

# Gate Syllabus of Electronics and Communication Engineering 2014

**General Aptitude(GA)**- It's a multiple choice test to judge the basic English knowledge of a person

- **This Paper Consists of Verbal Ability:** English grammar, verbal analogies, instructions, critical reasoning and verbal deduction, Sentence completion, Word groups

**Engineering Mathematics**- It is said to be a branch of mathematics which contains mathematical methods and techniques that are used in industry and engineering.

- **Linear Algebra: Branch of mathematics which does study of operation and applying it to solve equations.** It include following topics-Matrix Algebra, Eigen values and Eigen vectors, System of Linear Equations
- **Calculus: It is mathematical study of change.** It includes topics-Theorems of integral calculus, Mean Value Theorem, Evaluation of definite and improper integrals, Maxima and minima, Partial Derivatives, Multiple integrals, Fourier series. Directional derivatives, Line, Surface and Volume integrals, Stokes, Gauss and Green's theorems, Vector Identities
- **Differential equations: It deals with rate of change and slope of curves.** It include topics-First order equation (linear and nonlinear), Cauchy's and Euler's equations, Method of Variation of parameters, Initial and boundary value problems, Partial Differential Equations and variable separable method, Higher order linear differential equations with constant coefficients
- **Complex variables: It comes under complex analysis category.** It include topics-Analytic functions, Taylor's and Laurent' series, Residue theorem, solution integrals, Cauchy's integral theorem and integral formula.
- **Probability and Statistics: They are of two different academic disciplines but studied together.** It includes topics-Sampling theorems, Mean, median, Conditional probability, mode and standard deviation, Random variables, Discrete and continuous distributions, Correlation and regression analysis, Poisson, Normal and Binomial distribution

- **Numerical Methods: It is the study of step by step process that takes help of numerical approximation.** It include topics-Single and multi-step methods for differential equations, Solutions of non-linear algebraic equations
- **Transform Theory: It is the Study of transforms.** It include topics-Fourier transform, Z-transform, Laplace transform

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- **Networks: It is the connection of electrical elements together.** It includes topics- [Network graphs](#): matrices associated with graphs; incidence, fundamental cut set and fundamental circuit matrices. Network theorems: [superposition](#), Wye-Delta transformation. Linear constant coefficient differential equations; time domain analysis of simple RLC circuits, Solution of network equations using Laplace transform: frequency domain analysis of RLC circuits. [2-port network parameters](#): driving point and transfer functions. State equations for networks. [Thevenin](#) and Norton's maximum power transfer, [Steady state sinusoidal analysis using phasors](#), Solution methods: [nodal and mesh analysis](#)
- **Electronic Devices: These are the physical entities in an electronic system use to affect the electrons.** It includes Topics- Carrier transport in silicon: diffusion current, mobility, and resistivity, drift current. Generation and recombination of carriers. p-n junction diode, , MOSFET, [LED](#), p-I-n and [avalanche photo diode](#), [LASERS](#) basics. Device technology includes integrated circuits fabrication process, diffusion ,oxidation, ion implantation, photolithography, p-tub, n-tub and twin-tub CMOS process, Energy bands in silicon, intrinsic and extrinsic silicon, Zener diode, tunnel diode, JFET, [BJT](#), MOS capacitor
- **Analog Circuits: These are the circuits that use continuous time voltages and current.** It include topics-Small Signal Equivalent circuits of diodes, MOSFETs and analog CMOS , BJTs. Simple diode circuits, clamping, clipping, rectifier. Biasing and bias stability of transistor and FET amplifiers. Amplifiers include single-and multi-stage, [operational](#) and differential, feedback, and power. [Simple op-amp circuits](#). Filters. [Sinusoidal oscillators](#); criterion for oscillation; single-transistor and op-amp configurations , Frequency response of amplifiers, Function generators and 555 Timers, wave shaping circuits. Power supplies.
- **Digital circuits: These are made from analog components which represent signal by the help of discrete values.** It includes topics- minimization of Boolean functions; [Boolean algebra](#), [logic gates](#); digital IC families (DTL, TTL, ECL, MOS, CMOS). Combinatorial circuits include arithmetic circuits, multiplexers, code convertors, decoders, PLAs and PROMs. [Sequential circuits](#) include counters and shift-registers, latches and [flip-flops](#). Sample and hold circuits, DACs, ADCs.

Semiconductor memories. [Microprocessor](#) (8085): architecture, memory and I/O interfacing, programming.

- **Signals and Systems: Signal conveys information which is generally a function of independent variable and system is the physical set of components/parts that carries a signal.** It includes topics-Definitions and properties of Laplace transform continuous-time and discrete-time Fourier series, DFT and FFT, discrete-time and continuous-time Fourier Transform, z-transform. Sampling theorem. Linear Time-Invariant (LTI) Systems includes definitions and properties; causality, impulse response, stability, convolution, poles and zeros, frequency response, cascade and parallel structure, phase delay, group delay. Signal transmission through the LTI systems.
- **Control Systems: Devices that are meant to manage, order, direct or supervise the behaviour of other devices or systems.** It includes topics- [Basic control system components](#); reduction of block diagrams, block diagrammatic description. Open loop and closed loop (feedback) systems and stability analysis of these systems; steady state and transient analysis of LTI control systems and frequency response, Signal flow graphs and their use in determining transfer functions of systems. Tools and techniques for LTI control system analysis: Routh-Hurwitz criterion, root loci, Nyquist and Bode plots. Control system compensators: elements of Proportional-Integral-Derivative (PID) control elements of lead and lag compensation. State variable representation & solution of state equation of LTI control systems.
- **Communication: Refers to interaction. It includes topics-** Random signals and noise: probability, probability density function, random variables, power spectral density, random variables. [Analog communication systems](#) includes spectral analysis of the following operations, amplitude and angle modulation and demodulation systems, superheterodyne receivers; elements of hardware, realizations of analog communication systems; signal-to-noise ratio (SNR) calculations for [amplitude modulation \(AM\) and frequency modulation \(FM\)](#) for low noise conditions. Digital communication system includes [pulse code modulation](#) (PCM), differential pulse code modulation (DPCM), digital modulation schemes includes amplitude, phase and frequency shift keying schemes (ASK, FSK, PSK), matched filter receivers, bandwidth consideration and probability of error calculations for these schemes. [Basics of FDMA, TDMA and GSM and CDMA](#). Fundamentals of information theory and channel capacity theorem
- **Electromagnetics: It refers to electromagnetism.** It include topics -Elements of vector calculus includes divergence and curl; Maxwell's equations: differential and integral forms, Gauss' and Stokes' theorems. Poynting vector, Wave equation. Plane waves include propagation through various media; reflection and refraction; skin depth phase and group velocity. [Transmission lines](#): characteristic impedance; Smith chart; impedance matching, impedance transformation; S parameters, pulse excitation.

Waveguides includes: modes in rectangular waveguides; cut-off frequencies; boundary conditions, dispersion relations. Basics of propagation in [optical fibres](#) and dielectric waveguide. Basics of Antennas includes: radiation pattern; Dipole antennas, antenna gain.

