

Physics 3766: Field Theory II
Spring 2024
Syllabus

Location 321 Allen Hall

Time TH, 11:00 am - 12:15 PM

Instructor Brian Batell

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Course Website We will use the Pitt Canvas site for this course:

<https://canvas.pitt.edu>

Log in with your University ID and password and navigate to the PHYS 3766 page. Here you will find announcements, lecture notes, homework assignments and solutions, grades, the syllabus, and other important materials. Please check this site regularly for course announcements.

Office Hours I will hold regular office hours each week on Wednesdays and Fridays from 1:00 - 2:30pm in 401 Allen Hall (my office).

I strongly encourage you to take advantage of office hours. If my regular office hours do not work with your schedule for any reason, please email me to set up an appointment to meet outside of these times.

Course Description This is the second part of a self-contained two-semester graduate level course covering the theoretical concepts and computational methods of quantum field theory. Specific topics covered include the path integral formulation of quantum field theory; renormalization; quantization of non-Abelian gauge theories; spontaneous breaking of global symmetries and Nambu-Goldstone bosons; anomalies; spontaneous breaking of gauge symmetries and the Higgs mechanism; the Standard Model.

Learning Objectives Develop an understanding of the theoretical principles and computational techniques underlying the study of quantum field theory. Apply these basic concepts and methodologies to describe and understand a variety of phenomena.

Lecture Notes My lecture notes will serve as the primary source material for the course. I will be drawing on a variety of references in composing the lecture notes. I will post my lecture notes on Canvas.

Supplementary Texts There are a variety of excellent textbooks covering quantum field theory and related topics. A few of the standard ones are listed below:

Quantum Field Theory and the Standard Model, by M. D. Schwartz
An Introduction To Quantum Field Theory, by M. E. Peskin, D. V. Schroeder
The Quantum Theory of Fields, Vols 1-3, S. Weinberg

Homework Homework will be assigned every 1-2 weeks and will be due the following week. Homework will be graded and solutions to the homework will be made available after all students have turned in the assignment. Late assignments will be accepted if turned in no later than one week after the original due date and will be awarded 50% of the total credit. If there are outstanding circumstances that prevent you from completing the assignment on time, please see me to discuss the matter. I strongly encourage you to discuss the homework problems with your classmates. However, each student must write their own solutions to the homework problems.

Exams There will be one take-home midterm exam and one take-home final comprehensive exam during the semester.

Grading The final grade will be awarded according to the weighted credit for homework (30%), midterm exam (35%), and final exam (35%).

Academic Integrity Students in this course will be expected to comply with the [University of Pittsburgh's Policy on Academic Integrity](#). Any student suspected of violating this obligation for any reason during the semester will be required to participate in the procedural process, initiated at the instructor level, as outlined in the University Guidelines on Academic Integrity. This may include, but is not limited to, the confiscation of the examination of any individual suspected of violating University Policy. Furthermore, no student may bring any unauthorized materials to an exam, including dictionaries and programmable calculators.

To learn more about Academic Integrity, visit the [Academic Integrity Guide](#) for an overview of the topic. For hands-on practice, complete the [Academic Integrity Modules](#).

Disability Services If you have a disability for which you are or may be requesting an accommodation, you are encouraged to contact both your instructor and [Disability Resources and Services](#) (DRS), 140 William Pitt Union, (412) 648-7890, drsrecep@pitt.edu, (412) 228-5347 for P3 ASL users, as early as possible in the term. DRS will verify your disability and determine reasonable accommodations for this course.

Equity, Diversity, and Inclusion The University of Pittsburgh does not tolerate any form of discrimination, harassment, or retaliation based on disability, race, color, religion, national origin, ancestry, genetic information, marital status, familial status, sex, age, sexual orientation, veteran status or gender identity or other factors as stated in the University's Title IX policy. The University is committed to taking prompt action to end a hostile environment that interferes with the University's mission. For more information about policies, procedures, and practices, visit the [Civil Rights & Title IX Compliance web page](#).

I ask that everyone in the class strive to help ensure that other members of this class can learn in a supportive and respectful environment. If there are instances of the aforementioned issues, please contact the Title IX Coordinator, by calling 412-648-7860, or e-mailing

titleixcoordinator@pitt.edu. Reports can also be [filed online](#). You may also choose to report this to a faculty/staff member; they are required to communicate this to the University's Office of Diversity and Inclusion. If you wish to maintain complete confidentiality, you may also contact the University Counseling Center (412-648-7930).

Gender Inclusive Language Statement Language is gender-inclusive and non-sexist when we use words that affirm and respect how people describe, express, and experience their gender. Gender-inclusive/non-sexist language acknowledges people of all genders (for example, first year student versus freshman, chair versus chairman, humankind versus mankind, everyone versus ladies and gentlemen, etc.). It also affirms non-binary gender identifications, and recognizes both gender identity and expression. Identities including trans, intersex, and genderqueer reflect personal descriptions, expressions, and experiences. Just as sexist language excludes women's experiences, gendered language excludes the experiences of individuals whose identities may not fit the gender binary, and/or who may not identify with the sex they were assigned at birth. Students, faculty, and staff have the right to control their own identity and to be referred to by the name and pronouns with which they identify. People also have the right to maintain their privacy regarding information they do not wish to share about their identities, including gender identity and pronouns.

Source: [School of Social Work](#)

Religious Observances The observance of religious holidays (activities observed by a religious group of which a student is a member) and cultural practices are an important reflection of diversity. As your instructor, I am committed to providing equivalent educational opportunities to students of all belief systems. At the beginning of the semester, you should review the course requirements to identify foreseeable conflicts with assignments, exams, or other required attendance. If at all possible, please contact me (your course coordinator/s) within the first two weeks of the first class meeting to allow time for us to discuss and make fair and reasonable adjustments to the schedule and/or tasks.

Sexual Misconduct, Required Reporting, and Title IX The University is committed to combating sexual misconduct. As a result, you should know that University faculty and staff members are required to report any instances of sexual misconduct, including harassment and sexual violence, to the University's Title IX office. What this means is that as your professor, I am required to report any incidents of sexual misconduct that are directly reported to me, or of which I am somehow made aware. After a report is made, you will be contacted by the Title IX Office for opportunities for support and options for proceeding.

For additional information, please visit the [full syllabus statement](#) on the Office of Diversity, Equity, and Inclusion webpage.

Your Well-being Matters College/Graduate school can be an exciting and challenging time for students. Taking time to maintain your well-being and seek appropriate support can help you achieve your goals and lead a fulfilling life. It can be helpful to remember that we all benefit from assistance and guidance at times, and there are many resources available to

support your well-being while you are at Pitt. You are encouraged to visit [Thrive@Pitt](#) to learn more about well-being and the many campus resources available to help you thrive.

If you or anyone you know experiences overwhelming academic stress, persistent difficult feelings and/or challenging life events, you are strongly encouraged to seek support. In addition to reaching out to friends and loved ones, consider connecting with a faculty member you trust for assistance connecting to helpful resources.

The [University Counseling Center](#) is also here for you. You can call 412-648-7930 at any time to connect with a clinician. If you or someone you know is feeling suicidal, please call the University Counseling Center at any time at 412-648-7930. You can also contact Resolve Crisis Network at 888-796-8226. If the situation is life threatening, call Pitt Police at 412-624-2121 or dial 911.

If you have any concerns about the course, please do not hesitate to contact the instructor.