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.

Faculty

Cecil and Ida Green Chair in Physics: Roderick A. Heelis

Distinguished Chair in Physics: Myron B. Salamon

Green Distinguished Chair in Academic Leadership: B. Hobson Wildenthal


Professor Emeritus: Ervin J. Fenyes, Walter Heikkila, Brian A. Tinsley

Associate Professors: Yuri Gartstein, Mustapha Ishak-Boushaki, Lindsay J. King, David J. Lary, Anton V. Malko, Chuanwei Zhang, Jie Zheng

Assistant Professors: Lunjin Chen, Xingang Chen, Michael Kesden, Lloyd Lumata, Fabiano Rodrigues, Jason D. Slinker, Fan Zhang

Senior Lecturers: Paul MacAlevey, Beatrice Rasmussen

Affiliated Faculty: Yves J. Chabal, John P. Ferraris, Massimo V. Fischetti, Tobias Hagge, Wenchuang (Walter) Hu, Stephen D. Levene, A. Dean Sherry, Mary L. Urquhart, Duck Joo (D. J.) Yang

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, 15 semester credit hours of advanced physics courses are replaced with 15 semester credit hours of 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.

UTeach Option

The UTeach option may be added to the BA 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. 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 discipline related industry.

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.

Minor in Physics (20 semester credit hours)

A minor is offered that consists of PHYS 2325, PHYS 2125, PHYS 2326, PHYS 2126, PHYS 3411, and three other upper-division physics courses.
**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.

**Bachelor of Arts in Physics**

**Degree Requirements (120 semester credit hours)**

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

**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

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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
  - 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 I
  - or PHYS 2421 Honors Physics I - Mechanics and Heat and PHYS 2121 Honors Physics Lab or
HYS 2125 Physics Laboratory

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 XXXX Physics Elective

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.

Physics Electives

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 4395 Cosmology
PHYS 4386 Elementary Particle Physics
PHYS 4V07 Senior Research Projects
PHYS 4V10 Special Topics in Physics

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)

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

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

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**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

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 I

or PHYS 2421  Honors Physics I - Mechanics and Heat and PHYS 2121  Honors Physics Lab or PHYS 2125  Physics Laboratory

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

and 6 semester credit hours Physics 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.

Physics Electives

- PHYS 3317 Physics of the Human Body
- PHYS 3380 Astronomy
- PHYS 4335 Remote Sensing of the Earth
- PHYS 4395 Cosmology
- PHYS 4386 Elementary Particle Physics
- PHYS 4371 Solid State Physics
- PHYS 4381 Space Science
- PHYS 4383 Plasma Physics
- PHYS 4V07 Senior Research Projects
- PHYS 4V10 Special Topics in Physics

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 Arts in Physics with UTeach Option

Degree Requirements (123 semester credit hours)\(^1\)

1. 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\(^3\)
     or MATH 2417 Calculus I\(^3\)
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
  or MATH 2417 Calculus

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 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: 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

Major Related Courses: 15 semester credit hours

15 semester credit hours of upper-division Science Electives
NATS 4694 and NATS 4696 UTeach Apprentice Teaching can fulfill 6 of these semester credit hours.

III. Elective Requirements: 15 hours

Electives: 6 semester credit hours

All students are required to take at least six hours of electives outside their major field of

study. These must be either upper-division classes or lower-division classes that have prerequisites. UTeach courses can be used to fulfill these requirements.

**UTeach Requirements: 9 semester credit hours beyond core curriculum, science electives, and advanced electives**

- **NATS 1141**  UTeach STEP 1
- **NATS 1143**  UTeach STEP 2
- **NATS 3341**  Knowing and Learning in Mathematics and Science
- **NATS 3343**  Classroom Interactions
- **HIST 3328**  History and Philosophy of Science and Medicine
- **NATS 4390**  Research Methods
- **NATS 4341**  Project-Based Instruction
- **NATS 4694**  UTeach Apprentice Teaching, 8-12 Science and Mathematics
  or  **NATS 4696**  UTeach Apprentice Teaching, 4-8 Science and Mathematics
- **NATS 4141**  UTeach Apprentice Teaching Seminar

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.

1. Incoming freshmen must complete and pass UNIV 1010 Freshman Seminar 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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