PHYSICS 4360.001/5610.003
Nuclear and Particle Physics
Physics Room 104, TR 12:20-1:50 p.m.
Fall 2025

Professor: Duncan Weathers
Office: Physics Bldg., Room 003
Telephone: (940) 565-2079
E-mail: duncan.weathers@unt.edu
Office Hours: Th 3:30 - 4:30 p.m, and by appointment

Text: *Nuclear and Particle Physics,* by Wolfgang Demtröder, Springer, 2022, ISBN 9783030583132 (e-text available through library.unt.edu)
Supplemental text: *Introduction to Nuclear and Particle Physics,* by Saverio D'Auria, Springer, 2018 ISBN 978331993854 (e-text available through library.unt.edu)

Topics and General Information: The first half of the course will cover nuclear structure, nuclear stability and decay, experimental methods for studying nuclei and particles, nuclear models, and nuclear reactions. The second half of the course will cover the Standard Model of elementary particles including particle classification and the quark model, quantum numbers and conservation laws, symmetries, electrodynamics of quarks and hadrons, quantum chromodynamics, weak interactions, and gauge theories. The course will conclude with a brief look beyond the Standard Model.

Attendance: Attendance is strongly encouraged.

Exams: There will be one midterm exam and a final exam. Exam questions will be based on material covered in the lecture, contained in the text, and in the homework assignments. Corrected solutions for the midterm exam may be submitted to recover up to half of missed credit. If your homework score is higher than your lowest exam score, these two will be exchanged. Note that exams for 5610 students will have an additional problem.

Homework: Homework sets will be assigned each week on Canvas, and generally will be due a week after being assigned. Homework grades will be based principally on assignment completion. Note that extra problems will be assigned for 5610 students.

Optional Report: For extra credit (up to 10%), a review of a technical article related to course subject matter may be submitted.

Grade: The grading in the course will be based on the total points earned from exams, homework, and optional report, with the following weighting (out of 100):

Midterm Exam	40 points
Final Exam	40 points
Homework	20 points

The University of North Texas makes reasonable academic accommodation for students with disabilities. Students seeking reasonable accommodation must first register with the Office of Disability Accommodation (ODA) to verify their eligibility. If a disability is verified, the ODA will provide you with a reasonable accommodation letter to be delivered to faculty to begin a private discussion regarding your specific needs in a course. You may request reasonable accommodations at any time, however, ODA notices of reasonable accommodation should be provided as early as possible in the semester to avoid any delay in implementation. Note that students must obtain a new letter of reasonable accommodation for every semester and must meet with each faculty member prior to implementation in each class. Students are strongly encouraged to deliver letters of reasonable accommodation during faculty office hours or by appointment. Faculty members have the authority to ask students to discuss such letters during their designated office hours to protect the privacy of the student. For additional information see the Office of Disability Accommodation website at Office of Disability Access | University of North Texas. You may also contact them by phone at 940.565.4323.

UNT's policy on Academic Integrity can be found at: Academic Integrity | University of North Texas.

Drop information is available at: Fall Academic Calendar & Key Dates | University of North Texas.

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Tentative Lecture Schedule

Week	Dates	Chapter, Lecture Topic
1	Aug 19, 21	Introduction; Nuclear structure
2	Aug 26, 28	Nuclear stability and radioactive decay
3	Sept 2, 4	Experimental tools and methods
4	Sept 9, 11	Nuclear forces and models
5	Sept 16, 18	Nuclear reactions
6	Sept 23, 25	Nuclear reactions, cont'd
7	Sept 30, Oct 2 12	Elementary particle classification **Midterm Exam**
8	Oct 7, 9	Symmetries and conservation laws
9	Oct 14, 16	Quantum electrodynamics
10	Oct 21, 23	Electrodynamics of quarks and hadrons
11	Oct 28, 30	Quantum chromodynamics
12	Nov 4, 6	Weak interactions
13	Nov 11, 13	Gauge theories
14	Nov 18, 20	String theory – a glimpse
--	Nov 24-28	*No class – Thanksgiving break*
15	Dec 2, 4	Review

Final Exam – Thursday, December 11, 10:30 a.m.-12:30 p.m.