

# Syllabus for Astro 465: Stellar Astrophysics II

## Winter 2012

### Instructor: Natalia Ivanova

Phone: (780) 248-1899

Email: [nata.ivanova@ualberta.ca](mailto:nata.ivanova@ualberta.ca)

Office: CCIS 2-107

Office hours: on demand.

Course webpage: [http://www.ualberta.ca/~ivanova1/astro465\\_2012.html](http://www.ualberta.ca/~ivanova1/astro465_2012.html)

Course forum: <http://astro.physics.ualberta.ca/forum/>

Course room and time: **CCIS 4-285, MWF 11:00-11:50 AM.**

### Course Description:

In this course we aim to cover the essential physics of the internal structure of stars – the basic equations of stellar structure, opacity, and nuclear reactions. We will discuss at a semi-quantitative level how stars evolve, starting from prior the main sequence and to the ends of their life. We also will compute and analyze stellar models using realistic stellar evolution code.

### Topics Covered: (tentative)

1. Hydrostatic equilibrium. Virial theorem and applications.
2. Equations of state.
3. Radiative transfer and radiative opacity sources.
4. Heat transfers by conduction and convection; instabilities.
5. Nuclear reactions in stars.
6. Stellar modeling and numerical calculations.
7. Evolution of single stars: Pre-MS Evolution, Main Sequence, Off-MS Evolution, End of life.
8. Evolution in Binaries.

### Literature:

#### lecture notes by Onno Pols:

single stars <http://www.phys.uu.nl/~pols/education/stev/lnotes/>

binary stars <http://www.phys.uu.nl/~pols/education/binaries/lnotes/>

“**Stellar Interiors**” by C.J. Hansen, S.D. Kawaler and V. Trimble. Note that this is 2nd edition.

#### Supplementary reading material:

“**An Introduction to the Theory of Stellar Structure and Evolution**” by D. Prialnik.

“**Stellar Structure and Evolution**” by R. Kippenhahn and A. Weigert

“**Principles of Stellar Evolution and Nucleosynthesis**” by D. Clayton

“**Evolutionary Processes in Binary and Multiple Stars**” by P. Eggleton (available online in UofA library)

**Out-of schedule lectures:** Jan 23-27 I will be away, so several lectures will be given not during their usual scheduled time. Time and place: Thu Jan 19, Feb 2, Feb 9 (preliminary)

**Marking Scheme:**

6 homeworks:	30%	Due Jan 30, Feb 8, Feb 17, Mar 14, Mar 28, Apr 11
Computational HWs:	40%	Due March 2 (20%), Apr 4 (20%)
Take home final exam:	30%	TBA

- Your homework problem set with the lowest score will be dropped from your final mark.
- It is possible to get an extra credit for an extra problem (complicated ones only, ask me for this challenge).
- Active and sensible participation in class discussions may worth an extra credit.
- Homeworks will be due at 11am, at the start of the class.
- Computational HWs should be accompanied with your data and/or your codes being sent via email. Only electronic files (pdf/doc) will be accepted. No prints out/hand writing will be accepted.
- Carpet bombing will result in negative points, e.g. if irrelevant or wrong information is provided along with correct one.
- This is **astrophysics**. Do not write a lengthy essay. Only first hundred words (or a specified in the assignment number) will be accepted as an answer.
- Computational HW0 is not graded but is required to obtain input for CHW1.
- Only homeworks in CGS or astronomical units will be accepted. No SI units.

**Prerequisites:**

Thermodynamics (Phys 211)  
Modern Physics (Phys 271)  
Stellar Astrophysics I (Astro 320)  
Ordinary Differential Equations (Math 334 or equivalent)

It is important to prepare yourself for this course through a review of the prerequisite material. Students who do not have the required prerequisites at the time of taking this course should not expect supplementary professorial tutoring

**Academic Integrity:**

If you work together on homework assignments, write up your solutions independently. Direct copying of another's work is plagiarism.

From the University Calendar:

“The University of Alberta is committed to the highest standards of academic integrity and honesty. Students are expected to be familiar with these standards regarding academic honesty and to uphold the policies of the University in this respect. Students are particularly urged to familiarize themselves with the provisions of the Code of Student Behavior (online at [www.ualberta.ca/secretariat/appeals.htm](http://www.ualberta.ca/secretariat/appeals.htm)) and avoid any behaviour which could potentially result in suspicions of cheating, plagiarism, misrepresentation of facts and/or participation in an offence. Academic dishonesty is a serious offence and can result in suspension or expulsion from the University.”

“All forms of dishonesty are unacceptable at the University. Cheating, plagiarism and misrepresentation of facts are serious offenses. Anyone who engages in these practices will receive at minimum a grade of zero for the exam or paper in question and no opportunity will be given to replace the grade or redistribute the weights. Any offense will be reported to the Senior Associate Dean of Science who will determine the disciplinary action to be taken.”

**CELL PHONES & FOOD:** Cell phones are to be turned off during lectures. No food is allowed during lectures.