Quantum Field Theory 1

Year 2022/23

Angelo Bassi

Program

1. The Klein-Gordon equation (from G1: Chapter 1)
2. The Dirac equation and its solutions (from G1: Chapter 2, 3, 5 and 6)
3. Classical field theory and Noether's theorem (from G2: Chapter 1 and 2)
4. Non-relativistic quantum field theory (from G2: Chapter 3)
5. QFT: Klein Gordon field, micro-causality and spin-statistics (from G2: Chapter 4)
6. QFT: Dirac field, micro-causality and spin-statistics (from G2: Chapter 5)
7. QFT: Maxwell field (from G2: Chapter 6 and 7)
8. QFT: Interactions (from G2: Chapter 8)
9. The scattering cross section (from MS: Chapter 8 or PS: Chapter 4)
10. Elementary processes in QED (from PS: Chapter 5)

References

- G1: Greiner, *Relativistic Quantum Mechanics*, Springer.
- G2: Greiner and Reinhardt, *Field Quantization*, Springer.
- PS: Peskin and Schroeder, *An Introduction to Quantum Field Theory*, Perseus Books.
- MS: Mandl and Shaw, *Quantum Field Theory*, 2nd ed., Wiley.

Rules for the exams

There will be 6 exams during the year, arranged in 3 sessions:

- Winter session: January and February;
- Summer session: June and July;
- Fall session: September.

After September, the new academic year starts, with possibly a new program and new rules for exams.

One can take only one exam per session. (Alternatively, I will apply article 27.6 of "Carriera Studente" - http://web.units.it/node/22080)

Each exam consists of a multiple-choice quiz (15 questions to be answered in 15 minutes), followed by a written exercise about the theory (3 related questions for 1,5 hours). A discussion of the exam will follow.

In addition to the correctness of the answers, also presentation will be evaluated, and it can increase or decrease the final score. It is in your interest to write in a clear and organized way. A concise presentation will be preferred over a uselessly long one.

For any information, related to the course and to the exams, you are welcome to contact me at the email address: abassi@units.it