Mapping the Course Topics to the Student Outcomes' Aspects
[Table (c)]

	Code	Course	Course Topics	A		B				C			D				E			F		G			H				I			J		K
				A1	A2	B1	B2	B3	B4	C1	C2	C3	D1	D2	D3	D4	E1	E2	E3	F1	F2	G1	G2	G3	H1	H2	H3	H4	I1	I2	I3	J1	J2	K1
Term 3	EE 231	Electrical Circuits I	Basic DC circuits elements and its connection				✓	✓	✓				✓	✓	✓	✓																		
			Ohm's law and Kirchhoff laws.				✓	✓	✓				✓	✓	✓	✓																		
			Circuit analysis technique		✓	✓	✓	✓					✓	✓	✓	✓																		
			Determination of the suitable load which provide maximum power transfer		✓		✓	✓	✓				✓	✓	✓	✓																		✓
			RLC circuit and The relation between voltage and current	✓																														
		Assesment Method		Written Exam, Assignments and Laboratory Group Work.																														
	EE 232	Electrical Circuits II	Revision on alternate current series circuit and rest of other methods				✓	✓	✓				✓	✓	✓	✓																		
			Complex power and maximum power calculations.		✓																													
			Three-phase balanced and unbalanced systems and its power calculation		✓																													
			Natural and step response in RLC circuits		✓	✓	✓	✓	✓				✓	✓	✓	✓																		
		Assesment Method		Written Exam, Assignments and Laboratory Group Work.																														
Term 4			Accuracy of measurement and error analysis	✓			✓	✓	✓																										
			Absolute & secondary																															

Term			Absolute & secondary																															
			Moving coil	✓	✓		✓	✓	✓																									
			Dynamometer	✓	✓																													
			Induction instruments	✓	✓																													
	EE 211	Elect Meas & Inst. I	Measurement of active power and power factor		✓																													
			DC and AC bridges		✓		✓	✓	✓																									
			Current and potential transformers		✓																													
			Oscilloscope.																															
		Assesment Method		Written Exam, Assignments and Laboratory Work.																														
			Signal conditioning circuit	✓	✓	✓	✓	✓	✓	✓		✓																						
			Transducers	✓	✓		✓	✓	✓													✓	✓											
			Filters (active and passive)	✓	✓	✓	✓	✓	✓	✓		✓																						
	EE 312	Elect Meas & Inst. II	Convertes (ADC and DAC)	✓	✓																													
			Digital measurment (digital voltmeter and counter)		✓		✓	✓	✓																									
		Assesment Method		Written Exam, Assignemnts and Laboratory Work.																														
			Magnetic circuit principles		✓																													
	EE 321	Electrical Machines I	Theory of operation of DC machines		✓															✓	✓													
rm 5			Types of DC motors and Generators		✓		✓	✓	✓																									

Te																																						
	Assesment Method		Written Exam, Assignemnts and Laboratory Work.																																			
	EE 341	**Intr. to Power**	Elements of Power System		✓															✓	✓								✓	✓	✓	✓							
			Power system Transmission systems	✓	✓											✓	✓	✓														✓						
			Economics of power system	✓	✓					✓	✓					✓	✓	✓							✓							✓						
			Parameters of O.H.T.L. & its's design	✓	✓											✓	✓	✓																				
			Corona Phenomena	✓	✓											✓	✓	✓					✓		✓	✓												
			Mechanical design of power system Tramsmission	✓	✓					✓	✓					✓	✓	✓																				
	Assesment Method		Written Exam, Assignemnts and Research.																																			
	EE 332	**Network Analysis**	Complex frequency method for different wave forms	✓	✓												✓	✓																				
			Laplace transform and electric circuit sources	✓	✓											✓	✓	✓																				
			Linear and Ideal Transformers	✓	✓												✓	✓																				
			Two port networks and it's different equation forms	✓	✓											✓	✓	✓																				
	Assesment Method		Written Exam and Assignments.																																			
	EE 421	**Powe Electronics I**	Basics of Power Electronics	✓	✓	✓	✓	✓	✓				✓	✓	✓	✓	✓	✓	✓																			
			Thyristors & Their Firing angle	✓	✓												✓	✓	✓																			
			Single/Three phase Converter	✓	✓														✓																			✓
			Power Factor Improvement	✓	✓											✓	✓																					
	Assesment Method		Written Exam, Assignemnts, Laboratory Work and Mini-Project.																																			
	EE 342	**Power System I**	Per Unit System		✓																					✓											
			Reactive Power Control	✓	✓											✓	✓	✓							✓													✓
			Power Flow Analysis using Gauss-Siedel	✓	✓											✓	✓	✓																				✓
			Power Flow Analysis using Netwon Raphson	✓	✓											✓	✓	✓																				✓
			Economic Dispatch	✓	✓											✓	✓	✓							✓	✓						✓					✓
	Assesment Method		Written Exam and Assignments.																																			
			Vector revision and 3-D coordinates (systems)	✓	✓											✓	✓	✓																				

Term 6	**EE 331**	**Electric & Magnetic Field I**	Columb's law and field intensity	✓	✓						✓					✓	✓	✓																					
			Flux density and Gauss's law theory for electrical field	✓	✓						✓					✓	✓	✓																					
			Divergence theory	✓	✓											✓	✓	✓																					
			Conductors , Dielectrics and Capacitance	✓	✓						✓					✓	✓	✓																					
			Boundry condition	✓	✓											✓	✓	✓																					
			Current density and resistance calculations	✓	✓											✓	✓	✓																					
			poisson's and laplace equations	✓	✓					✓						✓	✓	✓																					
	Assesment Method			Written Exam and Assignments.																																			
	EE 322	**Electrical Machines II**	Single phase trans : theory, operation and autotransfo	✓	✓		✓	✓	✓									✓			✓	✓																	
			Three phase induction machines : theory , operation and modes of operation.															✓																					
			Three phase induction motors	✓	✓		✓	✓	✓							✓	✓	✓			✓	✓	✓																
			Application as induction generator.															✓						✓	✓	✓		✓		✓	✓	✓							
	Assesment Method			Written Exams, Assignments and Laboratory Work.																																			
	EE 311	**Fundamentals of Control Engineering**	Introduction to controlled systems (open and closed) systems		✓																																	
			Mathimatical modeling of physical system	✓	✓		✓	✓	✓			✓					✓	✓	✓			✓		✓															✓
			Block digram reduction	✓	✓		✓	✓	✓								✓	✓	✓			✓		✓															✓
			First order system	✓	✓		✓	✓	✓			✓					✓	✓	✓			✓		✓															✓
			second order system	✓	✓		✓	✓	✓			✓					✓	✓	✓			✓		✓															✓
			Error and steady state error	✓	✓		✓	✓	✓								✓	✓	✓			✓		✓															✓
			Routh's criteria	✓	✓		✓	✓	✓								✓	✓	✓			✓		✓															
			stability study using bode plot	✓	✓		✓	✓	✓								✓	✓	✓			✓		✓															✓
	Assesment Method			Written Exams, Assignemnts and Matlab Simulation.																																			

Term 7	**EE 333**	**Electric & Magnetic Field II**	Steady Magnetic Field (Biot-	✓	✓													✓												✓									
			Magnetic Forces and Torques	✓	✓			,																																
			Magnetic matrilas and magnetic circuits	✓	✓																																			
			Time varying magnetic filed (Farady's law of induction - motional emf)	✓	✓													✓										✓		✓									
			Maxwell's equation	✓	✓																								✓									
		Assesment Method		Written Exams and Assignemnts.																																				
	EE 441	**Power System II**	Transient in RL	✓	✓												✓	✓	✓																					
			Fault Analysis	✓	✓												✓	✓	✓																					
			Selection of Circuit Breaker		✓												✓	✓	✓																					
			Symmetrical components	✓	✓												✓	✓	✓																					
			Unsymmetrical fult	✓	✓												✓	✓	✓																					
			Power system stability under faulty condition	✓	✓												✓	✓	✓																					
		Assesment Method		Written Exams, Assignments and Matlab Simulation.																																				
	EE 422	**Electrical Machines II**	Three phase : construction , theory and performance.	✓	✓												✓	✓	✓						✓															
			Three phase synchronous machines construction.	✓	✓												✓	✓	✓																					
			Synchronouns generator operation	✓	✓		✓	✓	✓								✓	✓	✓			✓	✓	✓	✓	✓	✓		✓		✓									
			Three phase synchronization problems																	✓	✓																		
			Synchronouns motor operation	✓	✓		✓	✓	✓								✓	✓	✓																					
			Starting of synchronons motor.	✓	✓												✓	✓	✓	✓	✓																			
		Assesment Method		Written Exams, Assignments and Laboratory Work.																																				
	EE 423	**Power Electronics II**	AC Voltage control	✓	✓	✓	✓	✓	✓								✓	✓	✓																					✓
			DC Choppers	✓	✓	✓	✓	✓	✓				✓	✓	✓	✓	✓	✓	✓																					
			Cyclo Converter & Frequency Changer																																					
			PWM Inverter	✓	✓												✓	✓	✓			✓	✓	✓															
		Assesment Method		Written Exams, Assignments, Laboratory Work and Mini-Project.																																				

	EE411	Control System I	Root locus analysis	✓	✓					✓	✓	✓					✓	✓	✓					✓																✓
			Lead compansator design using R.C method	✓	✓					✓	✓	✓					✓	✓	✓					✓																✓
			Lag compansator design using R.C method	✓	✓					✓	✓	✓					✓	✓	✓					✓																✓
			Lead compansator design using Bode Plot method	✓	✓					✓	✓	✓					✓	✓	✓					✓																✓
			lag compansator design using bode plot (frequency response)	✓	✓					✓	✓	✓					✓	✓	✓					✓																✓
			Polar plot analysis	✓	✓																			✓																✓
			Nyguist stability	✓	✓																			✓																✓
			PI controller design	✓	✓					✓	✓	✓					✓	✓	✓																				✓
			PD controller design	✓	✓					✓	✓	✓					✓	✓	✓																				✓
			PID controller design	✓	✓					✓	✓	✓					✓	✓	✓																				✓
		Assesment Method		Written Exams, Assignments and Matlab Simulation.																																					
	EE 413	**Microprocessor Based Process Control**	Architecture of microprocessor and microcontrollers		✓																													✓						
			Memory Organization and microcontroller programming																																✓						
			Input/output ports with applications									✓					✓	✓	✓																						✓
												✓																												
			Timer modules and counters									✓					✓	✓	✓																						✓
			Interrupts: Software and hardware with applications									✓					✓	✓	✓																✓						✓
			Operational amplifiers and										✓	✓	✓	✓	✓	✓	✓																						

Term 8			Operational amplifiers and signal conditioning circuits			✓																												
			Analog to Digital converter and Data acquisition with									✓					✓	✓	✓															✓
			Serial port interface with applications									✓					✓	✓	✓															✓
		Assesment Method		Written Exams, Assignments and Mini-Project.																														
	EE 412	Control System II	State Model of Linear Systems using Physical Variables	✓	✓																													
			State Space Representation using Physical Variables	✓	✓												✓	✓	✓															✓
			State Space Representation using Canonical Variables	✓	✓												✓	✓	✓															✓
			Properties of Transition Matrix	✓																														
			Solution of State Equations	✓	✓																													✓
			Introduction to Pole Placement in State Feedback Design	✓	✓					✓	✓	✓					✓	✓	✓															✓
			Introduction to Nonlinear Control Systems	✓	✓																													✓

			Describing Function and the Phase Plane Methods	✓	✓												✓	✓	✓																										✓
		Assesment Method		Written Exams, Assignments and Matlab Simulation.																																									
	EE 442	**Powe System Protection I**	General Principles of							✓										✓	✓							✓					✓												
			Operation of the different types of relays									✓					✓										✓						✓											
			Circuit breakers and fuses							✓																																		
			Protection of the various components of power system									✓							✓							✓																			✓	
		Assesment Method		Written Exams, Assignments and Etap Simulation.																																									
	EE424	**Electrical Drives I**	Single Phase DC motor Drives	✓	✓												✓	✓	✓																										
			Semi and Full converter DC drives	✓	✓												✓	✓	✓																										✓
			Dual Converter	✓	✓												✓	✓	✓																										
			Reversible drives	✓	✓												✓	✓	✓																										
			Three-Phase Drives	✓	✓												✓	✓	✓																										
			Closed Loop Control of DC Drives																			✓	✓	✓																					
			DC Choper drives for DC Motors	✓	✓												✓	✓	✓																										
			Induction Motor Drives,Operation & Performance	✓	✓												✓	✓	✓																										
			Voltage & Freq. Control	✓	✓												✓	✓	✓																										
			Stepper Motor		✓																	✓		✓																	✓	✓	✓			
		Assesment Method		Written Exams, Assignments and Research.																																									
			Classification and history of renewable energy re¬sources.								✓														✓	✓	✓																		
			Wind energy basics																																							✓			
			Fixed speed wind turbines							✓	✓																																	✓	
										✓	✓																															✓		

[Elective Courses]	**EE 523**	**Fundamentals of Renewable Energy**	Variable speed wind turbines																															
			Vector control of Power electronics converters for wind generators									✓																						✓
			Solar energy basics																															✓
			Photovoltaic and fuel cells							✓																							✓	
			Power electronics in solar systems							✓																								✓
			Hydropower							✓																							✓	
			Biomass							✓																							✓	
			Grid integration for electricity generated from									✓																						
			Effect of government regulation (grid code) on the renewable energies industry																						✓									
			State of the industry																															✓
		Assesment Method		Written Exams, Quizzes																														
	EE 542	**Electrical Power Station**	Conventional P.S: Thermal and Internal Combustion		✓					✓	✓	✓								✓	✓								✓	✓	✓			
			Hydrulic		✓					✓	✓	✓								✓	✓								✓	✓	✓			
			Nucler		✓					✓	✓	✓					✓	✓	✓	✓	✓								✓	✓	✓			
			Renewable Energy P.S: wind, photovoltaic and solar thermal		✓												✓	✓	✓	✓	✓				✓	✓	✓	✓	✓	✓	✓			

[Elective Courses]		**Assesment Method**		Written Exams																														
	EE 543	**Electrical Power Distribution**	Voltage Profile & Regulation							✓							✓																	
			Distributed Substation Design, Load Distribution & Service Area of Distributed Substation							✓	✓	✓																						
			Operation of Distributed Substation							✓	✓																							
			Low Voltage Distribution in Residential and Commercial Areas							✓	✓	✓					✓	✓	✓															✓
		Assesment Method		Written Exams, Mini-Project.																														
	EE 542	**Control Application in Power Engineering**	Control problems in electrical power system								✓																							
			Modeling system components in power system dynamics							✓							✓	✓	✓															
			Excitation control systems QV control							✓	✓	✓																						
			Generation control systems PF control								✓																							✓
		Assesment Method		Written Exams																														
	EE 515	**Computer Control of Dynamic Systems**	Sampling Theory study	✓	✓					✓							✓	✓	✓															
			Z-Transformation and Discreet state space analysis	✓	✓					✓		✓					✓	✓	✓															✓
			Discreet state space studies Drscretization	✓	✓												✓	✓	✓															✓
			Deadbeat response and pole placement design	✓	✓					✓							✓	✓	✓															✓
			Application of computer control of dynamic system (such as PLC,SCADA, DCS)		✓								✓	✓	✓	✓				✓		✓	✓	✓	✓	✓			✓	✓				✓
		Assesment Method		Written Exams,Assignments																														

EE 541	Power Systems Protection II	Review of static/digital versus electomechanical relays														✓																	
		Components detectors and applications, hardware of digital relays							✓																								
		Mathematical background for digital protection														✓																	
		Digital relays for motor, transmission line and machine protection															✓	✓															✓
		Integration of protection and control in substations							✓	✓																							✓
		Traveling wave based protection														✓																	
	Assesment Method		Written Exams																														
EE 547	Utilization of Electrical Energy	Terms used in illumination and laws of illumination							✓																								
		Design of illumination schemes														✓	✓	✓															✓
		Electric heating, arc furnaces and electric welding							✓																								
		Traction system characteristics and control							✓																								
		Electrolytic processes. Refrigeration and air conditioning							✓																								
		Electric safety engineering							✓	✓																							
	Assesment Method		Written Exams, Mini-Project.																														
EE 548	Design of Electrical and Electromechanical Systems for Commercial and	Characteristics of industrial & commercial loads														✓																	
		Selection of distribution system and wiring systems								✓	✓																						✓
		System protection and coordination							✓		✓						✓	✓															✓
		Controllers and MCC									✓						✓	✓															✓
		Power factor correction								✓																							

[Elective Courses]

	Commercial and Industrial Installations	Lighting, HVAC, Lifts and escalators							✓		✓					✓	✓	✓															✓
		Grounding, Special Loads							✓	✓	✓																						✓
		Safety and Fire Alarm Safety								✓																							
		Codes and Standards							✓							✓																	
	Assesment Method		Written Exams,Mini-Projects and Etap Simulation.																														
EE 512	Automated Industrial Systems (1)	Automated hierarchical levels and components																										✓				✓	
		Introduction to PLC.S.																										✓				✓	
		Hardware configuration and descriptions				✓	✓	✓																				✓				✓	
		Programming and testing basic functions	✓	✓	✓													✓					✓										✓
		Programming and testing advanced functions	✓	✓	✓													✓					✓										✓
		Industrial Applications using PLCs	✓	✓	✓	✓	✓	✓								✓	✓	✓					✓									✓	✓
	Assesment Method		Written Exams,Mini-Projects.																														
EE 545	High Voltage Engineering	Generation and measurement of high voltage AC and DC	✓	✓	✓		✓	✓	✓																								
		Sources of transients in power system	✓	✓												✓	✓	✓															
		Travelling waves	✓	✓												✓	✓	✓															
		Insulations, lattice diagram and surge arresters	✓	✓												✓	✓	✓															
		High voltage switchgears																															✓
	Assesment Method		Written Exams,Assignments.																														

	EE554	Power System 3	Cost of Generation	√				√	√	√			√			
			Dispatch	√				√	√	√			√			
			Power SystemHarmonics	√		√		√	√	√						
			Reliability	√				√	√	√						
			Load Forecasting	√				√	√	√						