

**Hijjawi Faculty for Engineering Technology**  
**Electrical Power Engineering Department**  
**B.Sc. Program in Electric Power Engineering**  
**Required Courses**

**Compulsory Courses (107) credit Hour**

Course Code	Course Name	Number of Hours			Pre-Request Courses
		Theory	Practical	Credit Hours	
EPE 200	Engineering Mechanics	3	-	3	CS101
EPE 202	Engineering Drawing	-	6	2	--
EPE 203	Engineering Workshop	-	6	2	CS 102
ELE 205	Communication Skills	3	-	3	EPE 203
Math 212	Engineering Mathematics I	3	-	3	Math 203
Math 241	Linear Algebra	3	-	3	Math 102
EPE 220	Electric Circuits I	3	-	3	CS 102
EPE 222	Electric Circuits II	3	-	3	EPE 220
EPE 223	Electric Circuits Laboratory	-	3	1	EPE 222
CpE 230	Digital Logic Design	3	-	3	EPE 220
CpE 231	Digital Logic Design Lab	-	3	1	CpE 230
EPE 240	Engineering Materials	3	-	3	CS 102
ELE 250	Electronics I	3	-	3	EPE 222
ELE 251	Electronics I Lab.	-	3	1	ELE 250
EPE 310	Project Management and Quality Control	3	-	3	ELE 205
CME 312B	Signals and Systems	3	-	3	EPE 220
EPE 320	Control Systems Analysis	3	-	3	EPE 222
EPE 321	Control Systems Laboratory	-	3	1	EPE 320
EPE 340	Thermodynamics & Heat Transfer	3	-	3	CS 102
CME 342	Engineering Electromagnetics	3	-	3	Math 212
CpE 344A	Microprocessor and microcontroller Systems Design	3	-	3	CpE230
CpE 345A	Microprocessor and Microcontroller Systems Laboratory	-	3	1	CpE 344 + CpE 231
ELE 350	Electronics II	3	-	3	ELE 250
EPE 350	Transformers & DC Machines	3	-	3	EPE 222 + EPE 342
EPE 352	Power Electronics I	3	-	3	ELE 250
EPE 353	Power Electronics Lab.	-	3	1	EPE 352
EPE 360	Power System Analysis I	3	-	3	EPE 222
EPE 440	Electrical Measurements & Instrumentation	3	-	3	EPE 222
EPE 441	Measurements and Instrumentation Lab	-	3	1	EPE 440
CME 456	Communications Systems	3	-	3	CME 312B
ELE 450	Digital Electronics	3	-	3	ELE 251
CME 457	Communications Systems Lab	-	3	1	CME 456

EPE 452	AC Machines	3	-	3	EPE350
EPE 453	Electrical Machines Lab	-	3	1	EPE 452
EPE 460	Power System Analysis II	3	-	3	EPE 360
EPE 461	Computer Applications in Power Systems Lab	-	3	1	EPE 460
EPE 462	Power System Protection	3	-	3	EPE 460
EPE 463	Power System protection Lab	-	3	1	EPE 462
EPE 568	Power Systems Quality	2	-	2	EPE 460
EPE 470	High Voltage Engineering I	3	-	3	EPE 350+EPE 360
EPE 500	Field Training	Six Months		9	Departmental Supervision
EPE 598	Graduation Project	3	-	3	Departmental Supervision

### Elective Courses (9) Credit Hour

A Student can select 9 credit hours from the following courses:-

Course Code	Course Name	Number of Hours			Pre-Request Courses
		Theory	Practical	Credit Hours	
CME 314A	Probability and Random Processes for Engineering	3	-	3	CME 312B
EPE 550	Power Electronics II	3	-	3	EPE 352
EPE 552	Variable Speed Drives	3	-	3	EPE 352 + EPE 452
EPE 554	Design of Electrical Machines	3	-	3	EPE 452
EPE 560	Power System Distribution	3	-	3	EPE 360
EPE 562	Power System Stability and Control	3	-	3	EPE 460
EPE 564	Digital Protection of Power Systems	3	-	3	EPE 462
EPE 566	Power System Design	3	-	3	EPE 360
EPE 570	Electrical Energy Resources	3	-	3	EPE 340
ELE 575	Applications of Microcontrollers and PLCs	3	-	3	ELE 450
EPE 572	High Voltage Engineering (II)	3	-	3	EPE 470
EPE 574	Electrical Transients in Power Systems	3	-	3	EPE 470
EPE 596	Special Topics	3	-	3	Departmental Supervision

**Hijjawi Faculty for Engineering Technology**  
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**ADVISORY PLAN**

FIRST YEAR							
FIRST SEMESTER				SECOND SEMESTER			
Course Code	Course Name	Credit Hours	Prerequisite	Course Code	Course Name	Credit Hours	Prerequisite
100	Arabic Language I	3	-----	101	Programming in a Chosen Language	3	100
100	Linguistic Skills	3	-----	EPE 202	Engineering Drawing	2	-----
Math 1	Differentiation & Integration I	3	-----	111	Linguistic Skills	3	-----
CS 101	General Physics I	3	-----	Math 102	Differentiation & Integration II	3	Math 101
101	General Chemistry I	3	-----	CS 102	General Physics II	3	CS 101
100	Introduction to Computer & its Applications	3	-----	CS 105	General Physics Lab.	1	CS 101
					University Elective Course	3	
		<b>18</b>				<b>18</b>	

SECOND YEAR							
FIRST SEMESTER				SECOND SEMESTER			
Course Code	Course Name	Credit Hours	Prerequisite	Course Code	Course Name	Credit Hours	Prerequisite
Math 203	Ordinary Differential Equations 1	3	Math 102	EPE 240	Engineering Materials	3	CS 102
102	National Education	3	-----	CpE 202	Digital Logic Design	3	EPE 220
102	Arabic Language II	3	-----	Math 212	Engineering Mathematics	3	Math 203
EPE 220	Electric Circuits I	3	CS 102	EPE 222	Electric Circuits II	3	EPE 220
EPE 203	Engineering Workshop	2	CS 102		Military Sciences	3	----
EPE 200	Engineering Mechanics	3	CS 101	Math 101	Linear Algebra	3	Math 101
CS 106	General Physics Lab. II	1	CS 102				
		<b>18</b>				<b>18</b>	

THIRD YEAR							
FIRST SEMESTER				SECOND SEMESTER			
Course Code	Course Name	Credit Hours	Prerequest	Course Code	Course Name	Credit Hours	Prerequest
105	General Chemistry Lab.	1	101	EPE 350	Transformers & DC Machines	3	EPE 222 + CME 342
ELE 250	Electronics I	3	EPE 222	CpE 344	Microprocessor & microcontroller Systems Design	3	CpE 230
CME 312B	Signals & Systems	3	EPE 220	ELE 350	Electronics II	3	ELE 250
EPE 320	Control Systems Analysis	3	EPE 222	EPE 360	Power System Analysis I	3	EPE 222
CME 342	Engineering Electromagnetics	3	Math 212	ELE 251	Electronics Lab.	3	ELE 250
CpE 231	Digital Logic Design Lab.	1	CpE 230	EPE 340	Thermodynamics & Heat Transfer	3	CS 102
EPE 223	Electric Circuits Lab.	1	EPE 222				
ELE 205	Communication Skills	3	EPE 203				
		<b>18</b>				<b>16</b>	

FOURTH YEAR							
FIRST SEMESTER				SECOND SEMESTER			
Course Code	Course Name	Credit Hours	Prerequest	Course Code	Course Name	Credit Hours	Prerequest
EPE 352	Power Electronics I	3	ELE 250	ELE 450	Digital Electronics	3	ELE 350A
EPE 440	Electrical Measurements & Instrumentation	3	EPE 222	EPE 441	Electrical Measurements & Instrumentation Lab.	1	EPE 440
CME 456	Communications Systems	3	CME 312B	EPE 310	Project Management and Quality Control	3	EPE 203
EPE 452	AC Machines	3	EPE 350	EPE 568	Power Systems Quality	2	EPE 460
EPE 321	Control Systems Laboratory	1	EPE 320	EPE 353	Power Electronics Lab.	1	EPE 352
EPE 460	Power System Analysis I	3	EPE 360	CME 457	Communications Systems Lab	1	CME 456
CpE	Microprocessor	1	CpE 231 +	EPE 462	Power System	3	EPE 460

345A	and Microcontroller Systems Lab.		CpE 344A		Protection		
					Department Elective Course	3	Dept. Supervision
						<b>17</b>	<b>17</b>

<b>FIFTH YEAR</b>							
<b>FIRST SEMESTER</b>				<b>SECOND SEMESTER</b>			
<b>Course Code</b>	<b>Course Name</b>	<b>Credit Hours</b>	<b>Prerequest</b>	<b>Course Code</b>	<b>Course Name</b>	<b>Credit Hours</b>	<b>Prerequest</b>
EPE 500	Field Training	9	Dept. Supervision	EPE 463	Power System protection Lab	1	EPE 462
				EPE 598	Graduation Project	3	Dept. Supervision
					University Elective Course	3	
				EPE 470	High Voltage Engineering I	3	EPE 350 + EPE 360
				EPE 461	Computer Applications in Power Systems Lab	1	EPE 460
					Dept. Elective Course	3	
				EPE 453	Electrical Machines Lab	1	EPE 452
					Dept. Elective Course	3	
						<b>9</b>	<b>18</b>

# Hijawi Faculty for Engineering Technology

## Electrical Power Engineering Department

### Course Description

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#### **EPE 100: Alternative Energy**

Energy sector in Jordan, energy concepts, energy units, solar energy, solar measurements, wind energy, wind turbines, wind farms, wind speed measurements, tidal power, hydro power plants, bio fuel, fuel cells, alternative energy projects in developing countries, energy economics.

#### **EPE 200: Engineering Mechanics**

( 3 Cr. Hr.)

Force analysis, equilibrium of particles, moment of forces, vector products, moment of couple. Reactions and supports. Equilibrium of rigid bodies. Truss analysis. Kinematics of rigid bodies. Plane motion of rigid bodies (force, acceleration, energy and momentum). Prerequisite: CS101.

#### **EPE 202: Engineering Drawing**

( 2 Cr. Hr.)

Introduction, drawing instrument, dimensioning techniques, engineering geometry, representation of space relationships: two and three dimensional, multi-view representation for design and product development, orthographic drawing and projection, pictorial drawing and sketching, orthographic views, applications using AUTO CAD. Prerequisite: None.

#### **EPE 203: Engineering Workshop**

( 2 Cr. Hr. )

Introduction. Engineering materials and their properties. Casting processes. Working (forming process, marking out and measuring tools, carpentry, machining process). Joining of materials (riveting, welding). Introduction to electrical workshop components and requirements, definition of electric shock, prevention of electrical hazards, first aid for electric shock and fire safety , low voltage cables, fuses and circuit breakers, testing the continuity of electric circuits, basics of car electrical system (battery, ignition system, start motor, generator and regulator). Prerequisite: EPE 202.

#### **EPE 220: Electric Circuits I**

( 3 Cr. Hr. )

System of units, circuit variables (charge, current, voltage, power, energy). Circuit elements, and simple resistive circuits. Techniques of circuit analysis. The ideal operational amplifier, inductance and capacitance. Natural and step responses of first order RL and RC circuits. Natural and step responses of RLC circuits. Prerequisite: CS 102.

#### **EPE 222: Electric Circuits II**

( 3 Cr. Hr. )

Sinusoidal steady state analysis. AC power analysis (instantaneous, average power, maximum power transfer, complex and apparent power, power factor and power factor correction. Analysis of three-phase circuits. Mutual inductance and magnetically coupled circuits. Resonance circuits. Frequency response using Bode plots. Two-Port networks. Prerequisite: EPE 220.

#### **EPE 223: Electric Circuits Lab.**

( 1 Cr. Hr. )

Measuring devices (Ammeter, Voltmeter, Oscilloscope), DC circuit analysis (Ohm`s law, KCL, KVL, current division, voltage division, series/parallel combinations of resistors, wheatstone bridge, Thevenin`s and Norton`s equivalent circuits, maximum power transfer), RLC components and their frequency dependence, frequency resonance of RL and RC

Circuits, phase measurements using the oscilloscope, series sinusoidal circuits, parallel sinusoidal circuits, series-parallel sinusoidal circuits, Thevenin's theorem and maximum power transfer, resonant circuits, frequency response of filters (low-pass, high-pass, Band-pass). Prerequisite: EPE 222.

**EPE 240 : Engineering Materials ( 3 Cr. Hr. )**

Metal Alloys. Ferrous Alloys. Non-Ferrous Alloys. Ceramics. Glasses and Polymers, structure, electrical application. Composites, particle reinforced and fiber-reinforced composites. Corrosion and degradation of materials. Properties of materials (electrical, dielectric, magnetic, optical, mechanical, thermal). Prerequisite: CS 102.

**EPE 310 : Project Management and Quality Control ( 3 Cr. Hr. )**

Introduction to project management. Types of projects. Engineering projects. Stages of project. Project appraisal. Contractor evaluation process. Project planning and scheduling. Bar chart and critical path method. Company structure and fund raising. Cost analysis and management, risk management. Quality control. Importance of quality control. Industrial processes and quality control. Methods of quality control. Prerequisite: EPE 203.

**EPE 320: Control Systems Analysis ( 3 Cr. Hr.)**

Modeling of dynamic systems. Transient behavior and stability analysis of feedback control systems. Steady-state behavior, robustness, and sensitivity, achievable closed-loop maps and design of linear feedback systems, simple feedback types (P,I,D,PI,PD,PID), Routh stability criterion, root locus analysis and design, frequency response, relation between bandwidth and rise time, Nyquist theorem, Gain and phase margins.

Prerequisite: EPE 223.

**EPE 321: Control Systems Laboratory ( 1 Cr. Hr.)**

Practical applications on transient and steady state behaviors of simulated and actual systems: servo, flow, and temperature, sampled data system. Controller design (P, I, D, PI, PD, PID, and two-position), Ziegler-Nichols design approach, and CASSY PC interface to control systems.

Prerequisite: EPE 320.

**EPE 340 : Thermodynamics & Heat Transfer ( 3 Cr. Hr. )**

Introduction, some concepts and definitions, properties of a pure substance, work, heat transfer modes, conduction, convection and radiation. The first law of thermodynamics, control mass, control volume, entropy, some power and refrigeration systems, steam and gas power plants. Prerequisite: CS 102.

**EPE 350: Transformers & DC Machines ( 3 Cr. Hr. )**

Introduction to energy conversion and magnetic circuits, transforms (single phase, three phase, auto-transformer): construction, regulation, connections, special connections: T-connection, Scot connection. DC - machines: construction, types, windings, EMF equation, torque equation, armature reaction, power flow control and dynamics. Prerequisite: EPE 222+CME 342.

**EPE 352: Power Electronics I ( 3 Cr. Hr. )**

Introduction. Power semiconductor devices. AC-DC converters (rectifiers), Un-controlled rectifiers, controlled Rectifiers. Single-phase and three-phase converters. DC-DC converters,

Step-Down and Step-up converters. Switching mode regulations, Applications: DC Drives, DC power Supplies.

Prerequisite: ELE 250.

**EPE 353: Power Electronics Lab. ( 1 Cr. Hr. )**

AC-DC converters, Un-controlled and controlled converters. Controlled rectifiers. Single-phase and three-phase rectifiers. DC-DC converters, switching mode regulators, DC-AC inverters, single-phase and three-phase inverters. Pulse width modulation. AC-AC converters.

Prerequisite: EPE 352.

**EPE 354: Electrical Machines (3 Cr .Hr)**

Dc machinery fundamentals, internal generated voltage and torque equations, dc generators, parallel operation and power flow in dc machines, dc motors: starting and speed control, single-phase transformers: introduction, equivalent circuit and performance, three- phase transformer and connections, ac machine fundamentals and rotating magnetic field, induced voltage in ac machines, three- phase induction motors: instruction and principle of operation, equivalent circuit, torque equation, starting, speed control and braking, synchronous generators and motors: construction, operation , equivalent circuit and phasor diagrams, single phase induction motors . Prerequisite: EPE222, CME 342.

**EPE 360: Power System Analysis I ( 3 Cr. Hr. )**

Introduction to power systems, review of basic principles (active, reactive, and complex power, power factor, power factor correction, balanced three-phase circuits and analysis, Y/ $\Delta$  loads, per-phase analysis). Generator model, transformer model. Per-Unit systems and calculations, Transmission line parameters and calculations (resistance, capacitance, inductance, corona), line model and performance (modeling of short, medium, and long lines, voltage and current waves, surge impedance loading, complex power flow, power transmission capability, line compensation). Using Matlab for Power system analysis I. Prerequisite: EPE 222.

**EPE 440: Electrical Measurements & Instrumentation . ( 3 Cr. Hr.)**

Types of electrical measurements. Definitions of charge, current, voltage, average, peak and rms values. Digital measurement systems. Noise and decibels. Defining accuracy. Calibration, precision and errors. Accuracy and error measurements. Performance testing and calibration, quantifying and minimizing measured errors. Analogue measurements (ac and dc). Oscilloscope. Time and frequency measurements. Power and energy measurements. R, L and C measurements. Transducers. Interference signals. Digital signal processing. Recording and readout devices. Prerequisite: EPE 222.

**EPE 441: Measurements and Instrumentation Lab. ( 1 Cr. Hr. )** Moving

coil meters. Galvanometers, DC and AC bridges. Energy meters. Power factor measurements. Current and voltage transformers. Digital Oscilloscope and XY-recorders. Transducers. Power analyzer. High Voltage measurements. Prerequisite: EPE 440.

**EPE 452: AC Machines ( 3 Cr. Hr. )**

AC machine fundamentals. Rotating magnetic field and flux distribution. Induced voltage and torque, losses. Synchronous generators: construction, equivalent circuits, power and torque, parallel operation. Synchronous motors: starting, equivalent circuit, synchronous condenser. Induction motors: construction, equivalent circuit, power and torque, speed control. Induction Generator. Special motors: universal, single-phase, reluctance, hysteresis, stepper and linear inductor motors. Prerequisite: EPE350.

**EPE 453: Electrical Machines Lab. ( 1 Cr. Hr. )**

Single-phase transformers. Three-phase transformers. DC generators: Series, Shunt, compound. DC Motors: Series, Shunt, Compound. Synchronous generator: No-load test, parallel operation. Synchronous motors. Induction motors. Single-phase induction motors.  
Prerequisite: EPE 452.

**EPE 460: Power System Analysis II** ( 3 Cr. Hr. )

Power (load) flow analysis (bus admittance matrix, Gauss-Seidel method, Newton-Raphson method, decoupled and fast decoupled methods, dc load flow method, tap-changing transformers), Economic (Optimal) Dispatch of Generators, Fault analysis (introduction to faults, the bus impedance matrix building algorithm, balanced faults, symmetrical components, unbalanced faults). Prerequisite: EPE 360.

**EPE 461: Computer Applications in Power Systems Lab** ( 1 Cr. Hr )

Using Computer Packages in the following areas: Transmission Lines: parameters evaluation and line performance. Power flow studies. Fault calculations and analysis, stability assessment. Visualization of power systems. Relay co-ordination.  
Prerequisite: EPE 460.

**EPE 462: Power System Protection** ( 3 Cr. Hr. )

Principles and components of power system protection, types and operating principles of protective relays, protection of transmission lines (overcurrent, distance and pilot protection), apparatus protection (Bus bar, reactor, transformer, generator, motor), power fuses, circuit breakers, over voltage protection and mitigation techniques.  
Prerequisite: EPE 460.

**EPE 463: Power System protection Lab.** ( 1 Cr. Hr. )

CT's and VT's performance, characteristics of inverse time overcurrent relay, current setting and characteristics of biased differential relay, sensitive earth fault (E/F) Relay, definite and inverse time overvoltage relay, pilot wire protection, reverse power protection, instantaneous overcurrent and E/F protection. Prerequisite: EPE 462.

**EPE 470: High Voltage Engineering I** ( 3 Cr. Hr. )

Introduction to high voltage engineering and related industrial applications, electrostatic fields and field stress control, conduction and breakdown in gases, liquids and solids, applications of insulating materials, generation of high voltages and high currents, measurement of high voltages and current, calculation of voltage distributions along insulators, latest development and future trends in high voltage engineering.  
Prerequisite: EPE 350 + EPE 360.

**EPE 500: Field Training** ( 9 Cr. Hr. )

A training period of six month is to be spent in the field (inside or outside Jordan), under the follow up of an academic member from the department. Periodical as well as a final reports and an oral examination are required.

**EPE 550: Power Electronics II** ( 3 Cr. Hr. )

DC-AC Inverters, Single-phase, Three-phase inverters, Pulse width modulation, switching techniques. AC-AC Inverters, On-off control, phase control PWM control, Cycloconverters. Driving and protection of power electronics devices, driver circuits, snubber circuits, Thermal analysis. Applications: AC – drives, UPS systems. Prerequisite: EPE 352.

**EPE 552: Variable Speed Drives** ( 3 Cr. Hr. )

Introduction to motor drives. D-C motor drives, chopped and controlled drives. Induction motor drives. Speed control by varying stator frequency and voltage soft-start. Static slip power recovery. Synchronous motor drives. Drives with sinusoidal and trapezoidal wave forms. Specific Applications: Textile, Steel Rolling, Cranes, Cement, Sugar, Paper mills, Coal Mines and Centrifugal Pumps. Prerequisite: EPE 352+ EPE 452.

**EPE 554: Design of Electrical Machines** ( 3 Cr. Hr. )

Design of Transformers; Construction, choice of parameters, windings, tap changing, magnetic circuit cooling. Design of 3-phase induction motors: stator and rotor windings, squirrel cage motor. Design of single-phase induction motor: stator-windings, auxiliary winding, rotor design. Computer Aided Design of electrical machines. Optimization of design. Prerequisite: EPE 452.

**EPE 560: Power System Distribution** ( 3 Cr. Hr. )

The Supply system, distribution system planning, technical considerations of distribution systems, earthing system and earthing fault calculations, power cables in distribution systems, distribution substations and LV networks, load data, distribution loads and power quality problems. Computer applications in distribution systems.

Prerequisite: EPE 360.

**EPE 562: Power System Stability and Control** ( 3 Cr. Hr. )

Stability problem, machine dynamics and the swing equation. Steady state and transient state stability. Equal area criterion. Numerical solution of the swing equation. Methods of improving system stability. Power system control. Automatic generation control of single and multi area power systems. Voltage control in power systems. Prerequisite: EPE 460.

**EPE 564: Digital Protection of Power Systems** ( 3 Cr. Hr. )

Mathematical background to protection algorithms, basic elements of digital protection, sinusoidal waveform based algorithms, Fourier and Walsh analysis based techniques, least-squares based methods, differential equations based techniques, fundamentals of traveling wave based protection, traveling waves protective schemes, digital differential protection of transformers, digital differential protection of transmission line. Prerequisite: EPE 462.

**EPE 566: Power System Design** ( 3 Cr. Hr. )

Design concepts. Design of transmission lines (choice of voltage, conductor size, span, number of conductors, circuits, conductor configuration). Insulation design. Selection of ground wires. Evaluation of line parameters. Corona assessment. Design of power system grounding (objectives, tolerable limits of body currents, soil resistivity, earth resistance, tolerable step and touch voltages). Design of grounding grid for a substation. Computation of step and touch voltage. Measurement of soil receptivity. Neutral grounding. Using computer packages for design procedure. Prerequisite: EPE 360.

**EPE 568: Power Systems Quality** ( 3 Cr. Hr. )

Transients: impulsive and oscillatory. Long-duration voltage variations: overvoltages, under voltage, and sustained interruptions. Short-duration voltage variations: interruptions, sags (dips), and swells. Voltage imbalance. Voltage fluctuations. Power frequency variations. Wiring and grounding. Wave distortion: dc offset, notching, noise inter-harmonics, and harmonics. Harmonic distortion, harmonic distortion indices, power and power factor, effects of harmonic distortion, mitigation of harmonics. Sources of harmonics

and modeling. Computer tools for harmonic analysis . Monitoring power quality . Solution to power quality problems. Standards and regulations/ study cases. Prerequisite: EPE 460.

**EPE 570: Electrical Energy Resources ( 3 Cr. Hr. )**

Fossil-Fueled Power Plants: Requirements of power plants, fuel handling and processing system, boiler system (burners, water/system cycle, reheaters), Steam turbine system (HP, IP, LP, condensers), cooling water system, water treatment system, plant auxiliary systems. Gas Turbine: Applications, single stage and multi-stage GT, developments in GT. Combined Cycle: Principles of cogeneration, combined heat and power, efficiency of plants. Hydropower: Civil works, Turbine design, small-scale hydropower, efficiency of plants. Renewable energy: Wind energy: site selection, basic theory, types and sizes of turbines. Solar energy: characteristics, collectors, photovoltaic systems, solar-wind hybrid systems. Biomass: Biogas production, ethanol production, gasification, direct combustion. Tidal energy: origin of tides, power generation schemes. Geothermal energy: geothermal resources, types, applications for electricity generation. Fuel cell and energy storage. Prerequisite: EPE 340.

**EPE 572: High Voltage Engineering (II) (3 Cr. Hr. )**

Overvoltages (lightning, switching and temporary) in electric power systems, control of overvoltages, protection against overvoltages, insulation coordination in high voltage power systems, non-destructive testing of materials and electrical apparatus, high voltage testing of electrical apparatus. Prerequisite: EPE 470.

**EPE 574: Electrical Transients in Power Systems ( 3 Cr. Hr. )**

Principles of transients modeling of power systems and components. Modeling power apparatus: transformers , generators, motors, transmission lines and Cables. Computer aided calculations of electrical transients. Network analyzer, digital computer. Electromagnetic transients programs EMTP, Hybrid Computer, Pspice.

Prerequisite: EPE 470.

**EPE 596: Special Topics ( 3 Cr. Hr. )**

The content of this course will be determined by the Department.

**EPE 598: Graduation Project ( 3 Cr. Hr. )**

Theoretical investigation, practical implementation or both of a special project under the supervision of a faculty member.