

Texas State 3398 Software Engineering Course

- **Introduction to Software Engineering**
 - examines the various phases of the software lifecycle
 - apply a selected methodology (or two) to each phase
- **Intro to Software Engineering Synthesis**
 - examines methodologies, formalisms and processes for describing and synthesizing software systems
 - Requirements and design notations
 - Process models
- **Intro to Software Engineering Analysis**
 - explores approaches to testing and analysis to improve software quality, safety, and reliability across the lifecycle

Prerequisites

- Knowledge of a higher-level programming language
 - Java
 - Ada
 - C++
 - C
- Data structures
- Some discrete mathematics
 - E.g., Graph theory, predicate logic, set theory

Synthesis Topics

- The software crisis
- The software qualities
- Software development processes
- Requirements engineering
- Software architecture
- Principles of software design
- Configuration management

Testing & Analysis Topics

- Theoretical foundations
- Manual techniques
 - Software inspection
 - Cleanroom
- Dynamic analysis
 - Assertions
 - Error seeding, mutation testing
 - Coverage criteria
 - Dependency analysis
 - Fault-based testing
 - Regression testing
 - Object oriented testing

Testing & Analysis Topics (continued)

- **Static analysis**
 - Symbolic execution
 - Software verification
 - Data flow analysis
 - Interprocedural analysis
- **Specification based testing**

Testing & Analysis Topics (continued)

- **Concurrency analysis**
 - Safety and liveness
 - Reachability based analysis
 - Finite state verification
- **Experimental studies and s/w metrics**
- **Overall concerns**
 - Software safety, licensing, professionalism

Reading material

- **Required:**
 - On the web
- **Suggested Readings**
 - *The Mythical Man-Month: Essays on Software Engineering* by Frederick P. Brooks Jr ; Addison-Wesley Pub Co
 - *Fundamentals of Software Engineering* by Carlo Ghezzi, Mehdi Jazayeri, Dino Mandrioli; Prentice Hall

Flavor of Course

- **Combination of practical and theoretical approaches**
 - First half of class focuses on software synthesis approaches
 - Second half of class focuses on analysis approaches
- **Reading material from the literature**
 - Old “classics”
 - Promising new approaches
- **Discuss current industrial practices, “best” practices, “future” practices**
- **New insight into software quality**

Reading assignment

- F. P. Brooks, Jr., "No Silver Bullet--
Essence and Accidents of Software
Engineering," *Computer* 20(4), April 1987.
Reprinted from Proceedings of the IFIP
Congress, Dublin, Ireland, 1986.