General Relativity (M24)

David Tong

General relativity is the study of space and time and gravity. The theory is one of the great achievements of human civilisation, a single, elegant formula which, when unravelled, reveals many of the mysteries of the Universe and hints at what lies beyond. This formula, known as the Einstein field equation, tells us how apples fall, how planets orbit, how black holes evolve, how ripples of the spacetime continuum propagate, and how the entire Universe expands.

This is a second course on General Relativity, albeit one that could just about be followed without prior exposure to the subject. The first half of the course will give an introduction to Differential Geometry, the mathematics that underlies curved spacetime. The second half of the course will then turn to the physics of gravity.

Pre-requisites

Special Relativity (essential), General Relativity (highly desirable), Maxwell's equations in relativistic form (also highly desirable)

Literature

1. S. Carroll, "Spacetime and Geometry: An Introduction to General Relativity", Pearson International Edition.
2. Robert M. Wald, "General Relativity", University of Chicago Press.
3. C.W. Misner, K.S. Thorne, and J.A. Wheeler, "Gravitation", Princeton University Press.
4. M. Nakahara, "Geometry, Topology and Physics", IOP Publishing

Additional support

Four examples sheets will be provided and four associated examples classes will be given. There will be a one-hour revision class in the Easter Term.