CS 330-002: FORMAL METHODS AND MODELS
GEORGE MASON UNIVERSITY DEPARTMENT OF COMPUTER SCIENCE
SPRING 2018 - 3:00-4:15PM MON/WED - 1200 MERTEN HALL

PROFESSOR: Ivan Avramovic
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HOURS: *by appointment*

ASSISTANT: *TBA*

PREREQUISITES: CS211 and MATH125 (C or better in both)
TEXTBOOK: Hamburger and Richards, *Logic and Language Models for Computer Science,* Third Edition
WEBPAGE: https://mason.gmu.edu/~iavramo2/classes/cs330s18.html

DESCRIPTION

This course is an introduction to two kinds of formal systems - languages and logics - with important applications to computer science. The study of formal languages underlies important aspects of compilers and other language processing systems, as well as the theory of computation. Various systems of logic and automatic reasoning are put to use in artificial intelligence, database theory and software engineering. The entire course will give you practice in precise thinking and proof methods that play a role in the analysis of algorithms. The programming assignments provide practical experience with some theoretical topics.

OUTCOMES

1. Students will understand the concepts and relevance of logic, formal languages and automata theory, and computability.
2. Students will be able to do mechanical formal proofs, program correctness proofs and solve problems in first-order logic.
3. Students will be able to solve problems in elementary machine models: designing finite-state, pushdown and turing machines.
4. Students will be able to solve problems in formal languages: writing regular expressions, regular grammars, and context-free grammars.

TOPICS

- Logical proofs
    - Propositional Logic (including truth tables; boolean algebra)
    - Rules of Inference (proof by deduction)
    - Mathematical Induction
- Predicate Logic (including quantifiers)
- Program Verification (including loop invariants)
- PROLOG programming
- Regular Languages and conversions:
    - Regular Grammars
    - Finite Automata (including deterministic and non-deterministic FAs)
    - Regular Expressions
- Context-Free Languages
    - Context-Free Grammars
    - Push-Down Automata
- Turing Machines

GRADES

- Homework: 0%
  - homework will be assigned weekly but not collected or graded
- Quizzes: 20%
  - the lowest quiz score is dropped
  - quizzes will be weekly (except when displaced by exams)
- Programming Assignments (2): 10% + 10%
  - programs are penalized 10% off for every day they are late
  - PROLOG and AWK will be used for the assignments; they will not be demanding in terms of number of lines of code, but they will excercise some of the concepts learned in class
- Exams (2): 30% + 30%
  - exams are not cumulative
  - exams are closed-book, but one sheet (8.5"x11", 1-sided) of hand-written or printed (original work only, no photocopies!) notes is allowed; no copying note sheets from other students

POLICIES

- please do not use laptops, cellphones, or similar electronic devices during class without special permission
- it is a departmental requirement that all undergraduate Computer Science students taking CS330 **must see their advisor** during the semester and submit documentation of their visit; failure to do so will result in an Incomplete grade

HONOR CODE

Programming assignments are an individual effort, no group work is allowed. This includes the sharing of test cases. Any direct contribution on a quiz, exam, note sheet or programming assignment will be treated as a violation of George Mason's Honor Code.