

ICS 121 Topic S1: Midterm Review

Midterm Review

- Format
 - Brief problems, short answer questions, fill in blank, true/false, multiple choice
- Lectures 1 through 7
 - Software Engineering Scope & Principles
 - Software Lifecycles Models, Methods & Tools
 - Lifecycle Verification & Validation
 - Requirements Analysis and Specification, including
 - Requirements Acquisition
 - Rapid Prototyping
 - Cognitive Walkthroughs
 - System Modeling Techniques
- Readings: Schach
 - chapter 1
 - chapter 2
 - chapter 3
 - chapter 5
 - chapter 9
 - chapter 10, sections 1-7 & 11-13
 - chapter 13, sections 9 & 11
- Readings: Brooks
 - chapters 1-9
- Assignments
 - Material covered by assignments one, two, & three

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Software Engineering Principles

- Software engineering is multi-person construction of multi-version software
 - usually delivered late, over budget, and faulty
- Software engineering is part of system engineering
- Software engineering principles deal with both product and process
 - Rigor and formality: complement creativity and enhance understandability
 - Separation of concerns: concentrate on individual aspects and master complexity
 - Modularity and decomposition: decomposing the system into modules separates concerns in two phases and fosters reusability
 - Abstraction: identify important aspects and ignore details
 - Anticipation of change: planning for modifications is critical to large scale software
 - Generality: focus on discovering more than the immediate problem to be solved
 - Incrementality: identify and deliver subsets of the software system

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Software Production and Difficulties

- Software Production Personnel: client, developer, user
- Requirements: problem definition -> requirements spec
 - validation reviews
 - client/developer misunderstandings/misconceptions
- Design: reqts spec -> architectural & algorithmic design
 - verification reviews
 - multiple developer miscommunication
- Implementation: design -> code -> integrated system
 - testing for verification and validation
 - module interaction errors
- Maintenance: operation -> change
 - testing for validation
 - lack of consistent documentation

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Software Lifecycle Models

- The software challenge provoked the need for software lifecycle models as an improvement to build and fix approach
 - build-and-fix is not appropriate
- A lifecycle model has phases, reviews, and intermediate products
 - stagewise lifecycle models
 - waterfall lifecycle models
 - rapid prototyping model
 - incremental lifecycle model
 - spiral lifecycle model
- Software process is a device for producing a software product
 - process description describes multiple instances

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Requirements Analysis

- Requirements analysis addresses client/user's needs
 - intent is to develop a contract that specifies users' functional requirements and non-functional constraints
 - should include an acceptance test as part of contract
- Requirements state what not how
 - users' perspective not developers'
 - should introduce no implementation bias
- Requirements specification should be abstract, complete, consistent, unambiguous, precise, feasible, even, modifiable, readable, concise, appropriate, and verifiable
- Requirements should include lifecycle considerations
 - incremental deliveries
 - anticipated changes
 - validation plans
- System test should be developed along with requirements refinement and specification

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Mockups

- Requirements (knowledge) acquisition activities
 - help to address completeness, adequacy, usability, consistency, feasibility
- Prototyping
 - quick and dirty implementation
 - executable software mockup that exhibits some key functionality
 - to be thrown away
 - tools: executable specs, VHLL, 4GL, UI toolkits, application generators
- Scenario and UI Mockups
 - user interface mockups
 - diagrams depicting events and reactions

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Cognitive Walkthroughs

- Human Computer Interaction
 - requirements analysis requires more than just functionality
 - human factors must be considered
 - focus on usability
 - user's task
 - user's skills or experience
 - system's interface
- Cognitive walkthroughs
 - useful in testing usability
 - learnability, efficiency, memorizability, error recovery, user satisfaction
 - Process
 - Define the inputs
 - Gather the walkthrough team
 - Walk through the action sequences for each task
 - Record critical information
 - Revise the interface to fix the problems
 - Repeat

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Requirements Specification: System Models

- Data Flow Diagrams
 - structured, graphical technique
 - functional perspective
 - used in Structure Systems Analysis
- Entity-Relationship Models
 - structured, graphical technique
 - data orientation
 - often used to supplement dataflow diagrams
- Finite State Machines
 - possibly formal (at least semi-formal), graphical technique
 - system states and transitions
- Petri Nets
 - formal, graphical technique
 - specify synchronization and timing for concurrent and real-time systems

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Focus of Midterm Chapters

- Chapter 1: Scope of Software Engineering
 - wide range of knowledge and skills required
 - production of quality software meeting users' needs, delivered on time within budget
 - history and economics
 - importance of specification, design and maintenance
 - teams and management
- Chapter 2: The software process
 - the parties involved
 - software development phases
 - difficulties encountered in various phases
 - basic activities including testing in each phase
 - essential problems of software development
 - complexity, conformity, changeability, invisibility

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Focus of Midterm Chapters

- Chapter 3: Life-cycle models
 - build-and-fix versus true life-cycle
 - waterfall model
 - rapid prototyping and spiral models
- Chapter 4: Methods and Tools
 - Stepwise refinement
 - CASE tools
- Chapter 5: Lifecycle V&V
 - Quality issues
 - Testing principles

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Focus of Midterm Chapters

- Chapter 9: Requirements Phase
 - rapid prototyping
 - human factors and HCI
 - system and acceptance test planning
- Chapter 10: Requirements Specification Methods
 - informal specifications
 - structured specifications and semi-formal techniques (data flow, E-R diagrams, finite state machines, petri nets)

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