

PHYS 612 Mathematical Physics II
Spring 2019

Credits: 3.0

Lectures: REIC 207 TR 11:30 am -1:00 pm

Instructor: Dr. Martin Truffer
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Office Hours: REIC 107 TR 2:30-4:30 pm, ELVE 401D by appointment.

Prerequisites: PHYS F611.

Course Type: In person

Instructional Methods: Lecture

Course Goals:

1. Learn how to apply mathematical methods in solving physical problems
2. Prepare physics students for comprehensive exam
3. Prepare students for other graduate classes
4. Give students physics context in which to understand math problems

Course Content: The course is the second part of a two-semester sequence PHYS 611/612 that presents methods and ideas of modern mathematics important for science, engineering and, in particular for physics. The PHYS 612 course will cover Sturm-Liouville theory, partial differential equations, Green's functions, special functions, integral transforms and equations.

Text: "Mathematical Methods for Physicists", 7th ed., by Arfken, Weber, and Harris

Lecture notes: Some of the instructor's notes will be made available on Google Classroom.

Grading: The course grade will consist of the following components:

Homework	Due on Thursdays, 11:30 am	50%
Mid-term	Thursday February 28, 11:30 am – 1:00 pm	20%
Final exam	Tuesday April 30, 10:15 am – 12:15 pm	30%

Homework: There will be approximately one homework assignment per week. The assignment will be posted on Google Classroom on Thursday and will be due on the following Thursday by 11:30 am. You are allowed to work with others on the homework, but make sure the paper you

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turn in is not simply copied from someone else. **All homework assignments must be turned in directly to me in class. No emailed or otherwise electronically-submitted assignments will be accepted.** Late assignments will be marked down as follows: minus 10% points per one day late up to 7 days, minus 100% after 7 days late.

Mid-Term Exam: The mid-term exam will be on Thursday, February 28, 2019, during the regular lecture time. The exam will be closed-book, but you will be given most of the needed equations. The mid-term exam will cover material covered up to this point (details to be confirmed in class).

Final Exam: The final exam will be at 10:15 am – 12:15 pm, Wednesday, April 30, 2019. The final will be closed-book, but you will be given most of the needed equations. It will cover the entire course, with some emphasis on the more recent material.

Evaluation: Every student will be given a raw score out of 100%. A raw score above 90% will be at least an A, above 80% will be at least a B, above 70% will be at least a C, above 60% will be at least a D. Good class participation will be rewarded by rounding up grades that are near a cut-off.

Student Learning Outcomes:

1. Know how to solve assigned mathematical problems in weekly homework assignments.
2. Be able to solve most PhD comprehensive exam questions in mathematical physics.
3. Obtain good understanding of relevant physical concepts, as well as theoretical and mathematical tools that can help students to conduct their own graduate research.

Course policies: Attendance of lectures is expected. Active class participation and questions are encouraged. A missed exam will receive zero credit unless the instructor is notified by email or phone before the exam starts. Make-up exams will be individually scheduled with the student.

Tentative Course Calendar:

Week 1: Chapter 7. Ordinary differential equations.
Week 2: Chapter 7. Inhomogeneous linear ODEs.
Week 3: Chapter 8. Sturm-Liouville theory. **Homework 1.**
Week 4: Chapter 9. Partial differential equations. **Homework 2.**
Week 5: Chapter 9. Separation of variables. **Homework 3.**
Week 6: Chapter 10. Green's functions. **Homework 4.**
Week 7: Chapter 14. Bessel functions. **Homework 5. Midterm Exam.**
Week 8: Chapter 15. Legendre functions. **Homework 6.**
Week 9: Chapter 15. Spherical harmonics. **Homework 7.**
Week 10: Chapter 20. Integral transforms. **Homework 8.**
Week 11: Chapter 20. Fourier convolution theorem. **Homework 9.**
Week 12: Chapter 20. Laplace transforms. **Homework 10.**
Week 13: Chapter 20. Laplace convolution theorem. **Homework 11.**
Week 14: Chapter 21. Integral equations. **Homework 12.**
Week 15: Chapter 21. Neumann series. **Homework 13.**

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Special Needs: The Office of Disability Services implements the Americans with Disabilities Act (ADA), and insures that UAF students have equal access to the campus and course materials. We will work with the Office of Disabilities Services (Room 203 WHIT, Phone 474-7043) to provide reasonable accommodation to students with disabilities.

Plagiarism: Plagiarism and cheating are matters of serious concern for students and academic institutions. This is true in this class as well. The UAF Honor Code (or [Student Code of Conduct](#)) defines academic standards expected at the University of Alaska Fairbanks which will be followed in this class. (Taken from the [UAF plagiarism web site](#), which has many links with good information about this topic)

Complaints and Concerns: You are always welcome to talk to me about anything, however, if you have a non-subject matter question or concern that cannot be resolved by me, contact the department chair, Dr. Renate Wackerbauer, Physics Department Office, Room REIC 106.

Student Protections and Services Statement: Every qualified student is welcome in my classroom. As needed, I am happy to work with you, disability services, veterans' services, rural student services, etc to find reasonable accommodations. Students at this university are protected against sexual harassment and discrimination (Title IX), and minors have additional protections. As required, if I notice or am informed of certain types of misconduct, then I am required to report it to the appropriate authorities. For more information on your rights as a student and the resources available to you to resolve problems, please go the following site: www.uaf.edu/handbook/.

UA is an AA/EO employer and educational institution and prohibits illegal discrimination against any individual: <https://alaska.edu/nondiscrimination/>.

Incomplete Grade: Your instructor follows the University of Alaska Fairbanks Incomplete Grade Policy: “The letter “I” (Incomplete) is a temporary grade used to indicate that the student has satisfactorily completed (C or better) the majority of work in a course but for personal reasons beyond the student’s control, such as sickness, has not been able to complete the course during the regular semester. Negligence or indifference are not acceptable reasons for an “I” grade.”

Technology requirements: To access instructor’s lecture notes on the Blackboard, students will need to have access to the internet and software to view pdf files.

Effective communication: Students who have difficulties with oral presentations and/or writing are strongly encouraged to get help from the UAF Department of Communication’s Speaking Center (907-474-5470, speak@uaf.edu) and the UAF English’s Department’s Writing Center (907-474-5314, Gruening 8th floor), and/or CTC’s Learning Center (604 Barnette Street, 907-455- 2860).