Physics 560
Theoretical Nuclear Physics

Textbook:
"Introductory Nuclear Physics," by S.M. Wong, second edition, Wiley 1998.

The first edition was published in 1990 by Prentice Hall and is out of print. The core of the book is the same in both editions. In the second edition the author has added three new chapters and made some changes to the rest of the chapters. Several copies of both the first and second editions of the book are on reserve in the Physics Library.

This first part of the theoretical nuclear physics course will cover basic properties of nuclei and their semi-qualitative description. At the end of the course you should have a pretty good idea about the basic properties of nuclei and of some range of phenomena studied mostly until 1980 or so in this field. The course will not be able to cover the entire field, but hopefully this introductory course will help you later on to find your way in nuclear literature.

From time to time the Professor shall assign various problems as homework. In these assignments you will be asked to find an analytical, numerical or some other type of solution to a particular nuclear physics problem. In some cases you will have to use one or more of the following: fortran, matlab and mathematica. In order to find the corresponding solution you might need to consult other sources of information, either textbooks or original scientific articles. The solutions of these problems will be subsequently presented by students to the rest of the class in a seminar-like atmosphere. The students are strongly advised to participate in the general discussion.

The final grade will reflect the Professor's (subjective) opinion about the level at which you have mastered and understood the material presented. There will be no final exam and you will be graded only on your homework assignments or/and presentations.

The material in the course shall not be presented in quite the same sequence as in the textbook. The textbook starts with a presentation of the one and two-nucleon problems. Nuclear physics, however, is mostly about many nucleon problems and as in other physics fields (e.g. statistical physics) many details of the NN interactions are not particularly relevant if one intends to study the properties of relatively large systems.

The material in the textbook and in class will be presented at approximately the same level of difficulty, which is characterized as medium for a graduate course. This course will emphasize the qualitative understanding of nuclear phenomena and during this first quarter a special effort shall not be made to introduce sophisticated theoretical methods. The most difficult part of a new physics subject is not the formal part, the mathematical formalism, but the new concepts.