CS 330 is about
Models for CS, but …

• What is a model?

• Why does CS need them?
How do Models and CS relate to …

• Abstraction
• Generalization
• Principles
• Theory
• Precision
• Structure
• Concepts
• Thought
Models and Good Ones

Model: a collection of precisely stated interacting ideas that focus on a particular aspect of a

- thing
- topic
- situation
- class of problems

A good model should simplify a topic to its essence, stripping away the details, so we can reason precisely about it.

- frictionless plane
- elliptical orbits
- organic molecule models
- supply and demand curves

A formal model is expressed in terms of symbols, with precise and consistent rules about how to manipulate them, to prove things.
Why Models?

Conventional wisdom is to . .

• Reuse ideas and software
• Learn from mistakes / experience / history

But, situations differ, so . .

• Use models to capture similarities

Models and theory . .

• Do not deny experience, but capture its essence
How to Model

• Ignore some parts.

• Ignore some processes.

• Keep the key parts and processes.

• Keep what you’re interested in.
Models of What?

• Computers: architecture, not digital electronics

• Language: language concepts, not one language
  ✓ Arrangement of symbols
  ✓ Meanings of symbols and arrangements

• Software: software engineering, not one application
Models for Computer Science

Logic (used in CS for)

- Software Engineering
- Artificial Intelligence
- Databases

Language Models (used in CS for)

- Compilers
- Human Language Technology
- Computability Theory