KENNESAW STATE UNIVERSITY

SYLLABUS

COLLEGE NAME: SCIENCE AND MATHEMATICS
DEPARTMENT OF PHYSICS
PHYS 3110 DIRECTED METHODS
ACADEMIC TERM: Fall 2024

Course Information

Class meeting time: TBA
Modality and Location: In person, Room H230, Marietta Campus/ or Kennesaw Campus, Science Bldg. Room: TBA
Syllabus: Posted in D2L

Instructor Information

Name: Dr. Marco Guzzi, Associate Professor of Physics
Website: https://facultyweb.kennesaw.edu/mguzzi/
E-mail: mguzzi@kennesaw.edu
Office Location: Kennesaw Campus, Room SC436 (4th floor Science Bldg.)
Office phone: +1 470 578 4783
Office Hours: By appointment
Preferred method of communication: E-mail

Course Description

1 Class Hours, 1 Credit Hours
Prerequisite: Grades of "C" or better in PHYS 2211 and PHYS 2211L and permission of instructor.
This course will introduce students to elementary particles and their interactions.
Students will learn about particle reactions and hadron collider phenomenology.
They will familiarize with the Physics of the Standard Model of Elementary Particles and learn about the Quantum Theory of Electrodynamics and of the Strong and Weak interactions. Students will be exposed to research methodologies through direct involvement in a faculty-led research project.

Course Materials

Textbook: ``Introduction to Elementary particles'', Author: David Griffiths, Editor: WILEY-VCH

Extra directed method/research course materials will be provided by the instructor.

Learning Outcomes

After completing PHYS 3110, Directed Methods, students should be able to:
- Describe fundamental interactions between particles
- Use Feynman diagrams to represent and calculate physical processes.
- Describe the particle content of the Standard Model of Particle Physics.
- Calculate basic reactions at particle colliders.

Course Requirements and Assignments

Reading and homework problems/mini-projects will be assigned by the instructor on a weekly basis. Students will carry out a research project directly connected to the faculty-led research and will present their results in an oral presentation.

In addition to this, students are required to write a max 2 pages essay in which they critically reflect on their research experience and explore its relevance to academic content, personal growth and career aspirations.

This follows the HIP (High Impact Practice) requirements for this course.

Evaluation and Grading Policies

Students must maintain a logbook of activities. The final grade for this class is made up of the following components:

- Accomplishment of at least 70% of the assigned reading and homework.
- Accomplishment of the research project.

Grading Scale
S-Satisfactory >70%
U-Unsatisfactory <70%

Course Policies

Students are expected to: attend all lectures, finish all the assignments by the due date, accomplish the research project, present their results in an oral presentation, and write a (max 2 pages) critical reflection essay.

Students are expected to follow the academic honesty guidelines given below which is provided by KSU. Students should familiarize with these rules especially plagiarism and cheating and destruction of library materials. Failure to follow these guidelines at a minimum will result in a failing grade for the course.

Institutional Policies

Federal, BOR, & KSU Course Syllabus Policies:
https://cia.kennesaw.edu/bor-information/bor-curriculum-information.php

Student Resources:
https://cia.kennesaw.edu/instructional-resources/syllabus-resources.php

Academic Integrity Statement:
https://www.kennesaw.edu/student-affairs/dean-of-students/department-student-conduct-academic-integrity/students.php

Other Relevant Information can be found here:
https://cia.kennesaw.edu/instructional-resources/syllabus-policy.php

Students with Disabilities

Any student with a documented disability or medical condition needing academic accommodations of class-related activities or schedules must contact the instructor immediately. Written verification from the KSU Student Disability Services (http://sds.kennesaw.edu/) is required. No requirements exist those accommodations be made prior to completion of this approved University documentation. All discussions will remain confidential.

Course Delivery

KSU may shift the method of course delivery at any time during the semester in compliance with University System of Georgia health and safety guidelines. In this case, alternate teaching modalities that may be adopted include hyflex, hybrid, synchronous online, or asynchronous online instruction.

Course Schedule (Very Tentative)

Week 1: Gauge Theories/recap
Week 2: Quantum Chromodynamics and Deep inelastic Scattering
Week 3: Relativistic Wave Equations
Week 4: Euler/Lagrange Eqns., symmetries and gauge fields
Week 5: Canonical quantization and particle interpretation
Week 6: Path integrals
Week 7: Renormalization
Week 8: Applications to Quantum Electrodynamics
Week 9: Applications to Quantum Chromodynamics
Week 10: Examples of 1loop calculations
Week 11: Methods to treat for multiloop Feynman diagrams
Week 12: Renormalization Group Equations
Week 13: DGLAP Evolution
Week 14-15: Methods to solve DGLAP evolution