

Gravity, Particles and Fields MSc – suggested pre-course reading

For revision of pre-requisite knowledge, we recommend the following books.

Topic	Book title	Book author(s)	Notes
Mathematical Methods	<i>Mathematical Methods for Physics and Engineering: A Comprehensive Guide</i>	K. F. Riley, M. P. Hobson and S. J. Bence	<p>This is the most important book on this list to read for revision. This book is available online to download for free.</p> <p>The key topics you need to be comfortable with are:</p> <ul style="list-style-type: none"> • Calculus (chapters 2, 5 and 6) • Vector calculus (chapters 7, 10 and 11) • Matrices and vector spaces (chapter 8) • Tensors (chapter 26) • Fourier series and Fourier transforms (chapters 12 and 13.1) • The Laplace, heat and wave equations (chapters 20 and 21) • Complex variables and contour integration (chapter 24)
Classical Mechanics	<i>Classical Mechanics</i>	Kibble and Berkshire	In particular, it is worth looking at Lagrangian and Hamiltonian mechanics in chapters 10, 11 and 12.
Quantum Mechanics	<i>Quantum Mechanics Demystified</i>	David McMahon	
Special Relativity	<i>Flat and curved space-times</i>	George F. Ellis and Ruth M. Williams	The first part covers special relativity and the second part will be useful for the MSc course.

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For the modules taught during the MSc, here are a few suggestions for preliminary reading that will introduce some of the ideas in a fairly non-technical way.

These are not supposed to cover all the module material, but are there to get you started.

Topic	Book title	Book author(s)	Notes
Differential Geometry	Modern Geometry: Methods and Applications (Parts I and II)	B. A. Dubrovin, A. T. Fomenko and S. P. Novikov	Students should pay particular attention to chapters 1, 3 and 4 from Part I, and chapter 1 from Part II.
General relativity, black holes and cosmology	<i>Flat and curved space-times</i>	George F. Ellis and Ruth M. Williams	
Gravity	<i>An Introduction to Einstein's General Relativity</i>	J.B. Hartle	
	<i>Einstein Gravity in a Nutshell</i>	A. Zee	Anthony Zee's books are particularly recommended as they are written in a very accessible way.
	<i>On Gravity: A Brief Tour of a Weighty Subject</i>	A. Zee	
Quantum field theory	<i>Quantum Field Theory in a Nutshell</i>	A. Zee	
Quantum electrodynamics (QED)	<i>QED: The Strange Theory of Light and Matter</i>	R.P. Feynman	
Quantum information theory	<i>Quantum Computation and Quantum Information</i>	M. A. Nielsen and I. L. Chuang	