

Cosmology 2, Fall Semester 2022/23

Topics:

Galaxy formation, galactic structure, and gravitational lensing.

Lecturer:

Prof. Rennan Barkana, barkana@tau.ac.il, (03)640-5993, Kaplun 111
[Office hour: Kaplun 111, Wedn. 13:10-14:00, please email in advance].

Course Schedule:

3 weekly lecture hours, Monday 12:00 – 15:00 [Actual: 12:10 – 13:25, 13:40 – 14:55].

Room: Kaplun 205

Grade:

25%: Homework exercises (2 or 3 times)

75%: Final written exam

Exercises will be handed out and also posted on the course website, at:

<http://wise-obs.tau.ac.il/~barkana/cosmology2.html>

Textbook:

My lecture notes for this course have been written up as a book, Part I of the following:

The Encyclopedia of Cosmology, Volume 1: "Galaxy Formation and Evolution", by Rennan Barkana, World Scientific Series in Astrophysics, World Scientific Publishing Co (2018)

This book is in the TAU natural science library, and more importantly, it is available online in digital (ebook) form through your TAU account (please consult the library website for help).

<https://www.worldscientific.com/worldscibooks/10.1142/9496#t=aboutBook>

Other textbooks that may be useful:

Modern Cosmology, Scott Dodelson (A.P. 2003)

Theoretical Astrophysics: Vol. III, T. Padmanabhan (C.U.P. 2002)

Galaxy Formation, Malcolm S. Longair (Springer-Verlag 1998)

Principles of Physical Cosmology, P.J.E. Peebles (Princeton U.P. 1993)

Structure Formation in the Universe, T. Padmanabhan (C.U.P. 1993)

Galactic Dynamics, J. Binney and S. Tremaine (Princeton U.P. 1987; 2nd ed: 2008)

Course Plan (and corresponding chapters in Part I of the textbook):

1. Review of basic cosmology: the metric and cosmic dynamics (1 – 2.2)
2. Review continued: cosmic kinematics and redshift (2.3 – 2.5)
3. Statistics: Correlation functions and power spectra (3.1 – 3.2)

4. Statistics continued: related examples and topics (3.3 – 3.4)
5. Distribution functions and the fluid equations (4.1 – 4.4)
6. Linear perturbation theory (4.5)
7. The power spectrum, and baryons (4.6 – 4.8)
8. Non-linear collapse and the Press-Schechter model (5)
9. Dynamics of collisionless systems (6.1 – 6.3)
10. Virial equilibrium and the isothermal sphere (6.4 – 6.6)
11. Galactic disks (7.1 – 7.2)
12. Waves and spiral arms (7.3 – 7.4)
13. Gravitational lensing (8 – 9)

The progress through this plan will be updated on the course website.