Agenda Item #06-120
Effective Spring 2009

Eastern Illinois University
New Course Proposal
PHY 3100, Astronomical Techniques

Please check one: ☒ New course ☐ Revised course

PART I: CATALOG DESCRIPTION

1. **Course prefix and number:** PHY 3100
2. **Title:** Astronomical Techniques
3. **Long title:**
4. **Class hours per week, lab hours per week, and credit:** (2-3-3)
5. **Term(s) to be offered:** ☐ Fall ☒ Spring ODD years ☐ Summer ☐ On demand
6. **Initial term of offering:** ☐ Fall ☒ Spring ☐ Summer ☐ Year 2009
7. **Course description:** An introductory course in observational astronomy, with a two part emphasis. The first part covers the use and theory of modern telescopes, CCD cameras, filters, and spectrometers, while the second part covers the handling, calibration and reduction of data using astronomical image analysis software and other computer programs. Topics on the gathering of data outside the visible parts of the spectrum will also be addressed.
8. **Registration restrictions:**

   a. **Identify any equivalent courses**. There are no equivalent courses.
   b. **Prerequisite(s):** PHY 1055G, 1371, 1372
   c. **Who can waive the prerequisite(s)?**

      ☐ No one ☒ Chair ☐ Instructor ☐ Advisor ☐ Other (Please specify)

   d. **Co-requisites**:

   e. **Repeat status:** ☒ Course may not be repeated.

   f. **Degree, college, major(s), level, or class** to which registration in the course is restricted, if any:
   g. **Degree, college, major(s), level, or class** to be excluded from the course, if any:
9. **Special course attributes:**
10. **Grading methods**: ☒ Standard letter ☐ C/NC ☐ Audit ☐ ABC/NC
11. **Instructional delivery method:** lecture lab combined

PART II: ASSURANCE OF STUDENT LEARNING

1. List the student learning objectives of this course:

Students will:

- Gather observational data, using the university's robotic 16" telescope, CCD camera and spectrometer, and calibrate telescopes and CCD cameras.
- Design and perform observational experiments in photometry, astrometry, and spectroscopy.
- Apply data reduction techniques, such as maximum entropy deconvolutions, using programs Maxim and IRAF.

a. This is not a general education course.
b. This is not a graduate course.

2. Identify the assignments/activities the instructor will use to determine how well students attained the learning objectives:

	(35%) Homework	(30%) Exams	(35%) Projects
Gather observational data, using the university's robotic 16" telescope, CCD camera and spectrometer, and calibrate telescopes and CCD cameras.	X	X	X
Design and perform observational experiments in photometry, astrometry, and spectroscopy.	X	X	X
Apply data reduction techniques, such as maximum entropy deconvolutions, using programs Maxim and IRAF.	X	X	X

3. Explain how the instructor will determine students' grades for the course:

   - Exams (30%)
   - Homework (35%)
   - Projects (35%)

4. *This is not a technology-delivered course.*
5. *The course number for this course in not between 4750 and 4999.*
6. *There is no writing designation for this course.*

PART III: OUTLINE OF THE COURSE

a) Units of time: 2 fifty-minute lectures and one three hour laboratory for 15 weeks.

Week 1: Introduction: Celestial coordinates, distances, magnitude scales, motion of the sun and moon, precession of the earth
Week 2: Telescopes: Optical elements, refracting and reflecting telescopes, telescope mountings
Week 3: Astronomical detectors: CCDs, integrating detectors
Week 4-5: Reducing CCD data: Bad pixels and cosmic rays, bias and dark current subtraction, flat-fielding
Week 6: Photometry: UBVIR filters, astronomical magnitudes, relative calibration, calibration using standard stars
Week 7: Spectrometer design and function
Week 8: Spectroscopy: wavelength and flux calibration, extraction of spectra
Week 9: Observations outside the visible spectra
Week 10: Experimental uncertainties, analysis of error

Week 11: Planning an observational run
Week 12-15: Student observational projects and data reduction
Finals week: Project presentations

PART IV: PURPOSE AND NEED

1. Explain the department's rationale for developing and proposing the course.
   - Physics majors who are in the Astronomy option will need an introduction to modern observational techniques. The newly proposed course, PHY 3100, aims at this. This course focuses on the practical problems inherent in the gathering and handling of data in observational astronomy.

   a. *This is not a general education course.*
   b. *This is not a technology delivered course.*

2. Justify the level of the course and any course prerequisites, co-requisites, or registration restrictions.
   - This course is designed to be an upper-level course for physics majors and minors. Students are required to have a working knowledge of calculus through MAT 2443, as well as a working knowledge of calculus based physics through PHY 1372. This course is appropriately offered at the 3000 level.

3. If the course is similar to an existing course or courses, justify its development and offering.
   a. This course does not substantially duplicate any existing course.
   b. No courses will be deleted. This course will be a requirement in the newly proposed Astronomy option of the Physics major.

4. Impact on Program(s):
   This course is required for undergraduate Physics majors who have chosen the Astronomy Physics option. The course will be an elective for the Physics minor.

PART V: IMPLEMENTATION

1. Faculty member(s) to whom the course may be assigned:
   - This course will be initially taught by Dr. James Conwell, but can be taught by other faculty members in the Physics Department who have background in observational astronomy or astrophysics.
2. Additional costs to students: There are no additional course fees.
3. Text and supplementary materials to be used (Include publication dates):
   - "Observing the Universe", by Andrew Norton, Cambridge Press, 2004.
   - "Astrophysical Techniques", 4th edition, by C.R. Kitchin, Institute of Physics, 2003.

PART VI: COMMUNITY COLLEGE TRANSFER
A community college course will not be judged equivalent to this course.

PART VII: APPROVALS

Date approved by the Physics Department October 5th, 2006

Date approved by the College of Sciences Curriculum Committee November17th, 2006

Date approved by CAA December 7th, 2006