Abelian Gauge Theories

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This course of 8 lectures is intended primarily for first year graduate students in particle theory. It aims to provide an introduction to some selected topics in the theory of Abelian quantum gauge fields, and of QED in particular. Both Professor Cardy's M.T. 2000 course on "Quantum Field Theory I" and my M.T. 2000 course on "Canonical Quantisation" are pre-requisites for this course.

The topics I hope to discuss are:-

1. Canonical quantisation of the Maxwell field.
2. Path-integral quantisation of the Maxwell field; Faddeev-Popov determinant.
3. Feynman rules for QED; simple processes in QED; crossing symmetry.
4. One-loop renormalisation of QED.
5. BRS-transformations and Ward identities.

Books The standard reference is "An Introduction to Quantum Field Theory" by Peskin and Schroeder (Addison-Wesley). Two essential reference texts are "The Quantum Theory of Fields" (2 vols) by Weinberg (Cambridge) and "Quantum Field Theory" by Itzykson and Zuber (McGraw-Hill).

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