**PURDUE UNIVERSITY**

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

**DEPARTMENT:** Physics  
**EFFECTIVE SESSION:** Fall 2011

**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 prerequisites
- [ ] 11. Change in semesters offered (department head signature only)
- [ ] 12. Transfer from one department to another

**PROPOSED:**

<table>
<thead>
<tr>
<th>Subject Abbreviation</th>
<th>Subject Abbreviation</th>
<th>ASTR</th>
</tr>
</thead>
<tbody>
<tr>
<td>Course Number</td>
<td>Course Number</td>
<td>37000</td>
</tr>
<tr>
<td>Long Title Cosmology</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Short Title</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Abbreviated title will be entered by the Office of the Registrar if omitted. (20 CHARACTERS ONLY)

**CREDIT TYPE**

1. Fixed Credit: Cr. Hrs. 3
2. Variable Credit Range: Minimum Cr. Hrs. (Check One) To Or
   Minimum Cr. Hrs. 3
3. Equivalent Credit: Yes No

**SCHEDULE TYPE**

<table>
<thead>
<tr>
<th>Lecture</th>
<th>Minutes Per Mtg</th>
<th>Meetings Per Week</th>
<th>Weeks Offered</th>
<th>% of Credit Allocated</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>15</td>
<td>100</td>
</tr>
</tbody>
</table>

**COURSE ATTRIBUTES:** Check All That Apply

- 1. Pass/Not Pass Only
- 2. Satisfactory/Unsatisfactory Only
- 3. Repeatable
- 4. Credit by Examination
- 5. Special Fees
- 6. Registration Approval Type
- 7. Variable Title
- 8. Honors
- 9. Full Time Privilege
- 10. Off Campus Experience

**TERM OFFERED**

- Summer
- Fall
- Spring

**CAMPUS(ES) INVOLVED**

- Central
- Cont Ed
- Ft. Wayne
- Tech Slatevike
- Indianapolis
- N. Central
- W. Lafayette

**COURSE DESCRIPTION (INCLUDE REQUIREMENTS/RESTRICTIONS):**

Intended for science and engineering majors. Basic physics and math knowledge will be assumed. The picture of how the Universe came to be and how it has evolved has recently come into sharp focus. This progress is the result of improved observational techniques that have resulted in high resolution images of very distant galaxies, a more accurate mapping of the Large Scale Structure of the Universe or the high resolution picture of the young universe provided by Cosmic Microwave Background observations. We will present a historical perspective of how ideas and data have shaped Cosmology through the centuries. In addition, we will review the theoretical

**COURSE LEARNING OUTCOMES:**

Models that are in agreement with the current observations. Our goal will be to provide the students with a broad overview of the current research in Cosmology with an eye toward stimulating the students curiosity about the many questions still awaiting answers in this field.

Students will be able to describe how the universe has evolved and the observations used to support models of the universe

---

**OFFICE OF THE REGISTRAR**

[Signature and date]

[Signature and date]

[Signature and date]

[Signature and date]
ASTR 37000  Cosmology  Tentative Syllabus

Text: An Introduction to Modern Cosmology by Andrew Liddle
Instructor: Mark Masters, Ph.D.
Office: KT 127
Phone: 260-481-1653
e-mail: masters@ipfw.edu
web: http://users.ipfw.edu/masters
Office Hours: Officially, Monday 1330-1430, Thursday 1430-1530, By appointment and, unofficially, when you can find me.

Description:

Intended for science and engineering majors. Basic physics and math knowledge will be assumed. The picture of how the Universe came to be and how it has evolved has recently come into sharp focus. This progress is the result of improved observational techniques that have resulted in high resolution images of very distant galaxies, a more accurate mapping of the Large Scale Structure of the Universe or the high resolution picture of the young universe provided by Cosmic Microwave Background observations. We will present a historical perspective of how ideas and data have shaped Cosmology through the centuries. In addition, we will review the theoretical models that are in agreement with the current observations. Our goal will be to provide the students with a broad overview of the current research in Cosmology with an eye toward stimulating the students curiosity about the many questions still awaiting answers in this field.

This course will be divided into three sections:

Section 1: History, background and relativity. Topics: Cosmology up to 1920, astronomical objects and systems, basic physics (fundamental forces, E-M waves and the standard model of particle physics), and the special and general theories of relativity.

Section 2: The "Standard" Big Bang Model. Topics: Evidence for an expanding universe, Hubble's law, CMB, the first three minutes, subsequent evolution.

Section 3: Recent Developments: dark matter, dark energy and the cosmological frontier. Topics: evidence for dark matter, candidates for dark matter, evidence for dark energy, candidates for dark energy, the edge of time.

Grading:  
2 – 50 minute exams  200 points
1 – 110 minute final  200 points
Homework and participation  200 points

<table>
<thead>
<tr>
<th>% Grade</th>
<th>Letter Grade</th>
<th>% Grade</th>
<th>Letter Grade</th>
</tr>
</thead>
<tbody>
<tr>
<td>93-100%</td>
<td>A</td>
<td>73-77%</td>
<td>C</td>
</tr>
<tr>
<td>90-93%</td>
<td>A-</td>
<td>70-73%</td>
<td>C-</td>
</tr>
<tr>
<td>87-90%</td>
<td>B+</td>
<td>67-70%</td>
<td>D+</td>
</tr>
<tr>
<td>83-87%</td>
<td>B</td>
<td>63-67%</td>
<td>D</td>
</tr>
<tr>
<td>80-83%</td>
<td>B-</td>
<td>60-63%</td>
<td>D-</td>
</tr>
<tr>
<td>77-80%</td>
<td>C+</td>
<td>&lt;60%</td>
<td>F</td>
</tr>
</tbody>
</table>
I expect that you can write clearly and concisely in English. I will not give full credit for partial sentences.

I like to have the class have an informal atmosphere. I want you to feel free to ask questions and interrupt. I want you to have fun. Learning new things is fun!

In class, you MUST be an active MEMBER of YOUR class. This means that you must participate. You must THINK! The only things not acceptable in this class are saying “I can’t”, “I won’t”, and being brain dead!

You are required to participate. Answers such as “I don’t know” (which may be true) or shrugs of shoulders are not acceptable. While you may not know an answer you can think about what the answer could be using what we have discussed in class or you have read previously. I WANT you to be thoughtful. I am not worried about whether your answer is wrong as much as if you Think about your answer.

Students are responsible for all materials covered in class and all assignments must be in on time. No late homework will be accepted. Exams must be neat and legible, showing all work and answered using complete sentences. Any appearances of copying work will result in a zero grade for all parties.

Homework is for you not for me. As such, you need to complete it so that it benefits you. It is given as an activity to learn from. When you complete a homework assignment, you must think about what you are doing, why are you doing it, what is the physics involved. When you turn in a homework assignment, you must consider that if you come back to it in six months, you will understand what you were doing in answering that assignment.

This class will be presented in a way that is, perhaps, different from any other class you have ever had. The method is known as interactive engagement. In this approach, I will NOT really lecture and YOU will actively participate in your learning. Learning is not a passive activity. For example, you may passively watch a TV show about magnetic levitation. While you may be inspired by the show to investigate magnetism and be aware that magnetic levitation exists, it is unlikely that you will understand it. Understanding is not memorizing. To understand requires work.

Certainly, if I wanted, I could lecture and cover all of the material in the textbook in a single semester. However, how many of YOU would understand any of the material at the end of such a class? My goal is for you to understand the physics. To understand physics you have to think about the physics, work with the physics, wrestle with the physics. Physics is NOT just plugging in numbers to get some answer. There is a deeper understanding to physics. One of the main goals of physics is to take a complex system, simplify it so that we can understand it, then add the complexity back in with a deeper understanding of the system as a whole.

There will be frustration, but frustration is not necessarily a bad thing because it is an indicator of struggling with the ideas. You already have ideas (preconceptions) about physics whether you admit to them or not. In order to replace these preconceptions you have to first recognize that you have a preconception then you have to build new concepts, but that is difficult. My role in this class is to help you to recognize these preconceptions and to help you build new correct concepts of the physics. My goal is to have you UNDERSTAND the physics.
In particular, you must always consider asking yourself these questions:
• What is happening?
• How do I know what is happening?
• How is this happening?
• Why is that happening?
• Am I being consistent and paying attention to things I already know?

Student Learning Outcomes

1. Students will understand the history of cosmology.
2. They will be able to describe the basics of special and general relativity.
3. They will describe fundamental forces.
4. Students will be able to discuss the Big Bang Model and the evidence supporting it.
5. Students will be familiar with recent topics such as dark matter and dark energy.