Quantum Field Theory (PT.4.4)
Bibliography

Tim Evans, 5th May 2018

Bibliography

Most useful for this QFT course

- Tong, *Quantum Field Theory*, [http://www.damtp.cam.ac.uk/user/tong/qft.html]
  Provides an excellent set of free lecture notes. First three chapters follow a very similar path to this course using a similar notation. Tong includes some extra topics and these complement what will be in this course and are easy to follow. Later chapters take you on to QED which may be useful for the QFFF masters course.

Other sources

The remaining books may be useful for reference on certain topics but I would not suggest purchasing most of them for this course. They may be of more interest to anyone who pursues these ideas in the longer term.

Relativistic Quantum Field Theory

- T.Lancaster S.J.Blundell, *Quantum Field Theory for the Gifted Amateur*, OUP, 2014.
  This looks like an excellent introduction at exactly the right level for the course. It starts with brief summaries of essential topics such as special relativity and electromagnetism. The first chapter on Lagrangians, and it continues building up the key pieces, many of which I take for granted in my QFT course. I also like the motivation given in this book for the choices made in building up QFT. There are some early chapters on material I don't cover (mainly filling in more details on the symmetry aspects) but basically the first half of this book is about scalar field QFT and so covers the same ground as my QFT course. *Warning*: Feynman rules may be given for matrix elements not Green functions, almost but not exactly the same. This book will not carry you through the whole QFFF MSc course but the second half covers many of the basic elements of QED and Advanced QFT courses including fermions, path integrals, and renormalisation.

- M.E. Peskin, D.V. Schroeder, *An Introduction to Quantum Field Theory*, Westview Press, 1995
  A book often recommended for the QFFF MSc. For this course only chapters 1 and 3 are essential and we will also look at parts of chapter 2.

- Ryder, *Quantum Field Theory*, 1985.
  A relatively simple level book.

- Mandl and Shaw, *Quantum Field Theory*, 1993.
  Relatively simple book. Introduces photons early on and looks at QED but if you ignore the photons not a bad support for this course.

- Kaku, *Quantum Field Theory*, 1993
  Perhaps goes a little too fast for our course. However it has a very nice introduction,

with a historical overview of particle physics, a subsection on first to second quantisation, and Noether's theorem. The second chapter looks like an excellent potted review of key group theory results needed, both basic compact Lie groups used and discussion of space-time symmetries (Lorentz and Poincaré groups).

- Srednicki, *Quantum Field Theory*, 2007
  Uses a path integral approach to QFT so not so useful for this QFT course (but could be useful for the Advanced QFT course of the QFFF masters). You can download the prepublication Quantum Field Theory text from the web for free though the author warns there are some errors but his web page has a list of corrections.

- Weinberg, *The Quantum Theory of Fields*, Vols 1-3, 1995.
  An extremely thorough set of volumes of which only volume I is relevant here. Probes some of the fundamental issues often left out in modern texts but as a result is learning from this text will be much slower. Also uses the 'wrong sign' for the metric, not the form standard in particle physics. So one to use as a reference or to help you learn the deeper principles but unlikely to be of much use first time round.

- Zee, *Quantum Field Theory in a Nutshell*, 2003.
  Quite a different view and approach, with an emphasis on the path integral approach (so again this may be more useful for the Advanced QFT course of the QFFF masters). Not really of direct help for this course. However it makes the book stand out so you may well find you get something out of this later.

- Stone, *The Physics of Quantum Fields*, 2000
  Contains a wide variety of topics not always found in other books. While nothing is too deep (the book is quite short) it does give a good insight into all the key aspects. As it contains both relativistic and non-relativistic applications and approaches, it is particularly useful when trying to understand the different views and approaches in used in the two areas.

- Wilczek, *Quantum Field Theory*, 1999
  (free to download on a college network or use version on arXiv `hep-th/9803075`)
  Brief overview of the role of QFT in particle physics.

Non-Relativistic Quantum Field Theory

Typically superconductivity, superfluids and atomic gases.

- Simons, *Quantum Condensed Matter Field Theory*, free text on line

- D.Lee, *Quantum Theory of Matter* (download from Blackboard).
  A complete book by a previous previous lecturer of QTM course. The later parts contain QFT in the nonrelativistic condensed matter context.

- C.J.Pethick & H.Smith, *Bose-Einstein Condensation in Dilute Gases* (CUP, 2002).
  Covers the Bosonic material of the course and of both Annett and Lee's books. Accessible but more details and mathematics here. First part excellent on the experimental aspects of atomic gas BEC. Chapters 6-8 most useful.

- J.P.Blaizot & G.Ripka, *Quantum Theory of Finite Systems* (MIT Press 1986)
  Chapter 1 for an overview of annihilation and creation operators, Fock space, commutation relations, bosonic and fermionic statistics, and coherent states. Chapter 2 for Canonical transformations including the usual Bogoliubov transformations. Rest of book takes you on to QFT and other applications.