledge to simulate experiment & develop newer applications in real life.
CO2 – PSO1	3	Linear circuits can be used to analyze and design hardware to understand and design problems in electronics.
CO2 – PSO2	3	Students will be able to communicate technical details of design and analysis of hardware using linear circuits.
CO3 - PO1	3	Analog circuits can be designed and modified to provide solutions to real-life problems
CO3 – PO2	3	Design & demonstration of experiments will help to identify the problems and lead to modifications

CO3 – PO5	2	Analog circuits can be designed and modified using model simulation tools to provide solutions to different applications.
CO3 – PO12	1	With prior knowledge of op-amp basics, students can use their knowledge to simulate, experiment & develop newer applications in real life.
CO3 – PSO1	3	Wave form generators and voltage regulators can be used to design problems in electronics.
CO3 – PSO2	3	Students will be able to communicate technical details of design and analysis of hardware using operational amplifier
CO4 - PO1	3	Design & demonstration of experiments will help to identify the problems and lead to modifications
CO4 – PO2	3	Analog circuits can be designed and modified to provide solutions to real-life problems
CO4 – PO5	2	Analog circuits can be designed and modified using model simulation tools to provide solutions to different applications.
CO4 – PO12	1	With prior knowledge of op-amp basics, students can use their knowledge to simulate experiment & develop newer applications in real life.
CO4 – PSO1	3	PLL, ADC and DAC can be used to design problems in electronics.
CO4 – PSO2	3	Students will be able to communicate technical details of design and analysis of hardware using PLL, ADC and DAC.
CO5 - PO1	3	Analog circuits can be designed and modified to provide solutions to real-life problems.
CO5 – PO2	3	Design & demonstration of experiments will help to identify the problems and lead to modifications
CO5 – PO5	2	Analog circuits can be designed and modified using model simulation tools to provide solutions to different applications.
CO5 – PO12	1	The advancement in technology from discrete circuits to ICs
CO5 – PSO1	3	Active filters can be used to design problems in electronics.
CO5 – PSO2	3	Students will be able to communicate technical details of design and analysis of hardware using active filters.

EST 200	DESIGN AND ENGINEERING	L	T	P	CREDIT	Year of Introduction
		2	0	0	2	2019

Course Outcome: After the successful completion of this course, the student will be able to:

EST200.1	Explain the different concepts and principles involved in design engineering.
EST200.2	Apply design thinking while learning and practicing engineering.
EST200.3	Develop innovative, reliable, sustainable and economically viable designsincorporating knowledge in engineering.

CO – PO Matrix

CO	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
EST200.1	2	1	-	-	-	-	1	-	-	1	-	-	3	2
EST200.2	-	2	-	-	-	1	-	1	-	-	-	2	3	2
EST200.3	-	-	2	-	-	1	1	-	2	2	-	1	3	2
AVG.	2	1.5	2	-	-	1	1	1	2	1.5		1.5	2.67	2

Justifications

CO	PO	LEVEL	REMARKS
EST200.1	PO1	2	Illustrate the different concept and principles in Design Engineering.
	PO2	1	Analyze the different concepts in Design Engineering, in order to choose best design solution.
	PO7	1	Apply the different concepts and principles in Design Engineering to develop a sustainable design solution.
	PO10	1	Communicating the numerous design solutions developed by the designer effectively to the client through proper documentation.
	PSO1	3	Practice various Design thinking approaches to design hardware and software systems so as to understand and solve engineering problems.
	PSO2	2	Use the different concept, principles and design thinking approaches to communicate technical information in both oral and written formats effectively.
EST200.2	PO2	2	Analyze the different design thinking approaches, inorder to reach a sustainable design solution.
	PO6	1	Apply the design thinking approach to develop design solution in context with societal needs and aspects.
	PO8	1	Apply ethical principles while proposing design solution to the client, by following norms of engineering practices.
	PO12	2	Use the knowledge in design engineering through out the phase of career development and provide effectual problem solution to the habitué.
	PSO1	3	Practice various Design thinking approaches to develop a optimum and economical design solutions to design hardware and software systems so as to understand and solve engineering problems.
	PSO2	2	Apply the different concept, principles and design thinking approaches in proposing design solution, leading to communication of technical information in both oral and written formats effectively.
EST200.3	PO3	2	Evaluate the various adaptive and development level design to formulate a new design solution.
	PO6	1	Apply the design thinking approach to develop design solution in context with societal needs and aspects.

	PO7	1	Apply the proficiency in Design Engineering to develop a sustainable design solution.
	PO9	2	Construct design solution efficaciously in team environment or as an individual.
	PO10	2	Communicating the numerous design solutions developed by the designer effectively to the client through proper documentation.
	PO12	1	Use the knowledge in design engineering through out the phase of career development and provide effectual problem solution to the habitué.
	PSO1	3	Practice various Design thinking approaches to design hardware and software systems so as to understand and solve engineering problems.
	PSO2	2	Apply the different concept, principles and design thinking approaches in proposing design solution, leading to communication of technical information in both oral and written formats effectively.

MCN 202	CONSTITUTION OF INDIA	L	T	P	CREDIT	Year of Introduction
		2	0	0	-	2019

The students will be able to:

CO	Course outcome	Knowledge level
MCN202.1	Explain the background of the present constitution of Indiaand features.	K2
MCN202.2	Utilize the fundamental rights and duties.	K3
MCN202.3	Understand the working of the union executive, parliament and judiciary.	K2
MCN202.4	Understand the working of the state executive, legislature and judiciary	K2
MCN202.5	Utilize the special provisions and statutory institutions	K3
MCN202.6	Show national and patriotic spirit as responsible citizens of the country.	K3

CO - PO - PSO MAPPING

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PO 12	PS O1	PS O2
CO1	-	-	-	-	-	2	2	2	-	2	-	-	-	-
CO2	-	-	-	-	-	3	3	3	-	3	-	-	-	-
CO3	-	-	-	-	-	3	2	3	-	3	-	-	-	-
CO4	-	-	-	-	-	3	2	3	-	3	-	-	-	-
CO5	-	-	-	-	-	3	2	3	-	3	-	-	-	-
CO6	-	-	-	-	-	3	3	3	-	2	-	-	-	-
AVG	-	-	-	-	-	2.83	2.33	2.83	-	2.66	-	-	-	-

Justification

CO-PO-PSO	LEVEL (Low/ Moderate /High)	JUSTIFICATION
MCN202.1-PO6	M	Understanding the background of the present constitution of India and its features, students are able to apply the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to professional engineering practice.
MCN202.1-PO7	M	Understanding the background of the present constitution of India and its features, students are able to treat sustainable development is an integral part of life under article 21 of Indian Constitution.
MCN202.1-PO8	M	Understanding the background of the present constitution of India and its features, students are able to show ethical values like integrity, transparency, accountability, impartiality, public welfare and equity which are the guiding principles of Indian constitution.
MCN202.1-PO10	M	Understanding the background of the present constitution of India and its features, students are able to communicate judgements of various landmark cases and the amendments of articles in the constitution.
MCN202.2-PO6	H	Knowledge gained from the study of fundamental rights and duties, students are able to apply the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to professional engineering practice.
MCN202.2-PO7	H	Knowledge gained from the study of fundamental rights and duties; students are able to practice the duty imposed on every citizen to protect environment as stated in Article 48 A.
MCN202.2-PO8	H	Knowledge gained from the study of fundamental rights and duties, students are able to issue public statements in an objective and truthful manner.
MCN202.2-PO10	H	Knowledge gained from the study of fundamental rights and duties; students are able to raise their voice effectively if the fundamental rights are denied and also communicate the fundamental duties one should perform.

MCN202.3-PO6	H	Understand the working of the union executive, parliament and judiciary, students are able to apply the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to professional engineering practice.
MCN202.3-PO7	M	With the knowledge gained from the working of the union executive, parliament and judiciary, students are able to understand the key role played in achieving the development goals and targets through, for instance, setting and implementing water quality policy frameworks and standards, and regulating the discharge of pollutants into the environment and wastewater management, recycling and reuse.
MCN202.3-PO8	H	With the knowledge gained from the working of the union executive, parliament and judiciary, students are able to understand the government ethics appliesto the process, behavior, and policy of governments and the public officials who serve in elected or appointed positions. It also covers issues of honesty and transparency in government, dealing with matters such as bribery, political corruption, police corruption, legislative ethics, regulatory ethics, conflict of interest, avoiding the appearance of impropriety, open government and legal ethics.
MCN202.3-PO10	H	With the knowledge gained from the working of the union executive, parliament and judiciary, students are able to understand the government communication involves not only sending out persuasive messages to the public, but also explaining working policies, creating awareness ofthe rights of the citizens, and developing mechanismsthat enable two-way communication between citizen and government.
MCN202.4-PO6	H	Understand the working of the state executive, legislature and judiciary, students are able to apply the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to professional engineering practice.
MCN202.4-PO7	M	With the knowledge gained from the working of the state executive, legislature and judiciary, studentsare able to understand the key role played in achieving the development goals and targets through, for instance, setting and implementing water quality policy frameworks and standards, and regulating the discharge of pollutants into theenvironment and wastewater management, recycling and reuse.

MCN202.4-PO8	H	With the knowledge gained from the working of the state executive, legislature and judiciary, students are able to understand the government ethics applies to the process, behavior, and policy of governments and the public officials who serve in elected or appointed positions. It also covers issues of honesty and transparency in government, dealing with matters such as bribery, political corruption, police corruption, legislative ethics, regulatory ethics, conflict of interest, avoiding the appearance of impropriety, open government and legal ethics.
MCN202.4-PO10	H	With the knowledge gained from the working of the state executive, legislature and judiciary, students are able to understand the government communication involves not only sending out persuasive messages to the public, but also explaining working policies, creating awareness of the rights of the citizens, and developing mechanisms that enable two-way communication between citizen and government.
MCN202.5-PO6	H	With the knowledge gained on special provisions and statutory institutions, the students are able to understand that the State shall promote with special care the educational and economic interests of the weaker sections of the society and in particular, of the Scheduled Castes and Scheduled Tribes and shall protect them from social injustice and all forms of exploitation.
MCN202.5-PO7	M	With the knowledge gained on special provisions and statutory institutions, the students are able to understand that the State shall endeavor to protect and improve the environment. Various cases include Bhopal gas leakage tragedy, Taj Mahal case.
MCN202.5-PO8	H	With the knowledge gained on special provisions and statutory institutions, the students are able to understand that the various statutory institutions and ethical practices followed; SEBI issued a code on conflicts of interests for members on board of the regulator.
MCN202.5-PO10	H	With the knowledge gained on special provisions and statutory institutions, the students are able to understand that in most cases the justification for creation of a statutory body to give advice to Government is to introduce expertise of a particular kind or kinds into the decision-making process

MCN202.6-PO6	H	After the completion of the course, the students are able to show national and patriotic spirit as responsible citizens of the country – helping the country to do better; supporting and beingresponsible for your family, your community and all levels of government with your willingness to work, to volunteer, to pay your share of taxes and pay.
MCN202.6-PO7	H	After the completion of the course, the students are able to show national and patriotic spirit as responsible citizens of the country – helping the country to do better; rise of social movements that closely connect problems of environment protection with nationalist concerns - Eco-nationalism.
MCN202.6-PO8	H	After the completion of the course, the students are able to show national and patriotic spirit as responsible citizens of the country – helping the country to do better; supporting and beingresponsible for your family, your community and all levels of government with your willingness to work, to volunteer, to pay your share of taxes and pay, fight against corruptions.
MCN202.6-PO10	M	After the completion of the course, the students are able to show national and patriotic spirit as responsible citizens of the country – helping the country to do better; fight against corruptions, raise the voice if your fundamental rights are denied, organize campaigns to create awareness among illiterate ones about their fundamental rights and duties.

ERL 202	INTEGRATED CIRCUITS LAB	L	T	P	CREDIT	Year of Introduction
		0	0	3	2	2019

Course Outcomes (CO)

After the successful completion of this course, students will able to

No.	Course outcomes	Knowledge Level
CO 1	Use the various electronic instruments for conducting experiments.	**K3**
CO 2	Design and develop various electronic circuits using diodes and Zener diodes.	**K3**
CO 3	Design and implement amplifier and oscillator circuits using BJT and JFET.	**K3**
CO 4	Design and implement basic circuits using IC (OPAMP and 555 timers).	**K3**

CO – PO Matrix

	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
CO 1	1	-	-	-	-	-	-	-	2	-	-	-	2	1
CO 2	3	2	2	-	-	-	-	-	3	-	-	-	3	1
CO 3	3	2	2	-	-	-	-	-	3	-	-	-	3	1
CO 4	2	2	2	-	-	-	-	-	3	-	-	-	3	1
ERL 202	2.25	2	2	-	-	-	-	-	2.75	-	-	-	2.75	1

JUSTIFICATIONS FOR CO-PO MAPPING

Mapping	Mapping Level (3/2/1)	Justifications
CO1-PO1	1	Students will be able to use various electronic instruments for conducting experiments using the fundamental engineering knowledge
CO1-PO9	2	Students will be able to accomplish tasks in diverse teams individually or as a group.
CO1-PSO1	2	Ability to apply fundamental knowledge in Electronics and Computer Engineering to use various electronic instruments for conducting experiments so as to understand and solve engineering problems.
CO1-PSO2	1	Students will be able to communicate the technical information for using various electronic instruments for conducting experiments
CO2-PO1	3	Students will be able to use design and develop various electronic circuits using diodes and Zener diodes using the fundamental engineering knowledge
CO2-PO2	2	Students will be able to analyze various problems occurring in the design and development of various electronic circuits using diodes and Zener diodes.
CO2-PO3	2	Students will be able to design and implement solutions to problems in various electronic circuits using diodes and Zener diodes.
CO2-PO9	3	Students will be able to accomplish tasks in diverse teams individually or as a group.
CO2-PSO1	3	Ability to apply fundamental knowledge in Electronics and Computer Engineering to analyse and design various electronic circuits using diodes and Zener diodes.
CO2-PSO2	1	Students will be able to communicate the technical information of various electronic circuits using diodes and Zener diodes.
CO3-PO1	3	Students will be able to design and implement amplifier and oscillator circuits using BJT and JFET, using the fundamental engineering knowledge
CO3-PO2	2	Students will be able to analyze various problems occurring in amplifier and oscillator circuits using BJT and JFET

CO3-PO3	2	Students will be able to design and implement various amplifier and oscillator circuits using BJT and JFET
CO3-PO9	3	Students will be able to accomplish tasks in diverse teams individually or as a group.
CO3-PSO1	3	Ability to apply fundamental knowledge in Electronics and Computer Engineering to analyse and design amplifier and oscillator circuits using BJT and JFET
CO3-PSO2	1	Students will be able to communicate the technical information of amplifier and oscillator circuits using BJT and JFET
CO4-PO1	2	Students will be able to design and implement basic circuits using IC (OPAMP and 555 timer), using the fundamental engineering knowledge
CO4-PO2	2	Students will be able to analyze various problems occurring in basic circuits using IC (OPAMP and 555 timer)
CO4-PO3	2	Students will be able to design and implement various basic circuits using IC (OPAMP and 555 timer)
CO4-PO9	3	Students will be able to accomplish tasks in diverse teams individually or as a group.
CO4-PSO1	3	Ability to apply fundamental knowledge in Electronics and Computer Engineering to analyse and design basic circuits using IC (OPAMP and 555 timer)
CO4-PSO2	1	Students will be able to communicate the technical information of basic circuits using IC (OPAMP and 555 timer)

ERL 204	OBJECT ORIENTED PROGRAMMING LAB	L	T	P	CREDIT	Year of Introduction
		0	0	3	2	2019

After the completion of the course the student will be able to

CO	Statement
ERL204.1	Implement the Object Oriented concepts - constructors, inheritance, method overloading & overriding and polymorphism in Java (Cognitive Knowledge Level: Apply)
ERL204.2	Implement programs in Java which use datatypes, operators, control statements, built in packages & interfaces, Input/Output streams and Files (Cognitive Knowledge Level: Apply)
ERL204.3	Implement robust application programs in Java using exception handling (Cognitive Knowledge Level: Apply)
ERL204.4	Implement application programs in Java using multithreading and database connectivity (Cognitive Knowledge Level: Apply)
ERL204.5	Implement Graphical User Interface based application programs by utilizing event handling features and Swing in Java (Cognitive Knowledge Level: Apply)

CO - PO - PSO MAPPING

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PO 12	PSO 1	PSO 2
ERL204.1	3	3	3	3	3	-	-	1	-	3	-	3	3	1
ERL204.2	3	3	3	3	3	-	-	1	-	3	-	3	3	1
ERL204.3	3	3	3	3	3	-	-	1	-	3	-	3	3	1
ERL204.4	3	3	3	3	3	-	-	1	-	3	-	3	3	2
ERL204.5	3	3	3	3	3	-	-	1	-	3	-	3	3	1
AVG	3	3	3	3	3	-	-	1	-	3	-	3	3	1.2

JUSTIFICATION

Mapping	Low/Medium/ High	Justification
ERL204.1-PO1	3	By Implementing the Object Oriented concepts such as constructors, inheritance, method overloading & overriding and polymorphism in Java students are able to apply the knowledge gained for the solutions of complex engineering problems.
ERL204.1-PO2	3	With the knowledge of Object Oriented concepts such as constructors, inheritance, method overloading & overriding and polymorphism in Java, students are able to identify and analyse the complex engineering problems.
ERL204.1-PO3	3	With the knowledge of Object Oriented concepts such as constructors, inheritance, method overloading & overriding and polymorphism in Java, the students are able to design solutions for complex engineering problems that meet the specified needs.
ERL204.1-PO4	3	With the knowledge of Object Oriented concepts such as constructors, inheritance, method overloading & overriding and polymorphism in Java, the students are able to conduct investigations of complex problems.
ERL204.1-PO5	3	With the knowledge of Object Oriented concepts such as constructors, inheritance, method overloading & overriding and polymorphism in Java, the students are able to apply appropriate techniques, resources and modern engineering and IT tools including prediction and modelling to complex engineering activities with an understanding of the limitations.
ERL204.1-PO8	1	With the design of experiments the students are able to apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice
ERL204.1-PO10	3	With the knowledge of Object Oriented concepts such as constructors, inheritance, method overloading & overriding and polymorphism in Java, the students are able to communicate effectively on complex engineering activities with engineering community, able to comprehend effectively give and receive clear instructions
ERL204.1-PO12	3	With the knowledge of Object Oriented concepts such as constructors, inheritance, method overloading & overriding and polymorphism in Java, the students are able to communicate effectively on complex engineering activities with engineering community, able to recognize the need for, and life-long learning in the broadest context of technological change.
ERL204.1-PSO1	3	Students will be able to analyse, design and develop computing solutions with the knowledge of Object Oriented concepts such as constructors, inheritance, method overloading & overriding and polymorphism in Java
ERL204.1-PSO2	1	Students will be able to develop solutions for the real world engineering problems with the gained knowledge of Object Oriented concepts such as constructors, inheritance, method overloading & overriding and polymorphism in Java

ERL204.2-PO1	3	By Implementing the programs in Java which uses the datatypes, operators, control statements, built in packages & interfaces, Input/Output streams and files students are able to apply the knowledge gained for the solutions of complex engineering problems.
ERL204.2-PO2	3	With the knowledge gained from the programs in Java which uses the datatypes, operators, control statements, built in packages & interfaces, Input/Output streams and files, students are able to identify and analyse the complex engineering problems.
ERL204.2-PO3	3	With the knowledge of the programs in Java which uses the datatypes, operators, control statements, built in packages & interfaces, Input/Output streams and files, the students are able to design solutions for complex engineering problems that meet the specified needs.
ERL204.2-PO4	3	With the knowledge of the programs in Java which uses the datatypes, operators, control statements, built in packages & interfaces, Input/Output streams and files, the students are able to conduct investigations of complex problems.
ERL204.2-PO5	3	With the knowledge of the programs in Java which uses the datatypes, operators, control statements, built in packages & interfaces, Input/Output streams and files, the students are able to apply appropriate techniques, resources and modern engineering and IT tools including prediction and modelling to complex engineering activities with an understanding of the limitations.
ERL204.2-PO8	1	With the design of programs the students are able to apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice
ERL204.2-PO10	3	With the knowledge of the programs in Java which uses the datatypes, operators, control statements, built in packages & interfaces, Input/Output streams and files, the students are able to communicate effectively on complex engineering activities with engineering community, able to comprehend effectively give and receive clear instructions
ERL204.2-PO12	3	With the knowledge of the programs in Java which uses the datatypes, operators, control statements, built in packages & interfaces, Input/Output streams and files, the students are able to communicate effectively on complex engineering activities with engineering community, able to recognize the need for, and life-long learning in the broadest context of technological change.
ERL204.2-PSO1	3	Students will be able to analyse, design and develop computing solutions with the knowledge of the programs in Java which uses the datatypes, operators, control statements, built in packages & interfaces, Input/Output streams and files.
ERL204.2-PSO2	1	Students will be able to develop solutions for the real world engineering problems with the gained knowledge of the programs in Java which uses the datatypes, operators, control statements, built in packages & interfaces, Input/Output streams and files.

ERL204.3-PO1	3	By Implementing the robust application programs in Java using exception handling, students are able to apply the knowledge gained for the solutions of complex engineering problems.
ERL204.3-PO2	3	With the knowledge gained from the robust application programs in Java using exception handling, students are able to identify and analyse the complex engineering problems.
ERL204.3-PO3	3	With the knowledge of the robust application programs in Java using exception handling, the students are able to design solutions for complex engineering problems that meet the specified needs.
ERL204.3-PO4	3	With the knowledge of the robust application programs in Java using exception handling, the students are able to conduct investigations of complex problems.
ERL204.3-PO5	3	With the knowledge of the robust application programs in Java using exception handling, the students are able to apply appropriate techniques, resources and modern engineering and IT tools including prediction and modelling to complex engineering activities with an understanding of the limitations.
ERL204.3-PO8	3	With the design of robust application programs the students are able to apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice
ERL204.3-PO10	3	With the knowledge of the robust application programs in Java using exception handling, the students are able to communicate effectively on complex engineering activities with engineering community, able to comprehend effectively give and receive clear instructions
ERL204.3-PO12	3	With the knowledge of the robust application programs in Java using exception handling, the students are able to communicate effectively on complex engineering activities with engineering community, able to recognize the need for, and life-long learning in the broadest context of technological change.
ERL204.3-PSO1	3	Students will be able to analyse, design and develop computing solutions with the robust application programs in Java using exception handling.
ERL204.3-PSO2	1	Students will be able to develop solutions for the real world engineering problems with the gained knowledge of the robust application programs in Java using exception handling.
ERL204.4-PO1	3	By Implementing the application programs in Java using multithreading and database connectivity, students are able to apply the knowledge gained for the solutions of complex engineering problems.
ERL204.4-PO2	3	With the knowledge gained from the application programs in Java using multithreading and database connectivity, students are able to identify and analyse the complex engineering problems.
ERL204.4-PO3	3	With the knowledge of the application programs in Java using multithreading and database connectivity, the students are able to design solutions for complex engineering problems that meet the specified needs.

ERL204.4-PO4	3	With the knowledge of the application programs in Java using multithreading and database connectivity, the students are able to conduct investigations of complex problems.
ERL204.4-PO5	3	With the knowledge of the application programs in Java using multithreading and database connectivity, the students are able to apply appropriate techniques, resources and modern engineering and IT tools including prediction and modelling to complex engineering activities with an understanding of the limitations.
ERL204.4-PO8	1	With the design of application programs the students are able to apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice
ERL204.4-PO10	3	With the knowledge of the application programs in Java using multithreading and database connectivity, the students are able to communicate effectively on complex engineering activities with engineering community, able to comprehend effectively give and receive clear instructions
ERL204.4-PO12	3	With the knowledge of the application programs in Java using multithreading and database connectivity, the students are able to communicate effectively on complex engineering activities with engineering community, able to recognize the need for, and life-long learning in the broadest context of technological change.
ERL204.4-PSO1	3	Students will be able to analyse, design and develop computing solutions with the knowledge of the application programs in Java using multithreading and database connectivity.
ERL204.4-PSO2	2	Students will be able to develop solutions for the real world engineering problems with the gained knowledge of the application programs in Java using multithreading and database connectivity.
ERL204.5-PO1	3	By Implementing the Graphical User Interface based application programs by utilizing event handling features and Swing in Java students are able to apply the knowledge gained for the solutions of complex engineering problems.
ERL204.5-PO2	3	With the knowledge gained from the Graphical User Interface based application programs by utilizing event handling features and Swing in Java, students are able to identify and analyse the complex engineering problems.
ERL204.5-PO3	3	With the knowledge of the Graphical User Interface based application programs by utilizing event handling features and Swing in Java, the students are able to design solutions for complex engineering problems that meet the specified needs.
ERL204.5-PO4	3	With the knowledge of the Graphical User Interface based application programs by utilizing event handling features and Swing in Java, the students are able to conduct investigations of complex problems.
ERL204.5-PO5	3	With the knowledge of the Graphical User Interface based application programs by utilizing event handling features and Swing in Java, the students are able to

		apply appropriate techniques, resources and modern engineering and IT tools including prediction and modelling to complex engineering activities with an understanding of the limitations.
ERL204.5-PO8	3	With the design of Graphical user Interface based programs, the students are able to apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice
ERL204.5-PO10	3	With the knowledge of the Graphical User Interface based application programs by utilizing event handling features and Swing in Java, the students are able to communicate effectively on complex engineering activities with engineering community, able to comprehend effectively give and receive clear instructions
ERL204.5-PO12	3	With the knowledge of the Graphical User Interface based application programs by utilizing event handling features and Swing in Java, the students are able to communicate effectively on complex engineering activities with engineering community, able to recognize the need for, and life-long learning in the broadest context of technological change.
ERL204.5-PSO1	3	Students will be able to analyse, design and develop computing solutions with the knowledge of the Graphical User Interface based application programs by utilizing event handling features and Swing in Java.
ERL204.5-PSO2	1	Students will be able to develop solutions for the real world engineering problems with the gained knowledge of the Graphical User Interface based application programs by utilizing event handling features and Swing in Java

DEPARTMENT OF ELECTRONICS AND COMPUTER ENGINEERING

CST303 - Computer Networks

Semester : 5

Course Title : Computer Networks

Course Code : CST 303

Course Outcomes (CO)

After the successful completion of this course, students will able to

No.	Course outcomes	Knowledge Level
CO 1	Explain the features of computer networks, protocols, and network design models	**K2**
CO 2	Describe the fundamental characteristics of the physical layer and identify the usage in network communication	**K3**
CO 3	Explain the design issues of data link layer, link layer protocols, bridges and switches	**K2**
CO 4	Illustrate wired LAN protocols (IEEE 802.3) and wireless LAN protocols (IEEE 802.11)	**K2**
CO 5	Select appropriate routing algorithms, congestion control techniques, and Quality of Service requirements for a network	**K3**
CO6	Illustrate the functions and protocols of the network layer, transport layer, and application layer in inter-networking	**K2**

CO – PO Matrix

	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
CO 1	3	2	-	-	-	-	-	-	-	-	-	3	2	2
CO 2	3	3	2	-	-	-	-	-	-	-	-	3	2	2
CO 3	3	2	1	-	-	-	-	-	-	-	-	3	2	2
CO 4	3	2	1	-	-	-	-	-	-	-	-	2	3	2
CO 5	3	2	1	1	-	-	-	-	-	-	-	3	2	2
CO6	3	2	1	-	2	-	-	-	-	-	-	3	2	2
ERT 393	3	2.16	1.4	1	2	-	-	-	-	-	-	2.83	2.16	2

JUSTIFICATIONS FOR CO-PO MAPPING

Mapping	Mapping Level (3/2/1)	Justifications
CST303.1-PO1	H	Students could just apply the knowledge acquired to classify the features of computer networks.
CST303.1-PO2	M	Understanding the layer functions helps the students to identify and formulate the problems based on the layer
CST303.1-PO12	H	Knowledge in different layer functions helps to understand new technologies
CST303.1-PSO1	M	Apply fundamental concepts to classify the layers based on its function
CST303.1-PSO2	M	Understanding the layer functions and understanding the network factors, helps in analyzing and interpreting the quality of networks
CST303.2-PO1	H	Knowledge about the fundamental characteristics of physical layer
CST303.2-PO2	H	Identify formulate the usage of physical layer in network communication
CST303.2-PO3	M	Students can design solutions for physical layer issues and develop solutions for the same in network communication.
CST303.2-PO12	H	Students able to apply the solutions for the various physical layer issues and can apply new technologies in network communications.
CST303.2-PSO1	M	Apply fundamental concepts of physical layer and identify computing solutions to develop software and hardware solutions.
CST303.2-PSO2	M	Apply fundamental concepts of physical layer in developing quality network through communication with expertise.
CST303.3-PO1	H	Apply the knowledge required to understand various data link layer design issues and data link protocols
CST303.3-PO2	M	Apply the knowledge in identifying the appropriate channel access techniques for both wired and wireless communications
CST303.3-PO3	L	Students could apply knowledge to find solutions to complex data link layer problems
CST303.3-PO12	H	Knowledge in communication model helps to understand new technologies
CST303.3-PSO1	M	Apply fundamental concepts of data Link layer design issues and data link protocols in making effective hardware and software solution.
CST303.3-PSO2	M	Apply fundamental concepts of data link protocols helps in developing quality software's
CST303.4-PO1	H	Apply the knowledge required to understand different LAN protocols
CST303.4-PO2	M	Students could apply the knowledge to compare different Lan protocols.
CST303.4-PO3	L	Students could apply knowledge to find solutions to complex problems

CST303.4-PO12	M	Knowledge in different LAN Protocols helps to understand new technologies
CST303.4-PSO1	H	Apply fundamental concepts of different LAN protocols to analyze and understand software and hardware solutions.
CST303.4-PSO2	M	Apply fundamental concepts of different LAN protocols helps in developing quality software
CST303.5-PO1	H	Apply the knowledge required to understand various routing techniques
CST303.5-PO2	M	Applies the knowledge in identifying the appropriate end to end protocol for reliable communication
CST303.5-PO3	L	Studies about the various routing techniques helps the students to fix up the shortest path routes for packets in the network.
CST303.5-PO4	L	Understanding the various end to end protocols helps in analyzing and interpreting the quality of networks.
CST303.5-PO12	H	Knowledge in various routing algorithms helps to understand new technologies
CST303.5-PSO1	M	Apply fundamental concepts of various routing algorithms to design and implement different types of networks.
CST303.5-PSO2	M	Apply fundamental concepts of various routing algorithms helps in developing quality software
CST303.6-PO1	H	Apply the knowledge acquired on various applications over internet
CST303.6-PO2	M	Students could identify the various applications over internet
CST303.6-PO3	L	Students could apply knowledge to find solutions to complex problems
CST303.6-PO6	M	Knowledge in various aspects and functions of network layer, transport layer and application layer in internetworking helps in real life scenarios
CST303.6-PO12	H	Knowledge in various aspects and functions of network layer, transport layer and application layer in internetworking helps to understand new technologies
CST303.6-PSO1	M	Apply fundamental concepts of network layer, transport layer and application layer in internetworking and developing software and hardware solutions.
CST303.6-PSO2	M	Apply fundamental concepts of network layer, transport layer and application layer in internetworking helps in communication the actual issues and solutions related to networks.

Prepared by (Faculty Name & Signature)

Verified by: Stream Coordination Committee

DEPARTMENT OF ELECTRONICS AND COMPUTER ENGINEERING

ERT 305 - Database Management Systems

Semester : 5

Course Title : Database Management Systems

Course Code : ERT 305

Course Outcomes (CO)

After the successful completion of this course, students will able to

No.	Course outcomes	Knowledge Level
CO 1	Summarize and exemplify fundamental nature and characteristics of database systems	**K1**
CO 2	Model real word scenarios given as informal descriptions, using Entity Relationship diagrams.	**K3**
CO 3	Model and design solutions for efficiently representing and querying data using relational model	**K4**
CO 4	Demonstrate the features of indexing and hashing in database applications	**K3**
CO 5	Discuss and compare the aspects of Concurrency Control and Recovery in Database systems	**K3**
CO 6	Explain various types of NoSQL databases	**K2**

CO – PO Matrix

	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
CO 1	1	1	1	-		-	-	-	-	-	-	1	1	1
CO 2	2	3	3	2		-	-	-	-	-	-	3	2	1
CO 3	2	3	3	2		-	-	-	-	-	-	3	2	1
CO 4	2	3	3	-		-	-	-	-	1	-	3	3	2
CO 5	2	3	3	-		-	-	-	-	1	-	3	3	2
CO 6	1	1	1		2					1		3	2	1
ERT 305	1.7	2.3	2.3	2	2	-	-	-	-	1	-	2.66	2.16	1.33

JUSTIFICATIONS FOR CO-PO MAPPING

Mapping	Mapping Level (3/2/1)	Justifications
CO1 – PO1	1	As students could just identify fundamental nature and characteristics of database system
CO1 – PO2	1	Students could only analyse fundamental nature and characteristics of database system.
CO1 – PO3	1	Students could have only the basic knowledge of fundamental nature and characteristics of database system.
CO1 – PO12	1	Students will be capable of lifelong learning by designing simple digital systems with programmable logic devices
CO1 – PSO1	1	The basics characteristics of database system will help the students to analyse and design the software systems.
CO1 – PSO2	1	Students will be able to communicate the basic characteristics of database system.
CO2 – PO1	2	Students will be able to apply knowledge in DBMS to recognise ER diagram.
CO2 – PO2	3	Students will be able to analyse ER Diagram.
CO2 – PO3	3	Students will be able to design ER diagram from real world scenarios.
CO2 – PO4	2	Students will be able to conduct investigations on ER diagram and summarise the meaning from it at a moderate level.
CO2 – PO12	3	The knowledge in ER diagram will help the students to design database applications in all future projects.
CO2 – PSO1	2	Students will be able to analyse and design ER diagram by applying the fundamental concepts.
CO2 – PSO2	1	Students will be able to communicate the development of ER diagrams.
CO3 – PO1	2	Knowledge in Relational algebra will help the student model and design solutions in DBMS
CO3 – PO2	3	Students will be able to analyse the real-world problems and will be able to write relational algebra and SQL for solving it.
CO3 – PO3	3	Students will be able to design and develop database applications by using SQL
CO3 – PO4	2	Students will be able to conduct investigations on existing database and derive summary from it.
CO3 – PO12	3	The knowledge in relational algebra and SQL will help the students to design database applications in all future projects
CO3 – PSO1	2	Students will be able to analyse and design database solutions by applying the foundational concepts of relational algebra and SQL.
CO3 – PSO2	1	Students will be able to apply communicate engineering principles in development of relational algebra and SQL queries.

CO4 – PO1	2	The knowledge in Indexing and hashing will help the students to optimise the databases. Need more practice to create highly optimised databases
CO4 – PO2	3	Students will be able to analyse the optimisation problems in database and improve the optimisation using Indexing and hashing.
CO4 – PO3	3	Students will be able to design and develop the optimised database applications.
CO4 – PO10	1	The effective optimisation writing skills will help the students to develop stable databases
CO4 – PO12	3	The knowledge in optimisation will help the students to design efficient database applications in all future projects
CO4 – PSO1	3	Students will be able to analyse and design optimised database solutions by applying the foundational concepts of indexing and hashing
CO4 – PSO2	2	Students will be able to apply the knowledge of indexing and hashing in development of database applications
CO5 – PO1	2	The knowledge in Concurrency control will help the students to avoid conflict in simultaneous database operations.
CO5 – PO2	3	Students will be able to analyse concurrency issues in databases.
CO5 – PO3	3	Students will be able to design and develop databases that supports the concurrent transactions.
CO5 – PO10	1	Students will be able to write concurrent database applications but more experience required to write it properly.
CO5 – PO12	3	The knowledge in concurrency control will help the students to design database applications that can handle simultaneous operations in all their future projects
CO5 – PSO1	3	Students will be able to analyse and design database solutions with concurrency control by applying the foundational concepts they learned.
CO5 – PSO2	2	Students will be able to apply the knowledge of developing database applications that can handle simultaneous operations.
CO6 – PO1	1	Students will have a basic knowledge in NoSQL Databases
CO6 – PO2	1	Students will have basic analysing skills in NOSQL Databases
CO6 – PO3	1	Students will be able to develop basic NoSQL queries.
CO6 – PO5	2	Students will have a moderate knowledge in using the NoSQL software tools.
CO6 – PO10	1	Students will have a basic skill in writing NoSQL queries
CO6 – PO12	3	The knowledge in NoSQL will help the students to design unstructured database applications all their future projects
CO6 – PSO1	2	Students will have a basic analysis and design skills in solving computational problems using NoSQL

CO6 – PSO2	1	Students will be able to apply the knowledge in developing NoSQL Queries

Prepared by (Faculty Name & Signature):

Verified by : Stream Coordination Committee

DEPARTMENT OF ELECTRONICS AND COMPUTER ENGINEERING

ERT 301 Digital Signal Processing

Semester : **Five**

Course Title : **Digital Signal Processing**

Course Code : **ERT 301**

Course Outcomes (CO)

After the completion of the course, the students will able to

No.	Course outcomes	Knowledge Level
CO1	Summarize the fundamental concepts of discrete-time signals and systems and obtain the transfer function of system using Z-transform. **(Cognitive Knowledge Level: Understand)**	**K_2**
CO2	Illustrate the fundamental concepts of DFT and compute DFT and IDFT. **(Cognitive Knowledge Level: Understand)**	**K_2**
CO3	Design FIR filters and IIR filters for the given specifications. **(Cognitive Knowledge Level: Apply)**	**K_3**
CO4	Realize the various FIR and IIR filter structures for given the system function. **(Cognitive Knowledge Level: Apply)**	**K_3**
CO5	Explain the architecture of DSP processor (TMS320C67xx) and the finite word length effects in digital filtering. **(Cognitive Knowledge Level: Understand)**	**K_2**

CO – PO Matrix

	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
CO 1	3	3	3	-	3	-	-	-	-	-	-	3	3	3
CO 2	3	2	3	-	3	-	-	-	-	-	-	3	3	3
CO 3	3	3	3	-	3	-	-	-	-	-	-	3	3	3
CO 4	3	3	3	-	3	-	-	-	-	-	-	3	3	3
CO 5	2	2	2	-	1	-	-	-	-	-	-	2	2	2
CO	2.8	2.8	2.8	-	2.6	-	-	-	-	-	-	2.8	2.8	2.8

JUSTIFICATIONS FOR CO-PO MAPPING

Mapping	Mapping Level (3/2/1)	Justifications
CO1 - PO1	3	Students will be able to apply the knowledge of discrete-time signals and systems and transfer function of system using Z-transform in solving complex signal processing problems.
CO1 – PO2	3	Students will be able to apply the knowledge of discrete-time signals and systems and transfer function of system using Z-transform to analyze complex signal processing problems.
CO1 – PO3	3	Students will be able to apply the knowledge of discrete-time signals and systems and transfer function of system using Z-transform in solving complex signal processing problems.
CO1 – PO5	3	Students will be able to apply the knowledge of discrete-time signals and systems and transfer function of system using z-transform to conduct investigations of complex problems using MATLAB.
CO1 – PO12	3	Helps in lifelong learning in the contest of technological change.
CO1 – PSO1	3	Students will be able to apply the knowledge of discrete-time signals and systems and transfer function of system using Z-transform to analyze and design hardware and software systems.
CO1 – PSO2	3	Students will be able to apply the knowledge of discrete-time signals and systems and transfer function of system using z-transform to design and analyze hardware and software systems using MATLAB.
CO2 - PO1	3	Students will be able to apply the knowledge of DFT in solving complex signal processing problems.
CO2 – PO2	2	Students will be able to apply the knowledge of DFT in analyze complex signal processing problems.
CO2 – PO3	3	Students will be able to apply the knowledge of DFT to find solutions for complex signal processing problems.
CO2 – PO5	3	Students will be able to simulate DFT using MATLAB.
CO2 – PO12	3	Helps in lifelong learning in the contest of technological change.
CO2 – PSO1	3	Students will be able to apply the knowledge of DFT to analyze and design hardware and software systems.
CO2 – PSO2	3	Students will be able to apply the knowledge of DFT to design and analyze hardware and software systems using MATLAB.
CO3 - PO1	3	Students will be able to apply the knowledge of filter design in solving complex signal processing problems.
CO3 – PO2	3	Students will be able to apply the knowledge of filter design in analyze complex signal processing problems.
CO3 – PO3	3	Students will be able to apply the knowledge of filter design to find solutions for complex signal processing problems.

CO3 – PO5	3	Students will be able to simulate filter design using MATLAB.
CO3 – PO12	3	Helps in lifelong learning in the contest of technological change.
CO3 – PSO1	3	Students will be able to apply the knowledge of filter design to analyze and design hardware and software systems.
CO3 – PSO2	3	Students will be able to apply the knowledge of filter design to design and analyze hardware and software systems using MATLAB.
CO4 - PO1	3	Students will be able to realize filter structures for solving complex signal processing problems.
CO4 – PO2	3	Students will be able to realize filter structures for analyze complex signal processing problems.
CO4 – PO3	3	Students will be able to realize filter structures for find solutions for complex signal processing problems.
CO4 – PO5	3	Students will be able to realize filter structures using MATLAB.
CO4 – PO12	3	Helps in lifelong learning in the contest of technological change.
CO4 – PSO1	3	Students will be able to realize filter structures to analyze and design hardware and software systems.
CO4 – PSO2	3	Students will be able to realize filter structures for to design and analyze hardware and software systems using MATLAB.
CO5 - PO1	2	Students will be able to apply the knowledge of DSP processor in solving complex signal processing problems.
CO5 – PO2	2	Students will be able to apply the knowledge of DSP processor for analyze complex signal processing problems.
CO5 – PO3	2	Students will be able to apply the knowledge of DSP processor for find solutions for complex signal processing problems.
CO5 – PO5	1	Students will be able to apply the knowledge of finite word length effects in digital filtering using MATLAB.
CO5 – PO12	2	Helps in lifelong learning in the contest of technological change.
CO5 – PSO1	2	Students will be able to apply the knowledge of DSP processor to analyze and design hardware and software systems.
CO5 – PSO2	2	Students will be able to apply the knowledge of DSP processor for to design and analyze hardware and software systems using MATLAB.

Prepared by | Verified by | Approved by

(Faculty Name & Signature) | (Stream Coordinator) | HoD

DEPARTMENT OF ELECTRONICS AND COMPUTER ENGINEERING

ERT307 Microprocessors and Advanced Microcontrollers

Semester : **Fifth**

Course Title : **Microprocessors and Advanced Microcontrollers**

Course Code : **ERT307**

Course Outcomes (CO)

After the successful completion of this course, students will able to

No.	Course outcomes	Knowledge Level
CO 1	Illustrate the architecture, modes of operation and addressing modes of microprocessors (Cognitive knowledge: Understand)	**K2**
CO 2	Develop 8086 assembly language programs. (Cognitive Knowledge Level: Apply)	**K3**
CO 3	Demonstrate interrupts, its handling and programming in 8086. (Cognitive Knowledge Level: Apply)	**K3**
CO 4	Outline features of microcontrollers and develop low level programs. (Cognitive Knowledge Level: Understand)	**K2**
CO 5	Familiarize the building blocks of RISC processors and ARM microcontrollers. (Cognitive Knowledge Level: Understand)	**K2**

CO – PO Matrix

	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
CO 1	1	1	1	-	-	-	-	-	-	-	-	1	3	-
CO 2	2	1	1	1	-	-	-	-	-	-	-	2	2	-
CO 3	2	1	2	1	-	-	-	-	-	-	-	2	2	-
CO 4	1	1	1	1	-	-	-	-	-	-	-	2	2	-
CO 5	2	1	1	1	-	-	-	-	-	-	-	1	3	-
EST 130	1.6	1	1.2	1	-	-	-	-	-	-	-	1.6	2.4	-

JUSTIFICATIONS FOR CO-PO MAPPING

Mapping	Mapping Level (3/2/1)	Justifications
CO1-PO1	1	Able to understand the fundamentals of 8086 architecture and Addressing modes. Hence apply the same to solve engineering problems.
CO1-PO2	1	Able to analyze the problem and identify the architecture, modes of operation and addressing modes of microprocessors.
CO1-PO3	1	Able to design a variety of solution to solve problem using 8086 assembly code.
CO1-PO12	1	Understand the new features and demonstrate the need of updating for the current architecture.
CO1-PSO1	3	Able to analyse and design hardware and software systems so as to understand and solve engineering problems.
CO2-PO1	2	Able to understand the addressing modes and instruction set to develop 8086 assembly language programs.
CO2-PO2	1	Able to analyze the problem and identify the logic and parameter to solve problem related arithmetic.
CO2-PO3	1	Able to design a variety of solution to solve problem using 8086 assembly code.
CO2-PO4	1	Able to conduct investigations and apply the same to solve problem using 8086 assembly code.
CO2-PO12	2	Apply the knowledge of 8086 architecture and addressing modes and instruction set to design a better solution.
CO2-PSO1	2	Apply the knowledge of 8086 architecture and addressing modes and instruction set to design a better solution by analyzing hardware and software design systems.
CO3-PO1	2	Able to demonstrate interrupts, its handling and programming in 8086 by applying the engineering knowledge.
CO3-PO2	1	Able to analyze the problem and apply the same to demonstrate interrupts, its handling and programming in 8086.
CO3-PO3	2	Able to design a variety of solution to solve problems in interrupts, using programming in 8086.
CO3-PO4	1	Able to conduct investigations and apply the same to demonstrate interrupts, its handling and programming in 8086.
CO3-PO12	2	Apply the knowledge of interrupts, its handling and its programming in 8086 to design a better solution.
CO3-PSO1	2	Able to analyse and design hardware and software systems by applying the knowledge of interrupts, its handling and its programming in 8086
CO4-PO1	1	Understand the features of microcontrollers and develop low level programs.

CO4-PO2	1	Able to analyze the problem and apply the same to outline features of microcontrollers and develop low level programs.
CO4-PO3	1	Able to design a variety of solutions to solve problems using microcontrollers and develop low level programs.
CO4-PO4	1	Able to conduct investigations and apply the same to features of microcontrollers and develop low level programs.
CO4-PO12	2	Apply the knowledge of updated features of microcontrollers and develop low level programs.
CO4-PSO1		Able to analyze and design hardware and software systems by understanding the features of microcontrollers and develop low level programs.
CO5-PO1	2	Able to familiarize the building blocks of RISC processors and ARM microcontrollers.
CO5-PO2	1	Able to analyze the problem and apply the same to familiarize the building blocks of RISC processors and ARM microcontrollers.
CO5-PO3	1	Able to design a variety of solutions to solve problems using the building blocks of RISC processors and ARM microcontrollers.
CO5-PO4	1	Able to analyze the problem and apply the same to familiarize the building blocks of RISC processors and ARM microcontrollers.
CO5-PO12	2	Apply the knowledge of updated features to building blocks of RISC processors and ARM microcontrollers.
CO5-PSO1	3	Able to analyse and design hardware and software systems by understanding the building blocks of RISC processors and ARM microcontrollers.

Prepared by (Faculty Name & Signature):

Verified by : Stream Coordination Committee

Department of Electronics and Computer Engineering

Programme: Bachelor of Technology Course Code: CST309

Course Name: MANAGEMENT OF SOFTWARE SYSTEMS Semester: S5

COURSE OUTCOMES

The students will be able to:

CO	Course outcome	Knowledge level
CST309.1	Demonstrate Traditional and Agile Software Development approaches	K3
CST309.2	Prepare Software Requirement Specification and Software Design for a given problem.	K3
CST309.3	Justify the significance of design patterns and licensing terms in software development, prepare testing, maintenance and DevOps strategies for a project	K3
CST309.4	Make use of software project management concepts while planning, estimation, scheduling, tracking and change management of a project, with a traditional/agile framework.	K3
CST309.5	Utilize SQA practices, Process Improvement techniques and Technology advancements in cloud-based software models and containers & microservices	K3

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CO - PO - PSO MAPPING

CO \ PO	Programme outcomes													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CST309.1	3	3	3	3	-	2	-	-	-	-	-	3	3	-
CST309.2	3	3	3	2	-	2	-	-	-	2	3	2	3	-
CST309.3	3	3	2	2	-	-	-	2	-	3	3	2	3	-
CST309.4	3	3	3	2	-	2	-	-	2	3	2	3	3	-
CST309.5	3	3	3	3	-	3	-	-	-	-	-	3	3	-
AVG	3	3	3	2.4	-	1.8	-	0.4	0.4	1.6	1.6	2.6	3	-

Correlation : 1-Low, 2-Moderate, 3-High, No Correlation '-'

JUSTIFICATION

Mapping	Level (L/M/H)	JUSTIFICATION
CST309.CO1-PO1	H	They could apply the knowledge required to describe various software engineering models
CST309.CO1-PO2	H	They could apply the knowledge to analyze different software engineering models
CST309.CO1-PO3	H	They could apply knowledge to design appropriate software engineering models for various types of projects
CST309.CO1-PO4	H	They could apply knowledge to compare traditional and agile software development models
CST309.CO1-PO6	M	With the knowledge of different software models, the students are able to apply knowledge to assess societal issues and responsibilities relevant to professional engineering practice

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CST309.CO1-PO12	H	With the knowledge of different software models, the students are able to recognize the need for and to understand new technologies.
CST309.CO1-PSO1	H	Students will be able to design software models for various engineering problems.
CST309.CO2-PO1	H	They could apply the knowledge required to prepare SRS and software design for a given problem.
CST309.CO2-PO2	H	They could apply the knowledge to analyze different design models.
CST309.CO2-PO3	H	They could apply knowledge to design requirement analysis and to choose appropriate design models for various types of project.
CST309.CO2-PO4	M	They could apply knowledge to compare different design models within the context of software engineering
CST309.CO2-PO6	M	With the knowledge of different design models, the students are able to apply knowledge to assess societal issues and responsibilities relevant to professional engineering practice
CST309.CO2-PO10	M	The students are able to communicate the requirements effectively by creating SRS.
CST309.CO2-PO11	H	The students are able to manage project work through effective SRS and design models.
CST309.CO2-PO12	M	With the knowledge about SRS helps to prepare a professional document, the students are able to recognize the need for and to engage in independent and life-long learning in the broadest context of technological change
CST309.CO2-PSO1	H	Students will be able to prepare SRS and software design models for given engineering problem
CST309.CO3-PO1	H	They could apply the knowledge required to formulate appropriate testing strategy
CST309.CO3-PO2	H	They could apply the knowledge to analyze different testing methods.

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CST309.CO3-PO3	M	They could apply knowledge to design patterns and to choose appropriate licensing terms for various types of project.
CST309.CO3-PO4	M	They could apply knowledge to compare different testing and maintenance methods within the context of software engineering
CST309.CO3-PO8	M	With the knowledge of different testing methods the students are able to apply knowledge to assess societal issues and responsibilities relevant to professional engineering practice
CST309.CO3-PO10	H	The students are able to communicate with testing team requirements effectively by Dev Ops strategy.
CST309.CO3-PO11	H	The students are able to manage project work through effective testing methods.
CST309.CO3-PO12	M	With the knowledge about DevOps the students are able to recognize the need for and to engage in independent and life-long learning in the broadest context of technological change
CST309.CO3-PSO1	H	Students will be able to formulate testing and evaluate the system to solve complex engineering problems.
CST309.CO4-PO1	H	They could apply the concepts of software project management techniques while estimating cost and schedule for a given project.
CST309.CO4-PO2	H	They could apply the knowledge to analyze various cost estimation methods.
CST309.CO4-PO3	H	They could apply knowledge to choose appropriate cost estimation methods and team for various types of project.
CST309.CO4-PO4	M	They could apply knowledge to compare software project management in traditional and agile models.
CST309.CO4-PO6	M	With the knowledge of different software project management concepts, the students are able to apply knowledge to assess societal issues and

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		responsibilities relevant to the professional engineering practice
CST309.CO4-PO9	M	With the knowledge about software management principles, the students are able to function effectively as an individual, or a team leader in diverse or multidisciplinary settings
CST309.CO4-PO10	H	The students are able to communicate with in a team and mange people in that team.
CST309.CO4-PO11	M	The students are able to manage project work through scheduling, tracking and estimating.
CST309.CO4-PO12	H	With the knowledge about various risk, software pricing, the students are able to recognize the need for and to engage in independent and life-long learning in the broadest context of technological change
CST309.CO4-PSO1	H	Students will be able to apply planning and scheduling in various types of software projects.
CST309.CO5-PO1	H	They could apply the knowledge to describe SQA practices.
CST309.CO5-PO2	H	They could apply the knowledge to analyze various software process improvement methods.
CST309.CO5-PO3	H	They could apply knowledge to choose appropriate SQA practices and process Improvement techniques and technology.
CST309.CO5-PO4	H	They could apply knowledge to compare cloud and microservices
CST309.CO5-PO6	H	With the knowledge of SPI, the students are able to apply knowledge to assess societal issues and responsibilities relevant to the professional engineering practice
CST309.CO5-PO12	H	With the knowledge about microservices architecture, the students are able to recognize the need for and to engage in independent and life-long learning in the broadest context of

		technological change
CST309.CO5-PSO1	H	Students will be able to apply SQA principles in various types of software projects

DEPARTMENT OF ELECTRONICS AND COMPUTER ENGINEERING

MCN301 DISASTER MANAGEMENT

Semester : **FIVE**

Course Title : **Disaster mangement**

Course Code : **MCN301**

Course Outcomes (CO)

After the successful completion of this course, students will able to

No.	Course outcomes	Knowledge Level
CO 1	Define and use various terminologies in use in disaster management parlance and organise each of these terms in relation to the disaster management cycle	K1
CO 2	Distinguish between different hazard types and vulnerability types and do vulnerability assessment	K1
CO 3	Identify the components and describe the process of risk assessment, and apply appropriate methodologies to assess risk	K1
CO 4	Explain the core elements and phases of Disaster Risk Management and develop possible measures to reduce disaster risks across sector and community	K3
CO 5	Identify factors that determine the nature of disaster response and discuss the various disaster response actions	K1
CO6	Explain the various legislations and best practices for disaster management and risk reduction at national and international level	K1

CO – PO Matrix

	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
CO 1	-	2	-	-	-	2	-	-	-	2	-	2	1	1
CO 2	2	3	2	-	2	2	3	-	-	3	-	2	2	2
CO 3	2	3	2	2	2	2	3	-	-	3	-	2	2	2
CO 4	3	3	3	-	2	2	3	-	-	-	-	2	3	3
CO 5	3	3	-	-	2	2	3	-	-	-	-	2	2	2
CO6	3	-	-	-	-	2	3	3	-	-	-	2	2	2
MCN301	2.6	2.8	2.33	2	2	2	3	3	-	2.67	-	2	2.00	2

JUSTIFICATIONS FOR CO-PO MAPPING

CO	PO	LEVEL	REMARKS
MCN301.1	PO2	2	Understand the various Terminologies which help to grow professionally in technical aspect.
	PO6	2	Apply the knowledge gained to assess the disasters and take necessary measures.
	PO10	2	Help to document the Disasters for future reference.
	PO12	2	Recognize the need for Identification and proper management of Disaster.
	PSO1	1	Help to understand the various terminological aspects in industry.
	PSO2	1	Aid to prepare record of any Disasters.
MCN301.2	PO1	2	Sharpest weapon to win against disaster
	PO2	3	Enable to analyse and solve complex disaster related problems
	PO3	2	Development of new and sustainable measures to fight disaster.
	PO5	2	Hazard mapping to analyse the characteristics of Hazard.
	PO6	2	Apply the knowledge to assess the societal, health, safety and cultural issues.
	PO7	3	Apply the engineering solutions for the sustainable development.
	PO10	3	Communicate effectively with the society and professionals to give clear instructions and document in the context of disaster.
	PO12	2	Prepare to be updated everyday about the technological changes in assessment.
	PSO1	2	Aid to practice the knowledge gained in Disaster Management.
	PSO2	2	Help to grow professionally in technical aspect
MCN301.3	PO1	2	Apply the understanding of risk assessments in the advent of disasters.
	PO2	3	To put in appropriate methodologies to solve the after effects of Disasters.
	PO3	2	Design solutions with the assessment methodologies in the disaster scenario.

	PO4	2	Apply research methods and knowledge in the analysis and interpretation of Risks.
	PO5	2	Utilize appropriate methodologies to assess Risks
	PO6	2	Aware about the responsibilities and necessity of Risk assessment
	PO7	3	Utilization of Risk assessment in Societal and Environmental Context
	PO10	3	Efficient transfer of instructions regarding assessed risks and and to draft reports.
	PO12	2	To be aware of the recent technologies in risk assessment.
	PSO1	2	To develop sustainable solutions for the effective management of Disasters.
	PSO2	2	To develop technical and management skills.
MCN301.4	PO1	3	To utilize the knowledge Disaster Risk Management to solve complex disaster related issues.
	PO2	3	To identify and analyse the problems and develop possible measures to reduce disaster risks.
	PO3	3	Applying risk assessment methodologies with the proper consideration for public health and safety.
	PO5	2	Utilize the idea of phases of Disaster risk management and analyse its limitations
	PO6	2	Utilize the contextual knowledge to practice professional engineering.
	PO7	3	Recognize and demonstrate knowledge for Sustainable development
	PO12	2	Understand the need for updation of knowledge in Risk assessment measures.
	PSO1	3	Help to practice civil engineering in safeguarding the safety of environment and society
	PSO2	3	Enable career growth with the effective utilization of skills.
MCN301.5	PO1	3	Understand the nature of Disaster response and apply the knowledge to solve related problems
	PO2	3	Analyse the various disaster response actions

	PO5	2	Frame and apply Disaster response actions effectively
	PO6	2	Assess safety and health issues relevant to the disaster scenario
	PO7	3	Understand the effect of professional engineering solutions for effective management of disaster.
	PO12	2	Life long learning in the context of technological changes in the various disaster response actions
	PSO1	2	Aid to put in the knowledge to develop sustainable solutions in Practical working environment.
	PSO2	2	To be competent in work with the effective disaster response actions taken.
MCN301.6	PO1	3	Apply the knowledge of disaster management and risk reduction as solution for Disaster related problems.
	PO6	2	Apply contextual knowledge of various legislations to assess societal, safety, legal and cultural issues.
	PO7	3	practices for disaster management and risk reduction for sustainable development
	PO8	3	Apply disaster legislations maintaining ethical principles.
	PO12	2	Recognize the need for updating knowledge of risk reduction.
	PSO1	2	To practice the legislations and risk reduction measures at work in National and International levels.
	PSO2	2	Continual development of technical skills and management skills to work for disaster risk reduction globally.

Prepared by (Faculty Name & Signature):

Verified by : Stream Coordination Committee

DEPARTMENT OF ELECTRONICS AND COMPUTER ENGINEERING

CSL 333 - Database Management Systems Lab

Semester : 5

Course Title : Database Management Systems Lab

Course Code : CSL 333

Course Outcomes (CO)

After the successful completion of this course, students will able to

No.	Course outcomes	Knowledge Level
CO 1	Design database schema for a given real world problem-domain using standard design and modeling approaches	**K3**
CO 2	Construct queries using SQL for database creation, interaction, modification, and updation.	**K3**
CO 3	Design and implement triggers and cursors	**K3**
CO 4	Implement procedures, functions, and control structures using PL/SQL.	**K3**
CO 5	Perform CRUD operations in NoSQL Databases.	**K3**
CO 6	Develop database applications using front-end tools and back-end DBMS	**K6**

CO – PO Matrix

	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
CO 1	3	3	3		3			2		2		2	1	1
CO 2	3	2	3		3			2		2		2	2	2
CO 3	3	2	2	2	2			2		2		2	3	1
CO 4	3	2	2	2	2			2		2		2	2	1
CO 5	3	2	2		2			2		2		2	3	1
CO 6	3	2	2	2	2	2		2	2	2	2	2	3	2
CSL 333	3	2.16	2.33	2	2.33	2		2	2	2	2	2	2.33	1.33

JUSTIFICATIONS FOR CO-PO MAPPING

Mapping	Mapping Level (3/2/1)	Justifications
CO1-PO1	**3**	The students will be able to design database schema for a given real world problem-domain using standard design and modeling approaches by which the students will be able to apply engineering knowledge in complex engineering problems.
CO1- PO2	**3**	The students will be able to design database schema for analyzing a given real world problem-domain using standard design and modeling approaches.
CO1-PO3	**3**	Students can able to develop the solutions of complex engineering problems using standard design and modeling approaches in database.
CO1-PO5	**3**	The students will be able design database schema for a given real world problem-domain using standard design and modeling approaches and modern tool usage.
CO1-PO8	**2**	Students can apply ethical principles and commit to professional ethics and responsibilities while designing database schema for a given real world problem
CO1-PO10	**2**	Students can effectively communicate on complex engineering activities while designing database schema for a given real world problem
CO1-PO12	**2**	Students can apply in the area of designing database schema for a given real world problem-domain using standard design and modeling approaches to engage in independent and life -long learning in the broadest context of technological change.
CO1-PSO1	**1**	Students will be able to design database schema which helps them to analyse real world problems and build software solution.
CO1-PSO2	**1**	Students can able to apply adapt to emerging Information and Communication Technologies by providing innovative ideas and solutions to real world problems .
CO2-PO1	**3**	Students can construct queries using SQL for database creation, interaction, modification, and updation by applying engineering knowledge

CO2-PO2	**2**	Students can construct queries using SQL for database creation, interaction, modification, and updation for problem analysis.
CO2-PO3	**3**	Students can construct queries using SQL for database creation, interaction, modification, and updation for designing solutions.
CO2-PO5	**3**	Students can construct queries using SQL for database creation, interaction, modification, and updation using modern tool.
CO2-PO8	**2**	Students can apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice while constructing queries using SQL for database creation, interaction, modification, and updation
CO2-PO10	**2**	Students can communicate effectively on complex engineering activities while constructing queries using SQL for database creation, interaction, modification, and updation
CO2-PO12	**2**	Students can construct queries using SQL for database creation, interaction, modification, and updation to engage in independent and life-long learning in the broadest context of technological change.
CO2-PSO1	**2**	Students can be able to analyze, design and develop solutions by applying queries using SQL which helps them to understand the importance of software.
CO2-PSO2	**2**	Students can communicate innovative ideas and solutions to novel problems using SQL queries.
CO3-PO1	**3**	Students can able to apply engineering knowledge in design and implement triggers and cursors.
CO3-PO2	**2**	Students can able to design and implement triggers and cursors in appropriate complex engineering problems.
CO3-PO3	**2**	Students can design solutions for complex engineering problems and applying triggers and cursors in appropriate domain.
CO3-PO4	**2**	Students can use research-based knowledge including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid applying triggers and cursor in appropriate domain.
CO3-PO5	**2**	Students can design and implement triggers and cursors in appropriate complex engineering problems using modern tools in appropriate domain.

CO3-PO8	**2**	Students can apply ethical principles while implementing triggers and cursors
CO3-PO10	**2**	Students can able to communicate effectively about various classification algorithms while implementing triggers and cursors
CO3-PO12	**2**	Students can design and implement triggers and cursors to engage in independent and life - long learning in the broadest context of technological change.
CO3-PSO1	**3**	Students can analyze, design and develop the solutions by applying concepts of triggers and cursors which enables them about the software.
CO3-PSO2	**1**	Students will be able to communicate the ideas and solutions to the problems using cursors and triggers.
CO4-PO1	**3**	Students can apply the knowledge of mathematics, science, engineering fundamentals to implement procedures, functions, and control structures using PL/SQL
CO4-PO2	**2**	Students can implement procedures, functions, and control structures using PL/SQL for performance metrics and engineering sciences.
CO4-PO3	**2**	Students can design solutions for complex engineering problems by implementing procedures, functions, and control structures using PL/SQL
CO4-PO4	**2**	Students can analysis and interpret data, and synthesis of the information to provide valid conclusions while implementing procedures, functions, and control structures using PL/SQL
CO4-PO5	**2**	Students can implement procedures, functions, and control structures using PL/SQL using modern tools in appropriate domain.
CO4-PO8	**2**	Students can implement procedures, functions, and control structures using PL/SQL by considering the ethics.
CO4-PO10	**2**	Students can able to communicate effectively in implementing procedures, functions, and control structures using PL/SQL
CO4-PO12	**2**	Students can implement procedures, functions, and control structures using PL/SQL via lifelong learning.

CO4-PSO1	**2**	Students can implement procedures, functions, and control structures using PL/SQL by applying foundational concepts of Computer Science and Engineering.
CO4-PSO1	**1**	Students can communicate the concepts of procedures, functions, and control structures using PL/SQL
CO5-PO1	**3**	Students can apply the engineering knowledge to perform CRUD operations in NoSQL Databases.
CO5-PO2	**2**	The students can analyze the complex engineering problems and can perform CRUD operations in NoSQL Databases.
CO5-PO3	**2**	The students can design the solutions of complex problems by performing CRUD operations in NoSQL Databases.
CO5-PO5	**2**	Students can perform CRUD operations in NoSQL Databases by using modern tool.
CO5-PO8	**2**	Students can apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice to real world scenario while using CRUD operations in NoSQL Databases
CO5-PO10	**2**	Students can communicate effectively on complex engineering activities with the engineering community and with society at large, while performing CRUD operations in NoSQL Databases.
CO5-PO12	**2**	Students can able to perform lifelong learning while dealing with CRUD operations in NoSQL Databases.
CO5-PSO1	**3**	Students can be able to analyze, design and develop computing solutions by applying foundational concepts of CRUD operations in NoSQL Databases
CO5-PSO2	**1**	Students will be able to communicate of NOSQL database which increases their knowledge in NOSQL database.

CO6-PO1	**3**	Student can develop database applications using front-end tools and back-end DBMS using engineering knowledge.
CO6-PO2	**2**	Students can analyze the complex engineering and can develop database applications using front-end tools and back-end DBMS.
CO6-PO3	**2**	The students can develop the solutions for complex engineering problems by developing database applications using front-end tools and back-end DBMS.
CO6-PO4	**2**	The students can use the research-based knowledge for develop the solutions for complex engineering problems while developing database applications using front- end tools and back-end DBMS.
CO6-PO5	**2**	Students can make use of modern tools while developing database applications using front- end tools and back-end DBMS.
CO6-PO6	**2**	Students can make use of engineer and society while developing database applications using front-end tools and back-end DBMS.
CO6-PO8	**2**	Students can apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice while developing database applications using front-end tools and back-end DBMS
CO6-PO9	**2**	Students have to work individually and team work is very important while developing database applications using front-end tools and back-end DBMS
CO6-PO10	**2**	Students can communicate effectively on complex engineering activities with the engineering community and with society at large, while developing database applications using front-end tools and back-end DBMS.
CO6-PO11	**2**	Students can manage the project and finance effectively while developing database applications using front-end tools and back-end DBMS
CO6-PO12	**3**	Students can recognize and engage the solutions for complex engineering problems while developing database applications using front-end tools and back-end DBMS.

CO6-PSO1	**3**	Students can able to apply the knowledge of mathematics, science, engineering fundamentals, while developing database applications using front-end tools and back-end DBMS.
CO6-PSO2	**2**	Students can develop database applications using front-end tools and back-end DBMS for communicating innovative ideas and solutions to novel problems concept.

Prepared by (Faculty Name & Signature):

Verified by : Stream Coordination Committee

DEPARTMENT OF ELECTRONICS AND COMPUTER ENGINEERING

ERL331 - Computer Networking Lab

Semester : 5

Course Title : Computer Networking Lab

Course Code : ERL 331

Course Outcomes (CO)

After the successful completion of this course, students will able to

No.	Course outcomes	Knowledge Level
CO 1	Use network related commands and configuration files in Linux Operating System. (Cognitive Knowledge Level:Understand)	K2
CO 2	Develop network application programs and protocols. (Cognitive Knowledge Level:Apply)	K3
CO 3	Analyze network traffic using network monitoring tools. (Cognitive Knowledge Level:Apply)	K3
CO 4	Design and setup a network and configure different network protocols. (Cognitive Knowledge Level:Apply)	K3
CO 5	Develop simulation of fundamental network concepts using a network simulator. (Cognitive Knowledge Level:Apply)	K3

CO – PO Matrix

	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
CO 1	3	3	3	-	-	-	-	3	-	1	-	3	2	2
CO 2	3	3	2	2	-	-	-	3	-	1	-	3	3	2
CO 3	3	3	3	2	2	-	-	3	-	1	-	3	3	1
CO 4	3	3	3	2	2	2	-	2	-	1	-	3	3	2
CO 5	3	3	3	2	2	-	-	3	-	1	-	3	3	2
ERL331	**3**	**3**	**2.8**	**2**	**2**	**2**	**-**	**2.8**	**-**	**1**	**-**	**3**	**2.8**	**1.8**

JUSTIFICATIONS FOR CO-PO MAPPING

Mapping	Mapping Level (3/2/1)	Justifications
ERL331.CO1-PO1	3	Students 3ave ability to Use network related commands and configuration files in Linux Operating System.
ERL331.CO1-PO2	3	Students are able to identify t3e basic structure and functional units of Use network related commands and configuration files in Linux Operating System.
ERL331.CO1-PO3	3	Students are able to apply reasoning informed by t3e configuration files in Linux Operating System.
ERL331.CO1-PO8	3	Students can communicate effectively by presenting t3e functionalities of network related commands.
ERL331.CO1-PO10	3	Students can recognize t3e need for t3e digital computer and gain t3e ability to engage in independent and lifelong learning in t3e functionalities of a network.
ERL331.CO1-PO12	1	Students can develop computing solutions in functionality of a network related commands in Computer Science and Engineering.
ERL331.CO1-PSO1	2	Students are able to use commands and configuration files to analyze engineering problems and develop software and 3ardware solutions.
ERL331.CO1-PSO2	2	Students will be able to communicate t3e issues and solutions in t3e context of network related commands and configuration files in Linux Operating System.
ERL331.CO2-PO1	3	Students 3ave ability to develop network application programs and protocols.
ERL331.CO2-PO2	3	Students 3ave ability to develop network application programs.
ERL331.CO2-PO3	2	Develop network application programs suc3 as Socket programming.
ERL331.CO2-PO4	2	Students 3ave ability to develop client –server communication programs.
ERL331.CO2- PO8	3	Develop client –server communication programs.
ERL331.CO2- PO10	1	Students are able to formulate t3e network applications
ERL331.CO2- PO12	3	Students are able to formulate t3e network protocols.
ERL331.CO2-PSO1	3	Students will be able to develop network application programs suc3 as Socket programming.
ERL331.CO2-PSO2	2	Students will be able develop client –server communication programs.
ERL331.CO3- PO1	3	Students 3ave ability to analyze network traffic using network monitoring tools suc3 as wires3ark.

ERL331.CO3- PO2	3	Students 3ave ability to analyze network traffic using network monitoring tools suc3 as wire s3ark and applications
ERL331.CO3- PO3	3	Students 3ave ability to analyze network traffic using network monitoring tools
ERL331.CO3- PO4	2	Students are able to identify analyze network traffic using network monitoring tools
ERL331.CO3- PO5	2	Students can communicate effectively w3ile designing t3e basic structure of processing unit using t3e concepts network monitoring tools.
ERL331.CO3-PO8	2	Students 3ave ability to analyze network traffic using network monitoring tools.
ERL331.CO3-PO10	1	Students 3ave ability to analyze network traffic using network monitoring tools wires3ark.
ERL331.CO3-PO12	2	Students 3ave ability to analyze network traffic using network monitoring tools
ERL331.CO3-PSO1	3	Students will be able to design and develop software solutions in networking using network monitoring tools.
ERL331.CO3-PSO2	1	Students can communicate effectively about t3e problems and solutions related to network creation w3ile designing t3e network monitoring tools suc3 as wires3ark.
ERL331.CO4-PO1	3	Students 3ave ability to design and setup a network and configure different network protocols.
ERL331.CO4-PO2	3	Students 3ave ability to design and setup a network and configure different network protocols FTP
ERL331.CO4-PO3	3	Students are able to setup a network and configure different network protocols FTP
ERL331.CO4-PO4	2	Students are able to formulate different network protocols.
ERL331.CO4-PO5	2	Students are able to formulate different network protocols smtp.
ERL331.CO4-PO6	2	Students are able to formulate different network protocols DNS.
ERL331.CO4-PO8	2	Students are able to formulate different network protocols ftp.
ERL331.CO4-PO10	1	Students 3ave ability to design and setup a network and configure different network protocols.
ERL331.CO4-PO12	3	Students are able to formulate different network protocols.
ERL331.CO4-PSO1	3	Students are able to formulate different network protocols SMTP w3ic3 3elps t3em to build networking 3ardware and software.
ERL331.CO4-PSO2	2	Students 3ave ability to design and setup a network and configure different network protocols.
ERL331.CO5-PO1	3	Students are able to Develop simulation of fundamental network concepts using a network simulator.
ERL331.CO5-PO2	2	Students 3ave ability to develop simulation of fundamental network concepts using a network simulator.

ERL331.CO5-PO3	3	Students are able to formulate network concepts using a network simulator.
ERL331.CO5-PO4	2	Students are able to formulate and develop simulation fundamental network concepts .
ERL331.CO5-PO5	2	Students can communicate effectively by to develop simulation of fundamental network concepts using a network simulator
ERL331.CO5-PO8	3	Students 3ave ability to develop simulation of fundamental network concepts using a network simulator
ERL331.CO5-PO10	1	Students are able to Develop simulation of fundamental network concepts using a network simulator.
ERL331.CO5-PO12	3	Students are able to formulate network concepts using a network simulator.
ERL331.CO5-PSO1	3	Students are able to develop simulation of fundamental network concepts t3at productively 3elps t3em to create solutions related to software and 3ardware problems.
ERL331.CO5-PSO2	2	Students 3ave ability to communicate about fundamental network concepts using a network simulator for t3em to increase t3eir expertise in t3e same.

Prepared by (Faculty Name & Signature)

Verified by: Stream Coordination Committee

DEPARTMENT OF ELECTRONICS AND COMPUTER ENGINEERING

ERT 302 Operating Systems

Semester : **VI**
Course Title : **Operating Systems**
Course Code : **ERT 302**

Course Outcomes (CO)

After the successful completion of this course, students will able to

CO	Course outcome	Knowledge level
ERT302.1	Explain the relevance, structure and functions of Operating Systems in computing devices.	K2
ERT302.2	Illustrate the concepts of process management and process scheduling mechanisms employed in Operating Systems.	K2
ERT302.3	Explain process synchronization in Operating Systems and illustrate process synchronization mechanisms using Mutex Locks, Semaphores and Monitors	K2
ERT302.4	Explain any one method for detection, prevention, avoidance and recovery for managing deadlocks in Operating Systems.	K2
ERT302.5	Explain the memory management algorithms in Operating Systems.	K2
ERT302.6	Explain the security aspects and algorithms for file and storage management in Operating Systems.	K2

CO – PO Matrix

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	2	1	-	-	-	-	-	-	1	-	2	-	-
CO2	2	2	1	-	-	-	-	-	-	1	-	2	-	-
CO3	2	2	2	-	-	-	-	-	-	1	-	1	2	-
CO4	2	2	1	-	-	-	-	-	-	1	-	2	1	1
CO5	2	2	2	-	-	-	-	-	-	1	-	1	1	1
CO6	2	1	1	-	-	-	-	-	-	1	-	2	-	-
ERT 302	2	1.83	1.33		-	-	-	-	-	1	-	1.66	0.83	0.17

Correlation: 1-Low, 2-Moderate, 3-High, No Correlation '-'

JUSTIFICATIONS FOR CO-PO MAPPING

Mapping	Mapping Level (3/2/1)	Justifications
ERT3021-PO1	2	Understanding the relevance, structure and functions of Operating Systems in computing devices, students are able to gain the knowledge various types operating systems used in different computing environments, different functions performed by operating systems includes process, memory, storage management and security it provides.
ERT302.1-PO2	2	With the knowledge gained to explain the relevance, structure and functions of Operating Systems in computing devices, students are able to identify the functionalities and computing resources
ERT302.1-PO3	3	Understanding the relevance, structure and functions of Operating Systems in computing devices, students are able to perform systematic evaluation of the degree to which several design concepts meet the criteria
ERT302.1-PO10	3	With the knowledge gained to explain the relevance, structure and functions of Operating Systems in computing devices, the students are able to read, understand and interpret technical and non-technical information
ERT302.1-PO12	2	With the knowledge gained to explain the relevance, structure and functions of Operating Systems in computing devices, the students are able to recognize the need and be able to clearly explain why it is vitally important to keep current regarding new developments in the field; recently regarding the launch of Windows 11.
ERT302.2-PO1	2	With the understanding of the concepts of process management and process scheduling mechanisms employed in Operating Systems, students are able to demonstrate competence in specialized engineering knowledge to the program.

ERT302.2-PO2	2	With the understanding of the concepts of process management and process scheduling mechanisms employed in Operating Systems, students are able to identify algorithms and parameter to solve a problem.
ERT302.2-PO3	3	With the understanding of the concepts of process management and process scheduling mechanisms employed in Operating Systems, the students are able to refine architecture design into a detailed design within the existing constraints.
ERT302.2-PO10	3	With the understanding of the concepts of process management and process scheduling mechanisms employed in Operating Systems, the students are able to read, understand and interpret technical and non-technical information
ERT302.2-PO12	2	With the understanding of the concepts of process management and process scheduling mechanisms employed in Operating Systems, the students are able to recognize the need and be able to clearly explain why it is vitally important to keep current regarding new developments in the field
ERT302.3-PO1	2	With the understanding of process synchronization in Operating Systems and illustrate process synchronization mechanisms using Mutex Locks, Semaphores and Monitors, the students are able to apply the gained knowledge to demonstrate competence in specialized engineering knowledge to the program
ERT302.3-PO2	2	With the understanding of process synchronization in Operating Systems and illustrate process synchronization mechanisms using Mutex Locks, Semaphores and Monitors, the students are able to apply the gained knowledge to identify design constraints for required performance criteria.

ERT302.3-PO3	2	With the understanding of process synchronization in Operating Systems and illustrate process synchronization mechanisms using Mutex Locks, Semaphores and Monitors, the students are able to perform systematic evaluation of the degree to which several design concepts meet the criteria.
ERT302.3-PO10	3	With the understanding of process synchronization in Operating Systems and illustrate process synchronization mechanisms using Mutex Locks, Semaphores and Monitors, the students are able to read, understand and interpret technical and nontechnical information.
ERT302.3-PO12	2	With the understanding of process synchronization in Operating Systems and illustrate process synchronization mechanisms using Mutex Locks, Semaphores and Monitors, the students are able to comprehend technical literature and other credible sources of information.
ERT302.4-PO1	2	With the understanding of method for detection, prevention, avoidance and recovery for managing deadlocks in Operating Systems, the students are able to demonstrate competence in specialized engineering knowledge.
ERT302.4-PO2	2	With the understanding of method for detection, prevention, avoidance and recovery for managing deadlocks in Operating Systems, the students are able to identify methods to solve the problem, including forming justified approximations and assumptions
ERT302.4-PO3	3	With the understanding of method for detection, prevention, avoidance and recovery for managing deadlocks in Operating Systems, the students are able to produce a variety of potential design solutions suited to meet functional requirements.

ERT302.4-PO10	3	With the understanding of method for detection, prevention, avoidance and recovery for managing deadlocks in Operating Systems, the students are able to read, understand and interpret technical and non-technical information
ERT302.4-PO12	2	With the understanding of method for detection, prevention, avoidance and recovery for managing deadlocks in Operating Systems, the students are able to comprehend technical literature and other credible sources of information.
ERT302.5-PO1	2	With the understanding of various memory management algorithms in Operating Systems, the students are able to demonstrate competence in engineering fundamentals.
ERT302.5-PO2	2	With the understanding of various memory management algorithms in Operating Systems, the students are able to identify existing methods to solve the problem, including forming justified approximations and assumptions
ERT302.5-PO3	2	With the understanding of various memory management algorithms in Operating Systems, the students are able the students are able to produce a variety of potential design solutions suited to meet functional requirements
ERT302.5-PO10	3	With the understanding of various memory management algorithms in Operating Systems, the students are able to read, understand and interpret technical and non-technical information
ERT302.5-PO12	3	With the understanding of various memory management algorithms in Operating Systems, the students are able the students are able to recognize the need and be able to clearly explain why it is vitally important to keep current regarding new developments in the field

ERT302.6-PO1	2	With the understanding of the security aspects and algorithms for file and storage management in Operating Systems, students are able to demonstrate competence in engineering fundamentals.
ERT302.6-PO2	3	With the understanding of the security aspects and algorithms for file and storage management in Operating Systems the students are able to identify existing methods to solve the problem, including forming justified approximations and assumptions.
ERT302.6-PO3	3	With the understanding of the security aspects and algorithms for file and storage management in Operating Systems, the students are able to perform systematic evaluation of the degree to which several design concepts meet the criteria.
ERT302.6-PO10	3	With the understanding of the security aspects and algorithms for file and storage management in Operating Systems, the students are able to read, understand and interpret technical and non-technical information
ERT302.6-PO12	2	With the understanding of the security aspects and algorithms for file and storage management in Operating Systems, the students are able to demonstrate an ability to identify changing trends in engineering knowledge and practice
ERT302.3-PSO1	2	With the understanding of process synchronization in Operating Systems and illustrate process synchronization mechanisms using Mutex Locks, Semaphores and Monitors, the students are able to develop concurrent systems without the problem of race conditions and other synchronization issues.
ERT302.4-PSO1	3	With the understanding of method for detection, prevention, avoidance and recovery for managing deadlocks in Operating Systems, the students are able to produce a variety of potential design solutions suited for real world applications.

ERT302.5-PSO1	3	With the understanding of various memory management algorithms in Operating Systems, the students are able to achieve a degree of multiprogramming and proper utilization of memory.
ERT302.4-PSO2	3	With the understanding of method for detection, prevention, avoidance and recovery for managing deadlocks in Operating Systems, the students are able to produce a variety of potential design solutions suited for real world applications in line with artificial intelligence ethics.

DEPARTMENT OF ELECTRONICS AND COMPUTER ENGINEERING

ERT304 EMBEDDED SYSTEMS & IoT

Semester : **Sixth**

Course Title : **Embedded Systems & IoT**

Course Code : **ERT304**

Course Outcomes (CO)

After the successful completion of this course, students will able to

No.	Course outcomes	Knowledge Level
CO 1	Understand the basics of embedded systems, IoT and networking. (Cognitive knowledge level: Understand)	**K2**
CO 2	Illustrate various sensors and actuators for embedded systems and IoT. (Cognitive knowledge level: Understand)	**K2**
CO 3	Comprehend the underlying principles and concepts behind IoT design considerations. (Cognitive knowledge level: Understand)	**K2**
CO 4	Apply the understanding of IoT requirements and constraints to select suitable connectivity and communication technologies for specific IoT applications. (Cognitive knowledge level: Apply)	**K3**
CO 5	Model Interfacing of sensors and actuators with development boards. (Cognitive knowledge level: Apply)	**K3**
CO 6	Illustrate various IoT physical servers and cloud offerings. (Cognitive knowledge level: Understand)	**K2**

CO – PO Matrix

	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
CO 1	2	-	-	-	-	-	-	-	-	-	-	2	2	-
CO 2	1	-	-	-	2	-	-	-	-	-	-	2	1	-
CO 3	2	-	-	-	1	-	-	-	-	-	-	2	1	1
CO 4	1	-	2	2	2	-	-	-	-	-	-	2	2	1
CO 5	1	-	2	-	-	-	-	-	-	-	-	2	2	-
CO 6	1	-	-	-	-	-	-	-	-	-	-	2	-	1

ERT 304	1.33	-	2	2	1.67	-	-	-	-	-	-	2	1.6	1

JUSTIFICATIONS FOR CO-PO MAPPING

Mapping	Mapping Level (3/2/1)	Justifications
CO1-PO1	2	Able to understand the basics of embedded systems, IoT and networking. Hence apply the same to solve engineering problems.
CO1-PO12	2	Understand the new features and demonstrate the need of updating for the current architecture.
CO1-PSO1	2	Able to analyse and design hardware and software systems so as to understand and solve engineering problems.
CO2-PO1	1	Able to Illustrate various sensors and actuators for embedded systems and IoT.
CO2-PO5	2	Able to Illustrate various sensors and actuators for embedded systems and IoT using resources and IT tools.
CO2-PO12	2	Able to illustrate various sensors and actuators for embedded systems and IoT by understanding the new features.
CO2-PSO1	1	Able to illustrate various sensors and actuators for embedded systems and IoT by understanding the new features and fundamental engineering knowledge.
CO3-PO1	2	Able to comprehend the underlying principles and concepts behind IoT design considerations by the engineering knowledge.
CO3-PO5	1	Able to comprehend the underlying principles and concepts behind IoT design considerations to design a better solution.
CO3-PO12	2	Able to comprehend the underlying principles and concepts behind IoT design considerations by analyzing the new features
CO3-PSO1	1	Able to analyse and design hardware and software systems by comprehending the underlying principles and concepts behind IoT design considerations.
CO3-PSO2	1	Able to document the details by comprehending the underlying principles and concepts behind IoT design considerations.
CO4-PO1	1	Apply the understanding of IoT requirements and constraints to select suitable connectivity and communication technologies for specific IoT applications.
CO4-PO3	2	Able to design variety of solution to solve problem by the understanding of IoT requirements and constraints to select suitable connectivity and communication technologies for specific IoT applications.
CO4-PO4	2	Able to conduct investigations and apply the same for understanding of IoT requirements and constraints to select suitable connectivity and communication technologies for specific IoT applications.

CO4-PO5	2	Apply the knowledge of updated features of IoT requirements and constraints to select suitable connectivity and communication technologies for specific IoT applications.
CO4-PO12	2	Able to understanding of IoT requirements and constraints to select suitable connectivity and communication technologies for specific IoT applications through lifelong learning.
CO4-PSO1	2	Able to analyse and design hardware and software systems by understanding of IoT requirements and constraints to select suitable connectivity and communication technologies for specific IoT applications.
CO4-PSO2	1	Able to document the required details by understanding of IoT requirements and constraints to select suitable connectivity and communication technologies for specific IoT applications.
CO5-PO1	1	Able to familiarize the different model Interfacing of sensors and actuators with development boards.
CO5-PO3	2	Able to analyze the problem and apply the same to familiarize different model Interfacing of sensors and actuators with development boards.
CO5-PO12	2	Apply the knowledge of updated features to model Interfacing of sensors and actuators with development boards.
CO5-PSO1	2	Able to analyse and design hardware and software systems by understanding different model Interfacing of sensors and actuators with development boards.
CO6-PO1	1	Able to illustrate various IoT physical servers and cloud offerings by applying the fundamental engineering knowledge.
CO6-PO12	2	Able to illustrate various IoT physical servers and cloud offerings through lifelong learning.
CO6-PSO2	1	Able to analyse and design hardware and software systems by illustrating various IoT physical servers and cloud offerings.

Prepared by (Faculty Name & Signature): Soya Treesa Jose

Verified by: Stream Coordination Committee

Department of Electronics and Computer Engineering

Programme: Bachelor of Technology Course Code: ERT 306

Course Name: DATA COMMUNICATION AND NETWORKING Semester: 6

COURSE OUTCOMES

After the completion of the course the student will be able to

CO	Statement
ERT306.1	Understand data communication and networking using the layered concept, Open System Interconnect (OSI) and the TCP/IP Model. (Cognitive Knowledge: Understand)
ERT306.2	Illustrate various types of encoding techniques and error detection methods used in networks. (Cognitive Knowledge: Understand)
ERT306.3	Use the concept of multiplexing, switching and routing in networks. (CognitiveKnowledge: Apply)
ERT306.4	Discuss the working principles of LAN and the concepts behind congestion in networks.(Cognitive Knowledge: Understand)
ERT306.5	Recognize the principles and operations of internetworking and various protocols used.(Cognitive Knowledge: Understand)

CO - PO - PSO MAPPING

PO / CO	Programme outcomes												PSO	
	PO1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO1	PSO2
ERT306.CO1	3	2	2	1	-	-	-	-	-	-	-	3	3	-
ERT306.CO2	3	2	2	-	-	-	-	-	-	-	-	3	3	-
ERT306.CO3	3	2	2	1	-	-	-	-	-	-	-	3	3	-
ERT306.CO4	3	2	3	-	-	-	-	-	-	-	-	3	3	-
ERT306.CO5	3	2	3	1	-	-	-	-	-	-	-	3	3	-
AVG	3	2	2.4	0.6	-	-	-	-	-	-	-	3	3	-

Correlation : 1-Low, 2-moderate, 3-high, No Correlation '-'

Department of Electronics and Computer Engineering

JUSTIFICATION

Mapping	Level (L/M/H)	Justification
ERT306.CO1-PO1	H	Understanding data communication and networking principles directly contributes to the application of engineering knowledge, enabling students to design, implement, and troubleshoot network systems effectively.
ERT306. CO1-PO2	M	Understanding data communication and networking principles prepares students for effective problem analysis in diverse contexts.
ERT306. CO1-PO3	M	Understanding data communication and networking principles lays the groundwork for students to design and develop innovative solutions to address challenges in networking and related fields.
ERT306. CO1-PO4	L	Understanding data communication and networking (CO1) equips students to tackle complex network challenges effectively (PO4).
ERT306. CO1-PO12	H	Understanding data communication and networking principles fosters a foundation for lifelong learning, enabling students to adapt to emerging technologies, stay updated with industry advancements, and continuously enhance their skills in networking and related domains throughout their professional journey.
ERT306. CO1- PSO1	H	Mastering data communication and networking concepts equips students with the expertise to proficiently engineer and troubleshoot computer hardware and software systems
ERT306. CO2- PO1	H	Grasping encoding techniques and error detection methods in networks empowers students to apply their engineering acumen in crafting and rectifying network infrastructures
ERT306. CO2-PO2	M	Mastering encoding techniques and error detection methods in networks enhances students' capacity to analyze and resolve network issues effectively.
ERT306. CO2-PO3	M	Understanding encoding techniques and error detection methods in networks empowers students to design effective network solutions, ensuring reliable data transmission and system integrity.

Department of Electronics and Computer Engineering

ERT306. CO2-PO12	H	Understanding encoding techniques and error detection methods in networks cultivates a lifelong learning mindset among students, encouraging them to adapt to evolving technologies and stay updated in the field of networking throughout their careers.
ERT306.CO2-PSO1	H	Understanding encoding techniques and error detection methods in networks empowers students to apply their foundational knowledge in electronics and computer engineering to address challenges and solve problems effectively.
ERT306.CO3-PO1	H	Mastering the concepts of data management, transmission, and routing in networks enables students to proficiently apply their engineering expertise, ensuring the seamless operation and efficiency of network systems.
ERT306.CO3-PO2	M	Proficiency in utilizing concepts such as multiplexing, switching, and routing in networks enhances students ability to analyze network-related issues effectively.
ERT306.CO3-PO3	M	Proficiency in utilizing concepts such as multiplexing, switching, and routing in networks enables students to design and develop effective solutions to networking challenges
ERT306.CO3-PO4	L	Being skilled in using concepts like multiplexing, switching, and routing in networks allows students to investigate complex networking problems.
ERT306. CO3-PO12	H	Acquiring knowledge in concepts such as multiplexing, switching, and routing in networks enables students to cultivate a culture of life-long learning.
ERT306. CO3-PSO1	H	Applying concepts such as multiplexing, switching, and routing in networks enables students to apply fundamental knowledge in electronics and computer engineering to analyze and design hardware and software systems.
ERT306. CO4-PO1	H	Understanding the workings of LAN and network congestion equips students with practical engineering knowledge. By exploring these concepts, students apply scientific principles and engineering fundamentals to tackle network issues, showcasing their ability to solve real-world problems.
ERT306. CO4-PO2	M	Analyzing the operation of LANs and congestion in networks helps students develop their problem-solving abilities as they assess network performance and recognize congestion problems.
ERT306. CO4-PO3	H	Understanding how LANs operate and the factors leading to network congestion enhances students' ability to diagnose

		network issues, identify slowdowns, and propose effective solutions.
ERT306. CO4-PO12	H	Understanding the working principles of LAN and congestion in networks fosters a culture of life-long learning among students
ERT306. CO4-PSO1	H	Understanding the working principles of LAN and congestion in networks enables them to analyze and design hardware and software systems effectively, considering networking requirements and constraints.
ERT306. CO5-PO1	H	Understanding the principles and operations of internetworking and various protocols helps students grasp how networks function and how different protocols enable communication between devices. This enhances their overall engineering knowledge.
ERT306. CO5-PO2	M	Recognizing the principles and operations of internetworking and various protocols enhances their ability to analyze problems. They can evaluate network performance and solve connectivity issues more effectively.
ERT306. CO5-PO3	H	Understanding internetworking principles and protocols empowers students to choose suitable protocols, set up network devices, and create network structures tailored to specific needs. This aligns with their capacity to devise solutions for engineering tasks.
ERT306. CO5-PO4	L	By recognizing the principles and operations of internetworking and various protocols, students can analyze network behavior, explore protocol interactions, and diagnose network problems.
ERT306. CO5-PO12	H	Understanding internetworking principles and protocols lays the groundwork for continuous learning in the networking field.
ERT306. CO5-PSO1	H	Recognizing the principles and operations of internetworking and various protocols equips students with the skills to design hardware and software systems that integrate networking components effectively

DEPARTMENT OF ELECTRONICS AND COMPUTER ENGINEERING

ERT 322 – BIOMEDICAL SIGNAL & TRANSDUCERS

Semester : 06

Course Title : **Biomedical Signal & Transducers**

Course Code : **ERT 322**

Course Outcomes (CO)

After the successful completion of this course, students will able to

No.	Course outcomes	Knowledge Level
CO 1	Understand the Sources and Types of Different Biomedical Signals	**K2**
CO 2	Explain the principle of transducers, classification and the characteristics of different transducers and Biosensors	**K2**
CO 3	Understand the basics of sensors/ transducers and their characteristics.	**K2**
CO 4	Describe various temperature and blood flow meter sensors.	**K2**
CO 5	Differentiate between sensors used for the measurement of blood pressure and nano sensors.	**K2**

CO – PO Matrix

	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
CO 1	1	1	-	-	-	-	-	-	-	-	-	1	-	-
CO 2	2	2	-	-	-	-	-	-	-	-	-	1	1	1
CO 3	1	1	-	-	-	-	-	-	-	-	-	1	1	-
CO 4	1	1	-	-	-	-	-	-	-	-	-	1	1	-
CO 5	1	1	-	-	-	-	-	-	-	-	-	1	-	-
ERT 322	1.2	1.2	-	-	-	-	-	-	-	-	-	1	1	1

JUSTIFICATIONS FOR CO-PO MAPPING

Mapping	Mapping Level (3/2/1)	Justifications
CO1-PO1	1	Students will be able to Understand the Sources and Types of Different Biomedical Signals using the fundamental engineering knowledge
CO1-PO2	1	Students will be able to analyze various problems in the sources and types of different Biomedical Signals
CO1-PO12	1	Students can recognize the need for various biomedical signal Sources & Types and gain the ability to engage in independent and lifelong learning
CO2-PO1	2	Students will be able to Explain the principle of transducers, classification and the characteristics of different transducers and Biosensors using the fundamental engineering knowledge
CO2-PO2	2	Students will be able to analyze various Biomedical problems using the principle of transducers, classification and the characteristics of different transducers and Biosensors
CO2-PO12	1	Students can recognize the need understanding the principle of transducers, classification and the characteristics of different transducers and Biosensors. Thus gain ability to engage in independent and lifelong learning
CO2-PSO1	1	Students will be able to apply knowledge in principles of transducers, classification and the characteristics of different transducers and Biosensors to analyze and design Biomedical hardware and software systems so as to understand and solve engineering problems
CO2-PSO2	1	Students will be able to communicate the technical information in principle of transducers, classification and the characteristics of different transducers and Biosensors
CO3-PO1	1	Students will be able to Understand the basics of sensors/ transducers and their characteristics using the fundamental engineering knowledge
CO3-PO2	1	Students will be able to analyze various problems in Biomedical engineering by Understanding the basics of sensors/ transducers and their characteristics.
CO3-PO12	1	Students can recognize the need to Understand the basics of sensors/ transducers and their characteristics. Thus gain the ability to engage in independent and lifelong learning
CO3-PSO1	1	Students will be able to apply knowledge in basics of sensors/ transducers and their characteristics to analyze and design Biomedical hardware and software systems so as to understand and solve engineering problems

CO4-PO1	1	Students will be able to Describe various temperature and blood flow meter sensors using the fundamental engineering knowledge
CO4-PO2	1	Students will be able to analyze various problems in Biomedical Engineering by describing various temperature and blood flow meter sensors.
CO4-PO12	1	Students can recognize the need to Describe various temperature and blood flow meter sensors and thus gain the ability to engage in independent and lifelong learning
CO4-PSO1	1	Students will be able to apply knowledge in various temperature and blood flow meter sensors to analyze and design hardware and software systems so as to understand and solve engineering problems
CO5-PO1	1	Students will be able to differentiate between sensors used for the measurement of blood pressure and nano sensors using the fundamental engineering knowledge
CO5-PO2	1	Students will be able to analyze various problems in Biomedical engineering by differentiating between sensors used for the measurement of blood pressure and nano sensors.
CO5-PO12	1	Students can recognize the need to Differentiate between sensors used for the measurement of blood pressure and nano sensors. Thus gain the ability to engage in independent and lifelong learning

Prepared by (Faculty Name & Signature):

Verified by : Stream Coordination Committee

DEPARTMENT OF ELECTRONICS AND COMPUTER ENGINEERING

ERT 352 Cloud Computing

Semester : 06

Course Title : **Cloud Computing**

Course Code : **ERT 352**

Course Outcomes (CO)

After the successful completion of this course, students will able to

No.	Course outcomes	Knowledge Level
CO 1	Explain the various cloud computing models and services. (Cognitive Knowledge Level: Understand)	**K2**
CO 2	Demonstrate the significance of implementing virtualization techniques. (Cognitive Knowledge Level: Understand)	**K2**
CO 3	Explain different cloud enabling technologies and compare private cloud platforms (Cognitive Knowledge Level: Understand)	**K2**
CO 4	Apply appropriate cloud programming methods to solve big data problems. (Cognitive Knowledge Level: Apply)	**K3**
CO 5	Describe the need for security mechanisms in cloud (Cognitive Knowledge Level: Understand)	**K2**
CO 6	Compare the different popular cloud computing platforms (Cognitive Knowledge Level: Understand)	**K2**

CO – PO Matrix

	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
CO 1	3	-	-	-	-	-	-	-	-	-	-	3	1	1
CO 2	2	2	3	-	-	-	-	-	-	-	-	3	2	1
CO 3	3	-	-	-	-	-	-	-	-	-	-	3	2	2
CO 4	2	2	3	3	2	-	-	-	-	-	-	3	2	3
CO 5	2	3	-	-	-	-	-	-	-	-	-	2	2	2
CO 6	3				3							2	2	2
ERT 352	2.5	2.3	3	3	2.5	-	-	-	-	-	-	2.7	1.8	1.8

JUSTIFICATIONS FOR CO-PO MAPPING

Mapping	Mapping Level (3/2/1)	Justifications
CO1 -PO1	3	Students will understand the limitations of the existing techniques and various cloud computing models and services
CO1 -PO12	3	Students will be able to understand various cloud computing models and services, which directly supports life-long learning by fostering continuous skill acquisition and adaptation to evolving technological landscapes.
CO1 -PSO1	1	The understanding of various cloud computing models and services enhances the ability to design and analyze hardware and software systems, thereby enabling effective problem-solving in Electronics and Computer Engineering.
CO1 –PSO2	1	Students will understand various cloud computing models and services, which may influence their ability to effectively utilize modern software/hardware tools for design and analysis
CO2 –PO1	2	The students are able to function effectively so as to demonstrate the significance of implementing virtualization techniques
CO2–PO2	2	Students should prepare the working draft of the work plan and the proposed system architecture and to demonstrate the significance of implementing virtualization techniques
CO2–PO3	3	Students are able to analyse the selected project, identify the project management aspects and propose a detailed financial plan to demonstrate the significance of implementing virtualization techniques
CO2–PO12	3	Students will be able to understand the significance of implementing virtualization techniques, fostering a commitment to life-long learning by continually adapting to technological advancements.
CO2–PSO1	2	Students will comprehend the significance of virtualization techniques, offering insights that may influence their understanding of hardware and software systems
CO2–PSO2	1	Students will understand the significance of implementing virtualization techniques, yet its direct impact on their proficiency in utilizing modern software/hardware tools for design, analysis, and communication may be limited
CO3–PO1	3	Students will be able to plan and execute tasks utilizing available resources to identify different cloud enabling technologies and compare private cloud platforms
CO3–PO12	3	Students will be able to compare private cloud platforms and understand various cloud enabling technologies, fostering a commitment to life-long learning by continually adapting to advancements in cloud computing.
CO3–PSO1	2	Students will be able to explain various cloud enabling technologies and compare private cloud platforms, which can contribute to their problem-solving skills in analyzing and designing hardware and software systems.

CO3–PSO2	2	Students will understand different cloud enabling technologies and compare private cloud platforms, contributing to their ability to effectively use modern software/hardware tools for design, analysis, and communication
CO4–PO1	2	The students are able to function effectively so as to apply appropriate cloud programming methods to solve big data problems
CO4–PO2	2	Students should prepare the working draft of the work plan and the proposed system architecture and to apply appropriate cloud programming methods to solve big data problems
CO4–PO3	3	Students may apply the principles of mathematics and science to identify and formulate the processes and prepare and present technical and scientific findings to apply appropriate cloud programming methods to solve big data problems
CO4–PO4	3	Students shall be able to conduct investigations on complex engineering problems to apply appropriate cloud programming methods to solve big data problems
CO4–PO5	2	With the knowledge about usage of modern tools, students are able to apply appropriate cloud programming methods to solve big data problems
CO4–PO12	3	Students will be empowered to apply cloud programming methods for solving big data issues, nurturing a culture of life-long learning as they continually refine their skills and adapt to emerging technologies.
CO4–PSO1	2	Students will develop proficiency in applying cloud programming methods to tackle big data issues, enhancing their problem-solving capabilities relevant to analyze and design systems.
CO4–PSO2	3	Students will effectively apply cloud programming methods to tackle big data issues, significantly improving their use of modern software/hardware tools for designing, analyzing, and communicating technical details.
CO5–PO1	2	Students may provide innovative solutions to describe the need for security mechanisms in cloud
CO5–PO2	3	Students will apply software Engineering principles and practices, and prepare and present technical and scientific findings effectively to describe the need for security mechanisms in cloud
CO5–PO12	2	Students will be able to understand the importance of security mechanisms in the cloud, contributing to their foundational understanding of cybersecurity principles and fostering a culture of lifelong learning with a balanced need for ongoing adaptation.
CO5–PSO1	2	Students will understand the importance of security mechanisms in the cloud, contributing to their ability to analyze and design hardware and software systems
CO5–PSO2	2	Students will understand the importance of security mechanisms in the cloud, which can inform their use of modern software/hardware tools for design, analysis, and communication
CO6–PO1	3	Students may provide innovative solutions to novel problems and prepare and present technical and scientific findings effectively in written and oral forms to compare the different popular cloud computing platforms

CO6–PO5	3	Students will be able to evaluate various popular cloud computing platforms, enhancing their capacity for modern tool usage and enabling them to navigate complex technological environments with proficiency.
CO6–PO12	2	Students will be able to compare different popular cloud computing platforms, initiating their understanding of cloud technology diversity and fostering a mindset for lifelong learning with a balanced need for periodic adaptation to evolving platform features.
CO6–PSO1	2	Students will be able to compare various cloud computing platforms, enhancing their understanding of available technological solutions and potentially informing their ability to analyze and design hardware and software systems
CO6–PSO2	2	Students will be able to compare different popular cloud computing platforms, which provides foundational knowledge informing their use of modern software/hardware tools for design, analysis, and communication

Prepared by (Faculty Name & Signature):

Ancy Mathew

Verified by : Stream Coordination Committee

Tinu Thomas

ST. JOSEPH'S COLLEGE OF ENGINEERING AND TECHNOLOGY, PALAI

DEPARTMENT OF SCIENCE AND HUMANITIES

HUT 300	Industrial Economics & Foreign Trade	L	T	P	CREDIT	Year of Introduction
		3	0	0	3	2019

Prerequisite: Nil

Course Outcomes: After completion of the course the student will be able to:

CO 1	Explain the problem of scarcity of resources and consumer behavior, and to evaluate the impact of government policies on the general economic welfare. (Cognitive knowledge level: Understand)
CO 2	Take appropriate decisions regarding volume of output and to evaluate the social cost of production. (Cognitive knowledge level: Apply)
CO 3	Determine the functional requirement of a firm under various competitive conditions. (Cognitive knowledge level: Analyse)
CO 4	Examine the overall performance of the economy, and the regulation of economic fluctuations and its impact on various sections in the society. (Cognitive knowledge level: Analyse)
CO 5	Determine the impact of changes in global economic policies

Mapping of course outcomes with program outcomes (Minimum requirement)

	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	PSO 3
CO 1	2										3				
CO 2	2	2			2	2	3				3				
CO 3	2	2	1								3				
CO 4	2	2	1			1					3				
CO 5	2	2	1								3				
AVERAGE	2	2	1		2	1.5	3				3				

3: HIGH **2: MEDIUM** **1: LOW**

Justification for CO-PO Mapping.

CO	PO	LEVEL	REMARKS
CO 1	PO 1	2	By understanding the problem of scarcity of resources and consumer behavior and the impact of government policies on the general economic welfare students will be able to apply the knowledge in complex engineering problems.
	PO 11	3	By understanding the problem of scarcity of resources and consumer behavior and the impact of government policies on the general economic welfare students will be able to use it in project management and financing which would be appear in engineering problems
	PSO1	1	
CO 2	PO 1	2	the student will be able to find the solution of complex engineering problems
	PO 2	2	By understanding the knowledge of social cost of production and output determination students will be able to apply identify, formulate and analyze simple engineering problems.
	PO5	2	By understanding the knowledge of social cost of production and output determination students will be able to use tools like SPSS for the implementation of concepts
	PO6	2	By understanding the knowledge of social cost of production and output determination students will be able to speak on complex engineering activities with the engineering community and with the society.
	PO7	3	By understanding the knowledge of social cost of production and output determination students will be able to find solutions for the environment and sustainability issues
	PO11	3	By understanding the knowledge of social cost of production and output determination students will be able to use it in project management and financing which would be appear in engineering problems
	PSO1		
	PSO2		

CO 3	PO 1	2	By understanding the functional requirement of a firm under various competitive conditions. students will be able to apply the knowledge in complex engineering problems.
	PO 2	2	By understanding the functional requirement of a firm under various competitive conditions the student will be able to identify, analyze and make conclusions of simple engineering problems.
	PO 3	1	By understanding the functional requirement of a firm under various competitive conditions the student will be able to design solutions for simple engineering problems.
	PO 11	3	By understanding the functional requirement of a firm under various competitive conditions students will be able to use it in project management and financing which would be appear in engineering problems
	PSO1		

CO 4	PO 1	2	By understanding the overall performance of the economy, the regulation of economic fluctuations and its impact on various sections in the society, the student will be able to apply the knowledge on complex engineering problems.
	PO 2	2	By understanding the overall performance of the economy, the regulation of economic fluctuations and its impact on various sections in the society, the student will be able to identify formulate and analyze simple engineering problems.
	PO 3	1	By understanding the overall performance of the economy, the regulation of economic fluctuations and its impact on various sections in the society, the student will be able to design solutions for simple engineering problems.
	PO 6	1	By understanding the overall performance of the economy, the regulation of economic fluctuations and its impact on various sections in the society students will be able to speak on complex engineering activities with the engineering community and with the society.
	PO 11	3	By understanding the overall performance of the economy, the regulation of economic fluctuations and its impact on various sections in the society students will be able to use it in project management and financing which would be appear in engineering problems
	PSO1		
	PSO2		
CO 5	PO 1	2	By understanding the impact of changes in global economic policies students will be able to apply the knowledge on complex engineering problems.
	PO 2	2	By understanding the impact of changes in global economic policies the student will be able to identify formulate and analyze simple engineering problems.
	PO 3	1	By understanding the impact of changes in global economic policies the student will be able to design solutions for simple engineering problems.
	PO 11	3	By understanding the impact of changes in global economic policies the student will be able to use it in project management and financing which would be appear in engineering problems

	PSO 1		

DEPARTMENT OF ELECTRONICS AND COMPUTER ENGINEERING

ERT 308 Comprehensive Course Work

Semester : 06

Course Title : COMPREHENSIVE COURSE WORK

Course Code : **ERT 308**

Course Outcomes (CO)

After the successful completion of this course, students will able to

No.	Course outcomes	Knowledge Level
CO 1	Comprehend the concepts of data structures (Cognitive Knowledge Level: Understand)	**K2**
CO 2	Comprehend the concepts of logic system design (Cognitive Knowledge Level: Understand)	**K2**
CO 3	Comprehend the concepts of integrated circuits (Cognitive Knowledge Level: Understand)	**K2**
CO 4	Comprehend the concepts of database management system (Cognitive Knowledge Level: Understand)	**K2**
CO 5	Comprehend the concepts of Object Oriented Programming Using Java (Cognitive Knowledge Level: Understand)	**K2**

CO – PO Matrix

	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
CO 1	2	2	-	-	-	-	-	-	-	-	-	1	2	2
CO 2	3	3		-	-	-	-	-	-	-	-	2	3	2
CO 3	3	3	2	-	3	-	-	-	-	-	-	1	3	3
CO 4	2	2				1	1	2	-	-	2	1	2	1
CO 5	2	2	2	-	3	-	-	-	-	-	-	2	2	3
ERT 308	2.4	2.4	2	-	3	1	1	2	-	-	2	1.4	2.4	2.2

JUSTIFICATIONS FOR CO-PO MAPPING

Mapping	Mapping Level (3/2/1)	Justifications
CO1 -PO1	2	Students will gain a comprehensive understanding of data structures like stacks and queues, along with their applications and memory management principles, enabling them to effectively apply this knowledge to solve complex engineering problems.
CO1 -PO2	2	Students will develop a clear understanding of data structures such as stacks and queues, including their applications and memory management. This knowledge will empower them to recognize and formulate solutions for complex engineering problems.
CO1 -PO12	1	Students, through their understanding of data structures such as stacks, queues, their practical applications, and memory management, will be well-equipped for continuous learning throughout their engineering journey
CO1 –PSO1	2	Students will be able to effectively analyze and design hardware and software systems by understanding the concepts of data structures
CO1 –PSO2	2	Students will gain the ability to apply domain knowledge to analyze and design hardware and software by understanding the concepts of data structures
CO2 –PO1	3	Students will be able to apply their comprehension of logic system design concepts by utilizing mathematical, scientific, and engineering fundamentals to solve complex engineering problems effectively
CO2–PO2	3	Students will be able to utilize their comprehension of logic system design concepts to analyze complex engineering problems, employing first principles of mathematics, natural sciences, and engineering sciences
CO2–PO12	2	Students will be able to recognize the relevance of understanding logic system design concepts as a foundational skill in their ability to engage in lifelong learning
CO2–PSO1	3	Students will be able to leverage their comprehension of logic system design concepts to effectively apply domain knowledge in analyzing and designing hardware and software systems, facilitating the understanding and solution of problems in Electronics and Computer Engineering
CO2–PSO2	2	Students will be able to apply their comprehension of logic system design concepts as a foundational skill to effectively utilize modern software/hardware tools in designing, analyzing, and communicating technical details within the electronics and computer engineering domain
CO3–PO1	3	Students will be able to utilize their comprehension of integrated circuits concepts, applying mathematical, scientific, and engineering fundamentals to effectively solve complex engineering problems
CO3–PO2	3	Students will be able to employ their comprehension of integrated circuits concepts, utilizing first principles of mathematics, natural sciences, and engineering sciences to effectively analyze and solve complex engineering problems

CO3–PO3	2	Students will be able to incorporate their comprehension of integrated circuits concepts into the design process, ensuring that system components meet specified needs while considering factors such as public health, safety, and societal and environmental considerations
CO3–PO5	3	Students will be able to apply their comprehension of integrated circuits concepts by effectively utilizing modern engineering and IT tools for analysis, prediction, and modeling in complex engineering activities
CO3–PO12	1	Students will be able to recognize that while comprehending the concepts of integrated circuits is valuable for their lifelong learning journey in technology, the ability to engage in independent and lifelong learning
CO3–PO12	3	Students will be able to utilize their comprehension of integrated circuits concepts to effectively apply domain knowledge in analyzing and designing hardware and software systems, facilitating the understanding and solution of problems in Electronics and Computer Engineering
CO3–PSO2	3	Students will be able to seamlessly integrate their comprehension of integrated circuits concepts to proficiently utilize modern software/hardware tools, enabling effective design, analysis, and communication of technical details in the electronics and computer engineering domain
CO4–PO1	2	Students will gain the ability to effectively apply their knowledge in engineering problems by understanding the theory and practical applications of database management systems
CO4–PO2	2	Students will gain the ability to comprehend fundamental principles of database design and manipulation, enabling them to effectively analyze problems using pertinent database techniques
CO4–PO6	1	Students will be able to recognize and evaluate the societal implications, including legal and ethical considerations, associated with the implementation and usage of database management systems
CO4–PO7	1	Students will be able to evaluate the environmental implications and sustainability considerations associated with the implementation and operation of database management systems
CO4–PO8	2	Students will be able to assess and apply ethical principles concerning data privacy, security, and usage within the context of database management systems
CO4–PO11	2	Students will be able to integrate their comprehension of database management system concepts with project management principles, demonstrating effective project management skills in multidisciplinary environments
CO4–PO12	1	Students will be equipped for lifelong learning by applying their knowledge of the theory and applications of database management systems
CO4–PSO1	3	Students will be able to analyze and design hardware and software systems more effectively by comprehending the concepts and applications of database management systems
CO4–PSO2	1	Students will gain the ability to effectively apply their knowledge to use modern software/hardware tools to design, analyze and communicate technical details

CO5–PO1	2	Students will be able to apply their comprehension of Object-Oriented Programming concepts using Java within the broader framework of engineering knowledge
CO5–PO2	2	Students will be able to utilize their comprehension of Object-Oriented Programming concepts using Java as a tool within the broader process of problem analysis, involving the application of first principles from mathematics, natural sciences, and engineering sciences
CO5–PO3	2	Students will be able to utilize their comprehension of Object-Oriented Programming concepts using Java as a foundation for designing solutions to engineering problems, integrating considerations for public health, safety, societal, and environmental factors
CO5–PO5	3	Students will be able to apply their comprehension of Object-Oriented Programming concepts using Java to effectively utilize modern engineering and IT tools, including prediction and modeling, in complex engineering activities
CO5–PO12	2	Students will be able to recognize the importance of comprehending Object-Oriented Programming concepts using Java in their journey of lifelong learning within the field of technology
CO5–PSO1	2	Students will be able to utilize their comprehension of Object-Oriented Programming concepts using Java as a foundational skill to contribute to the analysis and design of hardware and software systems in Electronics and Computer Engineering
CO5–PSO2	3	Students will be able to effectively leverage their comprehension of Object-Oriented Programming concepts using Java to proficiently utilize modern software/hardware tools, enabling them to design, analyze, and communicate technical details in the electronics and computer engineering domain

Prepared by (Faculty Name & Signature):

Ancy Mathew

Verified by : Stream Coordination Committee

Tinu Thomas

DEPARTMENT OF ELECTRONICS AND COMPUTER ENGINEERING

ERL 332 – SIGNAL PROCESSING LAB

Semester : **06**

Course Title : **Signal Processing Lab**

Course Code : **ERL 332**

Course Outcomes (CO)

After the successful completion of this course, students will able to

No.	Course outcomes	Knowledge Level
CO 1	Simulate digital signals.	**K2**
CO 2	Implement LTI systems with linear convolution	**K3**
CO 3	Familiarize the DSP hardware and interface with computer	**K2**
CO 4	Implement FFT and use it on real time signals	**K3**
CO 5	Implement real time FIR and IIR filter and use it on real time audio signals.	**K3**

CO – PO Matrix

	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
CO 1	2	2	3	-	3	-	-	-	1	-	-	3	3	1
CO 2	3	3	3	-	2	-	-	-	1	-	-	2	3	-
CO 3	2	2	3	-	3	-	-	-	2	-	-	3	3	1
CO 4	3	3	3	-	2	-	-	-	1	-	-	2	3	-
CO 5	3	3	3	-	2	-	-	-	1	-	-	2	3	-
ERT 322	2.6	2.6	3	-	2.4	-	-	-	1.2	-	-	2.4	3	1

JUSTIFICATIONS FOR CO-PO MAPPING

Mapping	Mapping Level (3/2/1)	Justifications
CO1-PO1	2	Representation of signals and their operations require mathematical background.
CO1-PO2	2	Students gain the ability to identify, formulate, and analyse engineering problem related to signal simulation.
CO1-PO3	3	Students become capable of designing and developing solutions related to differed signals.
CO1-PO5	3	Students can use modern tools like Matlab to simulate different types of elementary signals.
CO1-PO9	1	Students gain the capability of working as an individual and as a team.
CO1-PO12	3	The knowledge of being able to simulate different signals using modern tools is a lifelong learning for students.
CO1-PSO1	3	Students will be able to apply knowledge in simulation of digital signals to design hardware and software systems so as to understand and solve engineering problems
CO1-PSO2	1	Students will be able to communicate the technical information involved in the Simulation of digital signals
CO2-PO1	3	Good mathematical and engineering fundamental know ledge is require to implement systems using convolution.
CO2-PO2	3	The capability to implement systems can help in analysing engineering problems.
CO2-PO3	3	Students gain the capability to develop systems which can lead to solutions for engineering problems.
CO2-PO5	2	Modern tools can be used in the development of systems.
CO2-PO9	1	Students gain the capability of working as an individual and as a team.
CO2-PO12	2	The capability to develop different systems using convolution can be a lifelong learning.
CO2-PSO1	3	Students will be able to apply knowledge in Implementation of LTI systems with linear convolution to design hardware and software systems so as to understand and solve engineering problems
CO3-PO1	2	The ability to inter ace the DSP hardware with computers enable students to find solutions for complex problems.
CO3-PO2	2	Students become able to analyse problems and decide if DSP hardware is require for implementing solution of the same.

CO3-PO3	3	Students become capable of designing and developing solutions to problems using the DSP hardware.
CO3-PO5	3	The familiarization and interfacing of DSP hardware enable the students to easily use other processors in future.
CO3-PO9	2	Students gain the capability of working as an individual and as a team.
CO3-PO12	3	The ability to interface a DSP hardware to a computer can be a lifelong learning for students.
CO3-PSO1	3	Students will be able to apply knowledge in DSP hardware and interface with computer to design hardware and software systems so as to understand and solve engineering problems
CO3-PSO2	1	Students will be able to communicate the technical information involved in the Familiarization of the DSP hardware and interface with computer
CO4-PO1	3	Good mathematical and engineering fundamental know ledge is require to implement FFT.
CO4-PO2	3	The capability to implement FFT and IFFT can help in analysing engineering problems.
CO4-PO3	3	Students gain the capability to solve engineering problems by the implementation of FFT.
CO4-PO5	2	Implementation of FFT require Matlab, DSP processor or other modern tools.
CO4-PO9	1	Students gain the capability of working as an individual and as a team.
CO4-PO12	2	The capability to implement FFT can be a lifelong learning.
CO4-PSO1	3	Students will be able to apply knowledge in Implementation of FFT and use it on real time signals to design hardware and software systems so as to understand and solve engineering problems
CO5-PO1	3	Students will be able to Implement real time FIR and IIR filter and use it on real time audio signals using the fundamental engineering knowledge
CO5-PO2	3	Students will be able to analyze various problems in the Implementation of real time FIR and IIR filter and use it on real time audio signals
CO5-PO3	3	Students are able to find solutions to meet specific needs by Implementing real time FIR and IIR filter and use it on real time audio signals
CO5-PO5	2	Implementation of real time FIR and IIR filter and use it on real time audio signals require Matlab, DSP processor or other modern tools.
CO5-PO9	1	Students gain the capability of working as an individual and as a team.
CO5-PO12	2	The capability to Implement real time FIR and IIR filter and use it on real time audio signals can be a lifelong learning.

CO5-PSO1	3	Students will be able to apply knowledge in Implementation of real time FIR and IIR filter and use it on real time audio signals to design hardware and software systems so as to understand and solve engineering problems

Prepared by (Faculty Name & Signature):

Verified by : Stream Coordination Committee

DEPARTMENT OF ELECTRONICS AND COMPUTER ENGINEERING

ERD 334- Miniproject

Semester : VI

Course Title : Miniproject

Course Code : ERD 334

Course Outcomes (CO)

After the successful completion of this course, students will able to

No.	Course outcomes	Knowledge Level
CO 1	Apply acquired knowledge within the selected area of technology to develop projects.	**K3**
CO 2	Apply a systematic approach to analyze, discuss, and justify the technical aspects and design elements of the project.	**K3**
CO 3	Evaluate, reproduce, improve, and refine technical aspects in engineering projects	**K3**
CO 4	Collaborate effectively as a team in the development of technical projects	**K3**
CO 5	Effectively communicate and report project-related activities and findings.	**K3**

CO – PO Matrix

	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
CO 1	3	3	3	3	-	3	-	-	-	-		3	3	2
CO 2	3	3	3	3	-	2	-	-	-	-	3	2	3	2
CO 3	3	3	3	3	-	2	-	-	-	-	2	3	3	2
CO 4	-	-	-	-	-	-	-	3	-	3	2	3	2	2
CO 5	-	-	-	-	-	-	-	3	3	2	-	2	1	3
ERD 334	**3**	**3**	**3**	**3**	**-**	**2.3**	**-**	**3**	**3**	**2.5**	**2.3**	**2.6**	**2.4**	**2.2**

JUSTIFICATIONS FOR CO-PO MAPPING

Mapping	Mapping Level (3/2/1)	Justifications
ERD-334-1-PO1	3	Students can identify technically and economically feasible problems of social relevance in the field of Electronics and computer engineering for project development to solve complex engineering problems.
ERD-334-1-PO2	3	From the basics of engineering fundamentals and various analysis, student can identify technically and economically feasible problems in the area of Electronics and computer engineering which changes according to the technological developments.
ERD-334-1-PO3	3	Design of various Electronics and computer engineering projects to meet the specified needs with appropriate consideration to the public health and safety can be achieved by identify technically and economically feasible problems of social relevance in the area of Electronics and computer engineering
ERD-334-1-PO4	3	Using the acquired knowledge within the selected area of technology and various technically and economically feasible problems in the area of various Electronics and computer engineering, students can conduct design experiments, analysis and interpretation and give valid results.
ERD-334-1-PO6	3	Graduates will be able apply reasoning informed by the contextual knowledge to identify technically and economically feasible problems of social relevance.
ERD-334-1-PO12	3	Students will learn to Identify technically and economically feasible problems of social relevance in the field of various Electronics and computer engineering. It will help their future leaning.
ERD-334-1-PSO1	3	Identification of technically and economically feasible problems of social relevance in the field of various Electronics and computer engineering helps the graduates of the program to apply the computational knowledge and algorithmic principles various Electronics and computer engineering e to bring in optimal solutions to complex computational problems through the development of innovative applications.
ERD-334-1-PSO2	2	Identification of technically and economically feasible problems of social relevance, team members should apply professional ethics and responsibilities in various Electronics and computer engineering while implementing scientific techniques to integrate intelligent systems
ERD-334-2-PO1	3	. Perform requirement analysis and identify design methodologies and develop adaptable and reusable solutions of minimal complexity by using modern tools and advanced programming techniques helps to solve complex engineering problems.
ERD-334-2-PO2	3	From the basics of engineering fundamentals and various analysis, student can perform requirement analysis and identify design methodologies and develop adaptable and reusable solutions of minimal complexity by using modern tools and advanced programming techniques which changes according to the technological developments
ERD-334-2-PO3	3	Design of various Electronics and computer engineering projects to meet the specified needs with appropriate consideration to the public health and safety can be achieved by performing requirement analysis and identify design

		methodologies and develop adaptable and reusable solutions of minimal complexity by using modern tools and advanced programming techniques.
ERD-334-2-PO4	3	Using the acquired knowledge within the selected area of technology and perform requirement analysis and identify design methodologies and develop adaptable and reusable solutions of minimal complexity by using modern tools and advanced programming techniques, students can conduct design experiments, analysis and interpretation and give valid results.
ERD-334-2-PO6	3	Graduates will be able apply reasoning informed by the contextual knowledge to perform requirement analysis and identify design methodologies and develop adaptable and reusable solutions of minimal complexity by using modern tools and advanced programming techniques.
ERD-334-2-PO12	3	Students will perform requirement analysis and identify design methodologies and develop adaptable and reusable solutions of minimal complexity by using modern tools and advanced programming techniques, will help their future leaning.
ERD-334-2-PSO1	3	Performing requirement analysis and identify design methodologies and develop adaptable and reusable solutions of minimal complexity by using modern tools and advanced programming techniques helps the graduates of the program to apply the computational knowledge and algorithmic principles of artificial intelligence and data science to bring in optimal solutions to complex computational problems through the development of innovative applications.
ERD-334-2-PSO2	2	Performing requirement analysis and identify design methodologies and develop adaptable and reusable solutions of minimal complexity by using modern tools and advanced programming techniques helps the team members to apply professional ethics and responsibilities in artificial intelligence and data science while implementing scientific techniques to integrate intelligent systems.
ERD-334-3-PO1	3	Apply engineering and management principles to achieve the goal of the project helps to solve complex engineering problems.
ERD-334-3-PO2	3	From the basics of engineering fundamentals and various analysis, student can apply engineering and management principles to achieve the goal of the project.
ERD-334-3-PO3	3	Design of various Electronics and computer engineering projects to meet the specified needs with appropriate consideration to the public health and safety can be achieved by apply engineering and management principles to achieve the goal of the project.
ERD-334-3-PO4	3	Using the acquired knowledge within the selected area of technology and apply engineering and management principles to achieve the goal of the project, students can conduct design experiments, analysis and interpretation and give valid results.
ERD-334-3-PO6	3	Graduates will be able apply reasoning informed by the contextual knowledge to apply engineering and management principles to achieve the goal of the project by using modern tools and advanced programming techniques.
ERD-334-3-PSO1	3	Apply engineering and management principles to achieve the goal of the project helps the graduates of the program to apply the computational knowledge and algorithmic principles of Electronics and computer engineering to bring in optimal solutions to complex computational problems through the development of innovative AI based applications.
ERD-334-3-PSO2	2	Apply engineering and management principles to achieve the goal of the project helps the team members should apply professional ethics and responsibilities in Electronics and computer engineering while implementing scientific techniques to integrate intelligent systems
ERD-334-4-PO8	3	Apply engineering and management principles to achieve the goal of the project helps the team members to apply professional ethics and responsibilities in Electronics and computer engineering

ERD-334-4-PO10	3	Communicate effectively as a team with the collaboration to the formation of a project
ERD-334-4-PO11	2	Manage finance and project because of the effective team work
ERD-334-4-PO12	3	Acquire a lifelong knowledge on management of employee employer relationship for the advancement of a product development.
ERD-334-4-PSO1	2	Provide a combined effort to the development of an innovative product due to the team work
ERD-334-4-PSO2	2	Produce an effective technical document because of a combined effort.
ERD-334-5-PO8	3	Document the textual and technical aspects effectively by communicating each other effectively.
ERD-334-5-PO9	3	Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings because of the knowledge in combined and individual effort
ERD-334-5-PO10	2	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
ERD-334-5-PO12	2	Identify the need for, and have the preparation and ability to engage in independent and lifelong learning in the broadest context of technological change
ERD-334-5-PSO1	1	Write and organize effective documentation about the hardware and software requirements and about the final product.
ERD-334-5-PSO2	3	Coordinate the technical writing as documentation is an important part of product development

Prepared by (Faculty Name & Signature)

Verified by: Stream Coordination Committee

6 CO–PO–PSO attainment calculation process

1. Mission:

Mission Statement

- To pursue continuous improvement in learning, creativity and innovation among both faculty and students by enhanced infrastructure, state-of-the art laboratories and a unique learning environment.
- To inculcate in both faculty and students technical and entrepreneurial skills by professional activities to create socially relevant and sustainable solutions in the electronics and computer domain.

2. Vision:

Vision Statement

- Develop into a center of excellence in Electronics and Computer Engineering by producing technically competent professionals catering to the needs for Industry, Academia and Society

3. Title of the Program (s):

Electronics and Computer Engineering

4. Program Educational Objectives:

PEO 1: Graduate will be professionally successful in diverse career paths including supportive and leadership roles or will pursue higher education.

PEO 2: Graduate will be receptive to new technologies and imbibe lifelong learning, professional and ethical values to provide suitable sustainable solutions in electronics and computer engineering.

5. Program Outcomes:

Engineering Graduates will be able to:

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.

6. Course- Program outcome Matrix (Sample):

	CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
MAT101 Linear Algebra & Calculus	CO1	3	3	3	3	2	1	-	-	1	2	-	2	1	-
	CO2	3	3	3	3	2	1	-	-	1	2	-	2	1	-
	CO3	3	3	3	3	2	1	-	-	1	2	-	2	1	-
	CO4	3	2	3	2	1	1	-	-	1	2	-	2	1	-
	CO5	3	3	3	3	2	1	-	-	1	2	-	2	1	-
	Average	3	2.8	3	2.8	1.8	1	-	-	1	2	-	2	1.6	-

	CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CYL 120 Engineering Chemistry Lab	CO1	3	-	-	-	2	-	-	-	-	-	-	3	-	1
	CO2	3	-	-	-	3	-	-	-	-	-	-	3	1	-
	CO3	3	-	-	-	3	-	-	-	-	-	-	3	1	-
	CO4	3	-	-	-	3	-	-	-	-	-	-	3	-	-
	CO5	3	-	-	-	1	-	-	-	-	-	-	3	-	-
	CO6	3	-	-	-	1	-	-	-	-	-	-	3	-	-
	Average	3	-	-	-	2	-	-	-	-	-	-	3	1	1

	CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
PHL 120 Engineering Physics Lab	1	3	-	-	-	3	-	-	1	2	-	-	1	1	-
	2	3	-	-	-	3	-	-	1	2	-	-	1	-	-
	3	3	-	-	-	3	-	-	1	2	-	-	1	-	-
	4	3	-	-	-	3	-	-	1	2	-	-	1	1	-
	5	3	-	-	-	3	-	-	1	2	-	-	1	1	-
	Average	2.83	2.17	1.4	1.4	1	-	-	-	1.4	1.4	-	-	2.83	2.83

	CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
EST 102 Programming in C	1	3	3	3	2	-	2	-	-	-	3	3	3	3	-
	2	3	3	3	2	2	-	-	-	-	2	-	3	3	2
	3	3	3	3	1	2	-	-	-	-	2	-	3	3	2
	4	3	3	3	1	2	-	-	-	-	2	3	3	3	2
	5	3	3	-	-	2	-	-	-	-	1	-	3	3	2
	6	3	3	-	-	2	-	-	-	-	1	-	3	3	2
	Average	3	3	3	1.5	2	2	-	1	-	1.8	3	3	3	2

7. Course Outcomes (for sample courses):

Course Code	Course name	CO	Statement
HUN 101	Life Skills	CO1	Define and identify different life skills required in personal and professional life
		CO2	Develop an awareness of the self and apply well-defined techniques to cope with emotions and stress.
		CO3	Explain the basic mechanics of effective communication and demonstrate these through presentations
		CO4	Take part in group discussions
		CO5	Use appropriate thinking and problem-solving techniques to solve new problems
		CO6	Understand the basics of teamwork and leadership
course code	**course name**	**CO**	**Statement**
CYL 120	Engineering chemistry Lab	CO1	Understand and practice different techniques of quantitative chemical analysis to generate experimental skills and apply these skills to various analyses.
		CO2	Develop skills relevant to synthesize organic polymers and acquire the practical skill to use TLC for the identification of drugs
		CO3	Develop the ability to understand and explain the use of modern spectroscopic techniques for analysing and interpreting the IR spectra and NMR spectra of some organic compounds.
		CO4	Acquire the ability to understand, explain and use instrumental techniques for chemical analysis.
		CO5	Learn to design and carry out scientific experiments as well as accurately record and analyse the results of such experiments.
		CO6	Function as a member of team, communicate effectively and engage in future learning. Also understand how chemistry addresses social, economical, and environmental problems and why it is an integral part of curriculum.
course code	**course name**	**CO**	**Statement**
PHL 120	Engineering Physics Lab	CO1	Develop analytical/experimental skills and impart prerequisite hands-on experience for engineering laboratories

		CO2	Understand the need for precise measurement practices for data recording
		CO3	Understand the principle, concept, working and applications of relevant technologies and comparison of results with theoretical calculations
		CO4	Analyse the techniques and skills associated with modern scientific tools such as lasers and fibre optics
		CO5	Develop basic communication skills through working in groups in performing the laboratory experiments and by interpreting the results
course code	**course name**	**CO**	**Statement**
EST 100	Engineering Mechanics	CO1	Recall principles and theorems related to rigid body mechanics
		CO2	Identify and describe the components of system of forces acting on the rigid body.
		CO3	Apply the conditions of equilibrium to various practical problems involving different force system
		CO4	Choose appropriate theorems, principles or formulae to solve problems of mechanics
		CO5	Solve problems involving rigid bodies, applying the properties of distributed areas and masses
		CO6	Recall principles and theorems related to rigid body mechanics

8. Set Target levels for Attainment of Course Outcomes:

Assessment Tool	Attainment Level			
	3	2	1	0
CIE	More than 70%of students scoring target value	More than 60%and up to 70% of students scoring target value	From50% andup to 60% of students scoring target value	Less than 50%of students scoring target value
ESE	More than 70%of students scoring target grade	More than 60%and up to 70% of students scoring target grade	From50% andup to 60% of students scoring target grade	Less than 50%of students scoring target grade
Course Exit Survey	More than 70%of students scoring target value	More than 60%and up to 70% of students scoring target value	From 50% andup to 60% of students scoring target value	Less than 50%of students scoring target value

9. Set Target level for Attainment of Program Outcomes:

The procedure for setting PO target has been decided as follows:
For every course, CO is to be mapped with each program outcome (PO) based on the relative significance. The average value of these matrix entries for each course is to be calculated upto two decimal points. Similar procedure is to be carried out for all courses and the final PO target for each PO, (PO1 to PO12) to be computed as the aggregate average of respective course wise PO averages (to be calculated up to two decimal points)

10. Course Attainment Levels:

ATTAINMENT LEVELS		
70	% or more students Score More than Set Target:	3
60	% or more students Score More than Set Target:	2
50	% or more students Score More than Set Target:	1
Less than 50% students Score More than Set Target:		0
Direct Attainment	CIE	70
	End Semester Examination	30
Co Attainment	Direct	80
	Indirect	20

11. Program attainment Level:

a. The PO attainment is based on the average attainment level of corresponding courses (Direct Method) and programme exit survey, (Indirect method);

b. The PO attainment levels are defined / set as stated below based on the recommendation from the DAC (Department Advisory Committee);

i. Level-1: Greater than 15% and less than 30% (15%>30%)- Poor
ii. Level-2: 30%>50%-Average
iii. Level-3: 50%>65%-Good
iv. Level-4: 65%>85%-Very Good
v. Level-5: 85% or more -Excellent

c. The PO attainment target level is set/defined (say, Level-4). It implies that, the department is aiming at minimum level-4 (very good) in the performance of abilities by the graduates. Based upon the results of attainment, the remedial measures are taken;

d. PO Attainment= 80% (Average attainment level by direct method) + 20% (Average attainment level by indirect method).

12. The Results of CO Attainment:

Table No. 1.0: CO Attainment Level

Course Code	CO'S	Course Title	Target level	Attainment	Fully Attained/Not attained	Remedial measures
CYT 100	CO1	Engineering Chemistry	3	3	ATTAINED	
	CO2		3	3	ATTAINED	
	CO3		3	3	ATTAINED	
	CO4		3	3	ATTAINED	
	CO5		3	3	ATTAINED	
CYL 120	CO1	Engineering Chemistry Lab	3	3	ATTAINED	
	CO2		3	3	ATTAINED	
	CO3		3	3	ATTAINED	
	CO4		3	3	ATTAINED	
	CO5		3	3	ATTAINED	
	C06		3	3	ATTAINED	
MAT 101	CO1	Linear Algebra & Calculus	3	2.48	NOT ATTAINED	
	CO2		3	2.2	NOT ATTAINED	
	CO3		3	1.92	NOT ATTAINED	
	CO4		3	1.08	NOT ATTAINED	
	CO5		3	2.76	NOT ATTAINED	
HUN 101	CO1	LIFE SKILS	3	1.88	NOT ATTAINED	More activities for understanding life skills
	CO2		3	3	ATTAINED	
	CO3		3	3	ATTAINED	
	CO4		3	0	NOT ATTAINED	Conduct mock GDs

	CO5		3	1.88	NOT ATTAINED	More activities regarding problem solving
	CO6		3	0	NOT ATTAINED	More activities to develop teamwork & leadership
EST 110	**CO1**	Engineering graphics	3	2.56	NOT ATTAINED	
	CO2		3	2.2	NOT ATTAINED	
	CO3		3	2	NOT ATTAINED	
	CO4		3	1.44	NOT ATTAINED	
	CO5		3	1.44	NOT ATTAINED	
	C06		3	2.76	NOT ATTAINED	
EST 120	**CO1**	Basics of Civil & Mechanical Engineering	3	0.84	NOT ATTAINED	
	CO2		3	1.4	NOT ATTAINED	
	CO3		3	1.4	NOT ATTAINED	
	CO4		3	0.84	NOT ATTAINED	
	CO5		3	2.52	NOT ATTAINED	
	C06		3	2.52	NOT ATTAINED	
	CO7		3	1.96	NOT ATTAINED	
	CO8		3	2.24	NOT ATTAINED	
	CO9		3	1.96	NOT ATTAINED	
	CO10		3	2.52	NOT ATTAINED	
	CO11		3	2.24	NOT ATTAINED	
ESL 120	**CO1**	Civil & Mechanical Workshop	3	3	ATTAINED	
	CO2		3	3	ATTAINED	
	CO3		3	3	ATTAINED	
	CO4		3	3	ATTAINED	
	CO5		3	3	ATTAINED	

	C06		3	3	ATTAINED	
	CO7		3	3	ATTAINED	
	CO8		3	3	ATTAINED	

13. Planned Actions for Course Attainment:

PROVIDING QUESTION PAPER BANK
VIDEO LECTURES
NPTEL LECTURES
REMEDIAL MEASURES