

Department of Physics and Astronomy

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The Department of Physics and Astronomy offers students the opportunity to study the fundamental principles and methodologies of physics for careers at the bachelor's level, or in preparation for graduate study in physics or engineering. We also have a great program for students interested in teaching physics in a high school setting, as well as specially tailored programs in astronomy, astrophysics, and medical physics. The Physics Common Requirements form the framework for the physics major. Each student then chooses an area of concentration that parallels their professional goals.

The departmental program of study leads to a Bachelor of Science degree in Physics. Students must also choose from one of the following concentrations: Professional Physics, Physics Teaching, or Astronomy. The department also offers minors in Physics, Electro-Acoustics, and Astronomy.

Curricular listings include General Education requirements in Communication, History, Humanities and/or Fine Arts, Mathematics, Natural Sciences, and Social/Behavioral Sciences categories as outlined on pages 64–67.

Major in Physics

Physics Common Requirements

(Required of ALL Physics Majors)

The physics core consists of 24 semester hours of physics and astronomy. Other requirements include 8 semester hours of chemistry, and 8 semester hours of mathematics. All physics majors must then choose to concentrate in Professional Physics, Physics Teaching, or Astronomy. Each concentration specifies additional upper-division electives in physics and astronomy, and other disciplines, which vary by concentration. A minimum of 12 upper-division semester hours in the physics major must be taken at MTSU. The Physics Common Requirements consist of:

Physics Core

PHYS 2010/2011	Non-Calculus-based Physics I
– or – PHYS 2110/2111	Calculus-based Physics I
PHYS 2020/2021	Non-Calculus-based Physics II
– or – PHYS 2120/2121	Calculus-based Physics II
PHYS 3100*	Modern Physics I
PHYS 3110*	Modern Physics II
PHYS 3111	Modern Physics Lab
PHYS 3610*	Thermodynamics
PHYS 3800	Physics Seminar
PHYS 3900	Physics Practicum
PHYS 4850	Physics Research
– or – ASTR 4850	Astronomy Research
PHYS 4900	Physics Thesis
– or – ASTR 4900	Astronomy Thesis

Other Requirements

CHEM 1110/1111	General Chemistry I
CHEM 1120/1121	General Chemistry II
MATH 1910	Calculus I
MATH 1920	Calculus II

* PHYS 3070, PHYS 3080, PHYS 3510 can be substituted for PHYS 3100, PHYS 3110, PHYS 3610, respectively, for students in the Physics Teaching or Astronomy concentrations. These substitutions are not allowed for the Professional Physics concentration.

Concentration: Professional Physics

The Professional Physics concentration is designed to prepare students for graduate work in physics, medical physics, astrophysics, or engineering. In addition to the Physics Common Requirements, the following courses are required:

PHYS 3150	Theoretical Physics I
PHYS 3160	Theoretical Physics II
PHYS 3200	Scientific Modeling
PHYS 3300	Classical Mechanics
PHYS 4310	Electricity and Magnetism I
PHYS 4330	Electricity and Magnetism II
PHYS 4380	Quantum Mechanics

Professional Physics: Recommended Sequence

FRESHMAN		SOPHOMORE	
PHYS 2110/2111 (Nat Sci)	4	PHYS 3100	3
PHYS 2120/2121	4	PHYS 3110	3
MATH 1910 (Math)	4	PHYS 3150	3
MATH 1920	4	PHYS 3160	3
CHEM 1110/1111 (Nat Sci)	4	COMM 2200 (Comm)	3
CHEM 1120/1121	4	HIST 2010,2020,or 2030 (History)	6
ENGL 1010, 1020 (Comm)	6	Electives	9
	30		30

Consult with a physics advisor for courses to take during the junior and senior years.

Professional Physics: Medical Physics Track

The Medical Physics track is designed to prepare students for graduate work in medical physics and radiation oncology physics, eventually leading to a career as a medical physicist in a clinical or academic setting. In addition to the Physics Common Requirements and the Professional Physics concentration requirements, the following courses are recommended:

PHYS 3600	Radiation Oncology Physics
PHYS 3601	Medical Physics Practicum
PHYS 4600	Topics in Medical Physics
BIOL 2010/2011	Human Anatomy and Phys. I
BIOL 2020/2021	Human Anatomy and Phys. II

Professional Physics: Astrophysics Track

The Astrophysics track is designed to prepare students for graduate work in astronomy or astrophysics. In addition to the Physics Common Requirements and the Professional Physics concentration requirements, the following courses are recommended:

ASTR 1031	Observing the Universe
ASTR 2030	Solar System Astronomy
ASTR 2040	Stars, Galaxies, and Cosmology
ASTR 3400	Fundamentals of Astrophysics
ASTR 3401	Experimental Astronomy

Concentration: Physics Teaching

The Physics Teaching concentration is designed to prepare students for careers as physics teachers, as well as serving as an appropriate degree path for other physics majors that do not plan on attending graduate school. In addition to the Physics Common Requirements, the following courses are required:

PHYS 3930	Teaching of Physics
PHYS 3950	Physics Licensure
ASTR 1030	Exploring the Universe

Supporting courses, also required:

BIOL 1110/11	General Biology I
MATH 2050	Probability and Statistics
(MATH 3120	Differential Equations
– or – PHYS 3150)	Theoretical Physics I

Contact the Physics and Astronomy department office for scholarship opportunities for Physics Teaching students.

Teacher Licensure in Physics

Students seeking a license to teach physics in secondary schools (grades 7-12) must complete (1) a major in physics with a concentration in Physics Teaching, and (2) a minor in Secondary Education.

Secondary Education Minor Requirements

Students must contact their Secondary Education minor advisors for approval of appropriate courses.

NOTE: See Department of Educational Leadership on page 166 for Secondary Education minor requirements.

Physics Teaching: Recommended Sequence

FRESHMAN		SOPHOMORE	
PHYS 2010/2011 (Nat Sci)	4	PHYS 3070	3
PHYS 2020/2021	4	PHYS 3080	3
MATH 1910 (Math)	4	MATH 2050	3
MATH 1920	4	MATH 3120	3
CHEM 1110/1111 (Nat Sci)	4	COMM 2200 (Comm)	3
CHEM 1120/1121	4	HIST 2010,2020,or 2030 (History)	6
ENGL 1010, 1020 (Comm)	6	Electives	9
	30		30

Consult with a physics advisor for courses to take during the junior and senior years.

Concentration: Astronomy

The Astronomy concentration is designed for students interested in a degree specializing in astronomy, but that do not plan on attending graduate school in astronomy or astrophysics. In addition to the Physics Common Requirements, the following courses are required:

ASTR 1031	Observing the Universe
ASTR 2030	Solar System Astronomy
ASTR 2040	Stars, Galaxies, and Cosmology
ASTR 3400	Fundamentals of Astrophysics
ASTR 3401	Experimental Astronomy

Supporting course, also required:

(MATH 3120	Differential Equations
– or – PHYS 3150)	Theoretical Physics I

Astronomy: Recommended Sequence

FRESHMAN		SOPHOMORE	
PHYS 2010/2011 (Nat Sci)	4	PHYS 3070	3
PHYS 2020/2021	4	PHYS 3080	3
MATH 1910 (Math)	4	MATH 2050	3
MATH 1920	4	MATH 3120	3
CHEM 1110/1111 (Nat Sci)	4	COMM 2200 (Comm)	3
CHEM 1120/1121	4	HIST 2010,2020,or 2030 (History)	6
ENGL 1010, 1020 (Comm)	6	Electives	9
	30		30

Consult with a physics advisor for courses to take during the junior and senior years.

Minor in Electro-Acoustics

The minor in Electro-Acoustics consists of at least 21 semester hours, 18 of which are required: MATH 1910; PHYS 1600, 3310, and 3350; and ET 3610. The remaining 3 semester hours may be chosen from PHYS 3000, ET 3620, or ET 3660.

Minor in Physics

The minor in physics consists of 19 semester hours in physics and astronomy including PHYS 2010/2011 (or PHYS 2110/2111), and PHYS 2020/2021 (or PHYS 2120/2121). Students minoring in physics should work closely with their physics advisor to tailor a program that meets their needs. At least four upper-division hours must be taken at MTSU.

Minor in Astronomy

The minor in Astronomy consists of 19 semester hours in astronomy and physics, 10 of which are required: ASTR 1031, 3401, PHYS 2010/2011 (or PHYS 2110/2111), and PHYS 2020/2021 (or PHYS 2120/2121). The remaining 9 credits of electives may be chosen from ASTR 1030, 2030, 2040, 3050, and 3400. At least four upper-division hours must be taken at MTSU.

Courses in Astronomy [ASTR]

See back of catalog for course descriptions.

Courses in Physics [PHYS]

See back of catalog for course descriptions.

Honors College

The Department of Physics and Astronomy offers the following courses in Honors: ASTR 1030 and 1031. See online class schedule and Honors information in this catalog.