Changes in GATE-2021 syllabus from GATE-2020 syllabus for Electrical Engineering (Technical Subjects)

Section (Subject)	Added New Topics	Removed Topics	Comment
Section-1 : Engineering Mathematics	Calculus: Divergence Theorem	Numerical Methods, Transform Theory	Two topics removed
Section-2: Electric Circuits	Dependent sources, R,L,C,M elements, Star-Delta transformation	Network Graph, Passive filters	The added topics are generally covered in GATE-2020 syllabus inherently but in GATE-2021 syllabus it was revealed. But Network graph and passive filters removal is major change.
Section-3: Electromagnetic Fields	**No Changes**		
Section-4: Signals and Systems	Fourier series representation of discrete time periodic signals, Fourier Transform for discrete time signals, RMS value, average value calculation for any general periodic waveform	-----	Fourier series and Fourier Transform of discrete signals is added. One more basic topic "finding RMS, average,values of general periodic waveforms" is added.
Section-5: Electrical Machines	Transformers: Vector groups	DC Machines: Starting of DC Motors	Vector groups of transformers is added but it is inherent in GATE-2020 syllabus.
Section-6: Power Systems	Economic Load Dispatch(with and without considering transmission losses), Principles of Directional protection	-----	The principles of directional protection are inherent in GATE-2020 syllabus but it was revealed in GATE-2021 syllabus. Major change is addition of Economic load dispatch.

Section (Subject)	Added New Topics	Removed Topics	Comment
Section-7: Control Systems	Solution of state equations of LTI system	State transition matrix	Even though this addition and removal taken place,almost there is no change in syllabus
Section-8: Electrical and Electronic Measurements	**No Changes**		
Section-9: Analog and Digital Electronics	Single stage active filters, Active filters: Sallen key, Butterworth	Simple active filters	The word simple active filters in GATE-2020 syllabus was elaborated in GATE-2021 syllabus.
		Characteristics of diodes, BJT, MOSFET	The removed one is very basic thing, it might be inherent in GATE-2021(present) syllabus.
		8085 microprocessor: Architecture, Programming and Interfacing	It' s a major removal in the whole syllabus change.
Section-10: Power Electronics	Static V-I characteristics and Firing/gating circuits for Thyristors, MOSFET,IGBT.	Characteristics of semiconductor power devices: Diode, Thyristor, Triac, GTO, MOSFET, IGBT	Characteristics of Diode,Triac,GTO was removed. But the firing/gating circuits of Thyristor,MOSFET,IGBT was added.
	Voltage and Current commutated Thyristor based converters	Line commutated Thyristor based converters	There is a change in the added and removed topics. But in general these two are basic parts in Power Electronic subject.
	Magnitude and phase of line current harmonics for uncontrolled and thyristor based converters	Issues of Line Current Harmonics	Almost no change in both words.

GATE - 2021 Syllabus - Electrical Engineering

Section - 1

Engineering Mathematics

Linear Algebra: Matrix Algebra, Systems of linear equations, Eigenvalues, Eigenvectors.

Calculus: Mean value theorems, Theorems of integral calculus, Evaluation of definite and improper integrals, Partial Derivatives, Maxima and minima, Multiple integrals, Fourier series, Vector identities, Directional derivatives, Line integral, Surface integral, Volume integral, Stokes's theorem, Gauss's theorem, Divergence theorem, Green's theorem.

Differential equations: First order equations (linear and nonlinear), Higher order linear differential equations with constant coefficients, Method of variation of parameters, Cauchy's equation, Euler's equation, Initial and boundary value problems, Partial Differential Equations, Method of separation of variables.

Complex variables: Analytic functions, Cauchy's integral theorem, Cauchy's integral formula, Taylor series, Laurent series, Residue theorem, Solution integrals.

Probability and Statistics: Sampling theorems, Conditional probability, Mean, Median, Mode, Standard Deviation, Random variables, Discrete and Continuous distributions, Poisson distribution, Normal distribution, Binomial distribution, Correlation analysis, Regression analysis.

Section - 2

Electric circuits

Network elements: ideal voltage and current sources, dependent sources, R, L, C, M elements; Network solution methods: KCL, KVL, Node and Mesh analysis; **Network Theorems:** Thevenin's, Norton's, Superposition and Maximum Power Transfer theorem; Transient response of dc and ac networks, sinusoidal steady-state analysis, resonance, two port networks, balanced three phase circuits, star-delta transformation, complex power and power factor in ac circuits.

Section - 3

Electromagnetic Fields

Coulomb's Law, Electric Field Intensity, Electric Flux Density, Gauss's Law, Divergence, Electric field and potential due to point, line, plane and spherical charge distributions, Effect of dielectric medium, Capacitance of simple configurations, Biot-Savart's law, Ampere's law,Curl, Faraday's law, Lorentz force, Inductance, Magnetomotive force, Reluctance, Magnetic circuits, Self and Mutual inductance of simple configurations.

Section - 4

Signals and Systems

Representation of continuous and discrete time signals, shifting and scaling properties, linear time invariant and causal systems, Fourier series representation of continuous and discrete time periodic signals, sampling theorem, Applications of Fourier Transform for continuous and discrete time signals, Laplace Transform and Z transform. R.M.S. value, average value calculation for any general periodic waveform

Section - 5

Electrical Machines

Single phase transformer: equivalent circuit, phasor diagram, open circuit and short circuit tests, regulation and efficiency; **Three-phase transformers:** connections, vector groups, parallel operation; Auto-transformer, Electromechanical energy conversion principles; DC machines: separately excited, series and shunt, motoring and generating mode of operation and their characteristics, speed control of dc motors; Three-phase induction machines: principle of operation, types, performance, torque-speed characteristics, no-load and blocked-rotor tests, equivalent circuit, starting and speed control; Operating principle of single-phase induction motors; Synchronous machines: cylindrical and salient pole machines, performance and characteristics, regulation and parallel operation of generators, starting of synchronous motors; Types of losses and efficiency calculations of electric machines

Section - 6

Power Systems

Basic concepts of electrical power generation, ac and dc transmission concepts, Models and performance of transmission lines and cables, Economic Load Dispatch (with and without considering transmission losses), Series and shunt compensation, Electric field distribution and insulators, Distribution systems, Per-unit quantities, Bus admittance matrix, Gauss-Seidel and Newton-Raphson load flow methods, Voltage and Frequency control, Power factor correction, Symmetrical components, Symmetrical and unsymmetrical fault analysis, Principles of over-current, differential, directional and distance protection; Circuit breakers, System stability concepts, Equal area criterion.

Section - 7

Control Systems

Mathematical modeling and representation of systems, Feedback principle, transfer function, Block diagrams and Signal flow graphs, Transient and Steady-state analysis of linear time invariant systems, Stability analysis using Routh-Hurwitz and Nyquist criteria, Bode plots, Root loci, Lag, Lead and Lead-Lag compensators; P, PI and PID controllers; State space model, Solution of state equations of LTI systems

Section - 8

Electrical and Electronic Measurements

Bridges and Potentiometers, Measurement of voltage, current, power, energy and power factor; Instrument transformers, Digital voltmeters and multimeters, Phase, Time and Frequency measurement; Oscilloscopes, Error analysis.

Section - 9

Analog and Digital Electronics

Simple diode circuits: clipping, clamping, rectifiers; Amplifiers: biasing, equivalent circuit and frequency response; oscillators and feedback amplifiers; operational amplifiers: characteristics and applications; single stage active filters, Active Filters: Sallen Key, Butterwoth, VCOs and timers, combinatorial and sequential logic circuits, multiplexers, demultiplexers, Schmitt triggers, sample and hold circuits, A/D and D/A converters.

Section - 10

Power Electronics

Static V-I characteristics and firing/gating circuits for Thyristor, MOSFET, IGBT; DC to DC conversion: Buck, Boost and Buck-Boost Converters; Single and three-phase configuration of uncontrolled rectifiers; Voltage and Current commutated Thyristor based converters; Bidirectional ac to dc voltage source converters; Magnitude and Phase of line current harmonics for uncontrolled and thyristor based converters; Power factor and Distortion Factor of ac to dc converters; Single-phase and three-phase voltage and current source inverters, sinusoidal pulse width modulation.