

Physics 471D -- Advanced Topics: Nonlinear Dynamics -- Spring 2022

Instructor	Renate Wackerbauer, Office Location: REIC 106 phone: 474-6108 e-mail: rawackerbauer@alaska.edu WELCOME, and have a great semester !!
Open office hours	Due to Covid19 there are no walk-in office hours unless the situation improves; discussions after class work well; meeting via zoom works; email is effective for straight-forward questions. additional recitation classes can be scheduled on request.
Course info	Phys471D, 1 credit
Prerequisites	Phys220 and Phys301, or instructor's permission
Lectures	MW 4:40-5:40pm, REIC 207 F 3:30 to 4:30 pm, REIC 207 Lectures are face to face 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.
Noyes Lab	Access to the Noyes Computer Lab (Rm 101 REIC) is provided to all students enrolled in a Physics course. Your polar express card lets you in.
Text	Required text: Excerpts from <i>Nonlinear Dynamics and Chaos</i> , by S. Strogatz, Perseus Publishing. (book is available as hard copy and as electronic copy at Rasmuson Library) Supplementary readings: <i>Chaotic dynamics</i> , by T. Tel and M. Gruiz, Cambridge (2007). --many nice applications, and great explanations. <i>Mathematical Biology I and II</i> , by J.D. Murray, Springer (3rd edition, 2002) --on nonlinear dynamics with particular focus on biological systems <u>There are many books on nonlinear dynamics in the library. Please explore them to see different approaches to our topics.</u>
Course Content	Introduction into the dynamics of nonlinear systems. Continuous and discrete dynamical systems, stability analysis, bifurcations, limit cycle,

<p>Tentative course calendar</p>	<p>chaos and strange attractors, fractals and dimension algorithms.</p>				
<p>Course Goals</p>	<p>This course provides an introduction into nonlinear dynamics at the undergraduate level. Dynamical systems that are characterized with coupling and feedback processes often show dynamical (or spatiotemporal) patterns that need to be described at the systems level; a reductionist approach is not suited for complex systems, since the entire system behaves different than the sum of its part. Complex systems can be high-dimensional but must not. A necessary requirement for complex dynamics is nonlinear equations of motion.</p>				
<p>Student Learning Outcomes</p>	<p>Students learn, *how to analyze the stability of complex systems *how nonlinear systems differ from linear systems regarding dynamical properties *how sensitivity of system dynamics is related to predictability, determinism, and control *to explore dynamical systems analytically and with computer simulations</p>				
<p>Homework homework assignments</p>	<p>Homework will be assigned weekly and will be due by 3:30 pm on the following wednesday, unless explicitly altered at the time of assignment. <i>Late homework will not be accepted.</i> Finished homework should be uploaded to "google classroom" in a single pdf-file. in case of issues with the homework link use: ffden-2.phys.uaf.edu/wacker/CLASS/471D.html</p>				
<p>Examinations</p>	<p>A one-hour in-term final examination will be held during the semester. The exam will be closed books and closed notes. No calculators, computers, or communication devices are allowed.</p> <table border="1" data-bbox="399 1339 1224 1455"> <tr> <td>Final exam</td> <td>Friday, Feb 11, in class</td> <td>Strogatz, approx chapt 2, 3, 5-10</td> </tr> </table>	Final exam	Friday, Feb 11, in class	Strogatz, approx chapt 2, 3, 5-10	
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<p>Grading</p>	<p>The maximum score for each homework will be 100 points. <i>illegible work will not be graded. To pass the course with a grade higher than an "F", you need 50% of the total credits. Grades A - D are assigned equal weight (units of 12.5%) for total credits between 50% and 100%. +/- are assigned 2.5% from grade boundary.</i> So A+ (>97.5), A(>90), A- (>87.5), B+(>85), B(>77.5), B- (>75), C+ (>72.5), C (>65), C- (>62.5), etc. For the final grade homework, exams, will be weighted as follows:</p> <table border="1" data-bbox="399 1822 915 1948"> <tr> <td>Homework</td> <td>70%</td> </tr> <tr> <td>Final exam</td> <td>30%</td> </tr> </table>	Homework	70%	Final exam	30%
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Final exam	30%				
<p>Course policies</p>	<p>Attendance at lectures is expected. Active class participation,</p>				

	<p>questions, comments 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.</p>
<p>Student Obligations</p>	<p>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. <i>Plagiarism on homework, or on 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 website:</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>Student protection and services statement</p>	<p>Student protections statement: UAF embraces and grows a culture of respect, diversity, inclusion, and caring. Students at this university are protected against sexual harassment and discrimination (Title IX). Faculty members are designated as responsible employees which means they are required to report sexual misconduct. Graduate teaching assistants do not share the same reporting obligations. For more information on your rights as a student and the resources available to you to resolve problems, please go to the following site: https://catalog.uaf.edu/academics-regulations/students-rights-responsibilities/.</p> <p>Disability services statement: I will work with the Office of Disability Services to provide reasonable accommodation to students with disabilities.</p> <p>Student Academic Support:</p> <ul style="list-style-type: none"> Speaking Center (907-474-5470, uaf-speakingcenter@alaska.edu, Gruening 507) Writing Center (907-474-5314, uaf-writing-center@alaska.edu, Gruening 8th floor) UAF Math Services, uafmathstatlab@gmail.com, Chapman Building Developmental Math Lab, Gruening 406 The Debbie Moses Learning Center at CTC (907-455-2860, 604 Barnette St, Room 120, https://www.ctc.uaf.edu/student-services/student-success-center/) <p>For more information and resources, please see the Academic Advising Resource List (https://www.uaf.edu/advising/lr/SKM_364e19011717281.pdf)</p>

Student Resources:

Disability Services (907-474-5655, uaf-disability-services@alaska.edu, Whitaker 208)

Student Health & Counseling [6 free counseling sessions] (907-474-7043, <https://www.uaf.edu/chc/appointments.php>, Whitaker 203)

Center for Student Rights and Responsibilities

(907-474-7317, uaf-studentrights@alaska.edu, Eielson 110)

Associated Students of the University of Alaska Fairbanks (ASUAF) or

ASUAF Student Government (907-474-7355, asuaf.office@alaska.edu, Wood Center 119)

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