Syllabus for Physics 418
Nuclear and Particle Physics
Spring 2003

Lecturer  Prof. Amitabh Lath.
- email: lath@physics.rutgers.edu (preferred form of communication).
- hours: Tuesdays by appointment (usually noon to 4pm are ok).

Text  Povh, Rith, Scholz, Zetsche. Particles and Nuclei, 2nd ed.

Time  MW 4 (1:10 to 2:30 pm)

Grades  Homework, Final Exam (in class), Presentation.

HW Grader  Young Jai Choi.
FIRST HALF  Tearing it Down.

Jan 22  Syllabus, Scattering physics (*review*).  

Jan 27  Text, 2.1 - 2.4 Nuclei, Binding energies.  

Jan 29  Text, 3.1 - 3.2 (3.3) $\alpha, \beta, \gamma$ decays, fission.  

Feb 3  Text, 4.1 - 4.4 Scattering and cross-section.  Feynman Diagrams, *Golden Rule*.  

Feb 5  Text, 5.1 - 5.4 Scattering details.  Mott scattering, form factors.  

Feb 10  Text, 7.1 - 7.4 Deep Inelastic Scattering.  First evidence for nuclear substructure (quarks).  

Feb 17  Text, 8.1 - 8.3 Strong Interactions.  Quarks, gluons.  

Feb 19  Text, 9.1 - 9.4 $e^+e^-$ collisions, evidence for “color”.  

Feb 24  Text, 10.1 - 10.3 Weak Decays.  

Feb 26  Text, 10.4 - 10.6 More weak decays.  Parity violation.  Neutrino scattering.  


Mar 5  Accelerators, Detectors.
SECOND HALF  Building it Up.

Mar 10 - 12  Detectors, Top Quark Discovery in detail

Spring Break.

Mar 24  Text: Ch 13 Mesons \((q\bar{q})\) systems. Onia resonances.  
Try Ch 13 problems 1,4.

Mar 26  Text: Ch 17.3 Effective Nuclear Potentials. Magic 
numbers, Shell Model of Nuclei.

Mar 31  More on Shell Model, predicting J,\(P\) of excited states. 
Try Ch 17 Problems relating to predicting \(J\), \(P\) of nuclei 
using shell model.

April 2,7  Review, Final Exam prep (practice final handed out).

April 9  Review, practice final gone over.

April 14  Real Final handed out.

April 16  Final collected, gone over.

April 21,23,28,30  Student Presentations.

- 20 min presentation, plus questions.
- 3 presentations per day. See next page for schedule.
- 4 page paper expected with presentation.

May 5  Last day of classes. Open discussion of student topics, 
more questions. Farewell.
April 21  •  Kent Horvath, Subject: Observing hot cosmic rays.
  •  Tamer Elkholy, Subject: Fusion and Plasma Physics
  •  David Hill, Subject: The Hunt for the Higgs Boson

April 23  •  Nick Smolney, Subject TBA
  •  Ross Fadley, Subject TBA
  •  Scott Fenton, Subject TBA

April 28  •  Gail Schneider, Subject: Possible accelerating mechanisms for ultra high energy cosmic rays.
  •  Seth Caughron, Subject: Supersymmetry.
  •  Rebecca Batorsky, Subject Running coupling constants and Grand Unification Theory.

April 30  •  Violeta Dimitrova, Subject: Neutrino Oscillations.
  •  Greg Mueller, Subject: TBA.