CPSC 3720: Lecture 7: Introduction to Design

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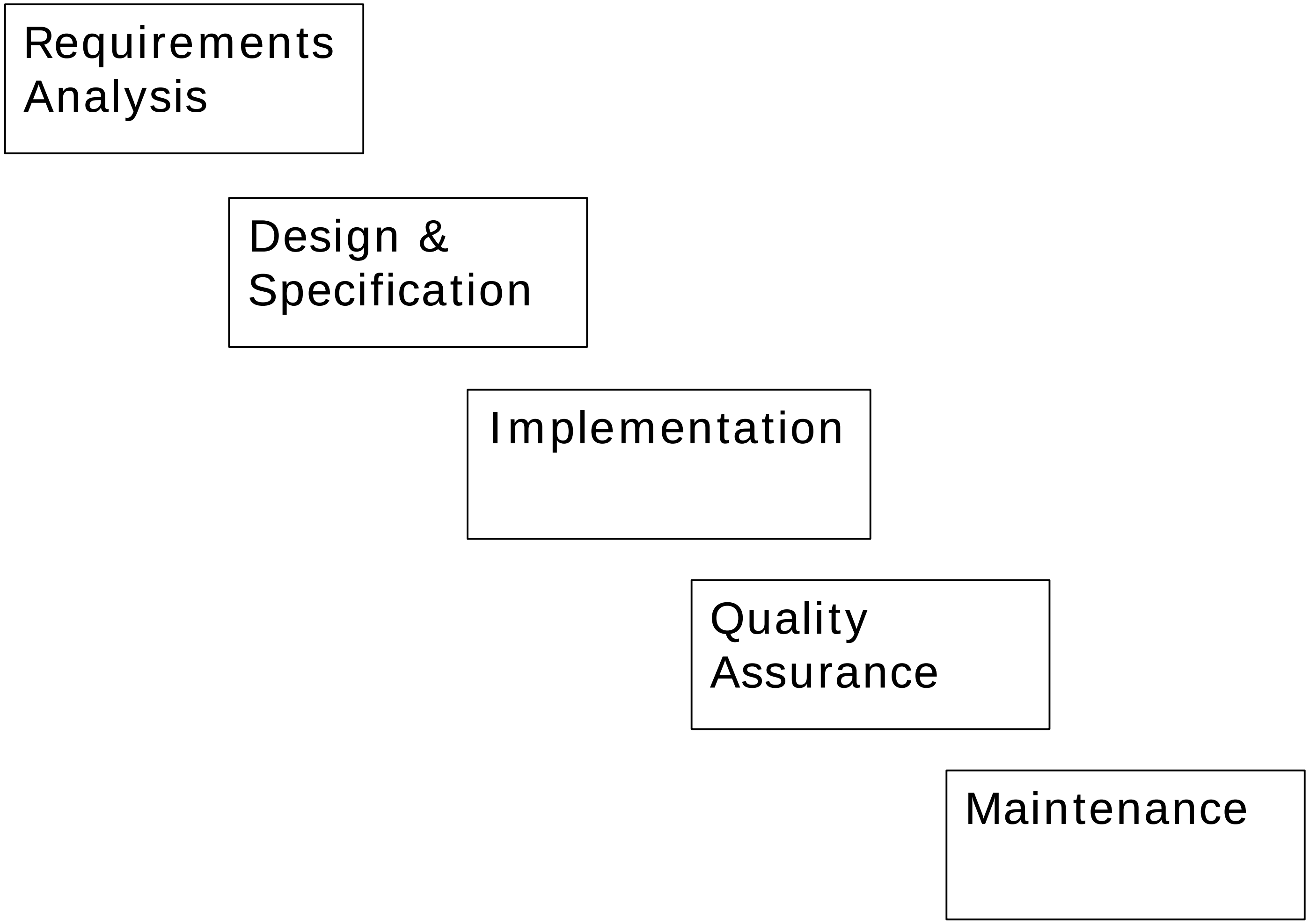
Software Lifecycle Phases



Discussion: Purpose of design

Design & Specification Intro

DESIGN & Specification

- Objectives: HOW?
- Inputs
- Outputs
- Approaches
- Verification

Implementation

Quality Ass

Maintenance

Design Intro

- Objectives: HOW should this system be built?
  - Key points: Modularization, reuse
- Inputs: Requirements Definition Document (RDD)
- Outputs: Design Documents
  - Design diagrams and specifications of modules
- Example Approaches:
  - Structured design
  - Object-oriented design
  - Component-based design

Design Principles

- Coupling
  - How inter-related are the modules in a system?
- Cohesion
  - How “singled-minded” is each module?

Coupling

- Coupling is communication
- Design goal: Minimize coupling, so there is less need for communication among modules
- All coupling cannot be avoided.
- Design goal: Where coupling is unavoidable:
  - make it a “desirable form” of coupling
  - Make the communication that is needed precise

Undesirable Forms of Coupling

- They are “non-modular”; Make it difficult to reason about software
- Global (or Common) coupling
  - E.g., Use global variables to share information among modules
- Content coupling
  - E.g., Implementation inheritance, whereby changes to the content of a class implementation affects that of another
- Control coupling
  - An external flag controls flow in a module

Desirable Forms of Coupling

- Parametric coupling
  - E.g., use of parameters to communicate information among modules
- Coupling strictly through interfaces
  - Reuse of components strictly based on their interface specifications
  - Specification inheritance, whereby existing specification is extended

Cohesion

- Cohesion is a module being coherent
- Design goal: Maximize cohesion in each module
- Design goal: Make the cohesion to be a “desirable form” of cohesion

Undesirable Forms of Cohesion

- Grouping of “unrelated” elements
- Coincidental cohesion
  - E.g., elements of a module come together by accident
- Logical cohesion
  - Sounds better than it actually is.
  - E.g., All outputs are grouped in a module
- Temporal cohesion
  - Elements that happen in close proximity in time are grouped together
  - E.g., “A start up” module

Desirable Forms of Cohesion

- Functional cohesion
  - Elements in a module perform related functionality
  - E.g., Interface specification and implementations that capture a well-designed “abstract data type” (e.g., stacks, queues, lists, or maps)