History and Philosophy of QFT Tutorial (FI-MHPST1L)

Utrecht University, 2025

Period: Block 2 [10-11-2025 until 30-01-2026]
Timeslot: C/D [Tuesday 13:00–17:00, Friday 13:15–15:00]
Course load: 7.5 EC

Supervisor: Guido Bacciagaluppi
TA: Noemi Bolzonetti
Organisers: Paolo Dioni & Luuk Kuiper

Overview: This course concerns the history and conceptual development of Quantum Field Theory (QFT). It will go through various foundational episodes and discuss the philosophical problems and proposed solutions throughout these periods. Examples of discussions that will be covered are *particle localisation*, *QFT ontologies*, and *axiomatic quantum field theory*. Each week's discussion will be explored through a close reading of two papers and a guest lecture by an expert on the subject. Through the study and discussion of these topics and their historical background, this course aims to offer an overview of QFT in broad strokes, an in-depth discussion of philosophical aspects of QFT, and an understanding of why certain programs within the QFT paradigm were developed and gained popularity.

Structure: This course will meet twice a week. The Tuesday meeting will feature a guest lecture (2 hours), followed by a discussion on the lecture and initial thoughts on the readings (2 hours). The Friday meeting will feature a student-led in-depth discussion focused on the submitted questions (2 hours).

Assessments: Every Thursday (from week 2 to week 8), students will submit a short (max one page) motivated critical question on the assigned literature, aimed at deepening understanding or producing discussion of core aspects of the works (80%). The lowest of these question assignment grades shall not be counted. Additionally, students shall be graded for their role in leading a specific Friday discussion session, for which they are expected to prepare a short introduction and discussion questions (20%).

Week-by-week of the course:

Session	Dates	Topic	Papers	Guest Lecturer
1 (week 46)	11-11 14-11	Introduction: Path Integrals	Weinberg, 1995[1] Kuhlman, 2020[2]	Stefan Vandoren (UU)
2 (week 47)	18-11 21-11	Locality I	Muller & Berkovitz, 2022[25]	F.A. Muller (EUR & UU)
3 (week 48)	25-11 28-11	Ontology	Gasparinetti & Collavini, *forthcoming*[24] Swanson, 2024[4] (Swanson, 2017[3])	Luca Gasparinetti (U Milan) Aaron Collavini (U Udine)
4 (week 49)	02-12 05-12	Renormalization	Williams, 2022[5] Butterfield, 2015[6] (Fraser, 2020[7])	Antonio Ferreiro de Aguiar (UU)
5 (week 50)	09-12 12-12	Locality II	Muller & Berkovitz, 2022[25]	F.A. Muller (EUR & UU)
6 (week 51)	16-12 19-12	Axiomatic QFT	Haag & Kastler, 1964[10] Fewster & Rejzner, 2019[11]	Guido Bacciagaluppi (UU)
7 (week 3)	13-01 16-01	Effective Field Theories	Rivat & Grinbaum, 2019[12] Williams, 2019[13] (Bain, 2013[14] Hartmann, 2001[15])	Sebastian de Haro (UvA)
8 (week 4)	20-01 23-01	History of QFT	Schweber, 1994[21] Blum, 2017[22]	Stefano Furlan (UU)

Bibliography:

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