

# ASTR 730 / CSI 661 Stellar Astrophysics

## Syllabus

**Fall 2012**

**Prerequisites:** PHYS 303 (Classical Mechanics), PHYS 305 (Electromagnetic Theory), PHYS 308 (Modern Physics with Applications); MATH 214 (Elementary Differential Equations)

**Credits:** 3

**Date and Time:** every Tuesday from 4:30 PM to 7:10 PM

**Location:** Room 1108, Nguyen Engineering Building

**Instructor:** Prof. Jie Zhang

**Contact Info:** (703)993-1998 (phone), [jzhang7@gmu.edu](mailto:jzhang7@gmu.edu) (e-mail)

**Office Hour:** 3:00 PM to 4:00 PM, Tuesday, or by appointment

**Office:** Room 351, Research Hall

**Description:** The general purpose of this course is a survey of contemporary astrophysics. Topics include physical concepts, stellar spectra, Hertzsprung-Russell diagram, stellar atmospheres, stellar structure, interstellar matter, stellar evolution, high-energy phenomena, hydrodynamical processes in astrophysics, accretion disk formation, and shock formation. In this semester, the class will focus on stellar structure and evolution, and stellar atmosphere.

### Content:

- Overview of Stellar Evolution
- Basic Principle
- Equations of State
- Radiative and Conductive Heat Transfer
- Convective Heat Transfer
- Stellar Energy Sources
- Stellar Modeling
- Structure and Evolution of the Sun
- Stellar Atmosphere: the Background
- The Line Absorption Coefficient

**Homework:** There will be weekly assignment of homework. Each homework consists of 2 to 5 short questions.

**Project:** There will be one project. Students learn how to use numerical methods to solve physical equations, in order to fully model and understand the structure of stars of different masses.

**Exams:** There will be one midterm and one final exam. Exams are of closed-book.

**Grades:** Homework (30%), Project (20%), Midterm (20%), Final Exam (30%)

**Class URL:** [http://solar.gmu.edu/teaching/2012\\_ASTR730/](http://solar.gmu.edu/teaching/2012_ASTR730/)

**Text Book (required):** "Physical Principles, Structure and Evolution". by C.J. Hansen, S.D. Kawaler and V. Trimble, 2nd edition, Springer-Verlag, 2004. ISBN 978-0-387-20089-7

**Supplement Reference Books:**

- "Stellar Atmosphere: The Observation and Analysis of Stellar Photospheres". By David F. Gray. Third Edition, Cambridge Press, 2005. ISBN 0-521-06681-6