NATS 102 Section 01 – The Physical Universe
Fall 2004 Syllabus

Class meets Tuesday and Thursday 8:00 AM – 9:15 AM Location: Room ILC120 (only)

Instructors: **Dr. Ed Prather**, Department of Astronomy, Steward Observatory Room 203A
E-mail: eprather@email.arizona.edu Phone: 621-6530
Office Hours: Held in the "Meeting Place" of the ILC
9:30 - 10:30 AM on Tuesday and Thursday or by appointment

Teaching Assistants: **Erik Brogt**, Department of Teaching and Teacher Education
Room #102 South - Education Building
E-mail: ebrogt@as.arizona.edu Phone: 626-8122
Office Hours: Held in the "Meeting Place" of the ILC
2:00 - 4:00 PM on Wednesday or by appointment

Erin Dokter, Department of Teaching and Teacher Education
Room #102 South - Education Building
E-mail: edokter@email.arizona.edu Phone: 626-8122
Office Hours: Held in the "Meeting Place" of the ILC
10:00 - 11:00 AM on Monday or by appointment

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) – on sale in the bookstore
- *Lecture Tutorials for Introductory Astronomy - First Edition*, by Adams, Prather and Slater, Prentice Hall (ISBN 0-13-147997-0) – on sale in the book store - **NOTE: BRING THIS TO CLASS EVERYDAY**!!
- *Ranking Tasks for Introductory Astronomy* – Photocopied packet handed out in class - **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 group activities occurring daily*.** 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) and Ranking Tasks (RT). The LT and RT 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 the LT and RT activities that are done in class 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 LT are available at the bookstore and they must be brought to class each day. The RT will be provided as a photocopied packet that will be handed out at the beginning of the semester and should also be brought to class each day

–***Attendance at all classes is REQUIRED*.** Since 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. 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 on these questionnaires will contribute to your overall participation grade. In addition conceptual questions will be asked periodically (in class) to assess your understanding of course concepts both after lecture and after doing in class activities. We will gather your answers using the class responders system, and you will be given credit for participation regardless of the correctness of your answer. Your end of the semester participation grade will be calculated using the total points you earned from both the questionnaires and the conceptual questions asked throughout the semester. You will not be allowed to make up any missed participation points (unless we are provided with a Deans Excuse). Therefore to allow for the unavoidable periodic absences, which naturally arise during the semester, without heavily penalizing your overall course grade we will establish your end of the semester participation grade based 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 and Ranking Tasks. 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, tutorials and ranking tasks will be less useful in helping you develop a deep understanding of the course topics. It may be useful (but is in now way required) 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.

–***A Homework Portfolio is REQUIRED***. - During the semester you will be provided many different homework assignments that are designed to help you assess your understanding of the material covered in the course. In some cases homework will consist of completing a Ranking Task or Lecture Tutorial on your own outside of class. In other cases a set of homework problems will be provided as a separate handout. The dates for homework assignments are not scheduled ahead of time. We will communicate all information about assignments in class. Competing the homework assignments and making sure that your answers are correct will be your responsibility. Making use of office hours to get help is strongly encouraged. You will be responsible for providing a Homework Portfolio at the end of the semester that includes the four homework assignments of your choosing that you feel best represent the depth of understanding that you have gained throughout the semester. We will only grade the four homework assignments that you chose to include in your Portfolio. Each of the submitted homework assignments in the Portfoilio will be graded on a 4 point grading scale as shown below:

4 - Thorough, detailed, correct response, maybe one **minor** science content error
3 – Major ideas present but with an abbreviated or somewhat incomplete description; more than half the science content correct
2 - Major errors in science content but thoughtful response
1 - Major errors in science content and very incomplete/abbreviated description; OR unreadable
0 - No meaningful attempt worthy of grading

We will use the following grading scheme to establish your end of the semester homework grade.

90% or more of total homework points – A
80% - 89% of total homework points – B
70% - 79% of total homework points – C
60% - 69% of total homework points – D
59% or less of total homework points – E

NOTE: No late Homework Portfolios will be accepted for ANY reason beyond December 2nd.

–***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 Thursday, December, 2nd (in class)**. No late Observing Logs will be accepted for ANY reason beyond December 2nd.**

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 15%
4. Participation 10%
5. Observatory Visit 5%

90 – 100	A
80 – 89.9	B
70 – 79.9	C
60 – 69.9	D
< 59.9	E

No plus or minus grades

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.

Exams and 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 these 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. Do to the layout and constraints of the seating in the classroom, you will not be allowed to leave until the end of the class period even if you have completed the exam. This ensures that students still taking the exam are not disturbed by students leaving early. If you have been certified as needing to take an exam under special circumstances, please see us privately well in advance of the exam date (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.

Dates	**Required Reading and Homework**	**In-Class Activity**
8/23 – 8/27	Nature of Science (pgs 1-10) The Night Sky (pgs 15-20)	Pre-Course Survey Position (LT) and
8/30 – 9/3	The Celestial Sphere (pgs 20-23)	Sky Motion (RT) Path of Sun (LT)
9/6 (Monday) No Class	**Labor Day**	
9/7 – 9/10	Seasons (pgs 23-28, 42)	Seasons (RT)
	Moon Phases (pgs 28-31)	Moon Phases (RT)
9/13 – 9/17	Eclipses (pgs 31-36) Star Charts (*back of book*)	Star Charts (LT)
9/21 (Tuesday)	**Found I and Chap. 1**	**Exam #1**
9/22 – 9/24	History of Astronomy I (pgs 44-52)	Retrograde Motion (LT)
9/27 – 10/1	History of Astronomy II (pgs 52-59)	Keplers Laws (RT) Gravity and Newtons Laws (RT)
10/4 – 10/8	Light and Telescopes (pgs 65-77, 84-85) Spectroscopy I (pgs 96-99)	Telescopes and Earth's Atmosphere (LT) Luminosity (RT)
10/11 – 10/15	Spectroscopy II (pgs 99-106)	Blackbody Radiation (LT)
		Types of Spectra (LT)
10/18 – 10/20	Spectroscopy III (pgs 106-110)	Analyzing Spectra (LT) Doppler Shift (RT)
10/21 (Thursday)	**Chaps 2, 3, and 4**	**Exam #2**
10/25 – 10/29	The Solar System (pgs 116-125)	Formation of the Solar System (LT)
	The Earth (pgs 135-143)	Earth's Changing surface(LT)
10/25 – 10/29	The Sun (pgs 249-263)	Greenhouse Effect and Global Climate Change (LT-handout) and Sun Size (LT)
11/1 – 11/5	Stellar Magnitudes (pgs 272-276)	Apparent and Absolute Magnitudes (RT)
	H-R Diagram (pgs 283-289)	H-R Diagram (LT)
11/8 – 11/10	Life Cycles of Stars (pgs 310-318)	Stellar Formation and Lifetimes (LT)
11/11 (Thursday) **No Class**	**Veterans Day**	
11/15 – 11/18	Stellar Death (pgs 327-335, 339-342, 358)	Stellar Evolution (LT)
11/18 (Thursday)	**Found II and Chaps 5, 9-13**	**Exam #3**
11/22 – 11/24	The Milky Way (pgs 375-383)	Milky Way Scales (LT)
11/25 No Class	**Thanksgiving**	
11/29 – 12/3	Galaxies (pgs 388-398)	Looking at Distant Objects (LT)
	Cosmology (pgs 402-407, 428-433)	Dark Matter (LT - handout)
	All Homework Portfolios and Observing Logs Due December 2nd (In Class)	
12/6 – 12/8	*Cosmology cont.*	Expansion of the Universe (LT)
		Post-Course Surveys and Evaluations
12/16	**8:00 am –10:00am in ILC 120**	**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

Drawing(s) of what you observed	

Written description of objects you viewed (Use back of sheet if you need more room)

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