Sri Adichunchanagiri Shikshana Trust (R)

SJB Institute of Technology

(Affiliated to Visvesvaraya Technological University, Belagavi & Approved by AICTE, New Delhi.)

Department of Electrical & Electronics Engineering

Course Outcomes and CO-PO-PSO articulation Matrix

Batch 2016-20

Semester-I/II

Subject: Basic Electrical Engineering		**Subject Code:** 15ELE13/23

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	Practice 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:15EE32		

Course Outcomes	
CO1	Familiarize the basic laws, theorems and the methods of analyzing electrical circuits
CO2	Explain the concept of coupling, resonance and methods of analyzing electrical circuits.
CO3	Analyze networks based on two port network and state variables
CO4	Analyze the transient response of circuits with dc and sinusoidal ac input
CO5	Impart basic knowledge on network analysis using Laplace transforms

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	2	2													2
CO3	2	2													2
CO4	2	2													2
CO5	2	2													2
Average	2.2	2													2

Subject: Transformers and Generators												Subject Code:15EE33		

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:15EE34		

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:15EE35

Course Outcomes	
CO1	Solve problems based on different Boolean expression minimization Techniques.
CO2	Analyse and design different combinational and sequential circuits.
CO3	Explain and analyse State Machine Models
CO4	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	2													2
CO2	2	3	2												2
CO3	2	2													2
CO4					2										2
Average	2	2.3	2		2										2

Subject: Electrical and Electronic Measurements	Subject Code:15EE36

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:15EEL37

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:15EEL38		

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:15EE41

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:15EE42

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	3					2	2						3	2	
CO2	3					2	2						3	2	
CO3	2	2				2	2						2	2	
CO4	2	2				2	2						2	2	
Average	2.5	2				2	2						2.5	2	

Subject: Transmission and Distribution													Subject Code:15EE43		
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	2	2				2	2						3		
CO4	2	2				2	2						3		
Average	2.25	2				2	2						3		

Subject: Electric Motors													Subject Code:15EE44		
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:15EE45
Course Outcomes	
CO1	Explain different coordinate systems, gradient, divergence and curl of vector.
CO2	Apply electrostatic laws for electric field produced by different charge configuration.
CO3	Evaluate the energy and potential due to system of charges.
CO4	Enumerate the behaviour of electric field across a boundary.

CO5	Apply electromagnetic laws for magnetic fields and materials.
CO6	Rephrase the 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	1												2
CO6	2	2													1
Average	2	2	1												1.66

Subject: Operational Amplifiers and LIC	Subject Code:15EE46

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:15EEL47

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:15EEL48

Course Outcomes

CO1	Understand the characteristic parameters of Op-Amp
CO2	Design and test the OP-Amp as Amplifier, adder, subtractor, differentiator and integrator
CO3	Evaluate OP-Amp oscillators ,filter and regulator.
CO4	Study of Linear IC's as multivibrator ,comparators and converter.

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					3
CO2	3	2							1	1					2
CO3	3	2							1	1					2
CO4	2	2							1	1					2
Average	2.75	2							1	1					2.25

Semester-V

Subject: Management & Entrepreneurship	Subject Code:15EE51

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		1						3	2	2	2		1		
CO3								3	2	2			1		
CO4								2	2	2	2		1		
Average		1						2.5	2.25	2	2		1		

Subject: Microcontrollers	Subject Code:15EE52

Course Outcomes	
CO1	Discuss the history of the 8051 and features of other 8051 family members and the internal architecture of the 8051.
CO2	Explain the use of an 8051 assembler, the stack and the flag register, loop, jump, and call instructions.
CO3	Discuss 8051 addressing modes, accessing data and I/O port programming, arithmetic, logic instructions, and programs
CO4	Develop 8051C programs for time delay, I/O operations, I/O bit manipulation, logic and arithmetic operations, data conversion and data serialization
CO5	Discuss the hardware connection of the 8051 chip, its timers, interrupts, serial data communication and its interfacing of 8051 to the RS232. Interface 8031/51 with real world devices such as LCDs and keyboards, ADC, DAC chips and sensors, external memories, 8255 chip to add ports and relays, opto isolators and 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
CO2	3	1			2										2
CO3	2	2			2										3
CO4	2	2	2		2										3
CO5	2	3	2		2										3
Average	2.2	2	2		2										2.6

Subject: Power Electronics													Subject Code:15EE53		

	Course Outcomes
CO1	Analyse application area of power electronics, types of power electronic circuits and Switches their characteristics and specifications
CO2	Explain types of power diodes, their characteristics, and the effects of power diodes on RL circuits. Study the techniques for design, operation and analysis of single phase diode rectifier circuits.
CO3	Discribe the steady state, switching characteristics and gate control requirements of different Power transistors and their limitations.
CO4	Discuss different types of Thyristors, their operation, gate characteristics and gate control requirements.
CO5	Design and analysis of thyristor controlled rectifiers
CO6	Discuss the principle of operation of single phase and three phase DC - DC, DC –AC converters and AC voltage controllers

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	1							2	
CO2	2	1				1	1							2	
CO3	2	2				1	1							2	
CO4	2	1				1	1							2	
CO5	2	2				1	1							2	
CO6	2	2				1	1							2	
Average	2	1.5				1	1							2	

Subject: Signals and Systems													Subject Code:15EE54		

	Course Outcomes
CO1	Explain basic signals, it's classification and properties of various system
CO2	Apply and analyze convolution in both continuous and discrete domain given the response of a system.
CO3	Construct a block diagram of a linear time invariant system.
CO4	Analyze linear time invariant systems using different transforms.

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	3													2
CO3	2	2													2
CO4	3	3													2
Average	2.5	2.5													2.25

Subject: Electrical Estimation & Costing													Subject Code:15EE553		

	Course Outcomes
CO1	Summarize the general principles of estimation & costing
CO2	Identify important considerations regarding Residential wiring & its installation Applying Safety rules
CO3	Analyse design aspects for Power circuits & their Earthing

COs	CO4	Estimate the cost of service connections, Overhead Transmission & Distribution Lines.
	CO5	Estimate & interpret the cost of 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	2	2				2	2	2			2		2	2	
CO2	3	1	2			2	2	2			2		2	2	
CO3	3	1	2			2	2	2			2		2	2	
CO4	2	1	2			2	2	2			2		2	2	
CO5	2	2	2			2	2	2			2		2	2	
Average	2.4	1.4	2			2	2	2			2		2	2	

Subject: Renewable Energy Sources	**Subject Code:**15EE563

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 biomass and biogas energy conversion system
CO5	Discuss and understand importance of tidal power generation.
CO6	Explain the power generation process from sea wave energy and ocean thermal energy.

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	1						2		
CO2	2	2				1	1						2		
CO3	2	1				2	2						3		
CO4	2	1				2	2						3		
CO5	2	1				2	2						2		
CO6	2	1				2	2						2		
Average	2	1.3				1.67	1.67						2.3		

Subject: Microcontroller Laboratory	**Subject Code:**15EEL57

Course Outcomes

CO1	Write codes for code conversions and data movements.
CO2	Solve the arithmetic and logical operations through program.
CO3	Develop the codes for DAC, ADC and elevator interfacing.
CO4	Design a code to control motors and keypad.

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			3				2	2					3
CO2	2	3	2		3				2	2					3
CO3	2	3	3		3				2	2					3
CO4	2	3	3		3				2	2					3
Average	2	3	2.66		3				2	2					3

Subject: Power Electronics Lab												**Subject Code:**15EEL58		

Course Outcomes

CO1	To Analyse the characteristics of SCR,IGBT,MOSFETandTRIAC
CO2	To understand Triggering of the SCR by different methods and to protect SCR by Snubber circuit
CO3	To understsnd performance of single phase controlled full wave rectifier and AC voltage controller with R and RL loads.
CO4	Anayse the speed control of dc motor, universal motor and stepper 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		2									3		2
CO2	3	2		2									1		2
CO3	3	2		2									3		2
CO4	3	2		2									1		2
Average	3	2		2									2		2

Semester-VI

Subject: Control Systems												**Subject Code:**15EE61		

Course Outcomes

CO1	Analyze and model electrical and mechanical system using analogous system .
CO2	Apply block diagram reduction techniques and signal flow graph methods to obtain transfer function of systems
CO3	Design and Analyze the stability of control system, ability to determine transient and steady state time response.
CO4	Examine the performance of system stability 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	
CO2	1	1												2	1
CO3	3	3	2											2	2
CO4	3	3	2											2	
Average	2.25	2.25	2											2	1.5

Subject: Power System Analysis-1												**Subject Code:**15EE62		

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	2	3											3	3	

CO2	3	3				2	2						3	2	
CO3	3	2				2	2						2	2	
CO4	3	2											3	3	
Average	2.75	2.5				2	2						2.75	2.5	

Subject: Digital Signal Processing													Subject Code:15EE63		
Course Outcomes															
CO1	Analyze signals and perform various signal processing operations using DFT.														
CO2	Explain and Apply FFT algorithms for efficient computation of DFT and IDFT of a given sequence.														
CO3	Design of IIR analog and digital filters by using Butterworth and Chebyshev technique.														
CO4	Design of IIR digital filters by using impulse invariant technique and bilinear transformation technique.														
CO5	Design a digital IIR and FIR filter by using direct, cascade, parallel and linear phase methods of realization.														
CO6	Design FIR filters by use of window functions 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													2
CO2	2	2													3
CO3	2	2	2												3
CO4	2	2	2												2
CO5	2	2													2
CO6	2	2	2												2
Average	2	2	2												2.3

Subject: Electrical Machines Design													Subject Code:15EE64		
Course Outcomes															
CO1	Discuss different design trends, factors, properties of materials, manufacturing and limitations of electrical machines.														
CO2	Ability to analyze the performance, design winding and core of transformer.														
CO3	Ability to analyze the performance, design winding and core of DC machine.														
CO4	Appreciate the importance of magnetic, thermal and electric loadings.														
CO5	Ability to analyze the performance, design Induction motor.														
CO6	A thorough knowledge of the design procedures in design of the Synchronous electric machines.														
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	
CO2	2	2	3										2	2	
CO3	2	2	3										2	2	
CO4	2	2											2	2	
CO5	2	2	3										2	2	
CO6	2	2	3										2		
Average	2	2	3										2	2	

Subject: Computer Aided Electrical Drawing		Subject Code:15EE651
Course Outcomes		
CO1	Discuss and develop the armature winding diagram for DC and AC machines	
CO2	Develop a layout for substation using the standard symbols for substation equipment.	

CO3	Draw sectional views of core and shell types transformers using the design data
CO4	Draw sectional views of assembled DC machine and alternator or its parts using the design data or the sketches.

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								3	2	
CO2	2	2			3								2	2	
CO3	3	2	2		3								3	2	
CO4	3	2	2		3								3	2	
Average	2.5	2	2		3								2.75	2	

Subject: Sensors and transducers	**Subject Code:**15EE662

Course Outcomes

CO1	Explain need of transducers, their classification, advantages and disadvantages.
CO2	Outline the working of different types of transducers and sensors.
CO3	Discuss recent trends in sensor technology and their selection.
CO4	Utilize signal conditioning and signal conditioning equipment.
CO5	Explain configuration of Data Acquisition System, data conversion and Data transmission and telemetry.
CO6	Infer measurement of various non-electrical quantities.

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	2													2
CO3	2	2				1									2
CO4	2	2													1
CO5	2	2													1
CO6	2														1
Average	2	2				1									1.5

Subject: Control system lab	**Subject Code:**15EEL67

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

Subject: Digital Signal Processing Lab												**Subject Code:**15EEL68		

	Course Outcomes
CO1	Utilize MATLAB platform to perform interpretation of sampling theorem in time and frequency domains.
CO2	Perform the impulse response, Linear and circular convolution of given sequences.
CO3	Compute DFT and IDFT of a given sequence using the basic definition and also using FFT algorithms.
CO4	Design and implementation of IIR and FIR filters for the given specifications.

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				2	2		1			3
CO2	3	2			3				2	2		1			3
CO3	3	2			3				2	2		1			3
CO4	3	2			3				2	2		1			3
Average	3	2			3				2	2		1			3

Semester-VII

Subject: Power System Analysis-2												**Subject Code:**15EE71		

	Course Outcomes
CO1	Able to formulate Y-bus and Compute the load flow solution using different iterative methods like GS, NR and FDLF.
CO2	Evolve a systematic general algorithm so that a digital computer can be used for short circuit analysis.
CO3	Solve the swing equation of synchronous machine using Numerical technique and study multimachine stability.
CO4	Utilize optimization techniques to economically schedule the load among all the generators in a power system.
CO5	Apply the knowledge of Engineering fundamentals to control the voltage profile at the generator, Reliability considerations and power system security.

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											2	3	
CO2	2	2											2	2	
CO3	2	3											2	2	
CO4	2	2					2				2		2	3	
CO5	2	2											2	2	
Average	2.2	2.4					2				2		2	2.4	

Subject: Power System Protection	**Subject Code:**15EE72

	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	2				2	2						2	2	
CO2	2	2				2	2						2	2	
CO3	2	2				2	2						2	2	
CO4	2	2				2	2						2	2	
CO5	2	2				2	2						2	2	
Average	2	2				2	2						2	2	

Subject: High Voltage Engineering	**Subject Code:**15EE73

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	2	2				2	2						3	2	
CO2	3	2				2	2						2	2	
CO3	2	1				1	1						2	2	
CO4	3	2				2	2						3	2	
Average	2.5	1.75				1.75	1.75						2.5	2	

Subject: Utilization of Electrical Power	**Subject Code:**15EE742

Course Outcomes

CO1	Understand and Discuss the different types of electrical heating, welding and electrolytic process employed in domestic and industrial applications
CO2	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, 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		
CO2	2	2				2	2						3		
CO3	3	2				2	2						3	2	
CO4	2					2	2						2	2	
Average	2.25	2				2	2						2.75	2	

Subject: Testing and Commissioning of Power System Apparatus	**Subject Code:**15EE752

Course Outcomes

CO1	Describe corrective and preventive maintenance of electrical equipment's.
CO2	Demonstrate the process to plan, control and implement commissioning of electrical equipment's

CO3	Analyze the routine tests for synchronous machine, induction motor, transformer & switchgears.
CO4	Differentiate the performance specifications of transformer and induction motor and 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	2	1				2	1	1							
CO2	2	1				2	1	1							
CO3	2	1				2	1	1							
CO4	2	1				2	1	1							
CO5	2	1				1	1	1							
Average	2	1				1.8	1	1							

Subject: Power System Simulation Lab	Subject Code:15EEL76

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	3			3				2	2			3	3	
CO2	3	3			3				2	2			3	3	
CO3	3	3			3				2	2			3	2	
CO4	3	3			3				2	2			2	3	
CO5	3	3			3	2			2	2		2	3	3	
Average	3	3			3	2			2	2		2	2.8	2.8	

Subject: Relay and High Voltage Lab	Subject Code:15EEL77

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. 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.
CO5	Acquire the skills of safety handling high voltage sources/units and prepare the effective report of experiments conducted.

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	3	
CO4	3	2				2	2		2	2			3	2	
CO5	3	2				2	2		2	2			3	2	
Average	3	2				2	2		2	2			3	2.6	

Subject: Project Phase I	**Subject Code:**15EEP78

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:**15EE81

Course Outcomes

CO1	Describe various levels of controls in power systems, the vulnerability of the system, components, architecture and configuration of SCADA.
CO2	Solve unit commitment problems in power system operation.
CO3	Discuss the issues of hydrothermal scheduling and solutions to hydro-thermal problems.
CO4	Develop and analyze mathematical models of Automatic Load Frequency Control in an interconnected power system.
CO5	Discuss different methods of voltage and reactive power control in an interconnected power system.
CO6	Explain the importance of reliability, security, contingency analysis, state estimation and related issues of power systems.

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	
CO2	2	3				2	2				2		2	3	

COs	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO3	3					2	2						3	2	
CO4	2	3											2	2	
CO5	2	2											2	3	
CO6	3					2						2	3	2	
Average	2.5	2.667				2	2				2	2	2	2.5	2.5	

Subject: Industrial Drives and Applications		Subject Code:15EE82

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:15EE831

Course Outcomes	
CO1	Discuss tools used for the analysis, design, operation and performance of smart grid
CO2	Explain predictive grid management and control technology using 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				1	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				1.75	2						2.75	1.25	

Subject: Integration of Distributed Generation		Subject Code:15EE833

Course Outcomes	
CO1	Explain energy generation by different renewablle energy sources and Discuss the variation in production capacity at different timescales.
CO2	Explain the performance of the system when distributed generation is integrated to the distributed system.
CO3	Discuss the effects of the integration of DG with respect to the increased risk of overload and increased losses.
CO4	Study the effect of DG on increased risk of over voltages and increased levels of power quality

CO5	Discuss the integration of DG for the power system stability and operation.

disturbances. (top of table, row before CO5)

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	
CO2	2	2				2	2						3	2	
CO3	2	2				2	2						3	2	
CO4	2	2				2	2						3	2	
CO5	2	2				2	2						3	2	
Average	2.2	2				2	2						2.8	2	

Subject: Internship		**Subject Code:**15EE84

Course Outcomes

CO1	Demonstrate the ability to learn industry working standards and technical report writing.
CO2	Acquire hands on experience in-line with industry and academia.
CO3	Demonstrate the ability to plan, implement, professional, ethical practice and evaluate engineering studies.
CO4	Develop communication, interpersonal and other critical skills in the job interview 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												3	3	3
CO2	3											3	3	3	3
CO3	3							3			3		3	3	3
CO4									3	3			3	3	3
Average	3							3	3	3	3	3	3	3	3

Subject: Project Phase II		**Subject Code:**15EEP85

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:15EES86		

	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

Co-ordinator
Mr. Kubera U

HOD
Dr. Babu N V