Syllabus for 3342.642
Topics in Modern Nuclear Physics Experiments
Fall 2004

Course:

Lecture: Tu/Th 4:00–5:15
Room: 022-401

Lecturer: Seonho Choi (최선호)

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Office Hours:	Tu/Th 2:00–3:00, and by appointment

Prerequisites: Introductory modern physics, introductory quantum mechanics.

References:

- *Quarks & Leptons: An Introductory Course in Modern Particle Physics*, Francis Halzen and Alan D. Martin (1984).
- *An Introduction to Quarks and Partons*, F. E. Close (1979).
- *Introduction to High Energy Physics*, Donald H. Perkins.
- *Quantum Chromodynamics*, Walter Greiner and Andreas Schäfer (1995).

Topics to be Covered: This course will try to cover some important issues in *modern nuclear physics experiments*. In the classroom, it will be attempted to have live discussions instead of traditional lectures. After a brief explanation of the difference between *nuclear* physics and *particle* physics (personal view, of course), we will begin by the introductory description of standard models such as quarks and leptons. We will discuss earlier success of naïve quark models in explaining the structure of nucleons and how such a naïve view has been shattered by spin crisis in the 1970's. More detail will be discussed on the structure of the nucleons, both unpolarized and polarized. The fundamental theory governing quarks and gluons in the nucleon (Quantum

Chromo-Dynamics, QCD) will be discussed without any theoretical details and various ways to apply QCD to experimental condistions will be explained. If time allows, the search of new material phase (quark-gluon plasma), which is believed to have existed just after the big bang will be discussed.

Homework and Quizzes: Homework will be given as a form of reading assignment for a discussion at the next class. Homework will be *graded* on the basis of the active or inactive participation to the discussion. There will be occasional, possibly announced, quizzes, during the semester. The results of the quizzes will be used to control the pace of the course, unless otherwise noted.

Exams: There will be two exams: mid-term and final. The exams will be scheduled during regular class hours.

Grading:

Homework	100
Mid-term Exam	100
Final Exam	100
Quizzes[1]	50
Total	300 points

Since the size of the class is quite small, even an approximate normal distribution of the grades is **not** expected. Actual table for grading will be made after mid-term exam, which will be communicated to each students.

[1] Only quizzes explicitly mentioned to be included in the grading will be counted up to 50 points. The total points can not exceed 300 points.

Working Together: It is highly encouraged to work together on homework. But if you work together on a homework which requires a definite solution, please try to write up the solution on your own after discussion with your classmates. Working together on exams, of course, is expressly forbidden.

Absences: You are expected to attend every class. If you are not able to attend a class, please send me an e-mail (or a phone call) so that everybody won't have to wait for you. Planned absence to exams (in the case of emergency) should be notified as soon as possible so that you can get another chance to take the exams.

Cheating: Cheating and plagiarism will be dealt strictly. If you use other person's idea, you should provide a proper citation. Intentional failure to do so may result no credit for your entire work, however creative.

Expectations: I expect that everyone will maintain a classroom conducive to learning. I like an informal atmosphere, but it must be orderly. Thus, everyone is expected to behave with basic politeness, civility, and respect for others. In particular, talking in class is ok if it's part of a class discussion or with me. Private communications are not, especially during quizzes and tests. Neither are reading extraneous materials, using electronic equipment (including cellular phone or PDA), or sleeping. All the cellular phones should be turned off or put into the vibration mode during the class.

Suggestions: Suggestions for improvement are welcome at any time. In the earlier stage of the course, there will be several quizzes (which won't be included in the final grading) to help adjust the pace of the course. Any concern about the course should be brought first to my attention. Further recourse is available through the Department Chair. Any improper wording or behavior from my part (sexual/personal/biased) can also be mentioned to me in private or in public.

Miscellany:

- English will be the main language in the classroom. Students are encouraged to speak in English. Any written homework including both exams should be in English. Language used in the classroom can be changed to Korean if a majority of the students want it.
- As usual, any reasonable questions are welcome anytime, anywhere. **NEVER** kill your curiosity.
- Students are **discouraged** to make a **detailed** lecture note during the class. All the materials will be available in advance, so **think** and **be curious** in the class instead of writing down.
- Occasionally (once per month?), I would like to open the class to undergraduate students (junior or senior level) with some easy, interesting topics. For that occasion, the lecture will be in Korean.

Time Table:

Week	Dates		Topics to be covered	Comments
1		Sep. 2	Introduction to Standard Model	
2	Sep. 7	Sep. 9	Naive Quark Model	
3	Sep. 14	Sep. 16	High energy experiments	
4	Sep. 21	Sep. 23	Electron scattering experiments	
5	Sep. 28	Sep. 30	Elastic form factors	仲秋節 (Sep. 28)
6	Oct. 5	Oct. 7	Deep Inelastic Scattering, parton model	
7	Oct. 12	Oct. 14	Structure functions, Bjorken scaling	
8	Oct. 19	Oct. 21	The violation of the scaling, Drell-Yann process	KPS Meeting (Oct 21.)
9	Oct. 26	Oct. 28	Polarized beam and target	Mid-term (Oct. 26)
10	Nov. 2	Nov. 4	Elastic form factor revisited, two photon effect	
11	Nov. 9	Nov. 11	Polarized structure functions, spin crisis	
12	Nov. 16	Nov. 18	QCD sum rules, lattice QCD	
13	Nov. 23	Nov. 25	Heavy Ion Physics, Quark Gluon Plasma	
14	Nov. 30	Dec. 2	Coulomb Sum Rule, high density nuclear matter	
15	Dec. 7	Dec. 9	Pentaquark, strangeness physics	
16	Dec. 14	Dec. 16	Qweak, To Be Determined.	Final (Dec. 16)

The previous plan, especially near the end of the semester may change **with** notice.