Physics 440: Nuclear and Particle Physics
Spring 2023, On-line

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Please note:

- All e-mail communication from the instructor concerning this course will be to GMU accounts only.
- If you are a student with a disability and you need academic accommodations, please see me **and** contact the Office of Disability Resources at 703.993.2474. All academic accommodations must be arranged through that office.

Course Goal:

1. To gain a basic familiarity with sub-atomic physics and its methods.

Suggested References:

- *Quarks & Leptons: An Introductory Course in Modern Particle Physics*, F. Halzen and A. Martin
- *Introduction to High Energy Physics*, D. Perkins
- *Introduction to Elementary Particles*, D. Griffiths
- *Nuclear and Particle Physics: An Introduction*, B. R. Martin [Recommended to me, but I'm unfamiliar with it]
- *Particle Physics*, B. R. Martin [Recommended to me, but I'm unfamiliar with it]

Reading Resources:

- Undergraduate: `http://physics.gmu.edu/~rubinp/courses/440-540/undergrad/`
- Graduate: `http://physics.gmu.edu/~rubinp/courses/440-540/grad/`
- Nobel Prize Lectures: `http://physics.gmu.edu/~rubinp/courses/440-540/nobel/`

Expectations:

A weekly, one-hour overview of each week's assignment will be presented sometime on Monday, when everyone in the class can meet. Attendance is not required. Questions can be asked then and in office hours. The objective is to answer all problems correctly.

Students are expected to complete assigned exercises in advance of weekly individual or small group tutorial sessions at which students present their solutions to the exercises. Working with others to get started or overcome difficulties is encouraged, but the solutions presented must be the work of the presenting student. Shared or copied solutions will earn no credit for all involved.

Timely attendance at tutorial sessions accounts for 40% of the final grade. The quantity of problems attempted and the quality of the solutions presented account for an additional quarter of the final grade. Another 10% of the final grade can be earned by submitting corrected solutions (this 10% is automatically granted when all presented solutions are correct).

Minimal tutorial time will be spent discussing concepts. Such discussions may take place at the Monday overview or in office hours.

An oral final exam or a final project will account for the remaining 25% of the final grade.

Grading:

- Exercises, 75%; final exam or project 25%

A+ = 100-93.33%	A = 93.32-86.67	A- = 86.66-80
B+ = 79.99-73.33	B = 73.32-66.67	B- = 66.66-60
C+ = 59.99-53.33	C = 53.32-46.67	C- = 46.66-40
	D = 39.99-20	
	F < 20	

Tentative Schedule:

Week	Topic
1	Dimensions and units
2	Four-momentum
3	Collisions and scattering
4	Nuclei
5	Nuclear stability and instability
6	Nuclear transformations and radioactivity
7	Nuclear models
8	Spring break
9	Nuclear reactions
10	Nuclear fission and fusion
11	Interactions between electromagnetic radiation and matter
12	Interactions between charged particle radiation and matter
13	Particle accelerators and detectors
14	Particle physics (I)
15	Particle physics (II)

Final Examination: One-hour, individual, cumulative oral exam based on the semester's exercises. Date and time to be scheduled after Spring break (week 8).

Project: Develop a 50-minute lesson on a topic of choice related to sub-atomic physics. The lesson must consist of lecture notes, homework, and homework solutions. Work on the project must be done independently, and must be original work. Due before Tuesday, 16 May 2023, 17:00 (5:00 pm).

Attendance and Tardiness: Preparation for and on-time attendance at tutorial sessions required. Half the attendance credit will be deducted for tardiness. Preparation credit will be allocated based on the number of exercises attempted and the quality of the attempt. All credit will be lost for an unexcused (in advance) missed session.

Disruptive Behavior: It is expected that you will engage constructively at tutorial sessions, prepared to offer and explain solutions to the exercises assigned.

Honor Code Violations: The work you present must be your own. Plagiarism and cheating will be punished with failing grades and trial by the honor committee. It's important to appreciate that science is impossible when dishonesty, in any manifestation, exists.

The GMU Honor Code: `https://oai.gmu.edu/mason-honor-code/`