AP PGECET 2025 Electronics & Communication Engineering Syllabus

Engineering Mathematics Syllabus

Linear Algebra	• Matrix algebra • Systems of linear equations • Eigenvalues and eigenvectors
Calculus	• Mean value theorems • Evaluation of definite and improper integrals • Theorems of integral calculus • Partial derivatives • Maxima and minima • Multiple integrals • Fourier series • Vector identities • Directional derivatives • Line/ surface/ and volume integrals • Stokes, Gauss, and Green's theorem
Differential Equations	• First-order equations (linear and non-linear) • Higher-order linear differential equations with constant coefficients • Methods of variations parameters • Cauchy's & Euler's equations • Initial and boundary value problems • Partial differential equations and variable separable method
Complex Variables	• Analytic functions • Cauchy's integral theorem and integral formula • Taylor & Laurent series • Residue theorem • Solution integrals
Probability & Statistics	• Probability and sampling theorems • Conditional probability • Probability of the density function

	• Mean/median/mode/standard deviation • Random variables • Discrete and continuous distributions • Exponential/ poisson/ normal/ binomial distributions • Correlation and regression analysis
Numerical Methods	• Solutions of non-linear algebraic equations • Single & multi-step methods for differential equations

Electronics and Communication Engineering Syllabus

Network	• Network graphs • Matrices associated with graphs • Incidence • Fundamental cut set and fundamental circuit matrices • Solution methods: nodal & mesh analysis • Network theorems - superposition, Thevenin, and Norton's maximum power transfer • Wye-delta transformation • Steady-state sinusoidal analysis using phasors • 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
Electronic Devices	• Energy band in silicon • Intrinsic and extrinsic silicon • Carrier transport in silicon -

	diffusion current, drift current, mobility, and resistivity • Generation and recombination of carriers • P-n junction diode/ Zener diode, tunnel diode, BJT, JFET, mos capacitor, MOSFET, LED, PIN, and avalanche photodiode • Basics of laser • Device technology - integrated circuits fabrication processes, oxidation, diffusion, ion implantation, photolithography, n-tub, p-tub, and twin-tub CMOS process
Analog Circuits	• Small signal equivalent circuits of diode • BJTs, MOSFETs, and analog CMOS • Simple diode circuits/ clipping/ clamping/ rectifier • Biasing and bias stability of transistor and FET amplifiers • Amplifiers: single and multi-stage, differential and operational, feedback and power • Frequency response of amplifiers • Simple opamp circuits • Filters • Sinusoidal oscillators • Criterion for oscillation • Single transistor and op-amp configurations • Function generators and wave-shaping circuits • 555 timers • Power supplies
Digital Circuits	• Boolean algebra • Minimization of Boolean functions • Logic gates • Digital IC families • Combinational circuits - arithmetic circuits, code converters, multiplexers, decoders, PROMs,

	and PLAs • Sequential circuits - Latches & flip flops, counters & shift registers, sample & hold circuits, ADCs, DACs • Semiconductor memories • Microprocessor - architecture, programming, memory and I/O interfacing
Signals & Systems	• Definitions and properties of laplace transform • Continuous time and discrete-time Fourier series • Continuous time and discrete-time Fourier transform • DFT and FFT • Z transform • Sampling theorem • Linear time-variant systems (definition and properties) • Casualty/ stability/ impulse response/ convolution/ poles/ zeroes • Parallel and cascade structures • Frequency response, group delay, and phase delay • Signal transmission through LTI systems
Control Systems	• Basic control system components • Block diagram description • Reduction of block diagrams • Open loop and closed loop systems and stability analysis of these systems • Signal flow graphs and their use in determining transfer functions of systems • Transient and steady-state analysis of LTI control systems and frequency response • Tools and techniques for LTI control system analysis - root loci, Routh-Hurwitz criterion, Bode and Nyquist plots

	• Control system compensators - Element of lead and lag compensation • Elements of proportional integral - -derivative control • State variable representation and solution of state equation of LTI control systems
Communications	• Deterministic and random signals • Types of noise • Autocorrelation • Power spectral density
Analog Communication Systems	• Amplitude and angle modulation and demodulation systems • Spectral analysis of these operators • Superheterodyne receivers • Elements of hardware • Realizations of analog communication systems • Signal-to-noise ratio calculations for amplitude modulation and frequency modulation for low noise conditions • Fundamentals of information theory and channel capacity theorem • Digital communication system - pulse code modulation, differential pulse code modulation • Digital modulation schemes - amplitude/ phase/ frequency shift keying schemes • Matched filters receivers • Bandwidth consideration and probability of error calculations for these schemes • Basics of TDMA, FDMA, CDMA, and GSM
Electromagnetics	• Elements of vector calculus - divergence and curl • Gauss and Stoke's theorem • Maxwell's equations - differential

	and integral forms • Wave equation • Poynting vector • Plane waves - propagation through various media • Reflection and refraction • Phase and group velocity • Skin depth • Transmission lines - characteristics of impedance and impedance transformation • Smith Chart • Impedance matching • S parameters • Dispersion relations • Basics of propagation in dielectric waveguide and optical fibers • Basics of antennas • Dipole antennas • Radiation pattern • Antenna gain