PHYS-PHYSICS (PHYS)

PHYS 1110. Explorations in Physics
1 Credit (1)
This course will introduce students to university resources, pre-professional student societies, learning strategies to help strengthen academic performance, and will explore career paths for graduates. Students will also discuss the roles of physicists in society, physics research being performed at and nearby NMSU, and what the latest discoveries in physics tell us about nature and the universe.
Learning Outcomes
1. Describe effective learning strategies for science/engineering classes.
2. Give examples of impactful scientists from groups underrepresented in physics and describe their career paths.
3. Research examples of positions open to physics majors.
4. Identify critical components of an effective resume.
5. Write a professional cover letter for an internship/undergraduate research application.
6. Discuss the boundaries of ethical science and give an example of an accidental breach of ethics.
7. Describe the societal impact of misinformation about scientific results or research.
8. Explore ways scientists can engage with the general public to shape the discourse of knowledge or the ways scientists are perceived.
9. List some of the burning questions current physicists are trying to answer. 1
10. Establish a sense of community within the department, the university, and the greater physics world. 1
11. Discover useful resources to help with academic success and avoid pitfalls while pursuing a physics degree. 1
12. Better understand the value of a physics degree, and what can be expected entering the workforce or academia. 1
13. Understand and discuss how the field of physics connects with the issues and problems facing society today.

PHYS 1111. Introductory Computational Physics
3 Credits (2+2P)
Introduction to computational techniques for the solution of physics-related problems.
Prerequisite: a C- or better in MATH 1220G or MATH 1250G or MATH 1511G.
Learning Outcomes
1. Use computers for visualizing and analyzing data.
2. Apply techniques of structured programming and software development.
3. Trouble shoot and debug programs.

PHYS 1112. Introductory Physics for the Health Sciences
3 Credits (3)
Algebra-level introduction to topics required for the Health Sciences including basic mechanics (including sound, mechanical waves and fluids), heat and thermodynamics, electricity and magnetism, optics and electromagnetic waves, atomic and nuclear physics and applications to medical imaging. Restricted to Community Colleges campuses only.
Prerequisite(s): MATH 1215 or Equivalent.
Learning Outcomes
1. The objective of the course is to familiarize the student with the concepts and methods used in the underlying physics associated with various Health Science disciplines.
2. The course will demonstrate how the basic principles of mechanics, thermodynamics, electricity, magnetism, electromagnetic waves and optics can be applied to solve particular problems in Health Sciences applications. Introduces the student to selected topics in modern physics including quantum physics, atomic and nuclear physics.

PHYS 1115G. Survey of Physics with Lab
4 Credits (3+3P)
Overview of the concepts and basic phenomena of physics. This course provides a largely descriptive and qualitative treatment with a minimum use of elementary mathematics to solve problems. No previous knowledge of physics is assumed. Includes laboratory.
Learning Outcomes
1. Apply concepts of classical mechanics (such as velocity, acceleration, force, inertia, momentum, torque, work, energy) to simple static and dynamic systems.
2. Apply concepts of thermodynamics (such as heat, temperature, internal energy, entropy) to simple processes.
3. Apply concepts of electricity and magnetism (such as fields, potential, charge conservation, static and dynamic induction) to simple circuits, motors, and other simple contrivances.
4. Apply simple geometric and wave optics in simple situations.
5. Test ideas using modern laboratory equipment.
6. Estimate experimental uncertainties.
7. Use computers to analyze and report laboratory results.
8. Draw appropriate conclusions from quantitative scientific observations.
9. Accurately and clearly communicate the results of scientific experiments.

PHYS 1125G. Physics of Music
4 Credits (3+2P)
Introduction for non-science majors to basic concepts, laws, and skills in physics, in the context of a study of sound, acoustics, and music.
Learning Outcomes
1. Demonstrate converting units and other aspects of dimensional analysis in the working of numerical problems.
2. Apply basic classical mechanics to static and dynamic fluids, including Archimedes'principle and Bernoulli's principle.
3. Apply the general properties of waves to simple models of musical instruments.
4. Demonstrate knowledge of basic operating principles of wind, string, and percussion instruments.
5. Demonstrate knowledge of how objectively measurable properties of sound waves correspond to the perceptions of pitch, loudness, and timbre.
6. Demonstrate understanding of the description of vibrations and waves in terms of Fourier's Theorem and normal modes.
7. Demonstrate understanding of vocalization in terms of physical principles such as resonance and fluid dynamics.
8. Demonstrate understanding of how the ear works.

PHYS 1230G. Algebra-Based Physics I
3 Credits (3)

An algebra-based treatment of Newtonian mechanics. Topics include kinematics and dynamics in one and two dimensions, conservation of energy and momentum, rotational motion, equilibrium, and fluids.

Learning Outcomes

1. Demonstrate converting units and other aspects of dimensional analysis in the working of numerical problems.
2. Apply principles of Newtonian mechanics to predict and account for simple phenomena modeled by the motion of particles in one and two dimensions.
3. Apply principles of Newtonian mechanics to predict and account for simple phenomena modeled by the motion of a rigid body in two dimensions.
4. Apply Newton's theory of gravitation to circular orbits and demonstrate understanding of how Kepler's laws of planetary motion provide the empirical foundation for Newton's theory.
5. Apply the mathematics of vectors to the principles of Newtonian mechanics.
6. Apply principles of Newtonian mechanics to the case of static and dynamic incompressible fluids, including Archimedes'and Bernoulli's principles.

PHYS 1230L. Algebra-Based Physics I Lab
1 Credit (1)

A series of laboratory experiments associated with the material presented in PHYS 1230G.

Prerequisite(s)/Corequisite(s): PHYS 1230G.

Learning Outcomes

1. Explain the scientific method.
2. Test ideas using modern laboratory equipment.
3. Estimate experimental uncertainties using statistical methods.
4. Use computers to analyze and report laboratory results.
5. Draw appropriate conclusions from quantitative scientific observations.
6. Accurately and clearly communicate the results of scientific experiments.

PHYS 1240G. Algebra-Based Physics II
3 Credits (3)

The second half of a two semester algebra-based introduction to Physics. This course covers electricity, magnetism and optics.

Prerequisite(s): a C- or better in PHYS 1230G or PHYS 2230G.

Learning Outcomes

1. Be able to state Coulomb's Law and Gauss's laws and apply them.
2. Apply the concepts of electric charge, electric field and electric potential to solve problems.
3. Analyze simple DC and AC circuits.
4. Apply the Lorentz force to solve problems.
5. Apply Faraday's law of induction (and Lenz's law) to solve problems.
6. Apply ray optics to practical lens systems such as microscopes and corrective lenses.
7. Apply the wave nature of light to the phenomena of reflection, refraction, and diffraction.

PHYS 1240L. Algebra-Based Physics II Lab
1 Credit (1)

A series of laboratory experiments associated with the material presented in PHYS 1240

Prerequisite(s)/Corequisite(s): PHYS 1240G.

Learning Outcomes

1. Explain the scientific method.
2. Test ideas using modern laboratory equipment.
3. Estimate experimental uncertainties using statistical methods.
4. Use computers to analyze and report laboratory results.
5. Draw appropriate conclusions from quantitative scientific observations.
6. Accurately and clearly communicate the results of scientific experiments.

PHYS 1310G. Calculus -Based Physics I
3 Credits (3)

A calculus level treatment of classical mechanics and waves, which is concerned with the physical motion concepts, forces, energy concepts, momentum, rotational motion, angular momentum, gravity, and static equilibrium.

Prerequisite: a C- or better in ENGR 190 or MATH 1511G or higher.

Learning Outcomes

1. Describe the relationships among position, velocity, and acceleration as functions of time.
2. Use the equations of kinematics to describe motion under constant acceleration.
3. Analyze linear motion using Newton's laws, force, and linear momentum.
4. Analyze rotational motion using torque and angular momentum.
5. Analyze motion using work and energy.

PHYS 1310L. Calculus -Based Physics I Lab
1 Credit (3P)

A series of laboratory experiments associated with the material presented in Calculus-based Physics I. Students will apply the principles and concepts highlighting the main objectives covered in coursework for Calculus-based Physics I.

Prerequisite(s)/Corequisite(s): PHYS 1310G.

Learning Outcomes

1. Develop a reasonable hypothesis.
2. Work effectively as part of a team.
3. Take measurements and record measured quantities to the appropriate precision.
4. Estimate error sources in experimental techniques.
5. Apply appropriate methods of analysis to raw data, including using graphical and statistical methods via computer-based tools.
6. Determine whether results and conclusions are reasonable.
7. Present experimental results in written form in appropriate style and depth.
8. Experience the relationship between theory and experiment.

PHYS 1311. Problems in Calculus-Based Physics I
0.5-1 Credits (.5-1)

This is a supplemental course for Calculus-based Physics I. May be repeated up to 1 credits.

Corequisite(s): PHYS 1310G.

PHYS 1320G. Calculus -Based Physics II
3 Credits (3)

A calculus level treatment of classical electricity and magnetism. It is strongly recommended that this course is taken at the same time as Calculus-based Physics II laboratory.

Prerequisite: a C- or better in (PHYS 2110 or PHYS 1310G) and (ENGR 190 or MATH 1521G or higher).

Learning Outcomes

1. Apply the concepts of electric charge, electric field and electric potential to solve problems.
2. Sketch the electric field in the vicinity of point, line, sheet, and spherical distributions of static electric charge.
3. Sketch the magnetic field in the vicinity of line, ring, sheet, and solenoid distributions of steady current.
4. Describe the relationship between electric field and electric potential.
5. Calculate the Lorentz force on a moving charge for simple geometries of the fields and use it to analyze the motion of charged particles.
6. Apply the integral forms of Maxwell's equations.
7. Calculate the energy of electromagnetic fields.
8. Analyze DC circuits.

PHYS 1320L. Calculus -Based Physics II Lab
1 Credit (3P)
A series of Laboratory experiments associated with the material presented in Calculus-Based Physics II. Students will apply the principles and concepts highlighting the main objectives covered in coursework for Calculus-Based Physics II.
Prerequisite(s)/Corequisite(s): PHYS 1320G. Prerequisite(s): A C- or better in PHYS 2110L or PHYS 1310L.

Learning Outcomes

1. Develop a reasonable hypothesis.
2. Work effectively as part of a team.
3. Take measurements and record measured quantities to the appropriate precision.
4. Estimate error sources in experimental techniques.
5. Apply appropriate methods of analysis to raw data, including using graphical and statistical methods via computer-based tools.
6. Determine whether results and conclusions are reasonable.
7. Present experimental results in written form in appropriate style and depth.
8. Experience the relationship between theory and experiment

PHYS 1321. Problems in Calculus-Based Physics II
0.5-1 Credits (.5-1)
This is a supplemental course for Calculus-based Physics II.
Corequisite(s): PHYS 1320G.

PHYS 2110. Mechanics
3 Credits (3)
Newtonian mechanics.
Prerequisite/Corequisite: MATH 1511G or higher.

Learning Outcomes

1. Describe matter as particles or extended objects, analyze forces or torques acting on it, and apply Newton's laws to determine if the object is in equilibrium or predict any change in the motion of such an object.
2. Apply vector algebra to predict motion or analyze interactions in one or two dimensions.
3. Apply techniques of conservation laws (linear momentum, energy, angular momentum) to determine the effect of interactions that are internal or external to the system studied.
4. Analyze systems in simple harmonic motion and explain qualitatively under what condition a driven oscillating system shows the phenomenon of resonance.
5. Use multiple representations to build, interpret and communicate a model, including visual representations such as sketches or diagrams, mathematical expressions, graphs, or text.
6. Given two or more cases, perform a ranking task by evaluating the similarities (comparison) or differences (contrast) in the cases and applying physics principles.
7. Self-check reasonableness of assumptions and solutions, making use of limiting cases or symmetry arguments.
8. Analyze real-world phenomena by defining and formulating the question or problem, constructing simplified idealized models(and stating their limitations), and applying appropriate mathematical reasoning to make predictions or explain a phenomenon or function.
9. Communicate effectively with audiences of different scientific backgrounds by recognizing their needs and making the communication relevant and impactful. 1
10. Work collegially and collaboratively in diverse teams both as a leader and as a member in pursuing a common goal.

PHYS 2110L. Experimental Mechanics
1 Credit (3P)
Laboratory experiments associated with the material presented in PHYS 2110. Science majors.
Prerequisite/Corequisite: PHYS 2110.

Learning Outcomes

1. Test scientific questions or ideas using appropriate laboratory equipment.
2. Collect experimental data and evaluate the outcomes of an experiment qualitatively and quantitatively.
3. Estimate measurement uncertainty.
4. Apply appropriate methods of analysis to raw data, including graphical or statistical methods, and computer-based tools.
5. Draw appropriate conclusions from quantitative scientific data.
6. Communicate the process and the outcomes of an experiment and reflect on possible revisions in the procedure.
7. Work effectively as part of a team.
8. Demonstrate professional responsibility.

PHYS 2111. Supplemental Instruction to PHYS 2110
1 Credit (1)
This Optional workshop as a supplement to PHYS 2110. The tutorial sessions focus on reasoning and hands-on problem solving. May be repeated up to 1 credit.
Corequisite: PHYS 2110.

Learning Outcomes

1. Analyze real world phenomena by constructing simplified idealized models and appropriate mathematical reasoning to make predictions or explain a phenomena or function.
2. Use multiple representations to build, interpret and communicate the model, including visual representations such as sketches or diagrams, mathematical expressions, graphs, or text.
3. In the contexts of concepts and physical laws discussed in PHYS 2110, apply quantitative analysis to solve problems, including the use of scientific notation, unit conversion and vector algebra.
4. Self-check reasonableness of assumptions and solutions, making use of limiting cases or symmetry arguments.
5. Develop learning strategies and use metacognition to promote thinking in the discipline.

PHYS 2120. Heat, Light, and Sound
3 Credits (3)
Calculus-level treatment of thermodynamics, geometrical and physical optics, and sound.
Prerequisite: a C- or better in PHYS 2110 or PHYS 1310G, and MATH 1511G or higher.
Learning Outcomes
1. Analyze real world phenomena that meet specific needs and use scientific judgement to draw conclusions.
2. Use multiple representations to build, interpret and communicate scientific models, including visual representations such as sketches or diagrams, mathematical expressions, graphs, or text.
3. Analyze oscillations and wave phenomena.
4. Analyze properties of sound waves.
5. Analyze properties of light using interference and diffraction.
6. Analyze light propagation through media using index of refraction and optical apparatus.
7. Analyze optical systems using light propagation.
8. Analyze the laws of thermodynamics and use them to describe processes in gases and other states of matter.

PHYS 2120L. Heat, Light, and Sound Laboratory
1 Credit (3P)
Laboratory experiments associated with the material presented in PHYS 2120. Science majors.
Prerequisite: a C- or better in PHYS 2110L or PHYS 1310L.
Prerequisite/Corequisite: PHYS 2120.
Learning Outcomes
1. Develop a reasonable hypothesis.
2. Work effectively as part of a team.
3. Take measurements and record measured quantities to the appropriate precision.
4. Estimate error sources in experimental techniques.
5. Apply appropriate methods of analysis to raw data, including using graphical and statistical methods via computer-based tools.
6. Determine whether results and conclusions are reasonable.
7. Present experimental results in written form in appropriate style and depth.
8. Understand the relationship between theory and experiment.

PHYS 2121. Supplemental Instruction to PHYS 2120
1 Credit (1)
This optional workshop supplements PHYS 2120 "Heat, Light, and Sound". Students actively apply concepts and methods introduced in PHYS 2120 to problem solving and quantitative analysis. May be repeated up to 1 credit.
Corequisite: PHYS 2120.
Learning Outcomes
1. Analyze real world phenomena by constructing simplified idealized models and appropriate mathematical reasoning to make predictions or explain a phenomena or function.
2. Use multiple representations to build, interpret and communicate the model, including visual representations such as sketches or diagrams, mathematical expressions, graphs, or text.
3. In the contexts of concepts and physical laws discussed in PHYS 2121, apply quantitative analysis to solve problems involving wave propagation and interference, geometric optics, heat transfer and thermodynamics.
4. Self-checkreasonableness of assumptions and solutions, making use of limiting cases or symmetry arguments.
5. Develop learning strategies and use metacognition to promote thinking in the discipline

PHYS 2140. Electricity and Magnetism
3 Credits (3)
Charges and matter, the electric field, Gauss law, the electric potential, the magnetic field, Ampere's law, Faraday's law, electric circuits, alternating currents, Maxwell's equations, and electromagnetic waves.
Prerequisite: a C- or better in PHYS 2110 or PHYS 1310G, and MATH 1511G or higher.
Prerequisite/Corequisite: MATH 1521G.
Learning Outcomes
1. Analyze real-world phenomena by deciding what information is relevant and constructing simplified idealized models and appropriate mathematical reasoning to make predictions or explain a phenomenon or function.
2. Use multiple representations to build, interpret and communicate the model, including visual representations such as sketches or diagrams, mathematical expressions, graphs, or text.
3. Use a physics problem-solving strategy: i. Identify relevant concepts. ii. Introduce and study simplified models. iii. Use symmetry arguments. iv. Establish the relation between known and unknown quantities. v. Calculate a quantitative result using appropriate mathematical methods. vi. Self-check reasonableness of assumptions and solutions.
4. Analyze/predict the interaction of charged particles, dipoles, or conductors with electric or magnetic fields. Apply concepts of force, work, or energy.
5. Describe sources of electric fields or magnetic fields and calculate field vectors for a point in space.
6. Apply Gauss's law to calculate electric fields for symmetric charge distributions or to determine surface charges on conductors in electrostatic equilibrium.
7. Apply Ampere's law and the Law of Biot-Savart to calculate magnetic fields.
8. Evaluate if magnetic flux changes and if an electric field or electric current is induced. Determine the direction of the induced current or the non-Coulomb electric field by applying Lenz's law. Apply Faraday's law to relate the rate of change of magnetic flux with the magnitude of emf induced.
9. Calculate and discuss properties of electric circuits (dc) with resistors, capacitors, and inductors applying Kirchhoff's rules or Ohm's law. 1
10. Discuss how the presence of a capacitor or an inductor modifies the behavior of a (dc) circuit and determine the time dependence of the current. 1
11. For a series RLC-circuit (or RC, LC, RL) with an ac-voltage source apply the concept of impedance or reactance to calculate the current through or voltages across each of the circuit elements, especially in the low-frequency limit, high-frequency limit, or at the resonant frequency.

PHYS 2140L. Electricity & Magnetism Laboratory
1 Credit (3P)
Laboratory experiments associated with the material presented in PHYS 2140.
Prerequisite: a C- or better in PHYS 2110 or PHYS 1310G.
Prerequisite/Corequisite: PHYS 2140.

Learning Outcomes

1. Develop a reasonable hypothesis.
2. Work effectively as part of a team.
3. Take measurements and record measured quantities to the appropriate precision.
4. Estimate error sources in experimental techniques.
5. Apply appropriate methods of analysis to raw data, including using graphical and statistical methods via computer-based tools.
6. Determine whether results and conclusions are reasonable.
7. Present experimental results in written form in appropriate style and depth.
8. Understand the relationship between theory and experiment.

PHYS 2141. Supplemental Instruction to PHYS 2140
1 Credit (1)
Optional workshop as a supplement to PHYS 2140. The tutorial sessions focus on reasoning and hands-on problem solving.
Corequisite: PHYS 2140.

Learning Outcomes

1. Analyze real-world phenomena by constructing simplified idealized models and appropriate mathematical reasoning to make predictions or explain a phenomenon or function.
2. Use multiple representations to build, interpret and communicate the model, including visual representations such as sketches or diagrams, mathematical expressions, graphs, or text.
3. In the contexts of concepts and physical laws discussed in PHYS 2140, apply quantitative analysis to solve problems, including the use of symmetry to study electric and magnetic fields. Practice concepts of calculus applied to charge and current distributions.
4. Self-check reasonableness of assumptions and solutions, making use of limiting cases or symmetry arguments.
5. Develop learning strategies and use metacognition to promote thinking in the discipline.

PHYS 2230G. General Physics for Life Science I
3 Credits (3)
This algebra-based introduction to general physics covers mechanics, waves, sound, and heat. Special emphasis is given to applications in the life sciences. This course is recommended for students in the life sciences and those preparing for the physics part of the MCAT.
Prerequisite: A C- or better in MATH 1220G or higher.

Learning Outcomes

1. Modeling: analyze real-world phenomena by deciding what information is relevant and constructing simplified idealized models and appropriate mathematical reasoning to make predictions or explain phenomena or function; use multiple representations to build, interpret and communicate the model,including visual representations such as sketches or diagrams, mathematical expressions, graphs, or text; critique assumptions and determine how to test the validity of a model and use the comparison of experimental data and prediction to refine the model.
2. Conceptual understanding: describe the motion of any object in terms of displacement, velocity, and acceleration; analyze external forces acting on an object and determine if a system is in equilibrium or relate the net force to changes in motion; predict or analyze motion using conservation laws for energy and momentum; analyze forces and torques fora rigid object in static equilibrium; for a static fluid determine pressure and the buoyant force; apply idealized models of fluid flow to the circulatory system; describe the properties of pressure waves known as sound, apply the model of standing waves to musical instruments and discuss how sound is used to sense the environment; predict qualitative changes in the internal energy of a thermodynamic system when energy has been transferred due to work or heat and justify those predictions using conservation of energy (First law of thermodynamics). Identify which heat transfer processes occur in a described situation.
3. Quantitative reasoning: use a physics problem-solving strategy (Identify relevant concepts; Introduce and study simplified models; Use symmetry arguments; Establish the relation between known and unknown quantities; Calculate a quantitative result using appropriate mathematical methods; Self-check reasonableness of assumptions and solutions); use scientific notation accurately and convert units if necessary.
4. Communicating scientific information: interpret or generate graphs or other visual representations and be able to switch between various representations including text,mathematical description, or diagrams.

PHYS 2230L. Laboratory to General Physics for Life Science I
1 Credit (1)
Laboratory experiments in topics associated with material presented in PHYS 2230G.
Prerequisite(s)/Corequisite(s): PHYS 2230G. Restricted to Las Cruces campus only.

PHYS 2231. Supplemental Instruction to General Physics for Life Sciences I
1 Credit (1)
This optional workshop supplements Physics for Life Sciences I. The tutorial sessions focus on reasoning and hands-on problem solving.
Corequisite: PHYS 2230G.

Learning Outcomes

1. analyze real world phenomena by constructing simplified idealized models and appropriate mathematical reasoning to make predictions or explain a phenomena or function.
2. use multiple representations to build, interpret and communicate the model, including visual representations such as sketches or diagrams, mathematical expressions, graphs, or text.
3. in the contexts of concepts and physical laws discussed in PHYS 2230, apply quantitative analysis to solve problems, including the use of scientific notation, unit conversion and vector algebra.
4. self-check reasonableness of assumptions and solutions, making use of limiting cases or symmetry arguments.
5. develop learning strategies and use metacognition to promote thinking in the discipline.

PHYS 2240G. General Physics for Life Science II
3 Credits (3)
This algebra-based course covers electricity, magnetism, light, atomic physics, and radioactivity. Special emphasis is given to applications in the life sciences This course is recommended for students in the life sciences and those preparing for the physics part of the MCAT.
Prerequisite: a C- or better in PHYS 1230G or PHYS 2230G, and MATH 1220G or higher.

Learning Outcomes

1. Modeling: analyze real world phenomena by constructing simplified idealized models (an abstract description) that allow making predictions or explaining a phenomena or function; use multiple representations to build and communicate the model, including sketches, mathematical expressions, diagrams or graphs; decide what information is relevant and critique assumptions and models

of others; determine how to test the validity of a model and use comparison of experimental data and prediction to refine the model.
2. Conceptual understanding: electric or magnetic fields can be used to describe interactions of objects that contain charges with their surroundings; changes that occur as a result of interactions are constrained by conservation laws (such as conservation of energy, conservation of charge or conservation of nucleon number); many macroscopic properties of materials can be described using microscopic models or related to their geometry; electromagnetic radiation can be modeled as a wave or as fundamental particles (photons); the direction of propagation of a wave may change when it encounters a boundary surface between two media of different properties (reflection or refraction); the spontaneous radioactive decay of nuclei is described by probability.
3. Quantitative reasoning: apply quantitative analysis and appropriate mathematical reasoning to describe or explain phenomena; use scientific notation accurately and convert units if necessary.
4. Communicating scientific information: interpretor generate graphs or other visual representations (e.g. field lines, equipotential lines) and be able to switch between various representations including text, mathematical description, or diagrams.

PHYS 2240L. Laboratory to General Physics for Life Science II
1 Credit (1)
Laboratory experiments in topics associated with material presented in PHYS 2240.
Prerequisite(s)/Corequisite(s): PHYS 2240G. Restricted to Las Cruces campus only.

PHYS 2241. Supplemental Instruction to General Physics for Life Sciences II
1 Credit (1)
This optional workshop is a supplement to Physics for Life Science II. The tutorial sessions focus on reasoning and hands-on problem solving. May be repeated up to 1 credits.
Corequisite(s): PHYS 2240G.
Learning Outcomes
1. analyze real world phenomena by constructing simplified idealized models and appropriate mathematical reasoning to make predictions or explain a phenomena or function.
2. use multiple representations to build, interpret and communicate the model, including visual representations such as sketches or diagrams, mathematical expressions, graphs, or text.
3. in the contexts of concepts and physical laws discussed in PHYS 2240, apply quantitative analysis to solve problems, including the use of scientific notation, unit conversion and vector algebra.
4. self-check reasonableness of assumptions and solutions, making use of limiting cases or symmetry arguments.
5. develop learning strategies and use metacognition to promote thinking in the discipline.

PHYS 2996. Special Topics
1,4 Credits
Topics to be announced in the Schedule of Classes. May be repeated up to 12 credits.
Learning Outcomes
1. Varies.

PHYS 2997. Independent Study
1-3 Credits
Individual analytical or laboratory studies directed by a faculty member. May be repeated for a maximum of 6 credits.
Prerequisite: consent of instructor.
Learning Outcomes
1. Varies