

**PHYSICS 7315**  
Quantum Field Theory I  
MWF 10:00-10:50 am  
Clements Hall 224  
FALL 2021

- CANVAS As per SMU requirements class administration will be entirely via the CANVAS coursepage. In the course page you will find dates for exams, homework, class notes and any announcements. Please check the course page frequently.
- INSTRUCTOR Roberto Vega  
Office: 105 Fondren Science Bldg  
email: vega@mail.physics.smu.edu  
Telephone: 214-768-2498
- OFFICE By arrangement.  
HOURS
- SUGGESTED *The Standard Model: A Primer* by Cliff Burgess  
TEXTS and Guy Moore, *The Quantum Theory of Fields I* by Steven Weinberg, *Quantum Field Theory and the Standard Model* by Matthew D. Schwartz., or *Principles of Quantum Mechanics* *Quantum Field Theory* by Mark Srednicki.
- GRADING The final course grade will be determined as follows. Homework 75%, exams 25%. There will be no final exam.
- HOMEWORK Homework will be collected weekly or bi-weekly. Late homework will be accepted up to one week after due date with a 30 percent reduction. No homework will be accepted after the one week extension. Homework will be turned-in and graded via the course CANVAS Onenote notebook. It is your responsibility to familiarize yourself on how to download and submit homework via CANVAS Onenote notebook by the due date.

### Objectives:

This is a two part course introducing the quantum theory of fields and the use of Feynman diagrams for computing cross sections for particle interactions. The course will closely follow the textbook by Weinberg guided in great part by the Burgess textbook.

In this semester we will cover Abelian Gauge Theories, and in particular Quantum Electrodynamics (QED) and associated Feynman Rules. Students will learn how to perform tree level calculations in QED.

### Learning Outcomes:

Upon completion of this course students should be able to:

- Have a basic understanding of the principles of Quantum Field Theory, including the understanding of a quantum field and its necessity.
- Have an understanding of QED including the underlying group structure.
- Derive the Feynman rules for QED.
- Compute tree level calculations in QED and Abelian Gauge theories.

## **SMU Required Syllabus Statements**

### **Title IX and Disability Accommodations**

Students who need academic accommodations for a disability must first register with Disability Accommodations & Success Strategies (DASS). Students can call 214-768-1470 or visit <http://www.smu.edu/Provost/SASP/DASS> to begin the process. Once they are registered and approved, students then submit a DASS Accommodation Letter through the electronic portal, DASS Link, and then communicate directly with each of their instructors to make appropriate arrangements. Please note that accommodations are not retroactive, but rather require advance notice in order to implement.

### **Sexual Harassment**

All forms of sexual harassment, including sexual assault, dating violence, domestic violence and stalking, are violations of SMU's Title IX Sexual Harassment Policy and may also violate Texas law. Students who wish to file a complaint or to receive more information about the grievance process may contact Samantha Thomas,

SMUs Title IX Coordinator, at [accessequity@smu.edu](mailto:accessequity@smu.edu) or 214-768-3601. Please note that faculty are mandatory reporters. If students notify faculty of sexual harassment, faculty must report it to the Title IX Coordinator. For more information about sexual harassment, including resources available to assist students, please visit [www.smu.edu/sexualmisconduct](http://www.smu.edu/sexualmisconduct).

### **Pregnant and Parenting Students**

Under Title IX students who are pregnant or parenting may request academic adjustments by contacting Elsie Johnson ([elsiej@smu.edu](mailto:elsiej@smu.edu)) in the Office of the Dean of Students, or by calling 214-768-4564. Students seeking assistance must schedule an appointment with their professors as early as possible, present a letter from the Office of the Dean of Students, and make appropriate arrangements. Please note that academic adjustments are not retroactive and, when feasible, require advance notice to implement.

### **Religious Observance**

Religiously observant students wishing to be absent on holidays that require missing class should notify their professors in writing at the beginning of the semester and should discuss with them, in advance, acceptable ways of making up any work missed because of the absence. [Click here for a list of holidays.](#)

### **COVID-19 and Other Medical-Related Absences**

Students who test positive for COVID-19 and need to isolate, or who are notified of potential exposure, must follow SMUs Contact Tracing Protocol. To ensure academic continuity and avoid any course penalties, students should follow the same procedures described by their instructors as they would for any other medical-related absence in order to be provided with appropriate modifications to assignments, deadlines, and exams.

### **Excused Absences for University Extracurricular Activities**

Students participating in an officially sanctioned, scheduled university extracurricular activity should be given the opportunity to make up class assignments or other graded assignments that were missed as a result of their participation. It is the responsibility of the student to make arrangements for make-up work with the instructor prior to any missed scheduled examinations or other missed assignments. (See 2020-2021

SMU Undergraduate Catalog under Enrollment and Academic Records/Excused Absences.)

## **Final Exams**

Final course examinations shall be given in all courses where appropriate, and some form of final assessment is essential. Final exams and assessments must be administered as specified in the official examination schedule. Exams cannot be administered or due during the last week of classes or during the Reading Period. Syllabi must state clearly the form of the final exam or assessment, and the due date and time must match the official SMU exam schedule. Final exams are not required to be provided online.

## **Student Academic Success Programs**

Students needing assistance with writing assignments for SMU courses may schedule an appointment with the Writing Center through Canvas. Students who would like support for subject-specific tutoring or success strategies should contact SASP, Loyd All Sports Center, Suite 202; 214-768-3648; <https://www.smu.edu/sasp>.

## **Caring Community Connections Program**

CCC is a resource for anyone in the SMU community to refer students of concern to the Office of the Dean of Students. The online referral form can be found at [smu.edu/deanofstudentsccc](http://smu.edu/deanofstudentsccc). After a referral form is submitted, students will be contacted to discuss the concern, strategize options, and be connected to appropriate resources. Anyone who is unclear about what steps to take if they have concerns about students should either consult the CCC Reference Guide or contact the Office of the Dean of Students at 214-768-4564.

## **Campus Carry Law**

In accordance with Texas Senate Bill 11, also known as the *Campus Carry* law, and following consultation with entire University community, SMU chooses to remain a weapons-free campus. Specifically, SMU prohibits possession of weapons (either openly or in a concealed manner) on campus. For more information, please see: [http://www.smu.edu/BusinessFinance/Police/Weapons\\_Policy](http://www.smu.edu/BusinessFinance/Police/Weapons_Policy).