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ASTRONOMY AS AN ELECTIVE COURSE: TEACHING INTRODUCTORY AND ORGANIZATION

If you are teaching this course under typical circumstances, you will likely find that the majority of your students are non-science majors. However, your students are there to learn about science. Astronomy is an excellent subject with which to introduce your students to science because of its scope and history and the subject can be approached on many levels from purely descriptive to intensely theoretical. The use of mathematics, then, is not required in order to develop the concepts, but may be used if appropriate to the backgrounds of your students. Even students who bring no mathematics background to the course will be able to follow and benefit from a few basic equations such as those contained in Newton's 2nd law or the universal law of gravitation. If your course is on the "descriptive" or "conceptual" end of the spectrum, the students may tend to have anxieties about mathematics. Don't let that stop you from introducing a few equations here and there. Equations can be discussed without expecting the students to use or to solve them. If you plan on teaching nearer to the theoretical end of the spectrum, you will find plenty of background and support material in the text as well as many problems ranging from easy to difficult. Many students enter an introductory astronomy class already fascinated by the subject, even if they do not yet know much about it. Capitalize on their interest and enthusiasm! In teaching astronomy, you have the opportunity to present some of the most bizarre, immense, baffling, and complex structures and ideas in science. Challenge your students to engage with and question them. Present the study of astronomy as a human endeavor, as a quest for understanding, and as an enriching, exciting experience. Your students will reward you by rising to the occasion! The days of the "sage on the stage" are, for the most part, falling away into oblivion. Research in recent years has shown that relatively few students learn well from sitting and listening to an instructor reciting facts. Interactive learning and peer instruction are increasingly being brought into the classroom with great effect. Mixing this cooperative learning into your lectures will have not only positive results in the information retention of our students, but it will improve on their problems solving skills while making the course more enjoyable as well. Although you will find that interactive activities are

more easily implemented in smaller class settings, you can encourage cooperative learning among students even in large classes. Pose a question and have students discuss it with their closest neighbor for a very short time, such as one minute. Then call on several random groups to give their responses. For some topics you can ask students to make predictions or guesses and then write a few of them on the board. This technique not only gets students more involved in the class, it also helps them apply knowledge they have gained to new situations and avoid seeing astronomy as a string of unrelated numbers.

The daily structure of your course will depend upon several factors, including class size, resources available to you, and your own teaching style. For a small class, you may engage in frequent discussions, question/answer sessions, and/or student presentations on specific topics. If you have a large lecture class, you will probably not have the luxury of extended class discussions and there will likely be insufficient time for presentations by each and every student. However, there are a number of ways you can still encourage an interactive atmosphere with your students. Students tend to find demonstrations and models particularly engaging when their peers are involved, so ask individuals to come forward to help you with presentations. Even in large classes you can encourage questions from your students; sometimes they are insightful, which adds tremendously to your presentation, and other times students' questions can point out misconceptions you may not otherwise recognize and address.

Astronomy is a very visual science. Take advantage of the large collection of slides or transparencies made available by the textbook publisher. You may wish to augment your collection by purchasing other educational slide sets. There are many different ways you can employ the images. For instance, you may wish to break the lecture in the middle each day, dim the lights and have a slide show concerning the topic of the day. Or, you can save all the images for the end of class to use as a conclusion and review. Finally, you may choose to have the slides interspersed throughout the lecture. Include images of people if possible, both historical figures and contemporary astronomers to illustrate the human side of astronomy. If you are teaching in a “smart classroom,” you can access the Companion Website and show animations illustrating particular concepts. Other Websites can also be employed. For instance, when discussing the Sun, you can bring up current photos of the Sun to show the locations of sunspots. Even after moving on to other topics, you can take a minute at the beginning of class each day for a week to view the Sun so students can watch the motion of the sunspots and even estimate the rotational period of the

Sun. Be sure to plan your Website “fieldtrips” ahead of time and check the locations before class, so you don't spend class time surfing or hunting down broken links. Demonstrations, models, and visualizations add an important dimension to any science class.

Finally, whatever balance of lecture, demonstration, interaction, and visual presentation you decide is right for you make sure your own enthusiasm for the subject shines through. Your fascination with and passion for astronomy will leave a lasting impression on your students, and will aid in their learning at least as much as demonstrations and slide shows will.

Literature

1. Karttunen, H. Fundamental Astronomy / H. Karttunen, P. Kroger, H. Oja,
M. Poutanen, K. Donner. – Berlin, Heidelberg: Springer-Verlag, 2007. – 507 p.