

# DEPARTMENT OF PHYSICS

## Undergraduate Degree(s):

- Bachelor of Science in Physics (Engineering-Physics Concentration) (<https://catalog.tsu.edu/undergraduate/schools-colleges/science-engineering-technology/physics/physics-engineering-physics-concentration-bs/>)
- Bachelor of Science in Physics (Premedical-Physics Concentration) (<https://catalog.tsu.edu/undergraduate/schools-colleges/science-engineering-technology/physics/physics-premedical-physics-concentration-bs/>)

## Minor(s):

- Physics (<https://catalog.tsu.edu/undergraduate/schools-colleges/science-engineering-technology/physics/physics-minor/>)

As the Texas top ranked program in undergraduate Physics degrees awarded to African-Americans, the Department of Physics in the College of Science, Engineering and Technology, offers the Bachelor of Science (B.S.) Degree in Physics in two concentrations (1) Engineering Physics and (2) Premedical Physics. Both of these concentrations require 120 credit hours in core classes, foundational mathematics and physics classes including two Advanced Physics Elective courses. In addition, the Engineering Physics concentration requires Engineering and Computer Science elective classes, while the Premedical Physics concentration requires Chemistry, Biology and Psychology.

The B.S. Degree in Physics is offered through the Texas Physics Consortium (TPC), administered by the Texas A&M University System, under a mutual agreement among several other Physics programs within Texas. This unique program offers a Diploma that bears the seal of the Texas A&M University System, in addition to the seal of Texas Southern University, and the other participating campuses that comprise TPC: Prairie View A&M University, Tarleton State University, Texas A & M Kingsville, Texas A & M Corpus Christi, Midwestern State University, and West Texas A & M University. TSU Physics students benefit from the diverse collective expertise of faculty at these institutions through synchronous on-line Physics classes for junior and senior students.

The goal of the undergraduate Physics program is to help students develop learning skills, problem solving techniques and professional ethics and attitudes that will support their further academic work or future employment in their technical or biomedical career of choice, through the study of physics. Of note, students interested in pharmacy would also benefit greatly in the physics premed concentration. It's not just rocket science: physics is the route to so many careers, from predicting climate change to designing computer games. Find out where physics can take you. It is no coincidence that physics graduates earn the highest scores in professional admission tests such as the MCAT, LSAT or PE. Hence, the graduate with a Physics degree will exhibit understanding of advanced physical concepts, mathematical and analytical skills, and also utilize technology to develop models for solving problems and analyzing new situations.

The Department of Physics is located on the second floor of the Leonard H. O. Spearman Technology Building and has significant resources on site to assist students and ensure their success. Besides teaching Physics laboratories, the faculty in the Department of Physics conducts research and manages well-equipped Radiation Health Physics, Radio Astronomy, High Performance Computing, and Mathematical Physics laboratories.

Physics tutoring and MCAT preparation workshops are routinely offered in a dedicated room.

Students wishing to pursue the B.S. degree in Physics are required to contact the Department of Physics about their intentions and declare a minor or a major in a second academic discipline. All courses completed that are designated for the minor selected must be completed with grades of "C" or better, where grades of "C-" are unacceptable. This grade requirement is more stringent for students interested in teaching physics. The same rule applies to students in other disciplines seeking the minor in Physics. Students wishing to pursue either a major (B.S.) or minor in Physics must first be admitted to the University, must satisfy TSI Assessment requirements, must eradicate deficiencies assessed at the time of admission through the University Testing Center, and must petition the Department for admission as TSI Assessment requirements or equivalent are completed. Once admitted to the program, students are assigned an official faculty advisor who must be consulted on a semester basis for schedule approval and status verification for progress toward graduation. An exit examination is required of all graduating seniors pursuing the B.S. in Physics.

The Department of Physics strongly encourages students to seek certification for Teaching Physics or Sciences in the public schools of Texas. The Teacher Certification Officer in the College of Education along with a TSU physics faculty member can further guide and advise students wishing to pursue this opportunity.

The minor (<https://catalog.tsu.edu/undergraduate/schools-colleges/science-engineering-technology/physics/physics-minor/>) in Physics requires 19 semester credit hours.

The physics Capstone courses are PHYS 415 and PHYS 416, respectively.

- Physics (Engineering-Physics Concentration), Bachelor of Science (<https://catalog.tsu.edu/undergraduate/schools-colleges/science-engineering-technology/physics/physics-engineering-physics-concentration-bs/>)
- Physics (Premedical-Physics Concentration), Bachelor of Science (<https://catalog.tsu.edu/undergraduate/schools-colleges/science-engineering-technology/physics/physics-premedical-physics-concentration-bs/>)
- Physics Minor (<https://catalog.tsu.edu/undergraduate/schools-colleges/science-engineering-technology/physics/physics-minor/>)

## Physics Course Inventory

### PHYS 101L Principles of Physical Science Lab (1 Credits)

PHYS 101L Principles of Physical Science Lab (1) Laboratory, Demonstration, and Recitation course in support of PHYS 101. One two hour session per week. Optional co-requisite beginning fall 2014. Course is taught as a co-requisite for students requiring eight (8) credits of Natural Science in the GENERAL EDUCATION CORE CURRICULUM prior to fall 2014. (PHYS 101L is optional for first time college students beginning fall 2014.)

**College/School:** Col of Science, Engr & Tech

**Department:** Department of Physics

### PHYS 116 Pre-University Physics Laboratory (1 Credits)

Laboratory, Demonstrator, and Recitation course in support of Physics 152. One two hour session per week.

**College/School:** Col of Science, Engr & Tech

**Department:** Department of Physics

**PHYS 152 Pre University Physics (3 Credits)**

Introduction to the advanced mathematics required for University Physics I (Phys 251), emphasizing the geometrical, analytical, and computational understanding of differential and integral calculus, vectors, algebraic and computational software. The advanced mathematics is taught from the perspective of physics, emphasizing an intuitive understanding of the integration of physics and mathematics. Three hours of lecture and demonstration.

**College/School:** Col of Science, Engr & Tech

**Department:** Department of Physics

**PHYS 205 Physics of Music (4 Credits)**

Overview of physics principles impacting the acoustics of musical instruments and the human voice. For non-science majors. Three hours of lecture and one hour demonstration, per week.

**College/School:** Col of Science, Engr & Tech

**Department:** Department of Physics

**PHYS 213 College Phys Lab I (1 Credits)**

Laboratory, Demonstration, and Recitation course in support of PHYS 237. One two hour session per week.

**College/School:** Col of Science, Engr & Tech

**Department:** Department of Physics

**PHYS 214 College Phys Lab II (1 Credits)**

Laboratory, Demonstration, and Recitation course in support of PHYS 238. One two hour session per week.

**College/School:** Col of Science, Engr & Tech

**Department:** Department of Physics

**PHYS 215 Phys for Engineers Lab I (1 Credits)**

Physics Laboratory for Technology and Life Science Students I (1) Experiments in classical mechanics, vibratory motion, and heat to accompany both Physics 235 and Physics 237. Two hours of laboratory per week. Referred to as General Physics I Laboratory in this document. Corequisites: PHYS 235 or 237. Listed as PHYS 1101 in the Texas Common Course Numbering System.

**College/School:** Col of Science, Engr & Tech

**Department:** Department of Physics

**PHYS 216 Phys for Engineers Lab II (1 Credits)**

Physics Laboratory for Technology and Life Science Students II (1) Experiments in waves, electricity, magnetism, and optics to accompany both Physics 236 and Physics 238. Two hours of laboratory per week. Referred to as General Physics II Laboratory in this document. Corequisites: PHYS 236 or PHYS 238. Listed as PHYS 1102 in the Texas Common Course Numbering System.

**College/School:** Col of Science, Engr & Tech

**Department:** Department of Physics

**PHYS 217 University Physics Laboratory I (1 Credits)**

College Physics Laboratory I (1) Laboratory, Demonstration, and Recitation course in support of Physics 251. One two hour session per week.

**College/School:** Col of Science, Engr & Tech

**Department:** Department of Physics

**PHYS 218 University Physics Laboratory II (1 Credits)**

College Physics Laboratory II (1) Laboratory, Demonstration, and Recitation course in support of Physics 252. One two hour session per week.

**College/School:** Col of Science, Engr & Tech

**Department:** Department of Physics

**PHYS 235 Gen Phys Tech Stu (3 Credits)**

General Physics for Technology Students I (3) First part of trigonometry-based introduction to physics for technology students, including classical mechanics, vibratory motion, and heat. Three hours of lecture per week. Corequisite: PHYS 215. Prerequisites: MATH 133 and MATH 134. Listed as PHYS 1301 in the Texas Common Course Numbering System.

**College/School:** Col of Science, Engr & Tech

**Department:** Department of Physics

**PHYS 245 Physics for Engineers I (3 Credits)**

Calculus based introductory course from an engineer's perspective: Newton's laws of mechanics, fluids, waves, and thermodynamics. Three lecture and demonstration hours per week. Prerequisites: PHYS 116 and PHYS 152, or MATH 241.

**Prerequisite(s):** MATH 241

**College/School:** Col of Science, Engr & Tech

**Department:** Department of Physics

**PHYS 246 Physics for Engineers II (3 Credits)**

Calculus based introductory course from an engineer's perspective: the laws of electricity and magnetism, electrical circuits, optics, and modern physics. Three lecture and demonstration hours per week. Prerequisite: PHYS 245.

**Prerequisite(s):** PHYS 245

**College/School:** Col of Science, Engr & Tech

**Department:** Department of Physics

**PHYS 247 Fundamentals of Scientific Programming (3 Credits)**

Introduction to scientific programming languages such as Fortran 90, C, C++, Mathematica, etc. Three hours of lecture and demonstrations per week including computational laboratory. Prerequisites: Physics 116 and 152, 251 or Math 241.

**Prerequisite(s):** (PHYS 251 and MATH 241)

**College/School:** Col of Science, Engr & Tech

**Department:** Department of Physics

**PHYS 252 University Physics II (3 Credits)**

University Physics II Introduction to Electricity and Magnetism, optics, and modern physics. This course assumes the student to be able to work with three dimensional scalar and vector field expressions. Chair's approval required.. Prerequisite: PHYS 251. Corequisite: PHYS 218.

**Prerequisite(s):** (PHYS 251)

**College/School:** Col of Science, Engr & Tech

**Department:** Department of Physics

**PHYS 329 Intro Mod Phys For Life Sc Stu (3 Credits)**

Non-calculus based overview of modern physics with particular emphasis on nuclear and high energy dynamical processes. Prerequisite: PHYS 238. Three hour lecture per week.

**Prerequisite(s):** PHYS 238

**College/School:** Col of Science, Engr & Tech

**Department:** Department of Physics

**PHYS 330 Intro to Medical Physics (3 Credits)**

**Prerequisite(s):** PHYS 252

**College/School:** Col of Science, Engr & Tech

**Department:** Department of Physics

**PHYS 332 Intro to Modern Physics (3 Credits)**

Introduction to Modern Physics (3) Topics in modern physics, including special theory of relativity, introduction to quantum physics, and applications to atomic and nuclear structure. Three hours of lecture per week. Prerequisites: PHYS 251, PHYS 252, PHYS 217, and PHYS 218.

**Prerequisite(s):** (PHYS 251 and PHYS 252 and PHYS 217 and PHYS 218)

**College/School:** Col of Science, Engr & Tech

**Department:** Department of Physics

**PHYS 333 Elec and Mag I (3 Credits)**

Electricity and Magnetism I (3) Electric fields, potential, conductors, dielectrics, capacitors, and DC circuits. Three hours of lecture per week. Prerequisites: PHYS 218 and 252. Offered as needed.

**Prerequisite(s):** (PHYS 248 and PHYS 252)  
**College/School:** Col of Science, Engr & Tech  
**Department:** Department of Physics

**PHYS 334 Electricity & Magnetism II (3 Credits)**

Electricity and Magnetism II (3) Magnetic fields, inductance, AC circuits, and electromagnetic theory. Three hours of lecture per week. Prerequisite: PHYS 333. Offered as needed.

**Prerequisite(s):** PHYS 333  
**College/School:** Col of Science, Engr & Tech  
**Department:** Department of Physics

**PHYS 335 Mechanics (3 Credits)**

Mechanics I (3) Dynamics, kinematics, oscillations, deformable bodies and wave motion. Three hours of lecture per week. Prerequisites: PHYS 218 and PHYS 252. Offered as needed.

**Prerequisite(s):** (PHYS 218 and PHYS 252)  
**College/School:** Col of Science, Engr & Tech  
**Department:** Department of Physics

**PHYS 336 Thermo & Stat Phys (3 Credits)**

Mechanics II (3) Mechanics of a rigid body, Lagrange's equations, and Hamilton's equations. Three hours of lecture per week. Prerequisite: PHYS 335. Offered as needed.

**Prerequisite(s):** (PHYS 251)  
**College/School:** Col of Science, Engr & Tech  
**Department:** Department of Physics

**PHYS 338 Math Methods I (3 Credits)**

Mathematical Methods for Physics I (3) Applications to physics of the following: series, complex numbers, linear equations, partial differentiation, vector analysis, Fourier series, and ordinary differential equations. Three hours of lecture per week. Prerequisites: MATH 242 and PHYS 251. Offered as needed.

**Prerequisite(s):** (PHYS 251 and MATH 242)  
**College/School:** Col of Science, Engr & Tech  
**Department:** Department of Physics

**PHYS 339 Mathematical Methods II (3 Credits)**

Mathematical Methods for Physics II (3) Basic methods in partial differential questions, complex analysis, variational calculus, numerical analysis, etc. Three hours of lecture and demonstrations per week. Prerequisites: Phys 252, Phys 338, and Math 242.

**Prerequisite(s):** (PHYS 252 and PHYS 338 and MATH 242)  
**College/School:** Col of Science, Engr & Tech  
**Department:** Department of Physics

**PHYS 340 Computational Physics I (3 Credits)**

Introduction to basic computational methods in physics, including algebraic software. Three lecture hours per week.

**Prerequisite(s):** (PHYS 247 and PHYS 252 and PHYS 338 and MATH 242)  
**College/School:** Col of Science, Engr & Tech  
**Department:** Department of Physics

**PHYS 341 Mechanics I (3 Credits)**

Mechanics I Intermediate mechanics: forces oscillators, Greens functions, nonlinear systems, rigid body dynamics, fluid dynamics, stress-strain relations. Three lecture hours per week. Prerequisites: Phys 252 and Math 242.

**Prerequisite(s):** (PHYS 252 and MATH 242)  
**College/School:** Col of Science, Engr & Tech  
**Department:** Department of Physics

**PHYS 342 Computational Physics II (3 Credits)**

Computational Physics II (3) Continuation of PHYS 341. Three hours of lecture per week. Prerequisite: PHYS 341.

**College/School:** Col of Science, Engr & Tech  
**Department:** Department of Physics

**PHYS 344 Electronics (4 Credits)**

Electronics (4) Theory and practical operation of modern electronics for students completing Physics 252. Three hours of lecture and three hours of laboratory per week. Prerequisites: PHYS 218 and PHYS 252.

**Prerequisite(s):** (PHYS 218 and PHYS 252)  
**College/School:** Col of Science, Engr & Tech  
**Department:** Department of Physics

**PHYS 360 Adv Undergrad Lab (2 Credits)**

Exposure to the fundamental experiments that shaped modern physics. One three hour laboratory per week. Prerequisite: PHYS 332.

**Prerequisite(s):** (PHYS 353)  
**College/School:** Col of Science, Engr & Tech  
**Department:** Department of Physics

**PHYS 361 Intro Atom & Rad Phys (3 Credits)**

Introduction to atomic and nuclear structure, radiation, radioactive decay, chemical and biological effects of radiation, dosimetry, radiation protection. Three lecture and demonstration hours per week. Prerequisites: PHYS 252 and PHYS 332. Students should also have demonstrated competencies in basic integral calculus, differential equations, and linear algebra.

**Prerequisite(s):** (PHYS 238 or PHYS 246 or PHYS 252) and (PHYS 354 (may be taken concurrently) or PHYS 329 (may be taken concurrently))  
**College/School:** Col of Science, Engr & Tech  
**Department:** Department of Physics

**PHYS 365 Environ Rad Seminar (1 Credits)**

Focus on natural and manmade environmental radionuclide sources, radiation biology, protection, and pathways for environmental contamination. Ninety minute lecture and demonstration per week.

**College/School:** Col of Science, Engr & Tech  
**Department:** Department of Physics

**PHYS 370 NUC PHYS LAB (1 Credits)**

Basic nuclear physics experiments indispensable to radiation detection and measurement. Three hour lab per week.

**Prerequisite(s):** PHYS 274 (may be taken concurrently)  
**College/School:** Col of Science, Engr & Tech  
**Department:** Department of Physics

**PHYS 374 Radiation Detec I (4 Credits)**

Comprehensive study of varying types of nuclear detection and measurement equipment, counting statistics and error prediction, etc. Four hours lecture-demonstration per week.

**Prerequisite(s):** (PHYS 366 (may be taken concurrently) and PHYS 370 (may be taken concurrently))  
**College/School:** Col of Science, Engr & Tech  
**Department:** Department of Physics

**PHYS 390 INTRO TO NANO SC & TECH (3 Credits)**

Introduction to the basic physics principles and techniques governing nanostructures and their applications. Three lecture hours per week.

**Prerequisite(s):** (PHYS 353) and (PHYS 360 (may be taken concurrently))  
**College/School:** Col of Science, Engr & Tech  
**Department:** Department of Physics

**PHYS 411 Senior Seminar/Workshop I (1 Credits)**

Student led, faculty supervised, seminars developed in a workshop format reviewing recent research developments. One three hour session per week. Prerequisite: Advanced Standing.

**College/School:** Col of Science, Engr & Tech

**Department:** Department of Physics

**PHYS 412 Senior Seminar/Workshop II (1 Credits)**

Continuation of student led seminars developed in a workshop format reviewing recent research developments. One three hour session per week. Prerequisite: Advanced Standing.

**College/School:** Col of Science, Engr & Tech

**Department:** Department of Physics

**PHYS 415 Senior Thesis I (1 Credits)**

STEM majors with senior standing work on a research topic with a TSU or adjunct faculty. One two hour meeting per week.

**College/School:** Col of Science, Engr & Tech

**Department:** Department of Physics

**PHYS 416 Senior Thesis II (1 Credits)**

Continuation of PHYS 415. STEM majors with senior standing work on a research topic with a TSU or adjunct faculty. One two hour meeting per week.

**College/School:** Col of Science, Engr & Tech

**Department:** Department of Physics

**PHYS 419 Nuclear Phys for Life Sci Lab (1 Credits)**

Introduction to basic experiments in nuclear detection and radiation monitoring for Life Science students. Three hour laboratory per week. Prerequisites: PHYS 361 and 365.

**Prerequisite(s):** (PHYS 361 and PHYS 365)

**College/School:** Col of Science, Engr & Tech

**Department:** Department of Physics

**PHYS 421 Nuclear Mag Reson Lab Life Sci (1 Credits)**

Nuclear magnetic resonance based experiments for life sciences students. Three hour laboratory per week. Prerequisites: PHYS 361 and 365.

**Prerequisite(s):** (PHYS 361 and PHYS 365)

**College/School:** Col of Science, Engr & Tech

**Department:** Department of Physics

**PHYS 423 Nuclear Mag lab (1 Credits)**

Comprehensive experiments in nuclear magnetic resonance. Three hour laboratory per week.

**Prerequisite(s):** (PHYS 353)

**College/School:** Col of Science, Engr & Tech

**Department:** Department of Physics

**PHYS 424 Rad Bio & Nuc Med Life Sci (1 Credits)**

Experiments (for non-physics majors) measuring the effect of radiation on living cells. Three hour laboratory per week. Co-requisite: PHYS 452.

**Prerequisite(s):** PHYS 452 (may be taken concurrently)

**College/School:** Col of Science, Engr & Tech

**Department:** Department of Physics

**PHYS 426 Rad Bio Nuc Med lab (1 Credits)**

Experiments measuring the effect of radiation on living cells. Three hour laboratory per week. Corequisite: PHYS 454.

**Prerequisite(s):** PHYS 452 (may be taken concurrently)

**College/School:** Col of Science, Engr & Tech

**Department:** Department of Physics

**PHYS 431 Mechanics II (3 Credits)**

Lagrangian-Hamiltonian formulations of classical mechanics. Three lecture hours. Prerequisites: PHYS 338, PHYS 341, and MATH 242.

**Prerequisite(s):** (PHYS 338 (may be taken concurrently) and PHYS 341 and MATH 242)

**College/School:** Col of Science, Engr & Tech

**Department:** Department of Physics

**PHYS 432 Quantum Mechanics I (3 Credits)**

The foundations of quantum mechanics via the Schrodinger representation: bound and scattering states, quantum tunneling, spin, perturbation theory, spin orbit interactions, angular momentum coupling, etc. Three lecture hours per week. Prerequisites: Phys 338, 341, Math 243 and Math 250.

**Prerequisite(s):** (PHYS 338 and PHYS 341 and MATH 243 and MATH 250)

**College/School:** Col of Science, Engr & Tech

**Department:** Department of Physics

**PHYS 433 QUANTUM MECHANICS II (3 Credits)**

Quantum Mechanics (3) Basic postulates, Schrodinger's equation, barrier transmission, energy levels in square well, harmonic oscillator and hydrogen atom, angular momentum, perturbation theory. Three hours of lecture per week. Prerequisites: PHYS 334 and PHYS 336. Offered as needed.

**College/School:** Col of Science, Engr & Tech

**Department:** Department of Physics

**PHYS 437 Nuclear Physics I (3 Credits)**

Study of radioactivity decay law, radioactive dating, nuclear radiation detection, alpha-beta-gamma decay, etc. Three lecture hours and one demonstration hour per week. Pre-requisites: Phys 332, 432.

**Prerequisite(s):** (PHYS 332 and PHYS 432)

**College/School:** Col of Science, Engr & Tech

**Department:** Department of Physics

**PHYS 437L Nuclear Lab I (1 Credits)**

**College/School:** Col of Science, Engr & Tech

**Department:** Department of Physics

**PHYS 451 Computational Phys II (3 Credits)**

Introduction to advanced (parallel) computer methods for many body physics, quantum chemistry, nanophysics, and materials science problems. Three lecture hours per week.

**Prerequisite(s):** PHYS 433 (may be taken concurrently)

**College/School:** Col of Science, Engr & Tech

**Department:** Department of Physics

**PHYS 452 Rad Bio for Life Sci Stu (3 Credits)**

Study of the different types of electromagnetic radiation and the impact on organisms, including beneficial diagnostics and treatment properties. Three lecture hours per week. Prerequisites: PHYS 361 and 365. Co-requisite: PHYS 424.

**Prerequisite(s):** (PHYS 361 and PHYS 365) and (PHYS 424 (may be taken concurrently))

**College/School:** Col of Science, Engr & Tech

**Department:** Department of Physics

**PHYS 454 Radiation Biology (3 Credits)**

Study of the different types of electromagnetic radiation and the impact on organisms, including beneficial diagnostics and treatment properties. Three lecture hours per week. Prerequisites: PHYS 361 and 365. Corequisite: PHYS 426.

**Prerequisite(s):** (PHYS 361 and PHYS 365) and (PHYS 426 (may be taken concurrently))

**College/School:** Col of Science, Engr & Tech

**Department:** Department of Physics

**PHYS 458 MEDICAL IMAGING (3 Credits)**

The physics of x-ray computed tomography (CT), magnetic resonance imaging (MRI), nuclear medicine, ultrasound, etc., and their application. Three lecture hours per week. Prerequisites: PHYS 334 and PHYS 432.

**Prerequisite(s):** (PHYS 334 and PHYS 353)

**College/School:** Col of Science, Engr & Tech

**Department:** Department of Physics

**PHYS 467 Nuclear Physics II (2 Credits)**

Nuclear Physics II (2) Continuation of PHYS 437, with emphasis on the nuclear reactions, neutron physics, and applications of nuclear physics. Two lecture hours per week. Prerequisites: PHYS 432 and PHYS 437.

**Prerequisite(s):** (PHYS 366 and PHYS 353)

**College/School:** Col of Science, Engr & Tech

**Department:** Department of Physics

**PHYS 471 Intermed Nuc Phys Lab (1 Credits)**

Health physics applications and spectroscopy. Three hour session per week. Co-requisite: PHYS 475

**Prerequisite(s):** PHYS 475 (may be taken concurrently)

**College/School:** Col of Science, Engr & Tech

**Department:** Department of Physics

**PHYS 472 Nuclear Elec Lab (1 Credits)**

Study of pulse processing and shaping, linear and logic pulse functions, multichannel pulse analysis and the NIM and CAMAC Instrumentation Standards. Three hour session per week alternating between lecture and lab format. Prerequisites: PHYS 471 and PHYS 475.

**Prerequisite(s):** (PHYS 471 and PHYS 475)

**College/School:** Col of Science, Engr & Tech

**Department:** Department of Physics

**PHYS 475 Radiation Detec II (4 Credits)**

Instrumentation for gamma-radiation, charged particle, and slow/fast neutron detection; background and detector shielding; etc.. Four hours lecture per week. Prerequisites: PHYS 437, and 374. Corequisite: PHYS 471.

**Prerequisite(s):** (PHYS 366 and PHYS 374) and (PHYS 471 (may be taken concurrently))

**College/School:** Col of Science, Engr & Tech

**Department:** Department of Physics

**PHYS 477 Rad Protect & Dos (4 Credits)**

Radiation biology, dosimetry, radiation sources of exposure, health physics instrumentation, standards and regulations. Four lecture hours per week. Prerequisite: PHYS 361.

**Prerequisite(s):** PHYS 361

**College/School:** Col of Science, Engr & Tech

**Department:** Department of Physics

**PHYS 478 Rad Protect & Dis II (4 Credits)**

Continuation of PHYS 477 focusing on radiation protection, practice, environmental monitoring and specialty health physics areas. Four lecture hours per week. Prerequisite: PHYS 477.

**Prerequisite(s):** PHYS 477

**College/School:** Col of Science, Engr & Tech

**Department:** Department of Physics

**PHYS 481 ENGINEERING PHYS MAT SC (3 Credits)**

Study of the theoretical and computational formulations for studying quantum materials. Three lecture hours per week. Corequisite: PHYS 451.

**Prerequisite(s):** PHYS 451 (may be taken concurrently)

**College/School:** Col of Science, Engr & Tech

**Department:** Department of Physics

**PHYS 482 ENG PHYS NANOBIOPHYS (3 Credits)**

A first principle's, physics based approach for understanding the dynamics between based nanostructures and bio-chemical molecular structures. Three lecture hours per week. Prerequisites: PHYS 433 and PHYS 451.

**Prerequisite(s):** (PHYS 433 and PHYS 451)

**College/School:** Col of Science, Engr & Tech

**Department:** Department of Physics

**PHYS 483 Independent Study (2 Credits)**

Detailed study of an advanced topic in physics under the guidance of an instructor. Departmental permission required. May be enrolled for up to 4 semester credit hours. Prerequisites: Senior standing and consent of the chair

**College/School:** Col of Science, Engr & Tech

**Department:** Department of Physics

**PHYS 484 Topics in Physics (3 Credits)**

Different advanced topics offered, depending on faculty/student interests in all branches of physics: particle physics, astrophysics, space physics, quantum computing, etc. May be repeated for credit as topics vary. Three hours per week. Prerequisites: Senior standing and consent of the chair.

**College/School:** Col of Science, Engr & Tech

**Department:** Department of Physics

**PHYS 485 BASIC CON ATOM RAD PHYS I (2 Credits)**

Introduction to atomic and nuclear structure, radiation, radiation detection, dosimetry, protection, etc. For professionals with advanced math competency. Two week sessions, two hour classes each day.

**College/School:** Col of Science, Engr & Tech

**Department:** Department of Physics

**PHYS 486 BASIC CON ATOM RAD PHYS II (2 Credits)**

Introduction to atomic and nuclear structure, radiation, radiation detection, dosimetry, protection. etc. For professionals with advanced math competency. Two week sessions, two hour classes each day.

**College/School:** Col of Science, Engr & Tech

**Department:** Department of Physics

**PHYS 487 BASIC CON ATOM RAD PHYS III (2 Credits)**

Introduction to atomic and nuclear structure, radiation, radiation detection, dosimetry, protection. etc. For professionals with advanced math competency. Two week sessions, two hour classes each day.

**College/School:** Col of Science, Engr & Tech

**Department:** Department of Physics

**PHYS 488 RAD PROTEC & DOS I (4 Credits)**

Radiation biology, dosimetry, radiation sources of exposure, standards and regulations, radiation protection practices. For professionals with advanced math competency. Five weeks, two hours per day. Combination of lectures (online) and labs/demonstrations.

**College/School:** Col of Science, Engr & Tech

**Department:** Department of Physics

**PHYS 489 RAD PROTEC & DOS II (4 Credits)**

Radiation biology, dosimetry, radiation sources of exposure, standards and regulations, radiation protection practices. For professionals with advanced math competency. Five weeks, two hours per day. Combination of lectures (online) and labs/demonstrations.

**College/School:** Col of Science, Engr & Tech

**Department:** Department of Physics

**PHYS 490 NUCLEAR INSTRUMENTATION (4 Credits)**

Training in nuclear detection and measurement instrumentation. Five weeks, two hours per day. For professionals with advanced math competency. Lectures and Lab/Demonstrations.

**College/School:** Col of Science, Engr & Tech

**Department:** Department of Physics

**PHYS 491 NUC PHYS LAB I (2 Credits)**

Basic experiments exploiting Geiger Muller counters. Two weeks, three hours per day. For professionals with advanced math competency. Lectures and Lab/Demonstrations.

**College/School:** Col of Science, Engr & Tech

**Department:** Department of Physics

**PHYS 492 Nuclear Phys Lab II (5 Credits)**

Basic experiments in radiation protection and radiation biology. Two weeks, three hours per day. For professionals with advanced math competency. Lectures and Lab/Demonstrations.

**College/School:** Col of Science, Engr & Tech

**Department:** Department of Physics

**PHYS 493 Nuclear Phys Lab III (5 Credits)**

Experiments emphasizing Nuclear Instrument Module (NIM) equipment, including basic nuclear electronics experiments. Two weeks, three hours per day. For professionals with advanced math competency. Lectures and Lab/Demonstrations.

**College/School:** Col of Science, Engr & Tech

**Department:** Department of Physics

**PHYS 494 Intro Nuclear Physics I (2 Credits)**

Basic nuclear structure. Two weeks, two hours per day. For professionals with advanced math competency.

**College/School:** Col of Science, Engr & Tech

**Department:** Department of Physics

**PHYS 495 INTRO NUC PHYS II (2 Credits)**

Independent Study (2) Detailed study of an advanced topic in physics under the guidance of an instructor. Consent of the Department required. May be enrolled for up to 4 semester credit hours.

**College/School:** Col of Science, Engr & Tech

**Department:** Department of Physics

**PHYS 496 Intro Nuclear Physics II (2 Credits)**

Basic nuclear structure. Two weeks, two hours per day. For professionals with advanced math competency.

**College/School:** Col of Science, Engr & Tech

**Department:** Department of Physics

**PHYS 497 Topics in Physics (3 Credits)**

Topics in Physics (3) Current topics in the various branches of physics such as quantum mechanics, space physics, solid state physics, atomic and nuclear physics, and biophysics. May be repeated for credit as topics vary. Three hours of lecture per week. Prerequisites: senior standing and consent of the department chair.

**College/School:** Col of Science, Engr & Tech

**Department:** Department of Physics

**PHYS 499 Drug Design (3 Credits)**

**College/School:** Liberal Arts & Behavioral Scie

**Department:** Department of Physics

**PHYS 1301 College Physics I (3 Credits)**

General Physics for Life Science Students I (3) Non-calculus based introductory physics course designed for pharmacy students (lab suggested, although not necessarily concurrently), life sciences and chemistry students, and (non-calculus oriented) engineering students: Newton's laws of mechanics, fluids, waves and thermodynamics. Demonstrated mastery of basic algebra, geometry, trigonometry, and pre-calculus will be assessed during the first week to determine if the student will be required to pursue mandatory concurrent remediation sessions. A sample of test related problems can be found at <http://physics.tsu.edu>. Three lecture and demonstration hours per week. It is recommended, but not required, that the students take the accompanying lab (although not necessarily concurrently): PHYS 213

**Prerequisite(s):** MATH 136

**College/School:** Col of Science, Engr & Tech

**Department:** Department of Physics

**PHYS 1302 College Physics II (3 Credits)**

General Physics for Life Science Students II (3) Second part of trigonometry-based introduction to physics for life science students, including waves, electricity, magnetism, optics, and modern physics. Three hours of lecture per week. Referred to as General Physics II in this document. Corequisite: PHYS 216. Prerequisite: PHYS 237 or PHYS 244.

**Prerequisite(s):** PHYS 1301 or PHYS 244

**College/School:** Col of Science, Engr & Tech

**Department:** Department of Physics

**PHYS 1315 Prin of Phys Sci (3 Credits)**

Survey of the physical sciences for non-science majors, including introductory physics, astronomy, chemistry, geology, atmospheric and environmental sciences. Three hours of lectures and demonstrations per week.

**College/School:** Col of Science, Engr & Tech

**Department:** Department of Physics

**PHYS 2325 University Physics I (3 Credits)**

College Physics I Calculus based, introduction to Newtonian physics impacting mechanics, fluids, waves and thermodynamics. Strong competency in calculus required as measured by department's online guide. Math assessment during first week will determine if student must participate in mandatory remediation sessions. Chair's approval required. Three lecture and demonstration hours per week. The corresponding laboratory is strongly recommended. PHYS 217.

**Prerequisite(s):** MATH 242

**College/School:** Col of Science, Engr & Tech

**Department:** Department of Physics