

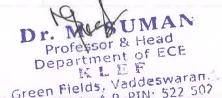
Koneru Lakshmaiah Education Foundation (Category -1, Deemed to be University estd. u/s. 3 of the UGC Act, 1956)

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Department of Electronics and Communication Engineering

Program: B.Tech -ECE Academic Year: 2021-22

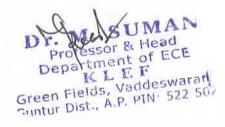
Course Code	Course Name	CO No.	CO DESCRIPTION
		CO1	Understand the concepts of grammar to improve communication, reading, and writing skills
20UC1101	Integrated Professional	CO2	Demonstrate required knowledge over Dos and Don'ts of speaking in the corporate context. Demonstrate ability to face formal situations / interactions.
20001101	English	CO3	Understand the varieties of reading and comprehend the tone and style of the author. Skim and scan effectively and appreciate rhetorical devices
	A III - II manara	CO4	Apply the concepts of writing to draft corporate letters, emails and memos
'-'	nd nemodount Sp ned ne sov etski	CO1	Demonstrating different interpersonal skills for employability
201101202	English Proficiency	CO2	Distinguishing Business essential skills
20UC1202		CO3	Classifying social media and corporate communication skills.
		CO4	Applying analytical thinking skills
-	Padna diana	CO1	Able to spot the common grammatical errors related to sentence structure, preposition, concord, relative and conditional clauses and parallel structures. The learner should be efficient to construct a context- determined text in addition to learning Technical Writing Skills.
20UC2103	Professional Communicatio n Skills	CO2	Able to read, understand, and interpret a text intrinsically as well as extrinsically. The learner can browse a text quickly to come-up with a gist and personal interpretation. Able to create a healthy work- environment and prove to be an asset or one of the most reliable resources to the organization.
		CO3	Apply the concepts of time and work; men-time-work problems based on wages, pipes and cisterns. Apply the concepts of time and distance and solve the problems related to average speed,



			Amely Vone diagram of C. 1
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		CO4	Apply Venn diagrams to find out appropriate conclusions from the given statements. Apply the logical implications and also the negations of various connectives to find the solutions. Analyze the data and represent in the form of Venn diagrams to find relations between any given set of elements.
		CO1	Verbal ability
	Corporate	CO2	Soft skills
20UC2204	Communicatio	CO3	Quantitative aptitude
	n Skills	CO4	Reasoning
	um Tagaban bandaran	CO4	
- 2 11		CO1	Apply the strategies and techniques for conversations in different contexts. Analyze the different parameters and formats of written technical communication and apply in everyday work and life.
		CO2	Analyze the concepts of critical and analytical reading skills. Apply the strategies and technique learnt in handling interviews in different contexts
20UC3005	Aptitude Builder I	CO3	Apply the concepts of Ratio & Proportion, Percentages, Profit &Loss, Simple
		ntr - Br	& Compound Interest
		CO4	Analyze the series of numbers or letters to predict the next number in the series or to find the analogy. Analyze the data to find the codes in the process of encoding and decoding. Apply the given set of conditions to select a team from a group of members.
		CO1	Apply the strategies and techniques for conversations in different contexts. Analyze the different parameters and formats of written technical communication and apply in everyday work and life.
	rie , bura	CO2	Analyze the concepts of critical and analytical reading skills. Apply the strategies and technique learnt in handling interviews in different contexts
20UC3006	Aptitude Builder II	CO3	Apply the concepts of Ratio & Proportion, Percentages, Profit &Loss, Simple
The state of	terrine menti	m	& Compound Interest Analyze the series of numbers or letters to predict the next number in the series or to find the
Luiu It- 14 rm	nue primase in '	CO4	analogy. Analyze the data to find the codes in the process of encoding and decoding.
1 1		711-7	Apply the given set of conditions to select a team
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	and different many	A 1173	from a group of members.
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	and resonant lead of	-	nilisar 2.82
		- 1 TM1	Jelijiac = =
		CO1	To familiarize with various aspects of the culture
	وأرسيك فالبار	ļ-	and heritage of India through ages.
	*Indian	CO2	To acquaint with the contributions of Indians in the areas of languages and literature, religion and philosophy
20UC0007	Heritage and Culture	CO3	To understand the Social structure and the spread of Indian culture abroad
		CO4	To know the development of Science and Technology in India through ages and to appreciate the contributions of some of the great Indian scientists
In	A Time November 1	CO1	To understand Constitutional development after Independence
201100000	*Indian	CO2	To learn the fundamental features of the Indian Constitution
20UC0008	Constitution	CO3	To get a brief idea of the powers and functions of Union and State Governments
	1-118/10/2	CO4	To understand the basics of working of Indian Judiciary and the Election Commission
	I HE HE PITE	CO1	Understand the importance of Environmental education and conservation of natural resources.
20UC0009	*Ecology &	CO2	Understand the importance of ecosystems and biodiversity.
	Environment	CO3	Apply the environmental science knowledge on solid waste management, disaster management and EIA process.
20UC0010 Hun & P.	*Universal	CO1	Understand and identify the basic aspiration of human beings
	Human Values & Professional	CO2	Envisage the roadmap to fulfill the basic aspiration of human beings.
	Ethics (online)	CO3	Analyze the profession and his role in this existence.
20UC0011		CO1	Learn critical elements of entrepreneurship and it development from institution's perspective
	*Entrepreneur ship	CO2	Understand the process of entrepreneurship and its eco system in an educational institute to fit in entrepreneurship zone
		CO3	Understand & Learn Design Thinking skills towards product innovation & prototype design
		CO4	Learn the essential component of planning a new startup, including a. Recognizing viable market opportunities & Market



			assessment via secondary market research and
			customer discovery via primary market research b. Creating a profitable business model and an executable business plan c. Protecting the intellectual property at the heart of their
			technology company d. Developing financial projections that are aligned with the proposed business plan
		CO5	Study the practices of working with Co-students in other discipline, integrating creative business strategies with solid engineering and effectively working in multi disciplinary teams
		6	Recognize the methods of making decisions in highly uncertain and unstructured environments to take feedback from a large variety of sources that use it to improve their business
	1 1	= 10	plans, or help them to 'pivot' and find alternative ideas or approaches
		CO1	Apply matrix algebra to the real-world applications in engineering, physical and biological sciences, computer science, finance, economics and solving the system of equations.
100 mg	Mathematics for	CO2	Apply basic and computational techniques on discrete structures like relations, orders, functions & FSM, Lattices, and propositional &predicate logic
20MT1101	Computing	CO3	Apply graph theory to solving real world structures and their related applications.
		CO4	Apply Statistical methods to solving the real-world applications in Engineering science, Economics and Management.
		CO5	Apply basic concepts of Aptitude and Reasoning to solve engineering and real world problems (Tests in skilling hours)
6		CO1	Apply differential and integral calucullus to find maxima and minimum of a functionctions.
	Mathematics for Engineers	CO2	Demonistrate the forier series and Laplace transforms.
21MT2102		CO3	Describe the probability, randam variables and Distributions
		CO4	Explain the complex variables analytic
	Biology for Engineers	CO1	Acquire the Knowledge of basic biology
21BT1001		CO2	Acquire the Knowledge of Human Biological Systems
		CO3	Acquire Knowledge on Microorganisms and Biosensors

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		CO1	Understand the basics of design thinking and its implications in product or service development
20UC1102	Design Thinking and	CO2	Understand and Analyse the requirements of a typical problem
20001102	Thinking and Innovation I	CO3	Plan the necessary activities towards solving the problem through ideation and prototyping
		CO4	evaluate the solution and refine them based on the customer feedback
		CO1	Understand the basics of design thinking and its implications in product or service development
20UC1203	Design Thinking and Innovation Ii	CO2	Understand and Analyse the requirements of a typical problem
	innovation ii	CO3	evaluate the solution and refine them based on the customer feedback
		SCIEN	CE ELECTIVE-1
	n i	CO1	Ability to understand classification of solids based on their Energy Bands.
		CO2	Ability to understand the conducting and semiconducting properties of solids at the microscopic level.
21PH1008 Physics for Electronic Engineers 21PH1004 Solid State Physics	Electronic	CO3	Ability to understand the dielectric properties of materials at the microscopic level and their applications.
		CO4	Ability to understand the magnetic interactions in materials and the applications.
	1111	CO5	Apply the knowledge on structure and properties of materials while executing related experiments and develop some inter disciplinary projects
	CO1	Understands spin and orbital motion of electrons in determining magnetic properties of materials and identifies their role in classification soft & hard magnetic materials having specific engineering applications.	
		CO2	Understands role of molecular level vibrations in determining thermal properties of materials, heat treatment methods for changing the microstructure of materials and micro and macro level responses of materials subjected to load,
			for identification of materials having specific engineering applications.
		CO3	Understands the role of electronic energy band structures of solids in governing various electrica and optical properties of materials.
		CO4	Understands the role of electronic energy band structures of solids using various models, classification of materials based on their band structures and their properties



		CO5	Apply the knowledge on structure and properties of materials while executing related experiments and develop some inter disciplinary projects.
	4	SCIEN	CE ELECTIVE-2
		CO1	Demonstrate different types of semiconducting materials
	03	CO2	Illustrate photo-physical basis of light absorption and emission by materials
21CY1101	Engineering Chemistry	CO3	Sketch the underlying principles of organic light emitting diodes
		CO4	Explain the concepts of solar cells modules and memory devices
		CO5	An ability to apply and generate experimental skills
21CY1004	Organic	CO1	Explain the concepts of solar cells modules and memory devices
21011004	Electronics	CO2	An ability to apply and generate experimental skills
ENGINEER	ING SCIENCES	67	
		CO1	Design basic and complex building blocks for real world problems using structured programming paradigm
20001101	Computational	CO2	Apply computtaional thinking into logic design for solving real world problems
20SC1101	Thinking for	CO3	Apply CRUD operations on basic data structures
	Design	CO4	Apply CRUD operations on linear data structures
		CO5	Apply the structured programming paradigm with logic building skills on basic and linear data structures for solving real world problems
		CO1	Apply measures of efficiency on algorithms and Analyse different Sorting Algorithms.
		CO2	Analyse and compare stack ADT and queue ADT implementations using linked list and applications.
20SC1202 20ME1103	Data Structures	CO3	Analyse the linked implementation of Binary, Balanced Trees and different Hashing techniques.
	11	CO4	Analyse different representations, traversals, applications of Graphs and Heap organization.
		CO5	Develop and Evaluate common practical applications for linear and non-linear data structures.
	Design Tools Workshop - I	CO1	Design a product using 3D modeling in Auto Desk Fusion 360 through the concept of Engineering Design Process.
		CO2	Design of static webpages using HTML5 and CSS.
		CO3	Apply the concepts of Latex in writing the reports.

Dr. WHAN

Professor & Head

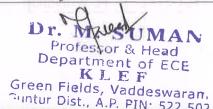
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Design Tools Workshop - II	CO2	Demonstrate the design ideology by 3D printing, 3D scanning techniques Illustrate the design ideology by incorporating VF technique and VR technology, Visualize and present his design idea by applying AR technique
	CO2	technique and VR technology, Visualize and
	CO3	and Hologram
		Summarizing PCB technology and their applications
	CO4	Demonstrate Arduino based skill with different interfaces
10 x y = 11	CO1	Understand basic Concepts of OOP, fundamentals of java and apply the concepts of classes and objects through Java Language. Apply constructors, Overloading, parameter
	= 1, 1,	passing.
	CO2	Apply access control, Inheritance, Packages.
Object Oriented Programming	CO3	Apply Interfaces, Exception Handling, multi- threading, I/o
	CO4	Apply collection framework and event driven programming.
	CO5	Apply object-oriented programming concepts to write programs and Analyses requirements and design to implement lab-based project with SDLO in a group of students.
an C	CO1	Understand the structure of a digital computer an design combinational circuits for processor using the principles of Boolean Algebra and gates
	CO2	Analyze the operation of latch/flip-flop and design timing and sequence control circuits using flip-flop
Digital Logic & Processors	CO3	Apply the programmable logic and design digital circuits using Programmable logic devices
	CO4	Apply the minimization techniques and Construc optimized combinational and sequential logic circuits
	CO5	Design of combinational and sequential circuits with logic gates and flip-flops with a verification using Logisim and Verilog HDL tool
	CO1	Able to understand the computer organization and architecture through Arithmetic and logic unit,
Computer		system bus, addressing modes and instruction set
Organization & Architecture	CO2	Apply the concept of arithmetic and logical unit in CPU design and memory mapping techniques like direct mapping, Associate and block set associated
		mapping in Cache memory
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	Digital Logic & Processors Computer Organization	Object Oriented Programming CO3 CO4 CO5 CO1 CO2 Digital Logic & Processors CO4 CO5 CO1 CO5 CO1 CO5



	c. = 101 = 10	CO3	Apply the concepts of the DMA controller and I/O transfer techniques in data transfer between peripharals and processor
		CO4	Analyze pipelining operation in instruction execution and parallel computing architectures to speed up program execution
		CO1	Analyze the V-I relations of different passive circuit
	Design of	l 111 - u.	elements
21EC1213	Basic Electronics and	CO2	Apply different circuit analysis techniques on practical circuits.
	Circuits	CO3	Analyze the V-I relations of different active circuit elements.
		CO4	Identify the practical circuits comprising semi conductor devices.
		CO1	Analyse the Analog and Digital electronic systems and their impacts on the performance
		CO2	Design PCB art -work by following PCB design rules using the Software and learning about fabrications, packaging and EMI/EMC issues
	Electronic	CO3	Apply the Raspberry Pi microcontroller to design an embedded system for
21EC2111	System Design		modern electronic system design
	Workshop		Analyse the Electronic Circuits for the noise
		CO4	reduction designs in components and circuits, high frequency designs and CAD packages
		CO5	Design the different Electronic Circuits and Develop with PCB FABRICATION techniques and also design an embedded system using raspberry Pi to demonstrate for social problems.
	-111-1	CO1	Demonstration of various Sensors both Analog & Digital for IoT Applications
	1EC2214 IoT Workshop	CO2	Applying & Interfacing various micro controllers with IoT: Micro controllers boards, ESP8266, Peripherals (Motors, Camera, Speaker, Displays). Controlling through Mobile & Web
21EC2214		CO3	Analyze different protocols with IoT Data Communication: Wi-Fi Protocols, Bluetooth, BLE, WSN, Zigbee, RFID, NFC, Client Server, Cloud.
		CO4	Examine the various Protocols & Case Studies: Issues & Challenges: Security, Privacy, Scalability, Store and Analytics Case Studies: Health, Smart cities, Village/ Agriculture
		CO5	Design and develop various mini projects using Node MCU, ESP 32 and Raspberry Pi for various applications.
			Apply the knowledge of HTML coding for The

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	Tilli		designing the web page
		CO2	Apply the basic concepts of Arduino Interfacing
			to develope Native apps for Android Phone.
		CO3	Apply the concepts of interfacing the
			Raspberry Pi
			board with Web-App, and develop similar
			applications for Mobile App
		CO4	Develop a Project using Raspberry pi for Web
			Apps or Mobile Apps
		CO5	Design the projects based on HTML, XML, and
			Arduino Uno Boards.
PROFESSIO	NAL CORE COU	IRSES	
			Analyze the operation of electronic devices like
	- 11 10	CO1	transistors and illustrate their electronic behaviour
			using Multisim.
			Distinguish linear and nonlinear circuits using
1. 15.11	n r r r r r	CO2	lumped elements and analyze their response using
- L	Analog		Multisim
21EC2103	Electronic	CO3	Interpret feedback in amplifiers and realize
21202100	Circuit Design		them through lumped element circuits and linear
		roodi ji	ICs IIII
	r late m	CO4	Design various electronic circuits using linear ICs
	د سیده سیار س		and demonstrate their applications using Multisim
		CO5	Design Analog circuits for realistic applications
		005	and demonstrate it through a mini-project
		CO1	To Interpret and analyse different types of signals
			and perform various operations on them.
		CO2	To make use of transforms in the analysis of
			signals and systems.
247762404	Communication n Signals & System Design		To utilize properties and operations of signals for
21EC2104		CO3	analysing the effects in the various
			communication systems.
		CO4	To develop the foundation of signal processing
		Y	for communication and analyse with system
	1 1 1 1 1		design.
		CO1	Apply time and frequency analysis techniques to
21EC2105			Analog modulation systems.
	Analog and Digital Communication	CO2	Analyze different digital modulation techniques.
		CO3	Analyze digital carrier
			,signaling techniques with baud rate
		THE R	considerations.
		CO4	
			time signalling systems.
			Design and analyze analog and digital
		CO5	communication circuits through project based
	the standard in	3.5	learning using modern tools.
	Embedded		Apply knowledge and demonstrate programming
01EC0106		004	
21EC2106	Controllers &	CO1	proficiency using the various addressing modes

Dr. SUMAN

Provisor & Head

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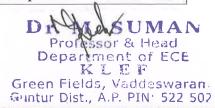
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	Systems Design		microprocessor & 8051 Microcontroller.
		CO2	Analyze the Interfacing of Peripherals to the 8051 Microcontroller through programming & Apply the basic architectures of PIC and ATMEGA 32
		V T III	Microcontrollers.
		CO3	Apply the concepts of ARM - CORTEX STM-32 Microcontroller and RTOS
		CO4	Apply the concepts of SoC and Modern Microcontroller Boards key Features, Specifications & Applications.
		CO5	Analyze the applications of programming with 8051, 8086 and Arduino on hardware / software.
	T 1 - 0 - 0	CO1	Apply the principles of vector calculus and static feilds to estimate the static electric feilds and magnetic feild due to different sources
21EC2207	Electromagnet ic Fields & Applications	CO2	Develop the boundary conditions on E, H Feilds and extend the concepts to obtain the governing laws of electromagnetic feild that helps to percieve the wave propagation
		CO3	Analysis of different electromagnetic feild applications
-		CO4	Analyse different advanced electromagnetic feild applications
		CO1	Develop DFT and apply that to analyze signals in the frequency domain
		CO2	Construct IIR filters for filtering operation
21EC2208	Digital Signal	CO3	Construct FIR filters and find solutions for filtering problems
	Processing	CO4	Analyse the multi-rate signal processing concepts
		CO5	Develop signal processing algorthems in software and apply them to finding solutions to real time problems
21EC2209A		CO1	Apply the concepts of probability and distributions to analyze engineering
	Statistics, AI, ANN	CO2	problems. Discover the relationship between statistics and machine learning and illustrate their usefulness in AI.
		CO3	Categorize the various searching techniques and employ them for finding optimal solutions to AI problems.
		CO4	Examine the neural network based models and test their learning capabilities in classification tasks.
21EC2209	Introduction to	CO1	Describe the basics of Probability, statistics and

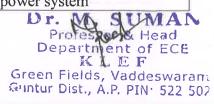
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	AI, ANN	n in g	apply them in engineering applications.
	Tools &	CO2	Analyze the AI applications and identify the
	Applications	1	usefulness in real world problem solving.
		CO3	Formulate the concepts of AI searching
		71.11	techniques and ANN models to solve basic
		ka na Ang	problems.
	MILL I	CO4	Develope and synthesize AI and ANN Models for
		11.7	real timeapplications.
		CO1	Interpret the basic network structure, software and models, device and applications
	a transition of the	CO2	Analyse the error detection and correction
		002	techniques in link layer protocols with cisco
			packet tracer
21EC2210	Data Networks	CO3	Design and analyse different routing algorithms
1	and Protocols	un curti	and network layer protocols
	T	CO4	Design and analyse transport and application layer protocols
		CO5	Design of different networking protocols using simulation
FLEXI COU	RSES	1 101 9	
		CO1	Apply the voltage biasing techineques to analyze
	a hadren and	F 191	MOS charecteristics
	1 1 1 1 1 1 1 1 1	CO2	Analyze the Pull up -pull down scaling ratios for
	5 Young Cong	111111111111111111111111111111111111111	MOS inverters
21EC3015	VLSI Design	CO3	Build MOS logic circuits using design rules
	31	CO4	Examine MOS circuit performance and faults
			using testing principles
		CO5	Develop MOS circuits and logic testing
			techniques
		CO1	Apply the wireless communciation concepts to
			interpret cellular architecture
	to Union	CO2	Analysis of different fadding mechanisims in
21EC3016		000	mobile communications
		CO3	Analyze the equalization and diversity techniques
	Windon		in wireless communications
	Wireless		Analyze GSM architecture, frame format other
	Communicatio ns	CO4	wireless communication technologies such CDMA, IEEE 802.11,
		1	4G and OFDM systems.
		CO5	Implement wireless fading channels and apply the
		CO3	concept of diversity and
			equalizer to evaluate signal reception performance
	pront print		in the presence of wireless channel using
		1 1	communication software tools
		CO1	Apply smith chart to analyze the impedence
	RF System		measurement for various passive RF devices.
21EC3017	RF System Design	CO2	Design and analyze RF filters
		002	Debigii alia aliai / Ze ia iliteib



Design and analyze different RF amplifers, oscillators and other applications using HfPSS Apply the bio- signal characteristics, measure the electrical activity of heart, brain, muscles and determine the non electrical parameters. Demonstrate the working and significance of Medical Instruments in health care applications. CO3 Analyze various IOT sensors for Healthcare as a next generation boon for Electronics. CO4 Analyze the various IOT health care monitoring devices. CO5 Design, simulate and test bio signal characteristics and IoT applications for health care. Demonstrate the characteristics of Electronics instruments and their Measurements and apply them to copute measurements. Electronics Instruments & Automation Electronics Instruments & Automation Electronics CO3 Automation and their Measurements and discover their usage in real time environment. Describe the importance of Control Systems in Automation to construct a robotic systems with desired response. Analyze the industrial automation based applications and summarize their advantages in sustinable developement. CO5 Synthesize various electronic instruments and control systems for automation. CO6 Apply operational research methodology and solve linear programming problems. CO7 Analyze the design concepts in UI, UX and product design. CO8 Construct and combine operational research methodologies in systems engineering. CO9 Interpret the basics of electrical technologies on electrical circuits, motor and generators. Analyze the design concepts of power generation, transmission, and distribution on commercial systems and modern distri		do la esconador	CO4	Analyse the design considerations of different real-time applications
Apply the bio- signal characteristics, measure the electrical activity of heart, brain, muscles and determine the non electrical parameters. CO2 Demonstrate the working and significance of Medical Instruments in health care applications. CO3 Analyze various IOT sensors for Healthcare as a next generation boson for Electronics. CO4 Analyze the various IOT health care monitoring devices. CO5 Design, simulate and test bio signal characteristics and IoT applications for health care. Demonstrate the characteristics of Electronics instruments and their Measurements and apply them to copute measurements. Electronics Instruments & Automation Electronic Measuring Instruments and discover their usage in real time environment. CO3 Explore the fundamental design concepts of Electronic Measuring Instruments and discover their usage in real time environment. CO5 Synthesize various electronic instruments and control systems for automation based applications and summarize their advantages in sustinable developement. CO5 Synthesize various electronic instruments and control systems for automation. CO6 Illustrate system design concepts and analyze their functionality. CO7 Apply operational research methodology and solve linear programming problems. CO8 Construct and combine operational research methodologies in systems engineering. CO9 Construct and combine operational research methodologies in systems engineering. CO9 Construct and combine operational research methodologies in systems engineering. CO9 Interpret the basics of electrical technologies on electrical circuits, motor and generators. Analyze the concepts of power generation, transmission, and distribution on commercial systems and modern distribution or commercial systems and modern distribution of photovoltaic systems and modern distribution of photovoltaic systems. CO3 Apply the basic concepts of photovoltaic systems on the design of solar power system		accomplished and the same	CO5	Design and analyze different RF amplifers,
Biomedical Electronics & IOT for Healthcare		deem dugma est		
21EC3018 CO3			CO2	Demonstrate the working and significance of
IOT for Healthcare IOT for Healthcare CO4 Analyze the various IOT health care monitoring devices. CO5 Design, simulate and test bio signal characteristics and IoT applications for health care. Demonstrate the characteristics of Electronics instruments and their Measurements and apply them to copute measurements. Explore the fundamentsl design concepts of Electronic Measuring Instruments and discover their usage in real time environment. Describe the importance of Control Systems in Automation to construct a robotic systems with desired response. Analyze the industrial automation based applications and summarize their advantages in sustinable developement. System Engineering, Operation Operation Research & Designing System Engineering, CO2 Apply operational research methodology and solve linear programming problems. CO3 Analyze finite queuing models and examine the applications in gaming theory. CO4 Analyze finite queuing models and examine the applications in gaming theory. CO5 Construct and combine operational research methodologies in systems engineering. Interpret the basics of electrical technologies on electrical circuits, motor and generators. Analyse the concepts of power generation, transmission, and distribution on commercial systems and modern distribution on commercial systems and modern distribution on commercial systems and modern distribution of soler power systems on the design of solar power system			land-u	
devices. CO5 Design, simulate and test bio signal characteristics and IoT applications for health care. Demonstrate the characteristics of Electronics instruments and their Measurements and apply them to copute measurements. Explore the fundamentsl design concepts of Electronic Measuring Instruments and discover their usage in real time environment. Describe the importance of Control Systems in Automation to construct a robotic systems with desired response. Analyze the industrial automation based applications and summarize their advantages in sustinable developement. CO5 Synthesize various electronic instruments and control systems for automation. CO1 Illustrate system design concepts and analyze their functionality. CO2 Apply operational research methodology and solve linear programming problems. CO3 Analyze finite queuing models and examine the applications in gaming theory. CO4 Analyze the design concepts in UI, UX and product design. CO5 Construct and combine operational research methodologies in systems engineering. Interpret the basics of electrical technologies on electrical circuits, motor and generators. Analyse the concepts of power generation, transmission, and distribution on commercial systems and modern distribution systems. CO3 Analyse the utilization of electrical smart grids of the existing electric grids using modern systems on the design of solar power system	21EC3018	IOT for	2 1111	next generation boon for Electronics.
characteristics and IoT applications for health care. Demonstrate the characteristics of Electronics instruments and their Measurements and apply them to copute measurements. Explore the fundamental design concepts of Electronic Measuring Instruments and discover their usage in real time environment. Describe the importance of Control Systems in Automation to construct a robotic systems with desired response. Analyze the industrial automation based applications and summarize their advantages in sustinable developement. CO5 System Engineering, Operation Research & Designing Electrical Technologies & Solar Power Systems Electrical Technologies & Solar Power Systems CO4 Apply the basic concepts of photovoltaic systems CO5 Apply the basic concepts of photovoltaic systems on the design of solar power system CO6 Apply the basic concepts of photovoltaic systems on the design of solar power system		Healthcare	111	devices.
CO1 instruments and their Measurements and apply them to copute measurements.		poline and allile to	CO5	characteristics and IoT applications for health
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Instruments & Automation			CO2	Electronic Measuring Instruments and discover
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CO5 Synthesize various electronic instruments and control systems for automation. CO1 Illustrate system design concepts and analyze their functionality. CO2 Apply operational research methodology and solve linear programming problems. CO3 Analyze finite queuing models and examine the applications in gaming theory. CO4 Analyze the design concepts in UI, UX and product design. CO5 Construct and combine operational research methodologies in systems engineering. Interpret the basics of electrical technologies on electrical circuits, motor and generators. Analyse the concepts of power generation, transmission, and distribution on commercial systems and modern distribution systems. CO3 Analyse the utilization of electrical smart grids of the existing electric grids using modern systems CO4 Apply the basic concepts of photovoltaic system on the design of solar power system		Andread studies	CO4	Analyze the industrial automation based applications and summarize their advantages in
System Engineering, Operation Research & Designing 21EC3021 Electrical Technologies & Solar Power Systems CO1 Illustrate system design concepts and analyze their functionality. CO2 Apply operational research methodology and solve linear programming problems. CO3 Analyze finite queuing models and examine the applications in gaming theory. CO4 Analyze the design concepts in UI, UX and product design. CO5 Construct and combine operational research methodologies in systems engineering. CO1 Interpret the basics of electrical technologies on electrical circuits, motor and generators. Analyse the concepts of power generation, transmission, and distribution on commercial systems and modern distribution systems. CO3 Analyse the utilization of electrical smart grids of the existing electric grids using modern systems CO4 Apply the basic concepts of photovoltaic system on the design of solar power system		or ugul ind stina	CO5	Synthesize various electronic instruments and
System Engineering, Operation Research & Designing CO3 Electrical Technologies & Solar Power Systems CO4 Engineering, Operation Research & Designing CO5 Electrical Technologies & Analyze the design concepts in UI, UX and product design. CO6 Electrical Technologies & CO7 Electrical Technologies & CO8 CO9 Electrical Technologies &	-91311110111	romandari um	CO1	Illustrate system design concepts and analyze
Operation Research & Designing CO4 Analyze finite queuing models and examine the applications in gaming theory. CO4 Analyze the design concepts in UI, UX and product design. CO5 Construct and combine operational research methodologies in systems engineering. CO1 Interpret the basics of electrical technologies on electrical circuits, motor and generators. Analyse the concepts of power generation, transmission, and distribution on commercial systems and modern distribution systems. CO3 Analyse the utilization of electrical smart grids of the existing electric grids using modern systems CO4 Apply the basic concepts of photovoltaic system on the design of solar power system		System	CO2	
Designing CO4 Analyze the design concepts in UI, UX and product design. CO5 Construct and combine operational research methodologies in systems engineering. CO1 Interpret the basics of electrical technologies on electrical circuits, motor and generators. Analyse the concepts of power generation, transmission, and distribution on commercial systems and modern distribution systems. CO3 Analyse the utilization of electrical smart grids of the existing electric grids using modern systems CO4 Apply the basic concepts of photovoltaic system on the design of solar power system		Operation	CO3	
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Systems CO3 Analyse the utilization of electrical smart grids of the existing electric grids using modern systems CO4 Apply the basic concepts of photovoltaic system on the design of solar power system	21EC3021	Electrical Technologies & Solar Power	CO2	transmission, and distribution on commercial
on the design of solar power system	V lēt v Notic		CO3	Analyse the utilization of electrical smart grids
	ere alle ere je	a malayara 15, x	CO4	



		CO5	Design and development of electrical circuits, power systems and analysis of solar photovoltaic systems
I IN THE TWO IS	In P	CO1	Describe the fundamentals of AI and interpret them for
		1	solving real world problems
	Advance	CO2	Construct the machine learning techniques and demonstrate their use in pattern recognition.
21EC3022	Course IN Soft- Computing (AI, ANN,	CO3	Formulate data dimensionality reduction problems and demonstrate their use for AI applications with large databases.
	Fuzzy Logic & Genetic	CO4	Recognize optimization and fuzziness in finding solutions to AI problems and demonstrate their approaches.
	Algorithms)	CO5	Develop and synthesize AI concepts for classification, prediction, optimization and regression applications by generating performance
IST OF DD	OFESSIONAL EI	FCTI	analysis reports.
151 OF FR	OFESSIONAL EL	CO1	Understanding of wireless sensor network
		mer' aur	technologies
	Wireless sensor Networks &	CO2	Study of BLE protocols in WSN security and power
21EC3051	IOT	i i İsm	applications.
	Applications	CO3	Study and application of IOT and WSN for smart cities/ villages.
		CO4	Study of various IoT application in various domains
		CO1	Apply the fundamentals, structure, and characteristics of photovoltaics to test the performance of the solar cell.
21EC3052	Solar Photo- Voltaic cells	CO2	Analyze the SPV materials and production of SPV cells with different methodologies
211.03032	& Solar Power Arrays	CO3	Apply design concepts and develop the reliable SPV with testing and optimization techniques.
		CO4	Analyse the SPV arrays, configurations with AI and ML.
		CO1	Apply the concept of Renewable Energy with solar power and electronic power converters.
21EC3053	Electronic Systems for	CO2	Apply the electronics system concept for renewable energy sources with different sensors and data management.
	Renewable Energy & Smart Grid	CO3	Analyse the Concept of smart grid sub system and circuits
		CO4	Analyse Smart grid to IOT applications with smart grid security, communication and power system
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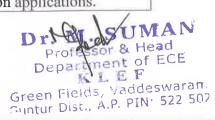
Minnia)	Smart Cities	CO2	Study of systems for smart cities with case studies.
	ست مماد با قلست ومنائمه	CO3	Analysis and design of smart grid sub-systems and circuits
		CO4	Study of advanced topics related to privacy, scaling and design considerations.
		CO1	Understanding the systems and smart systems with local requirements issues and solutions
LV	Systems for	CO2	Study of System for smart villages with different
21EC3055	Smart Cities &	office of Wilde	modules of smart villages with privacy and security
dedfire and	Smart Villages	CO3	Study of System for smart cities with different management modules of smart cities.
La.		CO4	Understanding the next generation needs for smar Systems and Smart Global System.
VLSI	ni Interne		
V LOI	THE PERSON NAMED IN STREET	COL	r e e e e e e e e e e e e e e e e e e e
		CO1	Understand the power dissipation in MOS structure
21EC3061	Low Power VLSI	CO2	Illustrate probabilistic power analysis and apply low power techniques at circuit level for CMOS circuits
		CO3	Apply low power techniques for various combinational circuits.
named 16		CO4	Design and analysis of low power techniques for memories.
THE RESERVE	e w noon alegge Le	CO1	Understanding of computational and automation tools
21502002	Algorithms for	CO2	Understanding of VLSI layout modeling
21EC3062	VLSI Design Automation	CO3	Understand and analysis of hardware models
The Intilitian	Automation	CO4	Analysis and understanding the FPGA technologies
artiile e	Leent or Linuxing apps will develor	CO1	Study and design of combinational and sequential circuits using PLDs and state machines.
21EC3063	ASIC and FPGA Chip	CO2	Understand Full-custom & Semi Custom design methodologies of for designing different PLD architectures.
T Devel	Design	CO3	To study PLD structures and design process. Study of different CPLD and FPGA architectures
100		CO4	To understand different physical process.
21 91 92 1	THE HER DAILY	CO1	Understand the design flow and methodologies of
	VLSI Sub- system Design	andini	VLSI sub-system
21EC2064		CO2	Study of memory and array sub systems
21EC3064	and Design for	CO3	Analysis of fault tolerant
nave fro	Testability		designs
711		CO4	Design of testing of VLSI systems
21EC3065	Semiconducto r Memories &	CO1	Demonstrate the basics of non-volatile memories and its applications

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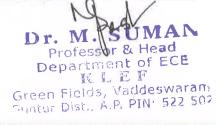
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heart de la	MEMS	CO2	Interpret the advanced random access memories and few basics of solar cells and supercapacitors
	manual mater	CO3	Apply the concepts of micro machining process to MEMS Devices
	equileran and and	CO4	Analysis the memory fault models and testing process
	ساده از ده نیزد د داده این داده دید	CO1	Revisit the Basic functionality and Electrical Properties of MOS Devices and apply the properties to determine the gain of amplifiers
	Analog &	CO2	Perform analysis on passive & active current mirrors and switched capacitor technique.
21EC3066	Digital IC Applications	CO3	Illustrate design procedure of static and dynamic CMOS
16=		direin u Namer Na 186 o	circuits and sequential logic gates and clock synchronization to design an efficient circuit for the given logic
	ang hilmow light on any		Illustrate the design procedure of arithmetic building blocks and memories.
AUTOMATI	ON & ROBOTIC	CS	Amilyze fu
- nga	per rempaissh	CO1	Apply the concepts of control systems and analyse their static and dynamic conditions
	Control Systems & Introduction to Robotics	CO2	Apply the time, frequency analysis and system design.
21EC3071		CO3	Analyse the components of robotic systems and apply to construction of simple robots.
		CO4	Apply the fundamentals of kinemetics to analyze the dynamic control in robotic design.
TO TOUR TO		CO1	Apply the foundations of autonomous vehicle
	nbm21 - A	101	technologies and its basic terminologies
	Autonomous Vehicles & Automotive Electronics	CO2	Analyze the essential principles of sensors and actuators used for automotive
21EC3072		CO3	Discover the fundamental principles of automotive electronic control systems
		CO4	Illustrate the case studies on autonomous vehicles and automotive electronics.
21EC3073	Advanced Robotics	CO1	Apply the fundamentals of robotic sensors and motions in robotics
		CO2	
		CO3	
		CO4	
TTT	Computer	CO1	
21EC3074	Vision & Applications	TIES III	dimensional signal processing and describe their usefulness in computer vision applications.



		CO2	Inspect various image representation models and examine their characteristics.
		CO3	Analyze various motion estimation models in video data and critisize their performance.
		CO4	Illustrate various machine learning models for computer vision applications and test their perfromance.
	1 11	CO1	Interpret the fundamental concepts of Human-Machine Interfaces and analyze their usefulness ir interactive system design.
21EC3075	Human Machine Interface &	CO2	Apply the knowledge generated in the development of HCI models and illustrate their design pardigrams.
21EC3073	Brain Machine	CO3	Analyze the brain control interface models and
	Interface		categorize their importance in understanding human performance.
		CO4	Interpret the BCI/HMI application designs and estimate their value in real world machine interactions.
		CO1	Analyze fundamental building blocks for automated system development and show design parameters.
	Designing Automation Systems & Assistive Robotic Systems	CO2	Interpret the design processes for building home automation systems and formulate the entire end-to- end system configurations.
21EC3076		CO3	Analyze the methods developed for the efficient utilization of industrial robots and examine their effectiveness in various industrial domains.
		CO4	Illustrate the application of robotics for human assistance and show the parameters required for designing assistive
			technologies.
SIGNAL PR	OCESSING		rangajo i 30 a - montab ta
	Speech Signal Processing	CO1	Apply Speech signal parameters to modal and classify distinguish Speech signal
21EC3081		CO2	Apply diversified Signal Processing approaches to represented Speech Signal
21103001		CO3	Apply and Analyze various signal processing approaches to represent various Speech signal
		CO4	Employ statistical methods and ANN for Speech signal processing with software tool
21502002	Digital Image	CO1	Interpret the fundamental concepts of digital image processing and apply then to generate reviews on some key applications
21EC3082	Processing	CO2	Develop 2D Transform models for analysing images in frequency domain and
		1	evaluate their capabilities.



		CO3	Develop restoration, segmentation and filtering algorithms on degraded images and list their
		CO4	efficiencies. Develop compression models and examine their performance for data transmission.
		CO5	Develope and modify various image processing algorithms.
		CO1	Describe imaging techniques applied to biomedical studies and summarize their usefulness in diagnostics.
		CO2	Apply image processing mechanisms to derive features on biomedical images and discover performance metrics.
21EC3083	Biomedical Image Analysis	CO3	Analyze the extracted features from biomedical images and categorize them with respect to usefulness in
		rji re i	automation.
		CO4	Discover important existing real time biomedical image analysis tools and explain their design processes.
		CO1	Apply statistical signal models and their properties in the analysis of signals using Stochastic processes
21EC3084	Statistical Signal	CO2	Design of optimum filters using classical and adaptive algorithms to extract the signals in the noisy environment.
21EC3084	Processing	CO3	Develop various spectral estimation techniques for achieving higher resolution in the estimation of power spectral density
		CO4	Analyze the Kalman and extended Kalman filters in the design of optimum filters
	Adaptive Signal Processing	CO1	Apply the fundamental concepts of adaptive systems and identify the critical design parameters.
21EC3085		CO2	Employ the Searching performance surface stability and rate of convergence parameters for describing adaptive systems.
		CO3	Apply the concepts of learning models and compare their performance in 1D domain.
		CO4	Illustrate the applications of adaptive systems and categorize their design processes.
21EC3086	Detection and Estimation of Signals	CO1	Apply the fundamental directions in the design and analysis of signal detection and estimation.
		CO2	Employ statistical decision theoretical models and test their performance on multiple signal types.
		CO3	Analyze the algorithms in signal estimation and describe the properties of a signal estimatior.
		CO4	Describe the importance of state estimation in various
	21	171	Dr. M. SUM

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			applications and report the process flow models.
		CO1	Describe various sources of biosignals and
21EC3087			identify their properties for signal analysis.
	Biomedical	CO2	Analyze the signals obtained from bio instruments and apply signal processing methods to extract useful information.
21EC3087	Signal Analysis	CO3	Review modern medical instruments and report their capabilities in enhancing health profiles.
		CO4	Apply advanced signal processing methods in improving the abilities of the existing models and test them.
RF AND MI	CROWAVE		
		CO1	Analysis of different microware components and devices
	1	CO2	Apply S parameters and Analysis of differnt
21EC3091	Microwave		microware components
21EC3091	Engineering	CO3	Apply S parameters and Analysis of microwave filters and periodic structures
		CO4	Interpret the applications of microwave and millimetric wave circuits
	Antenna Design & Wave Propagation	CO1	Apply the radiation concept and Analyze of different antennas
		CO2	Analyze the various antenna types and arrays
21EC3092		CO3	Analyze the VSWR and Impedance measurements for different antennas
		CO4	Interpret real-world applications of various antennas.
	Radar	CO1	Apply the basic principles of communications to build a radar system
21EC3093	Engineering &	CO2	Analyze the MTI radars
	Navigational Aids	CO3	Analyze different radar systems
	Alds	CO4	Understand the principles Navigation system
	Modern Antennas, Millimeter Waves & Applications	CO1	Understand and analysis of modern antenna design
21EC3094		CO2	Apply the concepts of mm waves for meteorological applications.
		CO3	Design and analyze mm wave circuits.
		CO4	Analyze the applications of modern antennas and mm wave radar.
	Electronic Warfare, EMI & EMC	CO1	Understand the basic concept of Electronic Warfare
21EC3095		CO2	Intrepret the different Jamming techniques and its methodologies
		CO3	Interpret the concept of design of EMC and components
		CO4	Analyse, design and testing of EMI and EMC
DATA COM	MUNICATION		

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		CO1	Analyze different statistitcal models for information
			theory and coding
W. P. 1990	Information	CO2	Analyze differnt coding methodologies for
21EC4051	Theory &	002	measuremnt of information
2120 1031	Coding	CO3	Analysis of various error detection and correction
	Coung	003	techniques
		CO4	Analysis of various Error detection and correcting
		004	using state diagrams
		CO1	Analysis of Spreading Sequences and Multi-user
	4G Wireless	001	systems
	Technologies	CO2	Analysis of Multi-carrier Communication
21EC4052	and Cellular	002	Systems
21201032	Communicatio	CO3	Analysis of Multi-user communciaion systesm
	n	CO4	Interpet various Advanced cellular
-1.00	-	001	communications and allied topics
777		CO1	Apply basic concepts of communications to
0.71		001	satellite communication
	Satellite Communicatio	CO2	Apply the spectrum analysis concept and Analyze
21EC4053			the Satellite Link Design and budget
	ns	CO3	Analysis of Multiple Access Techniques
		CO4	Analysis of global navigation systems
		CO1	Apply fundamental laws of optics and Analyse
			different optical fiber waveguide types
	Optical -	CO2	Analyze different optical sources, materials and
01E04054		A 1111	structures
21EC4054	Communication and Network	CO3	Evaluate different optical network protocols
	n and Network		against network performance
		CO4	Apply the network principles and Analyze the
1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1		I I FALTER	different optical networks
	Next Generation	CO1	Apply wireless communication techniques to
			analyze 5G New Radio
21EC4055		CO2	Apply Massive MIMO for 5G and Beyond 5G
21EC4033	Wireless	CO3	Analysis of Millimeter wave Communications
	Technologies	CO4	Design and Evaluate Vehicular Communications
			and other Advanced Topics
		CO1	Analyse addressing techniques and
			troubleshooting protocols
	TCP/IP & Other Protocol Suite	CO2	Design and Analyze DHCP for development of
21EC4061			different networks
21LC-1001		CO3	Design and analyze DNS for development of
			different networks
		CO4	Analyse congestion control protocols with case
		001	studies
21EC4062	VoIP Systems & Broad Band Networks	CO1	Apply the networking knowledge to interpret the
		000	legacy technology of classical telephony
21201002		CO2	Analyse different unicast routing protocols
		CO3	Analyse different VoIP protocols and codecs

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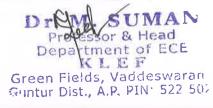
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		CO4	Apply NAT techniques and Analyse the quality of service for networks with SIP protocol
	5G Mobile, Wireless	CO1	Evolution of LTE beyond 4G and 5G and analyze the architectures of 5G and IoT for real-time applications
21EC4063	Technologies	CO2	Analysis of radio access technologies for 5G
	& IEEE 802 Standards	CO3	Analysis of multi-hop and multi-carrier systems for 5G
		CO4	Interpret various IEEE standards
	Cl. 1	CO1	Apply cloud network basics for network virtualization
21EC4064	Cloud- Computing &	CO2	Analysis software fabric architecture and cloud data center networks and standards
	Network Security	CO3	Apply cloud computing techniques for establishment of network and data center security
		CO4	Analysis of various Network Security issues
	IP Multimedia Sub-System &	CO1	Apply PSTN fundamendals to analyse IMS architecture
01504065	Emerging	CO2	Analyse IMS Protocol stacks and IMS operations
21EC4065	Technologies (Cloud, IOT, NFV, SDN)	CO3	Analyse IMS-PSTN and IMS services for GSM, Web-Msg, voice, VoLTE erc
		CO4	Interpret various Emerging Tech. of IMS
BIO-MEDIC	CAL INSTRUMEN	TATI	ON
		CO1	Apply fundamentals of automation in vehicular systems and review their functionalities.
21EC4071	Automated	CO2	Illustrate the safety parameters in designing an autonomous vehicular system and demonstate the same using design principles.
21EC40/1	Vehicles & Avionics	CO3	Apply digital communication technologies in vehicular automation and show their effectiveness in real-time scenarios.
		CO4	Outline the fundamental concepts in avionics and report design functionalities.
21EC4072	Calibrations and	CO1	Apply the knowledge of measuring instruments and show their usage in on-field measurements.
		CO2	Analyze the evolving design parameters of measuring instruments and evaluate the
			changes with respect to upgrading technologies.
	Designing Advanced Instruments	CO3	Apply instrument calibration methods and discover the impact of parameter relationships during the process.
	= 1 , = 10 - 10	CO4	Analyze the new approaches introduced in the design of instruments and examine various parameters required for improving reliability.
21EC4073	Biological & Cyber- Physical Systems	CO1	Apply the functionality of basic instruments used in cyber-physical systems and report their characteristics across applications.



			Analyze application fields of cyber-physical
		CO2	systems and demonstrate the process flow maps
		002	used in them to extract sustainablility.
			Apply the usefulness of biological models in
		CO3	formulating digital systems and examine their
			impact on designing learning algorithms.
		CO4	Apply the knowledge of the application pipelines
			and report the design and performance
			parameters.
			Illustrate the fundamental processes in the design
		CO1	of electronic measuring instruments and show
			their usage in sensing signals.
			Analyze the procedures followed in enhancing
	Electronic	CO2	communication between components and report
21EC4074	Instruments &		their effectiveness across instruments.
21EC4074	Biomedical		Analyze the performance of the instrument
	Applications	CO3	developed using bio-inspired electronics and
			discover the relationships.
			Illustrate the applications of biomedical
		CO4	electronics across multiple domains and compare
		004	their design aspects.
		CO1	Apply the foundations of autonomous vehicle
			technologies and its basic
	Autonomous	0.00	terminologies
01502070	Vehicles &	CO2	Analyze the essential principles of sensors and
21EC3072	Automotive	000	actuators used for automotive
	Human Machine Interface & Brain Machine Interface	CO3	Discover the fundamental principles of
		004	automotive electronic control systems
		CO4	Illustrate the case studies on autonomous vehicles
			and automotive electronics.
		CO1	Interpret the fundamental concepts of Human-Machine Interfaces and analyze their usefulness in
		COI	interactive system design.
		-	Apply the knowledge generated in the
		CO2	development of HCI models and illustrate their
		002	design pardigrams.
21EC3075			Analyze the brain control interface models and
		CO3	categorize their importance in understanding
			human performance.
		CO4	Interpret the BCI/HMI application designs and
			estimate their value in real world machine
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