

## SYLLABUS

### PHZ 5354, INTRO PARTICLE PHYSICS

Instructor: Prof. Guenakh Mitselmakher, Office: NPB 2021,  
Email: [mitselmakher@phys.ufl.edu](mailto:mitselmakher@phys.ufl.edu), office hours: after the class or by appointment,  
made in person or by email

This one semester introductory course is designed to give an introduction to the history of ideas, basic experimental and theoretical concepts and major experimental discoveries in elementary particle physics that emerged from the ultimate quest for understanding the most fundamental constituents of matter and the primary forces of nature.

Topics to be covered in this course. (May be somewhat modified depending on the interests of the students).

- 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
- Examples of large detectors
- Very brief introduction to statistics and 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. Discovery of pions.
- Neutono hypothesis. Fermi model of beta-decay. Discovery of different types of leptons. Particle generations.
- Strange Particles. Resonances
- Three Quarks: u,d,s. First ideas and experiments.
- c,b,t quarks. How many generations are there?
- QED, QCD and Electroweak. Development of the Standard Model
- Discovery of the Higgs Particle. Is it the end?
- Physics Beyond the Standard Model

**Recommended textbook:** Particle Physics, B.R. Martin & G.Shaw, 4<sup>nd</sup> edition, John Wiley & Sons

**The lecture notes:** <http://www.phys.ufl.edu/%7Ekorytov/tmp4/lectures/>

**Sample HW problems** (the HWs may include some of these problems, as well as additional problems, and also some problems from the textbook):

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

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%.. In class very short quick quizzes will not be announced. 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 for extraordinary circumstances

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

<b>A</b>	80% of max
<b>A-</b>	75% of the max
<b>B+</b>	70% of max
<b>B</b>	65% of max
<b>B-</b>	60% of max
<b>C+</b>	50% of max
<b>C</b>	40% of max
<b>D</b>	20% of max

For additional details regarding grading policies, see the university web site:

<https://catalog.ufl.edu/UGRD/academic-regulations/grades-grading-policies/>

## **CLASS ATTENDANCE**

Requirements for class attendance, and other work in this course are consistent with university policies that can be found at

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

## **ACCOMMODATIONS FOR STUDENTS WITH DISABILITIES**

Students with disabilities requesting accommodations should first register with the Disability Resource Center (352-392-8565, <https://www.dso.ufl.edu/drc>) by providing appropriate documentation. Once registered, students will receive an accommodations 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.

## **COURSE EVALUATIONS**

Students are expected to provide feedback on the quality of instruction in this course by completing online evaluations at <https://evaluations.ufl.edu>. Evaluations are typically open during the last two or three weeks of the semester, but students will be given specific times when they are open. Summary results of these assessments are available to students at <https://evaluations.ufl.edu/results>.