PHYS 610 **Fall 2023** **Prof. R. Brandenberger**

Quantum Field Theory I

Tentative Course Outline (Version 2):

1. Introduction

1.1 Invitation to QFT

1.2 The need for QFT

2. Lorentz and Poincaré Symmetries

3. Classical Field Theory

3.1 Action principle (point particles and strings)

3.2 Noether Theorem

3.3 Real and Complex Scalar Fields

3.4 Spinor Fields

3.5 Electromagnetic Field

4. Quantization of Free Fields

4.1 Real and Complex Scalar Fields

4.2 Spinor Fields

4.3 Discrete Symmetries

4.4 Electromagnetic Field

5. Perturbation Theory and Feynman Diagrams

5.1 S-Matrix

5.2 LSZ Reduction Formula

5.3 Perturbative Expansion

Textbook

:

1. M. Peskin and D. Schroeder, *An Introduction to Quantum Field Theory* (CRC Press, Taylor and Francis, 1995).

Format

The lectures will provide an overview of the important concepts. Students will be asked to follow the textbook in parallel to the lectures.

Meeting Times: Tu, Thu 13:05 - 14:25, Rutherford Board Room)

Office Hours:

Robert Brandenberger: TBA.

Aline Favero, TBA

Course information: Course information will be available on McGill MyCourses, and also on my home page http://www.physics.mcgill.ca/ rhb/

Proposed Grading Scheme

* Homework (roughly once per week) 70%
* Final Essay; 30%

Academic Integrity Statement

The following information must be included on course descriptions due to University rules:

McGill University values academic integrity. Therefore all students must understand the meaning and consequences of cheating, plagiarism and other academic offences under the Code of Student Conduct and Disciplinary Procedures (see www.mcgill.ca/students/srr/honest/ [www.mcgill.ca] for more information).

Language of Submission

In accord with McGill University's Charter of Students' Rights, students in this course have the right to submit in English and French any written work that is to be graded.

Contact

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Note: In the event of extraordinary circumstances beyond the University's control, the content and/or evaluation scheme in this course is subject to change.