# ASTROPHYSICS (ASTR 3415)

Course Syllabus – Fall 2016

**Lecture at 10:25 to 11:20, Brown 264, Monday, Wednesday, and Friday**

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| Instructor: | Richard Ignace<br>Department of Physics & Astronomy |
| Email: | ignace@etsu.edu |
| Web: | faculty.etsu.edu/ignace/astrophysics/astrophysics.html |
| Office: | 274 Brown Hall |
| Office Hours: | 11:30-12:30, Mon, Wed, Fri; or by appointment |
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## Objectives:

Students will learn the fundamentals of astrophysical study. Core components of this course include basic considerations of observational astronomy, orbital dynamics, radiation transport, and stellar astrophysics. Selected topics from the interstellar medium, galaxies, and cosmology will also be covered as time permits.

## Grading:

The course is for 3 credit hours. Grades will be assessed as follows.

- 35% – 7 Problem Sets
- 45% – Three mid-term exams
- 20% – Final exam

## Required Materials:

The text for the course is *Introduction to Modern Astrophysics*, by Carroll and Ostlie. Supplemental materials will be noted in lecture.

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**Honors Students:** Students taking the course for honors credit will do all of the normal assignments as well as an extra homework assignment consisting of a more challenging problem. Honors students should meet with the instructor for details concerning the extra assignment, which will be worth 5 points. (So, honors students can get up to 105 points total, which will be renormalized for assigning grades.)

**Students with Disabilities:** I need to hear from anyone who has a disability which may require some modification of seating, testing, or other class requirements so that appropriate arrangements may be made. Please see me after class or during my office hours.

**Complaint Procedures:** In the event of a complaint, the first step would be to speak with the Instructor. Alternatively one could speak with the Physics & Astronomy Chair in 277 Brown Hall.

## Schedule:

The following is a *loose* schedule of material that will be covered in the course.

| *Week* | *Date* | *Topic* | *Chapter* | *Homework* |
|---|---|---|---|---|
| 1 | 08/22 | Introduction | 1 | |
| | 08/24 | Celestial Mechanics | 1 | |
| | 08/26 | Overview of Astrophysics | 3, 5 | |
| 2 | 08/29 | Observational Astronomy | 6 | |
| | 08/31 | Gravity | 2 | |
| | 09/02 | *Labor Day* | | |
| 3 | 09/05 | Kepler's Laws | 2 | HW #1 Due |
| | 09/07 | Binary Stars | 7 | |
| | 09/09 | Gravitational Scattering | 2 | |
| 4 | 09/12 | The Sun as a Star | 11 | |
| | 09/14 | Radiation Transport | 9 | |
| | 09/16 | Radiation Moments | 9 | HW #2 Due |
| 5 | 09/19 | **EXAM #1** | | |
| | 09/21 | Plane-Parallel Atmosphere | 9 | |
| | 09/23 | The Gray Problem | 9 | |
| 5 | 09/26 | Opacities and Ionization | | |
| | 09/28 | Stellar Atmospheres | 9 | |
| | 09/30 | Considerations of Spectra | 8, 9 | HW #3 Due |
| 6 | 10/03 | Star Forming Environments | 12 | |
| | 10/05 | Star Formation Physics | 12 | |
| | 10/07 | Protostars | 12 | |
| 7 | 10/10 | *Fall Break* | | |
| | 10/12 | Stellar Structure | 10 | |
| | 10/14 | Polytropes I. | 10 | HW #4 Due |
| 8 | 10/17 | Polytropes II. | 10 | |
| | 10/19 | Abundance/Ionization Effects | 10 | |
| | 10/20 | Nuclear Fusion | 10 | |
| 9 | 10/24 | Nucleosynthesis | 10 | |
| | 10/26 | Hertspruning-Russell Diagram | 10, 13 | HW #5 Due |
| | 10/28 | **EXAM #2** | | |
| 10 | 10/31 | Stellar Evolution | 13 | |
| | 11/02 | Stellar Clusters | 13 | |
| | 11/04 | Death of Stars | 13, 15 | |
| 11 | 11/07 | Stellar Remnants | 16, 18 | |
| | 11/09 | Stellar Mass Loss | – | |
| | 11/11 | Stellar Winds | – | |
| 12 | 11/14 | The Interstellar Medium | 12 | HW #6 Due |
| | 11/16 | Milky Way as a Galaxy | 24 | |
| | 11/18 | Dark Matter | 24 | |
| 13 | 11/21 | Cosmology | 29, 30 | |
| | 11/23 | *Thanksgiving Break* | | |
| | 11/25 | *Thanksgiving Break* | | |
| 14 | 11/28 | Dark Energy | 29, 30 | HW #7 Due |
| | 11/30 | **EXAM #3** | | |
| | 12/02 | *Study Day* | | |
| 15 | 12/07 | FINAL EXAM (Wed, 8:00a-10:00a) | | |