

SPRINGFIELD COLLEGE IN ILLINOIS: Course Syllabus Template

Session E, 2005
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M 6 – 10 PM

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PHYSICAL SCIENCE I (PHS 103)

I. **Course Description**

Physical Science I (4 credits) gives the basic principles of physics and astronomy. Designed to give the non-science major and the education major an appreciation of the physical universe as well as some of the basic physical principles that govern the universe. A historical perspective of contemporary science is also included. Prerequisite: one year of high school algebra. (Three lecture hours). IAI P9 900L.

II. **Textbook and Materials**

Bill W. Tillery, *Physical Science* (6th edition)

III. **Mission Statement**

The mission of Springfield College in Illinois is to provide students the best liberal arts education in the Ursuline tradition of a nurturing faith-based environment. We prepare students for a life of learning, leadership and service in a diverse world.

IV. **Goals, Objectives, and Outcomes (see Syllabus Guidelines Attachment)**

- A. *Goals:* The student should complete this course with
- comprehension of the physical principles central to understanding the physical universe
 - the ability to apply those principles to understand complex natural phenomena
 - an understanding of the impact of those principles in technological decisions
 - the ability to formulate and test hypotheses concerning physical phenomena
- B. *Objectives.* The following Common Student Learning Objectives (CSLOs) adopted Dec. 9, 2004, are addressed:
- Content Knowledge (Lifelong Learning) CK-1. Know and apply the central concepts of the subject matter.
 - Content Knowledge (Lifelong Learning) CK-3. Use technology to enhance learning.
 - Problem-Solving Skills (Lifelong Learning and Leadership) PS-1. Use inquiry and collaboration to solve problems.
 - Social Responsibility (Service and Leadership) SR-3
- C. *Course Based Student Learning Objectives.* Upon completion of the course, students will be able to demonstrate their mastery of the following learning outcomes, addressing the following CLSOs (in parentheses):
- CBSLO-1. To describe the fundamental principles governing motion, force, energy, thermal phenomena, electromagnetism, optics, and the structure of matter at the atomic and subatomic levels (CK-1)
 - CBSLO-2. To apply knowledge of physical principles to orbital motion, the structure and behavior of planets, the properties, structure, and development of stars, galactic structure, and the evolution of the universe (CK-1)
 - CBSLO-3. To apply knowledge of physical principles to discuss the tradeoffs involved in various energy-generation technologies (including nuclear, coal, natural gas, solar, wind) and of electromagnetic technology (CK-1, SR-3)
 - CBSLO-4. To use technology to experimentally investigate physical phenomena (CK-3)
 - CBSLO-5. To predict, both qualitatively and quantitatively, the results of various physical processes (CK-1, PS-1)

V. **Teaching Methods.** Lecture and classroom discussion, in-class laboratory exercises, homework assignments, and computer simulations.

VI. **Course Requirements**

A. *Attendance Policy:* Attendance is mandatory. Each class session is the equivalent of more than a week in a traditional semester; therefore, 10 points will be deducted from a student's total number of course points for each hour (or portion of an hour – ten minute's tardiness will cost you the same as an hour!) of class missed. In order to avoid class disruption, students must be on time. If a student must miss a class, it is the student's responsibility to get lecture notes, assignments, etc. from another student. Missed tests cannot be made up (SR-3).

B. *Reading Assignments:* The following portions of the text should be read before the class session indicated:

- Week 1 – Chapters 1 and 2 (CBSLO-1)
- Week 2 – Chapters 3 and 4 (CBSLO-1)
- Week 3 – Chapters 5 and 6 (CBSLO-1, 3)
- Week 4 – Chapter 7 (CBSLO-1, 3)
- Week 5 – Chapters 8 and 9 (CBSLO-1)
- Week 6 – Chapters 15 and 16 (CBSLO-1, 2, 3)
- Week 7 – Chapters 17 and 18 (CBSLO-2)

C. *Written Assignments:* The following assignments are due at the class session indicated:

- Week 1: Chapter 1: Questions for Thought (QT) 2, 5, 7, 9, 10 (CBSLO-1)
Parallel Exercises (PE) Group A 1, 4, 10 (CBSLO-1, 5)
- Week 2: Chapter 2: QT 1, 3, 9, 11 (CBSLO-1)
PE Group B 2, 6, 20 (CBSLO-1, 5)
- Week 3: Chapter 3: QT 1, 3, 7, 12 (CBSLO-1)
PE Group A 1, 6, 12, 24 (CBSLO-1, 5)
- Chapter 4: QT 2, 6, 11, 12 (CBSLO-1)
PE Group B 1, 6, 10, 20a (CBSLO-1, 5)
- Week 4: Chapter 5: QT 2, 4, 11, 17, 18 (CBSLO-1, 3)
PE Group A 1, 7, 9, 16 (CBSLO-1, 3, 5)
- Week 5: Chapter 6: QT 2, 3, 5, 12 (CBSLO-1)
PE Group B 1, 3, 4 (CBSLO-1, 5)
- Chapter 7: QT 2, 3, 7, 8, 12 (CBSLO-1)
PE Group A 1, 4, 5, 7 (CBSLO-1, 5)
- Week 6: Chapter 8: QT 1, 2, 3, 4, 8, 10, 14 (CBSLO-1)
PE Group A 2, 5, 6 (CBSLO-1, 5)
- Chapter 9: QT 3, 4, 5, 9, 10 (CBSLO-1)
PE Group B 4, 7, 8 (CBSLO-1, 5)
- Week 7: Chapter 15: QT 4, 5, 9, 10, 11 (CBSLO-1, 3)
PE Group A 1, 6, 10 (CBSLO-1, 3, 5)
- Chapter 16: QT 2, 9, 11, 13, 14, 17, 19, 22, 25, 29, 31 (CBSLO-2)
- Week 8: Chapter 17: QT 1, 2, 4, 7, 8, 11, 13, 14, 20, 23, 32 (CBSLO-2)
- Chapter 18: QT 20, 21, 33 (CBSLO-2)

D. *Plagiarism:* Plagiarism is defined as follows: "The deliberate and knowing presentation of another person's original ideas or creative expressions as one's own. Generally, plagiarism is immoral but not illegal. If the expression's creator gives unrestricted permission for its use and the user claims the expression as original, the user commits plagiarism but does not violate copyright laws. If the original expression is copied without permission, the plagiarist may violate copyright laws, even if credit goes to the creator. And if the plagiarism results in material gain, it may be deemed a passing-off activity that violates the Lanham Act." Black's Law Dictionary, 8th ed. (2004), p. 1187. Also useful to establish guidelines for delineating plagiarism is Diana Hacker's definition: "Three different acts are considered plagiarism: (1) failing to cite quotations and borrowed ideas, (2) failing to enclose borrowed language in quotation marks, and (3) failing to put summaries and paraphrases in your own words." (A Writer's Reference, by Diana Hacker, Bedford St. Martin's Press, 2003, page 331.

Some instances of plagiarism may, in fact, be violations of copyright law and subject to prosecution. The SCI Student Handbook lists plagiarism as a serious breach of conduct standards and will result in disciplinary action.

E. Cell Phones: Cell phones must be turned off during class sessions (SR-3).

VI. Means of Evaluation of Outcomes

There will be two tests (a mid-term and a final exam). These tests will consist primarily of short-essay questions, but there will also be a few calculation problems. Tests will be graded on a scale of 0 to 100; homework will be graded on a scale of two points per problem (thus, assignments for different weeks may be of different weight). Answers to questions involving calculation should include the calculation as well as the final result; failure to include any calculation (at minimum, the equation(s) used and values of the quantities used in the equation(s)) will result in no credit awarded for the problem(s) in question. Brief write-ups of laboratory exercises (data collected, analysis of data including any applicable graphs, and experimental uncertainty) are due at the end of the class session in which that exercise was conducted. These will be graded on a scale of 0 to 10. Homework consists of a mixture of short-answer and computational problems. Answers to questions involving calculation should include the calculation as well as the final result; failure to include any calculation (at minimum, the equation(s) used and values of the quantities used in the equation(s)) will result in no credit awarded for the problem(s) in question. Each homework question is worth 2 points. In addition, there will be a quiz worth 5 points each class period (except for weeks 4 and 8) on the chapters which were to have been read for class. Therefore, at the end of the semester, the maximum number of points earned is:

Mid-Term	100
Final Exam	100
Homework	200
Labs	70
Quizzes	30
Total	500

(*Note:* There are actually slightly more than 100 homework questions assigned for the semester, leading to a maximum of slightly more than 200 possible homework points. The surplus points may be considered “extra credit”). Points lost for tardiness or absence from class are deducted from this total. Letter grades will be assigned on the following scale:

Course Points earned	Grade
450 – 500	A
400 – 449	B
350 – 399	C
300 – 349	D
Below 300	F

VIII. Topical Course Outline

Week 1 Introduction to the scientific method; hypotheses, theories, laws; metric units; density; scalars and vectors; speed and velocity; acceleration (CBSLO-1). **Laboratory:** metric measurements, significant figures, determination of density (CBSLO-4)

Week 2 Force and Newton’s laws of motion; action/reaction pairs of forces; circular motion; gravitation; work; kinetic energy; potential energy; forms of energy; energy conservation; current energy sources of commercial importance: petroleum, coal, water, solar, and nuclear (CBSLO-1, 3) **Laboratory:** Static equilibrium; projectile motion (CBSLO-4)

Week 3 Temperature; kinetic molecular theory; heat as energy transfer; heat capacity and specific heat; mechanisms of heat flow: conduction, convection, and radiation; the second law of thermodynamics, entropy, and engine efficiency; wave motion; vibration; wavelength, period, frequency, amplitude, and wave speed; transverse and longitudinal waves; sound waves; standing waves; resonance (CBSLO-1, 3) **Laboratory:** Resonance and the determination of the speed of sound (CBSLO-4)

Week 4 **Test** on Chapters 1 – 6; Electric charge; Coulomb's law; electric field and electric potential; electric currents; resistance, resistivity, and Ohm's law; magnetic field and magnetic poles; electromagnetism; electromagnetic fields and health (CBSLO-1, 3) **Laboratory:** Magnetic field mapping; Ohm's law (CBSLO-4)

Week 5 The electromagnetic nature of light; the speed of light; reflection; refraction; the rainbow; image formation; light as a wave phenomenon: interference and diffraction; light as a particle: the photoelectric effect; discovery of atomic structure: electrons and nucleus; the Bohr model; quantum mechanics (CBSLO-1) **Laboratory:** Thin lenses (CBSLO-4)

Week 6 Atomic nuclei; nuclear forces; radioactivity; nuclear fission; nuclear fusion; properties of stars; stellar structure; stellar energy generation; stellar evolution; galaxies; the expansion of the universe (CBSLO-1, 2, 3) **Laboratory:** Atomic spectra (CBSLO-4)

Week 7 Overview of the solar system; the Sun as a star; solar rotation; sunspots and the solar cycle; the terrestrial worlds: Mercury, Venus, Earth, the Moon, Mars; the gas giants: Jupiter, Saturn, Uranus, Neptune; large moons of the outer solar system; asteroids, comets, and meteoroids; the origin of the solar system (CBSLO-2) **Laboratory:** Orbital motion of the Galilean moons and determination of the mass of Jupiter (CBSLO-4)

Week 8 Review: what we've learned, how we've learned it, and what we don't know.

Final exam

IX. **Americans with Disabilities Act (ADA)**

Springfield College in Illinois provides individuals with disabilities reasonable accommodations to participate in educational programs, activities, and services. Students with disabilities requiring accommodations to participate in college-sponsored programs, activities, and services or to meet course requirements should contact the Director of the Resource Center as early as possible.

X. **Assessment: Classroom Assessment Techniques (see Syllabus Guidelines Attachment)**

Goals, objectives, and learning outcomes that will be assessed in the class are stated in this syllabus. Instructor will use pre/post-testing and three-question survey in order to provide continuous improvement of instruction. Students are required to take part in all assessment measures.

XI. **IAI statement**

Physical Science 103 has been approved by the Illinois Articulation Initiative as meeting the criteria stipulated for P9 900L Emphasizes the fundamental principles of chemistry, physics, geology, meteorology and astronomy and the philosophical importance of scientific discoveries.

PS 103 Physical Science I
First Week Assignment

The following is to be completed by the start of the *FIRST* class session:

READ Chapters 1 and 2 of the text

ANSWER the following questions from the end of Chapter 1:

Questions for Thought 2, 5, 7, 9, 10

Parallel Exercises, Group A 1, 4, 10