

ECE510 Introduction to Fuzzy Logic Control

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Office: 20-12
Office hours: TBD

Text: J. Jantzen, *Foundations of Fuzzy Control*, John Wiley & Sons Ltd., 2007

1. This graduate-level course introduces students to the theory and applications of fuzzy logic control. Specific topics covered are listed below. (The number in parenthesis represents lecture hours.)

- Concepts of fuzzy reasoning and control
 - What is fuzzy control? (1)
 - Fuzzy sets and operators (4)
 - Inference and implication (2)
 - Introductory example (1)
- Linear fuzzy control design & analysis
 - Fuzzy PD, PI and PID controllers (4)
 - Controller tuning (1)
- Non-linear fuzzy control design & analysis
 - Fuzzy PD, PI and PID controllers (4)
 - Controller tuning (1)
- Stability analysis
 - Describing functions (2)
 - Nyquist criteria (2)
- Supervisory fuzzy control
 - Process control (1)
 - High-level control (1)
- Fuzzy control applications (16)

NOTE: The fuzzy control applications topic includes student oral presentations of current literature.

2. This course requires a considerable amount of computer simulation using the MATLAB fuzzy logic toolbox. Students are expected to review the MATLAB fuzzy logic toolbox tutorial within the first two weeks of the class.
3. The course grade is based on three fuzzy control projects (60 points total), oral presentation of a journal or conference paper (10 points), and a comprehensive final exam (30 points).
4. Course grades are determined from a whole number point scale with a maximum score of 100 points. The grade scale is

A	↔	90-100 points	A-	↔	85-89 points
B+	↔	80-84 points	B	↔	75-79 points
B-	↔	70-74 points	C	↔	0-69 points

5. The MATLAB projects are designed to introduce you to different fuzzy logic control features. Each project will require a formal report with a specified due date. Late reports are *not* accepted. **Each student must conduct an independent investigation—no partners.**

Each report must include a formal description of the fuzzy logic controller characteristics (e.g., measurement functions) along with all of its pertinent details. Your reports must include an analysis of the results along with some meaningful (repeat, meaningful) conclusions. Make sure your results support your conclusions as points will be deducted for unsubstantiated claims.

Finally, all reports require at least of portion of the results to be plotted. You must use a software graphics package to produce these plots—hand-drawn plots are unacceptable.