PHY 8860 – Quantum Field Theory II – Syllabus
Semester: Winter 2010

Lecturer:

Prof. Alexey A. Petrov, Room 358 Physics Building,
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Lecture Time/Room:

Lecture Monday, Wednesday, Friday 3.00-3.55 pm, 185 Physics Building

Suggested Texts:

M. E. Peskin, D. V. Schroeder, An Introduction to Quantum Field Theory, (Addison-Wesley Publishing Company) [main text];
L. H. Ryder, Quantum Field Theory, (Cambridge University Press)
J.F. Dononghue, E. Golowich, B. Holstein, Dynamics of the Standard Model, (Cambridge Monographs on Particle Physics, Nuclear Physics & Cosmology);

Office Hours: by appointment

Grading:

Your course grade will be determined by your performance in homework assignments and a Final Project on the basis of the following distribution.

Homework Projects (two or three problems/10 days) 80%
Final Project 20%

The overall course grade will be determined on the basis of the following curve:

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<th>Grade</th>
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<tbody>
<tr>
<td>A</td>
<td>91-100</td>
<td>C</td>
<td>60-64</td>
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<tr>
<td>A-</td>
<td>85-90</td>
<td>C-</td>
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<td>B+</td>
<td>80-84</td>
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<td>B</td>
<td>75-79</td>
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<tr>
<td>B-</td>
<td>70-74</td>
<td>D-</td>
<td>40-44</td>
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<tr>
<td>C+</td>
<td>65-69</td>
<td>E</td>
<td>0-39</td>
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The completed homework assignments are due at 5 pm on the date specified, typically 10 days after the assignment is given. Late submissions are accepted, but maximum possible score for the late assignment will be linearly decreased according to the formula $N = N_{\text{max}} (1 - 0.2n)$, where $n$ is the number of days.

**Course description and objectives:**

This course provides an introduction to modern methods of quantum field theories, including renormalization, regularization, path integrals, Feynman diagrams, etc. It is suitable for both students of theory and experiment in the fields of nuclear, particle, and solid state physics.

**Topics to be covered:**

1. **Quantum electrodynamics (QED) and quantum chromodynamics (QCD).** Sample processes. Simple one-loop diagrams.
3. **Standard Model.** Fields and interactions.
4. **Renormalization.** Renormalization of $\psi^4$ theory. Renormalization of QED and QCD at one loop. Renormalization group, decoupling theorem.
5. **Example effective field theories and QCD.** Euler-Heisenberg Lagrangian. Sigma model. Fermi theory of weak interactions to one loop. EFTs of QCD.
6. **Further developments.**

Depending on how much time we have left, we will discuss other related topics.

**Website:**  http://www.physics.wayne.edu/~apetrov/PHY8860/