Department of Electrical Engineering
Delhi Technological University
Shahbad Daulatpur, Main Bawana Road
Delhi-110042, India

B.Tech. (Electrical Engineering)

COURSE OUTCOMES (COs)

After completing this course students should be able to:

First Semester			
S. No.	**Course**	**Course Outcomes**	
1	**Basic Electrical Engineering**	EE101.1	Apply the fundamental laws of Electrical Engineering. Analyze performance of different parmeters of electrical circuit and solve the network using different circuit solving techniques.
		EE101.2	Recall the Alternating current fundamentals and analyze combinations of different series and parallel AC circuits.
		EE101.3	Apply the fundamentals of three phase circuit to analyze the balanced/unbalanced circuits.
		EE101.4	Explain operative principle of transformer with background of magnetic circuits
		EE101.5	Classify different electrical measuring equipment's and understanding their principles
Third Semester			
2	**Electronic Devices and Circuits**	EE203.1	Analysis and design of configurations (common emitter, common collector, common base) using h parameters.
		EE203.2	Extensive knowledge of the low and high frequency behaviour of amplifier circuits
		EE203.3	Analysis and design of large scale amplifiers
		EE203.4	Explain the behaviour of tuned amplifiers for series and parallel resonant circuits
		EE203.5	Explain the principle of operation of oscillator circuit
3	**Network Analysis and Synthesis**	EE201.1	Analyse circuit systems using direct application of Kirchhoff's current and voltage laws along with Ohm's law and interpreting analytical circuit results
		EE201.2	Application of node voltage and mesh current
		EE201.3	Apply the concept of linearity and the associated technique in circuits and networks
		EE201.4	Compute time response of current and voltage in first order RL, RC and second order RLC capacitor
		EE201.5	Explaining the concept of mutual and self inductance
		EE201.6	Network functions and to find various two port network parameters
4	**Electromagnetic Field Theory**	EE 207.1	Apply vector calculus to Explain the behaviour of static electric and magnetic fields in different configurations
		EE 207.2	Explaining of Maxwell's equations in terms of integral and differential forms
		EE 207.3	Derive Poynting's theorem from Maxwell's equations and interpret the terms in the theorem
		EE 207.4	Analysis of transmission lines
		EE 207.5	Calculations of plane electromagnetic waves in homogeneous media, including reflection of wave in plane boundaries between homogeneous media

5	**Electromechanical Energy conversion and transformer**	MC261.2	Apply numerical methods to obtain approximate solutions to mathematical problems.
		MC261.3	Apply Unconstrained one dimensional optimization techniques
		MC261.4	Analyse and apply intelligent techniques such as neural network, fuzzy systems, PSO.
		MC261.5	Explain the formulation of Graphical and simplex methods-Big-M method.
		MC261.6	Apply the constrained optimization Techniques
6	**Electromechanical Energy conversion and transformer**	EE 205.1	Explain the transformation of electrical energy into mechanical energy or vice versa using electromagnetic fields.
		EE 205.2	Explain the operation of DC motors and generators and analysis.
		EE 205.3	Explain the basic principles of renewable alternate current energy production.
		EE 205.4	Explain the operation of transformer, induction machines and generators.
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Forth Semester			
7	**Linear Integrated Circuit**	EE 202.2	An ability to Explain and develop different current source circuits
		EE 202.3	Explaining different types of feedback topologies of amplifiers and their effects on input / output impedances, bandwidth and gain of the amplifier
		EE 202.4	An ability to Explain IC741 as inverting and non inverting amplifier
		EE 202.5	Application of OP-AMP as active filter, signal generator and various non-linear applications
		EE 208.1	Know the construction details and principle of operation of various type of transformer, derive equivalent circuit, analyse equivalent circuit from engineering aspects, carry out various tests, derive mathematical expression of voltage regulation and efficiency, inrush current, harmonics and excitation phenomenon
8	**Asynchronous and synchronous Machines**	EE 208.2	Identify the rotating electrical machine concepts
		EE 208.3	Recognize the electromechanical energy conversion principles
		EE 208.4	Describe commentator action, commutation process, armature reaction, compensating winding, excitation methods, performance equations, losses, efficiency, starting& speed control, construct characteristics of DC motors and generators
		EE 206.1	Derive mathematical models of physical systems and use block diagram reduction techniques and signal flow graphs to find the systems input output Relations
9	**Control System**	EE 206.2	Identify the basic structures of control system components and to derive their transfer functions
		EE 206.3	Correlate the pole-zero configuration of transfer function and their time domain response to known test inputs and specify design region in terms of settling time, rise time and overshoot to step response
		EE 206.4	Analyse stability of LTI systems based on Routh Hurwitz, Root locus, Bode plot and Nyquist criterion
		EE 206.4	Analyse stability of LTI systems based on Routh Hurwitz, Root locus, Bode plot and Nyquist criterion
		EE 206.5	Specify control system performance in the frequency domain in terms of gain and phase margins
		EE 204.1	To familiarize the students with the fundamentals of Boolean algebra
10	**Digital Circuits & Systems**	EE 204.2	To familiarize the students with the fundamentals of logic gates
		EE 204.3	Designing of combinational and sequential logic circuits.

		EE 204.4	Provide a preliminary insight into the computer organization at the functional and logical levels.
		EE 207.1	Apply vector calculus to Explain the behaviour of static electric and magnetic fields in different configurations
Fifth Semester			
11	**Power Electronics**	EE301.1	Comprehend comparison of various solid state devices and their characteristics w.r.t their application
		EE301.2	Implement solid switch devices schemes for power conversion i.e AC/DC to AC/DC
		EE301.3	Do mathematical and circuit diagram analysis of various power conversion schemes
		EE301.4	Know how to control the parameters of output of power electronics converter
		EE301.5	Application of Power Electronics system in real time industrial application.
12	**Power Transmission and Distribution**	EE303.1	Ability to design and analyze the real time electrical transmission system with respect to various electrical parameters considering environmental and economic obligations
		EE303.2	Ability to implement the knowledge of basic mathematical ,physical and electrical principles to formulate significant electrical hazards
		EE303.3	Judge the suitability of installing overhead and underground power transmission strategies considering electrical, mechanical, environmental, performance, safety and economic constraints
		EE303.4	Recognize the need to continuously follow the advancements in technology and incorporating them in the present system to improve efficiency
13	**Signals and Systems**	EE305.1	Apply the knowledge of linear algebra topics like vector space, basis, dimension, inner product, norm and orthogonal basis to signals.
		EE305.2	Apply the Laplace transform and Z- transform for analyze of continuous-time and discrete-time signals and systems.
		EE305.3	Classify systems based on their properties and determine the response of LSI system using convolution.
		EE305.4	Analyse the spectral characteristics of continuous-time periodic and a periodic signals using Fourier analysis.
		EE303.4	Analysis of the input output curve, the fuel cost curve, the incremental cost curve, and the heat rate curve.
		EE303.5	Develop and Analyze the power flow solutions using the Gauss Seidel's, Newton Raphson's and Fast Decoupled Load Flow methods.
14	**Digital Control and State Variable Analysis**	EL315.1	Writing description of different linear and nonlinear systems in state space form
		EL315.2	Converting given differential and transfer function based models of linear systems to state space form
		EL315.3	Establishing whether a given linear system is controllable/observable or not
		EL315.4	Representing the system description in terms of difference equation and representing such systems in terms of pulse transfer function using Z-transform
		EL315.5	Analysing stability of discrete time systems described by difference equations
		EL315.6	Understanding the nonlinearities and phenomena exhibited by nonlinear systems
		EL315.7	Mathematically analysing nonlinear systems for stability
15	**Soft Computing**	EE321.1	Comprehend the fuzzy logic and the concept of fuzziness involved in various systems and fuzzy set theory.
		EE321.2	Understand the concepts of fuzzy sets, knowledge representation using fuzzy rules, approximate reasoning, fuzzy inference systems, and fuzzy logic

		EE321.3	To understand the fundamental theory and concepts of neural networks, Identify different neural network architectures, algorithms, applications and their limitations
		EE321.4	Understand appropriate learning rules for each of the architectures and learn several neural network paradigms and its applications
		EE321.5	Reveal different applications of these models to solve engineering and other problems.
16	**Microprocessor and Microcontroller Application**	EE306.1	Implement different types of combinational logic circuits using logic gates
		EE306.2	Implement different types of sequential circuits using Flip Flops
		EE306.3	Familiarization of 8085, 8086 microprocessor kits and 8051 microcontroller kit
		EE306.4	Understand and apply the fundamentals of assembly level programming of microprocessors
		EE306.5	Work with microprocessor interfacing modules including serial ports, digital to analog converters, analog to digital converters etc.
Sixth Semester			
17	**Electrical Drives**	EE302.1	Describe components of Electric Drives System and their choice criterion
		EE302.2	Analyse the steady state and transient stability of Electric Drives
		EE302.3	Understand the various control techniques for electric drives system
		EE302.4	Select the particular motor according to duty it is used in drives
		EE302.5	Comprehend the basic concepts of DC, AC &FHP drives and know the characteristics of them such as starting, braking, speed control etc.
18	**Power System Operation & Control**	EE308.1	Identify different components of power system control centres
		EE308.2	Understand power system economic dispatch problem and its solution algorithm
		EE308.3	Model automatic load frequency control problem and analyse time domain response
		EE308.4	An ability to understand the reactive power control in power systems and the importance of supplying the reactive power locally, to a load.
19	**Power System Analysis**	EE304.1	Develop the structure of an electric power system comprising power sources (generators), power end users (loads) and a transmission and distribution network connecting them and be able to carry out its modeling
		EE304.2	To simplify the analysis of large power systems having many different voltage levels using the per unit system modeling
		EE304.3	To understand the power flow problem, its non-linear nature, its solution, application and the use of personal computers to solve it
		EE304.4	To understand the economic dispatch problem and be able to allocate the real power generation of each unit in order to minimize the total operating cost for a given load demand, without and with transmission losses and limits
		EE304.5	To compute the three phase short circuit currents in a power system by using the bus impedance matrix
20	**Advance Analog Circuit Design**	EE315.1	Apply knowledge of mathematics, science, and engineering to design and analysis of modern analog integrated circuits.
		EE315.2	Emphasize the design of practical amplifiers, small systems and their design parameter trade-offs.
		EE315.3	Understand the relationships between devices, circuits and systems.
		EE315.4	Observe the effect of negative feedback on different parameters of an Amplifier and different types of negative feedback topologies.
		EE315.5	Develop the skill to build, and troubleshoot Analog circuits.

Seventh Semester			
21	**B. Tech Project - I**	EE401.1	Demonstrate a sound technical knowledge of their selected project topic.
		EE401.2	Undertake problem identification, formulation and solution.
		EE401.3	Design engineering solutions to complex problems utilising a systems approach.
		EE401.4	Conduct an engineering project.
		EE401.5	Communicate with engineers and the community at large in written an oral forms.
		EE401.6	Demonstrate the knowledge, skills and attitudes of a professional engineer.
22	**Training Seminar**	EE403.1	Achieve skill to write technical documents and deliver oral presentation of the completed project, which in turn shall develop his communication skills.
		EE403.2	Approach ethically any multidisciplinary engineering challenges with economic, environmental and social contexts so that they are able to explain their work clearly and that helps them to set as a potential employers.
		EE403.3	Identify and apply appropriate steps to solve problems they have met during implementation of their project.
		EE403.4	develop skills towards discerning problems in the organisation, if any, and to plan for resolving it.
		EE403.5	evaluate the severity and consequences of the problems in the organisation and to take steps to address the problem.
		EE403.6	design simulation model for performing the validity tests of new approach towards the problem solving.
23	**Digital Signal Processing**	EE405.1	Analyze discrete time systems in time domain, z- domain and frequency domain
		EE405.2	Analyze and implement digital systems using DFT and FFT
		EE405.3	Realize digital filters using different structures
		EE405.4	Apply design techniques for digital filters according to specifications
		EE405.5	Use MATLAB for analysis and design of DSP systems
24	**Instrumentation and Measurement**	EE407.1	Recognize the evolution and history of units and standards in Measurements.
		EE407.2	Identify the various parameters that are measurable in electronic instrumentation.
		EE407.3	Employ appropriate instruments to measure given sets of parameters.
		EE407.4	Practice the construction of testing and measuring set up for electronic systems.
		EE407.5	To have a deep understanding about instrumentation concepts which can be applied to Control systems.
		EE407.6	Relate the usage of various instrumentation standards.
25	**Switch Gear and Protection**	EE409.1	Explain the working of different types of switchgear equipment's like circuit breakers and relays.
		EE409.2	Design the ratings for fuses according to the requirement
		EE409.3	Elucidate various protection schemes of various power system components like alternators, transformers and bus-bars.
		EE409.4	Explain various methods of over voltage protection in power systems.
26	**Design of Electrical Machine**	EE415.1	Exhibit the study of mmf calculation and thermal rating of various types of electrical machines.
		EE415.2	Design armature and field systems for D.C machines.
		EE415.3	Creatively apply knowledge to design core, yoke, windings and cooling systems of transformers.
		EE415.4	Construct the design of stator and rotor of induction machines.
		EE415.5	Design stator and rotor of synchronous machines and study their thermal behavior.

Eighth Semester			
27	High Voltage Engineering	EE412.1	Understand the importance of insulation providing for the high voltage equipment.
		EE412.2	Understand the different methods of breakdown mechanisms that occur on application of high voltages.
		EE412.3	Get the knowledge of different methods & techniques of generation and measurement of high voltages & currents of AC, DC and Impulse.
		EE412.4	Discriminate the advantages and limitations of high voltage equipment used in the transmission system.
		EE412.5	Understand Principals of insulation Coordination on high voltage and Extra High Voltage power systems.
28	**B.Tech Project (Part-II)**	EE402.1	Demonstrate a sound technical knowledge of their selected project topic.
		EE402.2	Undertake problem identification, formulation and solution.
		EE402.3	Design engineering solutions to complex problems utilising a systems approach.
		EE402.4	Conduct an engineering project.
		EE402.5	Communicate with engineers and the community at large in written an oral forms.
		EE402.6	Demonstrate the knowledge, skills and attitudes of a professional engineer.
29	**Data Communication and Computer Networks**	EE446.1	Describe the general principles of data communication.
		EE446.2	Describe how computer networks are organized with the concept of layered approach.
		EE446.3	Describe how signals are used to transfer data between nodes.
		EE446.4	Implement a simple LAN with hubs, bridges and switches.
		EE446.5	Describe how packets in the Internet are delivered.
30	**Utilization of Electrical Energy and Traction**	EE444.1	Describe nature of light, terms involved in illumination engineering, classify types of lamps & able to select the type of lamp for distinguish purposes.
		EE444.2	Explain the concept of electric heating & electric welding & electrolysis & their electrical equipments & designing.
		EE444.3	Analyze different traction systems, mechanics of train movement, speed time curves, average and schedule speed, acceleration and braking retardation etc.
		EE444.4	Explain the layout of modern 25kV ac single phase traction system & compare different characteristics like starting, control and braking of traction motors for different applications.
		EE444.5	Classify the different types of electrical drives, load equalization and use of fly wheel criteria for selection of motor.