Subject: Physics (PHGN)  Number: 311

Course Title: Introduction to Mathematical Physics

Section: 1

Semester/year: Fall/2013

Instructor or Coordinator: Reuben T. Collins

Contact information (Office/Phone/Email): MH466/(303) 273-3851/rtcollin@mines.edu

Office hours: M 3:00-3:50, T 3:00-3:50, W 3:00-5:00, TR 9:00-9:50

Class meeting days/times: MWF/10:00-10:50

Class meeting location: MH220

Web Page/Blackboard link (if applicable): http://inside.mines.edu/~rtcollin/phgn311

Teaching Assistant (if applicable): Mohammed Rezavi

Contact information (Office/Phone/Email): TBD

Instructional activity: 3 hours lecture  0 hours lab  3 semester hours

Course designation: ___ Common Core  ___ Distributed Science or Engineering  
_x_ Major requirement  ___ Elective  ___ Other (please describe ____________)

Course description from Bulletin: PHGN311. INTRODUCTION TO MATHEMATICAL PHYSICS
Demonstration of the unity of diverse topics such as mechanics, quantum mechanics, optics, and electricity and magnetism via the techniques of linear algebra, complex variables, Fourier transforms, and vector calculus. Prerequisite: PHGN300, MATH225/235, and MATH332/342 or consent of instructor. 3 hours lecture; 3 semester hours.

Textbook and/or other requirement materials:

Student learning outcomes: At the conclusion of the class students will...
1. Master the mathematical tools used in later courses in Physics at the undergraduate level
2. Learn how to design and implement mathematical solutions to practical problems in science and engineering
3. Apply mathematics to solve problems in other fields
4. Use modern computational tools to symbolically manipulate, numerically evaluate, and plot results to assist in finding and interpreting mathematical solutions

Brief list of topics covered:
1. Series
2. Multivariable calculus
3. Functions of a complex variable
4. Fourier series and transforms
5. Ordinary and partial differential equations
6. Special functions
Policy on academic integrity/misconduct: The Colorado School of Mines affirms the principle that all individuals associated with the Mines academic community have a responsibility for establishing, maintaining and fostering an understanding and appreciation for academic integrity. In broad terms, this implies protecting the environment of mutual trust within which scholarly exchange occurs, supporting the ability of the faculty to fairly and effectively evaluate every student’s academic achievements, and giving credence to the university’s educational mission, its scholarly objectives and the substance of the degrees it awards. The protection of academic integrity requires there to be clear and consistent standards, as well as confrontation and sanctions when individuals violate those standards. The Colorado School of Mines desires an environment free of any and all forms of academic misconduct and expects students to act with integrity at all times.

Academic misconduct is the intentional act of fraud, in which an individual seeks to claim credit for the work and efforts of another without authorization, or uses unauthorized materials or fabricated information in any academic exercise. Student Academic Misconduct arises when a student violates the principle of academic integrity. Such behavior erodes mutual trust, distorts the fair evaluation of academic achievements, violates the ethical code of behavior upon which education and scholarship rest, and undermines the credibility of the university. Because of the serious institutional and individual ramifications, student misconduct arising from violations of academic integrity is not tolerated at Mines. If a student is found to have engaged in such misconduct sanctions such as change of a grade, loss of institutional privileges, or academic suspension or dismissal may be imposed.

The complete policy is online.

Grading Procedures:

<table>
<thead>
<tr>
<th>Component</th>
<th>Weight</th>
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<tbody>
<tr>
<td>Attendance</td>
<td>3%</td>
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<tr>
<td>Homework, Reading, and/or Computer Assignments</td>
<td>27%</td>
</tr>
<tr>
<td>First Exam</td>
<td>20%</td>
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<tr>
<td>Second Exam</td>
<td>20%</td>
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<tr>
<td>Final</td>
<td>30%</td>
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</tbody>
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Coursework Return Policy:

While we use homework and tests to evaluate performance, their main benefit is as an instructional aid. This benefit is lost if a student has forgotten the issue they struggled with by the time they look at the solution set or receive their returned graded homework. For this reason, solutions to homework will be posted within a day or two after the due date, typically immediately after. It is also the instructor’s goal to return homework and tests within two weeks and preferably at the time the next assignment is collected. This also places a responsibility on the student to review solutions and returned homework and tests as soon as possible. In this way if the instructor had a more efficient or clearer approach, or if the student had difficulties with any of the problems, this can be more easily identified and assimilated because the material is still fresh in the student's mind.

Absence Policy (e.g., Sports/Activities Policy):

Both professors and students will occasionally need to be absent from class. When the instructor has a planned absence, students will be notified well in advance, and a mechanism to make up the absence will be worked out with the class. For students, the same process applies. If a student will be absent for a planned activity (an excused absence), they should notify the instructor well in advance and make plans to cover any missed material by, for example, arranging to borrow another student’s notes or turning in homework early. For students involved in sports or other campus sponsored activities, the schedule for absences is typically known at the beginning of the term and should be given to the instructor at that time. In particular, if an excused absence for such an activity occurs on the day of one of the course tests, given below, its important to let the instructor know at the very beginning of the term so the day can be adjusted. An unplanned absence due to, for example, illness that occurs on the day of a test or which keeps homework from being submitted requires documentation from the office of the Associate Dean of Students that the absence is considered excused before a make up will be administered or the homework accepted.

Homework:

Homework will be assigned each week on Friday and will be due the following week on Friday, accept during weeks with an exam, a holiday, or dead day when the due day may shift. Late homework is not
accepted because the instructor posts the solutions immediately after the homework is collected so students can resolve any issues that arose in the homework while it is still fresh in their mind. If a student will miss a Friday due to an excused absence, they should talk with the instructor well in advance to schedule when their homework will be due.

It is expected (and encouraged) that students will work with their classmates on homework, discussing concepts and helping each other through difficult steps. Students probably learn much more from each other than they can from the book or the prof. When the homework is turned in, however, the solutions need to be each student's own solutions, written by student and reflecting their understanding. Two students should not submit duplicate solutions even if they worked together. There will be zero tolerance for cheating in any form on homework or exams.

**Detailed Course Schedule:**

1. Introduction - 1 lecture
2. Series - 4 lectures
3. Complex numbers and functions of a complex variable - 6 lectures
4. Partial differentiation - 3 lectures
5. Multiple integrals, change of variables, and Jacobians - 3 lectures
6. Vector calculus review - 2 lectures
7. Fourier series and transforms - 10 lectures
8. Ordinary differential equations - 6 lectures
9. Partial differential equations, special functions and distributions - 6 lectures
10. Exam 1 - September 27
11. Exam 2 - November 1
12. Final Exam - TBD