

EECS 755 - Systems Requirements Modeling

Fall Semester, 2005

Class Time: 11:00 – 12:20 TR

Location: 1131 Learned

Instructor: Dr. Perry Alexander
136 Nichols Hall – 864-7741
2022 Eaton Hall – 864-8833
palexand@eecs.ukans.edu
<http://www.ittc.ku.edu/~alex>

Office Hours: 9:20 – 10:50 TR, 2022 Eaton Hall or By Appointment

Description: Systems Requirements Modeling and Analysis is an advanced introduction to modern techniques for specification, verification and implementation of computer-based systems. Topics cover both software and hardware specification and verification. Students will be exposed in lecture to modeling and requirements analysis using formal specification languages that support symbolic verification and model checking.

Prerequisites: Knowledge of at least one modern programming language, data structures, and discrete mathematics. An undergraduate introduction to software engineering and/or computer systems design is helpful, but not necessary.

Required Text: There are no required texts for this course.

Reference Texts: PVS and CafeOBJ Documentation and Tutorials. *This material is available online and can be copied freely.*

Grading: Grades will be assigned on a 10 point scale:

90 – 100%	A
80 – 90%	B
70 – 80%	C
0 – 70%	F

Classroom tasks are weighted using the following scale:

Midterm Exam	20%
Final Exam	30%
Mini-projects	35%
Final Project	15%

Homework: Mini-projects will be assigned on a bi-weekly basis. Unless otherwise noted, all mini-projects are due at the *beginning* of class on Friday of the following week. If the due date is a holiday and KU offices are closed, the due date becomes the next class period. Late mini-projects are not accepted. You must turn in 70% of your mini-project assignments *on time* to receive a passing grade in the course. If you have a valid excuse for being late, a new due date will be assigned.

Most of your mini-project assignments will involve using the PVS theorem proving system or the CafeOBJ specification system. Please allow plenty of computer access time to complete them. PVS and CafeOBJ are currently available on both the EECS Unix network and the ITTC Unix network. Both are also available for the Fedora Linux distribution and PVS is also rumored to work on the Debian Linux distribution. CafeOBJ is also available under Mac OS X.

Please use the my.eecs.ukans.edu web page to submit your assignments. I only need source, test cases, and documentation. I will not accept paper listings. Please document the main source files with your name and ID number. Undocumented source files will result in a serious point deduction!

Project: The final project will involve writing and verifying a small, formal specification using PVS or CafeOBJ. A default project will be provided, however I would prefer if you propose and define your own project.

The project due date is 5:00pm on Stop Day starting finals week. I will accept projects up to 2 days late at a penalty of 20% per day. No incompletes will be given except in emergency situations.

Repository: All homework assignments, exams, solutions and handouts you receive in class are available via the EECS 755 homepage linked to the main EECS homepage.

Policies: *Class Participation* - I do not take attendance in class, however participation in class is important to its success. Please ask questions and participate in class discussions. When assigning final grades, borderline cases will be decided based on class participation.

Grading Errors - If I have made an error in grading an exam or assignment, you have two weeks following the date the item is returned to see me about correcting the problem. After that time, your grade is set and will not be changed. This includes the final exam. I also request that you wait 24 hours after an exam is returned before coming to me with questions. If you ask me to re-grade a problem, I reserve the right to re-grade the entire project, homework or exam.

Curving - I may decide to curve final scores when the quarter is over. I will never curve up, but may curve down. Whether I curve and how much I curve is at my discretion. I will never curve scores on an individual item.

Email - I encourage you to use email to contact me. I am logged in when I am in the building and check my mail frequently over the weekends and holidays. From time to time, I will send you email, so please check it periodically. The EECS Department provides an email alias that includes the entire class. I will use this alias frequently, therefore you must make certain you are checking your EECS mail account for new mail.

Phone - Feel free to call me in my office at any time. I would prefer not to be called at home.

Office Hours - I will make every effort to be in my office during scheduled office hours. If there are exceptions, I will let you know as early as is possible. If you have a conflict with my office hours, please make an appointment or stop by my office at another time. I have an open door policy; you are free to come by whenever you choose. If I am busy, I may ask that you come back later, but please don't hesitate to knock! My schedule is available from my homepage.

Cheating - Academic misconduct of any kind will result in a 0 score on the homework, lab, project, or exam in question. If the offense is serious, your actions will be reported to the department head and you will receive a failing grade in the course. Your homework and exams must be individually prepared.

Excuses - Excusing a missed exam or assignment is left to the discretion of the instructor. Illness, family emergencies, and religious observances are examples of acceptable excuses. Computer down time, over sleeping, and social events are examples of unacceptable excuses. Please try to let me know of problems in advance when possible and be prepared to provide verification of your excuse.

Extensions - As a policy, I do not extend due dates of homework and projects. If I choose to do so, I will only announce the extension in class. If you hear an extension has been granted and I have not announced it in class, your information is incorrect.

Neatness - I will take points off on any assignment that is not neat and legible. Any code turned in as part of an assignment must be completely documented. If you turn code in undocumented, you will receive a 0 on that part of the assignment.

Topics: The following list represents probable course topics. Specific topics are subject to change without notice.

- Preliminaries
 - The Structure of Computer Systems
 - Higher order logic
 - Sequent calculus
- Formal Systems
 - Syntax
 - Semantics
 - Inference System
- Requirements Specification
 - State based specification
 - Axiomatic Specification
 - Abstraction, refinement and morphisms
 - State invariants
 - Temporal Logic
 - Conservative Extension
 - Distributivity and Monotonicity Laws
 - Constructive Specification
 - Semi-Constructive Specifications
- Verification
 - Property based verification
 - Induction
 - Bisimulation
 - Forward and Backward simulation
- The PVS Language and System
 - Type and Function Declaration
 - Axioms, Lemmas and Proof Obligations
 - Basic PVS Prover Commands
 - Abstract Data Types and Induction
- The CafeOBJ Language and Systems
 - Modules and specifications
 - Signatures and axioms
 - Hidden state and behavioral specification
 - Rewriting and proving