Fall 2017 **COT 4210 Section 1** **HUGHES**

SYLLABUS (MODIFIED 9/17/2017)

Instructor: **Dr. Charles E. Hughes**
Office: HEC247C; charles.e.hughes@knights.ucf.edu; Use Subject COT4210
Class: **TR 1:30pm – 2:45pm in CB2-105**
Office Hours: **TR 3:15pm – 4:45pm in HEC-247C**
GTA hours: **Anthony Wehrer; HEC-308; awehrer@knights.ucf.edu; Office Hours: W:3:00pm–4:15pm; F:4:00–5:15pm**

Texts: Course notes at http://www.cs.ucf.edu/courses/cot4210/Spring2017/COT4210Spring2017.html
Sipser, *Introduction to the Theory of Computation 3rd Ed*., Cengage Learning, 2013
or Sipser, *Introduction to the Theory of Computation 2nd Ed*., Cengage Learning, 2005

Rules to Abide by

- Do Your Own Work
  - When you turn in an assignment, you are implicitly telling me that these are the fruits of your labor. Do not copy anyone else's homework or let anyone else copy yours. In contrast, working together to understand lecture material and solutions to problems not posed as assignments is encouraged. Cheating on an assignment will result in an F on that assignment for the first infraction and an F for the course on the second. This can also lead to administrative action at the university level.
- Late Assignments
  - I will accept no late assignments, except under very unusual conditions, and those exceptions must be arranged with me or the GTA in advance unless associated with some tragic event.
- Exams
  - No communication during exams, except with me or a designated proctor, will be tolerated. A single offense will lead to termination of your participation in the class, the assignment of a failing grade and probable administrative action at the university level.

Grading Policy:

- Mid Terms (2) – 100 points each (200 total)
- Final Exam – 175 points
- Quizzes and Assignments (10 or so) – 75 points
- Bonus – best exam weighed +50 points (Note: This is a weighting change, not a free 50 points)
- Total Available: 500
- Grading will be A ≥ 90%, A- ≥ 88%, B+ ≥ 85%, B ≥ 80%, B- ≥78%, C+ ≥ 75%, C ≥ 70%, C- ≥ 60%, D ≥ 50%, F < 50%

Attendance: I do not take attendance but I expect it, and I expect you to arrive on time. If people begin arriving late or missing class as a matter of habit, I will begin having unannounced quizzes. If you have legitimate reasons for arriving late or leaving early, please inform me ahead of time, and please enter or leave the classroom as unobtrusively as reasonable.

Financial Aid.

As of Fall 2014, all faculty members are required to document students' academic activity at the beginning of each course. In order to document that you began this course, please complete the following academic activity by the end of the first week of classes. Failure to do so will result in a delay in the disbursement of your financial aid.

To meet the above requirement, complete the following:

1. Send an e-mail to me. The subject must be COT4210. Send it to charles.e.hughes@knights.ucf.edu
   cc: Anthony Wehrer, awehrer@knights.ucf.edu
   In the message, tell me your name, and where and when you took Discrete Structures I or its equivalent.
   Also, tell me what days/times you are NOT free to make office hours.
2. Prove the following: Let $\boldsymbol{R}$ be an equivalence relation over some universe $\boldsymbol{U}$, and let $\boldsymbol{C_a}$ be the class of all elements in $\boldsymbol{U}$ equivalent to the element $\boldsymbol{a}$, i.e., $\boldsymbol{C_a = \{x \mid x \in U \;\&\&\; a\ R\ x\}}$, and $\boldsymbol{C_b}$ be the class of all elements in $\boldsymbol{U}$ equivalent to the element $\boldsymbol{b}$, i.e., $\boldsymbol{C_b = \{x \mid x \in U \;\&\&\; b\ R\ x\}}$.
   Prove that either $\boldsymbol{C_a = C_b}$ or $\boldsymbol{C_a \cap C_b = \Phi}$.
   The assignment needs to be submitted through Webcourses.

Do this by midnight Friday, 8/25/17.

Important Dates

- Exam#1 – Tentatively Thursday, October 5 (changed from September 28)
- Withdraw Deadline – Monday, November 6 (changed from October 30)
- Exam#2 – Tentatively Thursday, November 2
- Final – Tuesday, Dec. 5, 1:00PM–3:50PM

Days off: 8/31 (Football); 9/7, 9/12, 9/14 (Hurricane Irma); 11/23 (Thanksgiving)

- Exam #1/#2 dates are subject to change with appropriate notice. Final exam is, of course, fixed in stone.

Expected Outcomes

- You will gain knowledge of various types of automata and other computational models and their relation to formal languages.
- You will have a strong sense of the limits that are imposed by the very nature of computation, and the ubiquity of unsolvable problems throughout CS.
- You will understand the notion of computational complexity and especially the classes of problems P, NP, NP-complete and NP-Hard.
- You will come away with stronger formal proof skills and a better appreciation of the importance of discrete mathematics to CS.

Brief Outline

Introduce Theory of Computation, including

- Various models of computation
  - Finite State Automata and their relation to regular expressions, regular grammars and regular equations
  - Push Down Automata and their relation to context-free languages and parsing of programming languages
  - Techniques for showing languages are NOT in particular language classes
  - Closure and non-closure problems
  - Decision procedures for solvable problems related to automata and languages
- Limits of computation
  - Turing Machines and other equivalent models
  - Undecidable problems
  - The technique of reducibility
  - Rice's Theorem and the ubiquity of undecidability
  - Undecidability of certain properties of formal languages
- Complexity theory
  - Order notation (this should be a review)
  - Time complexity, the sets P, NP, NP-Hard, NP-Complete, Co-NP, and the question does P=NP?
  - Reduction techniques applied to problems to show they are NP-Hard and NP-Complete.