K L E F
DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING
PROGRAM DEVELOPMENT DOCUMENT
B. Tech in Electrical and Electronics Engineering
2019-20

PROGRAM DEVELOPMENT DOCUMENT FOR B.TECH(EEE) 2019

B.Tech (EEE) program for the academic year 2019-20 has been framed to be in relevance to APIIC, Human Resource Development Policy, Govt. of India, National Skill Development Corporation, Govt. of India, Confederation of Indian Industries, ABET, NBA norms, O*NET NASSCOM, AP state IT policy and AICTE statutory norms.

As per the recommendations of APIIC number of courses are introduced in the areas green energy technologies such as solar, PV and thermal technologies, wind and micro energy, energy conservation related coursesand verbal, written communication.

As per the recommendations of NSDC, Electronics IT hardware number of courses are introduced in management courses, basic electronics related courses such as analog electronics & circuit design, electronics and computer related coursessuch as computer organization and architecture and embedded Systems courses such as embedded controllers, ARM and skilling courses on PCB design are also introduced in the EEE curriculum.

As per the recommendations of NSDC –IT and ITES number of courses are introduced in the areas of application development, Project management, Testing and quality assurance, Internet of Things (IoT), Data processing, Web development, UI development, Cloud computing, Big data analytics Information security.

As per the recommendations of O*net number of courses are introduced in the areas of networking software, operating system development, reasoning, and analysis, Team building & communication, Object oriented programming, Java, Python programming, MATLAB, PSPICE, Database management system, English language, Active listening, Critical thinking, Drafting and documentation skills.

As per the recommendations of AICTE number of courses are introduced in the areas of Mathematics, Engineering sciences, Humanities and management courses, English and communication development courses, Professional ethics, Heritage and culture and human values.

As per the recommendations of NASSCOM and AP state software policy number of courses are introduced in the areas of Internet of things , Artificial Intelligence, machine

learning, data networking, programming for complex problems related to electrical engineering, big data analytics.

Apart from these inputs, all stake holders like recruiting companies, exit feedback from our final year students and parents, alumni feedback and academic peer feedback is also considered while making the final program.

Thus framed curriculum has been developed through framing of Program Educational Objectives (PEO's) which are mapped to the university Vision and Mission, which are there by disseminated into Program Outcomes (PO's) which thereby have been developed into relevant Course Outcomes (CO's).

THRUST AREAS OF ELECTRICAL & ELECTRONICS ENGINEERING			
LOCAL	**REGIONAL**	**NATIONAL**	**GLOBAL**
APIIC	**NASSCOM**	**NSDC Electronics –IT hardware**	**O*net network Architect**
Recycling of Recourses	IOT	management courses	networking software
Use of renewable source of power	Machine learning	basic electronics related	operating system development
Importance of communication	cloud networking	electronics and computer related courses	reasoning and analysis
	programming for complex problems	Embedded Systems	Team building & communication
	big data analytics		
AP state software policy		**NSDC –IT and ITES**	**O*net programmer**
IoT		application development	Python programming
Big data analytics		Project management	Object oriented programming
Machine learning		Testing and quality assurance	Database management system
Cloud networking		Data processing	English language
		Web development	Active listening
		UI development	Critical thinking
		Cloud computing	Drafting skills
		Augmented reality	documentation skills
		Big data analytics	
		Information security	

		AICTE	
		Mathematics	
		Engineering sciences	
		Humanities and management courses	
		English and communication development courses	
		Professional ethics Heritage and culture	

UNIVERSITY

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.

DEPARTMENT

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

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 industryfocused, and incorporates Trans-discipline, inter-discipline aspects of the education system

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

ProgramOutcome (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.

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 PEOs with GOALS:

PEOs	Academic Goals						
	G1	G2	G3	G4	G5	G6	G7

PEO-1				√	√		√
PEO-2		√				√	√
PEO-3				√	√		
PEO-4	√	√	√			√	

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		✓		✓
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			
		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.
		PEO 1	**PEO 2**	**PEO 3**	**PEO 4**
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	✓	✓	✓	✓

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	✓	✓		✓

Thrust/Focussed areas as per APIIC, Telangana Industrial policy, CII, NSDC, Planning commission, UGC, US O*NET, World Economic Forum, UNESCO.

Local Needs identified as per policy document of APIIC			Regional Needs as per policy documents of APIIC & Telangana Industrial policy			National Needs as per policy documents of CII, NSDC, Planning commission			Global Needs as per policy documents of US O*NET, World Economic Forum, UNESCO	
L1	Pharmaceutical Hub		R1	Agro & Food Processing		N1	Industry Deep Dive: Banking		G1	Mobile internet, cloud technology
L2	Fabrication Hub-Rubber and Fabricated Metal		R2	Life sciences (including pharma, biotechnology and medical equipment)		N2	Industry Deep Dive: Telecom		G2	Processing power, Big Data
L3	Value-added Automation tools		R3	Textile & Apparel		N3	Industry Deep Dive: Manufacturing		G3	New energy supplies and technologies
L4	Aquaculture Hub - Logistics Park		R4	Electronics		N4	Industry Deep Dive: Media, Publishing, and Entertainment		G4	Internet of Things
L5	Manufacturing Hub - Agro, Textile, Metal and Mineral		R5	Aviation & Defence		N5	Industry Deep Dive: Retail		G5	Sharing economy, crowdsourcing

L6	Agricultural Trading Hub - Agro Processing and Textile		R6	Auto & Auto Components		N6	Industry Deep Dive: Insurance		G6	Robotics, autonomous transport
L7	Heavy Industries Hub - Textile and Mineral Products		R7	Petroleum, Chemicals, (including Fertilizers) and Petrochemicals		N7	Industry Deep Dive: Healthcare		G7	Artificial intelligence
L8	Tourism Hub- Temples, Schools and Heritage		R8	Energy		N8	Media & Social Developmen t		G8	Adv. manufacturing, 3D printing
			R9	Mineral based industry (e.g. cement)		N9	BioTechnolo gy		G9	Adv. materials, biotechnology
			R1 0	Leather		N1 0	Material Science		G1 0	ICT in education
			R1 1	Life Sciences		N1 1	Cognitive Science		G1 1	Skills development for work
			R1 2	IT hardware including bio-medical devices, electronics, and cellular communication		N1 2	Nanoscience		G1 2	Global citizenship education
			R1 3	Food processing		N1 3	Construction Material and Building Hardware		G1 3	Foresight and research
			R1 4	Automobiles, tractors and farm equipment		N1 4	Security		G1 4	lifelong learning for all
			R1 5	Plastics and polymers		N1 5	Transportati on and Logistics		G1 5	creative and responsible global citizens
			R1 6	Fast-moving consumer goods and domestic appliances		N1 6	Electronic and IT Hardware		G1 6	health through education
			R1 7	Engineering and capital goods		N1 7	Pharma and Life Sciences			
			R1 8	Waste management and green technologies		N1 8	Retail			
			R1 9	Renewable energy and solar parks		N1 9	Tourism, Hospitality and Travel			
			R2 0	Transportation, logistic hub, and inland ports		N2 0	Telecommu nication			

Mapping of PEOs with Local, Regional, National and Global needs

------> Curricula developed have relevance		Local Needs	Regional Needs		National Needs		Global Needs				
PE O	PEO-Description	L7	R8	R19	N1 6	N2 0	G 3	G 7	G 11	G 14	G1 15
PE O1	Practice engineering in a broad range of industrial, societal and real world applications.	√	√	√	√	√	√	√			

PE O2	Pursue advanced education, research and development, and other creative and innovative efforts in science, engineering, and technology, as well as other professional careers.	√	√	√	√	√	√	√			
PE O3	Conduct themselves in a responsible, professional, and ethical manner.								√	√	√
PE O4	Participate as leaders in their fields of expertise and in activities that support service and economic development throughout the world.								√	√	√

Courses Introduced and syllabus revised into curriculum as per the Local, regional, national and global needs

Courses introduced as per Local Needs			Courses introduced as per Regional Needs			Courses introduced as per National Needs			Courses introduced as per Global Needs	
	Course Name			Course Name			Course Name			Course Name
L1			R1			N1			G1	
L2			R2			N2			G2	
L3			R3			N3			G3	Wind and Micro Energy Systems
L4			R4			N4			G4	
L5			R5			N5			G5	
L6			R6			N6			G6	
L7	Materials & Measurements, Sensors & Instrumentation, Computer Application in Electrical Engineering, Industrial Applications of Electrical Machines		R7			N7			G7	AI for Electrical Engineering

L8			R8	Energy Estimation & Audit, Energy Management Systems		N8			G8	
L9			R9			N9			G9	
L10			R10			N10			G10	
			R11			N11			G11	Department Specific Skilling Courses.
			R12			N12			G12	
			R19	Green Energy Technologies		N13			G13	
						N14			G14	Energy Conservation & Audit
						N16	Embedded Controllers, ARM, Analog Electronic Circuit Design		G15	Ecology and Environment
						N20	Data Networks & Wireless Communication		G16	

MAPPING OF COURSE OUTCOMES WITH PROGRAM OUTCOMES (POs) and PROGRAM SPECIFIC OUTCOMES (PSOs)

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
HUMANITIES & SOCIAL SCIENCES																	
19UC1101	BASIC ENGLISH	CO1	Apply the practical knowledge of using action words in sentence construction.										2				
		CO2	Apply and analyse the right kind of pronunciation with regards to speech sounds and able to get different types of pronunciations.										2				
		CO3	Apply the concept of fundamental principle of counting to solve the problems on linear, circular permutations and also for the problems on selections. Apply the concept of probability, while doing the problems on Leap year & Non-Leap year problems, coins, dice, balls and cards.	2													
		CO4	Analyze the given conditions and finding out all the possible arrangements in linear & circular order. Analyze the given numbers or letters to find out the hidden analogy and apply that analogy to find solutions. Finding the odd man out by observing the principle which makes the others similar.					2									
19UC1202	ENGLISH PROFICIENCY	CO1	Apply the concepts of accurate English while writing and become equally at ease in using good vocabulary and language skills.								2	2	2				
		CO2	Understand the importance of pronunciation and apply the same day to day conversation.								2	2	2				
		CO3	Apply the concepts of ratios, percentages, averages	2			2										

			and analyze the given information on the basis of comparative analysis of the data in the form of tabulation, bar graphs, pie charts, line graphs.														
		CO4	Apply the basic functionality of clocks and calendars to find the solutions for the problems. Analyze the given symbols to understand the hidden meaning of the given expression and find the solutions. Analyze the possible arrangements in linear & circular order.	2				2									
19UC2103	PROFESSIONAL COMMUNICATION SKILLS	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.									2	2				
		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.								2						
		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, relative speed.	2													
		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.	2				2									
19UC2204	APTITUDE BUILDER - 1	CO1	Apply the concept of Critical Reading and Analytical Reading and comprehend the keyideas and gist of a passage.Understand the importance of the presentation skills, analyze the given topic, apply					2	2								

			various strategies and the principles of grammar in written expression.														
		CO2	Apply the concepts of grammar, various strategies and the usage of formal language in written expression. By using synonyms rewrite the same text in the same format and meaning. Write the gist of the given text.							2			2				
		CO3	Apply the concepts of Numbers to solve the problems related to divisibility rules, problems based on Unit's digit, Remainders, Successive Division, Prime Factorization, LCM & HCF problems. Apply the concepts of Averages &Alligations, students will be able to solve the problems related to Averages as well as problems based on Mixtures.	2				2								
		CO4	Apply the various concepts of cubes to find out how to cut a cube to get the maximum number of smaller identical pieces, how to minimize the number of cuts required to cut a cube into the given number of smaller identical pieces, how to count the number of smaller cubes which satisfy the given painting scheme. Apply the principles of binary logic to solve problems involving truth-tellers, liars and alternators. Analyze the given data to form an ordered arrangement from an unorganized raw data.	2				2								
19UC3105	APTITUDE BUILDER - 2	CO1	Apply the strategies and techniques learnt in carrying out conversations in different contexts. Analyse the different parameters and formats of written technical								2		2				

			communication and apply in everyday work and life.															
		CO2	Analyse the concepts of critical and analytical reading skills. Apply the strategies and techniques learnt in handling interviews in different contexts.								2		2				
		CO3	Apply the concepts of Ratio & Proportion, Percentages, Profit &Loss, Simple & Compound Interest, students will be able to solve the problems based on Ratios, problems involving Percentages, problems related to cost price, selling price, profit, loss, marked price and discounts, problems involving interest.	2				2									
		CO4	Analyze the given series of numbers to predict the next number in the series. Analyze the given set of numbers or letters to find the analogy. Analyze the given data to find the code which is used to encode a given word and use the same code in the process of decoding. Apply the given set of conditions to select a team from a group of members.	2													
	FOREIGN LANGAUGE																	
19UC0007	*INDIAN HERITAGE AND CULTURE	CO1	To familiarize with various aspects of the culture and heritage of India through ages.	1													
		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													

		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	1														
19UC0008	*INDIAN CONSTITUTION	CO1	To understand Constitutional development after Independence												1			
		CO2	To learn the fundamental features of the Indian Constitution												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												1			
19UC0009	*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									
19UC0010	*UNIVERSAL HUMAN VALUES & PROFESSIONAL ETHICS	CO1	Understand and identify the basic aspiration of human beings								1							
		CO2	Envisage the roadmap to fulfill the basic aspiration of human beings.								2							
		CO3	Analyze the profession and his role in this existence.								2							
19UC0011	*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				
Note: * marked course areaudit courses																		
BASIC SCIENCES																		
19MT1101	MATHEMATICS FOR COMPUTING	CO1	Understand the basic Structures, relations and permutations & combinations, probability	2														
		CO2	Model and solve the relevant physical problems mathematically as a system of linear equations.	2														
		CO3	Apply the rules of Propositional logic to establish valid results of mathematical arguments, Induction and solve recurrence relations.	2														
		CO4	Understand the graphs and analyze different problems associated with computer, logic design.	2														
		CO5	Describe the Aptitude & Reasoning skills	2														
19MT2102	MATHEMATICS FOR ENGINEERS	CO1	Apply differential and integral calculus to find maxima & minima of functions and evaluate the integrals	2														
		CO2	Model and solve the relevant phenomena as a differential equation.	2														
		CO3	Demonstrate Fourier series and Analytic functions	2														
		CO4	Describe probability , Random Variables and Algebraic structures	2														
19BT1001	BIOLOGY FOR ENGINEERS	CO1	Acquire the Knowledge of basic biology						2	2								
		CO2	Acquire the Knowledge of Human Biological Systems						2	2								

		CO3	Acquire Knowledge on Microorganisms and Biosensors						2	2								
SCIENCE ELECTIVE-1																		
19PH1006	MATERIALS AND MEASUREMENTS	CO1	Understand the basic lattice structure and bondings in materials.															
		CO2	Acquire the knowledge on the electrical properties of conductors and semiconductors.															
		CO3	Understand the materials used in the MEMS technology and the fabrication process.															
		CO4	Acquire the knowledge on generalized measurement system and able to select the suitable transducer for measurement applications.															
		CO5	Apply the skill of using meters for the measurement process.															
SCIENCE ELECTIVE-2																		
19CY1101	ENGINEERING CHEMISTRY	1	Demonstrate different types of semiconducting materials	1		1										1	1	
		2	llustratephotophysical basis of light absorption and emission by materials	1		1										1	1	
		3	Sketch the underlying principles of organic light emitting diodes					1		1						1	1	

		4	Explain the concepts of solar cells modules and memory devices					1	1	1						1	1	
SCIENCE ELECTIVE-3																		
19EE2101	ELECTRICAL CIRCUITS	CO1	Analyze transient behavior of DC & AC circuits and Two port networks.		1													
		CO2	Analyze the single and three phase AC circuits.			1	1											
		CO3	Understand the concepts of magnetic circuits and Frequency response in electrical circuits.			1		1										
		CO4	Understand the concepts of network topology and two port networks.			1										1		
		CO5	Test the Electrical networks of AC & DC															
ENGINEERING SCIENCES																		
19SC1101	PROBLEM SOLVING AND COMPUTER PROGRAMMING	CO1	Illustrate how problems are solved using computers and programming.	1	2										1			
		CO2	Illustrate and use Control Flow Statements in C.	1	2										1			
		CO3	Interpret & Illustrate user defined C functions and different operations on list of data.	1	2													

		CO4	Implement Linear Data Structures and compare them.				2											
		CO5	Apply the knowledge obtained by the course to solve real world problems.	1	2		2											
19ME1103	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										
19SC1202	DATA STRUCTURES	CO1	Apply measures of efficiency on algorithms and Analyse different Sorting Algorithms.	1	1											1	1	
		CO2	Analyse and compare stack ADT and queue ADT implementations using linked list and applications.	1			1									1	1	
		CO3	Analyse the linked implementation of Binary, Balanced Trees and different Hashing techniques.	1			1									1	1	
		CO4	Analyse different representations, traversals, applications of Graphs and Heap organization.		1		1									1	1	
		CO5	Develop and Evaluate common practical applications for linear and non-linear data structures.	1	1											1	1	
19SC1209	DESIGN TOOLS	CO1	Practice the design ideology by artistic skill			1												

	WORKSHOP -II	CO2	Visualize the design ideology by using VR technology				2											
		CO3	Visualize the design ideology by incorporating VR technique					2										
		CO4	Visualize and present his design idea by applying AR technique				2											
19SC1203	OBJECT ORIENTED PROGRAMMING	CO1	Understand basic Concepts of OOP, fundamentals of java and apply the concepts of classes and objects through Java Language. Apply constructors, Overloading, parameter passing.			2		2										1
		CO2	Apply access control, Inheritance, Packages.			2		2										1
		CO3	Apply Interfaces, Exception Handling, multi-threading, I/o			2		2										1
		CO4	Apply collection framework and event driven programming.			2		2										1
			Apply object-oriented programming concepts to write programs and Analyses requirements and design to implement lab-based project with SDLC in a group of students.							1		1	1			1		
19EC1101	DIGITAL LOGIC & PROCESSORS	CO1	Understand numerical and character representations in digital logic, number system, data codes and the corresponding 8design of arithmetic circuitry. Understanding Logic gates, Logic theorems, Boolean algebra and SOP/POS expressions.	2	2													
		CO2	Combinational systems design using standard gates and minimization methods	2	2												1	2
		CO3	Sequential systems: Design of counters using flip flops.	2	2												1	2
		CO4	Understanding PLA's, PAL's, FPGA's and processors		2													2

		CO5	Analyzing and realization of Boolean functions, half adder, encoders, decoders, flip flops and counters.					1								1	2
19EE1201	BASIC ELECTRICAL AND ELECTRONIC CIRCUITS	CO1	Understand basics of DC circuit analysis	2				1									
		CO2	Understand fundamentals of AC circuits	2				2									
		CO3	Understand characteristics of PN junction diode and applications of PN junction diode	2				2									
		CO4	Understand number systems and their conversions	2				2									
19SC1106	TECHNICAL SKILLS-1(CODING)	CO1	Apply the concepts of basic programming to solve the basic problems, pattern based problems	2	2											1	
		CO2	Build solutions for problems on Numbers and array based problems , functions, recursion	2	2											1	
		CO3	Solve problems solutions for character/string based problems and pointers	2	2											1	
		CO4	Build solutions to programs on Data structures concepts.	2	2											1	
PROFESSIONAL CORE COURSES																		
19EC1202	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											2	
		CO2	Understand, analyze and design main, cache and virtual memory organizations.		2											2	
		CO3	Understand, analyze and design different types of I/O transfer techniques.		2											2	
		CO4	Understand the design issues of RISC and CISC CPUs and the design issues of pipeline architectures.			2										2	2
19EC2103	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		2											2	

			Op-AMP and analyze active filters														
		CO4	Analysis of different types of oscillators, filter and regulators.		2											2	
		CO5	Design and Testing of Analog circuits for realistic applications		2											2	
19EC2106	EMBEDDED CONTROLLERS	CO1	Understand the architecture and programming concepts of 8086 Microprocessor	1	1												
		CO2	Apply the Programming concepts of 8051 Microcontroller	2	2												
		CO3	Analyse the Interfacing of Peripherals to the 8051 microcontrollers through programming. Understand the basic architectures of PIC and ARM 7 microcontrollers	1	1												
		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				2										
19EE2102	ELECTRICAL POWER ENGINEERING	CO1	Understand working of various generating stations and economical aspects of generation				1										
		CO2	Understand the parameters of overhead transmission lines and underground cables		2												
		CO3	Analyze the performance of overhead transmission lines and AC/DC distribution.				2										
		CO4	Understand Mechanical Sag, corona, Insulators and substation layouts.			2											
19EE2103	ELECTRICAL MACHINES	CO1	Understand the basic principles of electro mechanical energy conversion.	1												2	
		CO2	Compute the performance of DC machines.				2									2	
		CO3	Select a suitable technique to find the voltage				2									2	

			regulation of an alternator and analyze the load sharing.															
		CO4	Determine the performance of Transformers.					2								2		
		CO5	Test the performance of Electrical Machines.	2												2		
19EE2201	INDUSTRIAL APPLICATIONS OF ELECTRICAL MACHINES	CO1	Understand the concepts of the 3- phase induction motor				2									2		
		CO2	Select different speed control and starting methods of induction machine.				2									2		
		CO3	Analyze the performance of 3-phase synchronous motor				2									2		
		CO4	Select suitable motor for particular industrial applications.				2									2		
		CO5	Test the performance of Motors for various applications.	3													3	
19EE2202	POWER ELECTRONICS	CO1	Understand the differences between signal level and power level devices.			2	2									2		
		CO2	Analyse the operation and performance of DC-DC Converters			1	1									1		
		CO3	Analyse the operation and performance of voltage source inverters			1	1									1		
		CO4	Understand the operation of phase controlled converters			1	1									1		
		CO5	Demonstrate and test basic power electronic converters by hardware realization and MATLAB software.			2	2									2		
19EE2203	COMPUTER APPLICATIONS IN	CO1	Apply load flow and fault analysis in a power system	2												2		

	POWER SYSTEMS	CO2	Understand the principle of protective relays & circuit breakers	2												2	
		CO3	Understand over current, distance and differential protection schemes	2												2	
		CO4	Understand rotor angle stability	2												2	
		CO5	Analysis of Power system problems using simulation tools	2												2	
19EE2204	CONTROL SYSTEMS	CO1	Understand the basics of Control system components and its modelling.	1				1									
		CO2	Analyse the control systems under time domain and stability analysis.	2				2									
		CO3	Analyze the control systems under frequency domain analysis.	1				1									
		CO4	Analyze the state space model equations and Understand the control though PLC	1				1									
		CO5	Test the operation of control systems using software & prototype models				2										
19EM3201	SIGNAL PROCESSING	CO1	Understand basic concepts related to Signal Processing System		2											2	
		CO2	Ability to Analyse the Signal Processing Algorithms		3											3	
		CO3	Ability to Analyse the Filter design Methodologies		3											3	
		CO4	Ability to Analyse Signal Processing algorithms in different case studies		3											3	

19EE3101	AI TECHNIQUES IN ELECTRICAL ENGINEERING	CO1	Understand the neural network models, different architectures with different learning types and various algorithms for ANN to solve the load forecasting problems in Power systems	1	1													
		CO2	Apply ANN paradigms in Electrical Engineering	1	1													
		CO3	Apply the fuzzy logic concept, fuzzy sets, with suitable membership function with proper de-fuzzification methods Electrical Engineering	1	1													
		CO4	Apply the different cross over methods and their elitism, convergence of algorithm Electrical Engineering	1	1													
INDUSTRIAL AUTOMATION																		
19EE3111	INDUSTRIAL COMMUNICATION PROTOCALS & CYBER SECURITY		Understand the various Industrial Data Communication networks	1														
		CO2	Understand the industrial protocols and standards.	1														
		CO3	Apply the knowledge of cyber-security in industrial and various automation domains.	1														
		CO4	Understand the hacking concepts and counter attacking methods in automation.	1														
								2										
19EE3112	IOT FOR INDUSTRIAL	CO1	Understand the IOT terminology, technology	1														

	AUTOMATION	CO2	Apply the IOT elements to industrial automation	1														
		CO3	Understand the concept of M2M (machine to machine) with necessary protocols	1														
		CO4	Apply M2M for industrial automation	1														
								2										
19EE3113	SCADA AND DCS	CO1	Understand the need for SCADA for automation	1														
		CO2	Understand the principle of operation of SCADA elements	1														
		CO3	Understand principle operation of DCS	1														
		CO4	Apply the SCADA & DCS for industrial automation	1														
								2										
19EE3211	INDUSTRIAL DRIVES AND CONTROL	CO1	Understand electric drive system components and dynamics of a drive system.		1													
		CO2	Develop controllers for DC drive systems.			2												
		CO3	Develop controllers for AC drive systems.			2												
		CO4	Apply special machine drives for precise industrial processes.			2												
						2												
GREEN ENERGY TECHNOLOGIES																		
19EE3121	SOLAR PV AND	CO1	Understanding the need of Solar PV and Solar Thermal systems	1												1		

	THERMAL TECHNOLOGIES	CO2	Understanding the applications of solar thermal energy systems		2											2	
		CO3	Understand the design aspects of Solar PV system		2											2	
		CO4	Understand the operational issues of grid connected and isolated solar PV system		1											1	
19EE3122	WIND AND MICRO ENERGY SOURCES	CO1	Understand the concepts of wind energy conversion and measurement system.	1	1												
		CO2	Apply the concepts of wind energy system to electric power grid.	2	2												
		CO3	Understand the concepts ofgeothermal energy systems.	2	2												
		CO4	Understand the concepts of tidal, ocean and bio-mass energy systems.	1	1												
19EE3123	ENERGY CONSERVATION & AUDIT	CO1	Understand the energy auditing methods to meet the energy conservation and various tariffs		2		2										
		CO2	Apply the energy conservation techniques to power system elements		2		2										
		CO3	Understand the energy conservation opportunities in industrial motors and lighting systems		2		2										
		CO4	Understand the energy conservation opportunities incooling systems and cogeneration		2		2										
19EE3221	ENERGY STORAGE SYSTEMS	CO1	Interpret the significance of energy storage systems	2	2												
		CO2	Demonstrate various devices for electrochemical, mechanical ,elastic and hydro storage systems	2	2												
		CO3	Demonstrate various electro-magnetic energy storage systems	2	2												
		CO4	Apply energy storage technologies for smart electrical energy consumption	2	2												
19EE3222	ENERGY MANAGEMENT	CO1	Understand the need for energy management	1													
		CO2	Understand the Energy conservation building codes and energy conservation opportunities in different	1													

	SYSTEMS		types of buildings.															
		CO3	Understand the energy conservation through cogeneration plants	1														
		CO4	Understand the energy conservation opportunities in pumps and cooling systems	2														
SMART GRID TECHNOLOGIES																		
19EE3131	ENERGY ACCOUNTING AND MANAGEMENT SYSTEMS	CO1	Understand the communication technology and standards in smart grid	2														
		CO2	Apply the knowledge of information security in smart grids.					2										
		CO3	Understand the Interoperability and Standards.								2							
		CO4	Understand the hacking techniques and cyber-security in smart grid.				3										3	3
19EE3132	SUBSTATION PRACTICE	CO1	Understand the evolution and various components of smart grids.		1													
		CO2	Understand the smart sub-station operation and applications in smart grids.		1													
		CO3	Analyze various load forecasting techniques in modern electrical power systems.		1													
		CO4	Understand the Volt/Var control techniques in smart grid.		1													
19EE3133	DISTRIBUTION SYSTEM TESTING AND SAFETY	CO1	Understand the operation of distributed energy resources		1													
		CO2	Interpret Maximum Power Point Tracking System		1													

	PRACTICES	CO3	Understand the basic concepts of Energy Storage systems		1													
		CO4	Apply Power Electronic converters for DG integration		1													
19EE3231	SMART GRID COMMUNICATION AND CYBER SECURITY	CO1	Understand the communication technology and standards in smart grid		1													
		CO2	Apply the knowledge of information security in smart grids.		1													
		CO3	Understand the Interoperability and Standards.		1													
		CO4	Understand the hacking techniques and cyber-security in smart grid.		1													
19EE3232	SMART DISTRIBUTION SYSTEMS	CO1	Understand the evolution and various components of smart grids.		1													
		CO2	Understand the smart sub-station operation and applications in smart grids.		1													
		CO3	Analyze various load forecasting techniques in modern electrical power systems.		1													
		CO4	Understand the Volt/Var control techniques in smart grid.		1													
							2											
ELCTRIC VEHICLE TECHNOLOGIES																		
19EE3141	INTRODUCTION TO ELECTRIC VEHICLE	CO1	Understand the History, Economics and environmental issues of Electric Vehicles			1												
		CO2	Analyze the power train components and dynamics of EV			1												
		CO3	Select and size the motor for power train of EV			1												
		CO4	Select and size the converter for EV			1												
19EE3142	BATTERY MODELLING FOR	CO1	Understand the key components of Battery management systems	1														
		CO2	Understand the key functions of Battery management systems			1												

	ELECTRIC VEHICLES	CO3	Analyze the static battery models			1												
		CO4	Analyze the dynamic battery models			1												
19EE3143	CHARGING STATION FOR ELECTRIC VEHICLE	CO1	Interpret Power electronic converters for electric vehicle charging	2														
		CO2	Develop control algorithms for various electric vehicle charging modes					2										
		CO3	Demonstrate charging station infrastructure							2								
		CO4	Demonstrate installation of charging station				3										3	3
19EE3241	BATTERY STATES ESTIMATION	CO1	Understand the basic SOC estimation techniques of Battery			1												
		CO2	Apply Kalman filter for SOC estimation of Battery			1												
		CO3	Understand the methods to estimate the SOH of a Battery			1												
		CO4	Select different techniques used for Power management of battery			1												
19EE3242	ELECTRIC VEHICLE FAULT DIAGNOSIS AND CONTROL	CO1	Understand characteristics of sensors and actuators used for electric vehicle control	1														
		CO2	Understand usage of microcontroller for digital control of electric vehicle				2											
		CO3	Apply communication protocols for data communication in electric vehicle control system	1														
		CO4	Model fault diagnosis system for electric vehicle				1											
FLEXI CORE COURSES																		
19EE3104	UTILISATION OF ELECTRICAL ENERGY	CO1	Identify the motor ratings for different applications			1												
		CO2	Understand the concepts of electric heating & welding.			1												

		CO3	Compare various illumination methods			1											
		CO4	Apply electrical traction to different services			1											
19EE3105	POWER QUALITY	CO1	Understand the dynamics of electrical drives	1				1								1	
		CO2	Apply phase and chopper control techniques to DC motor drive	2				2								2	
		CO3	Analyze stator and rotor side speed control of Induction motor drive	2				2								2	
		CO4	Apply various control techniques to synchronous motor drive	2				2								2	
19EE3103	RESTRUCTERED POWER SYSTEMS	CO1	Understand the concept of deregulation market structure, market architecture and power system old vs new.			2										1	
		CO2	Understand electricity sector structures different structure models , bilateral and pool markets and LMP based markets			2										1	
		CO3	Analyze transmission pricing methods, congestion management methods and effect of congestion on LMPs			4										1	
		CO4	Understand ancillary services system security in deregulation					2								1	
19EE3105	POWER QUALITY	CO1	Outline the Power Quality problems in power system.							2						1	
		CO2	Model the characteristics of Long and short interruptions.					3									2
		CO3	Model the characteristics of voltage sag.					3									2

		CO4	Demonstrate various mitigation methods for interruptions and voltage sag					2									2	
19EC3109	DATA NETWORKS AND PROTOCOLS	CO1	Understand the various Industrial Data Communication networks	1	1													
		CO2	Understand the industrial protocols and standards.	1	1													
		CO3	Apply the knowledge of cyber-security in industrial and various automation domains.	1	1													
		CO4	Understand the hacking concepts and counter attacking methods in automation.	1	1													
				2				2										
19EC3016	WIRELESS COMMUNICATIONS	CO1	Understand cellular concept, frequency reuse and hand off strategies.	1	3													
		CO2	Evaluate and design wireless and cellular communication systems over a stochastic fading channel.			1	2	1										
		CO3	Evaluate Equalizers and diversity techniques in mobile receiver design			1	2	1										
		CO4	Analyze latest wireless technologies such as wireless systems and standards and OFDM systems	1	2													
		CO5	Various key technologies used in wireless communications and the impairments in the various wireless communications.	1	1	1	1	1	1									
19EM5101	FUNDAMENTALS OF INTERNET OF THINGS		Understand functional blocks of IoT devices	2														
		CO2	Demonstrate the Technologies involved in IoT based Systems					2										
		CO3	Apply different wireless technologies used for the development of IoT based Networks							2								

		CO4	Analyse various IOT Real time application design Components				3									3	3
19EM5104	WEB INTELLIGENCE	CO1	Able to understand the basic concepts of world wide web and supported new artificial intelligence	1													
		CO2	Ability to understand artificial intelligence and neural network-based web monitoring			1											
		CO3	Analyse web-based BISC decision support in the web			1											
		CO4	Analyse social networking intelligence			1											
OPEN ELECTIVES OFFERD BY THE DEPARTMENT																		
19EE40B4	Energy Estimation & Audit	CO1	Understand the present power scenario in India and need for energy estimation and Audit.	1		1											
		CO2	Understand the operation of Induction motors and various energy conservation opportunities	1		1											
		CO3	Understand the basics of transformers, cables and their energy conservation opportunities.	1		1											
		CO4	Understand Lighting systems, pumping systems and their energy conservation opportunities.	1		1											
19EE40B3	Renewable Energy Resources	CO1	Understand and analyze the solar thermal applications and solar photovoltaic cells	2													
		CO2	Analyze the performance of wind and tidal, wave and Ocean thermal energy conversion systems					2									

		CO3	Understand and analyze the operation of geothermal and bio energy conversion							2									
		CO4	Understand and analyze the Biogas digesters and bio power plants				3										3	3	