FOUNDATIONS OF ASTROPHYSICS II: GALAXIES & STARS

Spring 2014 **Astronomy 242** Tu, Th 13:30 — 14:45

ASTR 242 is a rigorous, calculus-based introduction to stellar and galactic, and extragalactic astrophysics. In this course, basic concepts of classical mechanics, thermodynamics, E&M, and modern physics are used to understand the structure and evolution of stars, galaxies, and the Universe. ASTR 242 is the second course in a sequence leading to a proposed astrophysics major.

Time & Place: Tuesday & Thursday, 13:30 — 14:45 in Watanabe 114

Professor: Joshua E. Barnes

- Office: Institute for Astronomy, Room C-219
- Telephone: 956-8138; Email: barnes at ifa.hawaii.edu
- Office hours: Tu, Th 13:00 — 13:25 and 14:55 — 15:20 in Watanabe 403, or by appointment

Text: ***Foundations of Astrophysics*** by Barbara Ryden & Bradley M. Peterson

Astronomy help: See any Astronomy TA in Watanabe 421; hours are posted outside

Course Outline & Schedule

DATES		TOPIC		READING
1/14	1/16	**Stars: Basic Properties**	Stellar distances; Luminosities, fluxes, & magnitudes; Colors & temperatures; Radii; Masses	2.6.2, 13.1—5
1/21	1/23	**Stars: Spectra**	Atomic energy levels; Ionization equilibrium; Formation of spectral lines; Spectral classification & effective temperature; Hertzsprung-Russell diagram	14.1—4
1/28	1/30	**Interstellar Material**	Phases of ISM; Interstellar dust & reddening; Neutral hydrogen: the 21 cm line; Giant molecular clouds; Star formation; Ionization regions	16.1—3, 17.1
2/04	2/06	**Structure of Milky Way**	Overview of the Milky Way; Kinematics of the disk; Star clusters; Stellar populations; Galactic center; Dark halo	19.1—7
2/11	2/13	**External Galaxies**	Galaxy classification; Galaxy masses; Supermassive black holes; Scaling relations; Distances	20.1—4
2/18	2/20	**REVIEW & MIDTERM**		
2/25	2/27	**Galactic Evolution**	Galaxy populations (color-luminosity); Color and metallicity gradients; Color evolution; Interacting galaxies; Active galaxies	22.2, 21.1—3

3/04	3/06	**Mapping the Universe**	Hubble's law; Galaxy distribution; Loose & compact groups; Galaxy clusters; The intercluster medium; Cluster masses; Superclusters & voids; High-redshift galaxies	20.5, 22.1, 22.3
3/11	3/13	**Cosmological Models**	Expansion of the universe; Newtonian & Relativistic cosmology; Friedmann equation	23.1—23.5
3/18	3/20	**The Big Bang**	Cosmic background radiation; Flatness & horizon problems; Inflation; Primeval nucleosynthesis	24.1—4
4/01	4/03	**REVIEW & MIDTERM**		
4/08	4/10	**Stellar Evolution**	Stellar structure; Main-sequence stars; Advanced nuclear burning; Giant stars	15.1—4, 17.2
4/15	4/17	**Stellar Remnants**	Degeneracy pressure; White dwarf stars; Core-collapse supernovae; Neutron stars	18.1—4
4/21	4/23	**Origin of the Elements**	Cosmic abundance of chemical elements; White-dwarf supernovae; Slow and rapid neutron capture; Galactic chemical evolution	
4/29	5/01	**REVIEW**		
5/06		**REVIEW**		

Problem Sets, Exams, & Grades

Problem sets will be assigned on Thursday of each week, and will be due the following Thursday. Late work **must** be handed in on Tuesday of the following week, and will receive 70% credit.

There will be two midterm exams, on 2/20 and 4/03. A review class will be given before each exam. The final exam will be given on 05/13 from 12:00 to 14:00 in Wat. 114. The final is cumulative.

The problem sets, midterms, and final are worth 45%, 30%, and 25%, respectively. You must take the final to receive a passing grade.

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Updated: 16 March 2014
http://www.ifa.hawaii.edu/~barnes/ast242_s14/index.html