

## Physics 301 - Intro to Mathematical Physics - Spring 2021

<b>Instructor</b>	Renate Wackerbauer, Office Location: REIC 106 phone: 474-6108 e-mail: rawackerbauer@alaska.edu
<b>Open Office hours</b>	Due to Covid19 there are no walk-in office hours unless the situation improves; meeting via zoom works; email is effective for straight-forward questions. additional recitation classes can be scheduled on request. homework questions can be discussed during/after class.
<b>Course Info</b>	Phys301, 4 credits (4 hours of lecture!)
<b>Prerequisites</b>	Phys211, 212, 213; Math252; or permission of instructor.
<b>Lectures</b>	MWF 2:15 to 3:15 am, REIC 207; T 9:45-10:45 am, REIC 207 <span style="color: red;">Lectures will be/start f2f; they will be recorded, uploaded to "google classroom", and shared with all students in class. Due to the fluid situation with covid, the course modality can change throughout the semester. In the case of online course delivery, lectures would be offered synchronously (tablet with whiteboard), recorded, and uploaded into google classroom.</span>
<b>Noyes Lab</b>	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.
<b>Text</b>	<u>Required text:</u> <i>Mathematical Methods in the Physical Sciences</i> , by M Boas, John Wiley and Sons (3rd edition, 2005); The publisher provides a listing of <a href="#">errata</a> for this text. Mathematical handbooks will be very useful for this course; one recommendation is <i>Abramowitz and Stegun: Handbook of Mathematical Functions</i> ; it can be <a href="#">downloaded</a> for free.  <u>Supplementary readings:</u> <i>*Essential Mathematical Methods for Physicists</i> , by HJ Weber, F Harris, and GB Arfken, Elsevier Academic Press ---- this is an undergraduate level book, widely used - <i>*Mathematical Methods for Physicists</i> , by GB Arfken and HJ Weber, Elsevier Academic Press, ---- this book is for advanced reading - usually at the graduate level - <u>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.</u>
<b>Course Content</b> <a href="#">Tentative course calendar</a>	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, Schrodinger's equation and diffusive systems.
<b>Course Goals</b>	This course provides an introduction into mathematical methods that are <i>essential</i> 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.									
<b>Student Learning Outcomes</b>	<p>You learn,</p> <ul style="list-style-type: none"> <li>--how to solve standard mathematical text book problems analytically</li> <li>--how to apply mathematical concepts to physical problems and to the sciences in general</li> <li>--limitations of analytically solvable mathematical problems and the need for computational methods</li> <li>--the most essential mathematical tools required for the theoretical physics courses ahead of you</li> </ul>									
<b>Homework homework</b>	<p><b>Richard Feynman (Nobel prize, 1965) "You don't understand anything until you have practiced"</b></p> <p>Homework (11 assignments, each counting 100pts) will be assigned weekly and will be due by <b>2pm</b> on the following Friday, unless explicitly altered at the time of assignment. Late homework will <i>not</i> be accepted. <b>Finished homework should be uploaded as a pdf-file to "google classroom"</b>.</p> <p>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/science problem, etc</p> <p>in case of issues with the homework link use: <a href="https://ffden-2.phys.uaf.edu/wacker/CLASS/301.html">ffden-2.phys.uaf.edu/wacker/CLASS/301.html</a></p>									
<b>Examinations</b>	<p>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.</p> <table border="1"> <tr> <td>Exam 1 (in class)</td> <td>Friday, February 19</td> <td>Boas: approx. chapt. 1-4</td> </tr> <tr> <td>Exam 2 (in class)</td> <td>Friday, April 2</td> <td>Boas: approx. chapt. 4-8</td> </tr> <tr> <td>Final Exam</td> <td>Thursday, April 29, 1:30-4pm</td> <td>Boas: approx. chapt. 1-8, 12-13</td> </tr> </table>	Exam 1 (in class)	Friday, February 19	Boas: approx. chapt. 1-4	Exam 2 (in class)	Friday, April 2	Boas: approx. chapt. 4-8	Final Exam	Thursday, April 29, 1:30-4pm	Boas: approx. chapt. 1-8, 12-13
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<b>Grading</b>	<p>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. <i>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+ (&gt;97.5), A(&gt;87.5), A- (&gt;85), B+(&gt;82.5), B(&gt;72.5), B- (&gt;70), C+ (&gt;67.5), C (&gt;57.5), C- (&gt;55), etc. For the final grade homework, exams, will be weighted as follows:</i></p> <table border="1"> <tr> <td>Homework</td> <td>20%</td> </tr> <tr> <td>Exam 1</td> <td>25%</td> </tr> <tr> <td>Exam 2</td> <td>25%</td> </tr> <tr> <td>Final Exam</td> <td>30%</td> </tr> </table>	Homework	20%	Exam 1	25%	Exam 2	25%	Final Exam	30%	
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<b>Course policies</b>	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.									
<b>Student Obligations</b>	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									

	<p>to make yourselves familiar with all conditions presented in the UAF Catalog. <i>Plagiarism on homework or on an exam will result in a failing grade.</i></p> <p><i>Students should keep up-to-date on the university's policies, practices, and mandates related to COVID-19 by regularly checking this <a href="#">website</a>.</i></p> <p><i>Further, students are expected to adhere to the university's policies, practices, and mandates and are subject to disciplinary actions if they do not comply.</i></p>
<p><b>Student protection and services statement</b></p>	<p>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: <a href="http://www.uaf.edu/handbook/">www.uaf.edu/handbook/</a>.</p> <p>UA is an AA/EO employer and educational institution and prohibits illegal discrimination against any individual: <a href="https://alaska.edu/nondiscrimination/">https://alaska.edu/nondiscrimination/</a>.</p> <p>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."</p> <p>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, <a href="mailto:speak@uaf.edu">speak@uaf.edu</a>) 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).</p>