Physics 716   Quantum Field Theory II   Spring 2018

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Lectures: Tuesday and Thursday 12:30 - 1:45 p.m., Blazer Dining 339
Office hours: Tuesday 11:30 - 12:30 p.m. or by appointment
Course website: https://pa.as.uky.edu/rhi235/teaching
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Course outline and text

The course provides an introduction to quantum field theory and will roughly follow part II and III of:

• Peskin and Schroeder, *An introduction to quantum field theory*

Other recommended books for selected topics are:

• Weinberg, *Quantum field theory*, volumes 1 and 2

• Cheng and Li, *Gauge theory of elementary particle physics*

Problem sets will be assigned biweekly. A final project will be assigned the week of April 9, and due by the end of the semester. It is to be completed independently and will account for 25% of the grade.

Topics covered

• Brief review of Lorentz invariant field theory: *Representations of the Lorentz group; invariant lagrangians for scalar, spinor and vector fields; quantization and perturbation theory.*

• Path integral methods: *path integral approach for quantum mechanics; path integrals for scalar and spinor fields; functional methods.*

• Quantization of gauge theories: *Fadeev Popov ansatz and gauge fixing; Ward identities; Feynman rules for QED.*

• Renormalization: *Renormalizability; Counterterms and renormalization conditions; Renormalization group evolution.*

• Non-abelian symmetries. *Nonabelian gauge invariance. Lie algebras.*

• Quantization of nonabelian gauge theory. *Feynman rules. Fadeev Popov lagrangian. The QCD β function.*

- Gauge theories with spontaneous symmetry breaking. *The Higgs mechanism. Weak interactions.*

- Quantization of spontaneously broken gauge theories. *Anomalies. Loop corrections to weak interaction gauge theory.*

Important information

While you are encouraged to discuss the problem set material with other students, the work turned in must be your own. The final project is to be completed independently. Please consult the University Code of Student Conduct, http://www.uky.edu/studentconduct/code-student-conduct .

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