CSI 5200: Fundamentals of Software Modeling
Winter 2018

Computer Science Department
School of Engineering and Computer Science
Oakland University

General Information

Instructor: Dae-Kyoo Kim
Office Location: EC 544
Office Hours: TR 4:30 PM – 5:30 PM or by appointment
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Date Range: Jan 03, 2018 – Apr 25, 2018
Lectures: TR, 5:30 PM – 7:17 PM
Class Room: WH 102

Course Information

Course Description
Laboratory Oriented course on mathematical modeling of Software Engineering issues: Program Specifications: Direct and indirect specifications, assertions; mathematical concepts involved: Propositions, Predicate calculus. Abstraction Notations: Sets and set operations, sequences, maps, bags, lambda notation. Algorithm Definition: Functions, operations, polymorphic functions, higher order functions. Stepwise Program Refinement: Programming by contract, correctness maintaining transformations; Static Analysis of Computer Programs: Relations, Flowgraphs, Data and Control Dependencies, Detection of Anomalies. Modeling Software Design: Procedure Call Graph, modules' export/import relations. Modeling Program Execution: Computation trace, dynamic data and control dependencies.

Course Objectives
Upon completion of the course, students will be able to:

- Define formally various types of numbers, sets, sequences, and maps, functions, and higher order functions.
- Specify and calculate lambda functions
- Describe a formal system in terms of languages, axioms, and inference rules
- Specify and evaluate Boolean logic, propositional logic, and predicate logic
- Use model-checking tools to verify formal specifications

Required Texts:

1. Software Engineering 1, Abstraction and Modeling, Dines Bjorner, Springer, 2006, ISBN: 9783540211495
2. Software Abstractions, Logic, Language, and Analysis by Daniel Jackson, The MIT Press, 2012, ISBN: 9780262017152

Course Website: All course information (lecture notes, assignments, project due, announcements, etc.) will be posted in Moodle. Students are expected to check Moodle on a regular basis. More information can be found about Moodle at https://moodle.oakland.edu/.

Topics Covered

- λ-Calculus
- Algebraic Specifications
- Propositional and Predicate Logics
- Axiom Systems
- Alloy
- Model checking

Assignments: There will be two individual assignments that are designed to exercise the principles and techniques discussed in class. The following table shows a tentative schedule (subject to change) for assignments:

Assignment	Assigned	Due	Topic
1	1/16/2018	2/6/2018	TBA
2	3/15/2018	4/5/2018	TBA

Project: The project description will be available a week before assignment. Students will have a presentation on 4/10 and 4/12 if time allows.

Assigned	Due	Topic
2/27/2018	4/17/2018	TBA

Exams: Two exams are scheduled.

- Midterm Exam: Feb 15 (Monday), 2018. Covering topics until Feb 13.
- Final Exam: Apr 19 (Tuesday), 2018 (7:00 PM - 10:00 PM) in the same classroom. Covering topics since the midterm.

Attendance: Attendance will be taken five times randomly throughout the semester. Advance notice for absence due to a situation that is beyond your control may be considered.

Grading: The final grade will be based upon the following weights:

- Assignments 20%
- Project 20%

- Midterm 25%
- Final 25%
- Attendance 10%

90+	4.0	
80 – 89	3.x	linearly in-between
70 – 79	2.x	linearly in-between
60 – 69	1.x	linearly in-between
0 – 59	0.0	

Policies

– Due dates are strict. Late submissions with rational reasons that are unexpected or beyond your control may be accepted.

– No form of plagiarism (e.g., copying or referencing other individual/group work), of any material submitted for grading, is permitted. All students must be aware of the contents of Academic Conduct Regulations (https://www.oakland.edu/deanofstudents/conduct-regulations/).