



Automatic Controls

The University of Toledo
Electrical Engineering Technology program, College of Engineering
EET-4450-001, CRN: 41198

Instructor:	William Mugge	Course Website:	Blackboard
Email:	William.Mugge@utoledo.edu	Class Location:	PH 2470
Office Hours:	(Insert Availability/by appointment)*	Class Day/Time:	2:30 – 3:50 pm
Office Location:	NE 1639	Lab Location:	NE2350
Instructor Phone:	419-530-3277	Lab Day/Time:	M, T, R 3:55 – 5:25
Offered:	Fall 2019	Credit Hours:	4.0

CATALOG/COURSE DESCRIPTION

This course is an introduction to industrial controls, including the PID control of closed-loop servo and process systems, with emphasis placed on the electronic circuits of the closed-loop sub-systems.

COURSE OVERVIEW

This course prepares the student for understanding of control systems commonly used in industry. Upon completion of this course, the students will be able to:

1. Perform linear instrument calculations.
2. Perform calculations for PID controllers
3. Be able to describe temperature, level, pressure, and flow instrument string components.
4. Describe signal processing, delay, cross limits, and umpiring modules
5. Describe and perform calculations for correction elements
6. Perform Laplace analysis of transfer functions
7. Perform system simplification through block reduction.
8. Describe system stability for a control system.

STUDENT LEARNING OUTCOMES

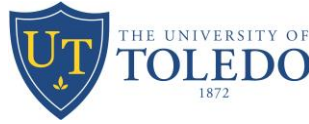
Outcome a. an ability to select and apply the knowledge, techniques, skills, and modern tools of the discipline to broadly-defined engineering technology activities;

Outcome b. an ability to select and apply a knowledge of mathematics, science, engineering, and technology to engineering technology problems that require the application of principles and applied procedures or methodologies;

Outcome f. an ability to identify, analyze, and solve broadly-defined engineering technology problems;

TEACHING METHODOLOGY

This is an active learning course that will require students to be fully engaged. Face-to-face instructions in lectures will provide maximum help to students. Homework, quizzes, and comprehensive tests will be



given. Laboratory sessions are used to reinforce control systems concepts. The purpose of this course is to help students understand the fundamental control theories and use those theories to solve the relevant problems. Students are welcome to ask questions and discuss problems. The course will be instructed based on the philosophy of cycling education:

- through the theory to understand the formula
- through the usage of formulae to the understand examples
- through the examples to solve similar exercise problems
- through face-to-face instruction to improve learning efficiency
- through lab guides reinforcement of principles provided in lecture
- through exams to emphasize importance and clarify confusion
- though taking this course to have the capability to self-study for future work or research

Recommendations for success:

- Come to lectures and take notes
- Read the relevant contents in the textbook
- Solve examples in the textbook and do homework
- Review the relevant contents and homework before each test or exam

Never hesitate to ask for help from the instructor

PREREQUISITES AND COREQUISITES

EET 3250 for UG with min of D- or ENGT 3050 for UG with min of D-

TEXTS AND ANCILLARY MATERIALS

Bolton, Instrumentation and Control Systems 2nd ed. ISBN:978-0-08-100613-9

TECHNOLOGY REQUIREMENTS

Web assist - Blackboard <http://blackboard.utdl.edu/>

ACADEMIC POLICIES

Students in this course should be familiar with policies that govern the institution's academic process.

Please find a total list of undergraduate Academic Polices:

<http://www.utoledo.edu/policies/academic/undergraduate/>

Missed Class Policy: Students are expected to attend each class session. Should there be an unexpected absence on your part, you must notify me **by e-mail**. Please read the Missed Class Policy:

<http://www.utoledo.edu/policies/academic/undergraduate/>

Academic Dishonesty Policy: MISCONDUCT: Students may work together on homework problems but must submit their own work. Students are not allowed to work together on exams. Any occurrence of academic misconduct will follow the policy for Academic Dishonesty. Students that receive a reduced course grade as a result of academic misconduct will not be allowed to withdraw from the course and may not petition for a GPA recalculation after retaking the course. Please refer to the [Academic](#)



Dishonesty and Academic Grievance policies for more details. If you are caught in the act of plagiarism or cheating, you will be reported to the Dean and you will be placing your entire academic career at risk. There are no reasonable excuses or exceptions for cheating and plagiarism. Examples include but are not limited to as followings. Please read the <http://www.utoledo.edu/policies/academic/undergraduate/>

1. Plagiarizing or representing the words, ideas or information of another person as one's own and not offering proper documentation;
2. Giving or receiving, prior to an examination, any unauthorized information concerning the content of that examination;
3. Referring to or displaying any unauthorized materials inside or outside of the examination room during an examination;
4. Communicating during an examination in any manner with any unauthorized person concerning the examination or any part of it;
5. Giving or receiving substantive aid during an examination;
6. Commencing an examination before the stipulated time or continuing to work on an examination after the announced conclusion of the examination period;
7. Taking, converting, concealing, defacing, damaging or destroying any property related to the preparation or completion of assignments, research or examination;
8. Submitting the same written work to fulfill the requirements for more than one course.

Exams Policy: There will be no makeup tests given. It is the student's responsibility to contact the instructor prior to the scheduled exam if an absence cannot be avoided in order to make alternate arrangements.

Attendance Policy: Attendance will not be taken, but students are fully responsible for being present at all examinations, and for all materials, announcements, or changes in the schedule in class. In case of excused absence, **any missed work must be done** and written documentation of the circumstance (such as a doctor's signed note) must be provided to be kept on file.

COURSE EXPECTATIONS

Homework: Homework will be assigned for the corresponding lecture. Homework is normally due at beginning of the class on the day a week from the assigning day. Homework will usually not be graded.

Quizzes: Quizzes may be given at any time, based on the assigned homework.

Laboratory reports: Lab reports are typically due the Thursday following the week of performance. The labs may be turned to the lab TA or to the instructor. Pre-labs are due on the date assigned, typically due in the first 10 minutes the day of the lab period. Late lab reports will incur point reduction as follows: one week minus 10 points, two weeks minus 20 points, no points after the end of the second week past due.

Quizzes, tests, and exams: The final answer alone is not enough to get credit. Solution steps must be shown to get credit.

Electronica Policy: No electronic items: cellular telephones, Blackberrys, personal digital assistants, digital music players or similar items that may disrupt the learning environment may be used at any time for any purpose during the classroom or laboratory time. If a cell phone must be kept on due to a potential emergency situation, it must be on a silent setting. If an emergency call must be taken during a class, the student must leave the classroom prior to



answering the call and not return until the call is completed. See also Article IV.B Conduct Rules and Regulations of the Student Code of Conduct at the University of Toledo, which states, in part:

“Disruption of operations of the University Community. Disruption is an action or combination of actions by an individual or a group, which unreasonably interferes with, hinders, obstructs, or prevents the right of others to freely participate in its programs, services, or academic settings. This may include but is not limited to a disruption by the use of pagers, cell phones and/or any other communication devices.”

If there is a conflict or misunderstanding, please see me privately to work out a resolution.

OVERVIEW OF COURSE GRADE ASSIGNMENT

Assigned work turned in passed the due date with no prior agreement with the instructor may be accepted, accepted with point reduction, or not at all.

Both the Test 1, Test2, and final grading use the same formula, scale, and weights.

Test 1 Grading

Midterm grades will be presented per university requirements and based on the current updated cumulative scores obtained by the students usually the first 5 or 6 weeks.

Final Grading

Quizzes: 20%	A: 93.00-100	C: 73.00-76.99
Lab reports: 20%	A-: 90.00-92.99	C-: 70.00-72.99
Mid-term test: 20% (T1)	B+: 87.00-89.99	D+: 67.00-69.99
Second test 20% (T2)	B: 83.00-86.99	D: 63.00-66.99
Final Exam: 20%	B-: 80.00-82.99	D-: 60.00-62.99
Total: 100%	C+: 77.00-79.99	F: < 59.99

UNIVERSITY POLICIES*

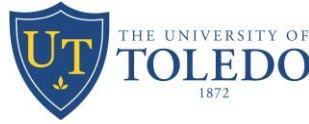
Policy Statement on Non-Discrimination on the Basis of Disability (ADA)

The University is an equal opportunity educational institution. Please read [The University's Policy Statement on Nondiscrimination on the Basis of Disability Americans with Disability Act Compliance](#).

Students can find this policy along with other university policies listed by audience on the [University Policy webpage](http://www.utoledo.edu/policies/audience.html/#students) (<http://www.utoledo.edu/policies/audience.html/#students>).

Academic Accommodations*

The University of Toledo embraces the inclusion of students with disabilities. We are committed to ensuring equal opportunity and seamless access for full participation in all courses. For students who have an accommodations memo from Student Disability Services, I invite you to correspond with me as soon as possible so that we can communicate confidentially about implementing accommodations in this course. For students who have not established affiliation with Student Disability Services and are experiencing disability access barriers or are interested in a referral to healthcare resources for a potential disability or would like information regarding eligibility for academic accommodations, please contact the [Student Disability Services Office](#) (<http://www.utoledo.edu/offices/student-disability-services/>) by calling 419.530.4981 or sending an email to StudentDisability@utoledo.edu.



ACADEMIC AND SUPPORT SERVICES

Please follow this link to view a comprehensive list of [Student Academic and Support Services](http://www.utoledo.edu/studentaffairs/departments.html) (http://www.utoledo.edu/studentaffairs/departments.html) available to you as a student.

In addition to visiting the instructor, which is highly encouraged, several offers additional support, are available which could aid you in succeeding in this course:

- Engineering Technology Department Teaching Assistants - NE 1604 & NE 1606

SAFETY AND HEALTH SERVICES FOR UT STUDENTS

Please use the following link to view a comprehensive list [Campus Health and Safety Services](#) available to you as a student.

COURSE SCHEDULE

No Class Dates: Per university calendar

Final Exam Date: Per university schedule

Course Schedule (Subject to Change depending on the course progress)

WEEK	DATES	TOPIC	LEARNING OUTCOME(S)	ASSIGNMENTS DUE
1	8/26	Introduction and $Y=mX+b$	All	
2	9/2	Control theory, Proportional and Integral control		Homework 1
3	9/9	Derivative and PID control		Homework 2
4	9/16	Performance terms and P&I Diagrams		Homework 3
5	9/23	Displacement and Speed		Homework 4
6	9/30	Pressure and Flow		
7	10/7	Level and Temperature		Test 1
8	10/14	Signal processing		
9	10/21	Controlled elements		Homework 5
10	10/28	Control valves and motors		Homework 6
11	11/4	Laplace		Homework 7
12	11/11	System transfer functions		Homework 8
13	11/18	Block reduction and stability		Homework 9
14	11/26	Bode plots and Review		Homework 10
15	12/2	Codes and Standards, Review		Test 2
16	12/9	Final exam		Final Exam