

# PHYSICS

## Academic Year

2011-2012

## School

School of Science, Engineering and Technology [School Web site](#)

## School Dean

Winston F. Erevelles, Ph.D. [werevelles@stmarytx.edu](mailto:werevelles@stmarytx.edu)

## Department

Physics

## Department Chair

Richard Cardenas, Ph.D. [rcardenas@stmarytx.edu](mailto:rcardenas@stmarytx.edu)

## Description of Program/Major

Physics is the study of an enormous span of natural phenomena ranging from the large scale involvement of galaxies to the the submicroscopic motion of atoms and nuclei. A major in physics at St. Mary's University prepares students with a broad based view of science, as well as the analytical tools necessary to tackle problems in many different fields. Physics is an intensive course of study that emphasizes analytical and problem solving skills. Students have the opportunity to acquire a degree either in physics or applied physics.

The Bachelor of Arts in physics is usually chosen by students who wish to teach high school physics. The applied physics degree has an option in computer science or electrical engineering. Applied physics is a Bachelor of Science degree plan that provides an instructional base in physics, engineering, mathematics and computer applications. It prepares students to enter today's high technology marketplace upon graduation. Along with technical courses, students in the program benefit from liberal arts courses in English, social science, philosophy, theology, speech, foreign language and fine arts.

## Degree Requirements

### Core Curriculum (SMC)

#### St. Mary's University Core (30 Hours)

*All St. Mary's Core SMC13## "Reflection" courses must be completed before registering for SMC23## "Practice" courses. "Reflection" courses can be taken in any order followed by "Practice" courses in any order.*

SMC 1301	Foundations of Civilization	3
SMC 1311	Foundations of Reflection: Self (Formerly PL 1310)	3

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SMC 1312	Foundations of Reflection: Nature	3
SMC 1313	Foundations of Reflection: Others	3
SMC 1314	Foundations of Reflection: God (Formerly TH 2301)	3
SMC 2301	Foundations of Practice: Ethics (Formerly PL 2332)	3
SMC 2302	Foundations of Practice: Civic Engagement and Social Action	3
SMC 2303	Foundations of Practice: Fine Arts and Creative Process (Formerly FA 1101, FA 1102, FA 1103)	3
SMC 2304	Foundations of Practice: Literature	3
SMC 4301	Capstone Seminar: Prospects for Community and Civilization	3

## School Specific Core (SSC)

### School of Science, Engineering, and Technology Specific Core (21 Hours)

Speech	SE 1321 (for international students), SE 1341, SE 2333, SE 3391	3
Composition and Rhetoric (grade of "C" or better)	EN 1311, EN 1313 (for international students)	3
Foreign Languages	Six hours at the sophomore level (2311, 2312) in a Foreign Language previously studied for a minimum of one year; Or, 6 hours of introductory level (1311, 1312) in a Foreign Language not previously studied; Or, 12 hours of CLEP credit for a language previously studied.	6
Social Science	BA 1310, BA 3325, CJ 2300, CJ 3300, EC 2301, EC 2303, PO 1311, PO 1312, PO 1314, PS 1301, PS 3386, SC/CR 1311, SC 3321, HU 3300, HU 3303	3
Theology	Advanced Theology 33XX	3
Fine Arts	AR, DM, MU or Literature: EN 2321, 2322, 2353, 2354, 2355, 2356	3

## Four Year Degree Plan

[Sample 4-year degree plan, Physics with Math Minor \(BA\)](#)

[Sample 4-year degree plan, Physics, Biophysics Option \(BS\)](#)

[Sample 4-year degree plan, Physics \(BS\)](#)

## Department Courses and Descriptions

### Physics Concepts & Application (3)

PY 1300

Designed to convey the considerable bearing physical laws have on common experience. Applications in trades, professions and industry are provided. Directed to ward non-science majors to help them evaluate the evidence of their own experience and see the pervasiveness of physics in virtually every aspect of technological society. Topics: Motion, Gravity, Relativity, Energy and Power, Energy Resources, Waves, Sound and Electricity.

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## **Modern Astronomy (3)**

PY 1310

A course that will be of interest to students not majoring in science, engineering or mathematics as well as those majoring in these fields. This course deals mainly with stellar and galactic astronomy but begins with a brief survey of our solar system including orbits and Kepler's laws. The emphasis is placed upon how compositions, ages and evolution are deduced. The course will be somewhat quantitative but the mathematical requirements are minimal.

## **General Physics I (4)**

PY 1401

First semester: mechanics, sound and heat. Second semester: electricity, light, atomic and nuclear physics. Intended for non-physics and non-engineering students. (Lecture 3 hours; Lab 4 hours.) (PHYS 1401)

## **General Physics II (4)**

PY 1402

First semester: mechanics, sound and heat. Second semester: electricity, light, atomic and nuclear physics. Intended for non-physics and non-engineering students. (Lecture 3 hours; Lab 4 hours.) (PHYS 1402)

## **Mechanics, Heat Acoustics (4)**

PY 1404

Calculus based physics. (Lecture 3 hours; Lab 4 hours.) Co-requisite MT 2412 (PHYS 2425)

## **Electricity, Magnetism, Optics (4)**

PY 2404

Calculus based physics. (Lecture 3 hours; Lab 4 hours.) Prerequisites PY1404, MT 2412 (PHYS 2426)

## **Atomic Physics Lab (1)**

PY 3101

(Lab 4 hours per week; usually concurrent with PY 3301.)

## **Nuclear Physics Lab (1)**

PY 3102

(Lab 4 hours per week; usually concurrent with PY 3302.)

## **Electronics Lab I (1)**

PY 3113

Same as EG 3156

## **Electronics Laboratory II (1)**

PY 3114

Same as EG 3157

## **Special Topics Laboratory (1)**

PY 3125

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## **Atomic Physics (3)**

PY 3301

Special relativity, electrons and quanta, Quantum Theory, Schrödinger's Equation, x-rays -spectra. Note: PY 1404 and PY 2404 are prerequisites and MT 3311 is a co-requisite for 3000 level physics courses.

## **Nuclear Physics (3)**

PY 3302

Radio activity, Rutherford scattering, nuclear atom, radiation detectors, nuclear reaction, alpha decay, beta decay, gamma radiation, nuclear models, accelerators. Prerequisite: PY 3301. Note: PY 1404 and PY 2404 are prerequisites and MT 3311 is a co-requisite for 3000 level physics courses.

## **Thermodynamics (3)**

PY 3304

States and processes, equations of state, internal energy, enthalpy, the ideal gas, incompressible substances, entropy and the second law, second law analysis, thermodynamics relationships, engineering applications. Note: PY 1404 and PY 2404 are prerequisites and MT 3311 is a co-requisite for 3000 level physics courses.

## **Physical Optics (3)**

PY 3305

Wave theory, interference, diffraction, polarization, spectroscopy, and photometry. Note: PY 1404 and PY 2404 are prerequisites and MT 3311 is a co-requisite for 3000 level physics courses.

## **Mechanics (3)**

PY 3307

Vector approach to Newtonian mechanics. Static and Kinetics. Introduction to the Lagrangian and Hamiltonian approach. Note: PY 1404 and PY 2404 are prerequisites and MT 3311 is a co-requisite for 3000 level physics courses.

## **Quantum Mechanics (3)**

PY 3308

Schrodinger wave equation, stationary state solutions, the hydrogen atom, angular momentum, perturbation theory. Note: PY 1404 and PY 2404 are prerequisites and MT 3311 is a co-requisite for 3000 level physics courses.

## **Electromagnetics (3)**

PY 3309

Vector analysis, electrostatics, dielectrics, magnetostatics, Maxwell's equation, wave propagation, radiation. Note: PY 1404 and PY 2404 are prerequisites and MT 3311 is a co-requisite for 3000 level physics courses.

## **Electronics (3)**

PY 3313

Theory of semiconductors; discrete devices and integrated circuits; linear and digital operation. (EG 2341, EG 2152, EG 2352, EG 2353 are prerequisites.) Note: PY 1404 and PY 2404 are prerequisites and

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MT 3311 is a co-requisite for 3000 level physics courses. (same as EG3356)

## **Electronics (3)**

PY 3314

Theory of semiconductors; discrete devices and integrated circuits; linear and digital operation. (EG 2341, EG 2152, EG 2352, EG 2353 are prerequisites.) Note: PY 1404 and PY 2404 are prerequisites and MT 3311 is a co-requisite for 3000 level physics courses. (same as EG3357)

## **Special Topics (3)**

PY 3325

This course is used to introduce special topics of interest. Topics in past have included the following: Particle Physics, Biophysics, Functional Neuro imaging, Fiesta of Physics Outreach, Advanced Electromagnetic theory and Advanced Quantum Mechanics. Note: PY 1404 and PY 2404 are prerequisites and MT 3311 is a co-requisite for 3000 level physics courses.

## **Department Faculty**

[Physics Faculty Website](#)

## **Department Website**

[Physics Website](#)