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)*

Faculty

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

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

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

**Professors Emeritus:** Walter Heikkila, Wolfgang A. Rindler, Myron B. Salamon, Brian A. Tinsley

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

**Assistant Professors:** Lunjin Chen, Michael Kesden, Lloyd Lumata, Bing Lv, Fabiano Rodrigues, Xiaoyan Shi, Russell Stoneback, Fan Zhang

**Senior Lecturer:** Paul MacAlevey, Kuei Sun

**UT Dallas Affiliated Faculty:** Yves J. Chabal, Kyeongjae (KJ) Cho, John P. Ferraris, Massimo V. Fischetti, Heather Hayenga, Christopher L. Hinkle, 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

**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
- **PHYS 2326** 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
CHEM 1312 General Chemistry II

II. Major Requirements: 66 semester credit hours

Major Preparatory Courses: 25 semester credit hours
CHEM 1111 General Chemistry Laboratory I
CHEM 1112 General Chemistry Laboratory II
CHEM 1311 General Chemistry I
CHEM 1312 General Chemistry II
MATH 2413 Differential Calculus
MATH 2417 Calculus I
or MATH 2414 Integral Calculus
or MATH 2419 Calculus II
MATH 2415 Calculus of Several Variables
or MATH 2451 Multivariable Calculus with Applications
MATH 2418 Linear Algebra
MATH 2420 Differential Equations with Applications
PHYS 1100 The Fun of Physics
PHYS 2303 Contemporary Physics
PHYS 2325 Mechanics and PHYS 2125 Physics Laboratory I
or PHYS 2421 Honors Physics I - Mechanics and Heat and PHYS 2121 Honors Physics
Lab I or PHYS 2125 Physics Laboratory I

PHYS 2326 Electromagnetism and Waves\textsuperscript{4} and PHYS 2126 Physics Laboratory II\textsuperscript{6}

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

Major Core Courses: 26 semester credit hours

PHYS 3312 Classical Mechanics
PHYS 3327 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 Research Project for the B. A. degree

Choose one Physics Elective course from the following:

PHYS 3317 Physics of the Human Body
PHYS 3380 Astronomy
PHYS 4301 Quantum Mechanics I
PHYS 4302 Quantum Mechanics II
PHYS 4335 Remote Sensing of the Earth
PHYS 4352 Concepts of Modern Physics
PHYS 4371 Solid State Physics
PHYS 4381 Space Science
PHYS 4383 Plasma Physics
PHYS 4386 Elementary Particle Physics
PHYS 4392 Extragalactic Astrophysics
PHYS 4395 Cosmology
PHYS 4V07 Senior Research Projects
PHYS 4V10 Special Topics in Physics
PHYS 4V11 Topics in Physics

Major Related Courses: 15 semester credit hours

15 semester credit hours of upper-division Science Electives
III. Elective Requirements: 12 semester credit hours

Electives: 6 semester credit hours

All students are required to take at least six semester credit hours of electives outside their major field of study. These must be either upper-division classes or lower-division classes that have prerequisites.

Free Electives: 6 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.

Other Courses

PHYS 1101 College Physics Laboratory I
PHYS 1102 College Physics Laboratory II
PHYS 1301 College Physics I
PHYS 1302 College Physics II

Bachelor of Science in Physics

Degree Requirements (120 semester credit hours)

Faculty

Distinguished Chair in Natural Sciences and Mathematics: Roderick A. Heelis
Green Distinguished Chair in Academic Leadership: B. Hobson Wildenthal
Professors Emeritus: Walter Heikkila, Wolfgang A. Rindler, Myron B. Salamon, Brian A. Tinsley
Associate Professors: Yuri Gartstein, Lindsay J. King, David J. Lary, Anton V. Malko, Jason D. Slinker
Assistant Professors: Lunjin Chen, Michael Kesden, Lloyd Lumata, Bing Lv, Fabiano Rodrigues, Xiaoyan Shi, Russell Stoneback, Fan Zhang
Senior Lecturer: Paul MacAlevey, 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 \(^3\)
- or **MATH 2417** Calculus I \(^3\)

Life and Physical Sciences: 6 semester credit hours

- **PHYS 2325** Mechanics \(^4\)
- **PHYS 2326** Electromagnetism and Waves \(^4\)

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
- **CHEM 1312** General Chemistry II

II. Major Requirements: 66 semester credit hours

Major Preparatory Courses: 25 semester credit hours

- **CHEM 1111** General Chemistry Laboratory I
- **CHEM 1112** General Chemistry Laboratory II
- **CHEM 1311** General Chemistry I \(^5\)
- **CHEM 1312** General Chemistry II \(^5\)
- **MATH 2413** Differential Calculus \(^3\)
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
MATH 2418 Linear Algebra
MATH 2420 Differential Equations with Applications
PHYS 1100 The Fun of Physics
PHYS 2303 Contemporary Physics
PHYS 2325 Mechanics and PHYS 2125 Physics Laboratory
    or PHYS 2421 Honors Physics I - Mechanics and Heat and PHYS 2121 Honors Physics Lab I or PHYS 2125 Physics Laboratory I
PHYS 2326 Electromagnetism and Waves and PHYS 2126 Physics Laboratory II
    or PHYS 2422 Honors Physics II - Electromagnetism and Waves and PHYS 2126 Physics Laboratory II

Major Core Courses: 23 semester credit hours
PHYS 3312 Classical Mechanics
PHYS 3327 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 3317 Physics of the Human Body
PHYS 3380 Astronomy
PHYS 4335 Remote Sensing of the Earth
III. Elective Requirements: 12 semester credit hours

Electives: 6 semester credit hours

All students are required to take at least six semester credit hours of electives outside their major field of study. These must be either upper-division classes or lower-division classes that have prerequisites.

Free Electives: 6 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.

Other Courses

- PHYS 1101 College Physics Laboratory I
- PHYS 1102 College Physics Laboratory II
- PHYS 1301 College Physics I
- PHYS 1302 College Physics II

UTeach Option

The UTeach option may be added either to the BA or BS degree in Physics. UTeach Dallas Option degree plans are streamlined to allow students to complete a rigorous Bachelor of Arts degree and all coursework for middle or high school teacher certification in four years. UTeach option with the BS degree may require an extra semester. 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 in fields other than physics and to work in industries involving problem-solving skills.

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 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.

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. Students may choose either calculus sequence MATH 2413, MATH 2414, and MATH 2415 or MATH 2417, MATH 2419 and MATH 2451.
6. Indicates a prerequisite class to be completed before enrolling for upper-division classes.

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