

# Astronomy 185 Spring 2008 Syllabus

**Prerequisites:** ASTR 41, PHY 50, or consent of the instructor.

**Text:** An Introduction to Modern Astrophysics — Bradley W. Carroll and Dale A. Ostlie, 2e, Addison-Wesley.

**Class Meetings:** T & Th 9:30 — 10:45 a.m. HI 28

**Instructor:** Dr. Charles Nelson

**Office Hours:** M 2:00 — 3:30 p.m.; W 2:00 — 3:15 p.m.; F 2:00 — 4:00 p.m.

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**Class Web Site:** <http://www.drake.edu/artsci/physics/astrocourses/astro185.html>

## Introduction

Welcome to Astronomy 185. In this class an overview of stellar astrophysics will be presented. We begin with a description of the basic properties of individual stars. We then move on to a more physical treatment including the concepts of radiative transfer. Next, a description of the structure of stars starting with their outer atmospheres and then moving to their interior followed by a discussion of the thermonuclear reactions which occur in stellar cores. Next we consider the formation of stars from the interstellar medium and the further evolution of stars as they age and die. A detailed discussion of stellar remnants, supernovae and close binaries composed of compact objects follows.

## Course Requirements

**Lectures:** The lectures presented in class will follow the text loosely and I expect to include topics of particular interest not found in the text, particularly those relating to recent results. A number of texts may be placed on reserve, some of which will have assigned readings. To help you keep up, I will make specific reading assignments to for each class and will regularly ask a student to give a summary of the material at the beginning of each class. Hopefully this will lead to further discussion and the identification of areas in which your understanding of the material could be improved. There is no attendance requirement since you are responsible for your own performance in the class. However, I do expect you to attend every class. In my experience, students who do not attend class regularly do poorly on exams. Please note that you are responsible for announcements and material presented in class whether you attend or not.

**Grading:** Grades in this class will be based on three exams, 7 homework assignments, a 10 page paper/presentation and class participation. A breakdown of the grading scheme is given in the table below. The exams will be essays or problems, the final will be part cumulative and part covering the topics presented after the second exam. The paper will include a 10 minute presentation to the class on a topic related to the course material to be selected from the list below (additional topics may be added or suggested later in

the semester). Progress will be monitored. An abstract must be turned in for approval by the end of February and a draft must be turned in by the end of March (dates listed below).

### Paper Topics

- Cygnus X-1 — black hole in binary system
- Algol — mass transfer eclipsing binary
- SS 433 — peculiar stellar jet system
- HH 47 — Herbig-Haro object
- The Binary Pulsar — test of general relativity
- Cassiopeia A — supernova remnant
- The Crab Nebula — supernova remnant
- SN 1987 A — recent supernova in the LMC
- S Doradus — massive young star
- The Orion Nebula — star forming region
- 51 Pegasi — extra-solar planetary system

### Grade Summary and Schedule

	Date		Weight
Exam #1	Thur	2/21	20 %
Paper Abstract	Thur	3/6	—
Exam #2	Tue	4/8	20 %
Paper Draft	Thur	4/17	—
Paper	Tue & Thurs	5/8	20 %
Homework	—	—	10 %
Final Exam	Wed	5/12	30 %
Total			100 %

**Missed Deadlines:** If you cannot attend class on the date of an exam you must make a request at least **TWO DAYS BEFORE** the scheduled date. The request must be in writing including a valid reason. I reserve the right to deny the request without explanation. If you miss an exam without prior approval you must contact me as soon as possible. Only under the most extreme circumstances will a request for a make-up exam after the scheduled date be approved.

**Academic Dishonesty:** Any acts of academic dishonesty will not be tolerated. No credit will be received for the assignment in question and further action may be taken as warranted.

**Office Hours:** I have listed my office hours on the front page of the syllabus. If you need to contact me at other times the best way is through e-mail or call (leave a message if I'm not available). I am often around Harvey Ingham at other hours so feel free to knock on my door.

**Web Page:** I will be maintaining a web page for the class. On it you will find: a pdf version of this syllabus for downloading, announcements of important class events and links to web sites relevant to the class. The URL is:

<http://www.drake.edu/artsci/physics/astrocourses/astro185.html>

## Tentative Class and Reading Schedule

Please note that exam dates are subject to change as well.

- 1/22 Introduction to Stellar Astrophysics
- 1/24 Basic Physical Properties of Stars
- 1/29 Spectral Classification
- 1/31 Stellar Atmospheres I
- 2/5 Stellar Atmospheres II
- 2/7 Stellar Interiors I
- 2/12 Stellar Interiors II
- 2/14 Thermonuclear Reactions
- 2/19 Review for Exam #1
  
- 2/21 **Exam #1**
  
- 2/26 The Interstellar Medium
- 2/28 Star Formation I
- 3/4 Star Formation II
- 3/6 Post-Main Sequence Evolution I — **Paper abstract due**
- 3/11 Post-Main Sequence Evolution II
- 3/13 Supernovae
  
- 3/17 — 3/21 **Spring Break**
  
- 3/25 Neutron Stars and Pulsars
- 3/27 Supernova Remnants
- 4/1 Stellar Mass Black Holes
- 4/3 Review for Exam #2
  
- 4/8 **Exam #2**
  
- 4/10 Variable Stars
- 4/15 Binary Stars
- 4/17 Evolution of Close Binaries — **Draft of paper due**
- 4/22 Compact X-ray Sources
- 4/24 Star Clusters
- 4/29 Extra-solar Planets
- 5/1  $\Gamma$ -ray Bursters
- 5/6 Class Presentations I
- 5/8 Review for Final Exam **Final draft of paper due**
  
- 5/12 **Final Exam 2:00 p.m.**