EECE 4320-5320 Digital Control Systems

Meeting Times: Tu. Th. 12:30-1:45 pm

Meeting Place: Olin 116

Instructor: Edwin E. Yaz, Ph.D., P.E., Professor, ECE Dept.

Office Hours: Tu. Th. 1:45-3:30 pm in person. If these are not convenient, you can call Ext. 8-3376 or send e-mail to Edwin.Yaz@mu.edu to make an appointment in person or via Teams.

Textbook:
R.J. Vaccaro, Digital Control, McGraw Hill, 1995. **We have the author's permission to provide free pdf files to our students.**

MATLAB: Available at http://www.marquette.edu/its/help/matlab/ (no cost to Marquette Students)

Course Description:
Review of classic continuous-time input-output system modeling, analysis and control. Basic results from linear algebra and matrix theory. Sampling process, z-transforms and linear discrete time transfer functions. Discrete time state variable modeling and analysis. Stability, controllability, and observability assessment. Transient response performance criteria. State feedback control for eigenvalue placement. Observer design. Steady state analysis. Disturbance reduction. Tracking systems. **This content also covers most of the topics included in the MS Comprehensive and PhD Qualifier Modern Control exams.**

Prerequisites: ELEN 3020 Linear Systems Analysis or equivalent with a minimum grade of C.

Course Goals:
This course is designed to give all engineering students the necessary tools to model, analyze, design and implement digital control algorithms.

Course Objectives:
By the end of this course, the student should be able to:

- Explain the concepts required to design and implement a digital control system.
- Use mathematical models of digital control systems components.
- Analyze digital control systems to determine Transfer Function and State Space representations.
- Use the z-Transform to analyze Transfer Function representations in order to determine system responses to given input signals, frequency domain characteristics, and stability.
- Generate and use the State Space representations to analyze and design digital controllers.
- Structure and implement mathematical control algorithms.

- Deal with issues related to model robustness, outside disturbances, steady state errors, and incomplete measurements.

Accommodation: If you have a disability and require accommodation, please contact me in the first week of the semester so that your learning needs may be appropriately met. You will need to provide documentation of your disability from the Office of Disability Services. If you are unsure of what you need to qualify for services, visit the Office of Disability Service's website at https://www.marquette.edu/disability-services/instructor-resources.php or contact the Office of Disability Services at 414-288-1645.

Performance Assessment:
Weekly homework (75%) and a term project (25%). For all Academic Policies regarding your studies, you are strongly urged to visit the University websites especially: http://bulletin.marquette.edu/undergrad/academicregulations/#attendance on attendance and http://www.marquette.edu/provost/integrity-index.php on academic integrity. The lowest homework grade will be dropped. If homework is not submitted on time, a reduction in the points will be made according to the length of the delay in submission.
The following will be the ranges for the letter grades:

A	[95,100]
A-	[90,95)
B+	[85,90)
B	[80,85)
B-	[75,80)
C+	[70,75)
C	[65,70)
C-	[60,65)
D	[55,60)

(For Graduate Students) TOTAL POINTS<70→F