CSCI 4370: Fuzzy Logic

2022 Winter Session	
Total Class Sessions: 25 **Class Sessions Per Week: 6** **Total Weeks: 4** **Class Session Length (Minutes): 145** **Credit Hours: 4**	**Instructor: Staff** **Classroom: TBA** **Office Hours: TBA** **Language: English**

Course Description:

Fuzzy logic is a design method that can be effectively applied to problems that, because of complex, nonlinear or ambiguous system models, cannot be easily solved using traditional analytical control techniques. This course discusses the types of applications for which fuzzy control is useful, and introduces basic concepts of fuzzy set theory, fuzzy logic operations, fuzzification and de-fuzzification as well as several types of fuzzy control design.

Learning objectives:

• Help students to be familiar with the fundamental concepts of fuzzy set theory and fuzzy logic;

• Foster competence in recognizing the feasibility and applicability of the design and implementation of intelligent systems (that employ fuzzy logic) for specific application areas; and

• Help students develop a sufficient understanding of fuzzy system design methodology and how it impacts system design and performance

Course Materials:

Text Book: Fuzzy Logic with Engineering Applications, 3rd Ed. John-Wiley, 2004, T.J. Ross,

References:
•L. X. Wang, "A Course in Fuzzy Systems and Control", Prentice-Hall, 1997.
•K. M. Passino, "Fuzzy Control", Addison-Wesley, 1998.
•Fuzzy Set Teory, 1997, G.Klir et al. Prentice Hall
•Fuzzy Sets and Fuzzy Logic 1995, G Klir et al. Prentice Hall
•Foundation of Fuzzy Control ,Jan Jantzen 2007

Course Format and Requirements:

The course will take place in a computer lab and the course format including lecture, project, and in-class discussion.

The specific topics that will be covered in the classes are listed in the course syllabus. The class

period will consist of an active learning environment. During a majority of the class time, students will be actively working on problems under the instructor's guides.

Attendance:

Attendance will not be taken but is strongly recommended. Each student will have three allowed absences and no grade deduction will be made for the first three absences. More than three unexcused absences will result in an automatic reduction in your participation grade, for instance from A- to B+. Your active participation in the class is expected and encouraged.

Course Assignments:

Quizzes: There will be 4 to 6 unannounced quizzes through this semester. Each quiz will be on the material covered in previous chapters. All of the quizzes will be closed book and the lowest score will be dropped in final grading. No make-up quizzes will be given. The quizzes will account for 15%of your final grade.
Projects There will be 3 hands-on projects based on course need. These projects are all individual work. Students are encouraged to exchange and discuss programming knowledge and ideas together. But each student shall submit completed individual work. The projects aim to enrich students' knowledge on application of learned ideas and concepts on fuzzy logic algorithms. The score will be given based on the correctness of the program. It will count for 30% of your grade for the course.
Exams (One Midterm Exam + Final Exam) Both exams will be based on the knowledge covered in class. Exam questions will includes multiple choice questions and True or false questions, which test your understanding on Java language, basic data structure and object oriented programming principles. It will also includes some short answer or programming question.

Course Assessment:

Quizzes	7%
Problem Sets	8%
Weekly Projects	40%
Midterm Exam	20%
Final Exam	25%
Total	**100%**

Grading Scale (percentage):

A+	**A**	**A-**	**B+**	**B**	**B-**	**C+**	**C**	**C-**	**D+**	**D**	**D-**	**F**

98-100	**93-97**	**90-92**	**88-89**	**83-87**	**80-82**	**78-79**	**73-77**	**70-72**	**68-69**	**63-67**	**60-62**	**<60**

Academic Integrity:

Students are encouraged to study together, and to discuss lecture topics with one another, but all other work should be completed independently.
Students are expected to adhere to the standards of academic honesty and integrity that are described in the Chengdu University of Technology's Academic Conduct Code. Any work suspected of violating the standards of the Academic Conduct Code will be reported to the Dean's Office. Penalties for violating the Academic Conduct Code may include dismissal from the program. All students have an individual responsibility to know and understand the provisions of the Academic Conduct Code.

Special Needs or Assistance:

Please contact the Administrative Office immediately if you have a learning disability, a medical issue, or any other type of problem that prevents professors from seeing you have learned the course material. Our goal is to help you learn, not to penalize you for issues which mask your learning.

Course Schedule:

Class	Topics	Activities
1-6	Go through syllabus Course overview + Introduction **Module 1:Introduction, Definitions and Concepts** • Intelligent Control • Fuzzy Logic • Fuzzy Control • Applications • Rule Base • Fuzzy Sets • Classic versus Fuzzy Control System Design An Example of Fuzzy Control	**Quizzes**

7-12	**Module 2: Fuzzy Mathematics** • Fuzzy Sets and Membership Functions • Mathematical Operations on Fuzzy Sets • Fuzzy Relations • Linguistic Variables • Fuzzy Rules • Approximate Reasoning	**Quizzes** **Programming Project 1** **Midterm1**
13- 18	**Module 3:Fuzzy Systems** • Fuzzy Rule Base • Fuzzy Inference Engine • Fuzzification • Defuzzification • Mathematical Representations of Fuzzy Systems • The Approximation Properties of Fuzzy Systems	**Programming Project 2** **Quizzes**
19-25	**Module 4:Design of Fuzzy Controllers** • Trial and Error Approach • Control surface of a fuzzy controller • Stable Fuzzy Controllers • Fuzzy Supervisory Control • Fuzzy Gain Scheduling • TSK Fuzzy Systems • Wrap-up and Review for Final Exam	**Quizzes** **Programming Project 3** **Final Exam (Cumulative)TBA**