

PHYSICS

DEPARTMENT OFFICE

2515 New Science Facility

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Physics at NMU

The Physics Department provides courses and training designed for the preparation of physics majors and minors. It also offers courses that provide the background in physics required in other curricula such as engineering, allied health sciences, biology, chemistry and education. Additionally, the department offers courses appropriate for students to meet the liberal studies foundations of natural sciences/mathematics requirement.

The department offers programs leading to a bachelor of science or bachelor of arts degree in physics and secondary education physics, and minor programs in physics and physics education. The department also participates in offering a secondary education general science major. See the "Interdisciplinary and Individually Created Programs" section of this bulletin.

Students seeking careers in engineering, mathematics, chemistry and other physical sciences should take PH 220 and PH 221, which provide a one-year, calculus-based physics sequence with laboratory. Nonphysical science majors and other preprofessional students should plan on taking PH 201 and PH 202. This is a noncalculus-based sequence (including laboratory), which is also suitable for biology majors.

Student Organizations

- Physics Club
- Pre-Medical/Pre-Dental Club
- Student Michigan Education Association

Department/Program Policies

Physics Breakage Fee

Students enrolled in a physics laboratory must pay the cost of replacement for any broken glassware, broken equipment or lost tools in excess of one dollar. Records are maintained in the Physics Department, and students are notified of any amount due after the last laboratory meeting.

Prerequisite Work

Physics courses that indicate prerequisites may be taken only when the prerequisite work has been completed with a grade of "C" or higher.



Grade Point Average Requirements

A grade of "C" or better must be earned in all physics courses that apply to the non-teaching major or minor in physics.

Students majoring in secondary education physics or minoring in physics education must maintain a grade point average of 2.70 or greater with no grade below a "C" in the professional education sequence, the major and/or minors and required cognates combined.

BACHELOR DEGREE PROGRAMS

Liberal Studies: Complete information on the liberal studies requirements and additional graduation requirements, including the health promotion requirement, is in the "Liberal Studies Program and Graduation Requirements" section of this bulletin.

Courses within each major that can be used to satisfy liberal studies requirements are listed with the Roman numeral (in brackets) that coincides with the liberal studies division the course falls under.

Physics Major

This major prepares students for technical or research positions in government or private industry, teaching or graduate study. Physics courses explain and describe physical interactions by utilizing conservation laws and the concepts of force and energy.

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|---|--------------|
| Total Credits Required for Degree | 124 |
| Liberal Studies | 30-40 |
| Health Promotion | 2 |
| Required Courses in Major | 35 |
| PH 220 Introductory Physics I [III] | 5 |
| PH 221 Introductory Physics II [III] | 5 |
| PH 322 Modern Physics | 4 |
| PH 375 Analytical Mechanics <i>or</i> | 3 |
| PH 380 Intermediate Electricity and Magnetism | |
| PH 480 Senior Physics Seminar | 1 |

Physics Electives 17
PH 370, PH 375, PH 380, PH 393, and PH 410 are strongly recommended.

Other Required Courses 10
 CH 111 General Chemistry I [III] 5
 CH 112 General Chemistry II [III] 5

Minor 21

Mathematics minor recommended as follows:

MA 161 Calculus I (5 cr.) [III]
 MA 163 Calculus II (4 cr.) [III]
 MA 211 Introduction to Matrix Theory and Linear Algebra (3 cr.)
 MA 265 Calculus III (3 cr.)
 MA 361 Differential Equations (3 cr.)
 Mathematics Elective (3 cr.)

Secondary Education Physics Major

Completion of the physics courses, a teaching minor and the professional education sequence leads to certification as a secondary teacher of physics. Advising for this major is provided by Carolyn J. Lowe in the School of Education.

Total Credits Required for Degree 150-152

Liberal Studies 30-40
Health Promotion 2

Required Courses in Major 32
 PH 220 Introductory Physics I [III] 5
 PH 221 Introductory Physics II [III] 5
 PH 322 Modern Physics 4

Physics Electives 18

Teaching Minor, minimum 23-25
Mathematics education or chemistry education recommended. If mathematics is not selected, appropriate mathematics courses must be taken as prerequisites for the required physics courses.

Other Required Courses 26
Choose from the following: 8
 AS 103 Observational and Solar System Astronomy (4 cr.) [III] *or*
 GC 255 Physical Geology (4 cr.) [III] *or*
 GC 385 Weather and Climate (4 cr.)
 BI 111 Introductory Biology: Principles [III] 4
 BI 112 Introductory Biology: Diversity [III] 4
 CH 111 General Chemistry I [III] 5
 CH 112 General Chemistry II [III] 5

Professional Education 37
 ED 201 Introduction to Education 2
 ED 231 Teaching and Learning in the Secondary Classroom 4
 ED 301 Dimensions of American Education 2
 ED 319 Teaching of Reading for Secondary Teachers 3
 MSED 340 Fundamental Concepts of Science 4
 ED 349 Teaching for Diversity, Equity and Social Justice in the Secondary School Community 2
 MSED 350 Methods and Materials in Teaching Science Education 4
 ED 361 Special Education and the General Classroom Teacher 2
 ED 483 Educational Media and Technology 2
 ED 430 Teaching in the Secondary School 11
 ED 450 Seminar in Teaching 1

MINOR PROGRAMS

Physics Minor

Total Credits Required for Minor 20

PH 220 Introductory Physics I 5
 PH 221 Introductory Physics II 5
 PH 322 Modern Physics 4
 PH 375 Analytical Mechanics *or* 3
 PH 380 Intermediate Electricity and Magnetism
 Physics Elective 3

Physics Education Minor

Total Credits Required for Minor 20-28

PH 220 Introductory Physics I 5
 PH 221 Introductory Physics II 5
 PH 322 Modern Physics 4
 PH 375 Analytical Mechanics *or* 3
 PH 380 Intermediate Electricity and Magnetism
 Physics Elective 3
 MSED 340 Fundamental Concepts of Science* 4
 MSED 350 Methods and Materials in Teaching* 4

**Not needed if major is biology education, chemistry education, earth science education or integrated science education.*