

# Ast9610: Fundamentals of Modern Astrophysics

*Fall Term, 2011*

**Content:** This course is an intensive introduction to modern astrophysics. It is expected that all entering Astronomy MSc students without an undergraduate degree in Astronomy will take this course in their first term of study. Topics include: astronomical terminology; spectra and radiative processes; stars, and stellar evolution; the interstellar medium; the Milky Way and external galaxies; the high-redshift universe and cosmology.

This course, or its equivalent, is a pre-requisite for all other astronomy graduate courses with the exception of Astronomy 9601 (Solar System and Planetary Astronomy) and Astronomy 9620 (Classical Electrodynamics).

**Instructors:** Prof. Els Peeters (first half), Prof. Pauline Barmby (second half)

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**Office hours:** drop by in afternoons (EP); Wed 3:00-4:30, or drop by (PB)

## Course Goals:

- give students experience with applying physics to astrophysics
- develop students' problem-solving skills
- familiarize students with astronomical jargon and modes of research
- give students a basic understanding of astronomy research tools (ADS, plotting)

Please see the separate document "Learning Outcomes for Astronomy 9604" for detailed expectations for each topic.

**Time and Location:** The class is held in Physics & Astronomy Room 232, Monday 11:00–12:00, Thursday 10:30–11:30, and Friday 9:30–10:30. Class time will be used for cooperative problem-solving and discussions. The course material will not be presented in lectures; students are expected to read the text in advance and come prepared for discussion.

**Textbook:** *Astrophysics for Physicists*, A.R. Choudhuri, 2010, Cambridge University Press. The textbook is available in the bookstore and a copy is on reserve in Taylor Library (call number QB461.C535x). However, as the quizzes and exam are open-book, students without their own copies will be at a disadvantage. Please see one of the instructors if this is a problem for you.

**Website:** <http://webct.uwo.ca>. Course notes, problem sets, online reading quizzes, and course marks will be distributed through the course site on WebCT.

**Evaluation:** The grade assigned for this course will be based on:

- online reading quizzes (RQ in schedule), best 10 of 12, 10%
- problem sets (PS in schedule), best 5 of 6, 25%
- in-class quizzes, best 5 of 6, 25%
- final exam, 40%

The pass standard for this course is at least 60% overall on all course components and at least 50% on the weighted average of the in-class quizzes and final exam. Please note: final course marks may need to be adjusted in order to conform to department policy.

**Online reading quizzes:** are based on the textbook reading for each week and are due on Sunday evenings at 6:00pm, with one exception (see schedule). These quizzes are intended to encourage students to keep up with the reading; an honest effort rather than detailed understanding is the criterion for full marks.

**Problem Sets:** are to be submitted in class on the due dates given in the schedule on the following page. Because only the best 5 of 6 problem sets are used to compute the final mark, late assignments will not be accepted. While you are encouraged to discuss your approaches to the assigned problems with your classmates, your solutions should represent your own original work. To help the TA grading the assignments avoid any conflict of interest, we ask that you identify your work with a numeric code that we will assign, rather than with your name or student number.

**In-Class Quizzes:** are one-hour tests scheduled approximately every other week. Because only the best 5 of 6 quizzes are used to compute the final mark, there are no make-ups for quizzes missed for any reason. The quizzes will be non-cumulative, with the material covered on each quiz given in the schedule. Use of the course textbook, but no other notes or references, will be permitted.

**Final exam:** The final exam covers all of the course material and will be scheduled for early in the December exam period. Use of the course textbook, but no other notes or references, will be permitted.

**Scholastic Offences:** Scholastic Offences are taken seriously and students are directed to read the appropriate policy, specifically, the definition of what constitutes a Scholastic Offence, at the following Web site:

[http://www.uwo.ca/univsec/handbook/appeals/scholastic\\_discipline\\_grad.pdf](http://www.uwo.ca/univsec/handbook/appeals/scholastic_discipline_grad.pdf)).

## Astronomy 9610: Weekly Schedule, 2011

Week starting	Topic	Text sections for RQ	Notes
Sep. 8	Welcome to Astronomy 9604	1.1–1.8	<i>Organizational meeting</i>
Sep. 11	radiative transfer	RQ1: 2.1–2.4	Sep. 16: PS 1 due
Sep. 18	energy transport & stellar structure	RQ2: 2.5–2.7, 3.1–3.3	Sep. 23: Quiz #1
Sep. 25	stars	RQ3: 3.4–3.6, 4.1	Sep. 30: PS 2 due
Oct. 2	nucleosynthesis & stellar evolution	RQ4: 4.2–4.7	Oct. 7: Quiz #2
Oct. 9	stellar remnants <i>RQ5 due Tuesday Oct. 11 at 4pm</i>	RQ5: 5.1–5.6	Oct 14: PS 3 due
Oct. 16	interstellar medium	RQ6: 6.5–6.8	Oct. 21: Quiz #3
Oct. 23	the Milky Way	RQ7: 6.1–6.4	Oct. 28: PS 4 due
Oct. 30	galaxies	RQ8: 9.1–9.3	Nov. 4: Quiz #4
Nov. 6	active galaxies & large-scale structure	RQ9: 9.4–9.6	Nov 11: PS 5 due
Nov. 13	intro to cosmology	RQ10: 10.1–10.7	Nov. 18: Quiz #5
Nov. 20	relativistic cosmology	RQ11: 14.1–14.5	Nov. 25 PS 6 due
Nov. 27	the early universe	RQ12: 11.1–11.9	Dec. 2: Quiz #6
Dec. 4	Catch-up/review		
Dec. 9	(or later) <b>Final Exam</b>		

Reading Quizzes are due on Sunday evenings at 6:00pm, with one exception noted above. Changes to this schedule will be discussed in class and posted on WebCT. The date of the final exam will be set based on consultation with class members.

**Additional information:** The following textbooks are available in Taylor Library (not on reserve) and may provide additional background. The first two are more general while the latter books cover more specific topics.

1. *An Introduction to Modern Astrophysics*, 2nd ed., 2007, B.W. Carroll & D.A. Ostlie (QB461.C35x)
2. *Astrophysical Concepts*, 4th ed., 2006, M. Harwit (QB461.H37)
3. *Astrophysics of Gaseous Nebulae and Active Galactic Nuclei*, 1989, D.G. Osterbrock (QB855.55.O88)
4. *The Physics & Chemistry of the Interstellar Medium*, 2010, A.G.G.M. Tielens (QB790.T54)
5. *The Physics of the Interstellar Medium*, 2010, J.E. Dyson & D.A. Williams (QB790.D97)
6. *Stellar Structure and Evolution*, 1990, R. Kippenhahn & A. Weigert (QB808.K57)
7. *Galactic Astronomy*, 1998, J. Binney & M. Merrifield (QB857.B522)
8. *Galaxies in the Universe*, 2000, L. Sparke & J. Gallagher (QB857.S63)
9. *Introduction to Cosmology*, 2003, B.S. Ryden (QB981.R93x)