PHYS 3490 – Selected Topics: Radiation Detection
PENS Department and the Texas Physics Consortium
Spring 2015

A. COURSE INFORMATION

Course number/section: PHYS 3490.001
Class meeting time: TR 01:00 pm-2:15 pm
Class location: CCH-246, TTVN Video Classroom
Course Website: http://wtclass.wtamu.edu/

B. INSTRUCTOR INFORMATION

Instructor: Dr. Mark Harvey
Office location: Texas Southern University, Spearman 205
Office hours: MW 1-2pm, TR 1-3pm (tentative)
Telephone: 713-313-1864
e-mail: harveymc@tsu.edu
Appointments: Email

Local Facilitator: Dr. Jeffery Spirko
Office location: NRC-1111 (inside NRC-1100 suite, near the Texas Spill Control School)
Office hours: [TBD]
Telephone: 361-825-6020
e-mail: jeffery.spirko@tamucc.edu
Appointments: Please Email to schedule an appointment outside office hours.

C. COURSE DESCRIPTION

Catalog Course Description
Subject materials will be chosen from Electromagnetic Field Theory, Thermodynamics, Mathematical Methods of Physics, Waves and Optics, Advanced Modern Physics, Quantum Theory, Computational Physics, Geophysics, Environmental Physics and Medical Physics. May be repeated for credit if topics selected are different.

Extended Course Description
An overview of nuclear radiation sources, interactions, and measurement techniques appropriate for physics majors.

This course is being offered by the Texas Physics Consortium as part of the Joint BS degree with a Physics Major. All TPC courses use the WTClass system for class management (instead of Blackboard). For more information on TPC, please visit our website (http://www.tarleton.edu/tpc/) or speak with the Local Facilitator.

The Course Syllabus from the sending institution is attached and is the primary Syllabus that the instructor will follow. This Syllabus exists to make sure you have all of the information summarized in one place and that you are informed about TAMUCC
policies.

D. PREREQUISITES AND COREQUISITES

Prerequisites
- TAMUCC PHYS 3334, Modern Physics I (may be taken simultaneously)

E. REQUIRED TEXTBOOK(S), READINGS AND SUPPLIES

Required Textbooks

Supplies
- Internet access is vital for interacting with the instructor and the local facilitator.
- Access to a scanner may be required to submit homework assignments. The Local Facilitator can help with this.

F. STUDENT LEARNING OUTCOMES AND ASSESSMENT

Assessment is a process used by instructors to help improve learning. Assessment is essential for effective learning because it provides feedback to both students and instructors. A critical step in this process is making clear the course’s student learning outcomes that describe what students are expected to learn to be successful in the course. The student learning outcomes for this course are listed below. By collecting data and sharing it with students on how well they are accomplishing these learning outcomes students can more efficiently and effectively focus their learning efforts. This information can also help instructors identify challenging areas for students and adjust their teaching approach to facilitate learning.

Specific learning objectives will be shared by the instructor in the Syllabus and during Class.

G. INSTRUCTIONAL METHODS AND ACTIVITIES

Classes will be held via live a video conference among all of the Texas Physics Consortium schools. Students will be able to ask questions during class, and the instructor will see who is asking the question.

H. MAJOR COURSE REQUIREMENTS AND GRADING

In-class quizzes, exams, and lab reports will be used to assess student learning and determine grades.
<table>
<thead>
<tr>
<th>ACTIVITY</th>
<th>% of FINAL GRADE</th>
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<tbody>
<tr>
<td>Midterm Exam</td>
<td>30%</td>
</tr>
<tr>
<td>Lab Reports</td>
<td>30%</td>
</tr>
<tr>
<td>Final Exam</td>
<td>30%</td>
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<tr>
<td>Quizzes</td>
<td>10%</td>
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</table>

I. COURSE CONTENT/SCHEDULE

<table>
<thead>
<tr>
<th>DATE (BY DAY OR WEEK)</th>
<th>TOPIC</th>
<th>CHAPTER(S)</th>
<th>ASSIGNMENTS</th>
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<tbody>
<tr>
<td></td>
<td>Radiation Sources</td>
<td>Chap 1</td>
<td></td>
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<tr>
<td></td>
<td>Radiation Interactions</td>
<td>Chap 2</td>
<td></td>
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<tr>
<td></td>
<td>Counting Statistics and Error Prediction</td>
<td>Chap 3</td>
<td></td>
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<tr>
<td>Thu 5/12</td>
<td>General Properties of Radiation Detectors</td>
<td>Chap 4</td>
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<tr>
<td></td>
<td>Midterm Exam</td>
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<td></td>
<td>Ionization Chambers</td>
<td>Chap 5</td>
<td></td>
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<tr>
<td></td>
<td>Proportional Counters</td>
<td>Chap 6</td>
<td></td>
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<tr>
<td></td>
<td>Geiger-Mueller Counter</td>
<td>Chap 7</td>
<td></td>
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<tr>
<td>Thu 5/7 11:00 am <em>or</em> Tue 5/12 1:45 pm</td>
<td>Final Exam (Ask Instructor which Time Slot)</td>
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</table>

Note: Changes in this course schedule may be necessary and will be announced to the class by the Instructor. The assignments and exams shown are directly related to the Student Learning Outcomes described in Section F.

Lab Experiments: Nuclear Physics Laboratory I (Geiger-Mueller Counter)
- Experiment 1: Determining the Operating Plateau for the Geiger-Mueller Tube
- Experiment 2: Resolving Time Corrections
- Experiment 3: Geiger-Mueller Tube Efficiency
- Experiment 4: Inverse Square Law
- Experiment 5: Statistical Variation of Data
- Experiment 6: Range of Alpha Particles
- Experiment 7: Absorption of Beta Particles
- Experiment 8: Linear Absorption Coefficient (Gamma Decay)
- Experiment 9: Study of GM Counter for Gammas and Betas
- Experiment 10: Beta Backscattering as a Function of Atomic Number
- Experiment 11: Half-Life Measurement
J. **COURSE POLICIES**

**Attendance/Tardiness**
Excessive tardiness will not be permitted.

**Late Work and Make-up Exams**
In the event of significant personal problems (i.e. medical, family, etc.), which might cause the student to miss many classes, the Dean of Students is available to counsel you on how to meet your academic responsibilities. It is your obligation to make these arrangements and not go to the instructor (particularly at the “last minute”).

**Cell Phone Use**
Cell phone and/or computer usage is NOT permitted during class time.

**Laptop Use**
(see above)

**Food in Class**
TAMUCC Media Services determines whether food is allowed in the TTVN room.

**Missed Exam**
(see above)

K. **COLLEGE AND UNIVERSITY POLICIES**

- **Academic Integrity (University)**
  It is expected that university students will demonstrate a high level of maturity, self-direction, and ability to manage their own affairs. Students are viewed as individuals who possess the qualities of worth, dignity, and the capacity for self-direction in personal behavior.
  See Full University Policy at [http://catalog.tamucc.edu/content.php?catoid=10&navoid=313#Academic_Integrity](http://catalog.tamucc.edu/content.php?catoid=10&navoid=313#Academic_Integrity)

- **Classroom/Professional Behavior**

- **Deadline for Dropping a Course with a Grade of W (University)**
  The grade of W will be assigned to any student officially dropping a course by Friday, April 10, 2015. No student is eligible to receive a W without completing the official drop process by this deadline. Visit the Office of the University Registrar for the Course Drop Form that must be submitted. After April 10, 2015 a student will not be allowed to drop a course.

- **Grade Appeals (College of Science and Engineering)**
  As stated in University Procedure 13.02.99.C2.01, Student Grade Appeal Procedures, a
student who believes that he or she has not been held to appropriate academic standards as outlined in the class syllabus, equitable evaluation procedures, or appropriate grading, may appeal the final grade given in the course. The burden of proof is upon the student to demonstrate the appropriateness of the appeal. A student with a complaint about a grade is encouraged to first discuss the matter with the instructor. For complete details, including the responsibilities of the parties involved in the process and the number of days allowed for completing the steps in the process, see University Procedure 13.02.99.C2.01, Student Grade Appeal Procedures. These documents are accessible through the University Rules website at http://www.tamucc.edu/provost/university_rules/index.html, and the College of Science and Engineering Grade Appeals webpage at http://sci.tamucc.edu/students/GradeAppeal.html. For assistance and/or guidance in the grade appeal process, students may contact the chair or director of the appropriate department or school, the Office of the College of Science and Engineering Dean, or the Office of the Provost.

- **Disability Services**
  Disability Services (DS) is the hub for coordinating services and accommodations to ensure accessibility and utilization of all programs for all Texas A&M University-Corpus Christi students with disabilities. Our services are designed to meet the unique educational needs of enrolled students with documented permanent or temporary disabilities. DS provides intake and consultation services to students seeking to register with our office. DS reviews an individual’s documentation of disability and assesses eligibility for services and the determination of reasonable accommodations. For more information visit the Disability Services Office at 116 Corpus Christi Hall or go to http://disabilityservices.tamucc.edu/

L. **OTHER INFORMATION**

- The Local Facilitator is happy to help with physics questions and with administrative matters, but you, the student, are responsible for keeping track of assignments and exams. Don’t assume that the Local Facilitator knows when your exams are taking place. Keep in touch; let us know when things are happening. Proctoring takes at least a few days to arrange, so make sure things are ready and confirmed **BEFORE** your exam takes place.
- The Course Syllabus from the sending institution is attached and is the primary Syllabus that the instructor will follow.

**GENERAL DISCLAIMER**

I reserve the right to modify the information, schedule, assignments, deadlines, and course policies in this syllabus if and when necessary. I will announce such changes in a timely manner during regularly scheduled lecture periods.
Texts: Radiation Detection and Measurements, 
Fourth Edition John Wiley & Sons, Inc., 2010

Techniques for Nuclear and Particle Physics Experiments: A How-to Approach 
William R. Leo, ISBN 978-3-540-57280-0 

Instructor: Dr. Mark Harvey 
Telephone No.: 713 313-1864 
e-mail: harveymc@tsu.edu 
Office: Spearman Technology Building, Room 205 
Office Hours: M W 1:00 PM – 2:00 PM 
T Th 1:00 PM – 3:00 PM

Classroom: Spearman Technology Building, Room 247 
Laboratory: Spearman Technology Building, Room 246 
Lecture: TTh 1:00 PM – 2:15 PM 
Lab: F 1:00 PM – 2:30 PM

Grading: The final grade will be based on the following: midterm exam, final exam, lab reports, quizzes. The grading percentages for all assignments are shown below:

<table>
<thead>
<tr>
<th>Assignment</th>
<th>Percentage</th>
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<tbody>
<tr>
<td>1. Midterm Exam;</td>
<td>30%</td>
</tr>
<tr>
<td>2. Lab Reports;</td>
<td>30%</td>
</tr>
<tr>
<td>3. Final Exam;</td>
<td>30%</td>
</tr>
<tr>
<td>4. Quizzes</td>
<td>10%</td>
</tr>
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Tests: The tests/exams dates are shown below. 
Midterm Exam Thursday March 12, 2015 
Final Exam Period: May 9 – 15, 2015 (No Early Exams Given)

Lecture Topics: Radiation Detection and Measurement 
Chapter 1: Radiation Sources 
Chapter 2: Radiation Interactions 
Chapter 3: Counting Statistics and Error Prediction 
Chapter 4: General Properties of Radiation Detectors 
Chapter 5: Ionization Chambers 
Chapter 6: Proportional Counters 
Chapter 7: Geiger-Mueller Counter
Laboratory experiments will employ radiation detection and measurement techniques, which emphasize the Geiger-Mueller counter. A procedural handout will be provided for each experiment prior to lab.

**Lab Experiments: Nuclear Physics Laboratory I (Geiger-Mueller Counter)**

- **Experiment 1:** Determining the Operating Plateau for the Geiger-Mueller Tube
- **Experiment 2:** Resolving Time Corrections
- **Experiment 3:** Geiger-Mueller Tube Efficiency
- **Experiment 4:** Inverse Square Law
- **Experiment 5:** Statistical Variation of Data
- **Experiment 6:** Range of Alpha Particles
- **Experiment 7:** Absorption of Beta Particles
- **Experiment 8:** Linear Absorption Coefficient (Gamma Decay)
- **Experiment 9:** Study of GM Counter for Gammas and Betas
- **Experiment 10:** Beta Backscattering as a Function of Atomic Number
- **Experiment 11:** Half-Life Measurement

**Grade Scale:**

<table>
<thead>
<tr>
<th>Score Range</th>
<th>Grade</th>
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<tbody>
<tr>
<td>90-100</td>
<td>A</td>
</tr>
<tr>
<td>80-89</td>
<td>B</td>
</tr>
<tr>
<td>70-79</td>
<td>C</td>
</tr>
<tr>
<td>60-69</td>
<td>D</td>
</tr>
<tr>
<td>&lt; 60</td>
<td>F</td>
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**STUDENTS’ RESPONSIBILITIES**

- In the event of significant personal problems (i.e. medical, family, etc.), which might cause the student to miss many classes, the Dean of Students is available to counsel you on how to meet your academic responsibilities. It is your obligation to make these arrangements and not go to the instructor (particularly at the “last minute”).

- Excessive tardiness will not be permitted. Also, cell phone and/or computer usage is NOT permitted during class time.

- Academic dishonesty will not be tolerated. If a student cheats, and this is proven beyond a doubt, he/she will be dropped from the course and sanctioned by the appropriate academic authorities.

**Disability Policy:** Texas Southern University maintains a policy for students with disabilities in accordance with the American with Disabilities Act of 1990, and Section 504 of the Rehabilitation Act of 1973. Under these federal guidelines, the University is obligated to:

- Protect the civil rights of students with disabilities.
- Protect the confidentiality and privacy of students with disabilities.
- Provide reasonable accommodations and services to students with known
disabilities, who are qualified to meet the requirements of the academic programs, apart from the handicapping condition.

The burden of proof is on the student to demonstrate the need for requested accommodations. If you feel you are qualified to receive services, please contact the Office of Disabled Students Services at 713-313-4210 or visit the office in the Fairchild Building, Room 147 between the hours of 8am – 5pm, Monday through Friday.

Additional useful websites:

Student Handbook:
http://www.tsu.edu/PDFFiles/student/services/student%20handbook%202009%20082409%20WEB.pdf

Student Code of conduct:
http://www.tsu.edu/PDFFiles/student/services/Student_Code_Conduct.pdf