POWER AND ENERGY

A-Thesis Track

The plan studying (33) Credits Hours as follows:

1-OBLIGATORY COURSES FOR SPECIALIZATION (9- credit hours)

No	code	course	LT	CR
1	EL501	English Technical Writing	3	0
2	ES501	Advanced Engineering Mathematics	3	3
3	EE561	Power System Analysis	3	3
4	EE563	Analysis of Electrical Machines	3	3

2-ELECTIVE COURSES: Studying (18 credit hours) from the following

No	code	course	LT	CR
1	EE562	Advanced High Voltage Engineering	3	3
2	EE564	Power System Control & Stability	3	3
3	EE565	Power System Protection	3	3
4	EE566	Power System Operation & Reliability	3	3
5	EE567	Industrial & Domestic Distribution System	3	3
6	EE568	Transients in Power System	3	3
7	EE569	Insulation CO- Ordination in Power System	3	3
8	EE570	High Voltage Test Techniques	3	3
9	EE571	Electrical Machines Dynamics	3	3
10	EE572	Renewable Energy sources	3	3
11	EE573	Advanced Power Electronics	3	3
12	EE574	Advanced Power System Protection	3	3
13	EE575	Computer Method In Power System Analysis	3	3
14	EE590	Independent Study	3	3

3. Dissertation: (6) Credit hours<u>EE599</u>

B-Comprehensive Exam Track

The plan studying (33) Credits Hours as follows:

1-OBLIGATORY COURSES FOR SPECIALIZATION (15- credit hours

No	code	course	LT	CR
1	EL501	English Technical Writing	3	0
2	ES501	Advanced Engineering Mathematics	3	3
3	EE561	Power System Analysis	3	3
4	EE562	Advanced High Voltage Engineering	3	3
5	EE563	Analysis of Electrical Machines	3	3
6	EE573	Advanced power electronics	3	3

2- ELECTIVE COURSES: Studying (18 credit hours) from the following

No	code	course	LT	CR
1	EE564	Power System Control & Stability	3	3
2	EE565	Power System Protection	3	3
3	EE566	Power System Operation & Reliability	3	3
4	EE567	Industrial & Domestic Distribution System	3	3
5	EE568	Transients in Power System	3	3
6	EE569	Insulation CO- Ordination in Power System	3	3
7	EE570	High Voltage Test Techniques	3	3
8	EE571	Electrical Machines Dynamics	3	3
9	EE572	Renewable Energy sources	3	3
10	EE574	Advanced Power System Protection	3	3
11	EE575	Computer Method In Power System Analysis	3	3
12	EE590	Independent Study	3	3

3- Passing Comprehensive Exam after successful completion of all courses

EE561 Power System Analysis

Steady state modeling and simulation techniques. Large-scale power systems. Sparsity programming. Short-circuit and load-flow studies. Introduction to transient stability. Introduction to state estimation

EE 562 Advanced High Voltage Engineering

Breakdown in gases, solids and liquids. Analysis of high voltage transmission: switching and lighting surges. Insulation coordination in electrical power system. Basic impulse levels. System grounding and insulation designs. High voltage generation and measurement.

EE 563 Analysis of Electrical Machines

Elements of generalized theory: basic machines-korn's primitive machine, Park's transformation. Application of generalized theory: steady state and transient performance of DC machine, induction machine, amplidyne, Charge motor. Synchronous machines, synchronous machine viewed as a system of network elements with time varying self and mutual inductance.

EE 564 Power System Control & Stability

Introduction to stability concepts. Basic Block diagram for small deviation of synchronous MIC. Machine voltage control & IEEE standard Exciter types. Control of steam and hydro turbine. IEEE standard turbine / governor types. Interconnected system.Dynamic response and effect of each components on stability. - Objective a.d recommendation for Power system stabilizers. - effect of behavior of load on stability & load shedding.

EE565 Power System Protection

Review of the basic principles and characteristic of protective systems. Measuring transforms with emphasis on transient performance. Comparator theory and characteristic. Distance protection methods. Plot relaying principles. A.C. generator and motor protection. Transformer protection.Bas-bar protection. Transmission line protection. Rural and Metropolitan distribution system protection. Microprocessor and computer based protection**.**

EE566 Power System Operation & Reliability

Concepts of power system reliability: Review of basic techniques, modeling in repairable systems, network approach, Markov modeling, frequency and duration. Generation capacity: loss of load indices, loss of energy indices, frequency and duration. Interconnected systems. Operation reserve. Composite systems. Distribution systems. Substations and switching stations. Reliability cost/worth.

EE 567Industrial and domestic distribution system

Distribution systems and their different standing. System earthling. Load estimation. Normal conditions and current carrying capability. Voltage drop. Fault conditions. Fundamentals of wiring specification: Low voltage systems protection. Power factor study and correction. Unit substation. Standby system.

EE 568 Transients in power system

Basic concepts of electrical transients. Abnormal switch transients. Transients in 3-phase circuits. The behavior of winding under transients conditions. Protection of systems and equipment against over voltages. Transients in special circuits :" electronics, telecommunication etc. Measuring techniques.

EE 569 Insulation Coordination high voltage power system

Basic insulation coordination concepts: levels and margins. Conventional and statistical coordination. Probability distribution of over voltages: amplitude and characteristic times. Simulation of surges-impulse voltages. Insulation level: breakdown probability curves, self-restoring and non-self-restoring insulation, convential and statistical level. Protection level: characteristic of protection devices, conventional and statistical features. Coordination of power system insulation risk.

EE 570High Voltage test technique

Standardized methods of. testing and measuring. Technical and economical reasons of testing. Generation of high voltages : DC, AC, impulse. Voltage testing of insulation systems:-Testing procedures, conditions of testing, reports, DC testing of cables and capacitors: Leakage current, voltage level, time of test, repeating of tests, a.c. testing of power equipment insulation: withstand and breakdown voltage, critical partial discharges voltage, recording of measured data; impulse voltage testing: lightning and switching voltage chopped impulses, breakdown characteristics, breakdown voltage probability, time lag, impulse-time characteristics.
Non-destructive tests: loss and capacitance measurement absorption factor, resistance's of conducting and insulating elements, partial discharges measurements. Elements of high voltage measurements.

EE 571 Electrical Machines Dynamics

DC machine dynamic and control. Transients and dynamics of synchronous machines. Effect of voltage regulator and governor. Methods of solution transients in hinting equations. Transients performance of induction machines. Experimental study of dynamic behavior of electrical machines.

EE572 Renewable Energy sources

Review of principle of energy and thermodynamics. Classification energy sources. Methods of indirect energy conversion. Methods of direct energy conversion. Generation of electric power from:
Solar, Wind, Oceans, geothermal, and waste. Nuclear fission and fusion power. Energy storage systems. Hydrogen as future energy carrier.

EE 573 Advanced Power Electronics

Review of power semiconductor devices: thyristors, GTO, power transistor, and MOSFET. Power control converters. Drive specifications. Rectifier control of DC motors. Fully controlled single-phase and three-phase drives. Multiquadrant operation of DC motors. Closed-loop control of DC motors. Induction motors by voltage controllers. Frequency controlled induction motor drives. Slip power control. Self-controlled synchronous motors. Current/voltage source inverter drives. Introduction to microcomputer control of AC and DC drives.

EE 574 Advanced Power System Protection

Uploaded later

EE 575Computer methods in power system Analysis

Review of basic power system concepts. Sequence impedances of: transmission line, machines, and transformers. Analysis of unsymmetrical faults: Three components methods (with particular emphasis on writing computer program). Simultaneous faults. Unsymmetrical faults: two components method. Computer solutions methods using the Admittance Matrix. Computer solution methods using the Impedance Matrix. Power flow problem:
Newton-Raphson formulation, Decoupled formulation, Stott-Alsac Approximation. Contingency analysis Interactive power flow.