

# Physics Courses

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## Courses

### **PHYS 1403. General Physics I.**

General Physics I: [TCCN PHYS 1401] A non-calculus treatment of mechanics and heat. Laboratory experience is an essential component of this course. May not be counted toward a major or minor in physics. Fees required.

**Department:** Physics

**4 Credit Hours**

**5 Total Contact Hours**

2 Lab Hours

3 Lecture Hours

0 Other Hours

**Prerequisite(s):** (MATH 1320 w/C or better ) OR (MATH 1508 w/C or better ) OR (MATH 1411 w/C or better ) OR (MATH 1312 w/C or better ) OR (MATH 2313 w/C or better ) OR (MATH 1309 w/C or better ) OR (MATH 2301 w/C or better ) OR (SXDG score of 1 ) OR (SXMA score of 1 ) OR (SXMN score of 1 ) OR (SXOI score of 1 ) OR (SXTR score of 1 ) OR (MATH 1310 w/C or better)

### **PHYS 1404. General Physics II.**

General Physics II: [TCCN PHYS 1402] A continuation of PHYS 1403 treating topics in electricity, magnetism, sound, and light. May not be counted toward a major or minor in physics. Fees required.

**Department:** Physics

**4 Credit Hours**

**5 Total Contact Hours**

2 Lab Hours

3 Lecture Hours

0 Other Hours

**Prerequisite(s):** (PHYS 1403 w/C or better)

### **PHYS 2120. Laboratory for PHYS 2320.**

Laboratory to accompany PHYS 2320. Prerequisites: MATH 1411 with a grade of C or better; may be taken concurrently.

**Department:** Physics

**1 Credit Hour**

**2 Total Contact Hours**

2 Lab Hours

0 Lecture Hours

0 Other Hours

**Prerequisite(s):** (MATH 1411 w/C or better ) OR (MATH 1312 w/C or better ) OR (MATH 2313 w/C or better)

**Corequisite(s):** PHYS 2320

### **PHYS 2121. Laboratory for PHYS 2321.**

Laboratory to accompany PHYS 2321. Prerequisites: PHYS 2320 and PHYS 2120, each with a grade of C or better; MATH 1312 with a grade of C or better, may be taken concurrently.

**Department:** Physics

**1 Credit Hour**

**2 Total Contact Hours**

2 Lab Hours

0 Lecture Hours

0 Other Hours

**Prerequisite(s):** (MATH 1312 w/C or better ) OR (MATH 2313 w/C or better ) OR (MATH 2326 w/C or better ) AND (PHYS 2120 w/C or better AND PHYS 2320 w/C or better ) OR (PHYS 2420 w/C or better)

**Corequisite(s):** PHYS 2321

**PHYS 2210. Vibrations and Waves.**

Forced oscillations and resonance. Coupled oscillations and normal modes. Transverse waves. Longitudinal waves. Boundary effects and interference. Standing waves and normal modes. Diffraction. Polarization. Non-linear oscillations and chaos. Non-linear waves and solitons.

**Department:** Physics

**2 Credit Hours**

**2 Total Contact Hours**

0 Lab Hours

2 Lecture Hours

0 Other Hours

**Prerequisite(s):** (PHYS 2420 w/C or better ) OR (PHYS 2120 w/C or better AND PHYS 2320 w/C or better)

**PHYS 2230. Thermal and Fluid Physics.**

Thermal and Fluid Physics: An introduction to thermal physics and introductory fluid dynamics. The properties of gases, temperature, internal energy, heat, and the first and second laws of thermodynamics. Buoyancy and Archimedes principle, simple hydrodynamics of compressible and incompressible flow, Bernoulli's equation, and convection. Prerequisite: PHYS 2420 with a grade of "C" or better.

**Department:** Physics

**2 Credit Hours**

**2 Total Contact Hours**

0 Lab Hours

2 Lecture Hours

0 Other Hours

**Prerequisite(s):** (PHYS 2420 w/C or better ) OR (PHYS 2120 w/C or better AND PHYS 2320 w/C or better)

**PHYS 2320. Introductory Mechanics.**

Kinematics and dynamics of particles and rigid bodies using vectors and calculus; Newton's Laws; conservation of energy and momentum. Prerequisites: MATH 1411 with a grade of C or better; may be taken concurrently.

**Department:** Physics

**3 Credit Hours**

**3 Total Contact Hours**

0 Lab Hours

3 Lecture Hours

0 Other Hours

**Prerequisite(s):** (MATH 1411 w/C or better ) OR (MATH 1312 w/C or better ) OR (MATH 2313 w/C or better)

**Corequisite(s):** PHYS 2120

**PHYS 2321. Introductory Electromagnetism.**

Electric field and potential; elementary circuits and Ohm's Law; current and magnetism; time varying fields and electromagnetic waves. Prerequisites: PHYS 2320 and MATH 1312, each w/grade of C or better. MATH 1312 may be taken concurrently with PHYS 2321.

**Department:** Physics

**3 Credit Hours**

**3 Total Contact Hours**

0 Lab Hours

3 Lecture Hours

0 Other Hours

**Prerequisite(s):** (MATH 1312 w/C or better ) OR (MATH 2313 w/C or better ) OR (MATH 2326 w/C or better ) AND (PHYS 2120 w/C or better AND PHYS 2320 w/C or better ) OR (PHYS 2420 w/C or better)

**Corequisite(s):** PHYS 2121

**PHYS 2325. Survey of Modern Physics.**

Survey of special relativity theory and quantum physics applied to atoms, molecules, nuclei, and the solid state. Prerequisite: PHYS 2421, with a grade of "C" or better.

**Department:** Physics

**3 Credit Hours**

**6 Total Contact Hours**

3 Lab Hours

3 Lecture Hours

0 Other Hours

**Prerequisite(s):** (PHYS 2421 w/C or better ) OR (PHYS 2121 w/C or better AND PHYS 2321 w/C or better)

**PHYS 2420. Introductory Mechanics.**

Introductory Mechanics: Dynamics of particles and rigid bodies using vectors and calculus, conservation of energy and momentum, and kinetic theory.

MATH 1411 may be taken concurrently with PHYS 2420. [TCCN PHYS 2425]

**Department:** Physics

**4 Credit Hours**

**NaN Total Contact Hours**

0-3 Lab Hours

0-3 Lecture Hours

0 Other Hours

**Prerequisite(s):** (MATH 1411 w/C or better ) OR (MATH 1312 w/C or better ) OR (MATH 2313 w/C or better)

**PHYS 2421. Introductory Electromagnetism.**

Introductory Electromagnetism: Electric field and potential; current and magnetism; time varying fields and electro magnetic waves. MATH 1312 may be taken concurrently with PHYS 2421. [TCCN PHYS 2426]

**Department:** Physics

**4 Credit Hours**

**NaN Total Contact Hours**

0-3 Lab Hours

0-3 Lecture Hours

0 Other Hours

**Prerequisite(s):** (PHYS 2420 w/D or better ) OR (PHYS 2120 w/D or better AND PHYS 2320 w/D or better)

**PHYS 3243. Advanced Laboratory Practice.**

Advanced Laboratory Practice: Topics in and practices of experimental physics. May be repeated three times for credit. Prerequisite: PHYS 2421. Fees required.

**Department:** Physics

**2 Credit Hours**

**6 Total Contact Hours**

6 Lab Hours

0 Lecture Hours

0 Other Hours

**Prerequisite(s):** (PHYS 2421 w/C or better ) OR (PHYS 2121 w/C or better AND PHYS 2321 w/C or better)

**PHYS 3280. Physics Seminar.**

A course designed to learn oral presentation skills. Students will do oral presentations and prepare a formal written paper on topics from the physics literature or from undergraduate research projects.

**Department:** Physics

**2 Credit Hours**

**2 Total Contact Hours**

0 Lab Hours

2 Lecture Hours

0 Other Hours

**PHYS 3323. Physical Optics.**

Physical Optics: Wave propagation, interference, diffraction, absorption, scattering, and polarization. The theory and operation of lasers and optical resonant cavities are introduced. Prerequisites: PHYS 2421 and MATH 2326.

**Department:** Physics

**3 Credit Hours**

**3 Total Contact Hours**

0 Lab Hours

3 Lecture Hours

0 Other Hours

**Prerequisite(s):** (PHYS 2421 w/C or better ) OR (PHYS 2121 w/C or better AND PHYS 2321 w/C or better ) AND (MATH 2326 w/C or better)

**PHYS 3331. Thermal Physics.**

Thermal Physics: Introduction to statistical mechanics and thermodynamics. Prerequisite: PHYS 2421 and MATH 2313 each with a grade of "C" or better.

**Department:** Physics

**3 Credit Hours**

**3 Total Contact Hours**

0 Lab Hours

3 Lecture Hours

0 Other Hours

**Prerequisite(s):** (PHYS 2421 w/C or better ) OR (PHYS 2121 w/C or better AND PHYS 2321 w/C or better ) AND (MATH 2313 w/C or better ) OR (MATH 2326 w/C or better)

**PHYS 3351. Analytical Mechanics I.**

Analytical Mechanics: Newtonian mechanics of particles and rigid bodies.

**Department:** Physics

**3 Credit Hours**

**3 Total Contact Hours**

0 Lab Hours

3 Lecture Hours

0 Other Hours

**Prerequisite(s):** (PHYS 2421 w/C or better ) OR (PHYS 2121 w/C or better AND PHYS 2321 w/C or better ) AND (MATH 2326 w/C or better)

**PHYS 3352. Analytical Mechanics II.**

Analytical Mechanics II: Topics in mechanics such as mechanics of deformable bodies and application of Lagrangian and Hamiltonian formulations.

Prerequisite: PHYS 3351.

**Department:** Physics

**3 Credit Hours**

**3 Total Contact Hours**

0 Lab Hours

3 Lecture Hours

0 Other Hours

**Prerequisite(s):** (PHYS 3351 w/C or better)

**PHYS 3359. Astrophysics.**

Astrophysics: An introduction to the physical basis of modern astrophysics: stellar structure and evolution, star formation, compact objects, high-energy astrophysics and cosmology. Prerequisites: PHYS 2421 and MATH 2325 and MATH 2326.

**Department:** Physics

**3 Credit Hours**

**3 Total Contact Hours**

0 Lab Hours

3 Lecture Hours

0 Other Hours

**Prerequisite(s):** (MATH 2326 w/C or better ) AND (PHYS 2421 w/C or better ) OR (PHYS 2121 w/C or better AND PHYS 2321 w/C or better)

**PHYS 3360. Comp Methods-Physics Problems.**

Computational Methods for Physics Problems: This course introduces students to numerical solutions of physical problems. Topics to be covered are: numerical methods for simulating single particle motion, trajectories in 2D and 3D, oscillatory motion, 2D and 3D motion of a charged particle in an electromagnetic field, dynamics of a driven pendulum, damp driven pendulum, classical scattering cross-sections for Yukawa potential, planetary motion, solution of one dimensional Schrodinger equation, random numbers, introduction to classical Monte Carlo method, and determining the geometry of a small cluster with classical potential.

**Department:** Physics

**3 Credit Hours**

**3 Total Contact Hours**

2 Lab Hours

1 Lecture Hour

0 Other Hours

**Prerequisite(s):** (MATH 2326 w/C or better AND PHYS 2325 w/C or better AND PHYS 3351 w/C or better)

**PHYS 4177. Undergrad Resrch Probs Physics.**

Undergraduate Research Problems in Physics: Supervised individual research. May be repeated for credit. Prerequisite: Department approval.

**Department:** Physics

**1 Credit Hour**

**1 Total Contact Hour**

0 Lab Hours

0 Lecture Hours

1 Other Hour

**PHYS 4277. Undergrad Resrch Probs Physics.**

Undergraduate Research Problems in Physics: Supervised individual research. May be repeated for credit. Students taking this course to partially fulfill the requirements for the B.S. degree with departmental honors in physics must complete six semester hours of PHYS 4177-4377 and submit an undergraduate thesis on the research accomplished. Prerequisite: Senior standing with a 3.2 grade point average or better and permission of both the research advisor and the department undergraduate advisor.

**Department:** Physics

**2 Credit Hours**

**2 Total Contact Hours**

0 Lab Hours

0 Lecture Hours

2 Other Hours

**Classification Restrictions:**

Restricted to class of SR

**PHYS 4327. Atmospheric Physics.**

The physical structure and dynamics of the atmosphere. Composition and structure of the earth's atmosphere, cloud formation, atmospheric thermodynamics, fundamentals of atmospheric dynamics, overview of climatology. Prerequisites: PHYS 2420 AND PHYS 2421 AND MATH 2326. Departmental approval also required.

**Department:** Physics

**3 Credit Hours**

**3 Total Contact Hours**

0 Lab Hours

3 Lecture Hours

0 Other Hours

**Prerequisite(s):** (MATH 2326 w/C or better ) AND (PHYS 2420 w/C or better ) OR (PHYS 2120 w/C or better AND PHYS 2320 w/C or better ) AND (PHYS 2421 w/C or better ) OR (PHYS 2121 w/C or better AND PHYS 2321 w/C or better)

**PHYS 4329. Atmospheric Radiation.**

Solar radiation, radiative flux in the atmosphere, Beer-Lambert Law, scattering and absorption from aerosols, optical studies of aerosols, actinic flux, photolysis, photodissociation, energy balance, radiative transfer, Earth's energy budget.

**Department:** Physics

**3 Credit Hours**

**3 Total Contact Hours**

0 Lab Hours

3 Lecture Hours

0 Other Hours

**Prerequisite(s):** (MATH 2326 w/C or better ) AND (PHYS 2421 w/C or better ) OR (PHYS 2121 w/C or better AND PHYS 2321 w/C or better)

**PHYS 4341. Electromagnetics I.**

Electromagnetics I: Electromagnetic theory via Maxwell's equations. Prerequisites: PHYS 2421 and MATH 3335.

**Department:** Physics

**3 Credit Hours**

**3 Total Contact Hours**

0 Lab Hours

3 Lecture Hours

0 Other Hours

**Prerequisite(s):** (PHYS 2421 w/C or better ) OR (PHYS 2121 w/C or better AND PHYS 2321 w/C or better ) AND (MATH 3335 w/C or better)

**PHYS 4342. Electromagnetics II.**

Electromagnetics II: Advanced topics in electrodynamic theory such as electrodynamic waves and radiation and relativistic electrodynamics.

Prerequisites: PHYS 4341.

**Department:** Physics

**3 Credit Hours**

**3 Total Contact Hours**

0 Lab Hours

3 Lecture Hours

0 Other Hours

**Prerequisite(s):** (PHYS 4341 w/C or better)

**PHYS 4353. Mathematical Physics Methods.**

Selected Topics in Mathematical Physics: Examples of topics are: approximations in physics, symmetries, asymptotic behavior of physical systems, and physical systems with singular distribution. Prerequisites: PHYS 2420 and PHYS 2421 (may be taken concurrently) and MATH 2326 (may be taken concurrently). Departmental approval also required.

**Department:** Physics

**3 Credit Hours**

**3 Total Contact Hours**

0 Lab Hours

3 Lecture Hours

0 Other Hours

**Prerequisite(s):** (MATH 2326 w/D or better ) AND (PHYS 2420 w/D or better ) OR (PHYS 2120 w/D or better AND PHYS 2320 w/D or better ) AND (PHYS 2421 w/D or better ) OR (PHYS 2121 w/D or better AND PHYS 2321 w/D or better)

**PHYS 4355. Intro Quantum Mechanics.**

Introductory Quantum Mechanics: Wave mechanics fundamentals, one-dimensional eigenvalue problems, angular momentum and spin, the hydrogen atom, and quantum statistics. Prerequisites: PHYS 3325 and MATH 2326 each with a grade of "C" or better.

**Department:** Physics

**3 Credit Hours**

**3 Total Contact Hours**

0 Lab Hours

3 Lecture Hours

0 Other Hours

**Prerequisite(s):** (PHYS 2325 w/C or better ) AND (MATH 2326 w/C or better)

**PHYS 4356. Atoms, Molecules, & Solids.**

Atoms, Molecules, and Solids: Multielectron atoms and molecules. Structure of solids, band theory of conduction, and other quantum properties of solids. Prerequisite: PHYS 4355.

**Department:** Physics

**3 Credit Hours**

**3 Total Contact Hours**

0 Lab Hours

3 Lecture Hours

0 Other Hours

**Prerequisite(s):** (PHYS 4355 w/C or better)

**PHYS 4370. Health Physics I.**

Health Physics I: The physics of ionizing radiation; charged particle, neutron, and high-energy photon interactions; natural and man-made sources of radioactivity, their production and detection. Prerequisites: PHYS 3325 and MATH 2326 or MATH 3326.

**Department:** Physics

**3 Credit Hours**

**3 Total Contact Hours**

0 Lab Hours

3 Lecture Hours

0 Other Hours

**Prerequisite(s):** (PHYS 3325 w/C or better ) OR (PHYS 2325 w/C or better ) AND (MATH 2326 w/C or better)

**PHYS 4371. Health Physics II.**

Health Physics II: Topics include radiation quantities and units, detection electronics, statistics, detectors and dosimeters. Also includes topics in radiation dose evaluation, radiation biophysics, and laboratory experiences in electromagnetic and particulate radiation detection and dosimetric methods. Prerequisites: PHYS 4370 and two semesters of PHYS 3243. Course fee required.

**Department:** Physics

**3 Credit Hours**

**5 Total Contact Hours**

3 Lab Hours

2 Lecture Hours

0 Other Hours

**Prerequisite(s):** (PHYS 4370 w/C or better ) AND (PHYS 3243 w/C or better)

**PHYS 4377. Undergrad Resrch Probs Physics.**

Undergraduate Research Problems in Physics: Supervised individual research. May be repeated for credit. Students taking this course to partially fulfill the requirements for the B.S. degree with departmental honors in physics must complete six semester hours of PHYS 4277 and/or PHYS 4377 and submit an undergraduate thesis on the research accomplished. Prerequisite: Senior standing with a 3.2 grade point average or better and permission of both the research advisor and the department undergraduate advisor.

**Department:** Physics

**3 Credit Hours**

**3 Total Contact Hours**

0 Lab Hours

0 Lecture Hours

3 Other Hours

**Classification Restrictions:**

Restricted to class of SR

**PHYS 4393. Special Topics in Physics.**

Special Topics in Physics: Topics to be announced. May be repeated for credit.

**Department:** Physics

**3 Credit Hours**

**3 Total Contact Hours**

0 Lab Hours

3 Lecture Hours

0 Other Hours