

**Course Syllabus**  
**29:50 Stars, Galaxies, and the Universe**  
**Fall Semester 2010**

Steven R. Spangler  
705 Van Allen Hall  
335-1948  
steven-spangler(AT)uiowa.edu  
<http://phobos.physics.uiowa.edu/~srs/>

*Stars, Galaxies, and the Universe* is an introductory course in astronomy for students who are not science majors. As the title indicates, this class is exclusively concerned with stellar and galactic astronomy and associated topics like the expansion of the universe. Solar system astronomy at an introductory level is the subject of another course offered by the Department of Physics and Astronomy (*Exploration of the Solar System*, 29:52) The excitement of astronomy results in part from the rapid advances that have occurred in the last few decades. These advances, such as the discovery of planets around other stars and the increasingly compelling evidence for a universe filled with “Dark Matter”, establish astronomy as one of the “frontier sciences”. An entirely different aspect of astronomy is to be found in its description and explanation of some of the most striking, beautiful, and awe-inspiring phenomena in nature.

Both of these aspects of astronomy will be presented in this class. Students will learn about the processes which power the Sun and stars, understand why we believe we have identified Black Holes among the stars and at the centers of galaxies, and become familiar with the arguments for a 13.7 billion year age of the universe. In discussing these topics, I will emphasize the way in which scientists reach conclusions through application of the scientific method. However, during this semester students will also learn how the skies change during the year and make the connection between the important objects of modern astrophysics and the lights in the night sky.

**General Course Information**

1. Lectures are from 1:30 to 2:20 PM Mondays, Wednesdays, and Fridays, in Lecture Room 1 of Van Allen Hall.
2. There is a laboratory associated with this course. Students registered for the laboratory receive 4 semester hours of credit and satisfy the

General Education requirement of a natural science laboratory. Students registered for 3 semester hours do not attend the laboratory. Students registered for 4 semester hours **must** attend the laboratory section. The lab section meets for two hours per week in room 665 or 666 of Van Allen Hall. Laboratory classes do not meet the first week, but commence the week of August 30. Projects in the laboratory consist of astronomical observations with simple instruments and small telescopes, use of star charts, laboratory demonstration of important physical principles, and individual projects with the Rigel automated telescope of the University. An important feature of the laboratory will be a field trip to the Eastern Iowa Observatory and Learning Center (EIOLC) outside of Iowa City for astronomical observations in a dark sky setting (see next item). Descriptions of the laboratory projects will be available on the course web page (see item #11 below). The grade in the laboratory portion will be determined by a student's scores on laboratory worksheets and reports, participation in the field trip, and a final project report. **Please Note:** Those students registered for 4 semester hours *must* receive a passing grade in the laboratory portion of the course as well as the lecture portion in order to receive a passing grade for the course.

3. **Field Trip for Lab Students:** The goal of the field trip will be identification of stars and non-stellar objects in the night sky, and viewing many of the objects discussed in the course through powerful telescopes. The field trip is **mandatory** for students enrolled in the lab. Students will be excused from the field trip if (a) there is a conflict with a regularly-scheduled class meeting of a University of Iowa course, or (b) the student has a job which requires work during the time of the class trip. Students needing an excused absence from the field trip should contact me early in the semester and furnish details on the class or work conflict.

The field trip will occur on Tuesday evening, September 28 for the following lab sections, 17, 21 25, 27, 29, and 35. Students in sections 37, 38, 43, 47, 49, 57, and 60 will go on Thursday evening, September 30. Alternate dates in case of cloudy skies are one week later, October 5 and October 7. Students should reserve both dates assigned to their lab section. Transportation from campus to the Eastern Iowa Observatory and Learning Center (EIOLC) will be provided. Buses will leave the intersection of Jefferson and Linn streets on the north

side of Van Allen Hall at 7:15 PM. We will arrive at the observatory at approximately 8 PM. Observations and sky-watching will continue until 9:30 PM, when we will board the buses for the return to Iowa City. We should be back on campus by 10-10:15 PM. There are restrooms at the EIOLC.

4. The required textbook for the course is *Astronomy: Journey to the Cosmic Frontier* by John D. Fix, 6th edition (selected material; we have a custom printing of the textbook). The publisher is McGraw Hill. Students should also be sure to purchase a response card (“clicker”) remote communication device for class participation and in-class quizzes (see next point).
5. A response card or “clicker” is required for this class. The same unit will be used for all University of Iowa courses which employ this technology. The clickers are available at the bookstores, which also provide an instruction sheet for registering and using the devices. Information on the registration and use of these devices is also available at the University of Iowa website <http://its.uiowa.edu/support/srs/> (see section “For Students”). For this class, students will need to select channel 44, which is the right channel for Lecture Room 1, Van Allen Hall. The clickers will be used to carry out dialog in the class, promote greater student participation, and for brief, in-class quizzes. Students need to have their devices registered and be familiar with their use prior to Friday, September 3.
6. Office hours for Professor Spangler are 2:30 - 3:30 PM Tuesday and Wednesday, and 3:00 - 4:00 PM on Thursday, or by appointment if these times are inconvenient.
7. One hour exams will be held in the regular class period on October 6 and November 10.
8. The final exam will be held on Monday, December 13 at High Noon (“A man’s gotta do, what a man’s gotta do . . .”). in Lecture Room 1. University policy requires that students be permitted to make up examinations missed because of illness, mandatory religious obligations, certain University activities, or unavoidable circumstances. Make-up exams will not be given except for the previous reasons, or equally compelling ones. It is the student’s responsibility to contact the instructor as soon as the student is aware that the exam will be missed.

Please note that University policy also requires excused absences to be documented. Excused absence forms are available from the Registrar's web site, <http://www.registrar.uiowa.edu> (see "Forms for Students").

9. Homework problems will be assigned and graded as a way of having students actively participate in the learning experience. The homework problems are accessed through ICON, and immediately graded. An assignment will be made weekly (with occasional exceptions), and must be completed by 8 AM on Mondays. The total score of all homework assignments will count for 25 % of the course grade (see below). The lowest homework score will be dropped. Students are encouraged to work together on these problems. I also expect and want students to talk to the teaching assistants or me about these problems.

10. The grade in the course will be determined as follows.

For students registered for three semester hours (without lab), each of the hour examinations will count for 20 percent of the course grade, the sum total of the homework and the final exam will each count for 25 % of the course grade, and the answers to the in-class, Friday questions administered via the "clicker" system will count for 10 % of the grade. For students registered for four semester hours (with lab), the sum total of exam, homework, and clicker quiz scores will count for 75 percent of the course grade, and the laboratory grade will count for the remaining 25 percent. **It is to be emphasized** that a student registered for 4 semester hours will not receive a passing grade for the course as a whole unless he or she receives a passing grade for the laboratory portion.

Letter grades for the course will be assigned in accordance with the policy of the College of Liberal Arts and Sciences for a course of this kind. To give students a clear idea of where they stand, the grading algorithm is based on the percentage of the maximum number of points, as follows:  $\geq 90\%$  = A;  $\geq 80\%$  = B;  $\geq 60\%$  = C; and  $\geq 50\%$  = D. To pass the course, a student must obtain 50 % or more of the maximum number of points. I employ + and - grades for students near the boundaries between grades.

11. There is a World Wide Web homepage associated with the course, <http://phobos.physics.uiowa.edu/~srs/>. Go to the link to 29:50,

Stars, Galaxies, and the Universe, for this semester. The website contains lecture notes, sample exams, and descriptions of laboratory exercises. It also serves as a gateway to other astronomical links such as the homepages for the Hubble Space Telescope and the Solar and Heliospheric Observatory. Lecture notes and messages to students will also be posted on ICON.

12. I would like to hear from anyone who has a disability which may require some modification of seating, testing, or other class requirements so that appropriate arrangements may be made. Please see me after class or during office hours.
13. **Classroom Environment** Students have the right to a classroom environment that encourages learning. The ability to learn is lessened when students engage in inappropriate behavior, distracting others. Such inappropriate behavior is a violation of the Code of Student Life. Activities which are unacceptable are (1) prolonged, audible conversation with a fellow student (not a brief comment to someone, which is OK), and (2) talking on cell phones. Please turn off cell phones when in class. For obvious reasons, texting during exams is strictly forbidden.
14. The College of Liberal Arts and Sciences has extensive, on-line material on plagiarism and academic fraud (don't do it), mechanisms for student complaints about the class or the instructor, and other matters. See the following URL: <http://www.clas.uiowa.edu/students/handbook/x/>.

### **Schedule of Topics**

*(Next page)*

<b>Date</b>	<b>Topic</b>	<b>Reading</b>
Aug. 23	Initial pleasantries; the sky tonight	–
Aug. 25	Getting oriented: astronomical coordinate systems	Chap.2
Aug. 27	Astronomical coordinate systems, cont.	2
Aug. 30 - Sept. 1	The solar system in a stellar context	–
Sept. 3 - 6	Distances to stars, parsecs and lightyears	16
Sept. 8	Telescopes	6
Sept. 10 - 13	Bright stars and faint stars: the magnitude system	16
Sept. 15	The Sun, the closest star	17
Sept. 17	The Sun, closeup to a G main sequence star	17
Sept. 20 - 24	Starlight	6
Sept. 27 - Oct. 1	How the Sun shines	17
Oct. 4	Double stars	21
Oct. 6	<b>First Hour Exam</b>	–
Oct. 8	The formation of stars	18
Oct. 11	Dark Clouds: chemistry sets in the sky	18
Oct. 13	Stellar evolution: the future of the Sun	19
Oct. 15 - 20	Dead stars	20
Oct. 22	Supernovas and neutron stars	20
Oct. 25	neutron stars and beyond	20
Oct. 27	Black Holes	20
Oct. 29	What is the Milky Way?	22
Nov. 1	The structure and content of the Milky Way	22
Nov. 3	At the center of the Milky Way	22
Nov. 5	Stars like the Sun	–
November 8	Distances to galaxies	23
Nov. 10	<b>Second Hour Exam</b>	–
Nov. 12	Extragalactic space and its objects	23
Nov. 15	Radio galaxies and quasars	24
Nov. 17	Mapping the universe with quasars	24
Nov. 19	Dark Matter and the universe	25
Nov. 22 - 26	<i>Thanksgiving: no class</i>	–
Nov. 29 - Dec. 1	Cosmology	26
Dec. 3	Faded Brilliance: the Big Bang	26
Dec. 6	Dark Energy	26
Dec. 8	Life elsewhere in the universe	–
Dec. 10	Summary and overview	–
<b>December 13 (Monday)</b>	12:00 PM: <b>Final Exam</b> - LR1, VAN	—