

office: Room 320 Physics Research Bldg.  
phone: 313-577-0156  
email: [sean@physics.wayne.edu](mailto:sean@physics.wayne.edu)

**TEXT:** *Introduction to Nuclear and Particle Physics*, by Das and Ferbel, Second Edition

**SUPPLEMENTS:** *Introduction to Elementary Particles*, Griffiths  
*Introduction to Quantum Mechanics*, Griffiths  
*Particles and Nuclei*, Povh, Rith, Scholz, and Zetsche  
*Nuclear Physics in a Nutshell*, Bertulani  
*Structure of the Nucleus*, Preston and Bhaduri  
*Introductory Nuclear Physics*, Krane

**OFFICE HOURS:** By appointment

**HOMEWORK:** Every 1-2 weeks. There will be a 10% penalty for late homework within one week of the due date, **with no credit after one week**. The lowest homework will be dropped.

**EXAMS:** There will be one midterm exam and one final presentation. Your grade will be determined as follows:

Homework	30%
Participation	10%
Exam	30%
Final Presentation	30%

Presentations will cover a topic that is either an area of current research interest in nuclear physics at the level of *Physics Today*, or *Scientific American*.

**FINAL EXAM:** **Wednesday, April 26, 2017, 10:15 a.m. – 12:15 a.m.**

### **COURSE CONTENT:**

- Nuclear Collisions: quantum scattering, Born approximation
- WKB theory of scattering and the eikonal approximation
- Nuclear Structure: liquid drop model, shell model
- Nucleon-nucleon interaction
- Quarks and the strong interaction
- Radioactive Decay: WKB theory of alpha decay, perturbation theory of beta and gamma transitions
- Nuclear Energy: Fission and Fusion
- Colliders and detectors: Energy deposition of high energy particles in matter
- Nuclear Astrophysics

### **LEARNING OUTCOMES:**

- Learn concepts, models, methods and nomenclature needed to begin research in nuclear physics and related areas.
- Understand how theoretical methods from quantum and statistical physics are used to address systems in nuclear physics.
- Learn about nuclear physics experimental results and methods.
- Appreciate the role of theory in interpreting data.
- Apply graduate level mathematical methods needed for such problems.