

Relativity and Gravitation

Desirable previous knowledge

Suffix notation, vector and tensor analysis. Variational principle and Lagrangian formulation of dynamics. Familiarity with Lorentz transformations and use of 4-vectors in special relativity, 4-momentum p^μ for a particle and energy-momentum conservation in 4-vector form. Relativistic formulation of electrodynamics using $F_{\mu\nu} = \partial_\mu A_\nu - \partial_\nu A_\mu$ and Lagrangian density $\mathcal{L} = -\frac{1}{4}F_{\mu\nu}F^{\mu\nu}$.

Knowledge of basic mathematical methods, including Fourier transforms, normal modes, and δ -function (including 3-dimensions). Basic quantum mechanics, wave functions, amplitudes and probabilities. Familiarity with aspects of statistical physics and thermodynamics, including notions of thermal equilibrium, entropy, black body radiation, and Fermi-Dirac, Bose-Einstein and Boltzmann distributions.

The desirable previous knowledge needed to tackle the Relativity and Gravitation courses is covered by the following Cambridge undergraduate courses. Students starting Part III from outside might like to peruse the syllabuses on the WWW at

<http://www.maths.cam.ac.uk/undergrad/schedules/>

Year		Courses
First	<i>Essential:</i>	Vectors & Matrices, Diff. Eq., Vector Calculus, Dynamics & Relativity.
Second	<i>Essential:</i>	Methods, Quantum Mechanics, Variational Principles.
	<i>Helpful:</i>	Electromagnetism, Geometry, Complex Methods.
Third	<i>Essential:</i>	Classical Dynamics.
	<i>Very helpful:</i>	General Relativity, Stat. Phys., Electrodynamics, Cosmology.
	<i>Helpful:</i>	Further Complex Methods, Asymptotic methods.

If you have not taken the courses equivalent to those denoted 'essential', then you should review the relevant material over the vacation.