Department of Electronics and Physics  
Institute of Science, GITAM University  

Physics - Syllabus for M.Phil. & Ph.D. entrance examination

PART-A

Unit-I  
Classical, Quantum and Statistical Mechanics  
Classical Mechanics  
D-Alembert's Principle, Lagrange's equation, Hamilton's equation of motion and conservation theorems. Euler angles, Canonical transformation and Poisson brackets.  
Quantum Mechanics  
General formalism of wave mechanics Schrödinger’s wave equation, Angular momentum operators, Time independent and dependent perturbation theory. Scattering phenomena, differential – cross section and Born approximation.  
Statistical Mechanics  

Unit-II  
Electrodynamics  

Unit-III  
Solid State Physics & Nuclear Physics  
Nuclear Physics  

Unit-IV  
Low dimensional Physics and Electronics  
Electromagnetic Spectrum, Molecular energies, Classification of molecules, Rotational, vibrational and vibrational-rotational spectra of diatomic molecules, Characteristic group absorptions, IR spectrometer, Electronic Spectra, Frank Condon principle  
Hydrogen atom-spectrum, Orbital angular momentum, Larmor precession, Stern and Gerlach experiment, Energy levels and transitions in Helium atom, Normal and anomalous Zeeman effect  

Electronics  
DEPARTMENT OF ELECTRONICS AND PHYSICS
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PART-A
Unit-I

BJT and FET
Bipolar Junction Transistor(BJT)
Three configurations of transistor, Biasing, BJT as an amplifier, BJT characteristics, Applications of Transistor.
Field Effect Transistor(FET)
Construction and characteristics, Biasing, FET as an amplifier, Applications of FET. MOSFET: Introduction, Depletion and Enhancement type MOSFETs. Feedback concepts: Practical feedback circuits, Feedback amplifiers, Oscillator operation, types of oscillators

Unit-II
Operational amplifiers
Op-amp Applications-Constant gain multiplier, Voltage to Current Converter, Current to Voltage Converter and filters.

Unit-III
Combinatorial and Sequential logic circuits
Combinatorial logic circuits
Simplification of Boolean expressions, Karnaugh map method, Encoders and Decoders, Multiplexers and Demultiplexers Binary addition, subtraction, multiplication and division.
Sequential logic circuits
Flip-Flops, Counters: Asynchronous (ripple) counters, Down counter, Synchronous counters, Up-down counter, Ring counter, Johnson counter.

Unit-IV
Communication & Microprocessors
Communications
FM Modulation-Direct and Indirect methods. Detection methods - Slope detector, balanced slope detector, Amplitude limiter, Pre-emphasis and De-emphasis.
Microprocessors
PART –B
(Comment to both Physics and Electronics)

Unit-I
Interpolation:
Forward and backward differences. Newton’s formula for interpolation, Lagrange’s interpolation formula, Simpson’s rule and Trapezoidal rule. Matrices, Inverse of matrices, types of matrices, eigen values and eigen vectors of matrices and rank of matrix.

Unit-II
Complex analysis

Unit-III
Laplace transforms & Basics of C language
Laplace transforms
Laplace transform, Inverse Laplace transforms and its computation for various functions. Application of laplace transform to differential equations with constant coefficients.
Basics of C-language
Introduction to C, constants, variables, data types, declaration of variables, user defined declaration, operators, Control statements: if, switch, conditional operator, go to, if ---- else; Decision making and looping statements: while, do --- while and for loop.

Unit-IV
Instrumentation methods:
Characterization techniques with UV visible IR Raman-XRD- TEM and SEM. Measurement techniques of Radio activity