



CS 240
Foundations of Computer Systems



CS 240 in context

1

How Computers Work

Software

Program, Application, Algorithm

Programming Language

Compiler/Interpreter

Operating System

Instruction Set Architecture

Hardware

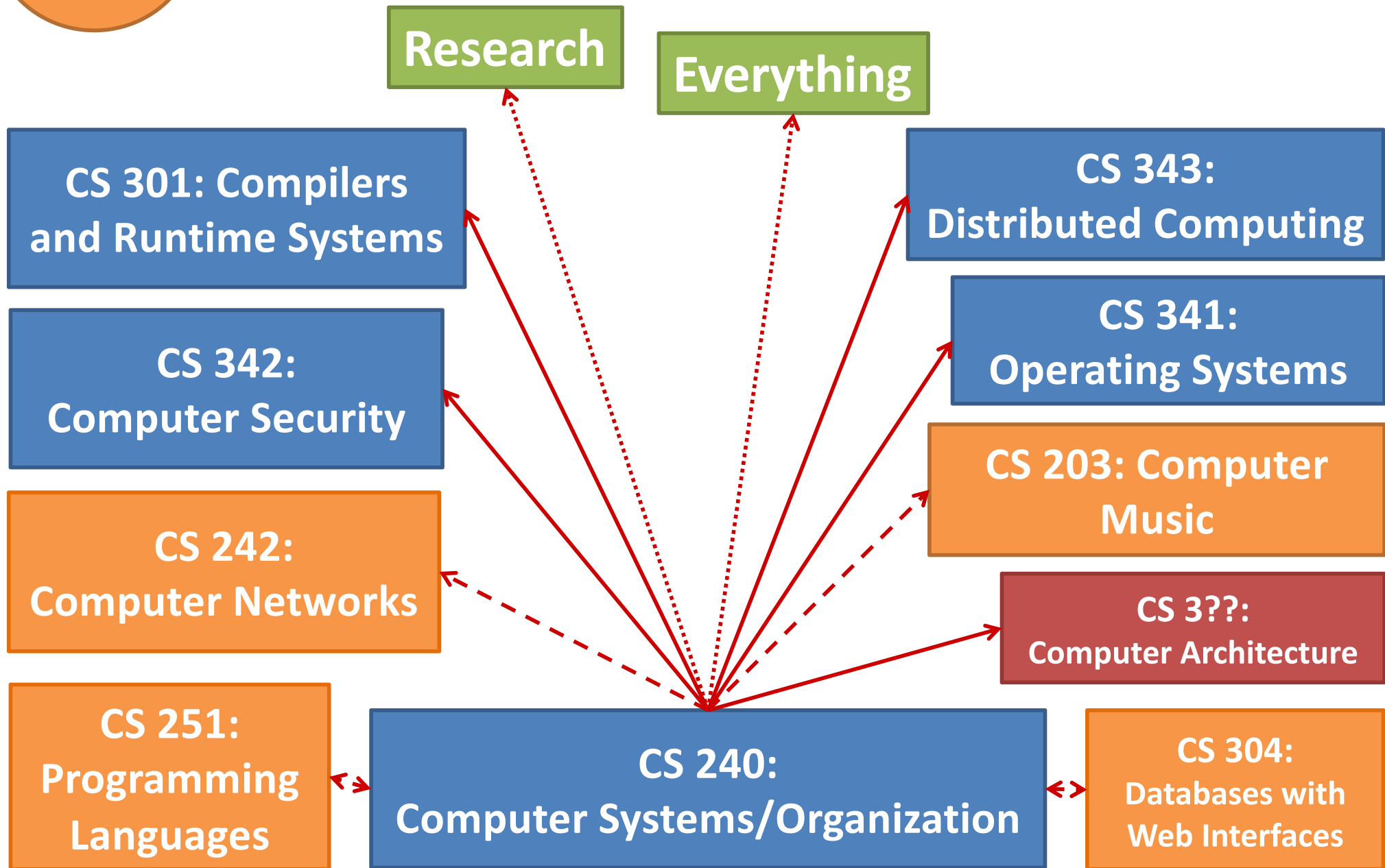
Microarchitecture

Digital Logic

Devices (transistors, etc.)

Solid-State Physics

2 Foundations



3

Skills for Thinking and Programming

Few of you will build new HW, OS, compiler, but...

1. Effective programmers and computer scientists understand their tools and systems.
2. The skills and ideas you learn here apply everywhere.

Reason about computational models, translation.

Debug for correctness and performance (with tools to help).

Assess costs and limits of representations.

"Figure it out" via documentation, experiments, *critical thinking*.

Remember low-level implications of high-level choices.

4

Big Ideas in CS, Systems, and beyond

Abstraction

Do not start every project with transistors.
Abstraction is beautiful and empowering,
but real abstractions have leaks and wrinkles.

Translation

Between layers of abstraction.
Structured computation.

Representation

No representation without taxation.
Representations have costs.

Performance

Memory: clever, imperfect abstraction.
Tiny code changes, huge impact.

Security + Reliability

Trickiest exploits & errors
involve multiple layers, even hardware!

These things matter more every day.