

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

Course No.: MSE660

Title: Formal Methods for Concurrent and Real-Time Systems

Cr Hrs: 3

Lecture Hours: 3

Laboratory Hours: 0

COURSE DESCRIPTION:

This course emphasizes formal specification languages, temporal logic, and current research in the specification of concurrent and real-time systems. It also includes discussion of verifying software designs based on formal specifications.

Prerequisite: Knowledge of discrete mathematics and predicate logic and experience with a formal specification language (such as Z).

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 the need for, and the value of, formal methods in the development of reactive systems;
2. analyze and develop concurrent algorithms
3. apply temporal logic to analyze and specify real-time software components and features
4. study and present current research material in the use of formal methods in the development of reactive systems.

Department of Computing and Mathematics
COURSE OUTLINE FOR MSE 660, Continued

TEXTBOOK:

The Temporal Logic of Reactive and Current Systems - Specification, Z. Manna and A. Pnueli, Springer-Verlag, 1992.

SUGGESTED SUPPLEMENTAL MATERIALS:

Selected papers on formal specification of real-time systems.

PREREQUISITE KNOWLEDGE BY TOPIC:

1. Knowledge of discrete mathematics and predicate logic
2. experience with a formal specification language (such as Z).

TOPIC	CLASS HOURS	COURSE OBJECTIVES
1. Introduction to Formal methods for Reactive Systems	2	Describe issues, principles, concepts and methods associated with reactive systems
2. A Generic Computational Model	3	Describe entities, properties and operations the Generic Computational Model.
3. Concurrent Algorithms	4	Describe entities, properties and the logic of concurrent algorithms.
4. Interleaving and Concurrency	2	Describe entities, properties and structure of the interleaving concurrency model.
5. Justice and Fairness	4	Describe entities, properties and operations of the Z specification language; and use this knowledge to read and write Z schemas.
6. Temporal Formulas	8	Define temporal operations and formulas and demonstrate their use in specifying reactive requirements.
7. Proof System for Temporal Logic	4	Describe and illustrate the use of a temporal logic proof system.
8. Formal Specification using Temporal Formulas	4	Use temporal logic to write simple real-time software specifications.
9. Current Research in Formal Methods for Real-Time Systems	6	Read and explain the contents of current literature on formal methods for real-time systems.

LABORATORY:

None

COMPUTER USAGE:

web browser and word processor

GRADING SYSTEM:

in-class and out-of-class problems	20 %
Research report	20 %
Exam 1	30 %
Exam 2	30 %

ESTIMATED CONTENT:

Skills:	30 %
Content:	70 %