

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

Course No.: MSE625

Title: Software Engineering and Assurance

Cr Hrs: 3

Lecture Hours: 3

Laboratory Hours: 0

COURSE DESCRIPTION:

This course addresses the engineering issues, practices, and technologies associated with achieving quality software. The major activities and techniques used to ensure the quality of a software artifact are discussed. This course provides a framework for understanding the application of software verification and validation (V&V) processes and techniques throughout the software development life cycle. Typical products of V&V processes are identified and discussed and their relationships to V&V objectives are defined. The course will analyze various categories of V&V approaches including: technical peer reviews, software testing, formal verification techniques and model checking, simulation and prototyping, and requirements tracing. The course emphasizes the importance of ensuring quality throughout the product life cycle, highlighting the value of ensuring quality early in any development or maintenance effort. Discussions of testing concepts, planning and controlling of testing activity, and integration-level testing are also included. The course covers the engineering practices required, discusses economics of software quality, and provides guidelines on addressing organizational issues involved in achieving quality.

Prerequisites: MSE 530, Consent of Instructor

GOALS:

The objective of this course is to prepare students to understand the role of ensuring quality in software development, recognizing its role from the elicitation, analysis, and specification of requirements through to the delivery and operation of a software system. The focus will be achieving quality through sound software engineering practices. Students will learn techniques for analyzing software artifacts throughout the life cycle and how to incorporate these techniques in software development activities to help ensure quality.

PERFORMANCE OBJECTIVES:

Upon completion of this course as student will be able to

1. Define the elements of software quality.
2. Define the terminology commonly utilized in the V&V area.
3. Explain and be capable of using representative techniques for software V&V.
4. Explain the theoretical and practical limitations of V&V approaches.
5. Evaluate the applicability and likely effectiveness of a V&V approach for various artifacts.
6. Develop an outline and a V&V plan for a project.
7. Assess the effectiveness of a V&V plan with respect to its objectives.
8. Analyze the economics of quality requirements.

Department of Computing and Mathematics
COURSE OUTLINE FOR MSE625, Continued

TEXTBOOK:

Michael S. Deutsch and Ronald Willis, *Software Quality Engineering, A Total Technical and management Approach*, Prentice-Hall, 1988.

SUGGESTED SUPPLEMENTAL MATERIALS:

- a. Gilb and Graham, *Software Inspection*, Addison-Wesley, 1993.
- b. Software Engineering Institute (SEI) technical reports on software verification and validation.

PREREQUISITE KNOWLEDGE BY TOPIC:

1. MSE530 Specification and Design of Software Systems

TOPIC	CLASS HOURS	COURSE OBJECTIVES
1. Introduction to Software Quality	2	This provides the foundation for the definition of quality and quality software engineering. The role and techniques of verification and validation are introduced.
2. Elements of Software Quality	2	The elements of a quality product, achieving it, and measuring it are discussed.
3. Specifying Software Quality Requirements	2	Achieving quality in software requirements is discussed. This includes both the production and analysis of the artifacts associated with specifying a software-intensive product. Software in a systems context is presented.
4. Software Reliability Engineering	3	The strategies and techniques for achieving reliability in software are discussed.
5. Software Verification and Validation Techniques	8	More traditional V & V techniques and related development approaches are discussed as well as alternative approaches, e.g. Cleanroom, formal methods.
6. Conducting Design Reviews, Walkthroughs and Inspections	5	The processes and individual skills needed for conducting peer reviews are discussed and practiced.
7. Analyzing Requirements and Design	5	This presents various techniques for analyzing specifications and code using models and related strategies.
8. Independent V&V	2	This discusses the role of and techniques for independent assessments of software artifacts.
9. Software testing	9	Software testing theory and practice are presented. This presents specification, structure, and hybrid-based testing. Statistical testing is also considered.
10. Economics of Software Quality	2	The economic value and trade-off issues associated with ensuring quality are discussed.

LABORATORY:

None

COMPUTER USAGE:

Computer-based classroom presentations, a web course site, and computer tools for software analysis and verification will be used.

GRADING SYSTEM:

The course will be graded based upon in-class exams, assignments, classroom presentations, and project reports. Assignments and projects will include elements of the following: elicitation, analysis and specification of quality requirements of a software system; development of a software verification and validation plan, analysis of various software artifacts (requirements, designs, and code), and oral and written reports on various aspects of software verification and validation.

ESTIMATED CONTENT:

Skills:	25%
Content:	75%