School of Natural Sciences and Mathematics

Physics (BA, BS)

The science of physics seeks understanding of the behavior of matter and energy at the most general and fundamental level. The physicist is trained to explore the physical universe in which people live and seeks interpretations of the natural phenomena found there. While much is known about the physical universe, many phenomena still remain to be investigated, understood, and exploited to the ultimate benefit of humankind. This is the challenge that a modern physicist faces.

The Degrees

The student majoring in Physics must meet the general University requirements for admission and for the specific degree the student is seeking. The Physics Program offers both the Bachelor of Arts and the Bachelor of Science degrees. A total of 120 semester credit hours is required for either degree. With the proper sequencing of courses, these degrees can be achieved in a four year period.

Bachelor of Arts

The Bachelor of Arts program provides an opportunity for a strong base in physics for students wishing to pursue graduate studies (non-physics) in, for example, business administration, economics, finance, oceanography, and patent or high technology law. Additionally, students seeking certification as high school teachers with physics as a major specialization and those seeking employment in industry, government service, and computer technology have the opportunity to obtain the necessary physics background through the BA program. The lower-division course requirements for the BA degree are the same as those for the BS degree. At the upper-division level, the physics core course are identical with the BS core courses, but the physics elective is replaced with PHYS 4398, Senior Research Project for BA degree and 15 semester credit hours of advanced physics courses are replaced with 15 semester credit hours of upper-division science electives.

Bachelor of Science

The Bachelor of Science is intended for students interested in a professional career in physics or closely related fields. It provides an excellent background for graduate programs in physics, biophysics, geophysics, engineering, medicine and other health related degree programs.

Graduate Studies Track

The recommended course of study toward a Bachelor of Science degree for those students who intend to pursue graduate studies in Physics begins with a two-semester Honors sequence of fundamentals of physics that gives the student a more extensive foundation in basic physics. The remainder of the program is the same as the regular BS program.
Algebra Based Physics

An algebra based general physics course (PHYS 1301, PHYS 1302) with lab (PHYS 2125, PHYS 2126) is offered for students interested in the health sciences and those curious about the physical world in which we live. It stresses understanding the workings of nature and the physical processes and phenomena occurring therein.

Bachelor of Arts in Physics

**Degree Requirements** (120 semester credit hours)\(^1\)

*View an Example of Degree Requirements by Semester*

Faculty

**Distinguished Chair in Natural Sciences and Mathematics:** Roderick A. Heelis

**Green Distinguished Chair in Academic Leadership:** B. Hobson Wildenthal

**Professors:** Phillip C. Anderson, Robert Glosser, Matthew J. Goeckner, Mustapha Ishak-Boushaki, Joseph M. Izen, Mark Lee, Xinchou Lou, Roger Malina, Robert M. Wallace, Anvar A. Zakhidov, Chuanwei Zhang

**Associate Professors:** Lunjin Chen, Yuri Gartstein, Lindsay J. King, David J. Lary, Anton V. Malko, Fabiano Rodrigues, Jason D. Slinker

**Assistant Professors:** Michael Kesden, Michael Kolodrubetz, Lloyd Lumata, Bing Lv, Kaloyan Penev, Xiaoyan Shi, Russell Stoneback, Fan Zhang

**Professors Emeritus:** Austin J. Cunningham, Walter Heikkila, John H. Hoffman, Wolfgang A. Rindler, Myron B. Salamon, Brian A. Tinsley

**Senior Lecturer:** Paul Mac Alevey, Kuei Sun

**UT Dallas Affiliated Faculty:** Yves J. Chabal, Kyeongjae (KJ) Cho, John P. Ferraris, Massimo V. Fischetti, Heather Hayenga, Julia W. P. Hsu, Wenchuang (Walter) Hu, Stephen D. Levene, Lawrence J. Overzet, A. Dean Sherry, Mary L. Urquhart, Duck Joo (D. J.) Yang

I. Core Curriculum Requirements: 42 semester credit hours\(^2\)

**Communication:** 6 semester credit hours

- **COMM 1311** Survey of Oral and Technology-based Communication
- **RHET 1302** Rhetoric

**Mathematics:** 3 semester credit hours

- **MATH 2413** Differential Calculus\(^3\) \(^4\)

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Life and Physical Sciences: 6 semester credit hours

PHYS 2325 Mechanics

or PHYS 2421 Honors Physics I - Mechanics and Heat

PHYS 2326 Electromagnetism and Waves

or PHYS 2422 Honors Physics II - Electromagnetism and Waves

Language, Philosophy and Culture: 3 semester credit hours

HUMA 1301 Exploration of the Humanities

Creative Arts: 3 semester credit hours

ARTS 1301 Exploration of the Arts

American History: 6 semester credit hours

Select any 6 semester credit hours from American History Core courses (see advisor)

Government/Political Science: 6 semester credit hours

GOVT 2305 American National Government

GOVT 2306 State and Local Government

Social and Behavioral Sciences: 3 semester credit hours

Select any 3 semester credit hours from Social and Behavioral Sciences Core courses (see advisor)

Component Area Option: 6 semester credit hours

CHEM 1311 General Chemistry

or CHEM 1315 Honors Freshman Chemistry

CHEM 1312 General Chemistry II

or CHEM 1316 Honors Freshman Chemistry II

II. Major Requirements: 66-68 semester credit hours

Major Preparatory Courses: 24-26 semester credit hours beyond core curriculum

CHEM 1111 General Chemistry Laboratory I

or CHEM 1115 Honors Freshman Chemistry Laboratory I

CHEM 1112 General Chemistry Laboratory II
or **CHEM 1116** Honors Freshman Chemistry Laboratory II

**CHEM 1311** General Chemistry I \(^5\)

or **CHEM 1315** Honors Freshman Chemistry I \(^5\)

**CHEM 1312** General Chemistry II \(^5\)

or **CHEM 1316** Honors Freshman Chemistry II \(^5\)

**MATH 2413** Differential Calculus \(^3, 4\)

or **MATH 2417** Calculus I \(^3, 4\)

**MATH 2414** Integral Calculus \(^4\)

or **MATH 2419** Calculus II \(^4\)

**MATH 2415** Calculus of Several Variables \(^4\)

or **MATH 2451** Multivariable Calculus with Applications \(^4\)

or **MATH 3351** Advanced Calculus

**MATH 2418** Linear Algebra

**MATH 2420** Differential Equations with Applications

**PHYS 1100** The Fun of Physics

**PHYS 2303** Contemporary Physics

**PHYS 2325** Mechanics \(^5\)

and **PHYS 2125** Physics Laboratory I \(^2\)

or **PHYS 2421** Honors Physics I - Mechanics and Heat \(^5, 6, 8\)

and **PHYS 2326** Electromagnetism and Waves \(^5\)

and **PHYS 2126** Physics Laboratory II \(^2\)

or **PHYS 2422** Honors Physics II - Electromagnetism and Waves \(^5, 6\)

and **PHYS 2126** Physics Laboratory II \(^2\)

**Major Core Courses: 30 semester credit hours**

**PHYS 3312** Classical Mechanics

**PHYS 3427** Electronics with Laboratory

**PHYS 3330** Numerical Methods in Physics and Computational Techniques

**PHYS 3411** Theoretical Physics

**PHYS 3416** Electricity and Magnetism

**PHYS 4311** Thermodynamics and Statistical Mechanics
PHYS 4373 Physical Measurements Laboratory
PHYS 4398 Senior Research Project for BA Degree

Choose one Physics Elective course from the following:

PHYS 3380 Astronomy
PHYS 4301 Quantum Mechanics I
PHYS 4302 Quantum Mechanics II
PHYS 4352 Concepts of Modern Physics
PHYS 4371 Solid State Physics
PHYS 4386 Elementary Particle Physics
PHYS 4392 Extragalactic Astrophysics
PHYS 4V07 Senior Research Projects
PHYS 4V10 Research Topics in Physics
PHYS 4V11 Topics in Physics

Major Related Courses: 12 semester credit hours

12 semester credit hours of upper-division Science Electives

III. Elective Requirements: 10-12 semester credit hours

Both lower- and upper-division courses may count as electives, but the student must complete at least 51 semester credit hours of upper-division courses to qualify for graduation.

Bachelor of Science in Physics

Degree Requirements [120 semester credit hours]¹

View an Example of Degree Requirements by Semester

Faculty

Distinguished Chair in Natural Sciences and Mathematics: Roderick A. Heelis

Green Distinguished Chair in Academic Leadership: B. Hobson Wildenthal


Associate Professors: Lunjin Chen, Yuri Gartstein, Lindsay J. King, David J. Lary, Anton V. Malko, Fabiano Rodrigues, Jason D. Slinker
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Senior Lecturer: Paul Mac Alevey, Kuei Sun


I. Core Curriculum Requirements: 42 semester credit hours

Communication: 6 semester credit hours

COMM 1311 Survey of Oral and Technology-based Communication
RHET 1302 Rhetoric

Mathematics: 3 semester credit hours

MATH 2413 Differential Calculus
or MATH 2417 Calculus I

Life and Physical Sciences: 6 semester credit hours

PHYS 2325 Mechanics
or PHYS 2421 Honors Physics I - Mechanics and Heat
PHYS 2326 Electromagnetism and Waves
or PHYS 2422 Honors Physics II - Electromagnetism and Waves

Language, Philosophy and Culture: 3 semester credit hours

HUMA 1301 Exploration of the Humanities

Creative Arts: 3 semester credit hours

ARTS 1301 Exploration of the Arts

American History: 6 semester credit hours

Select any 6 semester credit hours from American History Core courses (see advisor)

Government/Political Science: 6 semester credit hours

GOVT 2305 American National Government
**GOVT 2306** State and Local Government

**Social and Behavioral Sciences: 3 semester credit hours**

Select any 3 semester credit hours from **Social and Behavioral Sciences Core** courses (see advisor)

**Component Area Option: 6 semester credit hours**

- **CHEM 1311** General Chemistry I
  - or **CHEM 1315** Honors Freshman Chemistry I
- **CHEM 1312** General Chemistry II
  - or **CHEM 1316** Honors Freshman Chemistry II

**II. Major Requirements: 66-68 semester credit hours**

**Major Preparatory Courses: 24-26 semester credit hours beyond core curriculum**

- **CHEM 1111** General Chemistry Laboratory I
  - or **CHEM 1115** Honors Freshman Chemistry Laboratory I
- **CHEM 1112** General Chemistry Laboratory II
  - or **CHEM 1116** Honors Freshman Chemistry Laboratory II
- **CHEM 1311** General Chemistry I
  - or **CHEM 1315** Honors Freshman Chemistry I
- **CHEM 1312** General Chemistry II
  - or **CHEM 1316** Honors Freshman Chemistry II
- **MATH 2413** Differential Calculus
  - or **MATH 2417** Calculus I
- **MATH 2414** Integral Calculus
  - or **MATH 2419** Calculus II
- **MATH 2415** Calculus of Several Variables
  - or **MATH 2451** Multivariable Calculus with Applications
  - or **MATH 3351** Advanced Calculus
- **MATH 2418** Linear Algebra
- **MATH 2420** Differential Equations with Applications
- **PHYS 1100** The Fun of Physics
- **PHYS 2303** Contemporary Physics
PHYS 2325 Mechanics\textsuperscript{5} and PHYS 2125 Physics Laboratory I\textsuperscript{7}
or PHYS 2421 Honors Physics I - Mechanics and Heat\textsuperscript{5, 6, 8}

PHYS 2326 Electromagnetism and Waves\textsuperscript{5} and PHYS 2126 Physics Laboratory II\textsuperscript{7}
or PHYS 2422 Honors Physics II - Electromagnetism and Waves\textsuperscript{5, 6}
and PHYS 2126 Physics Laboratory II\textsuperscript{7}

**Major Core Courses: 24 semester credit hours**

PHYS 3312 Classical Mechanics
PHYS 3427 Electronics with Laboratory
PHYS 3330 Numerical Methods in Physics and Computational Techniques
PHYS 3411 Theoretical Physics
PHYS 3416 Electricity and Magnetism
PHYS 4311 Thermodynamics and Statistical Mechanics
PHYS 4373 Physical Measurements Laboratory

**Major Related Courses: 18 semester credit hours**

PHYS 4301 Quantum Mechanics I
PHYS 4302 Quantum Mechanics II
PHYS 4328 Optics
PHYS 4352 Concepts of Modern Physics

Choose two Physics Elective courses from the following:

PHYS 3380 Astronomy
PHYS 4371 Solid State Physics
PHYS 4386 Elementary Particle Physics
PHYS 4392 Extragalactic Astrophysics
PHYS 4V07 Senior Research Projects
PHYS 4V10 Research Topics in Physics
PHYS 4V11 Topics in Physics

**III. Elective Requirements: 10-12 semester credit hours**

Both lower- and upper-division courses may count as electives, but the student must complete at least 51 semester credit hours of upper-division courses to qualify for graduation.
UTeach Option

The UTeach option may be added to either the BA or BS degree. UTeach Dallas Option degree plans are streamlined to allow students to complete both a rigorous Bachelor of Science or Bachelor of Arts degree and all coursework for middle or high school teacher certification in four years. Teaching Option degrees require deep content knowledge combined with courses grounded in the latest research on math and science education. While most graduates go on to classroom teaching, UTeach alums are also prepared to enter graduate school and to work in a discipline related industry.

Fast Track Baccalaureate/Master's Degrees

For students interested in pursuing graduate studies in physics, the Physics Department offers an accelerated BS / MS Fast Track that involves taking graduate courses in lieu of several advanced undergraduate courses. Acceptance into the Fast Track is based on the student's attaining a GPA (grade point average) of at least 3.200 on a minimum of 30 semester credit hours of upper-division courses that include PHYS 3411, PHYS 3312, PHYS 3330, PHYS 3416, PHYS 4301 and PHYS 4311. Eligible students may take up to 15 semester credit hours of selected graduate courses that may be used to complete the baccalaureate degree and also satisfy requirements for the master's degree. These credits will partially satisfy the UT Dallas MS degree requirements when the student completes the BS degree. Interested students should contact their advisor during their junior year to apply to the Fast Track program.

Minor in Physics: 20 semester credit hours

Require: 12 semester credit hours

PHYS 2325 Mechanics
PHYS 2125 Physics Laboratory I
PHYS 2326 Electromagnetism and Waves
PHYS 2126 Physics Laboratory II
PHYS 3411 Theoretical Physics

Also:

Three other upper-division physics courses

1. Incoming freshmen must enroll and complete requirements of UNIV 1010 and the corresponding school-related freshman seminar course. Students, including transfer students, who complete their core curriculum at UT Dallas must take UNIV 2020.

2. Curriculum Requirements can be fulfilled by other approved courses from institutions of higher education. The courses listed are recommended as the most efficient way to satisfy both Core
Curriculum and Major Requirements at UT Dallas.

3. One semester credit hour of Calculus is counted as Major Preparatory credit; three semester credit hours are counted in Core Curriculum.

4. Students may choose either calculus sequence MATH 2413, MATH 2414, and MATH 2415 or MATH 2417, MATH 2419 and (MATH 2451 or MATH 3351).

5. A required Major preparatory course that also fulfills a Core Curriculum requirement. Semester credit hours are counted in Core Curriculum.

6. If Honors Physics is taken, three hours are counted under the sciences core and one hour is counted under Physics Major Preparatory Courses.

7. Indicates a prerequisite class to be completed before enrolling for upper-division classes.

8. Students who complete PHYS 2421 do not need to complete PHYS 2125.

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