Principles of Astrophysics & Cosmology

PHYS 3368 Syllabus – Fall 2019

http://www.physics.smu.edu/~kehoe/3368/F19.html

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Texts: Astrophysics in a Nutshell, 2nd edition, Maoz (2016).

Class Coordinates: Tues. & Thurs. 2:00pm – 3:20pm in Rm 157 Fondren Science, Labs Rm 60 Fondren Science

Course Objectives: The course is designed to provide a comprehensive understanding of the physical processes of stars, galaxies and the universe. Stellar formation, structure and evolution will be covered. Underlying nuclear reactions and nucleosynthesis are discussed. The interstellar medium, galaxies, and their clustering will be introduced. A discussion of Big Bang cosmology and the evolution of the expansion of the universe will include theoretical and observational findings.

Method of Instruction: The class will consist of lectures and a lab. Homework is a valuable aid in learning the material in the course, and will be worth 20% of the course grade. Homework will be due in-class 2 weeks after it is assigned. A mid-term and final exam will be worth 20% and 25% of the grade, respectively. A total of 35% of the course grade will come from one lab-based research project in stellar astrophysics from each student.

Research Project and Report: The research project will involve several elements. Literature research and review on a chosen topic will be due in the first half of the course. The research project itself will entail data reduction and analysis, application of appropriate statistical methods, and development of scientific measurements and conclusions. Sections of the report for detector, data and analysis will be due during the semester, each accounting for 10% of the final report grade. The final report will include discussion of motivation, methodology, data and results of the research project.

Grading and Attendance Policy: In all cases, it is *crucial* to show your work *clearly* to obtain credit for solutions to physics problems. Regrading requests must be well-justified in writing. Anticipated absences resulting from religious observance or officially sanctioned extracurricular activity must be brought to the instructor's attention at least 2 weeks in advance. Make-up exams will need to be arranged with the instructor.

Physics 3368 Schedule

Week	Material	Lab
Aug 27 T	Introduction and Stellar Physics Maoz Ch. 1: 1,2; Ch. 2: 1-4	–
Sep 3 T	""	Linux 101, IDL, project report outlines and review
Sep 10 T	Stellar Structure - Maoz Ch. 3: 2,3,5,6,7a,8,9; **Ch. 1/2 due**	–
Sep 17 T	""	Variable stars, measure-ments and data structures, astrometry, photometry
Sep 24 T	Stellar Evolution - Maoz Ch. 4: 1-4; **Ch. 3 due**	–
Oct 1 T	""	Statistical analysis of data, systematic observing effects
Oct 3 Th	""	**Motivation/Literature review due**
Oct 8 T	Stellar Birth and Death. - Cataclysms and Remnants - Formation and Interstellar Medium - Maoz Ch. 5: 3,5,6; **Ch. 4 due**	**–**
Oct 10 Th	**Mid-term exam**	**–**
Oct 15 T	*Fall break, no classes	**–**
Oct 17 Th	""	finding candidate variable stars
Oct 29 T	Galaxies and Galaxy Clusters Maoz Ch. 7: 1,3,5; **Ch. 5 due**	**–**
Nov 5 T	""	Phasing analysis; **Detector and Data sections due**
Nov 12 T	Introduction to Cosmology Maoz Ch. 8: 1-3; Ch 9: 1,3; **Ch. 7 due**	**–**
Nov 19 T	""	Classification; **Analysis/ Results draft due**
Nov 28 Th	*Thanksgiving holiday, no classes	–
Dec 3 T	Evolution of Cosmic Expansion Maoz Ch. 10: 1,4,10; **Ch. 8/9 due**	–
Dec 5 Th	""	**Final reports due**
Dec 18 F	**Final exam** 11:30am-2:30pm	

Physics 3368 Schedule

Week	Material	Report
Aug 27 T	Introduction	
Sep 3 T	Stellar Physics Project report outlines and review	Linux 101
Sep 10 T	Nuclear Energy and Stellar Structure	Measurements and data structures
Sep 17 T	Variable Stars	Statistical analysis of data
Sep 24 T	Stellar Evolution	finding candidate variable stars; **Motivation and Literature review due**
Oct 3 Th	Stellar Cataclysms and Remnants	
Oct 15 T	*Fall break, no classes	
Oct 17 Th	Interstellar Medium and Star Formation	**Project update discussion**
Oct 29 T	Galaxies	
Nov 5 T	Clustering of Galaxies	
Nov 12 T	Introduction to Cosmology	**Draft of full Project Report due**
Nov 19 T	Big Bang Cosmology	
Nov 28 Th	*Thanksgiving holiday, no classes	
Dec 3 T	Evolution of Cosmic Expansion	
Dec 5 Th		**Final reports due**
Dec 18 F	Final exam 11:30am-2:30pm	