CS 261 Midterm 1

Review Session

Exam Format

- 50 minutes, 10% of final grade (same as a project!)

- Closed book, closed note

- 10 true/false questions

- ~2 pages of multiple-choice 5-option questions

- ~3 pages of short-answer free response

- **NO** extensive coding or long-form essays

- Scientific and graphing calculators allowed

Review Strategies

- Review slides and notes (linked from calendar)

- Review quizzes (available on Canvas)

- Review labs and examples (available on stu)

- Write problems for yourself and your friends; check your work against each other

- Solve problems from the textbook (Ch.1 - 3.2)

Core Theme:

Opening Black Boxes

General Issues

- Systems are collections of communicating components.

- Modern computers are comprised of a large number of large and diverse systems (both hardware and software).

- How do these systems work, and how do their internals impact external systems?

Core Theme:

Computer as Other

General Issues

- How do we (as humans) interact at a low level with a digital machine?

- What kinds of tools facilitate this interaction?

- How do we use computers to solve problems?

- Computers are less flexible than we are; what must we do to accommodate this difference?
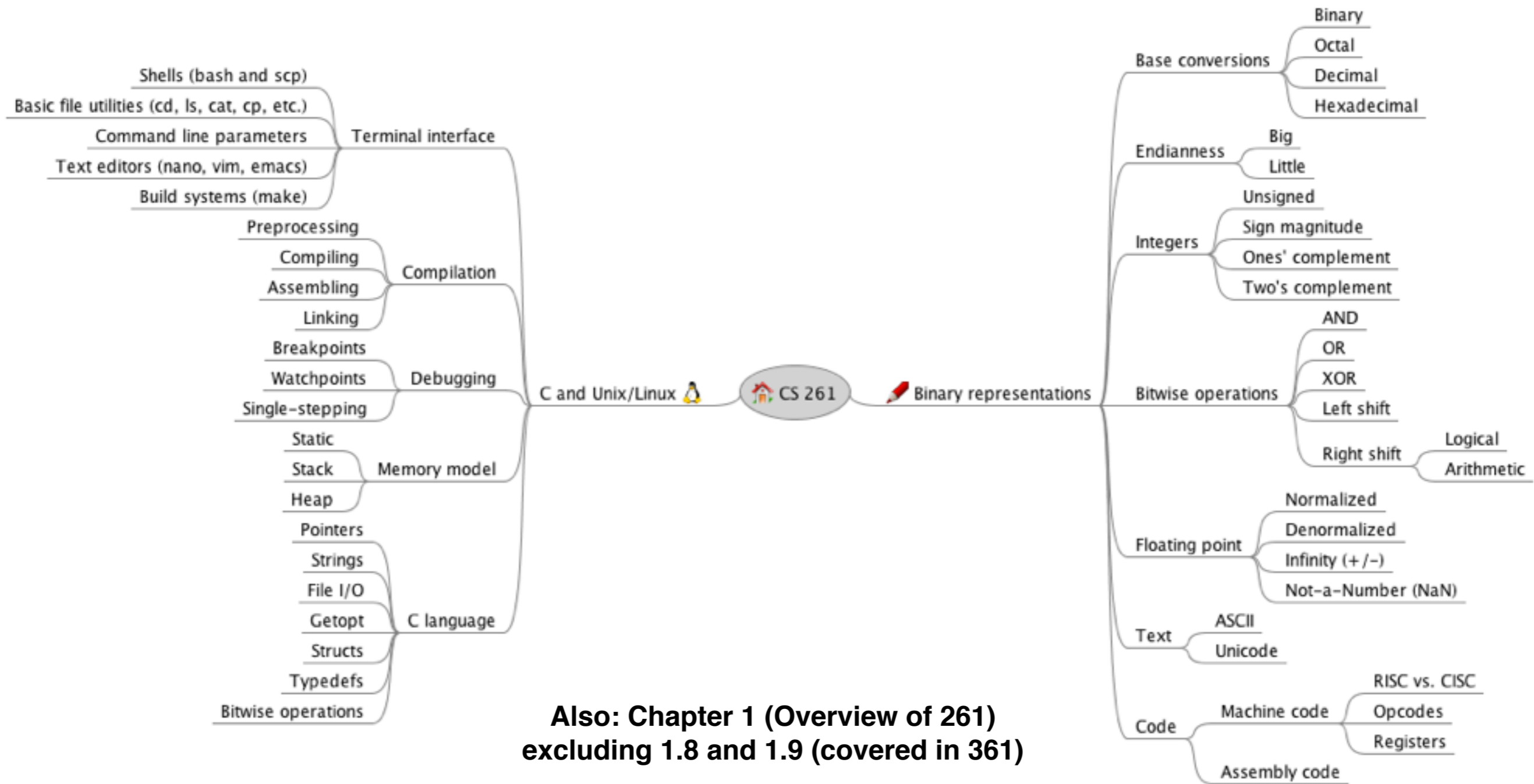
Core Theme:

Information = Bits + Context

General Issues

- How do we represent non-binary information in a digital system?

- How do specific encodings work?

- How do we convert information to/from various encodings?

- Do the transformations preserve all data?

Course Topics

Also: Chapter 1 (Overview of 261)
excluding 1.8 and 1.9 (covered in 361)

What are you comfortable with?

What are you LEAST comfortable with?

Max Numbers

Value	Word size w			
	8	16	32	64
$UMax_w$	0xFF	0xFFFF	0xFFFFFFFF	0xFFFFFFFFFFFFFFFF
	255	65,535	4,294,967,295	18,446,744,073,709,551,615
$TMin_w$	0x80	0x8000	0x80000000	0x8000000000000000
	−128	−32,768	−2,147,483,648	−9,223,372,036,854,775,808
$TMax_w$	0x7F	0x7FFF	0x7FFFFFFF	0x7FFFFFFFFFFFFFFF
	127	32,767	2,147,483,647	9,223,372,036,854,775,807
−1	0xFF	0xFFFF	0xFFFFFFFF	0xFFFFFFFFFFFFFFFF
0	0x00	0x0000	0x00000000	0x0000000000000000

Figure 2.14 **Important numbers.** Both numeric values and hexadecimal representations are shown.

Denormal Example

- `0x06 = 0 0000 110`

- Exp = **1 - bias** = $1 - (2^{4-1} - 1) = 1 - 7 = -6$

- Sig = **6/8** = 0.75

- Value = $0.75 \times 2^{-6} = 0.0117$