

PIKEVILLE COLLEGE  
COURSE REQUIREMENT SHEET

Course Prefix & Number: PHY 106

Course Title: Introduction to Astronomy and Astrophysics, Laboratory

Course Credit Hours: 1 Credit

Official Course Description: Laboratory to accompany the Introduction to Astronomy and Astrophysics lecture.

Course Co-requisites: Physics 105

- Even though the laboratory is a separate course from the Physics 105 lecture, the two courses are directly connected. I do expect that you recall lecture material to answer some of the laboratory questions. Bringing your Physics 105 lecture notes to lab each week certainly would not hurt!

Professor's Name: Dr. Robert Arts

Professor's Phone Number: 218-5476

- Leave a message if you call; don't assume just because you tried to call that I know that you tried to call.

Professor's E-mail: rarts@pc.edu

- I do not generally check email past 9:00 p.m. So, please do not assume if you send a late message that you'll get a reply that evening. Please plan ahead if you need to ask a question and expect a timely reply
- Also, please at least check for a reply if you send me an email. Far too often I get the question "Did you get my email" and my response is "Yes, I sent you a reply" to which I get the response "Oh, I did not check." So, please don't send me a message unless you actually care about the response!

Professor's Office Location: Room 307  
Armington Science Building

Professor's Office Hours: Monday and Friday = 9:00 a.m. - 9:50 a.m.  
Monday, Wednesday and Friday = 11:00 a.m. - 11:50 a.m.

- Please feel free to contact me for alternate meeting times if these times are not convenient for you and you wish to see me.

Required Text & Supplies:

- Arts, R. (2008). Introduction to astronomy and astrophysics: Laboratory activities manual. Pikeville, KY: Pikeville College Press.

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Course Outcomes:

*Critical Thinking*

Most students take this course, in conjunction with the Physics 105 lecture, to fulfill a General Education laboratory-science core requirement, so the level of instruction is not as rigorous as a course for students who plan to major in science. However, you will be expected to comprehend fundamental concepts and apply physical reasoning to a variety of situations. Many students find astronomy lab difficult because it goes beyond memorization by requiring higher level thinking skills (levels 4 through 6 below). Learning astronomy is also like learning a foreign language since new words and symbols must be understood and applied correctly within the context of various astronomical activities and experiments.

Bloom's Taxonomy of the Cognitive Domain:

1. Knowledge - memorization of facts, words, and symbols
2. Comprehension - understanding the meaning of knowledge
3. Application - applying concepts to various situations
4. Analysis - breaking apart complex ideas
5. Synthesis - putting individual ideas together to form a complete explanation
6. Evaluation - judging the merits of individual ideas and making decisions

Not only are these skills needed for astronomy, but employers consistently rank critical thinking and problem-solving ability near the top of their list of desired traits in valued employees.

Upon completion of the course the student will have learned to:

- Construct a world view based on scientific principles and methods
- Understand some of the methods of astronomy
- Understand about stars, galaxies, and our visible universe
- Familiarize themselves with the fundamental physical concepts associated with astronomy
- Apply the methods and concepts of astronomy to exercises that illustrate some of the most important topics in introductory astronomy
- Analyze experimental data to determine patterns, relationships, perspectives, and credibility; using graphs and figures to assist in quantitative analysis; and consider the possible effects of measurement errors on calculations
- Evaluate experimental findings based on scientific investigations that include detailed procedures, graphs, tables, and conclusions

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Course Contribution to the General Education Outcomes:

1) The Pikeville College graduate will demonstrate effective oral and written communication skills.	Successful completion of PHY 106 will contribute to a student's being able to demonstrate this outcome by adequately writing answers to essay questions on each of the required laboratory assignments.
2) The Pikeville College graduate will demonstrate effective quantitative skills.	Successful completion of PHY 106 will contribute to a student's being able to demonstrate this outcome by applying specific astronomical equations in order to answer questions within each of the required laboratory assignments.
3) The Pikeville College graduate will demonstrate independent and critical thinking.	Successful completion of PHY 106 will contribute to a student's being able to demonstrate this outcome by performing data analysis, concept application, and information synthesis in their analysis of astronomy concepts.
4) The Pikeville College graduate will demonstrate cultural awareness.	N/A
5) The Pikeville College graduate will demonstrate historical awareness.	Successful completion of PHY 106 will contribute to a student's being able to demonstrate this outcome by drawing together elements from the history of astronomy in order to build a basis for current understandings.
6) The Pikeville College graduate will demonstrate basic scientific knowledge.	Successful completion of PHY 106 will contribute to a student's being able to demonstrate this outcome by applying the student's knowledge of science (chemistry, physics, computer science, earth science, and biology) to synthesize the most important concepts in introductory astronomy as they are applied to basic exercises that illustrate some of these concepts.
7) The Pikeville College graduate will demonstrate awareness of social science concepts.	N/A
8) The Pikeville College graduate will demonstrate ethical awareness.	N/A
9) The Pikeville College graduate will demonstrate the ability to integrate knowledge across disciplines.	Successful completion of PHY 106 will contribute to a student's being able to demonstrate this outcome by drawing together elements from history as well as from chemistry, physics, computer science, earth science, and biology.
10) The Pikeville College graduate will demonstrate effective use of technology.	Successful completion of PHY 106 will contribute to a student's being able to demonstrate this outcome by utilizing online exercises and supplementary web links in the completion of required laboratory assignments.

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Course Outline:

<u>Wednesday:</u>	<u>Description</u>
8/20	The Syllabus & Introduction
8/27	The Syllabus & Introduction
9/3	Laboratory #0 - Astronomy and the Internet

**\*\*Note:** Laboratory #0 is NOT eligible to be replaced with a makeup lab and cannot be made up. It is both completed and submitted when scheduled or no credit is given!

Laboratory #0 is a take-home assignment and is to be completed and returned by **12 noon, Friday, September 5**. Late work will be given a reduced credit, prior to grading, of 10 points for each day it is late; which includes submissions received after 12 noon.

9/10	Laboratory #1 - Celestial Coordinates and Constellations
9/17	Laboratory #2 - Phases of the Moon and the Earth
9/24	Laboratory #3 - Spectroscopy
10/1	Laboratory #4 - Energy Flow from the Sun
10/8	Laboratory #5 - The Solar System
10/15	No lab this week
10/22	Laboratory #6 - Telescopes and the Earth's Atmosphere
10/29	Laboratory #7 - Angles and Parallax
11/5	Laboratory #8 - The H-R Diagram
11/12	Laboratory #9 - Spiral Arms near the Sun
11/19	Laboratory #10 - The Age of the Universe
11/26	No Lab - Thanksgiving Break
12/3	Laboratory #11 - The Drake Equation
12/10	No Lab - Finals Week

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Course Structure:

This is not an observational astronomy laboratory. We will be meeting each week to complete laboratory activities and/or experiments that directly relate to each of the topics covers in the Physics 105 lecture course.

Laboratory Details:

- Each of the twelve required laboratories will generally take the entire laboratory period to complete. You will need to read over each lab to know what you're getting yourself in to prior to coming to lab each week. In addition, there is a corresponding pre-laboratory assignment for each lab that must be completed and submitted when you arrive to lab each week.
  - If you do not submit your pre-lab assignment when you arrive to lab you will not be permitted to complete that for that week and will accept the consequences thereof.
- Also, be aware that each laboratory is selected to complement a corresponding section of materials within the Physics 105 (Introduction to Astronomy & Astrophysics) lecture. Generally, the lecture materials will be covered prior to the onset of the corresponding laboratory; however, this might not always be the case! Regardless of the order, the laboratory material and the lecture material WILL complement each other. If the laboratory is completed first then this will allow you to become more comfortable with that material when covered in the lecture; correspondingly, if the lecture material is covered first then this will allow you to become more comfortable with that material prior to the onset of the corresponding laboratory assignment.
- Laboratory assignments are worth up to 100 points each. There are twelve laboratories assigned for the semester which you must complete and turn in. Aside from Laboratory #0, all laboratories will be completed during class time. Clear and complete explanations must be given for all questions when ask for.

Tutoring Center:

- Staffed by members of the faculty, staff, and student body, the tutoring center provides a variety of services to Pikeville College students through peer tutoring, computer tutorials in math and English, and a videotaped lecture series in math.
- The Tutoring Center is located in Allara Library, Room 001; it is open Monday through Friday from 9:00 AM to 4:00 PM. All Tutoring Center services are free. You can contact the Center by phoning (606) 218-5602.

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Course Requirements & Evaluation:

The final course grade will be based solely on the twelve laboratory assignments.

Laboratory write-ups and reports:	<u>1200 points (100 points each)</u>
TOTAL:	1200 points

Each 100 point lab is broken down accordingly:

Pre-lab assignment	= 10 points
Collecting all data and/or filling in all tables/graphs	= 50 points
Answering all questions (within lab and post-lab)	= 20 points
Completing the "Final Thoughts" section	= 20 points

- The "Final Thoughts" section of the lab is a discussion of what you learned from the lab. You'll answer questions like "what did you do" and "why." Answering these questions with the "because the professor said so" is not sufficient! You are to use several complete sentences (5-10) in making comparisons of your graphs/trials and information from the figures & text. You basically need to write small and use your own words to complete a brief yet full summary of your laboratory experience.

\*\* Grade Determination Scale: The grade scale for the class is based on the point scale listed below which follows a 10% grade range:

<u>Grade Range (Points)</u>	<u>Grade Range (Percentage)</u>	<u>Letter Grade</u>
1200 - 1080	100.0% - 90.0%	A
1079 - 960	89.9% - 80.0%	B
959 - 840	79.9% - 70.0%	C
839 - 720	69.9% - 60.0%	D
719 - 0	59.9% - 0.0%	F

Attendance Policy: All the material is important to your understanding of the concepts presented. In addition, the pace of the class is quite rapid. Therefore, you are strongly encouraged to attend all classes. Failure to attend class will only serve to hurt your chances in the course. If you cannot attend a scheduled class meeting, please contact myself or the division secretary (218-5460) prior to your absence. Please see the information relating to missed labs and makeup work for further details.

- You must show up for your registered section of the lab unless prior notification and approval are given. I will not let you participate if you do not do this! Also, it is important that you be on time because I will not repeat the directions once lab has started.

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Missed Work Policy:

- As all the material is important to your understanding of the course, absence from a laboratory requires you to make up the missed assignment. I will only give permission for a make-up provided a valid excuse is presented within **24 hours** of the missed lab. In addition, if you are aware of an upcoming lab meeting that will be missed due to prior obligations, please contact me ahead of time to make arrangements to complete the assignment for that day. I acknowledge that many of you have additional responsibilities outside of this class (work, family obligations, school functions, etc.). However, this is no excuse for missing class and/or missing class work. Do not assume that I will ask you to make up the missed work; because I will not. It is your responsibility to contact me and make these arrangements! I reserve the right to substitute a related make-up laboratory for the missed work.
  - Generally, these make-up laboratories are 3-page research papers related to the material contained in the missed laboratory.
- In addition, you will be permitted to make up **ONLY** two missed laboratory assignments. Basically, you can't just keep missing class and expect to make up the missed work; you need to be **HERE** and participating during class-time! Certainly circumstances arise that may prevent you from attending but it is your job to limit these occurrences in order to be an active participant in this laboratory course!
- **DO NOT** assume that if you miss a certain lab (ex. Laboratory #1), and have not contacted me regarding this absence and the associated missed laboratory, that you can simply complete this laboratory assignment at home and bring it with you the next class day. You **MUST** get permission to complete **ANY** and **ALL** missed laboratories prior to beginning the assignment.
  - For example: You did not feel like coming to class on Wednesday because you wanted to sleep in (or any other reason you can think of). You had read the laboratory assignment for that day and noticed that it did not require materials that you did not have. Thus, you decided to go ahead and complete the laboratory on your own, in your spare time, and bring it with you to turn in at the beginning of class-time on Friday. I **WILL NOT** accept such work as you were not given permission to complete the work on your own; regardless of whether your excuse was actually valid or not. At this point you have done the work for nothing and will be required to complete a make-up laboratory assignment, of my choosing, prior to the end of the semester. Thus, take responsibility for yourself and your actions in the event that you have to miss a scheduled class and/or assignment!

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- Also, you are not permitted to complete a laboratory assignment ahead of time. Several of the laboratories require no more than a pencil a paper to complete. Certainly you are welcome and encouraged to read the lab ahead of time to know what we'll be doing that day but the actual laboratory assignment is to be completed during class time; while I am present to assist with any questions. If you are caught with a laboratory you completed prior to arriving to lab your "illegal" work will be confiscated and you will be given a blank lab to start over with. If this action occurs more than once during the semester each additional occurrence will receive a zero for that assignment!

Withdrawal Policy:

- From the first day of class until the *Last day to receive a grade of "W"* (see the Academic Calendar for this specific date), you may officially withdraw from a class and receive a grade of W. However, in the unlikely event that you wish to withdraw from the course I'd appreciate you contacting me first. I will do what I can in order to help keep you enrolled in the course; if there is anything that can be done.
- After this cutoff date through the end of class work (again, see the Academic Calendar for the specific date), I will allow you to withdraw with a grade of "WP" only under extraordinary circumstance such as illness, accident, etc. If you have stopped showing up, have not contacted me, and wish to withdrawal after the "W" date, then I will not be as receptive to helping you and you may simply have to live with the consequences of your actions; i.e. receiving an "F" or a "WF." You are an adult and I will treat you as such. From the same standpoint, if you treat me with the respect I deserve than I will be willing to do the same for you. Please keep an open line of communication at all times regarding your involvement in this course.

Academic Conduct: "Instances of plagiarism or academic dishonesty may result in the student receiving a failing grade for the activity, being requested to withdraw from the course (W) (WP) (WF), or receiving a failing grade for the course according to the perceived intent and extent of the instance(s) of academic dishonesty."

- This means don't copy your friend's laboratories; this includes, as mentioned previously, using your OWN words when completing the "Final Thoughts" section! Do your own work!
- If you copy any answers word for word from a friend then you will both receive a zero on that section of the laboratory. If this happens again then you will both receive a zero for the entire laboratory. If, for some reason, you did not learn your lesson and did this a third time then you will both receive a failing grade for the entire course!!

### ADA Information:

- Pikeville College is committed to providing students with disabilities the same educational programs and services offered other students, in accordance with Section 504 of the Rehabilitation Act of 1973 and the Americans with Disabilities Act (ADA) of 1990. Under Section 504, a student has a disability if that individual has a physical or mental impairment that substantially limits major life activities such as walking, seeing, hearing, speaking, working, or learning. Section 504 further requires that institutions make appropriate and reasonable adjustments for students with disabilities to ensure accessibility to academic and nonacademic activities. Under ADA, all institutions of higher education must comply with government policies, procedures, and employment practices that impact the treatment of students. If you have a disability that warrants special accommodation within this course, please contact the Disabilities Resources Office located in the Student Services Counselor's Office.

### Cell Phone Policy:

You are permitted to have your cell phone with you in lab. However, the cell phone MUST be either set to vibrate or turned off; I do not want to hear it ring nor do you really need to have it out at all. Further, unless you are expecting an emergency call, and have cleared it with me ahead of time, you are NOT to answer your phone during lab time. This also includes sending text messages during lab time. You'll get one warning if any of these inappropriate actions occur; after which you will be asked not to return to lab.

### iPod Policy:

You are permitted to have and listen to your iPod during lab but only AFTER I have stopped my introductory lecture. Please keep the volume down so as not to disturb others; this includes singing to yourself. Violations will result in the potential loss of this privilege.

### Final Thoughts:

There are many copies of my old astronomy laboratory assignments out in circulation; you may know friends that have had the course before. While some minor changes have occurred between semesters (small revisions), the basics of each laboratory assignment remains the same from year to year. I expect that when you're in lab that you are doing the assignment yourself and are actually trying to understand what you're doing and how it relates to the course in general. Therefore, if I see you with a graded laboratory assignment from a previous semester, whether you are actually using it or not, you will automatically receive a ZERO for that day's assignment! If this happens more than once, you will receive a failing grade for the entire laboratory course. Basically, don't bring another student's graded laboratory assignment into the lab or attempt to use another student's graded laboratory assignment and run the risk of getting caught with it; you will be penalized, no questions asked!

### Disclaimer:

The schedules and policies associated with this course may be subject to revision or change as a consequence of changing circumstances or events. I will provide you with reasonable notification prior to any major changes in course policies or procedures.

## Course Requirement Sheet Acknowledgment Form

I, \_\_\_\_\_, have received a copy of the Course  
(Printed Name)

Requirement Sheet for Physics 106 - Introduction to Astronomy and Astrophysics,  
Laboratory and understand all the policies and procedures outline therein.

\_\_\_\_\_  
(Signature) (Date)

Please fill out the information requested below:

Major: \_\_\_\_\_

Contact Phone Number: \_\_\_\_\_

E-mail Address (the one you actually use): \_\_\_\_\_

Medical information that I should be aware of: \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

Comments: \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

- This Course Requirement Sheet Acknowledgment Form is to be filled out and returned to me by the end of the first class period!