

ECH 4323 Process Control Theory

1. ECH 4323 Process Control Theory
2. 3 credits
3. Spyros A. Svoronos
4. Instructor notes will be posted in the CANVAS learning management site.
 - a. Other supplemental materials
 - i. Arduino-based equipment for conducting experiments
 - ii. Windows capable laptop computer
5. Specific course information
 - a. The analysis and automatic control of process systems in chemical engineering.
 - b. Corequisites: ECH 4323L
 - c. Required
6. Specific goals for the course
 - a. Specific outcomes of instruction
 - The student will be able to draw feedback and feedforward control loops.
 - The student will be able to formulate dynamic models for chemical engineering systems and to perform model-linearization procedures
 - The student will be able to obtain approximate process models from experimental data
 - The student will be able to use and tune proportional-integral-derivative controllers
 - The student will be able to analyze the performance and stability of linear control systems, both open loop and closed loop
 - The student will be able to specify control instrumentation, including process sensors and actuators.
 - b. Student outcomes addressed by the course
 - Outcome (a): an ability to apply knowledge of mathematics, science, and engineering.
 - Outcome (k): an ability to use the techniques, skills, and modern engineering tools necessary for engineering practice

7. Brief list of topics to be covered

- Introduction to feedback and feedforward control
- Nonlinear state space models and their linearization
- Laplace transforms, transfer functions, and open-loop stability
- First-order plus time delay systems and approximate transfer functions from experimental data
- The PID control law and low-pass filtering
- Velocity and position forms of the discrete PID control law
- Frequency response analysis
- Closed-loop stability analysis
- Controller tuning methods

8. Course Assessment (Integrated with ECH 4323L):

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| a. Exam 1, Tuesday Oct. 22, evening | 35% |
| b. Exam 2, Thursday Dec. 12, 4:30 PM or Friday Dec 13 12:30 PM | 35% |
| c. Classwork and Homework | 25% |

Each homework/classwork problem (or part of it) will be graded in a scale from 0 to 3, with a 3 earned only for perfect answers. Some assignments involve performing experiments.

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| d. Class attendance & participation | 5%. |
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9. Class Requirements:

- Arduino-based equipment for conducting experiments
 - Windows capable laptop computer
- No text is required. Notes will be posted.

ADDITIONAL INFORMATION

Students Requiring Accommodations

Students with disabilities requesting accommodations should first register with the Disability Resource Center (352-392-8565, <https://www.dso.ufl.edu/drc>) by providing appropriate documentation. Once registered, students will receive an accommodation letter which must be presented to the instructor when requesting accommodation. Students with disabilities should follow this procedure as early as possible in the semester.

Course Evaluation

Students are expected to provide feedback on the quality of instruction in this course by completing online evaluations at <https://evaluations.ufl.edu/evals>. Evaluations are typically open during the last two or three weeks of the semester, but students will be given specific times when they are open. Summary results of these assessments are available to students at <https://evaluations.ufl.edu/results/>.

University Honesty Policy

UF students are bound by The Honor Pledge which states, “We, the members of the University of Florida community, pledge to hold ourselves and our peers to the highest standards of honor and integrity by abiding by the Honor Code. On all work submitted for credit by students at the University of Florida, the following pledge is either required or implied: “On my honor, I have neither given nor received unauthorized aid in doing this assignment.” The Honor Code (<https://www.dso.ufl.edu/sccr/process/student-conduct-honor-code/>) specifies a number of behaviors that are in violation of this code and the possible sanctions. Furthermore, you are obligated to report any condition that facilitates academic misconduct to appropriate personnel. If you have any questions or concerns, please consult with the instructor or TAs in this class.

Commitment to a safe and inclusive learning environment

The Herbert Wertheim College of Engineering values broad diversity within our community and is committed to individual and group empowerment, inclusion, and the elimination of discrimination.

It is expected that every person in this class will treat one another with dignity and respect regardless of gender, sexuality, disability, age, socioeconomic status, ethnicity, race, and culture.

If you feel like your performance in class is being impacted by discrimination or harassment of any kind please contact your instructor or any of the following:

- Your academic advisor or Graduate Program Coordinator
- Robin Bielling, Director of Human Resources, 352-392-0903, rbielling@eng.ufl.edu
- Curtis Taylor, Associate Dean of Student Affairs, 352-392-2177, taylor@eng.ufl.edu
- Toshikazu Nishida, Associate Dean of Academic Affairs, 352-392-0943, nishida@ufl.edu

Sexual Discrimination, Harassment, Assault, or Violence

If you or a friend has been subjected to sexual discrimination, sexual harassment, sexual assault, or violence contact the **Office of Title IX Compliance**, located at Yon Hall Room 427, 1908 Stadium Road, (352) 273-1094, title-ix@ufl.edu

Campus Resources:

Health and Wellness

U Matter, We Care:

If you or a friend is in distress, please contact umatter@ufl.edu or 352 392-1575 so that a team member can reach out to the student.

Counseling and Wellness Center: <http://www.counseling.ufl.edu/cwc>, and 392-1575; and the University Police Department: 392-1111 or 9-1-1 for emergencies.

Sexual Assault Recovery Services (SARS)

Student Health Care Center, 392-1161.

University Police Department at 392-1111 (or 9-1-1 for emergencies), or <http://www.police.ufl.edu/>.

Academic Resources

E-learning technical support, 352-392-4357 (select option 2) or e-mail to Learning-support@ufl.edu. <https://lss.at.ufl.edu/help.shtml>.

Career Resource Center, Reitz Union, 392-1601. Career assistance and counseling. <https://www.crc.ufl.edu/>.

Library Support, <http://cms.uflib.ufl.edu/ask>. Various ways to receive assistance with respect to using the libraries or finding resources.

Teaching Center, Broward Hall, 392-2010 or 392-6420. General study skills and tutoring. <https://teachingcenter.ufl.edu/>.

Writing Studio, 302 Tigert Hall, 846-1138. Help brainstorming, formatting, and writing papers. <https://writing.ufl.edu/writing-studio/>.

Student Complaints Campus:

https://www.dso.ufl.edu/documents/UF_Complaints_policy.pdf.