

## **ASTR 302 Observational Astronomy**

### **Course Description**

Introduction to observational astronomy. Topics include night sky observing skills, celestial coordinate and time systems, planning astronomical observing sessions, astronomical telescopes and instruments, basic digital imaging, image processing and analysis. This course is designed for astronomy educators and amateur astronomers. (3 credit hours)

Prerequisite: ASTR 120

### **Course Objectives**

Provide skills and resources to observe celestial objects both with and without telescopes

Develop the skills needed to use small telescopes to observe celestial objects.

Develop the skills needed to acquire and use digital images in astronomy.

### **Course Rationale**

The study of celestial objects through use of textbooks and images is an exciting process enjoyed by many people. However, it is much more satisfying to be able to go out at night and see these objects in the night sky. Whether one wants to be able to find and observe celestial objects for personal gratification or to plan instructional observing programs for others, changes in resources and equipment in recent years have made such activities much more productive and entertaining. Persons interested in astronomy used to be limited to naked-eye constellation identification using star charts or, with the purchase of binoculars or a small telescope, the visual study of planets and bright nonstellar objects such as nebulae and galaxies. Modern software is now available to facilitate planning of observing sessions. There are modestly priced telescopes which have computer aided pointing capabilities and, when combined with digital CCD cameras, offer the opportunity to create black and white and color images of thousands of celestial objects. This course provides the information and skills needed to acquire and use small telescopes and cameras to study celestial objects. The BSU Planetarium is used on a regular basis to create familiarity with the night sky and its changing appearance throughout the year. It is also extremely helpful in helping students to visualize celestial coordinate systems and to describe the changing positions of celestial objects during a single night and throughout the year. The BSU observatory is used to provide hand-on experience with small telescopes. Students learn how to align portable telescopes and how to use coordinate systems to locate faint objects not visible to the naked eye. Digital CCD cameras are used by students to acquire images of astronomical objects.

Digital image processing skills are subsequently developed to turn raw image data into scientific information or color images.

### **Course Content, Format, and Bibliography**

#### *Content*

1. Astronomical Nomenclature
2. Stars and Constellations
3. Celestial Coordinate Systems
4. Time and Calendar
5. Planetarium Software
6. Astronomical Telescopes
7. Telescope Alignment
8. Digital Image Acquisition
9. Digital Image Reduction and Calibration
10. Astrometry and Photometry

#### *Format*

This is primarily a lab course which will meet in the planetarium, lab and astronomical observatory on a regular basis. Students will work in small groups in all three venues to achieve the goals of the course. Most contact time will be spent completing student-centered activities.

This course is taught as a dual undergraduate/graduate course. Students will be required to complete activities appropriate for the level of the course in which they are enrolled. Student performance on homework, exams and/or labs will be evaluated using different standards for undergraduate and graduate students.

#### *Bibliography*

Textbook: TheSkyX Workbook, 1<sup>st</sup> Edition, by Dr. Thomas M. Jordan and Scott Peters,

Brooks-Cole; Cengage Learning Publishing, 2011.

Observer's Handbook yyyy published by The Royal Astronomical Society of Canada. (yyyy = the year in which the course is taught)