

PIKEVILLE COLLEGE
FALL 2009
COURSE REQUIREMENT SHEET

Course Prefix & Number: PHY 102

Course Title: Introduction to Physics

Course Credit Hours: 4 Credits

Official Course Description: This is a laboratory-science course designed for non-science majors utilizing guided inquiry teaching and learning methodologies. The course is designed to introduce the student to concepts in classical mechanics, thermodynamics, sound, electricity, magnetism, light and optics. Students will be engaged in small, hands-on, group activities during each class meeting. The course meets 5 hours per week.

Course prerequisites: MTH 099 or placement beyond.

Professor's Name: Dr. Robert Arts

Professor's Office 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 Home Phone Number: 437-0103

- As with the office phone, please leave a message if you call. Also, please do not call after 9:00 p.m. or before 6:00 a.m.

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 214B
Armington Science Building

Professor's Office Hours: Monday, Wednesday and Friday = 11:00 a.m. -- 11:50 a.m.
& 1:00 p.m. – 1:50 p.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:

- *Physics by Inquiry* Volumes 1 & 2, Lillian McDermott
- Physics 102 Course Packet

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Course Outcomes:

Critical Thinking

Most students take this course to fulfill the related studies requirements for the biology and chemistry degree programs, so the level of instruction is not as rigorous as a course for students who plan to major in physics. However, you will be expected to comprehend fundamental concepts and apply physical reasoning to a variety of situations. Many students find physics difficult because it goes beyond memorization by requiring higher level thinking skills (levels 4 through 6 below). Learning physics is also like learning a foreign language since new words and symbols must be understood and applied correctly within the context of various physical situations.

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 physics, 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:

- Analyze experimental data to determine patterns, relationships, perspectives, and credibility. (Analysis)
- Present arguments based on scientific investigations that include detailed procedures, graphs, tables, and conclusions; participate in follow-up discussions by responding to alternative positions. (Analysis)
- Analyze the motion of an object in one dimension. (Analysis)
- Apply Newton's three laws to predict the outcome of static and dynamic situations. (Application)
- Identify the characteristics of waves associated with vibrations and oscillatory motion. (Knowledge)
- Identify the characteristics of light waves as they bounce off the boundary between two media. (Comprehension)
- Evaluate the formation of images from mirrors using graphical methods and the mirror equation. (Evaluation)
- Identify the characteristics of light waves as they travel from one media into another. (Knowledge)
- Evaluate the formation of images created with lenses, using graphical methods and the thin-lens equation. (Evaluate)
- Evaluate the relationship between electric current, voltage and resistance. (Evaluation)
- Compare and contrast the characteristics of current, voltage and resistance in series and parallel circuits. (Analysis)
- Compare and contrast the characteristics of different types of magnets. (Analysis)

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Course Contribution to the General Education Outcomes:

General Education Outcomes	Course Contribution
1) The Pikeville College graduate will demonstrate effective oral and written communication skills.	Successful completion of PHY 102 will contribute to a student's being able to demonstrate this outcome by adequately writing answers to open response essay-type questions on each of the required examinations. Further, students will present written and oral information regarding selected experiments and exercises during each of the required checks.
2) The Pikeville College graduate will demonstrate effective quantitative skills.	Successful completion of PHY 102 will contribute to a student's being able to demonstrate this outcome by applying specific mathematical equations in order to answer questions within selected activities.
3) The Pikeville College graduate will demonstrate independent and critical thinking.	Successful completion of PHY 102 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 physics concepts.
4) The Pikeville College graduate will demonstrate cultural awareness.	N/A
5) The Pikeville College graduate will demonstrate historical awareness.	N/A
6) The Pikeville College graduate will demonstrate basic scientific knowledge.	Successful completion of PHY 102 will contribute to a student's being able to demonstrate this outcome by applying the student's knowledge of physics to real-world physical situations.
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 102 will contribute to a student's being able to demonstrate this outcome by drawing together elements from physics, engineering and mathematics.
10) The Pikeville College graduate will demonstrate effective use of technology.	N/A

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Course Outline:

<u>DAY</u>	<u>DATE</u>	<u>MATERIAL</u>
Wednesday	8/19/2009	Introduction & Magnets
Friday	8/21/2009	Activity = Magnets
Monday	8/24/2009	Activity = Magnets
Wednesday	8/26/2009	Activity = Magnets
Friday	8/28/2009	Activity = Magnets
Monday	8/31/2009	Activity = Magnets
Wednesday	9/2/2009	Activity = Finish Magnets
Friday	9/4/2009	Exam #1 = Magnets Magnets Section Summary Due Notebook Collected
Monday	9/7/2009	No class – Labor Day
Wednesday	9/9/2009	Activity = Electricity
Friday	9/11/2009	Activity = Electricity
Monday	9/14/2009	Activity = Electricity
Wednesday	9/16/2009	Activity = Electricity
Friday	9/18/2009	No Class – Dr. Arts is out of town
Monday	9/21/2009	Activity = Electricity
Wednesday	9/23/2009	Activity = Finish Electricity
Friday	9/25/2009	Exam #2 = Electricity Electricity Section Summary Due Notebook Collected
Monday	9/28/2009	Activity = Light & Optics
Wednesday	9/30/2009	Activity = Light & Optics
Friday	10/2/2009	Activity = Light & Optics
Monday	10/5/2009	Activity = Light & Optics
Wednesday	10/7/2009	Activity = Light & Optics
Friday	10/9/2009	No Class – Fall Holiday
Monday	10/12/2009	Activity = Light & Optics
Wednesday	10/14/2009	Activity = Light & Optics
Friday	10/16/2009	No Class – Dr. Arts is out of town

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Course Outline Continued:

Monday	10/19/2009	Activity = Light & Optics
Wednesday	10/21/2009	Activity = Light & Optics
Friday	10/23/2009	Exam #3 = Light & Optics Light & Optics Section Summary Due Notebook Collected
Monday	10/26/2009	Activity = Force and Motion
Wednesday	10/28/2009	Activity = Force and Motion
Friday	10/30/2009	Activity = Force and Motion
Monday	11/2/2009	Activity = Force and Motion
Wednesday	11/4/2009	Activity = Force and Motion
Friday	11/6/2009	Activity = Force and Motion
Monday	11/9/2009	Activity = Force and Motion
Wednesday	11/11/2009	Activity = Force and Motion
Friday	11/13/2009	Activity = Force and Motion
Monday	11/16/2009	Activity = Force and Motion
Wednesday	11/18/2009	Activity = Force and Motion
Friday	11/20/2009	Activity = Force and Motion
Monday	11/23/2009	Activity = Force and Motion
Wednesday	11/25/2009	No Class – Thanksgiving Recess
Friday	11/27/2009	No Class – Thanksgiving Recess
Monday	11/30/2009	Activity = Force and Motion
Wednesday	12/2/2009	Activity = Force and Motion Last day to submit extra credit work
Friday	12/4/2009	Activity = Sound and Vibrations Force and Motion Section Summary Due
Monday	12/7/2009	Final = (Exam #4 on Force & Motion – with a bit of Sound & Vibrations) Sound & Vibrations Section Summary Due Notebook Collected

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Course Structure:

This is a new type physics course especially designed for elementary and middle school teachers of science. The approach to the course will be different. This is because of conversations with middle and elementary school teachers. They told us "teach us like we will be required to teach." The success of this course will depend not only on me but on your cooperation. The approach to this course is inquiry-based, which requires that you are an integral part of the learning process. It is necessary that you buy into this methodology. This means that you need to be in class, on-time and ready to work each and every class day. If not, you will let down not only yourself but also those in your group. Do not fear if you are not an elementary or middle school teacher of science. The inquiry-based nature of this course makes it an excellent learning environment for any major.

The aim of this course is not to train physicists. This means that jargon will be kept to a minimum. Mathematics will be minimized. For those of you in education, topics that are listed in the national standards for middle and elementary school science teachers will be presented in a way that you can understand and this understanding will allow you to teach this subject from a position of confidence. In fact, the notebooks that you will be keeping should be very beneficial to you in your own classrooms. Many of the items developed (summaries, graphs, notebooks) can be used as ready made lesson plans or for portfolio entries in content or technology.

Selected topics in physics will be covered in the following order:

- I. Magnets
- II. Electricity
- III. Light and Optics
- IV. Force and Motion
- V. Sound and Vibrations (briefly)

These topics will be covered primarily in McDermott. A schedule for each section will be presented to you at the beginning of each of these segments. A list of relevant or essential questions for each section will be given to you as a means of focusing your efforts in each topic.

Activities: The class will be taught in an inquiry-based mode. Lecture will not be the primary means of teaching science in this class, but you will work towards a self-taught approach. In a typical class period, you will be divided into groups of three-four which will work as a team. The assigned text from McDermott will be used as a guide to lead you through selected exercises that illustrate certain areas of physics. Your group will be allowed to work at your own speed within certain limits. As you work on a particular exercise you will be required to keep a notebook (explained in class). These notebooks can be used on exams or in answering any question that I may pose; your notebook will be collected and graded for completeness at the conclusion of each exam. At certain intervals, your group will be asked for a "check" as shown in the textbook ("✓"); more information on the checks is outlined below. These checks will be rotated through the members of a group and each of you will have approximately the same number of checks at the end of the semester. You are encouraged to talk and interact with each other within your group in order to learn from each other.

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Checks (“✓”): Key experiments and exercises direct you to have your responses checked. After discussing the relevant issues within your group you will prepare a **written response** (i.e. a written summary of the completed tasks or conclusions drawn from certain activities). One of you from the group will read your summary to me. After a brief discussion of the summary I will either initial the response as complete or will discuss any problems with your group and ask that certain aspects be investigated further prior to moving forward. Credit for the checks is given to each member of the group present during the class day when the check is discussed with the instructor; regardless of which group member actually read their check.

Homework: Homework will be assigned in class on a regular basis. I recommend promptly working the problems on your own at home and then discussing your responses with classmates before turning in the assignment. Homework will be collected at the beginning of the next class period. You are not to be working on homework during class time; this time is reserved for the activities!! The most important part of homework is the explanation of why you believe your answer is correct. You should refer to your in-class work and your ideas should be presented in a clear and complete way. Sometimes I will not fully grade your solutions, but rather simply mark that you made a serious effort on the homework and turned it in. Late homework will assigned a reduced grade of 10% off per day late. This includes submitting work after the beginning of class deadline. All homework will be returned to you before the test on the corresponding subject. Test questions will often be similar to homework, so doing homework helps you learn physics and helps you practice the test-like problems.

Remember this: We will do our work but we will have fun while learning. If our classroom is not informal to the extent that you are not comfortable asking questions other students or me then something is wrong. These active hands-on sessions will last for two hours on Mondays & Wednesdays and one hour on Fridays.

Section Summaries: Periodically, you will be asked to give a short summary of what you have learned in a particular group of exercises. This is done to help you see the big picture. One might call these lab reports but I prefer laboratory summaries. These summaries should be a written in a paragraph form (not a series of bulleted items) and outline each of the high-points learned throughout the activities related to the topics covered.

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 the Armington Science Center, Room 301; it is open Monday through Friday from 9:00 a.m. - 5:00 p.m. and evening services by appointment. All Tutoring Center services are free. You can arrange tutoring services by contacting the ACE Program at 218-5701 or 218-5719.

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Use of Technology:

N/A

Course Requirements & Evaluation:

Grades will be calculated according to 2100 points being the total possible number of points available in the course:

<u>Assessment Item</u>	<u>Points</u>
Exam 1: Magnets	100
Exam 2: Electricity	100
Exam 3: Light & Optics	100
Exam 4: Force & Motion + Sound	100
Section Summaries:	
Magnets	100
Electricity	100
Light & Optics	100
Force & Motion + Sound	100
Notebook Sections:	
Magnets	100
Electricity	100
Light & Optics	100
Force & Motion + Sound	100
Attendance	300
Checks	300
Homework	300
Total Possible	2100

Grade Determination Scale: The grade scale for the class is fixed. It is based on the 10 percent scale illustrated below:

<u>Grade Range</u>	<u>Corresponding Point Range</u>	<u>Letter Grade</u>
100.0% - 90.0%	2100 - 1890	A
89.9% - 80.0%	1889 - 1680	B
79.9% - 70.0%	1679 - 1470	C
69.9% - 60.0%	1469 - 1260	D
59.9% - 0.0%	1259 - 0	F

- Your final average in the class will include the points from any extra credit that you complete. Extra credit can only serve to help move you into a higher grade bracket.
- I reserve the right to move you into a higher grade bracket if you have a border-line grade and if it is deemed appropriate.

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Attendance Policy: You will be working as teams. If you are absent you are not only missing material for yourself, but also causing problems within your learning group. For this reason, **whenever you are absent and want to be excused, you must write a letter to me explaining why you were absent.** A decision will be made based on that letter. Tardiness will also affect the group and will be taken into account as class participation. Attendance has become such an issue that it must be addressed in a more stringent manner as per its value in the overall course grade. If you cannot attend a scheduled class meeting, please contact me or the division secretary (218-5460) prior to your absence.

More about the Attendance Policy: All the material is important to your understanding of the concepts presented. Therefore, you are strongly encouraged to attend all classes. Failure to attend class will only serve to hurt your chances in this course. This is of special importance in this course since there is no lecture and you are essentially missing the hands-on learning activities covered that day. If you cannot attend a scheduled class meeting, please contact me prior to your absence; if at all possible.

- As all the material is important to your understanding of the course, absence from the class requires you to make up or submit any missed assignments. I will only give permission for any make-up provided a valid excuse is presented within **24 hours** of the missed assignment. In addition, if you are aware of an upcoming class meeting that will be missed due to prior obligations, please contact me ahead of time to make arrangements to complete or turn in any assignments that are due 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 or submit any missed work; because I will not. It is your responsibility to contact me and make these arrangements! Because of the nature of the work in this course, missing class means you've missed the hands-on activities covered that day. As a result, you will be required to check out the necessary equipment and complete the activity on your own; in order to make your notebook complete. You will write out your own check and discuss it with me in order to get credit for the missed check. Again, you have to ask for permission to complete this and be proactive about getting it done and discussing the missed check with me; I will not hunt you down to complete the activity and the check! Finally, if you are aware that you will not be in class on the day when an assignment is due, you are still responsible for submitting that assignment on time!
- This means that you have three options:
 - (1) Submit the work early
 - (2) Send your work with a friend to drop off for you
 - (3) Understand that there will be a 10% deduction, per day late, if you submit the assignment when you return (after the due date).

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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), students at their discretion, 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 a student 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 homework, their answers, their checks, or their summaries! Do your own work!

ADA Information:

- Pikeville College works to ensure that students with disabilities receive appropriate accommodations in accordance with the requirements of the American Disabilities Act of 1990 (ADA) and Section 504 of the Rehabilitation Act of 1973. Students with disabilities requiring accommodations should contact the Disabilities Resource Office located in the Student Services Counselor's Office. Accommodations are made on an individual basis according to documented need. Additional information can be found in the College Catalog and the Student Handbook.

Contact Information:

Kathy Petot
Disabilities Resource Office/Student Services Counselor's Office
kpetot@pc.edu
Administration Building (Lower Level)
(606) 218-5232

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Extra Credit:

- Research Paper: The body of the text must be at least 3-5 typed pages long (12 point Times New Roman font & 1" margins, double-spaced); this does not include the required cover sheet and reference page. You must include a cover page (the paper's title, your name, and the date). You must use at least three unique references (included on a separate reference page). The paper can be biographical, historical, or subject oriented. Each paper is worth up to 15 points.

- The topics/sources for the papers are to be approved by me prior to their onset. Points are awarded based on the, completeness of work, accuracy of work, etc.

- Article Summary: Assignments are a review of a **physics** article from a 2009 scientific magazine or journal. The summary includes reading the article, summarizing it, and evaluating it in a logical, clear, and scientific manner. The body of the summary is to be no less than two typed (12 point Times New Roman font, 1" margins, and double-spaced); this does not include a required cover sheet and your views about the article. Thus, the actual summary of the article should be at least two pages long plus an additional paragraph of your views on the content of the article. The extra credit article summaries are worth up to 10 points each.

- The topics/sources for the article summaries are to be approved by me prior to their onset. Points are awarded based on the, completeness of work, accuracy of work, etc.

- Out-of-Class Assignment: Occasionally, topics have practical applications to real world physics observations. For these topics, I may have out-of-class assignments available that will help to physically demonstrate and/or observe a concept. A set of observations and/or experiments will accompany the assignment and will require a detailed write-up for credit to be awarded. Specific details are included with each assignment. Each assignment is worth up to 15 points.

- Exam Rework: Upon receipt of an exam (excluding the final exam), the student may rework the exam in its entirety **on a separate sheet of paper**. The rework should include the complete solution or explanation of (if no mathematical solution is necessary) all the missed problems. Citing page numbers or definitions are typical ways to justify an explanation. Rewriting the questions is not required. Exam reworks are worth up to 5 points each. Points are awarded based on the completeness and accuracy of the rework. Reworks are to be turned in within one week after the initial graded exam has been returned.

The points generated from the extra credit will be credited to your overall course grade. The most extra credit possible, in any combination of the above, is 50 points. Failure to do the extra credit assignments will not lower your grade in any way. They are intended to help you not hurt you.

FURTHER, no extra credit should be done at the expense of your required course work for this or any other course. Extra credit is optional and should be treated as such. Students caught abusing this policy (skipping classes, etc.) for the sake of completing extra credit assignments will lose their ability to acquire extra credit for this course.

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Cell Phone Policy:

You are permitted to have your cell phone with you in class. 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 class time. This also includes sending text messages during class time. You'll get one warning if any of these inappropriate actions occur; after which you will be asked not to return to class.

iPod Policy:

As you will be working in small groups during each class period, in which you must discuss information about activities with your fellow group mates, you are not permitted to use your iPod during class time. You'll get one warning if this inappropriate action occurs; after which you will be asked not to return to class.

Disclaimer:

The schedules and policies associated with this course may be subject to revision or change as a consequence of changing circumstances or events. Reasonable notification will be provided to students prior to any major changes in course policies or procedure.

Course Requirement Sheet Acknowledgment Form Fall 2009

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

Requirement Sheet for Physics 102 – Introduction to Physics and understand all the policies and procedures outline therein.

(Signature) (Date)

Please fill out the information requested below. Please Print Clearly!!

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!