Sequence: #7 63

PURDUE UNIVERSITY
REQUEST FOR ADDITION, EXPIRATION, OR REVISION OF AN UNDERGRADUATE COURSE
(10000-40000 LEVEL)

DEPARTMENT: Physics  EFFECTIVE SESSION:

INSTRUCTIONS: Please check the items below which describe the purpose of this request.

1. New course with supporting documents
2. Add existing course offered at another campus
3. Expiration of a course
4. Change in course number
5. Change in course title
6. Change in course credit type
7. Change in course attributes (department head signature only)
8. Change in instructional hours
9. Change in course description
10. Change in course requisites
11. Change in semesters offered (department head signature only)
12. Transfer from one department to another

PROPOSED:
Subject Abbreviation: ASTR
Course Number: 47100
Long Title: Stellar Evolution
Short Title: Stellar Evolution

EXISTING:
Subject Abbreviation: 
Course Number: 
Long Title: 
Short Title: 

TERMS OFFERED:
Check All That Apply:
- Summer
- Fall
- Spring

CAMPUS(ES) INVOLVED:
- Calumet
- Cont Ed
- W. Wayne
- Tech Statewide
- W. Lafayette
- Indianapolis

CREDIT TYPE:

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<th>Credit Type</th>
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COURSE ATTRIBUTES: Check All That Apply

- 6 Registration Approval Type
- Department
- Instructor
- 7 Variable Title
- 8 Honors
- 9 Full Time Privilege
- 10 Off-Campus Experience

I certify that the information presented on this request is true and correct.

[Signature]

Course Description:
We will discuss observations related to stellar astrophysics. These will include formation of galaxies and stars; evolution of stars; cosmology; cosmic rays, their origin and acceleration; radio astronomy; radio galaxies; the H-21 cm line; gravitational radiation; stellar X-rays and gamma rays.

This is a calculus-based course.
Prerequisites: MA23100 grade 2.8 or better. PHYS34200 grade 2.8 or better.

Course Learning Outcomes:
To develop skill in computational physics.

[Signature]  Date

Calumet Department Head

[Signature]  Date

Calumet School Dean

[Signature]  Date

Cont Ed Department Head

[Signature]  Date

Cont Ed School Dean

[Signature]  Date

Indy Department Head

[Signature]  Date

Indy School Dean

[Signature]  Date

North Central Faculty Senate Chair

[Signature]  Date

Vice Chancellor for Academic Affairs

[Signature]  Date

West Lafayette Department Head

[Signature]  Date

West Lafayette College/School Dean

[Signature]  Date

West Lafayette Registrar

OFFICE OF THE REGISTRAR
ASTR 47100 Tentative Syllabus  Spring 2014
Stellar Evolution

Instructor:  Stephen Gillam
Office:  KT122A
Office Hours:  TBD
Class room:  TBD
Textbook:  TBD

In this calculus-based course for physics majors, we will discuss observations related to stellar astrophysics. These will include formation of galaxies and stars; evolution of stars; cosmology; cosmic rays, their origin and acceleration; radio astronomy, radio galaxies; the H-21 cm line; gravitational radiation; stellar X-rays and gamma rays.

You will be required to read selected background material and to lead class discussions on the astronomical observations that motivate each topic. For instance, you may be asked to research the literature, prepare a presentation, and brief the class on observations of and properties of the solar magnetosphere.

Prerequisites:

PHYS 34200  (Modern Physics ) Minimum Grade of 2.0.

Tentative Schedule of Topics

Observations

The Sun
- Basic properties
- Magnetosphere
- Solar wind
- The sun is a variable star.

Star-formation regions
- The Torus and Orion Molecular clouds, the Eagle Nebula

Young stars
- Hyashi Track
- T-tauri stars and their winds
- Radio jets from young stellar objects
- Radio emission from stellar winds
The Milky Way
Open clusters
Globular clusters - Are they interlopers?
The galactic bulge - is it a captured dwarf galaxy?
The galactic disk - Molecular cloud distribution and spiral structure from the
21cm hydrogen lines
The Galactic halo - stellar chemical abundances and galactic structure

Cosmology
Cepheid variable distances
Supernova distances

Stellar Modeling
Equations of stellar structure
Equations of State
Energy generation and atmospheric opacity
Energy transport in stars

The main sequence
The lowest mass stars at the hydrogen burning limit
Brown dwarfs in the Milky Way

Post main-sequence evolution
Subgiants
Red Giants
Horizontal branch stars
Asymptotic giant branch stars

Binaries and variables
Blue stragglers
R-R Lyrae and delta-Sculi variables
Eclipsing binaries
Flare stars, cataclysmic variables and other stellar X-ray sources
Gravitational radiation from close binaries.

Endpoints of stellar evolution
Supernovae - SN1987A
White dwarfs
Neutron stars and pulsars
Black holes
X-rays and gamma-rays from accretion disks around black holes.
Millisecond pulsars in globular clusters

Homework
This will consist of a semester-long computational astronomy project to model a main sequence star. It will be in four graded phases.
1) Definition of the problem. This will end with a presentation of the relevant physics in week 4 of the semester.
2) Development of algorithms, ending with presentation of the pseudocode in week 6.
3) Development of the code. This phase will end with a report on the code development in week 9.
4) Computations and results. These will be reported the week before finals week.

Each phase will be worth the same number of points.

**Observational Project**
This will be a stellar astronomy project using the IPFW Physics Dept. remotely-controlled 8-inch telescope or archival data. It will consist of a proposal to be presented to the class by the third week of the semester, a data taking phase to be completed by the week eight, followed by data analysis, and a report due the week before finals week.

Suggested projects
1. Light curves of bright variable stars
2. Search for variability in normal stars (e.g. Vega)
3. Diameters of bright stars using the infrared flux method.

**Reports**
You will present your homework and project results in two word-processed reports of 4-10 pages length.

**Grading**
Class presentations 15%
Midterm 20%
Final 20%
Project 20%
Homework 25%