

EMBRY-RIDDLE AERONAUTICAL UNIVERSITY
Department of Computing and Mathematics
COURSE OUTLINE FOR

Course No.: MSE520
Cr Hrs: 3

Title: Formal Methods for Software Engineering

Lecture Hours: 3

Laboratory Hours: 0

COURSE DESCRIPTION:

A study of mathematical logic and proof techniques, discrete structures, and other mathematical topics used in software engineering; the use of formal methods in software specification; and the use of formal methods throughout the software life-cycle. Prerequisite: CS222 or consent of the instructor

GOALS:

This course is designed to provide students with mathematical foundations and experiences necessary for study and research in software engineering, with specific emphasis on formal system specification. Students successfully completing the course should understand why and how formal methods are used.

PERFORMANCE OBJECTIVES:

Upon completion of this course, students should be able to:

1. Describe issues, principles, methods and technology associated with the use of formal methods in software engineering.
2. Describe the major problems in large software requirements specification.
3. Describe entities, properties and operations of discrete sets, relations and functions; and use this knowledge to perform computations on these discrete structures.
4. Describe entities, properties and operations of predicate calculus and use this knowledge to model natural language logical expressions.
5. Use the Z specification language to specify software requirements.
6. Translate Z specifications into structured English.
7. Read and explain the contents of current literature on formal methods.

Department of Computing and Mathematics
COURSE OUTLINE FOR MSE520, Continued

TEXTBOOK:

Diller, A., *Z – Introduction to Formal Methods*, 2nd Edition, John Wiley, 1994.

SUGGESTED SUPPLEMENTAL MATERIALS:

- a. Selected readings on formal methods

PREREQUISITE KNOWLEDGE BY TOPIC:

1. Senior level or graduate standing
2. High-level language computer programming
3. Set theory and propositional logic accessible

TOPIC	CLASS HOURS	COURSE OBJECTIVES
1. Introduction to Formal Methods	2	Describe issues, principles, methods and technology associated with the use of formal methods in software engineering.
2. Review of Discrete Mathematics (sets, relations, and functions)	5	Describe entities, properties and operations of discrete sets, relations and functions; and use this knowledge to perform computations on these discrete structures.
3. First Order of Logic	4	Describe entities, properties and operations of predicate calculus and use this knowledge to model natural language logical expressions
4. Proof Systems	2	Use a simple proof system to establish the validity of logical assertions.
5. The Z Language	10	Describe entities, properties and operations of the Z specification language; and use this knowledge to read and write Z schemas.
6. Formal Specification and Verification	8	Use the Z language to specify the requirements of small to moderate size software systems. Describe the value of the specification in requirements and design verification.
7. Survey of Formal Methods (model-based, algebraic specification, process algebras, model logics)	1	Classify and describe various formal methods used to develop software.

TOPIC (cont.)	CLASS HOURS	COURSE OBJECTIVES (cont.)
8. Formal Methods for Reactive Systems (e.g., temporal logic, RTTL, durational calculus, RTL, timed history logic)	2	Classify and describe various formal methods used to develop real-time software.
9. Discussion of Selected Readings in Formal Methods	6	Read and explain the contents of current literature on formal methods.

LABORATORY:

None

COMPUTER USAGE:

web browser and word processor

GRADING SYSTEM:

in-class and out-of-class problems	10 %
Exam 1	30 %
Exam 1 Project	10 %
Exam 2	30 %
Exam 2 Project	20 %

ESTIMATED CONTENT:

Skills:	30 %
Content:	70 %