PH111: Introductory Physics Seminar

1 Course Description

PH 111: Introductory Physics Seminar. One hour.
Prerequisite: none
Meeting times: M 4-5:30
Instructors: P. LeClair & R. White.

Lecture series on current topics in physics. Open to all undergraduates, aimed at students just starting their university education who want a broad introduction to exciting developments in modern physics at an introductory level. Faculty will present introductions to recent developments in physics, including student-suggested topics. The course will stress a conceptual understanding of everything from fundamental phenomena to recent technologies in terms of their basic underlying physical principles. Students present short research seminars on a topic of their choice once per semester.

2 Course Objectives

2.1 General Learning Outcomes for 100- and 200-level courses

1. Discriminating between reliable and less reliable information in decision-making. [analysis]
2. Knowing the scientific method and the process of critically evaluating scientific information. [knowledge, comprehension, evaluation]
3. Developing skills to work together effectively in team activities. [collaboration]

2.2 Anticipated Learning Outcomes for this Course

The objective is for students to learn about recent developments in physics and related areas at an accessible level, become aware of the current state of the field, and generate interest for and appreciation of the role of physics in modern society. Intrinsic to this overview will be a continual reinforcement of the problem solving techniques used in physics, and how these core techniques can be applied to a wide variety of problems. Students will be expected present (in a small group) one short seminar on a topic of their choosing based on their own literature research, and gain experience in research, communication, and effective teamwork.

1. Recognizing the relevant quantities to solve a physics problem. [knowledge, comprehension]
2. Estimating the order of magnitude of a result. [evaluation]
3. Identifying major topical areas and unsolved issues in physics. [knowledge]

2.3 Assessment Measures

Direct

1. One-minute summary papers (following faculty presentations)
2. Checklists / rubrics to evaluate post-lecture discussion

3. Apply major principles learned during the course to a short research presentation

Indirect

1. Peer evaluation using a scoring rubric (following student group presentations)
2. Polling of faculty and students - which activities were most engaging, and why
3. Online discussion board / blog

3 Course Format

Physics 111 is a seminar course, aimed at students just starting their university education who want a broad introduction to exciting developments in modern physics at an introductory level. As such, there are no formal prerequisites, and no formal background in physics or mathematics (beyond the traditional high school level) is necessary. The course will meet once per week for approximately 90 minutes. Topics will vary widely from week to week, with student selection of possible topics playing a primary role. There will be two types of class meetings: one will consist of a faculty seminar and discussion, and the other will consist of a student group presentation and discussion. Student talks will begin during the latter portion of the semester.

During class periods with faculty presentations, roughly half of the course period will be devoted to the seminar itself, and roughly one half will be devoted to discussion and generation of follow-up questions. These follow-up questions can serve as topics for student presentations the following week, or as a seed for further discussion in a subsequent class period or in an online forum devoted to the class. At the end of each class period, both students and faculty will assess both the presentation and discussion with a scoring rubric. In some cases, students will be asked to complete “one minute" summary papers briefly outlining - in their view - the most critical points of learning and discussion.

During class periods with student presentations, roughly one third of the course period will be devoted to student presentations on a current topic in physics or a related area. The remaining portion of the class period will be devoted to discussion and debate of the topic, and suggestions for further research (which may itself be the subject of another student presentation). In particular, the presentations are meant as a mechanism for students to raise questions not only for their peers, but for participating faculty members to answer (to the best of their abilities). Students may choose their own topics (subject to approval) or present a follow-up on a previous lecture topic. Students can present as a team (2-4 members) or individually, and will be expected to give a 20 minute presentation (including media of their choosing), to be followed by a group discussion of the topic. A list of potential topics is listed in Sect. 14, and potential sources of information are listed in Sect. 7, though students are by no means restricted to these lists. As with faculty lecture periods, at the end of each class period, both students and faculty will assess both the presentation and discussion with a scoring rubric. In some cases, students will be asked to complete “one minute" summary papers briefly outlining - in their view - the most critical points of learning and discussion.

4 Course Topics

After a course introduction and first faculty seminar during the initial class meeting, students will be invited rank-order their preferences for subsequent faculty seminars during the semester from a list provided. Students will also be strongly encouraged to suggest their own topics both at the beginning of the course

and throughout. Both during and following each seminar, students and faculty will be expected to engage in discussion about the current topic, occasionally with short follow-up questions to be researched and discussed during the subsequent period. A sample list of topics and lecturers is attached at the end of this document.

In some cases, for both student and faculty lectures, there will be a light background reading assignment required before the following class period. It is expected that the students will have read the appropriate texts before each class when necessary. This is essential for being able to follow the discussion topic. You have to think of the texts as being not just a support for the class, but as the starting point for further discussion. Because of time limitations, lectures are necessarily brief, and students should use class time to actively seek clarification of their questions and engage in discussion. This can happen through discussions with their peers or the instructor, and both modes of discussion will be encouraged.

5 Required and Recommended Items

There is no primary text for this course, materials will be (freely) disseminated electronically as needed, or will be made available in the university library system. You are expected to keep a separate notebook for this course to record your notes during presentations and your discussion points for subsequent class periods.

6 Course Web Site and Online Resources

A course web site in a “blog" format will be created specifically for this course to allow rapid dissemination of announcements, reading materials, discussion topics, and polling of potential topics for future seminars. The site will also provide students and faculty with the resources to continue discussion online after the class period. Students are encouraged to post comments on specific posts - anonymously if they choose - to provide instant feedback or discussion with faculty members and their peers.

The use of syndicated RSS “feeds” will allow students to be notified whenever new information is posted. If a student subscribes to the news “feed,” they are notified whenever new information becomes available. Updates can be imported by many mobile phones, email accounts, and Facebook.

7 Grading Policy and Major Assignments

This course will be graded “Pass/Fail." In addition to class attendance, discussion, and class participation, students will be expected to give a 20 minute presentation once during the semester, either singly or in groups of 2-4. The presentation topic is open (subject to prior instructor approval), and should be aimed at highlighting a recent scientific development and encouraging discussion of its meaning, utility, and relevance to the advancement of physics as well as everyday life.

Student are expected to use visual aids of some kind in their presentations, but are not restricted in their means. Presentations can purely disseminate the results of a literature survey, provide an introduction to a topic for further discussion, or present a “point-counterpoint" analysis of a current scientific topic or socio-scientific debate.

The overall learning goals of the presentation to recognize key scientific concepts, relate these key concepts to the world around you, discriminate between reliable and less reliable information given in your source, and critically evaluate the information using the scientific method.

More concretely, you must touch on the following:

- what you learned from your source
- are there ideas which are, in your opinion, more or less tenable based on the evidence provided?
- how it may or may not be relevant to your potential career path
- how it explains aspects of everyday phenomena around you

You will be assessed according to:

- whether the time and format requirements have been met
- whether you addressed the points above
- your overall description of the source material and ease of spoken communication
- the quality and appropriateness of the source material
- the ability of your presentation to generate discussion, and your ability to guide the discussion
- peer and instructor evaluation using a scoring rubric

Example sources could include, but are not limited to:

1. Popular science books: suggestions available on request
2. Magazine Articles: Scientific American; Popular Science; Discover; New Scientist
3. Newspaper Articles: New York Times science specials
4. Documentaries: Choose wisely ... sci-fi movies are not fair game.
5. Journals: Nature journals; Science; any well-respected peer-reviewed journal

Example topics could include, but are not limited to:

1. the science of global warming: point and counter-point
2. nuclear energy
3. nanotechnology
4. negative refraction and cloaking
5. bad movie physics
6. will the LHC destroy the earth?
7. medical imaging technologies
8. the physics of time travel

8 Attendance and Make-up Policies

No makeup of in-class activities *generally* be given. If you have a legitimate and acceptable reason for missing a class (with documentation), then the missed in-class work will not be counted against you.

If you have a **legitimate** *reason for missing your presentation*, then you must inform the instructor as soon as possible **before the presentation occurs**. If the reason is acceptable, a rescheduling of your presentation can be discussed with your group members (if applicable).

Acceptable reasons for missing classes must be documented, if possible in advance, and *may* include but are not limited to: prior athletic commitments, medical issues, off-campus academic commitments, prior commitments to on-campus academic events, band travel, standardized testing, graduate school interviews, and certain personal/family issues. Unacceptable reasons are fairly numerous. Among the least likely to be accepted are oversleeping, leaving early for academic breaks, and fan travel to 'away' athletic events.

9 Office Hours

To be announced.

10 Academic Misconduct

Students are expected to follow the Code of Student Conduct, as laid down by The University of Alabama. All acts of dishonesty in any work constitute academic misconduct. In particular each student is expected to do his/her own term paper. Suspected violators of this policy will be referred to the Arts and Sciences Dean's Office. On group presentations, however, students are obviously encouraged to work together.

The University of Alabama is committed to helping students to uphold the ethical standards of academic integrity in all areas of study. Students agree that their enrollment in this course allows the instructor the right to use electronic devices to help prevent plagiarism. All course materials are subject to submission to Turnitin.com and will be included as source documents in Turnitin.comÕs restricted access database for the purpose of detecting textual similarities. Turnitin.com will be used as a tool to help students avoid plagiarism in written documents.

11 Disability Accommodations

Students with disabilities are encouraged to register with the Office of Disability Services, 348-4285. Thereafter, you are invited to schedule appointments to see the instructor during office hours to discuss accommodations and other special needs.

12 Classroom Decorum

The Code of Student Conduct requires that students behave in a manner that is conducive to a teaching/learning environment. Students who engage in behavior that is disruptive or obstructive to the teaching/learning environment will be subject to disciplinary sanctions outlined by the Code of Student Conduct. Disruptive/obstructive behavior is not limited to but may include the following: physical abuse, verbal abuse, threats, stalking, intimidation harassment, hazing, possession of controlled substances, possession of alcoholic beverages, obtrusive cellular telephones or other communication devices, *etc.*.

13 Diversity

The Department of Physics and Astronomy is committed to providing an atmosphere of learning that is representative of a variety of perspectives. In this class, you will have the opportunity to express and experience cultural diversity as we focus on issues that affect society as a whole, and often generate considerable (sometimes heated) discussion. In addition, assignments and daily activities have been designed to encourage individuality and creative expression. You are encouraged to not only take advantage of these opportunities in your own work, but also, learn from the information and ideas shared by other students.

14 Possible seminar topics

At the beginning of the course, students will be asked to choose 7-8 topics from the list below (or suggest their own) to determine the series of lectures for that semester.

- Patrick LeClair
  - Physics on the Back of an Envelope: Classic Estimation Problems & Techniques
  - Quantum Physics in the Household
  - Orders of Magnitude: from the Largest to the Smallest Scales
- Jerry Busenitz
  - Particle Accelerators Beyond the Large Hadron Collider (LHC)
  - A Physicist's History of Renewable Energy
- William Keel
  - Gravitational Lensing
  - Galaxy Evolution
  - Which Came First - Stars or Black Holes?
- Ray White
  - Radical Scepticism
  - Large Numbers Hypothesis
  - Dimensionless Numbers & Similarity Solutions
  - The Big Bang
  - Black Holes
  - The Largest Explosions in the Universe
- William Butler
  - "Physics and Applications of Magnetism"
- Louis Clavelli
  - "The Standard Model"
  - "String Theory"
  - "Supersymmetry"
- J.W. Harrell
  - "Nanomagnetism"
  - "The future of magnetic recording"
- Andreas Piepke
  - Fundamental Building Blocks of Matter
- Stan Jones TBA
- Dawn Williams TBA
- Pieter Visscher TBA

Other (please specify):