PHYS-4309 COURSE SYLLABUS

PHYS-4309 Nuclear & Particle Physics
Fall 2018
MW 10:50-12:05, EMAGC 1.410/BSTUN 2.24
R 10:30-11:30 (BM 1, 217), 15:20-16:20 (EACSB 1.102M)

Dr. Mkhitar Hobosyan
mkhitar.hobosyan@utrgv.edu

Textbook and/or Resource Material
A. Das and T. Ferbel, Introduction to Nuclear and Particle Physics,

Course Description and Prerequisites
This course is a study of atomic nuclei and the fundamental constituents of matter. Topics include nuclear structure, natural and artificial radioactivity, nuclear reactions, fission, fusion, particles, and their interactions, standard model or particle physics, particle accelerators, cosmic rays, experimental methods, and examples from current research topics. Prerequisites: PHYS 4303 Quantum Mechanics I.

Learning Objectives/Outcomes for the Course
The objective of this course is to develop a working knowledge of Nuclear and Particle Physics at the undergraduate level, and to use this knowledge to explore various applications.

Learning Objectives for Core Curriculum Requirements
Students are expected to acquire:
1) Critical Thinking Abilities – Students must be able to read and analyze a stated problem, determine the solution required, identify the needed data, select the appropriate physical theory, apply the proper mathematical calculations and ultimately reach the desired result. Students will be given the opportunity to demonstrate these skills on the course assignments and examinations.
2) Communication Skills – To be scientifically literate, students should be able to read and understand scientific material that has been written for a popular audience as well as scientific resources designed for teachers. Students should be able to write clearly about scientific material and relate it to the contents of this course and society in general. Students will be required to review (1) an article from a popular scientific publication, (2) the creditability of a scientific resource website, and (3) a science lesson plan or science simulation website.
3) Computer Literacy Skills – Solving Problems and Acquiring Information. Students in this course should be able to use computers to solve simple mathematical problems. The students use computers in many of the laboratory activities both to collect and analyze data. Successful completion of these lab activities indicate that students have gained this competency. Students should be able to locate material directly relevant to the course on the course’s own website. Students should be able to find material on the World Wide Web by using a search engine, of the site that was located, they are assumed to be competent in this area.

Grading Policies
The student will practice the material by creating written solutions to weekly homework assignments. The homework solutions will be graded and contribute to the final grade. The student will demonstrate mastery of the learning objectives through one Midterm Exam and a Final Exam.

The grading scheme for this course is:
- 35 % Homework
- 30 % Midterm Exam
- 35 % Final Exam

Homework – There will be 11 homework assignments that will reinforce material covered in the lecture. The homework will normally be due one week after distribution of the homework assignment. Late homework will not be accepted. Solutions will be posted on Blackboard. Lowest graded homework will be dropped.

Class Participation – Attendance to lectures is required
Midterm / Final Exams – You must take both the Midterm Exam and the Final Exam to pass the course. Exams are closed book. The Final Exam will be comprehensive.

Calendar of Activities
All topics will closely follow the textbook by A. Das and T. Ferbel; in the table below, corresponding chapter numbers in the textbook are given in brackets. It will be essential that you prepare for the class by doing the reading assignments. We will not cover everything in the textbook explicitly in class, but focus on selected topics and examples; however, it will be assumed that you become familiar with the entire material covered by the reading assignments.

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<thead>
<tr>
<th>Week</th>
<th>Topics (Chapter)</th>
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<tbody>
<tr>
<td>Week 1-2</td>
<td>Rutherford scattering (1)</td>
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<td>Week 3</td>
<td>Nuclear phenomenology (2)</td>
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<td>Week 4</td>
<td>Nuclear models (3)</td>
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<td>Week 5</td>
<td>Nuclear radiation (4)</td>
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<td>Week 6, 7</td>
<td>Applications of Nuclear Physics (5)</td>
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<td>Midterm Exam</td>
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<td>Week 8</td>
<td>Energy Deposition in Media (6)</td>
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<td>Week 9</td>
<td>Particle Detection (7)</td>
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<td>Week 10</td>
<td>Accelerators (8)</td>
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<td>Week 11</td>
<td>Properties and interactions of elementary particles (9)</td>
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<td>Week 12</td>
<td>Symmetries (10)</td>
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<td>Week 13</td>
<td>Discrete transformations (11)</td>
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<td>Week 14, 15</td>
<td>Standard Model (13)</td>
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<td></td>
<td>Final Exam</td>
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The UTRGV academic calendar can be found at https://my.utrgv.edu/home at the bottom of the screen, prior to login. Some important dates for fall 2018 include:

- August 27: First day of classes
- August 30: Last day to add a course or register for fall 2018
- September 3: Labor Day – NO classes
- November 14: Last day to drop a course; will count toward the 6-drop rule
- November 22 - 24: Thanksgiving Holiday – NO classes
- December 6: Study Day – NO classes
- December 7 - 13: Final Exams
- December 14 – 15: Commencement Exercises

Mandatory attendance in department colloquia
The attendance in the physics department colloquia is an important element of the education of the students that take this class. All students in this class are required to attend the colloquia and the attendance will be taken into account when grading the class.

Other Course Information
Online course content can be accessed on Blackboard through MyUTRGV at https://my.utrgv.edu/home. It is important that you become familiar with Blackboard since essential parts of the course content, such as homework assignments, will be disseminated online.

UTRGV Policy Statements
STUDENTS WITH DISABILITIES:
Students with a documented disability (physical, psychological, learning, or other disability which affects academic performance) who would like to receive academic accommodations should contact Student Accessibility Services (SAS) as soon as possible to schedule an appointment to initiate services. Accommodations can be arranged
through SAS at any time, but are not retroactive. Students who suffer a broken bone, severe injury or undergo surgery during the semester are eligible for temporary services.

**Pregnancy, Pregnancy-related, and Parenting Accommodations**
Title IX of the Education Amendments of 1972 prohibits sex discrimination, which includes discrimination based on pregnancy, marital status, or parental status. Students seeking accommodations related to pregnancy, pregnancy-related condition, or parenting (reasonably immediate postpartum period) are encouraged to contact Student Accessibility Services for additional information and to request accommodations.

**Student Accessibility Services:**
**Brownsville Campus:** Student Accessibility Services is located in Cortez Hall Room 129 and can be contacted by phone at (956) 882-7374 (Voice) or via email at ability@utrgv.edu. **Edinburg Campus:** Student Accessibility Services is located in 108 University Center and can be contacted by phone at (956) 665-7005 (Voice), (956) 665-3840 (Fax), or via email at ability@utrgv.edu.

**MANDATORY COURSE EVALUATION PERIOD:**
Students are required to complete an ONLINE evaluation of this course, accessed through your UTRGV account (http://my.utrgv.edu); you will be contacted through email with further instructions. Students who complete their evaluations will have priority access to their grades. Online evaluations will be available on or about:

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<tr>
<th>Module</th>
<th>Date Range</th>
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<tr>
<td>Module 1</td>
<td>October 4 – 10</td>
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<tr>
<td>Module 2</td>
<td>November 29 – December 5</td>
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<td>Full Fall Semester</td>
<td>November 15 – December 5</td>
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**ATTENDANCE:**
Students are expected to attend all scheduled classes and may be dropped from the course for excessive absences. UTRGV's attendance policy excuses students from attending class if they are participating in officially sponsored university activities, such as athletics; for observance of religious holy days; or for military service. Students should contact the instructor in advance of the excused absence and arrange to make up missed work or examinations.

**SCHOLASTIC INTEGRITY:**
As members of a community dedicated to Honesty, Integrity and Respect, students are reminded that those who engage in scholastic dishonesty are subject to disciplinary penalties, including the possibility of failure in the course and expulsion from the University. Scholastic dishonesty includes but is not limited to: cheating, plagiarism (including self-plagiarism), and collusion; submission for credit of any work or materials that are attributable in whole or in part to another person; taking an examination for another person; any act designed to give unfair advantage to a student; or the attempt to commit such acts. Since scholastic dishonesty harms the individual, all students and the integrity of the University, policies on scholastic dishonesty will be strictly enforced (Board of Regents Rules and Regulations and UTRGV Academic Integrity Guidelines). All scholastic dishonesty incidents will be reported to the Dean of Students.

**SEXUAL HARASSMENT, DISCRIMINATION, and VIOLENCE:**
In accordance with UT System regulations, your instructor is a “Responsible Employee” for reporting purposes under Title IX regulations and so must report any instance, occurring during a student’s time in college, of sexual assault, stalking, dating violence, domestic violence, or sexual harassment about which she/he becomes aware during this course through writing, discussion, or personal disclosure. More information can be found at www.utrgv.edu/equity, including confidential resources available on campus. The faculty and staff of UTRGV actively strive to provide a learning, working, and living environment that promotes personal integrity, civility, and mutual respect that is free from sexual misconduct and discrimination.

**COURSE DROPS:**
According to UTRGV policy, students may drop any class without penalty earning a grade of DR until the official drop date. Following that date, students must be assigned a letter grade and can no longer drop the class. Students considering dropping the class should be aware of the “3-peat rule” and the “6-drop” rule so they can recognize how dropped classes may affect their academic success. The 6-drop rule refers to Texas law that dictates that
undergraduate students may not drop more than six courses during their undergraduate career. Courses dropped at other Texas public higher education institutions will count toward the six-course drop limit. The 3-peat rule refers to additional fees charged to students who take the same class for the third time.

**STUDENT SERVICES:**
Students who demonstrate financial need have a variety of options when it comes to paying for college costs, such as scholarships, grants, loans and work-study. Students should visit the Students Services Center (U Central) for additional information. U Central is located in BMAIN 1.100 (Brownsville) or ESSBL 1.145 (Edinburg) or can be reached by email (ucentral@utrgv.edu) or telephone: (888) 882-4026. In addition to financial aid, U Central can assist students with registration and admissions.

Students seeking academic help in their studies can use university resources in addition to an instructor's office hours. University Resources include the Learning Center, Writing Center, Advising Center and Career Center. The centers provide services such as tutoring, writing help, critical thinking, study skills, degree planning, and student employment. Locations are:
- Learning center: BSTUN 2.10 (Brownsville) or ELCTR 100 (Edinburg)
- Writing center: BLIBR 3.206 (Brownsville) or ESTAC 3.119 (Edinburg)
- Advising center: BMAIN 1.400 (Brownsville) or ESWKH 101 (Edinburg)
- Career center: BCRTZ 129 (Brownsville) or ESSBL 2.101 (Edinburg)