

**NATS 102 – The Physical Universe
Spring 2004 Syllabus**

Section 9 1:00 PM – 1:50 PM MWF Location: Room N210 (only)

Instructors: Ed Prather, Department of Astronomy, Steward Observatory Room 203A
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Office Hours: 8:00 - 10:00 AM on Thursday or by appointment

Teaching Assistants: Erik Brogt, Department of Teaching and Teacher Education
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Office Hours: 2:00 - 3:00 PM on Monday and 10:00 – 11:00 AM
Friday, held in Room #102 South - Education Building

Course Description

“The Physical Universe” presents the astronomical phenomena of the universe in the context of physical science and examines Newton's laws governing force and motion, the laws of thermodynamics governing energy and entropy, the role of electromagnetism in nature, and the atomic structure of matter, in the context of current issues in planetary and space sciences (3 credits).

Required Texts

- *Discovering the Universe*, 6th Edition, by Comins and Kaufmann, WH Freeman (ISBN 0-7167-3637-3)
- *Lecture Tutorials for Introductory Astronomy - Preliminary Edition*, by Adams, Prather and Slater, Prentice Hall (ISBN 0-13-101109-X) – NOTE: BRING THIS TO CLASS EVERYDAY!!

Instructional Philosophy of the Course

The overarching goals of this course are for you to understand the nature of science through the eyes of astronomy; to understand the big ideas in astronomy; and to develop a lifelong interest in astronomy and current events surrounding astronomy. To meet these three goals, the course instructors have carefully designed a sequence of learning tasks and assessment procedures as outlined on the following pages.

–*Active engagement with nearly daily group activities.* It is our belief that you can only learn a limited amount of information from lecture alone, no matter how clear or entertaining. Therefore, this course is composed of a series of mini-lectures that will be augmented by collaborative classroom activities called Lecture Tutorials (LT). The LT activities target specific ideas presented in lecture and are designed to be completed in pairs during class by talking through the questions and writing a detailed, consensus response. You will not submit these for grading. However, the questions are quite similar to the questions you will find on the course exams and you are therefore strongly encouraged to consider these activities as a critical component to your success in the course. The LTs are available at the bookstore and they must be brought to class each day.

–*Attendance at all classes is REQUIRED.* Because this course is built around daily activities to accompany the lecture, your attendance and full participation at each class period will be an essential component of your success in the course. Periodically we will administer unscheduled questionnaires in class that will be collected during class and used to establish a participation grade. These questionnaires will not be given a letter or numeric graded, rather you will be given credit for what you complete on an all or nothing basis and your grade will be established on the following grading scheme.

80% or more of participation points – A

70% - 79% of participation points – B

60% - 69% of participation points – C

50% - 59% of participation points – D

49% or less of participation points – E

–*Carefully studying the text is REQUIRED.* The course mini-lectures are designed to focus on the really difficult aspects of astronomy or to provide structure for your out-of-class study. You are accountable for all material, concepts, and interrelationships presented in the mini-lectures, the text, and, most importantly, the Lecture Tutorials. Therefore, it is imperative to your success in this course that you complete the assigned readings *prior* to coming to class. Reading assignments should be completed **BEFORE** the date listed. Otherwise, the mini-lectures and tutorials will be less useful in helping you develop a deep understanding of the course topics. It may be useful to bring your text with you each day to class so that you can make notes in the margins and highlight the relevant passages. It is important to remember that the exams will cover material from the text readings that may or may not be discussed in class.

–*Periodic homework is REQUIRED.* - During the semester you will be required to complete homework assignments that are designed to assess your understanding of the material covered in the course text, and in lecture. In some cases homework will consist of a short writing assignment that will be completed and handed in at the end of class. In other cases we will assign a set of homework problems that you are to complete on your own time and submit one week later in class. The dates for homework assignments are not scheduled ahead of time. We will communicate all information about assignments in class. If you are not in class on the day of an in-class writing assignment, you will not be able to make up this homework. **No late homework will be accepted for ANY reason.** All homework will be graded on a 4 point grading scale. We will use the following grading scheme for homework.

80% or more of total homework points – A

70% - 79% of total homework points – B

60% - 69% of total homework points – C

50% - 59% of total homework points – D

49% or less of total homework points – E

–*Activities Outside of Class are REQUIRED.* During the semester you are required to participate in an evening of observing the night sky at Steward Observatory. Observing times are available Monday – Thursday evenings starting at approximately 7:00 PM. You will need to *reserve an observing time by signing up* on the observing roster located in the ground floor (lobby) of the Steward Observatory building. An *Observing Log* is attached to the end of the syllabus and is to be submitted to record your work. Although we recommend that you submit your Observing Log very soon after completing your night of observing, they will also be accepted through Friday, April 30th (in class). **No late Observing Logs will be accepted for ANY reason beyond April 30th.**

Grading Scheme

Absolute grading (no curves, no competition, and **absolutely no extra credit** - it is in your best interest to help each other learn astronomy)

1. Three Exams (*drop lowest*) 50%
2. Final Exam (*cannot drop*) 20%
3. Homework 20%
4. Participation 5%
5. Observatory Visit 5%

| | |
|--------------------------------|---|
| 90 – 100 | A |
| 80 – 89.9 | B |
| 70 – 79.9 | C |
| 60 – 69.9 | D |
| < 59.9 | E |
| <i>No plus or minus grades</i> | |

Your course grades can be accessed via Astronomica.org - a course management system available through the Astronomy department. You will be given information on how to login and use Astronomica during the second week of class. If at any time you have lost your login information or directions on how to use Astronomica, please email Adrienne Gauthier at ag2003@email.arizona.edu. Otherwise, course grades will not be posted. If you find a mistake on your grade listing, please contact the course TA as soon as possible. It is your responsibility to uncover and notify the instructors of any errors.

All grades in the class are final 72 hrs after they have been posted and/or returned. Please make sure if you have any grading dispute that you contact us BEFORE this 72 hour period is over.

Testing Circumstances

Because of the large lecture nature of this course, you will take several examinations throughout the term on the dates scheduled on the syllabus. **Please do not make any plans that interfere with scheduled exams as there are no late or make-up exams given.** If you need to miss an exam for **any reason**, you will **not** be allowed to make up this exam, rather, it will be the exam that you drop as your lowest score. You **cannot** miss the final exam and there are no opportunities to take it at a different time. The University has scheduled the time for the class final exam and this is the only time it is to be offered. If you have an irresolvable conflict with another course's final exam, you must see the instructor well in advance to make other arrangements. During closed-book, closed-note exams, you must bring a photo ID, you are not allowed to wear headphones, or allowed to communicate with anyone in the classroom except for the course instructors and exam proctors. Cell Phones must remain off at all times during exams. If you have been certified as needing to take an exam under special circumstances, please see us privately well in advance (at least 10 days).

Course Conduct

Please turn off cell phones before you enter the classroom. Also, please **do not leave class early unless you have talked to the instructors in advance.** These requests are both for issues of safety as well as consideration for your fellow students. We consider academic dishonesty, including cheating, plagiarism, and fabrication, as defined in the *U of A Code of Academic Integrity*, to be a serious offense and the maximum punishments allowed will be pursued in all scenarios. This includes completing any homework assignments or scantron forms with the help of another student or for scantron forms completed by another student who is not you. If similar work is submitted, all parties involved will receive a zero for their assignment. Make your work your own, be original.

| <u>Dates</u> | <u>Required Reading and Homework</u> | <u>In-Class Lecture Tutorial</u> |
|-------------------------------|---|--|
| 1/14 – 1/16 | Nature of Science (pgs 1-10) The Night Sky (pgs 15-20) | Pre-Course Survey Position |
| 1/19 (Monday) No Class | MLK Day | |
| 1/21 – 1/23 | The Celestial Sphere (pgs 20-23) Seasons (pgs 23-28, 42) | Motion Path of Sun |
| 1/26 – 1/30 | Moon Phases (pgs 28-31) Moon Phases cont. | Seasons Cause of Moon Phases |
| 2/2 – 2/6 | Eclipses (pgs 31-36) Star Charts (<i>back of book</i>) | Predicting Moon Phases Star Charts |
| 2/9 (Monday) | Found I and Chap. 1 | Exam #1 |
| 2/11 - 2/13 | History of Astronomy I (pgs 44-52) History of Astronomy II (pgs 52-59) | Retrograde Motion Keplers Second Law |
| 2/16 - 2/20 | Light and Telescopes (pgs 65-77, 84-85) Spectroscopy I (pgs 96-99) | Orbital Period and Distance Telescopes and Earth's Atmosphere Stefan-Boltzmann Law |
| 2/23 – 2/27 | Spectroscopy II (pgs 99-106) Spectroscopy III (pgs 106-110) | Blackbody Radiation Types of Spectra Analyzing Spectra |
| 3/1 | Review | |
| 3/3 (Wednesday) | Chaps 2, 3, and 4 | Exam #2 |
| 3/5 | The Solar System (pgs 116-125) | Doppler Shift |
| 3/8 – 3/12 | The Earth (pgs 135-143) The Sun (pgs 249-263) | Formation of the Solar System Earth's Changing surface |
| 3/15 – 3/19 | No Class – Spring Break | |
| 3/22 – 3/36 | Stellar Magnitudes (pgs 272-276) H-R Diagram (pgs 283-289) | Greenhouse Effect and Global Climate Change Sun Size |
| 3/29 – 4/2 | Life Cycles of Stars (pgs 310-318) | Apparent and Absolute Magnitudes H-R Diagram Stellar Formation and Lifetimes |
| 4/5 (Monday) | Found II and Chaps 5, 9-13 | Exam #3 |
| 4/12 – 4/16 | Stellar Death (pgs 327-335, 339-342, 358) The Milky Way (pgs 375-383) | Stellar Evolution Milky Way Scales |
| 4/19 – 4/23 | Stellar Parallax and Parsecs (pgs 272-273) Galaxies (pgs 388-398) | Parallax and Distance Looking at Distant Objects |
| 4/26 – 4/30 | Cosmology (pgs 402-407, 428-433) <i>All Observing Logs Due April 30th (In Class)</i> | Dark Matter Expansion of the Universe |
| 5/3 – 5/5 | Review Days | Post-Course Surveys and Evaluations |
| 5/12 | 11:00 am –1:00pm in N210 | Comprehensive Final Exam |

Do not make travel arrangements that conflict with this Final Exam. Exams are NOT given early.

Observing Log

Name: _____

Student ID: _____

Observing Date: _____

| |
|--------------------|
| UA Astronomy Stamp |
|--------------------|

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|---------------------------------|--|
| Drawing(s) of what you observed | |
| | |

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|---|
| Written description of objects you viewed (Use back of sheet if you need more room) |
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NATS 102 – The Physical Universe

STUDENT INFORMATION SHEET

Name _____

Student ID Number _____

Local Telephone Number _____

Email Address (*if checked regularly*) _____

By signing below, I acknowledge I understand that:

- (a) This course has scheduled examinations and a final examination as shown in the syllabus and listed in the University student schedule and that I will not make plans that interfere with these scheduled examinations. In addition, I will bring my photo-student ID to each examination and show to the test administrator if asked.
- (b) Attendance is required for this course.
- (c) In addition to assigning a course grade, the periodic questionnaires and scheduled exams are also used for purposes of improving this current course offering and future course offerings. Any and all scores gathered during this semester might be shared with other faculty or published, however, my name will never be associated with this data as a participant in any way.

Signature

Date