

Syllabus for Adani University Research Entrance Test (ARET)

Department of Physics

Faculty of Sciences

Mathematical Physics: Vector algebra and calculus, Linear algebra, Cayley-Hamilton Theorem, Eigenvalues and eigenvectors, Linear ordinary differential equations, Special functions, Fourier series, Fourier and Laplace transforms, Complex analysis, analytic functions, Taylor & Laurent series, Poles, Residues and Evaluation of integrals, Probability theory, random variables, Distributions, Central limit theorem.

Quantum Mechanics: Schrödinger equation, Eigenvalue problems, Wave-function in coordinate and momentum representations, Dirac notation for state vectors, Motion in a central potential, Orbital angular momentum, Spin, addition of angular momenta, Hydrogen atom, Perturbation theory and applications, Identical particles, Pauli exclusion principle, Spin-statistics connection.

Electronics: Semiconductor devices, structure, characteristics, frequency dependence, and applications; Opto-electronic devices, Operational amplifiers and their applications, Digital techniques and applications (registers, counters, comparators and similar circuits). A/D and D/A converters. Microprocessor and microcontroller. Data interpretation and analysis.

Condensed Matter Physics: Bonding of solids. phonons, lattice specific heat, Free electron theory, Response and relaxation phenomena, Hall effect and thermoelectric power, Electron motion in a periodic potential, Band theory of solids, Superconductivity: type-I and type-II superconductors, Josephson junctions, Superfluidity, Defects and dislocations, Ordered phases of matter, Translational and orientational order, Kinds of liquid crystalline order, Quasi crystals.

Nuclear and Particle Physics: Basic nuclear properties, Binding energy, semi-empirical mass formula, liquid drop model, Nature of the nuclear force, Deuteron problem, Evidence of shell structure, Single-particle shell model, Rotational spectra, Elementary ideas of alpha, Beta and gamma decays and their selection rules, Fission and fusion, nuclear reactions, Classification of fundamental forces, Elementary particles and their quantum numbers, Quark model, Baryons and mesons, Application of symmetry arguments to particle reactions.

Signature of HoD/Dean

