

sized) objects. Beginning with mechanics and motion, we develop methods for mathematically describing the way objects move and predicting their future movement. The course proceeds to study wave motion with springs, strings, water, sound, and light. We will take advantage of the power of calculus to depict movement by weaving its structure into our physical laws and theories. Since the development of both calculus and Newtonian mechanics by Sir Isaac Newton, calculus and physics have been intertwined, and students in this course will see these close connections. Credit will not be granted for both PHS 201 and 211.

- 212. Physics for Scientists and Engineers II (4).** *Prerequisites: PHS 211 and MS 126. Concurrent enrollment in PHS 214 is required.* The second semester of this sequence begins by studying electricity and basic circuits, followed by magnetism. A section on light, including lenses and mirrors, follows. The behavior of light waves, such as rainbows and soap bubbles, will also be explored. Finally, topics from quantum mechanics and special relativity are introduced to give students a flavor of the revolutionary nature of these topics in their original scientific setting. Once again, calculus will be used throughout the course. Credit will not be granted for both PHS 202 and 212.
- 213. Elementary Laboratory Techniques I (1).** *Concurrent enrollment in PHS 211 is required.* Two laboratory hours each week. Concepts of physics developed in the associated courses will be studied through the use of hands-on activities. Students will work in groups to explore topics in motion, mechanics, waves, and sound.
- 214. Elementary Laboratory Techniques II (1).** *Concurrent enrollment in PHS 212 is required.* Two laboratory hours each week. Concepts of physics developed in the associated courses will be studied through the use of hands-on activities. Students will work in groups to explore topics in electricity, magnetism, optics, and modern physics.

#### COURSES FOR WHICH PHS 202 OR 212 ARE PREREQUISITES

- 383. Special Topics (3).** This course will explore a topic of current interest in the field of physics. May be taken twice for a total of six semester hours.

#### COURSES FOR WHICH PHS 211, 213, 212, AND 214 ARE PREREQUISITES

- 301. Modern Physics (3).** Explore the two 20th century revolutions in physics: quantum mechanics and special relativity. We will study the evidence that led to the acceptance of each of these theories and some of the implications of these theories. Both quantum mechanics and relativity have become part of the popular culture. This course offers the opportunity to understand their ideas in their original context and see how popular culture usage differs from scientific usage.
- 303. Classical Mechanics (3).** This course investigates various aspects of classical mechanics, including kinematics and dynamics of motion, rigid bodies, oscillatory motion, central forces and gravitation, and Lagrangian and Hamiltonian formulations of classical mechanics.
- 343. Electromagnetism I (3).** *Additional prerequisite: MS 227.* Electric and magnetic fields will be studied. What are their origins? What features of nature affect the nature and strength of the fields? What are some of their effects? Maxwell's equations uniting all of electricity and magnetism will be seen in their full glory.
- 491. Quantum Mechanics I (3).** *Additional prerequisites: PHS 301 and MS 344.* This course extends the investigation of quantum mechanics begun in PHS 301 to include the full mathematical development of the theory. Basic tools, including linear operators and matrices, will be used to explore physical systems, such as a particle in a box, a linear harmonic oscillator, the hydrogen atom, and a one-dimensional crystal.

#### COOPERATIVE EDUCATION PROGRAM

Cooperative education is a structured educational strategy integrating classroom studies with learning through productive paid work experiences in a field related to the student's academic or career goals. It provides progressive experiences in integrating theory and practice. Co-Op brings together the university, the business and professional community, and students in a collaborative effort with specified responsibilities for each party. Academic credit is not awarded for participation in the cooperative education program. A pass/fail notation is entered on the transcript upon completion of the semester's work experience.

In order to qualify for cooperative education, a student must meet the following qualifications:

1. The student must satisfactorily complete a minimum of 24 semester hours prior to entering the program. Employers may suggest a lower minimum hour requirement.
2. The student must meet and maintain a 2.50 (4.00 scale) grade point average. Employers may establish higher GPA requirements.
3. The student must have the recommendation of two professors and a completed file in the Career Services Office. To apply for the cooperative education program, contact the Career Services Office at 256-782-5092 or visit [http://www.jsu.edu/careerservices/students/student\\_co\\_op.html](http://www.jsu.edu/careerservices/students/student_co_op.html). Upon approval of the cooperative education coordinator and the employer, the student will register for the following alternating or parallel cooperative education courses.

**CEA-001 Through 012. Alternating Co-Op Education (0)** Cooperative education experience of full-time employment (approximately 40 hrs./week) is equivalent to full-time student status, with the exception of financial aid. (Contact Financial Aid for additional information.)