Course Outcomes and CO-PO-PSO articulation Matrix

Batch 2017-21

Semester-I/II

Subject: Basic Electrical Engineering	**Subject Code:**17ELE13/23
Course Outcomes	
CO1	Understand the basic concepts of DC circuits and Magnetic circuits and also able to solve problems related to DC and magnetic circuits.
CO2	Analysis of Single Phase and three phase AC Circuits and the representation of alternating quantities and also determining the power and other parameters in these circuits
CO3	Explain the construction, basic principle of operation, applications and also determine performance parameters of electrical Machines.
CO4	Discuss the importance of Electrical Safety Rules & standards and types of electrical wiring and domestic earthing.

CO-PO-PSO Mapping

COs	**POs**												**PSOs**		
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**
CO1	3												3		
CO2	3	2				2							3		
CO3	3	2				2							3		
CO4	2					2		2					3		
Average	2.75	2				2		2					3		

Semester-III

Subject: Engineering Mathematics-III	**Subject Code:**15MAT31
Course Outcomes	
CO1	Know the use of periodic signals and Fourier series to analyze circuits and systems communication.
CO2	Explain the general linear system theory for continous - time signals and digital signal processing using the Fourier transform and z-transform.
CO3	Employ appropriate numerical methods to solve algebraic and transcedental equations.
CO4	Apply Green's theorem, Divergence theorem and Stokes theorem in various applications in the field of electro-magnetic and gravitational fields and fluid flow problems.
CO5	Determine the extermals of functional and solve the simple problems for calculus of variations. Utilize the concepts of functional and their variations in the applications of communication systems, decision theory, synthesis and optimization of digital circuits.

CO-PO-PSO Mapping

COs	**POs**												**PSOs**		
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**
CO1	3	2													
CO2	3	2													
CO3	3	2													
CO4	3	2													
CO5	3	2													
Average	3	2													

Subject: Electric Circuit Analysis												**Subject Code:**17EE32		
Course Outcomes														
CO1	Understand the basic concepts, basic laws and methods of analysis of DC and AC networks ,Reduce the complexity of networks using source shifting and transformation and network reduction using transformations													
CO2	Solve complex electric circuits using network theorems													
CO3	Discuss resonance in series and parallel circuits													
CO4	Discus the importance of initial conditions and their evaluation and Synthesize typical waveforms using Laplace transformation													
CO5	Evaluate the performance of two port networks													
CO-PO-PSO Mapping														
COs	**POs**												**PSOs**	
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**
CO1	3	2													3
CO2	2	2													2
CO3	2	2													2
CO4	2	2													2
CO5	2	2													2
Average	2.2	2													2.2

Subject: Transformers and Generators												**Subject Code:**17EE33		
Course Outcomes														
CO1	Explain the construction, operation and performance of transformers, understanding different connections for the three phase operations, their advantages and applications													
CO2	Analyze the working and operation of dc generator and Synchronous machines.													
CO3	Analyze and explain the operation of the synchronous machine connected to infinite machine.													
CO4	Compare the effects of various reactance's on the performance of synchronous machine and Dc generator.													
CO5	Evaluate and analyze the various regulation of Synchronous machines by different methods.													
CO-PO-PSO Mapping														
COs	**POs**												**PSOs**	
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**
CO1	2	2				1							2	3	
CO2	2	1				1							2	3	
CO3	3	2				1							2	3	
CO4	2	2				1							2	3	
CO5	2	3				1							2	3	
Average	2.2	2				1							2	3	

Subject: Analog Electronic Circuits												**Subject Code:**17EE34		
Course Outcomes														
CO1	Design and Analyze the diode circuits													
CO2	Compare different biasing circuits and apply the knowledge to transistor amplifiers and the transistor switching													
CO3	Explain the concept of feedback, its types and design of feedback circuits													
CO4	Design and analyze the power amplifier circuits and oscillators for different frequencies													
CO5	Understand FET and MOSFET amplifiers in the common source mode with fixed bias.													
CO-PO-PSO Mapping														
COs	**POs**												**PSOs**	
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**

CO1	2	3	1											2
CO2	2	3	2											3
CO3	2	2	2											2
CO4	2	2	2											2
CO5	2	2												3
Average	2	2.4	1.75											2.4

Subject: Digital System Design												**Subject Code:**17EE35		
Course Outcomes														
CO1	Solve problems based on different Boolean expression minimization Techniques.													
CO2	Analyse and design different combinational circuit													
CO3	Analyse and design different sequential circuit													
CO4	Explain and analyse State Machine Models													
CO5	Describe the structure of HDL module, operators,data types													
CO-PO-PSO Mapping														
COs	**POs**												**PSOs**	
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**
CO1	2	1													1
CO2	2	2	1												2
CO3	2	2	1												2
CO4	2	2													2
CO5					1										1
Average	2	1.75	1		1										1.6

Subject: Electrical and Electronic Measurements												**Subject Code:**17EE36		
Course Outcomes														
CO1	Outline the importance of units and dimensions.													
CO2	Measure resistance, inductance and capacitance by different methods.													
CO3	Compare and anaylze the working of various meters used for measurement of power and energy.													
CO4	Analyse the working of different electronic instruments and display devices.													
CO-PO-PSO Mapping														
COs	**POs**												**PSOs**	
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**
CO1	2	2											2		1
CO2	2	2											2		1
CO3	2	2											2		2
CO4	2	2											1		2
Average	2	2											1.75		1.5

Subject: Electrical Machines Lab 1												**Subject Code:**17EEL37		
Course Outcomes														
CO1	Demonstrate different tests on transformers to evaluate the performance characteristics of the transformers.													
CO2	Analyze single phase transformers for three phase operation and phase conversion.													
CO3	Evaluate and compare the voltage regulation, performance of synchronous generator using the test data obtained in the laboratory.													
CO-PO-PSO Mapping														
COs	**POs**												**PSOs**	
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**
CO1	3	2				1			1	1			2	3	

CO2	3	2				1			1	1			2	3	
CO3	3	2				1			1	1			2	3	
Average	3	2				1			1	1			2	3	

Subject: Electronics Laboratory									**Subject Code:**17EEL38						
Course Outcomes															
CO1	Design and test different diode circuits.														
CO2	Design and test amplifier and oscillator circuits and analyse their performances.														
CO3	Utilize universal gates and IC's for code conversion and arithmetic operation.														
CO4	Design and verify different counters and sequence generators														
CO-PO-PSO Mapping															
COs	**POs**												**PSOs**		
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**
CO1	2	2			1				2	2					3
CO2	2	2			1				2	2					3
CO3	2	1			2				2	2					3
CO4	2	2			1				2	2					3
Average	2	1.8			1.3				2.5	2.5					2.5

Semester-IV

Subject: Engineering Mathematics									**Subject Code:**17EE41						
Course Outcomes															
CO1	Solve first and second order ODE arising in flow problems using single step and multistep numerical methods.														
CO2	Solve problems of quantum mechanics employing Bessel's function relating to cylindrical polar coordinate systems and Legendre's polynomials relating to spherical polar coordinate systems.														
CO3	Understand the analyticity, potential fields, residues and poles of complex potentials in field theory and electromagnetic theory. Describe conformal and bilinear transformation arising in aerofoil theory, fluid flow visualization and image processing.														
CO4	Solve problems on probability distributions relating to digital signal processing. Describing joint probability distributions and stochastic matrix connected with the multivariable correlation problems for feasible random events.														
CO5	Draw the validity of the hypothesis proposed for the given sampling distribution in accepting or rejecting the hypothesis. Define transition probability matrix of a Markov chain and solve problems related to discrete parameter random process.														
CO-PO-PSO Mapping															
COs	**POs**												**PSOs**		
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**
CO1	3	2													
CO2	3	2													
CO3	3	2													
CO4	3	2													
CO5	3	2													
Average	3	2													

Subject: Power Generation and Economics	**Subject Code:**17EE42
Course Outcomes	
CO1	Interpret the working of hydroelectric, steam, nuclear power plants and state functions of major equipment of the power plants.
CO2	Understand and classify various substations and explain the importance of grounding.
CO3	Analyze the economic aspects of power system operation and its effects.

CO4	Explain the importance of power factor improvement methods.

CO-PO-PSO Mapping

COs	POs												PSOs		
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**
CO1	2					2	2						3	2	
CO2	2					2	2						3	2	
CO3	2	2				2	2						2	2	
CO4	2	2				2	2						2	2	
Average	2	2				2	2						2.5	2	

Subject: Transmission and Distribution	**Subject Code:**17EE43

Course Outcomes

CO1	Explain the concepts of various methods of generation of power.
CO2	Explain the importance of HVAC, EHVAC, UHVAC and HVDC transmission.
CO3	Design and analyze overhead and underground cables for transmission system for a given voltage level.
CO4	Calculate the parameters of the transmission line for different configurations and assess the performance of line and evaluate AC distribution system

CO-PO-PSO Mapping

COs	POs												PSOs		
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**
CO1	2	2				2	2						3		
CO2	3	2				2	2						3		
CO3	3	2				2	2						3		
CO4	3	2				2	2						3		
Average	2.75	2				2	2						3		

Subject: Electric Motors	**Subject Code:**17EE44

Course Outcomes

CO1	Explain the constructional features of Motors and select a suitable drive for specific application.
CO2	Analyze and assess the performance characteristics of DC motors by conducting suitable tests and control the speed by suitable method.
CO3	Explain the constructional features of Three Phase and Single phase induction Motors and assess their performance
CO4	Control the speed of induction motor by a suitable method.
CO5	Explain the operation of Synchronous motor and special motors.

CO-PO-PSO Mapping

COs	POs												PSOs		
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**
CO1	2	2				2							2	2	
CO2	3	2				2							2	3	
CO3	3	2				2							2	3	
CO4	2	2				2							2	2	
CO5	3	2				2							2	3	
Average	2.6	2				2							2	2.6	

Subject: Electromagnetic Field Theory	**Subject Code:**17EE45

Course Outcomes

CO1	Understand different coordinate systems and concept of gradient, divergence, curl of a vector.
CO2	Apply Coulomb's Law and Gauss Law for electric fields produced by different charge

	configurations.
CO3	Analyze electric field across a boundary between a conductor and dielectric and between two different dielectrics.
CO4	Study the magnetic fields and magnetic materials.
CO5	Understand time varying fields and propagation of waves in different media.

CO-PO-PSO Mapping

COs	POs												PSOs		
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**
CO1	2	1													1
CO2	2	3	1												2
CO3	2	2	1												2
CO4	2	2	1												2
CO5	2	2													2
Average	2	2	1												1.8

Subject: Operational Amplifiers and LIC	**Subject Code:**17EE46

Course Outcomes

CO1	Describe the characteristics of ideal and practical operational amplifier and their applications
CO2	Design filters and voltage regulators.
CO3	Demonstrate the application of Linear ICs as comparators ,rectifiers, limiters clampers andsignal generators
CO4	Utilize 555 timer and PLL IC

CO-PO-PSO Mapping

COs	POs												PSOs		
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**
CO1	2	2													1
CO2	3	3	2												2
CO3	2	2													2
CO4	2	1													1
Average	2.25	2	2												1.5

Subject: Electrical Machines Lab 2	**Subject Code:**17EEL47

Course Outcomes

CO1	Demonstrate and understanding the performance of DC motors by conducting suitable experiments.
CO2	Evaluate the performance of induction and synchronous motor by conducting suitable experiments
CO3	Compare and analyze the speed control techniques for single phase and three-phase induction motors.

CO-PO-PSO Mapping

COs	POs												PSOs		
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**
CO1	3	2				1			1	1			2	3	
CO2	3	2				1			1	1			2	3	
CO3	3	2				1			1	1			2	3	
Average	3	2				1			1	1			2	3	

Subject: Op-amps and Linear ICs Lab	**Subject Code:**17EEL48

Course Outcomes

CO1	Conduct experiment to determine the characteristic parameters of OP-Amp
CO2	Design and test the OP-Amp as Amplifier, adder, subtractor, differentiator ,comparator and

	integrator
CO3	Design and test the OP-Amp as oscillators and filters and regulators
CO4	Design and study of Linear IC's as multivibrator power supplies.

CO-PO-PSO Mapping

COs	POs												PSOs		
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**
CO1	3	1							1	1				2	
CO2	3	1							1	1				2	
CO3	3	1							1	1				2	
CO4	3	1							1	1				2	
Average	3	1							1	1				2	

Semester-V

Subject: Management & Entrepreneurship	**Subject Code:**17EE51

Course Outcomes

CO1	Explain the nature of management, entrepreneur and intrapreneurship
CO2	Apply the knowledge of project proposal for getting the funding from different funding agencies
CO3	Utilize the scheme and facilities provided by government sector
CO4	Manage the human and material resources and also manage capital building process

CO-PO-PSO Mapping

COs	POs												PSOs		
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**
CO1								2	3	2			1		
CO2								3	2	2	2		1		
CO3								3	2	2			1		
CO4								2	2	2	2		1		
Average								2.5	2.25	2	2		1		

Subject: Microcontrollers	**Subject Code:**17EE52

Course Outcomes

CO1	Discuss the architectural details of microcontrollers and instruction set
CO2	Develop and analyse the assembly and C language programs to facilitate the data movement, arithmetic, logical, branching operation and other operations
CO3	Design and apply the knowledge of on-chip peripherals and also to interface external hardware to microcontroller

CO-PO-PSO Mapping

COs	POs												PSOs		
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**
CO1	3														2
CO2	2	2			2										2
CO3	2	2			2										3
Average	2.3	2			2										2.3

Subject: Power Electronics	**Subject Code:**17EE53

Course Outcomes

CO1	Explain the working , sketch the steady state and dynamic characteristics of power semiconductor devices, types of power converters and their applications, Peripheral effects, and derive relevant expressions for their performance parameters etc. Explain types of power diodes, their characteristics, and the effects of power diodes on RL circuits
CO2	Formulate equations and estimate circuit components, power lossfor given specifications of

	operation of power devices under steady state and dynamic conditions.
CO3	Apply relevant expressions to analyze the performance of different power converters.

CO-PO-PSO Mapping

COs	POs												PSOs		
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**
CO1	3	2										1		2	
CO2	3	2										1		2	
CO3	3	2										1		2	
Average	3	2										1		2	

Subject: Signals and Systems	**Subject Code:**17EE54

Course Outcomes

CO1	Explain basic signals, it's classification and properties of various systems
CO2	Analysis of the given continuous and discrete LTI system using frequency response, different transforms, & convolution methods.
CO3	Solve difference and differential equation and block diagram representation of the LTI system.

CO-PO-PSO Mapping

COs	POs												PSOs		
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**
CO1	2	1													2
CO2	3	3													2
CO3	3	3													2
Average	2.75	2.3													2

Subject: Electrical Estimation & Costing	**Subject Code:**17EE553

Course Outcomes

CO1	Acquire knowledge on general principles of estimation & costing
CO2	Identify important considerations regarding motor installation, Residential wiring Applying Safety rules
CO3	Analyse design aspects for service connections, Power circuits & their Earthing
CO4	Estimate the cost of Overhead Transmission & Distribution Lines, Sub-station.

CO-PO-PSO Mapping

COs	POs												PSOs		
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**
CO1	3	2				1		1					2	2	
CO2	3	1	2			1		1					2	2	
CO3	3	1	2			1		1					2	2	
CO4	3	1	2			1		1					2	2	
Average	3	1.25	2			1		1					2	2	

Subject: Renewable Energy Sources	**Subject Code:**17EE563

Course Outcomes

CO1	Summarize the conventional and non conventional energy sources and discuss sun-Earth Angles and their representation related to solar geometry.
CO2	Discuss different types of solar collectors for various thermal applications and explain the working of solar cell system, characteristics and their applications.
CO3	Understand and explain the different types of energy production from hydrogen, geothermal system, wind and calculate the power in the wind.
CO4	Describe the importance of tidal power generation, tidal energy availability, sea wave energy and explain the methods of power generation.

CO-PO-PSO Mapping

COs	POs												PSOs		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1	2	2				2	2						3	2	
CO2	2	2				2	2						3	2	
CO3	2	1				1	1						3	2	
CO4	2	1				1	1						3	2	
Average	2	1.5				1.5	1.5						3	2	

Subject: Microcontroller Laboratory												**Subject Code:**17EEL57		
Course Outcomes														
CO1	Formulate programs to handle data movement, arithmetic and logical instructions													
CO2	Develop codes to handle different data types													
CO3	Create codes in order to control the external devices using microcontroller													
CO-PO-PSO Mapping														
COs	POs												PSOs		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1	2	3	2		3				2	2					3
CO2	2	3	2		3				2	2					3
CO3	2	3	3		3				2	2					3
Average	2	3	2.3		3				2	2					3

Subject: Power Electronics Lab												**Subject Code:**17EEL58		
Course Outcomes														
CO1	Understand and Analyze the static characteristics of power semiconductor devices.													
CO2	Demonstrate the speed control of universal motor and DC motor using power devices.													
CO3	Analyze natural and force commutation techniques using SCRs													
CO4	Demonstrate the application of AC voltage controller for different loads.													
CO5	Demonstrate the working of controlled Rectifiers and inverters for different loads.													
CO-PO-PSO Mapping														
COs	POs												PSOs		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1	3	2		2					2	2			3	2	
CO2	3	2		2					2	2			3	2	
CO3	3	2		2					2	2			3	2	
CO4	3	2		2					2	2			3	2	
CO5	3	2		2					2	2			3	2	
Average	3	2		2					2	2			3	2	

Semester-VI

Subject: Control Systems												**Subject Code:**17EE61		
Course Outcomes														
CO1	Analyze and model electrical and mechanical system using analogous system .													
CO2	Formulate transfer functions using block diagram and signal flow graphs.													
CO3	Design and Analyze the stability of control system, ability to determine transient and steady state time response.													
CO4	Illustrate the performance of a given system in time and frequency domains, stability analysis using Root locus , Bode plots ad Nyquist plots.													
CO-PO-PSO Mapping														
COs	POs												PSOs		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3

CO1	2	2										2		2
CO2	1	1										1		
CO3	2	2										2	2	
CO4	2	2										1	2	
Average	1.75	1.75										1.5	2	2

Subject: Power System Analysis-1												**Subject Code:**17EE62		
Course Outcomes														
CO1	Show understanding of per unit system, computation and its implementation in problems of one-line diagram power system.													
CO2	Model and analyze power systems using complex mathematical transformations under short circuit and unbalanced conditions.													
CO3	Analyze different unsymmetrical faults on unloaded alternator and on complex power systems using symmetrical component transformations.													
CO4	Apply mathematical techniques to evaluate system stability.													
CO-PO-PSO Mapping														
COs	**POs**												**PSOs**	
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**
CO1	3	3											3	3	
CO2	3	3				2	2						3	3	
CO3	3	3				2	2						3	2	
CO4	3	2											3	3	
Average	3	2.75				2	2						3	2.75	

Subject: Digital Signal Processing												**Subject Code:**17EE63		
Course Outcomes														
CO1	Analyze signals using the discrete Fourier transform (DFT). And solve problems on circular convolution using periodic, matrix and tabular methods.													
CO2	Solve problems on efficient computation of DFT using DIT and DIF- FFT and composite DFT algorithms.													
CO3	Implement digital systems (FIR and IIR systems) in a variety of forms (direct form I and II, parallel, cascade, ladder structure and linear phase realization).													
CO4	Apply design (IIT and BLT) techniques for IIR type (Butterworth and Chebyshev) digital filters.													
CO5	Design FIR type digital filters using "windowing method" and “frequency sampling method.													
CO-PO-PSO Mapping														
COs	**POs**												**PSOs**	
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**
CO1	2	2													3
CO2	3	2													3
CO3	2	2													3
CO4	3	3	2												3
CO5	3	3	2												3
Average	2.6	2.4	2												3

Subject: Electrical Machines Design	**Subject Code:**17EE64
Course Outcomes	
CO1	Discuss different design trends, factors, properties of materials, manufacturing process, limitations of electrical machines, short circuit ratio and its effects on performance of synchronous machines.
CO2	Formulate, Design and solve the output equations, stator and rotor circuits of DC machines and AC machines.

CO3	Design windings, core of transformer and Estimate the number of cooling tubes, no load current and leakage reactance of core type transformer.

CO-PO-PSO Mapping

COs	POs												PSOs		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1	2													2	
CO2	2	3	3											2	
CO3	2	3	3											2	
Average	2	3	3											2	

Subject: Computer Aided Electrical Drawing	**Subject Code:**17EE651

Course Outcomes

CO1	Discuss the terminology and develop armature windings for DC and AC machines
CO2	Develop a layout for substation using the standard symbols for substation equipment.
CO3	Sketch the sectional views of core and shell types transformers, assembled DC machine and alternators design data and its parts.

CO-PO-PSO Mapping

COs	POs												PSOs		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1	3	2	2		3								3	2	
CO2	3	2	2		3								3	2	
CO3	3	2	2		3								3	2	
Average	3	2	2		3								3	2	

Subject: Control system lab	**Subject Code:**17EEL67

Course Outcomes

CO1	Design and analyze Lead, Lag and Lag – Lead compensators for given specifications.
CO2	Determine the performance characteristics of ac and dc servomotors and synchro-transmitter receiver pair used in control systems.
CO3	Simulate the DC position and feedback control system to study the effect of P, PI, PD and PID controller
CO4	Write a script files to plot root locus, bode plot, Nyquist plots to study the stability of the system using a software package. Use software package or discrete components in assessing the time and frequency domain reposes of a given second order system.

CO-PO-PSO Mapping

COs	POs												PSOs		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1	3	3			3				2	2			2	2	
CO2	3	2			3				2	2			3	3	
CO3	3	2			3				2	2			2	2	
CO4	2	3			2				2	2			3	3	
Average	2.75	2.5			2.75				2	2			2.5	2.5	

Subject: Digital Signal Processing Lab	**Subject Code:**17EEL68

Course Outcomes

CO1	Compute the frequency Response and time Response of the gven system using sampling theorem.
CO2	Solve impulse response and step response of a given difference equation theoretically & by using a suitable software and compare the results.
CO3	Compute N-point DFT as well N-point FFT (Both DIT and DIF) of a given sequence and also

	plot magnitude and phase response
CO4	Perform Convolution of (Linear and circular) two sequences using DFT and IDFT.
CO5	Design and implement IIR and FIR digital filter to meet the given specification using suitable software

CO-PO-PSO Mapping

COs	**POs**												**PSOs**		
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**
CO1	3	2		2	3				2	2					3
CO2	3	2		2	3				2	2					3
CO3	3	2		2	3				2	2					3
CO4	3	2		2	3				2	2					3
CO5	3	2		2	3				2	2					3
Average	3	2		2	3				2	2					3

Semester-VII

Subject: Power System Analysis-2	**Subject Code:**17EE71

Course Outcomes

CO1	Able to formulate Y-bus and Compute the load flow solution using different iterative methods like GS, NR and FDLF
CO2	Discuss optimal scheduling for hydro-thermal system, power system security and reliability
CO3	Analyze short circuit faults in power system networks using bus impedance matrix
CO4	Solve the swing equation of synchronous machine using Numerical technique and study multi-machine stability

CO-PO-PSO Mapping

COs	**POs**												**PSOs**		
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**
CO1	2	3											2	2	
CO2	2	2	2			1	1						2	2	
CO3	2	2											2	2	
CO4	2	2											2	2	
Average	2	2.25	2			1	1						2	2	

Subject: Power System Protection	**Subject Code:**17EE72

Course Outcomes

CO1	Classify & compare various relays & its protective schemes.
CO2	Analyse schemes of Overcurrent protection & distance protection
CO3	Analyse schemes such as carrier current protection& differential protection
CO4	Understand various circuit breakers,fuse used in power system.
CO5	Discuss the protection against Over voltages and modern trends in power system protection.

CO-PO-PSO Mapping

COs	**POs**												**PSOs**		
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**
CO1	2	1	1										2	2	
CO2	1	2	1				1						1	2	
CO3	1	2	1				1						1	2	
CO4	1	2	1				1						2	2	
CO5	1	2	1				1						2	2	
Average	1.2	1.8	1				1						1.6	2	

Subject: High Voltage Engineering												**Subject Code:**17EE73		
Course Outcomes														
CO1	Apply the knowledge to analyze equivalent circuit models of the HVAC, HVDC and impulse generators.													
CO2	Apply their knowledge to distinguish breakdown phenomenon in dielectrics and specifications of Equipment conforming to standards.													
CO3	Analyze the factors affecting HVAC & HVDC measurements, overvoltage phenomenon in electric power systems													
CO4	Analyze the knowledge of testing various materials and electric apparatus in power system.													
CO-PO-PSO Mapping														
COs	**POs**											**PSOs**		
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**
CO1	3	2				2	2						3	2	
CO2	3	2				2	2						3	2	
CO3	3	2				2	2						3	2	
CO4	3	2				2	2						3	2	
Average	3	2				2	2						3	2	

Subject: Utilization of Electrical Power												**Subject Code:**17EE742		
Course Outcomes														
CO1	Understand and discuss the different types of electrical heating, welding and electrolytic process employed in domestic and industrial applications													
CO2	Understand and Apply the knowledge of fundamental engineering principles to design various lighting systems for different applications.													
CO3	Apply the basic knowledge of engineering to analyze the behavior of electrical traction systems under various conditions of operation.													
CO4	Understand and discuss the importance of electric vehicles and hybrid electric vehicles and its architectures.													
CO-PO-PSO Mapping														
COs	**POs**											**PSOs**		
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**
CO1	2	2				2	2						3	2	
CO2	2	2				2	2						3	2	
CO3	3	2				2	2						3	2	
CO4	2					2	2						3	2	
Average	2.25	2				2	2						3	2	

Subject: Testing and Commissioning of Power System Apparatus		**Subject Code:**17EE752
Course Outcomes		
CO1	Describe corrective and preventive maintenance of electrical equipments.	
CO2	Demonstrate the process to plan, control and implement commissioning of electrical equipment's	
CO3	Demonstrate the routine tests for synchronous machine, induction motor, transformer & switchgears.	
CO4	Differentiate the performance specifications of transformer, induction motor and synchronous machines. Explain the different tests and factors to be considered while selecting underground cables .	
CO5	Explain the operation and selection of an electrical equipment's such as isolators, circuit breakers, insulators and switchgears.	
CO-PO-PSO Mapping		
COs	**POs**	**PSOs**

	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1	3	1				2	1	1					3	3	
CO2	3	1				2	1	1					3	3	
CO3	3	1				2	1	1					3	3	
CO4	3	1				2	1	1					3	3	
CO5	3	1				2	1	1					3	3	
Average	3	1				2	1	1					3	3	

Subject: Power System Simulation Lab												**Subject Code:**17EEL76		
Course Outcomes														
CO1	Develop a MATLAB/C++ program to access the performance of MTL, LTL and transient stability under fault conditions													
CO2	Build the MATLAB program to obtain the power angle characteristics of alternator													
CO3	Develop the MATLAB program to formulate bus admittance, Jacobian and bus impedance matrices of power system													
CO4	Build the MATLAB program to determine Bus current, Bus power and line flows for the specified system voltage profile.													
CO5	Use Mi-power package to solve the load flow solution using GS/NR/FDLF method, short circuit analysis and Economic load dispatch problems.													
CO-PO-PSO Mapping														
COs	**POs**												**PSOs**		
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**
CO1	3	2		2	1				2	2			2	3	
CO2	3	2		2					2	2			2	3	
CO3	3	2		2					2	2			2	3	
CO4	3	2		2	1	2			2	2			2	3	
CO5	3	2		2					2	2			2	3	
Average	3	2		2	1				2	2			2	3	

Subject: Relay and High Voltage Lab												**Subject Code:**17EEL77		
Course Outcomes														
CO1	Apply knowledge on conduct experiment for obtaining breakdown characteristic of air insulation subjected for HVAC, HVDC applications to distinguish between Uniform/Non-uniform field conditions.													
CO2	Apply knowledge on the quality of transformer oil sample by conducting experiment as per standards and assessing dielectric strength of it.													
CO3	Analyse the experiment on an Electromechanical type overcurrent relay, Static over-voltage relay, Static undervoltage relay, Microprocessor based overcurrent relay and Microprocessor based overvoltage/under-voltage relay.													
CO4	Acquire the knowledge experimentally by map field lines for co-axial cable model using electrolytic tank.													
CO-PO-PSO Mapping														
COs	**POs**												**PSOs**		
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**
CO1	3	2				2	2		2	2			3	3	
CO2	3	2				2	2		2	2			3	3	
CO3	3	2				2	2		2	2			3	2	
CO4	3	2				2	2		2	2			3	2	
Average	3	2				2	2		2	2			3	2.5	

Subject: Project Phase I												**Subject Code:**17EEP78		
Course Outcomes														
CO1	Ability to research literature, and formulate a complex engineering problem of their selected project topic.													
CO2	Apply the fundamental knowledge of mathematics, science and engineering principles in design of Solutions or system components.													
CO3	Identify, Select, Apply a suitable engineering/IT tool in modeling/data interpretation/analytical Studies, conduct experiments leading to a logical solution.													
CO4	Design multidesciplinary engineering solutions to complex problems addressing societal and environmental concerns.													
CO5	Communicate effectively to a diverse audience and develop technical reports and publications.													
CO6	Work as a team member/leader to manage projects and costs in a diversified environment.													
CO-PO-PSO Mapping														
COs	**POs**												**PSOs**	
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**
CO1	3	3		3								3	2	2	2
CO2	3	3	3										2	2	2
CO3	3	3			3								3	3	3
CO4	2	3	3	3		3	3						3	3	3
CO5										3		3	3	3	3
CO6						3			3	3	3		2	2	2
Average	3.75	3	3	3	3	3	3		3	3	3	3	2.5	2.5	2.5

Semester-VIII

Subject: Power System Operation And Control												**Subject Code:**17EE81		
Course Outcomes														
CO1	Describe various levels of controls in power systems, components, architecture and configuration of SCADA													
CO2	Solve unit commitment problems using different methods in power system operation													
CO3	Explain the methods of problem formulation and solution methods for hydrothermal scheduling													
CO4	Explain, develop and analyze mathematical models of Automatic Load Frequency Control in an interconnected power system													
CO5	Explain methods of voltage and reactive power control, voltage stability in an interconnected power system													
CO6	Explain methods of voltage and reactive power control, voltage stability in an interconnected power system													
CO-PO-PSO Mapping														
COs	**POs**												**PSOs**	
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**
CO1	3				2					1			3		2
CO2	2	2											2		1
CO3	3												2		
CO4	3	2			1								3		1
CO5	2	2											3		
CO6	3		1										3		
Average	2.67	2	1		1.5					1			2.67		1.3

Subject: Industrial Drives and Applications												**Subject Code:**17EE82		
Course Outcomes														
CO1	Explain different modes of operation of electric drives.													
CO2	Analyze dc motor speed control techniques using controlled rectifiers.													
CO3	Analyze the performance of induction motor drives under different conditions.													
CO4	Study the Control of synchronous motor and stepper motor drives.													
CO5	Identify a suitable electrical drive for specific application in the industry.													
CO-PO-PSO Mapping														
COs	**POs**												**PSOs**	
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**
CO1	2	2											3	2	
CO2	3	3				2	2						2	3	
CO3	3	3				2	2						2	3	
CO4	2	3				2	2						2	3	
CO5	2	2				2	2						3	2	
Average	2.4	2.6				2	2						2.4	2.6	

Subject: Smart Grid												**Subject Code:**17EE831		
Course Outcomes														
CO1	Discuss tools for the analysis of smart grid and design, operation and performance on measurement techniques using Phasor Measurement Units and smart meters.													
CO2	Explain predictive grid management and control technology using computational techniques, communication, measurement, and monitoring technology tools and discuss classical optimization techniques and computational methods for smart grid design, planning and operation.													
CO3	Develop cleaner, more environmentally responsible technologies for the electric system.													
CO4	Explain methods to promote smart grid awareness and making the existing transmission system smarter by investing in new technology and discuss the progress made by different stakeholders in the design and development of smart grid.													
CO-PO-PSO Mapping														
COs	**POs**												**PSOs**	
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**
CO1	3	2				2	2						3	1	
CO2	2	2				2	2						2	1	
CO3	3	2				2	2						3	2	
CO4	3	2				2	2						3	1	
Average	2.75	2				2	2						2.75	1.25	

Subject: Integration of Distributed Generation												**Subject Code:**17EE833		
Course Outcomes														
CO1	Explain Distributed Generation by various Sources of Energy.													
CO2	To study the Power System Performance, Overloading and Losses impacts on Distributed Generation													
CO3	To study the Voltage Magnitude Variations impacts on Distributed Generation													
CO4	To study the Power Quality Disturbances impacts on Distributed Generation													
CO-PO-PSO Mapping														
COs	**POs**												**PSOs**	
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**
CO1	3												2	2	

CO2	3	2				2	2						3	2	
CO3	3	2				2	2						3	2	
CO4	3	2				2	2						3	2	
Average	3	2				2	2						2.8	2	

Subject: Internship												**Subject Code:**17EE84		
Course Outcomes														
CO1	Gain practical experience and knowledge of the Industry and professionals													
CO2	Develop and experience communication, interpersonal and other critical skills in technical fields													
CO3	Demonstrate the ability to assess and report the technical documents													
CO4	Develop a greater understanding about career options to achieve career goals in the interested technical fields													
CO-PO-PSO Mapping														
COs	**POs**												**PSOs**	
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**
CO1	3	2	1		2			1					3	3	3
CO2	2	2						1	2	2			3	3	3
CO3	2	2							1	2			3	3	3
CO4	2	2									1	3	3	3	3
Average	2.25	2	1		2			1	1.5	2	1	3	3	3	3

Subject: Project Phase II												**Subject Code:**17EEP85		
Course Outcomes														
CO1	Ability to research literature, and formulate a complex engineering problem of their selected project topic.													
CO2	Apply the fundamental knowledge of mathematics, science and engineering principles in design of Solutions or system components.													
CO3	Identify, Select, Apply a suitable engineering/IT tool in modeling/data interpretation/analytical Studies, conduct experiments leading to a logical solution.													
CO4	Design multidesciplinary engineering solutions to complex problems addressing societal and environmental concerns.													
CO5	Communicate effectively to a diverse audience and develop technical reports and publications.													
CO6	Work as a team member/leader to manage projects and costs in a diversified environment.													
CO-PO-PSO Mapping														
COs	**POs**												**PSOs**	
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**
CO1	3	3		3								3	2	2	2
CO2	3	3	3										2	2	2
CO3	3	3			3								3	3	3
CO4	2	3	3	3		3	3						3	3	3
CO5										3		3	3	3	3
CO6						3			3	3	3		2	2	2
Average	2.75	3	3	3	3	3	3		3	3	3	3	2.5	2.5	2.5

Subject: Seminar												**Subject Code:**17EES86		
Course Outcomes														
CO1	Identify, understand and discuss current, real-time issues.													
CO2	Improve oral and written communication skills.													
CO3	Attain, use and develop knowledge in the field of electrical and electronics engineering and other disciplines through independent learning and collaborative study.													
CO4	Explore an appreciation of the self in relation to its larger diverse social and academic contexts.													
CO5	Demonstrate the ability to assess and report.													
CO-PO-PSO Mapping														
COs	**POs**												**PSOs**	
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**
CO1	3	3		3							3		3	3	3
CO2										3			3	3	3
CO3				3								3	3	3	3
CO4	3	3									3		3	3	3
CO5									3				3	3	3
Average	3	3		3					3	3	3	3	3	3	3

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