K L UNIVERSITY
DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING
PROGRAM DEVELOPMENT DOCUMENT
B.Tech. in Electrical and Electronics Engineering
2018

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 leader in education, extension activities and Carrying out 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 having strong theoretical foundation, innovative, good design experience , exposure to research and development and responsible for social needs.

Program Educational Objectives:

1. Apply their immense knowledge acquired in Electrical & Electronics Engineering with modern computational tools to serve the needs of ongoing research, industry.
2. Apply immense knowledge acquired in electrical and Electronics Engineering to pursue higher education.
3. Employ leadership qualities with professional and ethical values in effectively dealing with societal challenges.
4. Inculcate in students, self and lifelong learning, effective interpersonal communication skills when working with multidisciplinary teams.

Program Outcomes (POs):

1. An ability to apply knowledge of mathematics, science, engineering fundamentals and an engineering specialization for the solution of complex engineering problems.

2. An ability to identify, formulate, research literature, analyse complex engineering problems in mechanical engineering using first principles of mathematics, natural sciences and engineering sciences
3. An ability to design solutions for complex engineering problems and system component or processes that meet the specified needs considering public health & safety and cultural, societal & environment
4. An 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 engineering problems
5. Ability to create, select and apply appropriate techniques, resources and modern engineering activities, with an understanding of the limitations
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
7. Ability to demonstrate the knowledge of engineering solutions, contemporary issues understanding their impacts on societal and environmental contexts, leading towards sustainable development
8. An ability to apply ethical principles and commit to professional ethics and responsibilities and norms of engineering practice
9. An ability to function effectively as an individual, and as a member or leader in diverse teams and in multi-disciplinary settings
10. Ability to communicate effectively oral, written reports and graphical forms on complex engineering activities
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
12. An ability to recognize the need for and having the preparation and ability to engage independent and life-long learning in broadest context of technological change.

Program Specific Outcomes (PSOs):

1. An ability to demonstrate the knowledge, skill to analyse the cause and effects on Electrical system, processes and systems.
2. An ability to apply the acquired Electrical Engineering knowledge for the advancement of society and self.

MAPPING OF PEOs WITH MISSION OF THE DEPARTMENT

Key components From Department Mission	MISSION 1	MISSION 2	MISSION 3	MISSION 4
	Training the leaders of tomorrow	Training the innovators of tomorrow	Training the outstanding career professionals of tomorrow	Conducting fundamental research
Apply their immense knowledge acquired in Electrical & Electronics Engineering with modern computational tools to serve the needs of ongoing research, industry.		√	√	√
Apply immense knowledge acquired in electrical and Electronics Engineering to pursue higher education.		√	√	√
Employ leadership qualities with professional and ethical values in effectively dealing with societal challenges.	√	√	√	
Inculcate in students, self and lifelong learning, effective interpersonal communication skills when working with multidisciplinary teams.	√	√	√	

MAPPING OF PEOs WITH POs

PO No.	POs	Apply their immense knowledge acquired in Electrical & Electronics Engineering with modern computational tools to serve the needs of ongoing research, industry.	Apply immense knowledge acquired in electrical and Electronics engineering to pursue higher education.	Employ leadership qualities with professional and ethical values in effectively dealing with societal challenges.	Inculcate in students, self and lifelong learning, effective interpersonal communication skills when working with multidisciplinary teams.
		PEO 1	**PEO 2**	**PEO 3**	**PEO 4**
PO 1	Engineering knowledge	3	3	3	
PO 2	Problem analysis	3	3	2	
PO 3	Design/ development of solutions	3	3	2	
PO 4	Conduct investigations of complex problems	3	3	3	
PO 5	Modern tool usage	3	3	3	
PO 6	The engineer and society	2	2	3	
PO 7	Environment and sustainability	2	2	3	1
PO 8	Ethics	2	2	3	2
PO 9	Individual and team work	2	2	2	3
PO 10	Communication	1	1	2	3
PO 11	Project management and finance	1	1	3	2
PO 12	Lifelong learning	3	3	2	3
PSO 1	An ability to demonstrate the knowledge, skill to analyze the cause and effects on Electrical system, processes and systems.	3	3	2	3
PSO 2	An ability to apply the acquired Electrical Engineering knowledge for the advancement of society and self.	3	3	3	3

2018-2022 BATCH Course Outcomes vs Program Outcomes

Course Articulation Matrix

S No	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	18UC1101	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									
2	18UC1202	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 and Analysing the given information, a student is required to understand the given information and thereafter answer the given questions on the basis of comparative analysis of the data in the form of tabulation, bar graphs, pie charts, line	2			2										

				graphs. Analyse the given data to find whether it is sufficient or not.															
			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 finding the solutions. Analyze the given conditions and finding out all the possible arrangements in linear & circular order.	2				2									
3	18UC2103	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. One should be enabled to use English Language efficiently in the written medium to communicate Personal as well as Professional.									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. One is able to create a healthy work-environment and prove to be an asset or one of the most reliable resources to the Organization. As a professional, one is mature to bridge the gulf between the existing behavior/ lifestyle and the expected corporate behaviour cum lifestyle.								2						
			CO3	Apply the concepts of Time and work, the students will be able to solve the questions related to 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, problems based on trains, boats, circular tracks, races and games.	2													

			CO4	Apply Venn diagrams to the given statements to find out whether the given conclusions can be deducted from the given statements. Apply the logical implications and also the negations of various connectives to find the solutions. Analyze the given data and representing the data in the form of Venn Diagrams to find relations between any given set of elements.	2				2									
4	18UC2204	Aptitude Builder-1	CO1	Apply the concept of Critical Reading and Analytical Reading and comprehend the key ideas and gist of a passage. Understand the importance of the presentation skills, analyze the given topic, apply various strategies and the principles of grammar in written expression.					2	2								
			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									

5	18UC3105	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 communication and apply in everyday work and life.								2		2				
			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													
6	18UC0007	Indian Heritage	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													
7	18UC0008	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			
8	18UC0009	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									
9	18UC0010	Universal Human Values and 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							
10	18SC1103	Single Variable Calculus and Matrix Algebra	CO1	Model the physical laws and relations mathematically as a first order differential equations, solve by analytical and numerical methods also interpret the solution.	2														
			CO2	Model physical laws and relations mathematically as a second/higher order differential equations, solve by analytical method and interpret the solution.	2														
			CO3	Obtain the Fourier series expansions of periodic functions and use the series to solve ordinary differential equations.	2														
			CO4	Model physical problems mathematically as a system of linear equations and solve them by analytical and numerical methods. Also, determine the nature of Quadratic form using Eigen values.	2														
11	18SC1104	Foundations of Computational Mathematics	CO1	Identify the quantities of Real world problems by using the concepts of arithmetic.	1														
			CO2	Computing the areas of regular and irregular solids of real world problems.	1														

			CO3	Identifying the numbers by successive division also finding the solution of equations.	1														
			CO4	Estimating the roots of an equations and find the unknown values from the data by numerical methods	1														
12	18SC1105	Logic and Reasoning	CO1	Understand how to use Venn diagrams to find the conclusion of statements, solve puzzles using binary logic.	1														
			CO2	Understand to solve problems on clocks, calendars and problems on Non-verbal reasoning.	1														
			CO3	Understand the available models for Venn diagrams with given data, solve problems relating to cubes and number and letter series.	1														
			CO4	Understand the techniques used to solve problems puzzles using analytical reasoning on coding and decoding and blood relations	1														
13	18MT1201	Multivariate Calculus	CO1	Determine extreme values for functions of several variables	2														
			CO2	Determine area, volume moment of inertia through multiple integrals in Cartesian or polar coordinates.	2														
			CO3	Apply the concepts of vector calculus to calculate the gradient, directional derivative, arc length, areas of surfaces and volume of solids in practical problems	2														
			CO4	Obtain analytical and numerical solutions of Heat and wave equations	2														
14	18PH1004	Solid State Physics	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.	1		1				1								
			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	1		1												

				load, for identification of materials having specific engineering applications.															
			CO3	Understands the role of electronic energy band structures of solids ingoverning various electrical and optical properties of materials.	1						1								
			CO4	Understands the formation of various energy band structures if various types of solids using various models. Applies the knowledge of band structures for various semiconductor applications.	1						1								
			CO5	Apply the knowledge on structure and properties of materials while executing related experiments and develop some inter disciplinary projects.	2			2											
15	18CY1001	Engineering Chemistry	CO1	Describe some important design considerations in choosing a battery for a specific application.			2	2											
			CO2	Predict potential complications from combining various chemicals or metals in an engineering setting			2	2											
			CO3	Examine water quality and select appropriate purification technique for intended problem			3	3											
			CO4	Explain the role of chemical kinetics in the formation and destruction of ozone in the atmosphere and predict the connection between molecular behavior and observable physical properties.			3												
			CO5	An ability to analyze& generate experimental skills			3	3											
16	18BT1001	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								
17	18SC1101	Problem Solving and Computer	CO1	Illustrate how problems are solved using computers and programming	2	2													

		Programming	CO2	Illustrate and use Control Flow Statements in C.	2	2													
			CO3	Interpret & Illustrate user defined C functions and different operations on list of data.	2	2													
			CO4	Implement Linear Data Structures and compare them				2											
			CO5	Apply the knowledge obtained by the course to solve real world problems	2	2													
18	18SC1101	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											
19	18SC1202	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	
20	18EC1002	Engineering Graphics & Design for Electrical Engineers	CO1	ConstructandInterpretdrawingscaleto visualizethe geometriesof Engineeringobjectsusingpoints,lines bothmanuallyandbyAutoCAD.	1											1			
			CO2	Drawprojectionofplanes,solidsandGeneratethe sectionalviewsofsolidsbothmanuallyandby AutoCAD.	1											1			

			CO3	DrawEngineeringcurvesanddevelopthelateral surfaceofsolidsbothmanuallyandbyAutoCAD.	1											1		
			CO4	Buildorthographicprojections,createisometric sketchesandidentifystandardfeaturesbothmanually andbyAutoCAD.	1											1		
			CO5	DraftappropriateElectricalandElectronicssymbols, withPCBstructureandhousewiringlayouts.	1											1		
21	18EE1003	Workshop Practice for Electrical & Electronics Engineers	CO1	Prepare wooden Lap T, Plus joints. Prepare square and L fits. Fabricate parts made of sheet metal. Demonstrate the ability to execute stair-case lighting and godown lighting house wiring connections		1												
			CO2	Use arc welding equipment and tools to prepare butt joint for joining mild steel metal flats in a safe manner. Demonstrate the ability to melt and pour molten material into dies. Perform facing and plain turning on Lathe to prepare cylindrical jobs. Drill holes on Mild steel metal flats using drilling machine.				2									
			CO3	Identify hardware components in a computer system, Assemble and disassemble a computer system, Install operating system and software				2										
			CO4	Identify electronics components& soldering practice, connect identified computers in a network,				2										
			CO5	Demonstrate the ability of fabricating a product involving multiple trade skills (at least three trades)					3									
22	18SC2004	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. 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.			2		2										1
23	18EE1201	Network Theory	CO1	Understand the circuit elements, Kirchhoff's law and theorems to solve the networks	1	1			1								1		
			CO2	Analyze the steady state behaviour of AC networks	2	2			2								2		
			CO3	Analyze the physical circuits with Two port network	2	2			2								2		
			CO4	Understand the fundamentals of magnetic circuits and its analysis	1	1			1								1		
24	18EE3201	Electrical Engineering Measurements	CO1	Understand the Basic fundamentals of a measurements and characteristics	1														
			CO2	Implement the concepts of DC and AC bridges for the measurement of R-L-C measurements and applications.		2													
			CO3	Analyse the working of Electrical Measuring instruments for the measurement of Power, Energy and Power factor		2													
			CO4	Analyse various display and storage devices for the measurement process.		2													
			CO5	Demonstration of various measuring instrument for the electrical engineering parameters including programming capabilities													3		
25	18EE1202	Electromagnetic Fields	CO1	Apply the vector algebra to analyse electrostatic field distributions		2	2	2									2		
			CO2	Understand the importance of magneto static field and analyse its spatial distributions		1	1	1									1		
			CO3	Analyse the Force generation due to static fields		2	2	2									2		

			CO4	Analyse the importance of Electromagnetic fields and its distributions		2	2	2									2	
26	18MT1004	Probability & Numerical Methods	CO1	Identify the types of random variables and also obtain the mean and variance using mathematical expectation	1			2									3	
			CO2	Apply discrete and Continuous distributions to analyze various real-world situations	1			2									3	
			CO3	Draw conclusion about the population based upon samples drawn from it	1			2									3	
			CO4	Obtain the solutions of transcendental equations using numerical methods and also determine the future predictions using interpolation and different numerical techniques	1			2									3	
27	18EC1101	Digital System Design	CO1	Understand numerical and character representations in digital logic, number system, data codes and the corresponding design of arithmetic circuitry.		3												3
			CO2	Understanding Logic gates, Logic theorems, Boolean algebra and SOP/POS expressions.		1											1	
			CO3	Combinational and sequential systems design using standard gates and filp-flops and minimization methods		1			1								1	
			CO4	Verilog HDL design for logic gates, combinational and sequential Logic Functions.		1			1									1
			CO5	Concepts of Programmable Logic devices.		1			1								1	
28	18EC2103	Analog Electronic 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	

				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	
29	18EE2101	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													3	
30	18EE2102	DC Machines & Transformers	CO1	Apply the basic principles of electro mechanical energy conversion to electrical machines	2												2	
			CO2	Analyze operating characteristics of various types of DC generators.				2									2	
			CO3	Identify various speed control methods of DC motor and evaluate this performance				2	2								2	
			CO4	Evaluate the performance of a transformers and selecting it for particular application.				2	2								2	
			CO5	Test the DC machines and transformers to evaluate their performance	2			2									2	
31	18EE2103	Electrical Power Generation,	CO1	Understand working of various generating stations and	1		1										1	

		Transmission & Distribution		economical aspects of generation.															
			CO2	Analyseparameters of overhead transmission lines and underground cables.	2	2			2								2	
			CO3	Analyse performance of overhead transmission lines andAC / DC distribution networks.	1		1										1	
			CO4	Analyse Mechanical Sag, corona, Insulators and substation layouts.	1		1										1	
32	18EE2201	AC Rotating Machines	CO1	Understand the concepts of the 3- phase induction motor				**2**	**2**								**2**	
			CO2	Select different speed control and starting methods of induction machine.				**2**	**2**								**2**	
			CO3	Understand the concepts of 3-phase alternator.				2	2								2	
			CO4	Analyze the performance of 3-phase synchronous motor				3	3								3	
			CO5	Test the performance of AC Rotating Machines	2			2									2	
33	18EE2202	Control Systems	CO1	Analyse the concepts of control systems such as open loop, closed loop, transfer function approach, mathematical modelling of physical systems, and similarities between synchro's and AC generators.	1			1									1	
			CO2	Analyse the control systems in time domain andstability analysis of physical systems	2	2		2									2	
			CO3	Analysestabilityin frequency domain and different compensation techniques.	2			2						2			2	

			CO4	Understand the concepts of state space analysis	3	3		3	3								3	
			CO5	Test and apply the knowledge obtained in the subject by MATLAB or hardware.	3	3		3	3								3	
34	18EE2203	Power System Analysis & Stability	CO1	Apply the network matrices for solution of power flow problems	2	2											2	
			CO2	Apply the reactance diagrams for symmetrical short circuit faults in a power system.	2	2											2	
			CO3	Apply symmetrical components for unsymmetrical fault analysis in a power system.	2	2											2	
			CO4	Analyze rotor angle stability.	2	2											2	
			CO5	Test and Analyze various short circuit faults, load flows, economic dispatch problems, rotor angle stability problems using MATLAB.	2	2											2	
35	18EE3101	Power Electronics	CO1	Understand the differences between signal level and power level devices.	2												2	
			CO2	Analyse the operation and performance of DC-DC Converters			3	3									3	
			CO3	Analyse the operation and performance of voltage source inverters			3	3									3	
			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.														
36	18EE3102	Power System Protection	CO1	Understand the principle of protective relays & circuit breakers		1											1	

		&Control	CO2	Apply overcurrent, distance and differential protection schemes.	2	2			2								2	
			CO3	Analyze over voltage protection and economic operation of power system	2	2											2	
			CO4	Analyse automatic generation control and voltage regulators	2	2											2	
			CO5	Experimental verification of characteristics of differential relays and operation and control of power systems through programming /simulation.														
37	18EC2205	Embedded Controller	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										
38	18EM3201	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	
39	18EE3231	Solar PV and Thermal	CO1	Understanding the need of Solar PV and Solar Thermal systems	1												1	

		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	
40	18EE3222	Wind & 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 of geo-thermal energy systems.	2	2												
			CO4	Understand the concepts of tidal, ocean and bio-mass energy systems.	1	1												
41	18EE3223	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 in cooling systems and cogeneration		2		2										
42	18EE4121	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												
43	18EE4122	Energy	CO1	Understand the need for energy management	1													

		Management Systems	CO2	Understand the Energy conservation building codes and energy conservation opportunities in different types of buildings.	1														
			CO3	Understand the energy conservation through cogeneration plants	1														
			CO4	Understand the energy conservation opportunities in pumps and cooling systems	2														
44	18EE3231	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	
45	18EE3232	Substation Practice	CO1	Understand the evolution and various components of smart grids.		1											2		
			CO2	Understand the smart sub-station operation and applications in smart grids.		1											2		
			CO3	Analyze various load forecasting techniques in modern electrical power systems.		1											2		
			CO4	Understand the Volt/Var control techniques in smart grid.		1											2		
46	18EE3233	Distribution System Testing and Safety Practices	CO1	Understand the operation of distributed energy resources		1											2		
			CO2	Interpret Maximum Power Point Tracking System		1											2		
			CO3	Understand the basic concepts of Energy Storage systems		1											2		
			CO4	Apply Power Electronic converters for DG integration		1											2		

47	18EE4131	Smart Grid Communication and Cybersecurity	CO1	Understand the communication technology and standards in smart grid		1												2
			CO2	Apply the knowledge of information security in smart grids.		1												2
			CO3	Understand the Interoperability and Standards.		1												2
			CO4	Understand the hacking techniques and cyber-security in smart grid.		1												2
48	18EE4132	Smart Distribution Systems	CO1	Understand the evolution and various components of smart grids.		1												2
			CO2	Understand the smart sub-station operation and applications in smart grids.		1												2
			CO3	Analyze various load forecasting techniques in modern electrical power systems.		1												2
			CO4	Understand the Volt/Var control techniques in smart grid.				2										2
49	18EE3241	Introduction to Electric Vehicles	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											
50	18EE3242	Battery Modelling for Electric Vehicles	CO1	Understand the key components of Battery management systems	1													
			CO2	Understand the key functions of Battery management systems			1											
			CO3	Analyze the static battery models			1											
			CO4	Analyze the dynamic battery models			1											
51		Charging Stations	CO1	Interpret Power electronic converters for electric vehicle	2													

	18EE3243	for Electric Vehicle		charging															
			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
52	18EE4141	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												
53	18EE4142	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											
54	18EE3211	Industrial Communication Protocols & Cyber Security	CO1	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														

55	18EE3212	IoT for Industrial Automation	CO1	Understand the IOT terminology, technology	1														
			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					2										
56	18EE3213	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										
57	18EE4111	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												
58	18EE4112	Industrial Process Control & Automation	CO1	Understand the basic process flow in various industrial facilities like power plants, steel/ iron, chemical and cement industry.			2												
			CO2	Understand the need and different types if industrial automation.			2												
			CO3	Apply the PID design principles for tuning industrial controllers.			2												
			CO4	Analyze the performance of controllers in various industrial processes.			2												

59	18MB4051	PARADIGMS IN MANAGEMENT THOUGHT	CO1	Understand the basic management concepts along with an insight into levels of management.								1						
			CO2	Understand the key contributions of classical approach to Management											1			
			CO3	Understand and apply Quantitative methods to improve Management performance.								1						
			CO4	Understand the key contributions of Behavioral and contemporary approaches to Management.								1			1			
60	18MB4052	INDIAN ECONOMY	CO1	Understand the structure of Indian Economy						1								
			CO2	Understand the structural problems encountered by India						1								
			CO3	Develop a perspective approaches to economicplanning and development in India						1								
			CO4	Understand the role of the Indian Economy in the global context						1					1			
61	18MB4053	MANAGING PERSONAL FINANCES	CO1	Understand the need for effective financial planning											1			
			CO2	Analyze the basic concepts of money management, tax planning, consumer credit, housing and other consumer decisions, insurance, investments, retirement planning etc.											1			
			CO3	Evaluate various financial tax saving schemes to save money to get tax benefits.											1			
			CO4	Design savings and investment plans.											1			
62	18MB4054	BASICS OF MARKETING FOR ENGINEERS	CO1	Understand the basic concepts of marketing management											1			
			CO2	Analyze the markets and consumers, the changing environmental factors with special focus on technology products											2			
			CO3	Understand the basics of marketing mix											1			
			CO4	Create an appropriate strategy for the marketing of high tech products and services											2			

63	18MB4055	ORGANIZATION MANAGEMENT	CO1	Understand the theories and approaches of organizational management									1							
			CO2	Understand the basics of organization structure									1							
			CO3	Understand the methods for motivating in competitive business environment.									1							
			CO4	Understand the basic modes of maintaining good industrial relations									1							
64	18MB4056	RESOURCE, SAFETY AND QUALITY MANAGEMENT	CO1	Understand the basics systems of man power and materials management					1											
			CO2	Understand the basics systems of machinery management					1											
			CO3	Understand the basics systems of safety management						1										
			CO4	Understand the basics systems of quality management					1											