Physics 301 - Intro to Mathematical Physics - Spring 2020

Instructor	Renate Wackerbauer, Office Location: NSCI 106 phone: 474-6108 e-mail: rawackerbauer@alaska.edu
Open Office hours	Walk-ins are very welcome; appointments help; email is effective for straight-forward questions.
Course Info	Phys301, 4 credits (4 hours of lecture!)
Prerequisites	Phys211, 212, 213; Math252; or permission of instructor.
Lectures	MWF 2:15 to 3:15 am, REIC 207; T 9:45-10:45 am, REIC 207. The lectures will explore in depth material presented in the text. This is an intense class with 4hrs of lecture per week; homework questions relevant to the entire class can be discussed in the lectures.
Noyes Lab	Access to the Noyes Computer Lab (Rm 101 NSCI) is provided to all students enrolled in a Physics course. Your polar express card lets you in.
Text	Required text: *Mathematical Methods in the Physical Sciences*, by M Boas, John Wiley and Sons (3rd edition, 2005); The publisher provides a listing of errata for this text. Mathematical handbooks will be very useful for this course; one recommendation is *Abramowitz and Stegun: Handbook of Mathematical Functions*; it can be downloaded for free. Supplementary readings: **Essential Mathematical Methods for Physicists*, by HJ Weber, F Harris, and GB Arfken, Elsevier Academic Press ---- this is an undergraduate level book, widely used - **Mathematical Methods for Physicists*, by GB Arfken and HJ Weber, Elsevier Academic Press, ---- this book is for advanced reading - usually at the graduate level - Various mathematics books in the library cover individual parts of the material presented in the lectures. Please explore them to see different approaches to our topics.
Course Content **Tentative course calendar**	Introduction to theoretical foundations of classical and modern physics. Includes calculus of vector fields, linear algebra and elementary tensor theory, complex analysis, ordinary linear differential equations, linear partial differential equations, Fourier analysis and probability. Physical applications include planetary motion, rotating bodies and inertia tensor, damped and driven harmonic oscillator, wave equation, Schroedinger's equation and diffusive systems.
Course Goals	This course provides an introduction into mathematical methods that are *essential* for the upper division Physics courses. Of course these mathematical tools have much broader applications in many technical fields other than physics, e.g., engineering, industrial research/development, and even economics/finances or mathematical biology. This course, and its companion course PHYS 220 "Introduction to Computational Physics", are crucial prerequisites for the rest of the undergraduate Physics curriculum.
Student	You learn,

Learning Outcomes

--how to solve standard mathematical text book problems analytically
--how to apply mathematical concepts to physical problems and to the sciences in general
--limitations of analytically solvable mathematical problems and the need for computational methods
--the most essential mathematical tools required for the theoretical physics courses ahead of you

Homework

homework

Richard Feynman (Nobel prize, 1965) "You don't understand anything until you have practiced"
Homework (10 assignments, each counting 100pts) will be assigned weekly and will be due by **2:15 pm** on the following Friday, unless explicitely altered at the time of assignment. Late homework will *not* be accepted. Finished homework can be handed in in class, or in my mail box in the main office. Homework solutions will be posted in the glass case in the Physics Department hallway. I HIGHLY appreciate it if you RECYCLE paper for your homeworks! You can earn 100 bonus points in the homework by giving a 10min presentation to class on a topic related to class, for example the life of a mathematician/physicist, an application of a mathematical concept - discussed in class - to a particular physics problem, etc

Examinations

Two one-hour in-term examinations and a two hour final examination will be held during the semester. In-term exams will be held in the classroom. The exams will be closed books and closed notes. No calculators, computers, or communication devices are allowed.

Exam 1 (in class)	Friday, February 21	Boas: approx. chapt. 1-4
Exam 2 (in class)	Friday, April 3	Boas: approx. chapt. 4-8
Final Exam	Thursday, April 30, 1-3pm	Boas: approx. chapt. 1-8, 12-13

Grading

The maximum score for each homework will be 100 points. A solution (homework, exam) that presents nothing more than a restatement of the problem will receive zero credit. *illegible work will not be graded*. *To pass the course with a grade higher than an "F", you need 40% of the total credits. Grades A - D are assigned equal weight (units of 15%) for total credits between 40% and 100%. +/- are assigned 2.5% from grade boundary.* So A+ (>97.5), A(>87.5), A- (>85), B+(>82.5), B(>72.5), B- (>70), C+ (>67.5), C (>57.5), C- (>55), etc. For the final grade homework, exams, will be weighted as follows:

Homework	20%
Exam 1	25%
Exam 2	25%
Final Exam	30%

Course policies

Attendance at lectures is expected. Active class participation, questions are extremely welcome in the lectures. A missed exam will receive 0 credit unless the instructor is notified by email, phone, etc before the exam starts. Make-up exams will be individually scheduled with the student.

Student Obligations

As students of UAF, you are bound by the policies and regulations of the University of Alaska, UAF rules and procedures, and the Student Honor Code. You are obligated to make yourselves familiar with all conditions presented in the UAF Catalog. *Plagiarism on homework or on an exam will result in a failing grade.*

Student protection and

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

services statement	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/. 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." 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 Department's Writing Center (907-474-5314, Gruening 8th floor), and/or CTC's Learning Center (604 Barnette Street, 907-455- 2860).