

**New Course Request**

**Indiana University**

**Indiana University East Campus**

Check Appropriate Boxes: Undergraduate credit  Graduate credit  Professional credit

1. School/Division Natural Science & Mathematics 2. Academic Subject Code PHYS (Physics)  
 3. Course Number P 104 (must be created with University Enrollment Services) 4. Instructor Ron Bingaman  
 5. Course Title Concepts in Physical Science  
 Recommended Abbreviation (Optional) \_\_\_\_\_ (Limited to 32 Characters including spaces)

6. First time this course is to be offered (Semester/Year): Fall 2008

7. Credit Hours: Fixed at \_\_\_\_\_ or Variable from 3 to 4

8. Is this course to be graded S-F (only)? Yes \_\_\_\_\_ No X

9. Is variable title approval being requested? Yes \_\_\_\_\_ No X

10. Course description (not to exceed 50 words) for Bulletin publication: Introduces the fundamental concepts and principles of physical science (physics and chemistry), with limited use of algebra. Topics include motion, light, electricity, magnetism, states of matter, energy and chemical reactions. Intended for non-science majors and appropriate for elementary education majors. Lab fee required.

11. Lecture Contact Hours: Fixed at \_\_\_\_\_ or Variable from 2 to 3

12. Non-Lecture Contact Hours: Fixed at 24 (Lab) or Variable from 0 to \_\_\_\_\_

13. Estimated enrollment: \_\_\_\_\_ of which \_\_\_\_\_ percent are expected to be graduate students.

14. Frequency of scheduling: Fall & Spring Will this course be required for majors? No

15. Justification for new course: Introductory Physical Science course to fulfill general education requirements.

16. Are the necessary reading materials currently available in the appropriate library? Yes (IUE)

17. Please append a complete outline of the proposed course, and indicate instructor (if known), textbooks, and other materials. See attachments.

18. If this course overlaps with existing courses, please explain how the overlap is necessary, desirable, or unimportant. Partial overlap of P100 & C100 desirable for general education students wanting experience in both physics and chemistry, without the detail of P100 (4 cr) and C100 (3 cr).

19. A copy of every new course proposal must be submitted to departments, schools, or divisions in which there may be overlap of the new course with existing courses or areas of strong concern, with instructions that they send comments directly to the originating Curriculum Committee. Please append a list of departments, schools, or divisions thus consulted. Natural Science & Mathematics Division and Education at IUE have been informed and copied.

Submitted by: \_\_\_\_\_ Approved by: \_\_\_\_\_

\_\_\_\_\_  
 Department Chairman/Division Director Date \_\_\_\_\_ Dean Date \_\_\_\_\_

\_\_\_\_\_  
 Dean of Graduate School (when required) Date \_\_\_\_\_ Chancellor/Vice-President Date \_\_\_\_\_

\_\_\_\_\_  
 University Enrollment Services Date \_\_\_\_\_

After School/Division approval, forward the last copy (without attachments) to University Enrollment Services for initial processing, and the remaining four copies and attachments to the Campus Chancellor or Vice-President.

## COURSE OUTLINE OF RECORD

### Physics P-104 : Concepts in Physical Science

**COURSE TITLE:** Concepts in Physical Science

**COURSE NUMBER:** PHYS-P104

**CREDIT HOURS:** 3 or 4 (variable) cr.

**COURSE CATALOG DESCRIPTION** Introduces the fundamental concepts and principles of physical science (physics and chemistry), with limited use of algebra. Topics include motion, light, electricity, magnetism, states of matter, energy and chemical reactions. Intended for non-science majors and appropriate for elementary education majors. Lab fee required.

**PREREQUISITES:** Elementary algebra. (Math M007, or the equivalent.)

**COURSE OBJECTIVES:** The course is designed to give students an introductory working knowledge of the fundamental concepts of physics and chemistry. Upon completion of the course, students will have become familiar with fundamental physical concepts and introductory problem solving techniques in the study of:

- Motion, Force, and Energy
- Heat, Thermal Processes & Light
- Waves, Electricity, Magnetism, Sound and Light
- Atoms, Elements and Chemical Processes
- Compounds and Reactions

**ANTICIPATED COURSE FORMAT (Online, Classroom, Hybrid):** Classroom, w/some online

**CONTACT TYPE (Lecture, Lab, Other):** Lecture/Lab

**TEXTBOOK(S) FOR FIRST OFFERING:** Conceptual Physical Science 4<sup>th</sup> ed by Hewitt © 2008.

P104 Laboratory Manual by Ron Bingaman © 2008.

**TOPICS TO BE ADDRESSED:** The following topics will be studied;

- Measurement, motion and momentum
- Force, work, energy and power
- Gravity, projectiles & satellites
- Properties of fluids, solids and gasses
- Heat and thermal processes
- Electricity, magnetism and light
- Vibration, waves, light and sound
- Atomic structure and the periodic table
- Nuclear processes and radiation
- Chemical processes.
- Compounds and nomenclature.
- Acid-base reactions.

**Interdependence/Disciplinary:** *Educated persons should be exposed to a broad variety of academic fields traditionally known as the Liberal Arts (humanities, fine arts, social sciences, natural sciences) in order to develop critical appreciation of a diversity of ideas and creative expression.*

- The content of the Concepts in Physical Science course will provide students the opportunity to study topics related to the fields of; Physics, Chemistry, Mathematics, Biology, History, and Geography.

**Depth of Knowledge:** *Educated persons should have achieved depth in some field of knowledge. A sequential accumulation of knowledge and skills in an academic discipline is essential for a focused personal and professional development.*

- The Concepts in Physical Science course will provide students with the opportunity to gain depth in the understanding of fundamental principles of physical processes, particularly the importance of force and energy underlying the analysis and description of those processes.

**Communication:** *Educated persons should be able to express themselves clearly, completely, and accurately. Effective communication entails sharing ideas through a variety of techniques, including reading, writing, speaking and technology.*

- The Concepts in Physical Science course requires written homework assignments and written laboratory reports. Students are required to communicate understanding of course material to the instructor through in-class discussion, written examination and instructional technology.

**Critical/Creative Thinking:** *Educated persons should have the ability to develop informed opinions, to comprehend, formulate, and critically evaluate ideas, and to identify problems and find solutions to those problems. Effective problem solving involves a variety of skills including research, analysis, interpretation, and creativity.*

- The Concepts in Physical Science course will require students to read, comprehend, formulate and critically evaluate problems in physics and chemistry in the form of homework and example problems, exam questions and problems and written directed laboratory activities.

**Computational Skills:** *Educated persons should be able to relate computational skills to all fields so that they are able to think with numbers. At a minimum, students should be able to carry out basic arithmetic and algebraic functions; they should have a working concept of simple statistics; and they should be able to interpret and use data in various forms.*

- The Concepts in Physical Science course will provide students with the opportunity to use computational skills in application to the solutions of problems encountered in the physical sciences. Elementary statistical techniques will also be used in the analysis of data collected in the laboratory, as well as elementary algebra and mathematical modeling to express physical law.

**Socio-Cultural Relationships:** *Educated people should develop the skills to understand, accept, and relate to people of different backgrounds and beliefs. In a pluralistic world one should not be provincial or ignorant of other cultures; one's life is experienced within the context of other races, religions, languages, nationalities, and value systems.*

- The Concepts in Physical Science course will provide students with exposure to other cultures through the discussion of historical evolution and geographic distribution of the discovery of physical law, and related investigative experimentation, which transcends national borders as well as cultural, racial and gender preeminence.

**Ethics:** *Educated persons should be expected to have some understanding of, and experience in, thinking about moral and ethical problems. A significant quality in educated persons is the ability to question and clarify personal and cultural values, and thus to be able to make discriminating moral and ethical choices.*

- The Concepts in Physical Science course will expose students to a variety moral and ethical problems associated with the gathering, investigation, analysis and reporting of scientific data and results.

**REVISION DATE OF THIS COURSE OUTLINE/ABBREVIATED SYLLABUS:** April 5, 2008

**EFFECTIVE DATE OF THIS COURSE OUTLINE/ABBREVIATED SYLLABUS:** April 5, 2008

**Actual course syllabi may contain additional materials.**

Physics 104 - Concepts in Physical Science (3 cr)  
Location: WZ 201; 12:30pm - 2:30pm TuTh

Syllabus      Fall Term 2008  
Sec: 0000

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Physics 104 Learning Objectives:      Listed in logical groupings, with chapters by week.

I **Fundamentals of Physics.**      (Quiz 1 & Exam I zone.)

Chapters & Content.

1. Motion & Equilibrium.
  - i. Distance, Time & Mass. (Inertia)
  - ii. Speed, Velocity & Acceleration. (Vector & Scalar Quantities)
  - iii. Momentum, Force & Impulse. (Conservation of Momentum)
  - iv. Newton's Three Laws of Motion.
  - v. \*Center of Mass & Equilibrium. (Support & Balance) (Optional)
2. Work, Energy & Power.
  - i. Work & Force
  - ii. Kinetic, Potential & Total Energy. (Conservation of Energy)
  - iii. The Work-Energy Theorem. (Dissipative Forces - Friction & Air Resistance)
  - iv. Power & Sources of Energy.
3. Gravity, Projectiles & Satellites.
  - i. Newton's Law of Gravitation. (The Gravitational Constant)
  - ii. Free Fall .& Projectile Motion (The Earth's g-field)
  - iii. Satellite Motion. (Space Shuttle & International Space Station)
  - iv. Kepler's Laws of Planetary Motion. (Circular & Elliptical Orbits)

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--- Quiz 1 (Secs. 1 - 3)

4. Gasses, Fluids & Solids
  - i. States of Matter. (Phases & Energy)
  - ii. Density & Pressure.
  - iii. Buoyancy & Archimedes' Principle. (Floatation)
  - iv. Gas Laws. (Pressure, Volume & Temperature)
  - v. Bernoulli's Principle. (Fluid Flow)
5. Heat & Thermal Processes.
  - i. Thermal Energy & Heat. (Energy Transfer)
  - ii. Temperature Scales. (Absolute Zero)

iii. Specific Heat Capacity. (Calorimetry)

iv. Phase Changes. (Energy Considerations)

v. Conduction, Convection & Radiation (Emission, Absorption & Reflection).

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--- Exam 1 (Secs. 1 - 5)

6. Electricity & Magnetism. (Quiz 2 & Exam 2 zone)

i. Forces, Fields & Potentials. (Coulomb's Law)

ii. Current & Resistance. (Ohm's Law & Simple Circuits)

iii. Voltage Sources & Electrical Power Generation. (Electrolysis)

iv. Magnetism. (Poles, Domains, Fields & Forces)

v. Electric Currents & Magnetic Fields. (Induction & Electromagnetism)

7. Vibrations, Waves & Sound.

i. Elasticity & Vibration. (Simple Harmonic Motion.)

ii. Transverse Mechanical Waves. (Standing Wave on Strings & Surfaces)

iii. Reflection, Refraction & Interference of Waves. (Harmonics & Beats)

iv. Forced Vibrations & Resonance. (Tacoma Narrows Bridge Collapse)

v. Sound, Music & Musical Instruments.

8. Light & Optics.

i. The Electromagnetic Spectrum. (Visible & Invisible Light)

ii. Color, Frequency & Wavelength. (The Speed of Light,  $c$ )

iii. Transmission, Absorption & Polarization of Light.

iv. Reflection, Refraction, Diffraction & Interference of Light.

vi. Mirrors & Thin Lenses. (Optical Instruments - Telescopes & Microscopes)

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--- Quiz 2 (Secs. 6 - 8)

9. Atomic Structure & The Periodic Table.

i. The Elements, Periodic Table, Periods & Groups (Historical Perspective)

ii. Atomic Particles. (Building Blocks of Atoms - Electrons, Protons & Neutrons)

iii. Atomic Number & Mass, Atomic Orbitals & Shells. (Isotopes).

iv. Rutherford & Bohr Models of Atomic Structure. (Spectroscopes)

## 10. The Atomic Nucleus.

- i. Radioactivity. (Alpha-, Beta- & Gamma- Rays)
- ii. Environmental Radiation. (Units, Background, Doses & Tracers)
- iii. Nuclear Processes. (The Strong Nuclear Force, Decay & Half-Life).
- iv. Fission & Fusion. (Mass-Energy Relationship,  $E = mc^2$ )

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--- Exam 2 (Secs. 6 - 10)

## II Fundamentals of Chemistry.

### Chapters & Content.

#### 11. Elements of Chemistry. (Quiz 3 & Final Exam zone.)

- i. Physical & Chemical Properties. (The Submicroscopic World)
- ii. Elements & Compounds & Ions. (Nomenclature)
- iii. Chemical Equations. (Balancing Simple Chemical Equations)
- iv. Mixtures, Solutions & Molecules. (Classification of Matter)
- v. Chemical Bonds. (Ionic, Covalent, Polar-Covalent & Metallic Bonds)
- vi. \*Applications. (Purification, Desalination, Wastewater Treatment) (Optional)

#### 12. Chemical Reactions.

- i. Reaction Rates & Catalysts.
- ii. Energy Considerations. (Exothermic & Endothermic Reactions).
- iii. Relative Mass & Molar Mass.
- iv. Acids & Bases. (Proton Donors & Acceptors, Relative Strength)
- v. Neutral and Buffer Solutions. (The pH Scale)
- vi. \*Applications. (Acid Rain & Basic Oceans) (Optional)

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--- Quiz 3 (Secs. 11 - 12)

#### 13. \*Oxidation & Reduction Reactions, (Optional)

- i. Losing & Gaining Electrons. (Electron Affinity & Valence)
- ii. Electrochemical Processes. (Electrolysis)
- iii. Corrosion & Combustion.
- iv. Applications. (Photo-chemicals, Voltaic Cells, Fuel Cells)

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--- Final (All)

