

# Particle Physics – Spring 2016/ January 19 – May 8, 2016

[physics.kent.edu/~smargeti/hep2016](http://physics.kent.edu/~smargeti/hep2016)

Instructor: Dr. Spyridon (Spiros) Margetis  
Office: 304 Smith Hall, Physics Department, Kent State University  
Office Phone: (330) 672-9739  
Office Fax: (330) 672-2959  
Email: [smargeti@kent.edu](mailto:smargeti@kent.edu)  
Office Hours: 14:00 – 16:00 TR, 304 Smith Hall, Physics Dept  
Class Hours: 12:30 – 13:45 TR, Henderson Hall, Room 107

## Course (Catalog) Description

---

- Discussion of particle detectors, invariance principles and conservation laws, fundamental interactions, quark model of hadrons, basic concepts of field theory, the Standard Model and selected topics of current interest.
- This course has the following co/pre-requisite: PHY6/76162 (Quantum Mechanics II) or special permission

## Course Learning Outcomes

---

Upon successful completion of this course, the student will be able to:

1. Demonstrate knowledge at a satisfactory level with basic concepts of Particle Physics, including the quark model, elementary forces and their properties, symmetries and quantum numbers, and elements of relativistic electrodynamics using the Feynman calculus.
2. Solve quantitative fundamental problems related to elementary particle interactions and quantum number conservation.

## Textbook(s)

---

**Required textbook:** D. Griffiths, *Introduction to Elementary Particles*, 2<sup>nd</sup> Revised Edition. Wiley

**Supplemental material (not required but useful):**

- Halzen and Martin, *Quarks and Leptons*
- Perkins, *Introduction to High Energy Physics*

The above-mentioned book(s) are only a reference. All relevant material will be presented and discussed in class. We will cover the first seven (7) chapters of this book but also discuss material that is not explicitly discussed in the book. You must attend the lectures. A list of topics discussed is presented below:

1. Introduction/Review of Particle physics
2. Elementary particle dynamics
3. Quark model
4. Relativistic kinematics – four vectors
5. Symmetries, groups and conservation laws
6. Spin, isospin and bound states
7. Klein-Gordon equation, Electrodynamics of spinless particles
8. The Dirac equation, Electrodynamics of spin-1/2 particles
9. Feynman Calculus, QED
10. Elements of QCD

## Course Assessments

---

### Homework:

- The selection of homework problems will be assigned a week in advance and announced in class and the web. Homework is due every Tuesday, class time. Late homework will be accepted in the case of documented illness only. Otherwise a 20% penalty will be assessed.
- This is a problem-solving course so homework is essential.** Homework problems may be discussed with fellow students, and consultation with me for help on problem solutions is allowed but after you have seriously tried them yourself. There is no substitute for working lots of problems. Many of the exam problems will be similar to the homework.

### Tests/Exams:

- All the exams will be "closed book, closed notes." Calculators are allowed. No makeup exam will be given except in the case of documented illness. The final will be comprehensive.
- All exams will each cover only the material covered in class since the previous exam.
- Again, make-up exams will be given only for acceptable and documented reasons.
- Quizzes, if any, given in class will be counted as bonus points
- All tests and exams (including the Final) are not cumulative. Test and exams will contain questions based on material presented since the previous exam.

### Quizzes:

- Quizzes will cover material from the specific week only.
- Every quiz contains 12 questions. You only need to answer 10 correctly to receive 100%. You should attempt ALL questions. **Answering more than 10 questions correctly will not give you extra points.**

### Deadlines, Late and Make-up Work Policy

Typically there are no make-up quizzes or tests since you will have three full days to take them, and one full week to participate in a discussion but, if there is a documented reason, the quiz may be extended by one or two more days. For these cases there is no penalty, i.e. reduction of points.

### Assignment Distribution and Grading Scale

Method of Assessment	Percent
Homework	20%
Midterm Exam	25%
Midterm Exam	25%
Final Exam	30%
<b>Total Possible</b>	<b>100%</b>

Percentage of Earned Points	Grade
90% -100%	A
88%-89%	A-
84%-87%	B+
80%-83%	B
78%-79%	B-
74%-77%	C+
70%-73%	C
68%-69%	C-
65%-67%	D+
60%-64%	D
Under 60%	F

## University Policies

---

Students are required to be aware of and follow all general and academic policies established by Kent State University. A list of the general academic policies is listed on the online version of the [Kent State University Catalog](#). Specific policies related to the successful completion of this online course can be located and reviewed in your Blackboard Learn course. University policies are located in the **Online Student Support Services & University Policies** folder contained within the START HERE folder in your Blackboard Learn course.

### Regarding Students with Disabilities

(Revised 6/01/07) University policy 3342-3-01.3 requires that students with disabilities be provided reasonable accommodations to ensure their equal access to course content. If you have a documented disability and require accommodations, please contact the instructor at the beginning of the semester to make arrangements for necessary classroom adjustments. Please note, you must first verify your eligibility for these through Student Accessibility Services (contact 330-672-3391 or visit <http://www.kent.edu/sas> for more information on registration procedures).

### Course Enrollment and Withdrawal

Registration Requirement:

University policy requires all students to be officially registered in each class they are attending. Students who are not officially registered for a course by published deadlines should not be attending classes and will not receive credit or a grade for the course. Each student must confirm enrollment by checking his/her class schedule (using Student Tools in FlashLine) prior to the deadline indicated.

If registration errors are not corrected by this date and you continue to attend and participate in classes for which you are not officially enrolled, you are advised now that you will not receive a grade at the conclusion of the semester for any class in which you are not properly registered.

### Registration Deadlines:

The official registration deadline for this course is 1/22/2016 with late registration (and \$100.00 fee) ending on 1/29/2016. The official deadline to drop this class (without a grade of "W" assigned) is 1/31/2016 and the deadline to withdraw (a grade of "W" will be assigned) is 4/3/2016.

### Plagiarism and Academic Integrity

Students enrolled in the university, at all its campuses, are to perform their academic work according to standards set by faculty members, departments, schools and colleges of the university; and cheating and plagiarism constitute fraudulent misrepresentation for which no credit can be given and for which appropriate sanctions are warranted and will be applied.

For more information: <http://www.kent.edu/plagiarism/information-students>

### Subject to Change Statement

---

The syllabus and course schedule may be subject to change. Changes will be communicated in class or via email. It is the responsibility of students to check email messages and course announcements to stay current.