

AP PGECET 2025 Instrumentation 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 varying 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

Instrumentation Engineering Syllabus

Basics of Circuits and Measurement Systems	• Kirchhoff's law • Mesh and nodal analysis • Circuit theorem • One-port and two-port network functions • Static and dynamic characteristics of measurement systems • Error and uncertainty analysis • Statistical analysis of data and curve fitting
Transducers, Mechanical Measurement and Industrial Instrumentation	• Resistive/ capacitive/ inductive/ piezoelectric transducers and their signal conditioning • Measurement of displacement/ velocity/acceleration • Force/ torque/ vibration/ shock • Measurement of pressure/ flow/ temperature/ liquid level • Measurement of pH/ conductivity/ viscosity/ humidity
Analog Electronics	• Characteristics of diode/ BJT/ JFET/MOSFET • Diode circuits • Transistors at low and high frequencies • Amplifiers/ single and multi-stage • Feedback amplifiers

	• Operational amplifiers • Characteristics and circuit configurations • Instrumentation amplifier • Precision rectifier • V to I and I to V converter • Op-amp-based active filters • Oscillators and signal generators
Digital Electronics	• Combinational logic circuits • Minimization of Boolean functions • IC families/ TTL/ MOS and CMOS • Arithmetic circuits • Comparators/Schmitt trigger/ mono stable multi vibrator • Sequential circuits/ flip flops/ counters/ shift register • Multiplexer/ S/H circuit • Analog to digital and digital to analog converters • Basics of the number system • Microprocessor applications, memory, and input-output interfacing • Microcontrollers
Signals, Systems, and Communications	• Periodic and aperiodic signals • Impulse response/ transfer function/ frequency response of first and second order systems • Fourier transform/ laplace transform/ z-transform • Convolution/correlation/characteristics of linear time invariant systems • Discrete time system/impulse/ frequency response • Pulse transfer function • IIR and FIR filters • Amplitude and frequency modulation and demodulation • Sampling theorem/ pulse code modulation • Frequency and time division multiplexing • Amplitude shift keying/ frequency shift keying/ pulse shift keying for

	digital modulation
Electrical and Electronic Measurements	• Bridges and potentiometers • Measurement of R/L/ and C • Measurement of voltage/current/power/power factor/energy • AC & DC probes • Extension of instrument ranges • Q-meter and waveform analyzer • Digital voltmeter and multimeter • Time, phase, and frequency measurements • Cathode ray oscilloscope • Series and parallel communication • Shielding and grounding
Control Systems and Process Control	• Feedback principles • Signal flow graphs • Transient response/ steadystate-errors • Routh and Nyquist criteria • Bode plot/ root loci • Time delay systems • Phase and gain margin • State space representation of systems • Mechanical/hydraulic/ pneumatic system component • Synchro pair/ servo/ step motors • On-off/cascade/ P, PI, PID/ feed forward/ derivative controller/ fuzzy controllers • Analytical/ optical/ biomedical instrumentation • Mass spectrometry/ UV visible/ IR spectrometry • X-ray and nuclear radiation • Optical sources and detectors/ LED/ Laser/ photo-diode/ photo-resistor and their characteristics • Interferometers/ applications in metrology • Basics of fiber optics • Biomedical instruments/ EEG/

	ECG/ EMG • Clinical measurements • Ultrasonic transducers and ultrasonography • Principles of computer-assisted tomography
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