भारतीय प्रौद्योगिकी संस्थान तिरुपति
INDIAN INSTITUTE OF TECHNOLOGY TIRUPATI
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Syllabus for M.S.(R) & Ph.D. Written test/ Interview – January 2026 semester

Department of Electrical Engineering - Power and Control

Control and Robotics

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, Routh-Hurwitz and Nyquist criteria, Bode plots, Root loci, Stability analysis in Time and Frequency Domain, Lag, Lead and Lead-Lag compensators; P, PI and PID controllers; State space modeling, fundamentals of non-linear control, and Lyapunov stability analysis.

Power Electronics

Basic Mathematics. Basic engineering circuit analysis. Phasor diagrams. Steady state operation of Buck, Boost and Buck Boost Converters. Operation of Isolated Converters - Flyback, Forward and Full bridge DC-DC converters - CCM and DCM operation. Operation of Inverters, Rectifiers and PWM techniques, Basic concepts of electric machines and drives. Modelling and Control aspects in power converters. Bode plot and Root locus based controller design.

Smart Power Grids

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.

Reference books:

[1] Grainger J J and Stevenson W D, Power System Analysis, McGraw Hill (1994).
[2] Saadat H, Power System Analysis, McGraw Hill (2002).
[3] Power Electronics: Converters Applications and Design, 3rd edition, Wiley by Ned Mohan, Robbins.
[4] Control Systems Part-1 and 2, 2nd edition, RBS publishers by Nagoor kani.