CECS 543 / 643
Advanced Software Engineering
Comprehensive Examination Syllabus
July 2016

This is a list of TOPICS for the exam.

- Traditional Process Models - know their phases, flow types, deliverables, intended programming paradigms, advantages and disadvantages
    - Waterfall Lifecycle Model
    - Incremental Model
    - Spiral Model
    - Rational Unified Process
- Agile Process Models - define "agility", understand the advantages and disadvantages of agile processes, compare and contrast different agile approaches with traditional process models, common threads of agile models
    - Extreme programming
    - Scrum
- Requirements Engineering
    - Types of requirements (functional, etc)
    - How requirements are gathered
    - How requirements are represented. Details of how each is constructed, purpose of each, relationship between each (if it exists)
    - Purpose and character of requirements analysis
    - Purpose and character of requirements models
    - Elements of requirements analysis
    - Diagramming techniques in detail
        - UML
        - CRC
    - Data objects - structure, manifestations (event, things, roles, etc) and purpose
    - Analysis Class objects -
        - structure, manifestations and purpose
        - identifying classes, attributes and operations
    - Class types - entity, boundary and controller
    - Associations and dependencies among classes
    - Control flow specification
- Product Metrics
    - Measures, metrics and indicators
    - Reasons to measure
    - Measurement principles
    - Measurement process
    - Goal-oriented software measurement
    - Metrics attributes
    - Function-based metrics
        - Function points
        - Information domain values

        - Function point computation
        - Value adjustment factors
        - Interpretation of the FP number
    - Metrics for OO design
    - Component-Level design metrics
    - Code Metrics - lines of code
        - Logical vs Physical
        - Problems with LOC
    - Code Metrics - Halstead's Software Science
    - Code Metrics - McCabe's Cyclomatic Complexity
    - Metrics for testing
    - Metrics for maintenance - Software Maturity Index
- Project Management Concepts
    - What's a project? PMI definition
    - Project characteristics
        - Unique, temporary, customer specified performance
    - The Four P's - People, Product, Process, Project
        - People - Stakeholders
            - Key project stakeholder roles
            - Software teams
            - MOI Model
            - Organizational paradigms
            - Agile teams
            - Team coordination & communication
        - Product
            - Scope and objectives
            - Problem decomposition
        - Project
            - Common-sense approach to projects
            - Start on the right foot
            - Maintain momentum
            - Track progress
            - Make smart decisions
            - Conduct a postmortem analysis
            - W^5HH
- Estimation for Software Projects
    - Goal of planning
    - Basic process
        - Estimate the size of the product
        - Estimate the effort (person-months)
        - Estimate the schedule
    - Project planning task set
    - Problem Based Estimation
        - LOC
        - FP

        - Process Based Estimation
        - Estimation with Use-Cases
        - Tool-Based Estimation
    - Empirical Estimation Models
        - COCOMO-II
    - Estimation for agile projects
    - Make-Buy decision
    - Computing Expected Cost
- Project Scheduling
    - Why Are Projects Late?
    - What is software project scheduling?
    - Basic scheduling principles
    - People and effort interaction
    - Defining task sets
        - Iterative refinement
        - Task networks - task flow, critical path
    - Scheduling
        - PERT and CPM
    - Schedule Tracking
        - Project status meeting
        - Reviewing the reviews
        - Matching accomplished versus planned tasks
        - etc
    - Tracking OO project progress
    - Earned value analysis