**George Mason University**
**DEPARTMENT OF COMPUTER SCIENCE**

# CS330 / Section 3 - Formal Methods and Models - Spring 2018

Monday, Wednesday 1:30 – 2:45pm, Lecture Hall 3 (LH3)

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Office hours: Wednesday 5-6 pm
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***PREREQUISITES :***
CS211 and Math 125 (C or better in both).

***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 : Students will:***
understand the concepts and relevance of logic, formal languages and automata theory, and computability.

- be able to able to do mechanical formal proofs and solve problems in first-order logic.
- be able to solve problems in elementary machine models: designing finite-state, pushdown and turing machines.
- be able to solve problems in formal languages: writing regular expressions, regular grammars, and context-free grammars.

***READINGS:***

1. Logic and Languages Models for Computer Science: third edition, by Richards and Hamburger. (available at the GMU bookstore)

***SYLLABUS:***
The pace is **approximate**. Later chapters will not be covered as completely.

| Topic | Week | Section |
|---|---|---|
| 1. Introduction | 1 | 1 |
| 2. Propositional Logic and Proofs | 1-2 | 2-3 |
| 3. Predicate Logic and Proofs | 3-4 | 4-5 |
| 4. Applications of Logic | 5-7 | Lecture |
| 5. Midterm | 9 | |
| 6. Regular Languages & Finite Automata | 10-11 | 7-9 |
| 7. Regular Expressions Application | 11 | Lecture |
| 8. Context-Free Grammars & PDAs | 11-12 | 10-11 |
| 9. Turing Machines & Computability | 13-14 | 12 |

Tentative Schedule:

| # | Date | Topic | HA assigned | HA due | Quiz |
|---|---|---|---|---|---|
| 1 | 1/22 | Introduction | | | |
| 2 | 1/24 | Propositional Logic & Proofs | 1 | | |
| 3 | 1/29 | | | | |
| 4 | 2/31 | | | 1 | |
| 5 | 2/5 | Predicate Logic & Proofs | 2 | | 1 |
| 6 | 2/7 | | | | |
| 7 | 2/12 | | | | |
| 8 | 2/14 | | | 2 | |
| 9 | 2/19 | Applications of Logic: Relational Calculus | 3 | | 2 |
| 10 | 2/21 | | | | |
| 11 | 2/26 | | | 3 | |
| 12 | 2/28 | | 4 (program) | | 3 |
| 13 | 3/5 | | | | |
| 14 | 3/7 | | | | |
| 15 | 3/9 | Friday, 4:30 – 5:45, catch-up & review for midterm – extra class | | 4 (program) | |
| | 3/12 | No class – spring break | | | |
| | 3/14 | No class – spring break | | | |
| 17 | 3/19 | **Midterm exam** | | | |
| | 3/21 | No class | | | |
| 19 | 3/26 | Regular Languages & Finite Automata | 5 | | |
| 20 | 3/28 | | | | |
| 21 | 4/2 | | | 5 | |
| 22 | 4/4 | Regular Expressions Application | 6 | | 5 |
| 23 | 4/9 | Context Free Grammars & Pushdown Automata | | | |
| | 4/11 | | | | |
| 24 | 4/16 | | | 6 | |
| 25 | 4/18 | Turing Machine & Computability | 7 | | 6 |
| 27 | 4/23 | | | | |
| 28 | 4/25 | | | | |
| 29 | 4/30 | | | 7 | |
| 30 | 5/2 | Catch-up & review before final | | | 7 |
| **31** | **5/9** | **Final Exam (Wednesday, 1:30-3:45)** | | | |

***GRADING :***
6 Quizzes – 24%
1 Programming Assignment -- 10%
2 Exams (midterm & final) -- 66%

The two exams, including the final, each cover about a half of the semester; the final is not cumulative. Of these exams the highest score will count 36%, and the lowest 30%.

Homework (except for the programming one) is ungraded, but must be submitted via Blackboard; un-submitted homework will cause the 20% penalty of the corresponding quiz score.
Quizzes will test homework. The lowest quiz score will be dropped.

All testing is closed book.

There is to be NO group work on the programs. Receiving direct contributions to the code that is submitted is considered a violation of the Honor Code. (See cs.gmu.edu/wiki/pmwiki.php/HonorCode for the GMU and Computer Science guidelines.)

It is a departmental requirement that students in CS330 **must see their advisor** and discuss their degree progress. Students not fulfilling this requirement will receive an Incomplete grade. (Non-majors and graduate students are not included.) The visit must be documented by a signed note or email from your advisor.

***LATENESS:***
Programming assignments will be marked down 25% each class they are late; in particular, it is marked down 25% after the due date.

***TA:*** TBA

**NO LAPTOP USAGE during class** (If you NEED a laptop for note-taking then speak to me.)