PHYS 717: NUCLEAR THEORY I - COURSE INFORMATION

INSTRUCTOR:

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OFFICE HOURS:

Wednesday 2:00 to 4:00 or by appointment

CLASS MEETINGS:

TTH 11:00 to 12:15 (PSC 006)

REQUIREMENTS:

Quizzes
Homework
Final Examination on Friday, December 12 at 9:00 a.m.

GRADING:

Your overall score will be an average of all grades you have accumulated during the course, weighted as follows:

Quizzes: 30%
Homework: 30%
Final Examination: 40%

Exams will be based on the material discussed in class, the material in homework assignments, the material in quizzes, and textbook.

GRADING SCALE:

A:88-100 B:76-87 C:63-75 D:50-62.

ACADEMIC RESPONSIBILITY:

All work you submit must be your own and must comply with the rules stated on this sheet. Please refer to *Carolina Community* for further information concerning the Code of Student Academic Responsibility.

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The purpose of the course is to introduce students to modern theory of nuclear many-body systems and to develop the understanding of the strong interactions in the nuclear domain.

Upon completion of the course, the student should be able to understand basic ideas of:

- quark-gluon origin of the nuclear forces
- general properties of nucleon-nucleon interactions
- symmetries of the nuclear Hamiltonian
- global properties of atomic nuclei and nuclear matter
- basic models for the nuclear structure description
- elements of nuclear reaction theory
- nuclear decay modes

Successful students should be able to:

- calculate properties of deuteron
- calculate/estimate of nuclear properties based on empirical data and nuclear models
- calculate/estimate of the lifetimes of nuclear states that are unstable to alpha-, beta-, gamma-decay, and fission using simple nuclear models
- use nuclear models to predict low-energy level structure
- use nuclear models to predict spins and parities of low-lying levels
- use theory of reactions to describe simple nuclear reactions (e.g. the Breit-Wigner single level formula for cross section calculations)

Recommended textbook: "Theoretical Nuclear And Subnuclear Physics" by J. D. Walecka.

List of Topics:

- Nuclear Forces
- Theory of Deuteron
- Effective Field Theory
- Nuclear Matter
- The Shell Model
- Random Phase Approximation
- Nuclear Reactions
- Electromagnetic and Weak Interactions
- Alpha Decay, Beta-Decay, Fission