

MSc Astrophysics - Partial list of some recommended course textbooks in recent years

ASTM041 RELATIVISTIC ASTROPHYSICS AND GRAVITATION:

The Classical Theory of Fields - L. Landau and E. Lifshitz

A First Course in General Relativity - Bernard F. Schutz

Black Holes, White Dwarfs and Neutron Stars The Physics of Compact Objects - Stuart Shapiro and Saul Teukolsky

ASTM108 ADVANCED COSMOLOGY:

A. Liddle, An Introduction to Modern Cosmology Wiley, 1999, ISBN 0471987581.

A very gentle introduction to the field with almost no mathematics. Intended for undergraduates, it may be helpful if you have no previous background in cosmology, but it does not by itself provide enough detail for this course. Its main advantage is that covers the main topics of relevance to modern cosmology.

J. F. Harvey & K. A. Holcomb, Foundations of Modern Cosmology, OUP, 1998, ISBN 0195104978.

A very descriptive, non-mathematical account of modern cosmology and the big bang. Another gentle introduction

M. S. Madsen, The Dynamic Cosmos, Chapman & Hall, 1995, ISBN 0412623005.

Intended for final-year undergraduates, this covers most of the topics relevant to modern cosmology and has a more mathematical approach. It provides a good introduction to this course.

J. N. Islam, An Introduction to Mathematical Cosmology, Cambridge, 1992, ISBN 0521499739.

This is more advanced than the books by Liddle and Madsen. Although parts of it focus on aspects of general relativity, about half of it is directly relevant to topics we cover.

E. W. Kolb & M. S. Turner, The Early Universe, Addison-Wesley, 1990, ISBN 0201116030.

A classic graduate textbook on the early universe. Although some parts of it are a little dated, the sections relevant to this course have stood the test of time, especially the chapters on physical cosmology and the big bang model. Although quite mathematical in places, I used this book a lot when preparing the course.

P. Coles & F. Lucchin, Cosmology: The Origin and Evolution of Cosmic Structure, Wiley, 1995, ISBN 0471489093.

This is another excellent graduate textbook. Its emphasis is on models of large-scale structure as the authors are physical, rather than mathematical, cosmologists. The first half contains much of what you need to know and is pitched at about the right level for the course.

J. A. Peacock, Cosmological Physics, (CUP 1999) ISBN 0521422701.

This is an advanced text and discusses a vast array of cosmological topics in great detail, certainly more than we will be able to cover. The level is probably better suited to students who are setting out on their PhD studies. However, with a bit of work, you would benefit from having a look at this book, as parts of it are certainly accessible.

P. J. E. Peebles, Principles of Physical Cosmology, Princeton University Press, 1993, ISBN 0691019339.

This is another advanced book, providing a full survey of current issues in cosmology at a somewhat specialized level. Again, parts of it should be accessible and are worth looking at.

A. R. Liddle & D. H. Lyth, *Cosmological Inflation and Large--Scale Structure*, CUP, 2000, ISBN 0521575982.

This book specialises, as its title suggests, on inflation and structure formation. It evolved out of a technical review article and gives an advanced treatment of current issues in this field. Worth dipping into if you are particularly interested in the physical motivation and current status of inflationary cosmology.

#### ASTM052 EXTRAGALACTIC ASTROPHYSICS:

*Galaxies in the Universe: An Introduction* - Linda S. Sparke and John S. Gallagher  
Cambridge University Press (2000). ISBN 0-521-59740-4. This is a good introduction to the subject in general.

*Quasars and Active Galactic Nuclei* - Ajit K. Kembhavi and Jayant V. Narlikar, Cambridge University Press (1999) ISBN 0-521-47989-4

Both these books on AGN are good. Kembhavi and Narlikar is technically the more demanding.

*An Introduction to Active Galactic Nuclei* - Bradley M. Peterson, Cambridge University Press (1997) ISBN 0-521-47911-8

*Modern Cosmological Observations and Problems* - Gregory Bothun, Taylor and Francis (1998) ISBN 0-7484-0645-X. A fairly recent title that deals with large-scale structure at an accessible level.

#### ASTM112 ASTROPHYSICAL FLUID DYNAMICS:

ASTROPHYSICAL FLUID DYNAMICS Lecture Notes and references therein.  
M. J. Thompson, S. V. Vorontsov

#### LITERATURE

Batchelor, G. K., 1967. *An Introduction to Fluid Dynamics* (C.U.P.: Cambridge)

Landau, L. D., Lifshitz, E. M., 1959. *Fluid Mechanics* (Pergamon Press: Oxford)

Shu, F. H., 1992. *The Physics of Astrophysics Vol. II. Gas Dynamics* (University Science Books: Mill Valley, CA)

Cox, J. P., 1980. *Theory of stellar pulsation* (Princeton University Press: Princeton)

Kippenhahn, R. & Weigert, A., 1990. *Stellar structure and evolution* (Springer-Verlag: Berlin)

Parker, E. N., 1963. *Interplanetary Dynamical Processes* (Wiley).

Chandrasekhar, S., 1969. *Ellipsoidal Figures of Equilibrium* (Yale University Press: New Haven)

Lyttleton, R. A., 1953. The stability of rotating liquid masses (C.U.P.: Cambridge)

Tassoul, J. L., 1978. Theory of rotating stars (Princeton University Press: Princeton).

Unno, W., Osaki, Y., Ando, H., Saio, H. & Shibahashi, H., 1989. Nonradial oscillations of stars (2nd edition) (University of Tokyo Press)

ASTM003 ANGULAR MOMENTUM and Accretion Processes in Astrophysics:  
Accretion Power in Astrophysics by Juhan Frank, Andrew King, and Derek Raine, published by Cambridge University Press (third edition, 2002).

ASTM001 SOLAR SYSTEM:

C.D. Murray and S.F. Dermott, Solar System Dynamics, Cambridge University Press, Cambridge, 2001.

Jack J. Lissauer and Imke de Pater - Planetary Sciences

Physics of the Solar System by B. Bertotti et al. (Kluwer Academic Publishers)

The New Solar System (4th Ed.) by J. K. Beatty et al. (Cambridge Univ. Press/Sky Pub.)

Physics and Chemistry of the Solar System (2nd Ed.) by J. S. Lewis (Elsevier Acad. Press)

ASTM002 THE GALAXY:

The main textbooks are:

J. Binney & M. R. Merrifield, Galactic Astronomy, Princeton University Press, 1998  
(a detailed review of the Galaxy and galaxies in general, with summaries of results from the research literature).

J. Binney & S. Tremaine, Galactic Dynamics, Princeton University Press, 1987  
(a detailed review of the theory of dynamics of stars within galaxies).

Some other books that might be of use are:

L. Sparke & J. Gallagher, Galaxies in the Universe: an Introduction, Cambridge University Press, 2000.

G. Gilmore, I. King & P. van der Kruit, The Milky Way as a Galaxy, University Science Books, 1990, previously published as the 19th Advanced Course of the Swiss Society of Astrophysics and Astronomy (Saas-Fee), publ. Geneva Observatory, Switzerland, 1989

S. Phillipps, The Structure and Evolution of Galaxies, publ. John Wiley and Sons Ltd., 2005

D. Mihalas & J. Binney, Galactic Astronomy, publ. W. H. Freeman and Company, 1981  
(the predecessor to Binney & Merrifield, with a different emphasis, but slightly dated; it is itself a greatly revised version of an earlier book, Galactic Astronomy by Mihalas and Routley).

Some basic material is given in

F. Shu, The Physical Universe, University Science Books:

this may be of value for a summary of the background to the subject.

Further material on the dynamics of stars can be found in

Dynamics of Galaxies by Giuseppe Bertin (Cambridge University Press, 2000).

The material on galactic chemical evolution is covered in depth in the book *Nucleosynthesis and Chemical Evolution of Galaxies* by Bernard Pagel (Cambridge University Press, 1997).

#### ASTM109 STELLAR STRUCTURE AND EVOLUTION:

##### Reading List:

There are many books on stellar structure and evolution, at a variety of levels. The main textbook for the course is:

*The Stars: their Structure and Evolution* – R. J. Tayler (CUP 1994); in paperback.

This book contains most that is in the course and gives useful background beyond the syllabus.

Other books at a similar level are:

*Introduction to Stellar Astrophysics* (3 volumes) by E. Boehm Vitense, i.e.: Vol. 1. Basic Stellar Observations, and Vol. 3. Stellar Structure and Evolution, CUP 1989, 1992.

Prialnik, D., *An Introduction to the Theory of Stellar Structure and Evolution*, CUP 2000.

This is a new book, with a rather different approach from the others - try it and see how it appeals.

MPhys students will find it useful to do some wider reading, and the rest of the list is directed mainly at them for useful background information and more detailed material:

Karttunen, H. et al., *Fundamental Astronomy*, Springer Verlag, 1993 (2nd Ed.)

Hansen, C.J. and Kawaler, S.D., *Stellar Interiors: Physical Principles, Structure, and Evolution*, Springer-Verlag 1994.

Kippenhahn, R. and Weigert, A., *Stellar Structure and Evolution* (this graduate text is the present-day replacement for the monograph by Schwarzschild - see below), Springer-Verlag 1990.

Schwarzschild, M., *Structure and Evolution of the Stars* (this was the first modern monograph on stellar structure, written just before the advent of fast computers), Dover paperback 1965; first published 1958.

*Principles of Stellar Evolution and Nucleosynthesis* - D.D. Clayton.

*Theoretical Astrophysics* - T. Padmanabhan

#### ASTM116 ASTROPHYSICAL PLASMAS:

*Astrophysical-Plasmas Lecture Notes* – D. Burgess, et al.

M.G. Kivelson and C.T. Russell (Editors), *Introduction to Space Physics*, Cambridge University Press, 1995. Available in paperback.

G.K. Parks, *Physics of Space Plasmas*, Addison-Wesley 1991.

Quite good. Covers a lot of material, but misses details sometimes. Only available in hardback.

R.O. Dendy, *Plasma Dynamics*, Oxford, 1990. Good. Available in paperback.

AST740P / MTH740U Electromagnetic Radiation in Astrophysics - Reading List:

Recommended Text:

Astrophysics: Decoding the Cosmos (2nd edition) - J. Irwin (Wiley 2007)

J. Irwin's Decoding the Cosmos website -

<http://decoding.phy.queensu.ca/>

Additional reading:

Astrophysical Processes: the physics of astronomical phenomena - H. Bradt (Cambridge University Press 2008)

An Introduction to Modern Astrophysics (2nd edn) - B.W. Carroll and DS Ostlie (Addison-Wesley 2007)

Interpreting Astronomical Spectra - D. Emerson (Wiley 1997)

Theoretical Astrophysics: Volume I Astrophysical Processes, - T. Padmanabhan (CUP 2000)

Astronomical Spectroscopy: An Introduction to the Atomic and Molecular Physics of Astronomical Spectra - J. Tennyson (Imperial College Press 2005)