

## Physics 422: Nuclear & Particle Physics

Based on A16 & A17 as taught by G. Watts

### Overview

This course is an introduction to nuclear and particle physics, building on the concepts learned in 226. In nuclear physics this course covers basic properties of nuclei, the semi-empirical mass formula, and scattering. In particle physics, after a review of 226, we will cover neutrino oscillations and Feynman rules, doing cross section and decay calculations with a toy model and QED. Each student is also required to give a talk at the end of the quarter covering theoretical and experimental aspects of a particle or nuclear physics topic.

### Evaluation

Homework is assigned weekly, and there is a midterm and final exam. The talks are also graded.

### Texts

1. **Required:** Introduction to Elementary Particles, by Griffiths

### Topics by week

1. Intro to Nuclear and Particle Physics
2. Introduction to Nuclear physics and scattering (Coulomb, Rutherford, Mott)
3. Stability of Nuclei, Radioactive Decays, and Carbon Dating
4. Passage of particles through material, and a review of particles, forces, and symmetries
5. Review of particles, forces, and symmetries, continued.
6. Neutrinos: oscillations, mass, and CP violation (and exam)
7. Neutrinos: continued and introduction to the Feynman Calculus
8. The Feynman Calculus, continued
9. The Feynman Calculus continued (Thanksgiving Holiday)
10. QED
11. QED Continued, and talk presentation