

**PHY  
431****Nuclear and Particle  
Physics****Spring  
2021****Instructor:**

- Professor Concha Gonzalez-Garcia,  
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Office hrs: W 11:30-12:30 am in the office or in an open Zoom session or by appointment if  
required by email

**Place and Time:**

- Tuesday and Thursday 8:00-09:20 in ENGINEERING 145
- The lectures will be presented in a combination of handwriting on the blackboard and projected/shared pdf notes  
At the end of each lecture session the pdf notes for that lecture will be posted in Blackboard and on the "Supplementary material" link in this homepage
- This homepage: [http://insti.physics.sunysb.edu/~concha/PHY431/S21/phy431\\_S21.html](http://insti.physics.sunysb.edu/~concha/PHY431/S21/phy431_S21.html)

**Prerequisites:**

- Quantum Mechanics PHY 308. Modern Physics PHY 251 is also recommended.

**Objectives:**

PHY 431 is an introductory physics course which offers comprehensive survey of particle and nuclear physics.

The goal of the course is to give an overview of these diverse and exciting fields.

We will discuss our present knowledge of particle interactions -- The Standard Model--.

Rigorous field theory approach will be avoided and more phenomenological approach will be taken.

Applications of quantum mechanics and the role of symmetry principles are stressed.

**Syllabus (Temptative):**

Topics
1. Introduction: Overview of Elementary Particle Physics
2. Relativistic Kinematics
3. Particle Sources: Particle Accelerators
4. Symmetries in Particle Physics
5. Wave functions for Relativistic Particles
6. The Feynman Calculus
7. Quantum Electrodynamics
8. Strong Interactions: From Nuclear Forces to QCD
9.*(if time allows) Weak Interactions and neutrino physics

**TextBook:**

- D. Griffiths, Introduction to Elementary Particle Physics, Wiley 1987 (or newer edition)

## Supplementary Books/materials:

- F. Halzen and A. Martin, Quark and Leptons. Wiley 1984
- D. Perkins, Introduction to High Energy Physics, Addison Wesley, 2004
- R.N. Cahn and G. Goldhaber, The Experimental foundations of particle physics, Cambridge University Press, 1991.

## Course Instructions:

Communication of homework assignments, schedules, and other informations will be done via Blackboard, email and via this web site.

This page can be reached from the instructor's homepage, and from Blackboard

## Homework:

Homework will be assigned each week.

They will be posted in Blackboard with set deadline

**Homework must be written by hand CLEARLY**

Homework will be submitted via Blackboard as pdf or jpg or png

Although cooperative learning is encouraged, you are required to solve the problems on your own and to consult others only after giving it a serious try yourself.

The final calculations and solutions have to be done by you alone.

Copied or late homeworks will not be accepted and will count as zero.

## Examinations:

There may be one or two midterm exams and a final exam.

## Grading:

Homework 50%; Tests, Attendance and Participation 50%

## Special Notes:

Any excuses (medical or otherwise) are to be documented, and discussed with the instructors in a timely manner. If you have a physical, psychiatric, medical, or learning disability that may impact on your ability to carry out assigned course work, I urge that you contact the staff in the Disabled Student Services office (DSS), Room 133 Humanities, 632-6748. DSS will review your concerns and determine, with you, what accommodations are necessary and appropriate. All information and documentation of disability is confidential.

## Accademic Integrity:

Each student must pursue his or her academic goals honestly and be personally accountable for all submitted work. Representing another persons work as your own is always wrong. Any suspected instance of academic dishonesty will be reported to the Academic Judiciary. For more comprehensive information on academic integrity, including categories of academic dishonesty, please refer to the academic judiciary website at <http://www.stonybrook.edu/uaa/academicjudiciary/>

## Critical Incident Management

Stony Brook University expects students to respect the rights, privileges, and property of other people. Faculty are required to report to the Office of University Community Standards any disruptive behavior that interrupts their ability to teach, compromises the safety of the learning environment, or inhibits students' ability to learn. Faculty in the HSC Schools and the School of Medicine are required to follow their school-specific procedures. Further information about most academic matters can be found in the Undergraduate Bulletin, the Undergraduate Class Schedule, and the Faculty-Employee Handbook.

