

SYLLABUS

PHZ 6355, ELEMENTARY PARTICLE PHYSICS 1

Instructor: Prof. Guenakh Mitselmakher, Office: NPB 2021, preferred communication: in class or Email: mitselmakher@phys.ufl.edu. You may also phone 352-392-5703. Office hours: after the class, or by appointment

This two-semester course is designed to give an introduction to the ideas, basic experimental and theoretical concepts, and major experimental discoveries, that emerged from the ultimate quest for understanding the most fundamental constituents of matter, and the primary forces of nature.

The first part, PHZ 6355, ELEMENTARY PARTICLE PHYSICS 1, is an introductory overview of the subject. The second part, PHZ 7357 ELEMENTARY PARTICLE PHYSICS 2 (to be given in the next semester), present the subject in more depth.

Topics to be covered in the first semester in PHZ 6355: (may be modified depending on the interests of the students).

- Very brief Summary of the Standard Model.
- Natural Units
- Relativistic kinematics
- Perturbation theory: rate of transitions and scattering amplitude
- Particle lifetime, decay width, branching ratios.
- Interactions via an exchange with particles
- Particle Accelerators. Fixed target machines and colliders. Large Hadron Collider.
- Interaction of Particles with Matter
- Particle detectors basics
- Examples of large detectors
- Brief introduction to statistics. Data Analysis basics
- Discoveries of the first Particles: electron, proton, photon, neutron
- Relativistic Quantum Mechanics: Klein-Gordon, Dirac equations
- Antimatter, discovery of positron, antiproton, antineutron
- Yukawa particle. Great confusion: discovery of muons, beginning of discover particle generations. Discovery of pions.

- Neutrino hypothesis. Fermi model of beta-decay. Discovery of different types of leptons. Particle generations.
- Strange Particles. Resonances
- Three Quarks: u, d, s. First ideas of quarks and experiments.
- c,b,t quarks. How many particle generations are there?
- QED, QCD and Electroweak. Development of the Standard Model
- Discovery of the Higgs Particle. Is it the end?

Recommended textbook: Particle Physics, B.R. Martin & G. Shaw, 4nd edition, John Wiley & Sons

The lecture notes: <http://www.phys.ufl.edu/~korytov/tmp4/lectures/>

Sample HW problems can be found here:

<http://www.phys.ufl.edu/~korytov/tmp4/HW/>

The HWs may include some of these problems, as well as additional problems, and also some problems from the textbook.

GRADING. Grades will be based on your homework assignments (one HW every two-three weeks), two partial tests (one in the middle of the semester, one in the end) and quick quizzes in class. The tests will be 20% of your grade each, the homework 50%, and in class quick quizzes 10%. There will be bonus questions in the HW and tests.

Late homework:

- -50% (within 7 days)
- homework overdue by more than one week will not be graded and no makeups will be possible except extraordinary circumstances

Your final grades will be based on the percentage from the maximum possible total score:

A 80% of max

A- 75% of the max

B+ 70% of max

B 65% of max

B- 60% of max

C+	50% of max
C	40% of max
D	20% of max

For additional details regarding grading policies see the university web site:
<https://catalog.ufl.edu/ugrad/current/regulations/info/grades.aspx>

Requirements for Class attendance and make-up exams, assignments and other work in this course are consistent with the university policies that can be found

at:<https://catalog.ufl.edu/ugrad/current/regulations/info/attendance.aspx>

Students with disabilities requesting accommodations should first register with the Disability Resource Center (352-392-8565, www.dso.ufl.edu/drc/) by providing appropriate documentation. Once registered, students will receive an accommodation letter which must be presented to the instructor when requesting accommodation. Students with disabilities should follow this procedure as early as possible in the semester.

Students are expected to provide feedback on the quality of instruction in this course by completing course evaluations online via GatorEvals.

Guidance on how to give feedback in a professional and respectful manner is available at <https://gatorevals.ua.ufl.edu/students/>. Students will be notified when the evaluation period opens, and can complete evaluations through the email they receive from GatorEvals, in their Canvas course menu under GatorEvals, or via <https://ufl.bluera.com/ufl/>. Summaries of course evaluation results are available to students at <https://gatorevals.ua.ufl.edu/public-results/>.

UF students are bound by The Honor Pledge which states “We, the members of the University of Florida community, pledge to hold ourselves and our peers to the highest standards of honor and integrity by abiding by the Honor Code. The Honor Code can be found here:

<https://www.dso.ufl.edu/sccr/process/student-conduct-honor-code/>

Counseling and Wellness Center

Contact information for the Counseling and Wellness Center:

<http://www.counseling.ufl.edu/cwc/Default.aspx>

(392-1575), and the University Police Department: (392-1111 or 911 for emergencies.