

Astronomy 0113/0413

Introduction to Astronomy

Class meets:

All classes are online for the foreseeable future.

Tue 8:55 am – 10:10 am (109 Lawrence)

Thu 8:55 am – 10:10 am (109 Lawrence)

Thu 12:00 pm -- 1:00 (105 Allen Hall) -- **A0413 only**

Instructor:

Dr. D. John Hillier

Professor of Physics and Astronomy, 318 Allen Hall, Phone 412-624-9213

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Physics Office: 100 Allen Hall: Phone 412-624-9000

Office Hours:

Mondays : 11:00 – 11:50 am

Thursday: 4:00 – 5:00

ANYTIME when I'm free, or by appointment.

To arrange an appointment, you can send an EMAIL with 3 (or more) suitable times. I will then EMAIL back a time suitable for me.

Always include A0113 or A041 in the subject line of the EMAIL.



Text Book

None required, but it is STRONGLY recommended that you use one of the following resources with this course:

A useful online textbook is available at:

<https://openstax.org/details/books/astronomy>

Other textbooks:

“Universe -- 10th or 11th edition”

R. A. Freedman, R. M. Geller, W. J. Kaufmann III,, W. H. Freeman and Company

Stars, Galaxies, and Cosmology, The Cosmic Perspective

by Bennett, Donahue, Schneider & Voit (Addison-Wesley)

“The Cosmos: Astronomy in the New Millennium”

Pasachoff & Filippenko

“Explorations -- An Introduction to Astronomy”

Arny (McGraw-Hill)

“Astronomy -- A Beginner’s Guide” [or “Astronomy Today”]

Chaisson & McMillan (Prentice-Hill)

Study Technique:

Read the previous set of class notes.

View any recommended video before class.

Read the lecture notes/chapter **BEFORE** the lesson.

In class:

Ask questions!

Simple note taking -- what does the lecturer emphasize?

Written examples done live can be copied during the lecture, or from the recording at a later date..

Do NOT attempt to copy type-written powerpoint notes that are presented on ZOOM. These notes are available in CANVAS. Rewriting these notes at home may/will help you learn the material.

After class, summarize, in your own words, the material covered (utilizing a text book, lecture material and other resources). Write out important facts. Keeping a journal may help.

Have a friend ask you question from the notes --- this will test whether you truly remember/understand important concepts.

Do all the homework. Ask the instructor/TA for help if you have difficulty (alternatively visit the physics resource room).

Use the online resources that I will give as the course proceeds.

Study continuously – cramming the night before can be disadvantageous.

After you get your HW returned, compare your solutions with the instructors. If you got a problem wrong understand why --- you can always ask the instructor for clarification.

Redo previous homework problems, especially those you got wrong or found difficult. Remember, solutions are posted on line.

Course Comment:

This is a self-contained course for students majoring in the physical sciences which utilizes arithmetic, algebra, physics, and geometry. The course also has a considerable descriptive content. Exams are **NOT** multiple choice. A sample midterm has been placed on Canvas.

While a physics course (at high school or University) is not mandatory, it is **highly** desirable.

Non-science and non-engineering Majors:

Instead of taking A0113, those students without a mathematical/physics background will/may be better served by taking A0089 (similar to A0113 but less math content), A0088 (Stonehenge to Hubble) or A0087 (Basics of Space Flight).

Students wishing to major (or minor) in Astronomy must take A0113/A0413.

Pre-COVID 19 Exam Policy

Exam policy will be updated prior to any exam.

Students **MUST** bring their ID cards to exams.

Calculators are permitted but all memory must be cleared. Students failing to clear the calculator memory will receive a zero for the exam, and may be reported to the Dean.

Cheating results in an immediate failure, and a report will be sent to the Dean.

Exams

Mid term exam (70 minutes):

Tuesday, Mar. 9th – 1st exam (normal class time)

Final exam (2hrs):

To be decided.

Cumulative (generally).

Exam questions:

A variety of question styles: multiple choice, written discussion like answers, and longer mathematical problems.

Make-up exams will not be given.

NB: The instructor MUST be informed PRIOR to the exam if a student is to miss an exam for a reason which is NOT an emergency. The instructor reserves the right to reject any excuse which THEY deem not to be sufficient.

Grades:

25% of the course grade will be based on the 1st exam/essay.

45% of the course grade will be based on the FINAL exam/essay

20% of the course grade will be based on the homework.

10% of the course grade will be for work sheets and quizzes.

I reserve the right to make (slight) adjustments to these allocations.

Course grades will be determined from a curve of the distribution of scores on the final cumulative grade. However, a student scoring

90% will receive at least an A–,

80% will receive at least a B–,

65% will receive at least a C,

50% will receive at least a D

NB: If you are taking the SN option, you need a C, or better, in order to be given credit for the course.

Canvas

Recording of lectures, Panopto videos, copies of overhead transparencies, homework assignments, solutions, and demonstrations will be available on Canvas. In addition homework and exam grades will be placed on Canvas. It is your responsibility to ensure that the posted grades are correct and up-to-date.

Homework assignments must be upload on Canvas where they will be graded. Please make sure they are LEGIBLE.

NB: You cannot simply add marks posted on Canvas to get you current grade. Marks must be weighted according the the grading scheme described earlier.

Additional Resources

A list of various resources available to all students can be found at <https://www.physicsandastronomy.pitt.edu/resources-current-students> .

EMAIL

Only EMAIL me when necessary.

Always include **A0113** in the EMAIL subject line: If **A0113** is not included in the subject line I may not read the EMAIL

DO NOT EMAIL me for grades.

DO NOT EMAIL for exam dates etc. which are on Canvas.

DO NOT EMAIL me .DOC files etc, or files with unnecessary rubbish. Send simple text messages.

DO NOT EMAIL HOMEWORK.

Please email me regarding any important errors that you find.

You should receive an EMAIL from me the first week of term. If you do not, check your EMAIL service.

NB: All EMAIL will be sent to your PITT account. Mail sent to this account can be automatically forwarded to your regular EMAIL account (ask CIS for help). Please check your PITT EMAIL account regularly, and delete unwanted messages. All EMAIL is saved, and the account may fill up. As a consequence you will not receive new EMAIL.

Homework Assignments (HW)

Regular homework assignments will be given. These must be completed on time. Unless prior approval has been given by the instructor, up to 14% of the total grade will be deducted for every day the HW is late. **Assignments more than 1 week late will NOT be accepted.**

NB: The HW is to be regarded as a learning experience. You may discuss the HW with other students, but you **MUST** do the HW (calculations etc.) **BY YOURSELF**. If you cannot do a problem, **DO NOT** copy some else's work. Instead contact the instructor and arrange a time when the problem can be discussed. No marks will be deducted for discussing the problem with the instructor.

Copied homework will receive a grade of zero, and a report may be sent to the DEAN.

For all mathematical problems:

You **MUST** show you working, **INCLUDING** the propagation of units.

Problems **MUST** be laid out in a logical fashion (i.e., from top to bottom) and the working must **NOT** be so crammed that there is no room for comments.

At the top of each problem, you should define the problem.

As this is a learning exercise, define (before doing the problem) the symbols you are using, and list all relevant physical constants.

Clearly restate the quantities (e.g., the star's mass) supplied in the question.

Evaluate all calculations at least twice with the calculator – incorrect results often arise from incorrect typing.

Check that the calculator result is of the “right order of magnitude”.

Ask: **Is my answer reasonable?** If you deduce that the star's mass is 10 kg you have **OBVIOUSLY** made a mistake. Check your units and calculations. If this fails, ask for help. In an exam, noting that your answer is absurd will often mean less marks lost.

Your goal in the HW is not simply to get an answer --- you must understand both the problem, and the technique used to solve it. Remember – most exam problems will be similar to the HW problems.

Marks **will be deducted** for untidy or careless work, and for not propagating units.

Please save your graded HW and use it to study.

Please regularly check your HW scores on Canvass --- a missing grade for an earlier HW will not be corrected unless you can produce the graded HW.

Homework is a LEARNING exercise – if need help ask the instructor or TA.

Extra credit

There is **NO** extra credit given in this course.

Grades are based on the exams and criteria listed earlier. Failure to do the homework and exams, will severely and adversely affect your final grade.

HELP

If you are having difficulty with course, see the instructor **immediately**.

If you have a personal problem which is affecting your performance, contact the instructor **immediately**. This includes missing quizzes of worksheets.

Requests for exemptions and special consideration, made at the end of term, will be rejected.

Course Outline

The Scientific Method.

Knowing the Heavens

Gravitation and the Waltz of the Planets

The Nature of Light

Optics and Telescopes

Our Star, the Sun

The Nature of Stars

The Birth of Stars

Stellar Evolution: On and After the Main Sequence

Stellar Evolution: The Death of Stars

Neutron Stars and Black Holes

Our Galaxy

Galaxies

Quasars and Active Galaxies

Cosmology; The Origin & Evolution of the Universe

Exploring the Early Universe

For each topic/chapter, coarse goals will be made available on CW.

Other Important Dates

Tuesday,	Jan.	19 th	Spring term begins
Friday,	Feb.	5 th	End add/drop
Tuesday,	Feb.	23 rd	Self-care day
Friday,	Mar.	19 th	Last day to file exam conflicts
Wednesday,	Mar.	24 th	Self-care day
Friday,	Apr.	23 rd	Last day of classes

Honors section (A0413)

4 Credit hours.

As for A0113, but meet for 1 extra hour. Final exam will follow the A0113 exam schedule (similar exam).

Scheduled to meet 12:00 to 10:0 pm, Thursday

Pre-requisites: Math 0230 or 0235; Phys 0110 or 0174 or 0475.

More advanced discussions on some topics + additional homework.

Primary Course Goals

Provide an introduction to Astronomy/Astrophysics, necessary for the more advanced astrophysics courses.

- (1) The night sky.
- (2) The nature of stars and their evolution.
- (3) The nature of galaxies.
- (4) The Universe.

Problem solving skills

- (1) Use of units.
- (2) Problem layout.
- (3) Is answer reasonable?

Useful life skills

- (1) To provide you with the tools and confidence to use estimation.
- (2) Nature of science.
- (3) Science and politics.