

K L E F
DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING
PROGRAM DEVELOPMENT DOCUMENT
B. Tech in Electrical and Electronics Engineering
2022-23

Vision of University:

To be a globally renowned university.

Mission of University:

To impart quality higher education and to undertake research and extension with emphasis on application and innovation that cater to the emerging societal needs through all-round development of students of all sections enabling them to be globally competitive and socially responsible citizens with intrinsic values.

Vision of Department:

To produce globally renowned leaders in academics, extension activities, research and technology development in frontier areas of Electronics and Electrical Engineering and allied fields.

Mission of Department:

To produce quality electrical and electronics engineers with abundant theoretical foundation, innovative thinking, and accurate design experience, exposure to research and development and awareness of social / sociological needs.

Program Educational Objectives

PEO-1: Acquiring engineering knowledge in a wide range of industrial, societal and real world applications

PEO-2: Pursuing advanced education, research and development, and other creative and innovative efforts in science, engineering, and technology, as well as other professional careers

PEO-3: Managing themselves in a committed professional and ethical manner

PEO-4: Participate as leaders in their fields of expertise and in activities that support service and economic development throughout the world.

Mission statements:

M1: Training the leaders of future

M2: Training the innovators of coming days

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M3: Training the outstanding career professionals of future

M4: Conducting fundamental research

Academic Goals:

G1: To offer academic flexibility by means of Choice based credit systems and the like.

G2: To identify and introduce new specializations and offer programs in emerging areas therein

G3: To incorporate into the curriculum the Application orientation and use high standards of competence for academic delivery

G4: To design and implement educational system adhering to outcome based International models.

G5: To introduce and implement innovation in teaching and learning process to strengthen academic delivery

G6: To offer academic programs at UG, PG, doctoral, Post-Doctoral which are industry focused, and incorporates Trans-discipline, inter-discipline aspects of the education system

G7: To deliver higher education that includes technologies and meeting the global requirements

Program Outcome (POs)

PO-1: Ability to apply knowledge of mathematics, science, engineering fundamentals and engineering specialization for the solution of complex engineering problems.

PO-2: Ability to identify, formulate, research literature, analyze complex engineering problems using first principles of mathematics, natural sciences and engineering sciences.

PO-3: Ability to find solutions for complex engineering problems and system component of processes that meet the specified needs considering public health, safety and cultural, societal & environment.

PO-4: Ability to use research-based knowledge and research methods including design of experiments, analysis and interpretation of data and synthesis of the information to obtain solutions to critical engineering problems.

PO-5: Ability to create, select and apply appropriate techniques, resources and modern engineering activities, with an understanding of the limitations.

PO-6: Ability to 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.

PO-7: Ability to demonstrate the knowledge of engineering solutions, contemporary issues understanding their impacts on societal and environmental contexts, leading towards sustainable development.

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PO-8: Ability to apply ethical principles and commit to professional ethics and responsibilities and norms of engineering practice.

PO-9: Ability to function effectively as an individual, and as a member or leader in diverse teams and in multi-disciplinary settings.

PO-10: Ability to communicate effectively verbal, written reports and graphical forms on complex engineering activities.

PO-11: Ability to demonstrate knowledge and understanding of the engineering and management principles and apply those one's own work, as a member and leader in team, to manage projects and in multi-disciplinary environments.

PO-12: Ability to recognize the need and having the preparation and ability to engage independent and life-long learning in the broadest context of technological change.

Program Specific Outcome's:

PSO-1: Ability to demonstrate the knowledge, skill to analyze the cause and effect on Electrical system, processes and systems

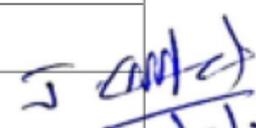
PSO-2: Ability to apply the acquired Electrical Engineering knowledge for the advancement of society and self

Mapping of GOALS with MISSION:

Academic Goals	Mission Statements			
	M1	M2	M3	M4
G1	√	√		
G2	√			
G3			√	
G4		√		
G5				√
G6			√	
G7	√			√

Mapping of PEOs with GOALS:

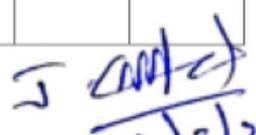
PEOs	Academic Goals						
	G1	G2	G3	G4	G5	G6	G7
PEO-1				√	√		√
PEO-2		√				√	√
PEO-3				√	√		
PEO-4	√	√	√			√	


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Thrust areas of Electrical and Electronics Engineering			
LOCAL ()	REGIONAL (APIIC & Industry Policy-Telangana)	NATIONAL (CII, NSDC)	GLOBAL (World Economic Forum)
Wind energy installation	Solar based Installation	Smart Grids for Smart Cities	Clean energy Technologies
Electric vehicle manufacturing	Energy management	Energy Conservation and Audit	Industrial Automation
Smart Grid installation	Electric Automotive sector	Charging station setups for Electric Vehicle	Smart and Micro Grid Implementations
Agriculture robotics	Energy storage systems hub		
https://nredcap.in/PDFs/Pages/AP_Electric_Vehicle_Policy.pdf https://nredcap.in/EnergyAuditing.aspx https://nredcap.in/PDFs/Pages/AP_Wind_Power_Policy_2018.pdf	https://tsredco.telangana.gov.in/Updates_2020/Telangana_EVES_policy_2020_30.pdf https://unfccc.int/process-and-meetings/the-paris-agreement/the-paris-agreement	https://www.niti.gov.in/e-mobility-national-mission-transformative-mobility-and-battery-storage https://www.nsgm.gov.in/en/nsgm-framework https://nielit.gov.in/content/industrial-automation-0	https://www.ncsl.org/research/energy/state-electric-vehicle-incentives-state-chart.aspx https://ec.europa.eu/energy/topics/renewable-energy_en

Mapping of needs with Mission:

Local,Regional,National andGlobal Needs		MissionStatements			
		M1	M2	M3	M4
Local Needs	Wind energy installation		√	√	√
	Electric vehicle manufacturing	√		√	
	Smart Grid installation				
	Agriculture robotics				
Regional Needs	Solar based Installation	√			√
	Energy management	√		√	
	Electric Automotive sector		√		
	Energy storage systems hub				√
National Needs	Smart Grids for Smart Cities	√			
	Energy Conservation and Audit		√	√	
	Charging station setups for Electric Vehicle				
Global Needs	Clean energy Technologies		√		√
	Industrial Automation	√			
	Smart and Micro Grid Implementations				

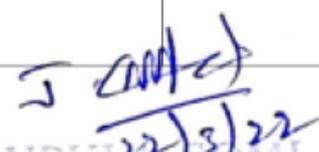

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Courses Introduced in 2020-21 Curriculum as per Local, regional, National and Global Needs:

Local, Regional, National and Global Needs		Courses introduced in 2022-23 curriculum as per identified needs
Local Needs	Wind energy installation	Dynamics of Renewable Sources
	Electric vehicle manufacturing	Communication Protocols and Testing of EV practical component
	Smart Grid installation	Data Science Applications for Smart Grid
	Agriculture robotics	AI & IoT applications for green energy systems
Regional Needs	Solar based Installation	Renewable and Energy Storage Systems
National Needs	Smart Grids for Smart Cities	
	Energy Conservation and Audit	
Global Needs	Clean energy Technologies	Grid Integration of Renewable sources
	Industrial Automation	Machine Learning applications for Automation
	Smart and Micro Grid Implementations	Micro-Grids

MAPPING OF PEOs with MISSION OF THE DEPARTMENT:

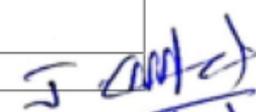
S.No	Description of PEOs	Key Components of Mission			
		M 1	M 2	M 3	M 4
		Training the leaders of tomorrow	Training the innovators of tomorrow	Training the outstanding career professionals of tomorrow	Conducting fundamental research
PEO-1	Acquiring engineering knowledge in a wide range of industrial, societal and real world applications	.	.✓	.✓	
PEO-2	Pursuing advanced education, research and development, and other creative and innovative efforts in science, engineering, and technology, as well as other professional careers		✓		✓


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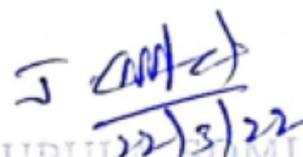
PEO-3	Managing themselves in a committed professional and ethical manner	✓			
PEO-4	Participate as leaders in their fields of expertise and in activities that support service and economic development throughout the world.	✓		✓	✓

MAPPING OF POs/PSOs with PEOs:

S No.	Key Components of POs and PSOs	Description of PEO			
		PEO 1	PEO 2	PEO 3	PEO 4
		Acquiring engineering knowledge in a wide range of industrial, societal and real world applications	Pursuing advanced education, research and development, and other creative and innovative efforts in science, engineering, and technology, as well as other professional careers	Managing themselves in a committed professional and ethical manner	Participate as leaders in their fields of expertise and in activities that support service and economic development throughout the world.
PO1	Engineering knowledge	✓	✓		✓
PO2	Problem analysis	✓	✓		✓
PO3	Design/development of solutions	✓	✓		✓
PO4	Conduct investigations of complex problems	✓	✓		✓
PO5	Modern tool usage	✓	✓		✓
PO6	The engineer and society	✓	✓	✓	✓
PO7	Environment and sustainability	✓	✓	✓	✓
PO8	Ethics	✓	✓	✓	✓
PO9	Individual and team work	✓	✓	✓	✓
PO10	Communication	✓	✓	✓	✓


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PO11	Project management and finance				✓
PO12	Lifelong learning	✓	✓	✓	✓
PSO1	Ability to demonstrate the knowledge, skill to analyze the cause and effect on Electrical system, processes and systems	✓	✓		✓
PSO2	Ability to apply the acquired Electrical Engineering knowledge for the advancement of society and self	✓	✓		✓


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SN O	Course Code	Course Title	CO NO	Description of the Course Outcome	Program Outcomes										PSO							
					1	2	3	4	5	6	7	8	9	10	11	12	1	2				
1		INTEGRATED PROFESSIONAL ENGLISH	CO1	Understand the concepts of grammar to improve communication, reading, and writing skills												1						
			CO2	Demonstrate required knowledge over Dos and Don'ts of speaking in the corporate context. Demonstrate ability to face formal situations / interactions.												1						
			CO3	Understand the varieties of reading and comprehend the tone and style of the author. Skim and scan effectively and appreciate rhetorical devices													1					
			CO4	Apply the concepts of writing to draft corporate letters, emails, and memos														1				
2		ENGLISH PROFICIENCY	CO1	Demonstrating different interpersonal skills for employability															1			
			CO2	Distinguishing business essential skills																1		
			CO3	Classifying social media and corporate communication skills																	1	


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				Progressions, Logarithms, Data Interpretation, Data Sufficiency which will enable them to improve their problem-solving abilities which in turn improve their programming skills.																	
			CO4	To apply deductive logic to solve questions in Connectives, Blood relations, Ranking and time sequence, Symbols and notations. Apply principles of reflection and rotation to solve picture puzzles.	1																
6	20UC 0007	INDIAN HERITAGE AND CULTURE	CO1	To familiarize with various aspects of the culture and heritage of India through ages.	1								3								
			CO2	To acquaint with the contributions of Indians in the areas of languages and literature, religion and philosophy	1																
			CO3	To understand the Social structure and the spread of Indian culture abroad	1									2							
			CO4	To know the development of Science and Technology in India through ages and to appreciate the contributions of	1																

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				some of the great Indian scientists																		
7	20UC 0008	INDIAN CONSTITUTION	CO1	To understand Constitutional development after Independence															1			
			CO2	To learn the fundamental features of the Indian Constitution											3					1		
			CO3	To get a brief idea of the powers and functions of Union and State Governments																	1	
			CO4	To understand the basics of working of Indian Judiciary and the Election Commission												2					1	
8	20UC 0009	ECOLOGY AND ENVIRONMENT	CO1	Understand the importance of Environmental education and conservation of natural resources.																1		
			CO2	Understand the importance of ecosystems and biodiversity																	1	
			CO3	Apply the environmental science knowledge on solid waste management, disaster management and EIA process																		2
			CO4	Understand the importance of Environmental education and conservation of natural resources																		1
9	20UC 0010	UNIVERSAL HUMAN	CO1	Understand and identify the basic															1			

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		VALUES & PROFESSIONAL ETHICS	aspiration of human beings																
			CO2	Envisage the roadmap to fulfill the basic aspiration of human beings.								2							
			CO3	Analyze the profession and his role in this existence.								2							
10	20UC 0011	ENTREPRENEURSHIP	CO1	Analyze the business environment in order to identify business opportunities,															2
			CO2	Identify the elements of success of entrepreneurial ventures															1
			CO3	Consider the legal and financial conditions for starting a business venture															1
			CO4	Evaluate the effectiveness of different entrepreneurial strategies															2
11	20MT 1101	MATHEMATICS FOR COMPUTING	CO1	Model a system of equations for real world applications in engineering, physical and biological sciences, computer science, finance, economics and solve them through matrix algebra															2
			CO2	Model basic and computational techniques on discrete structures like															2

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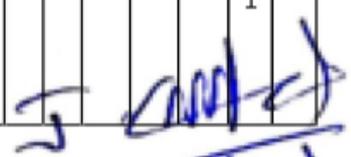
				relations, orders, functions & FSM, Lattices, and propositional & predicate logic																
			CO3	Model real world structures and their related applications using advanced discrete structures like graphs and trees.	2															
			CO4	Model the given Statistical data for real world applications in Engineering science, Economics and Management.	2															
			CO5	Demonstrate the Aptitude and Reasoning skills (Tests in skilling hours)	1															
12	20SC 1102	INTRODUCTION TO DESIGN	CO1	Be able to understand elements and principles of design			1								1					
			CO2	Able to grasp stage model of action cycle			2								2					
			CO3	Be able to understand design laws and their importance in design field			1								1					
			CO4	To comprehend various rules of composition of design			2								2					
			CO5	To gain hands-on experience of fundamentals of design			2								2					
13	19MT 2102	MATHEMATICS FOR ENGINEERS	CO1	Apply differential and integral calculus to find maxima & minima of functions,	2															

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				evaluate the integrals and solve the differential equations.																
			CO2	Demonstrate the Fourier series and Laplace transforms.	1															
			CO3	Describe probability, Random Variables	1															
			CO4	Explain complex variables, analytic functions and introduction to stochastic process and Algebraic structures.	1															
14	20EE 2104	Mathematical Transforms for Signal Processing	CO1	understand basic concepts related to Signals and Systems	3							3								
			CO2	Apply Fourier series and transforms to various periodic and aperiodic waveforms	2															
			CO3	Apply Laplace transforms and its properties to various signals	2															
			CO4	Apply Z transforms and its properties to various signals	2															
15	20SC 1203	USER CENTRIC DESIGN TECHNIQUES	CO1	Understand the different roles and responsibilities in phases of User centered Design			1						1							
			CO2	Identify user pain points and opportunity areas through empathy and collaborative design			1								1					
			CO3	To be able to design a better			2								2					

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				User Experience using UCD and 6D process																	
16	20SC 2104	DESIGN THINKING AND INNOVATION-I	CO1	Understand the basics of design thinking and its implications in product or service development	1																
			CO2	Understand and Analyze the requirements of a typical problem	2																
			CO3	Plan the necessary activities towards solving the problem through ideation and prototyping			2	2							2						
			CO4	evaluate the solution and refine them based on the customer feedback			3								3						
17		BIOLOGY FOR ENGINEERS	CO1	Acquire the Knowledge of basic biology					1	1											
			CO2	Acquire the Knowledge of Human Biological Systems					1	1											
			CO3	Acquire Knowledge on Microorganisms and Biosensors					1	1											
18		Electrical Circuits	CO1	Understand two port network parameters and their relations	1				1										1		
			CO2	Analyze the transient behaviour of DC / AC circuits.	2				3											1	
			CO3	Understand the network topology and apply three phase circuit balanced and unbalanced circuits.	2				3											1	


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				Linear Data Structures for solving real world problems.																
22		DESIGN TOOLS WORKSHOP -I	CO1	Practice design thinking by developing artistic skills, Visualize and complete his/her innovative design by final drafting using 3D modeling			2													
			CO2	Understand the concept of web page, web browser, web server, and able to create Static webpages				2												
			CO3	Understand the concept of report writing using a markup language Latex					2											
			CO4	Understand the concept of data visualization and creating data visualization dashboards, Understand the basic concept of VR/AR.					2											
23		Data Structures and Algorithms	CO1	Apply measures of efficiency to algorithms and Compare various linear data structures like Stack ADT, Queue ADT, Linked lists.	2		2													
			CO2	Analyze and compare linear data structures and analyze different searching and hashing techniques	2		2													

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			CO3	Analyze and compare various non – linear data structures like Trees and Graphs	2	2														
			CO4	Analyze and compare various sorting algorithms, to select from a range of possible options, to provide justification for that selection, and to implement the algorithm in a particular context.	2	2														
			CO5	Execute lab experiments and develop a small project along with his/her team members.	2	2														
24	Object Oriented Programming	CO1	Understand Basic Concepts of OOP, introduction to classes and objects through Java Language and apply.	1																
		CO2	Understand the concepts of constructors, Overloading, parameter passing, access control, Inheritance and apply	1																
		CO3	Understand Packages, Interfaces, and Exception Handling and apply.	2																
		CO4	Understand I/O Streams & apply and understand Basic Concepts of Multi –Threading	2	2															

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				description language																		
			CO3	Substantiation of sequential logic circuits and logical verification through hardware description language	2																	
			CO4	Implementation of digital circuits using PAL, PLA and FPGA. Discriminate the operations of ALU and execution of microinstructions.	2	2																
			CO5	Analyse the digital IC logic for combinational and sequential circuits implementation				2														
28		Computer Organization & Architecture	CO1	Understand the functionality and design the CPU functional units - control unit, registers, the arithmetic and logic unit, the instruction execution unit, and the interconnections among these components.																	2	
			CO2	Understand, analyze and design main, cache and virtual memory organizations.																		2
			CO3	Understand, analyze and design different types of I/O transfer techniques.																		2



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			CO4	Understand the design issues of RISC and CISC CPUs and the design issues of pipeline architectures.		2													2	2		
29		Basic Electrical and Electronic Circuits	CO1	Understand the methods to solve electrical circuit using nodal and mesh analysis and apply various network theorems.	1				1													
			CO2	Analyse the various properties of Ac circuits and understand the concept of resonance.	2				2													
			CO3	Understand the active circuit elements and working.	2				1													
			CO4	Understand the applications of semiconductor devices	2				2													
			CO5	Demonstration of various experiments related to basics of electrical and electronics concepts.	2				2													
30		Analog Electronics Circuit Design	CO1	Study of BJT's and Various application in Amplifiers	1	1														1		
			CO2	Understand various types of FET's, IC Types and analyze FET as an Amplifier		1																1
			CO3	Understand the Linear & Non-linear application of Op-AMP and		2																2

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				analyze active filters																	
			CO4	Analysis of different types of oscillators, filter and regulators.	2														2		
31		Embedded Controllers	CO1	Understand the architecture and programming concepts of 8086 Microprocessor	2																
			CO2	Apply the Programming concepts of 8051 Microcontroller		3															
			CO3	Analyze the Interfacing of Peripherals to the 8051 Microcontroller through programming. Understand the basic architectures of PIC and ARM 7 microcontrollers				2													
			CO4	Understand the basic concepts of CORTEX STM-32 microcontroller and RTOS		2															
			CO5	Analyze the applications of programming with 8051 and 8086 on hardware / software. Analyze the applications of programming with Arduino						3											
32		Electrical Power Engineering	CO1	Understand working of various generating stations and economical aspects of generation	1		1												1		

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			CO4	Apply the different cross over methods and their elitism, convergence of algorithm Electrical Engineering	2												3			3			
			CO5	Train and test various ANN' s for various applications		2														1			
39		ELECTRICAL DRIVES	CO1	Demonstrate steady state and dynamic behaviour of electric drives	1	1														1			
			CO2	Interpret and Model control of dc motor based electric drives		3																1	
			CO3	Interpret and model scalar methods for Induction Motor speed control		3																	1
			CO4	Interpret and Model vector control of Modern Industrial Motor Drives		2																	1
40		Restructured Power Systems	CO1	Understand the concept of deregulated market structures and reforms in Indian Power Sector	1																1		
			CO2	Apply different techniques for finding available transfer capacity for congestion management																			1
			CO3	Analyze transmission pricing methods and effect of congestion on LMPs																			1

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				storage components																
			CO4	Interpret and Model Mechanical energy storage components	3															1
51		ENERGY MANGEMENT AND GREEN BUILDINGS	CO1	Apply energy audit for energy management in buildings	2															1
			CO2	Interpret energy conservation opportunities in electrical systems						1										2
			CO3	Identify energy management strategies for energy efficiency						2										1
			CO4	Identify practices for energy efficiency green buildings	1												3		1	
52		Distribution System Practices	CO1	Understand the basic structure of distribution system and compute AT&C loss.	1															2
			CO2	Apply the knowledge for erection and commissioning of a substation.	2															2
			CO3	Understand the various protection systems deployed in distribution system.	1															2
			CO4	Test and understand the test results of various distribution system equipment.	2															2
53		Distributed Energy Resources and Smart Grids	CO1	Understand different types of distributed energy resources	1															1

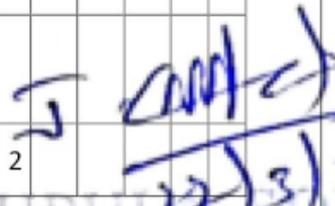
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69	Technical Proficiency - 4	CO1	Understand components of cloud computing	3																
		CO2	Apply procedures for cloud data security				3													
		CO3	Apply cloud networking techniques				3													
		CO4	Apply cloud data storage and monitoring techniques				3													

Program Articulation Matrix (Mapping of Courses with POs)

S. No.	Course code	Course Name	Course category	L	T	P	S	Cr	Pre-Req.	PO												PSO					
										1	2	3	4	5	6	7	8	9	10	11	12	1	2				
1		Integrated Professional English	HSS	0	0	4	0	2	NIL								1	1									
2		English Proficiency	HSS	0	0	4	0	2	NIL							1	1			2							
3		Professional Communication Skills	HSS	0	0	4	0	2	NIL	1			1							1							
4		Corporate Communication Skills	HSS	0	0	4	0	2	NIL	1			1							1							
5		Aptitude Builder	HSS	0	0	4	0	2	NIL	1			1							1							
6		Indian Heritage and Culture	HSS	2	0	0	0	0	NIL	1																	
7		Indian Constitution	HSS	2	0	0	0	0	NIL																1		
8		Ecology & Environment	HSS	2	0	0	0	0	NIL						2										1		
9		Universal Human Values & Professional Ethics	HSS	2	0	0	0	0	NIL								2										
10		Entrepreneurship	HSS	2	0	0	0	0	NIL												2						
11		Mathematics for Computing	BS	2	2	0	2	4.5	NIL	2																	
12		Design Thinking and Innovation-I		1	0	0	4	2	NIL				2												2		


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13	Mathematics for Engineers	BS	2	1	0	0	3	NIL	2											
14	Science Elective-1 (Engineering Chemistry)	BS	3	0	2	0	4	NIL	2			2								
15	Design Thinking and Innovation-II	BS	1	0	0	4	2	NIL	1	2	3	2	2			3		2		
16	Science Elective - 2 (Measurements & Materials)	BS	3	0	2	0	4	NIL	3	2		2								
17	Biology for Engineers	BS	3	0	2	0	4	NIL	1			1							1	
18	Computational Thinking for Design	BS	2	0	0	0	2	NIL						1	1					
19	Design Tools Workshop –I	ES	3	0	2	6	5 . 5	NIL	2	2		2								
20	Data Structures and Algorithms	ES	0	0	4	0	2	NIL			2	2								
21	Computational Thinking and Data Sciences	ES	3	0	2	3	4 . 8	NIL	2		2									
22	Design Tools Workshop –II	ES	3	0	2	3	4 . 8	NIL	2	2										
23	Mathematical transforms for Signal Processing	ES	2	1	0	0	3	NIL	3											
24	Basics of Electrical & Electronics Engineering	ES	2	1	0	0	3	NIL	1	2										
25	Electrical Circuits	ES	3	1	0	0	4	NIL	2			2								
26	Digital Logic & Processors	ES	3	0	2	0	4	NIL	2	2		2								
27	Object oriented programming	ES	3	0	2	3	4 . 8	NIL	2	2										
28	Computer Organization & Architecture	PC	2	0	0	0	2	NIL	2	2										2 2
29	Analog Electronics Circuit Design	PC	3	0	2	2	4 . 5	Nil	1	2	1									2 1
30	Embedded Controllers	PC	2	0	3	2	4	Nil		2	3	2								
31	Electrical Power Engineering	PC	3	1	0	0	4	Nil	3		2									3
32	Electrical Machines	PC	3	0	2	0	4	Nil	2	2	3									3


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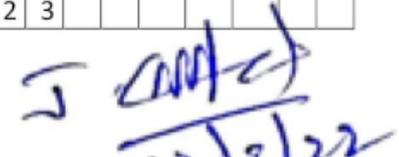
33	Industrial Applications of Electrical Machines	PC	3	0	2	0	4	19EE 2103	2		3	3							2				
34	Power Electronics	PC	3	0	2	2	4	20EE 1201	2		3	3		3					2	3	2		
35	Computer Applications in Power Systems	PC	3	0	2	0	4	19EE 2102	2			3								3			
36	Control Systems	PC	3	0	2	2	4	Nil	3	3		3								3	2		
37	AI TECHNIQUES IN ELECTRICAL ENGINEERING	FC	3	1	0	0	4	19EE 2203	2		2	2						3	3		3		
38	ELECTRIC DRIVES	FC	3	1	0	0	4	19EE 2202	1	3		2									1		
39	RESTRUCTURED POWER SYSTEMS	FC	3	1	0	0	4	19EE 2102	1			3									2		
40	Power Quality	FC	4	0	0	0	4	Nil	2	3		2	3								2		
41	UTILISATION OF ELECTRICAL ENERGY	FC	3	1	0	0	4	Nil	2					3							3	1	
42	SENSORS AND INTERNET OF THINGS	FC	3	0	2	0	4	Nil	1	1		2								2	1	2	
44	SOLAR AND MICRO ENERGY TECHNOLOGIES	PE	3	0	0	0	3	NIL	2			2									1		
45	WIND AND ENERGY STORAGE TECHNOLOGIES	PE	3	0	0	0	3	NIL	1	3											2		
46	ENERGY MANAGEMENT AND GREEN BUILDINGS	PE	3	0	0	0	3	NIL		2				2						3	2	1	
47	AI AND IOT FOR GREEN ENERGY INTEGRATION	PE	3	0	0	0	3	NIL			2	1								1	2	1	
48	GRID INTEGRATION OF RENEWABLE ENERGY SOURCES	PE	3	0	0	0	3	NIL				1	2									3	
49	POWER TRAIN DESIGN FOR ELECTRIC VEHICLE	PE	3	0	0	0	3	19EE 2103					2	3								1	2

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50	BATTERY STATE ESTIMATION ALGORITHMS FOR ELECTRIC VEHICLE	PE	3	0	0	0	3	NIL	1			2	2							1	2		
51	CHARGING STATIONS FOR ELECTRIC VEHICLES	PE	3	0	0	0	3	19EE 2202				2	1							1	2		
52	AI AND IOT FOR ELECTRIC VEHICLE	PE	3	0	0	0	3	NIL			2	1	2							1	2		
53	COMMUNICATION PROTOCOLS & TESTING OF EV	PE	3	0	0	0	3	NIL			2	1								1	2		
54	INDUSTRIAL AUTOMATION AND ROBOTICS	PE	3	0	0	0	3	NIL	1												2		
55	INTRODUCTION TO INDUSTRIAL INTERNET OF THINGS	PE	3	0	0	0	3	NIL	1												2		
56	INDUSTRIAL DRIVES AND CONTROL	PE	3	0	0	0	3	19EE 2103	1												1		
57	INDUSTRIAL COMMUNICATION PROTOCOLS AND CYBER SECURITY	PE	3	0	0	0	3	NIL	1				1								2		
58	SMART SENSORS AND SMART NETWORKING	PE	3	0	0	0	3	NIL	1	1	1												
59	DISTRIBUTION SYSTEM PRACTICES	PE	3	0	0	0	3	19EE 2102	2												2		
60	DISTRIBUTED ENERGY RESOURCES AND SMART GRIDS	PE	3	0	0	0	3	NIL		2	1	2									1	2	
61	ENERGY MANAGEMENT SYSTEMS AND SCADA	PE	3	0	0	0	3	NIL	1			2									1	2	
62	SMART GRID COMMUNICATION AND CYBERSECURITY	PE	3	0	0	0	3	NIL	1			2										2	
63	INTERNET OF THINGS AND	PE	3	0	0	0	3	NIL	1			2										1	2

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		SMART GRID ANALYTICS																		
64	Modelling Business Systems	ME	2	0	0	0	2	Nil				1			3	2		1		
65	Entrepreneurship Essentials	ME	2	0	0	0	2	Nil				1			3	2		1		
66	Social internship	PR	0	0	0	8	2	NIL				1		2		2		3		
67	Technical Internship	PR	0	0	0	8	2	NIL			3	1				2		2		
68	Mid Grad Capstone Project – I	PR	0	0	0	8	2	NIL				2								
69	Mid Grad Capstone Project – II	PR	0	0	0	8	2	NIL				2								
70	Capstone Project – I	PR	0	0	0	24	6	NIL			2	3								2
71	Capstone Project – II	PR	0	0	0	24	6	NIL			2	3								2
72	Practice School	PR	0	0	0	24	6	NIL			2	3								2
73	Internship	PR	0	0	0	24	6	NIL			2	3								2
74	Technical Proficiency - 1 / Entrepreneurial Incubation	PTA	0	0	0	12	3	NIL	1	2	3									2
75	Technical Proficiency - 2 / Technopreneurship	PTA	0	0	0	12	3	NIL	1	2	3									2
76	Technical Proficiency - 3 / Entrepreneurial Skilling	PTA	0	0	0	12	0	NIL	1	2	3									2
77	Technical Proficiency - 4 / Entrepreneurial Skilling	PTA	0	0	0	12	0	NIL	1	2	3									2
78	Renewable Energy Sources	OE	3	0	0	0	3	NIL				2	3							
79	Energy Estimation & Audit	OE	3	0	0	0	3	NIL				2	3							


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