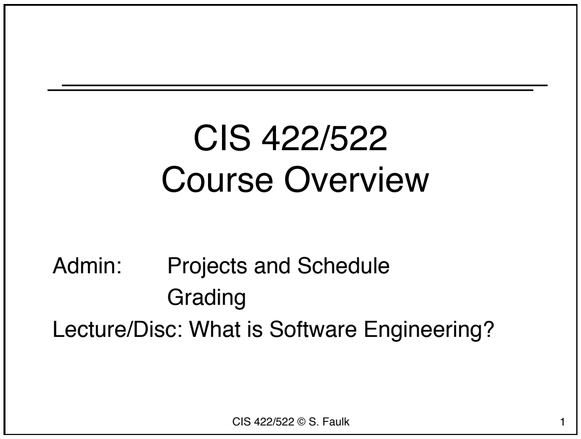
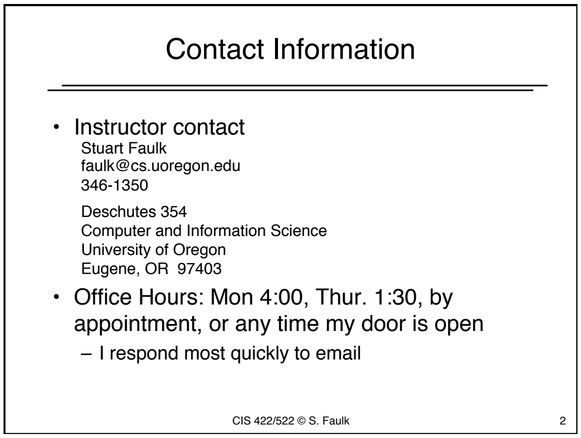


CIS 422/522
Course Overview

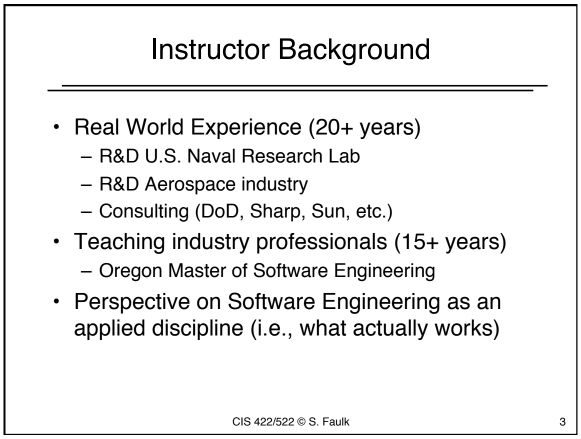
Admin: Projects and Schedule
Grading
Lecture/Disc: What is Software Engineering?



Contact Information

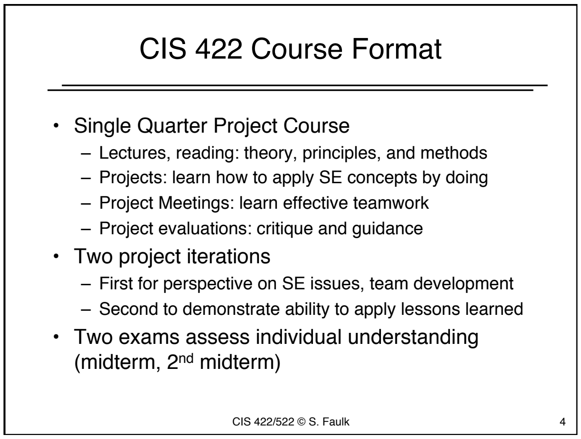
- Instructor contact
  Stuart Faulk
  faulk@cs.uoregon.edu
  346-1350

  Deschutes 354
  Computer and Information Science
  University of Oregon
  Eugene, OR 97403
- Office Hours: Mon 4:00, Thur. 1:30, by appointment, or any time my door is open
  - I respond most quickly to email



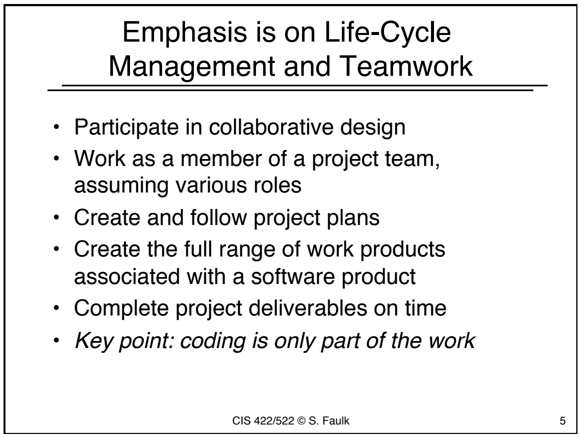
Instructor Background

- Real World Experience (20+ years)
  - R&D U.S. Naval Research Lab
  - R&D Aerospace industry
  - Consulting (DoD, Sharp, Sun, etc.)
- Teaching industry professionals (15+ years)
  - Oregon Master of Software Engineering
- Perspective on Software Engineering as an applied discipline (i.e., what actually works)



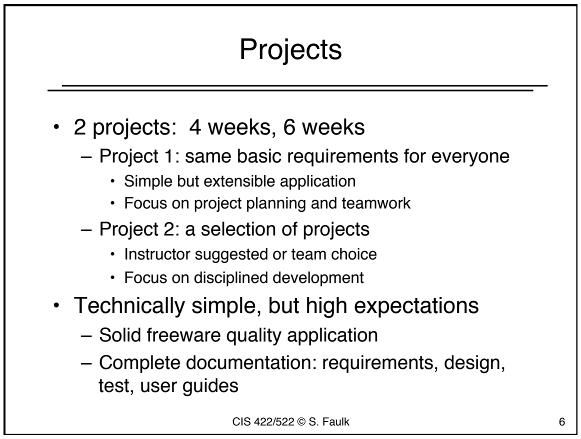
CIS 422 Course Format

- Single Quarter Project Course
  - Lectures, reading: theory, principles, and methods
  - Projects: learn how to apply SE concepts by doing
  - Project Meetings: learn effective teamwork
  - Project evaluations: critique and guidance
- Two project iterations
  - First for perspective on SE issues, team development
  - Second to demonstrate ability to apply lessons learned
- Two exams assess individual understanding (midterm, 2nd midterm)



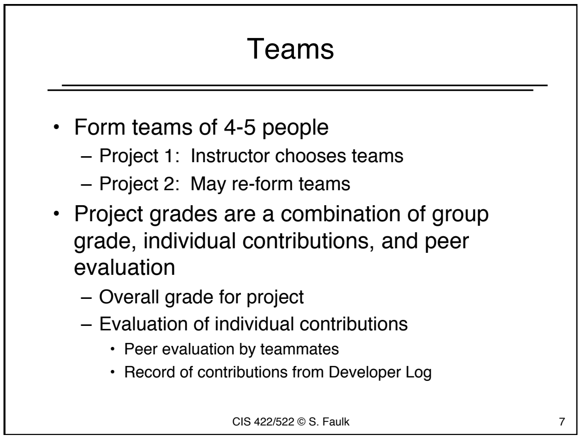
Emphasis is on Life-Cycle Management and Teamwork

- Participate in collaborative design
- Work as a member of a project team, assuming various roles
- Create and follow project plans
- Create the full range of work products associated with a software product
- Complete project deliverables on time
- *Key point: coding is only part of the work*



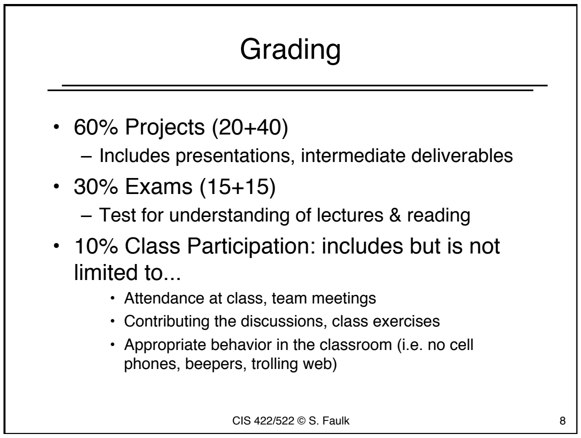
Projects

- 2 projects: 4 weeks, 6 weeks
  - Project 1: same basic requirements for everyone
    - Simple but extensible application
    - Focus on project planning and teamwork
  - Project 2: a selection of projects
    - Instructor suggested or team choice
    - Focus on disciplined development
- Technically simple, but high expectations
  - Solid freeware quality application
  - Complete documentation: requirements, design, test, user guides



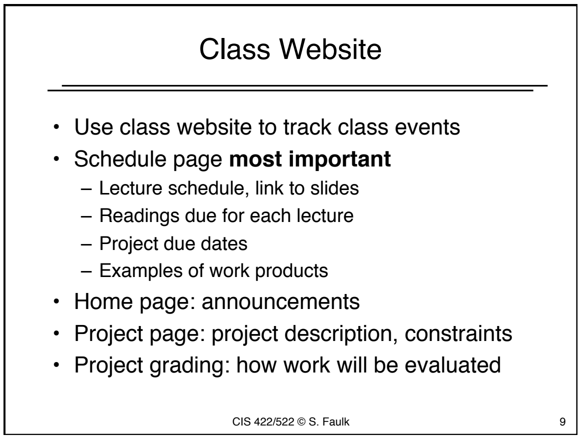
Teams

- Form teams of 4-5 people
  - Project 1: Instructor chooses teams
  - Project 2: May re-form teams
- Project grades are a combination of group grade, individual contributions, and peer evaluation
  - Overall grade for project
  - Evaluation of individual contributions
    - Peer evaluation by teammates
    - Record of contributions from Developer Log



Grading

- 60% Projects (20+40)
  - Includes presentations, intermediate deliverables
- 30% Exams (15+15)
  - Test for understanding of lectures & reading
- 10% Class Participation: includes but is not limited to...
    - Attendance at class, team meetings
    - Contributing the discussions, class exercises
    - Appropriate behavior in the classroom (i.e. no cell phones, beepers, trolling web)



Class Website

- Use class website to track class events
- Schedule page **most important**
  - Lecture schedule, link to slides
  - Readings due for each lecture
  - Project due dates
  - Examples of work products
- Home page: announcements
- Project page: project description, constraints
- Project grading: how work will be evaluated

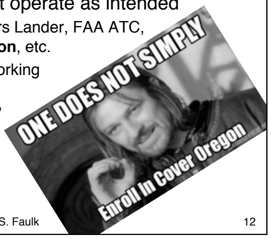
What is Software Engineering?

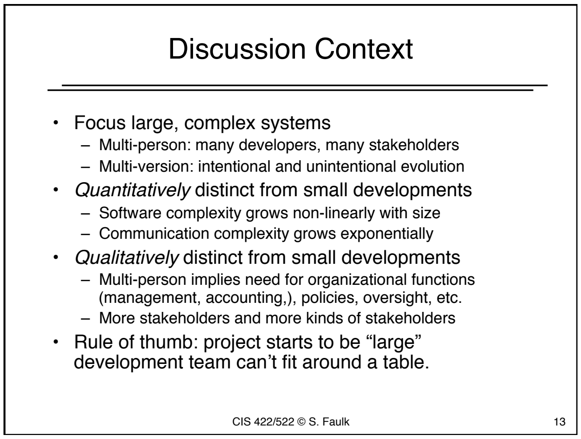
The “Software Crisis”

- Have been in “crisis” since the advent of “big” software (roughly 1965)
- What we want for software development
  - Low risk, predictability (time, cost, functionality, quality)
  - Lower costs and proportionate costs
  - Faster turnaround
- What we have:
  - High risk, high failure rate
  - Poor delivered quality
  - Unpredictable schedule, cost, effort
- Characterized by **lack of *control*** (inability plan the work, work the plan)

Symptoms of the “Crisis”

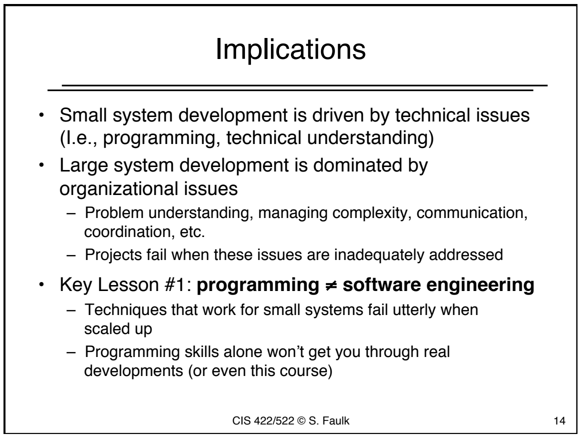
- One of every four large software project is cancelled
- Average project overshoots schedule by 50%, large project often do much worse
- 75% of large systems do not operate as intended
  - E.g., Ariane 5, Therac 25, Mars Lander, FAA ATC, Universal Credit, **Cover Oregon**, etc.
  - Many fail to deliver a single working line of code
- Really the “state of practice”





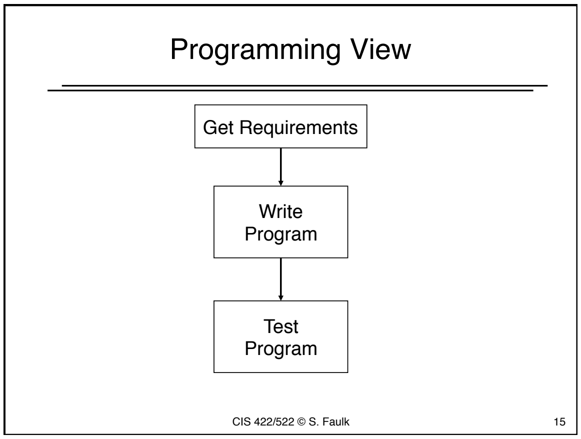
Discussion Context

- Focus large, complex systems
  - Multi-person: many developers, many stakeholders
  - Multi-version: intentional and unintentional evolution
- *Quantitatively* distinct from small developments
  - Software complexity grows non-linearly with size
  - Communication complexity grows exponentially
- *Qualitatively* distinct from small developments
  - Multi-person implies need for organizational functions (management, accounting,), policies, oversight, etc.
  - More stakeholders and more kinds of stakeholders
- Rule of thumb: project starts to be “large” development team can’t fit around a table.



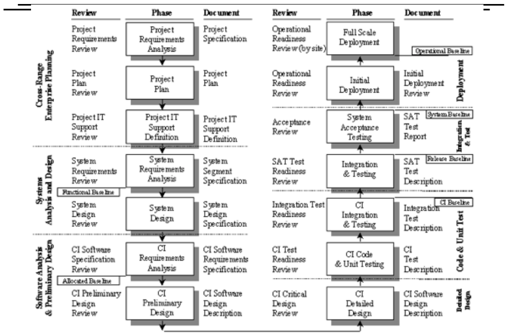
Implications

- Small system development is driven by technical issues (I.e., programming, technical understanding)
- Large system development is dominated by organizational issues
  - Problem understanding, managing complexity, communication, coordination, etc.
  - Projects fail when these issues are inadequately addressed
- Key Lesson #1: **programming ≠ software engineering**
  - Techniques that work for small systems fail utterly when scaled up
  - Programming skills alone won’t get you through real developments (or even this course)



Programming View

DoD Software Life Cycle



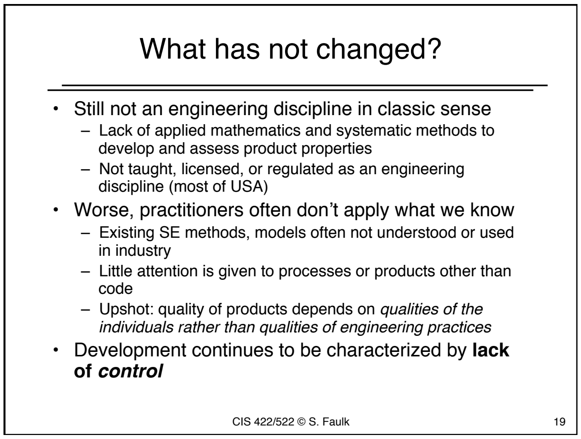
	Review	Phase	Document	Review	Phase	Document	
Cross-Range Enterprise Planning	Project Requirements Review	Project Requirements Analysis	Project Specification	Operational Readiness Review (by site)	Full Scale Deployment		Deployment
	Project Plan Review	Project Plan	Project Plan	Operational Readiness Review	Initial Deployment	Initial Deployment Review	
	Project IT Support Review	Project IT Support Definition	Project IT Support Definition	Acceptance Review	System Acceptance Testing	SAT Test Report	Integration & Test
Systems Analysis and Design	System Requirements Review	System Requirements Analysis	System Segment Specification	SAT Test Readiness Review	Integration & Testing	SAT Test Description	
	System Design Review	System Design	System Design Specification	Integration Test Readiness Review	CI Integration & Testing	Integration Test Description	Code & Unit Test
Software Analysis & Preliminary Design	CI Software Specification Review	CI Requirements Analysis	CI Software Requirements Specification	CI Test Readiness Review	CI Code & Unit Testing	CI Test Description	
	CI Preliminary Design Review	CI Preliminary Design	CI Software Design Description	CI Critical Design Review	CI Detailed Design	CI Software Design Description	Detailed Design

Origins of SE

- Term "software engineering" was coined at 1968 NATO conference:
  "Software engineering is the establishment and use of sound engineering principles in order to obtain economically software that is reliable and works efficiently on real machines."
- Response to "software crisis"
- Desire for software development to be more like mature engineering disciplines
  - Analytical, predictable, manageable
  - But, stated as an aspiration, not the state of practice

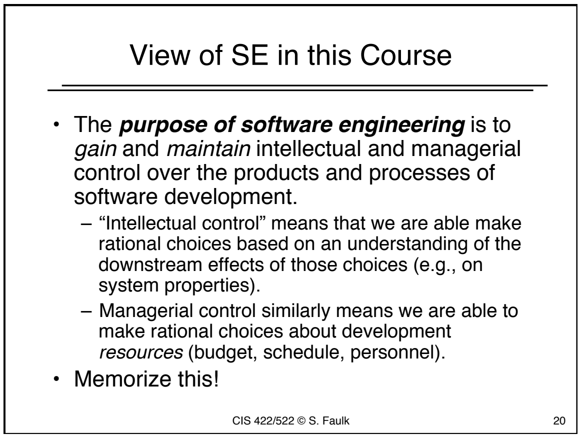
What has changed since '68?

- Incorrect to conclude that no progress has been made
  - Better understanding of issues
  - Substantial improvements in programming languages, tools
  - Better understanding and control of software processes
- But the problems have also changed
  - Improved capabilities often overcome by larger problems, greater complexity
  - Orders of magnitude more code, faster pace of technology, etc.



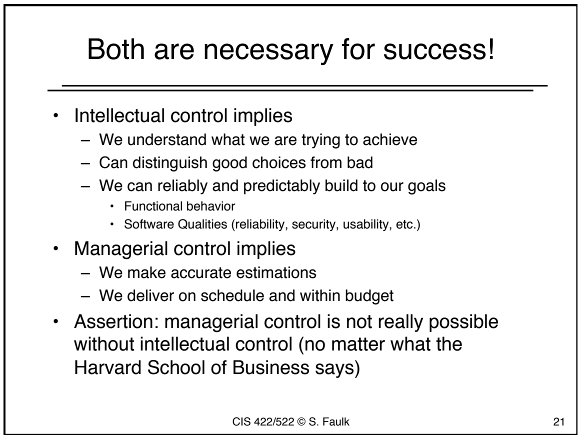
What has not changed?

- Still not an engineering discipline in classic sense
  - Lack of applied mathematics and systematic methods to develop and assess product properties
  - Not taught, licensed, or regulated as an engineering discipline (most of USA)
- Worse, practitioners often don't apply what we know
  - Existing SE methods, models often not understood or used in industry
  - Little attention is given to processes or products other than code
  - Upshot: quality of products depends on *qualities of the individuals rather than qualities of engineering practices*
- Development continues to be characterized by **lack of *control***



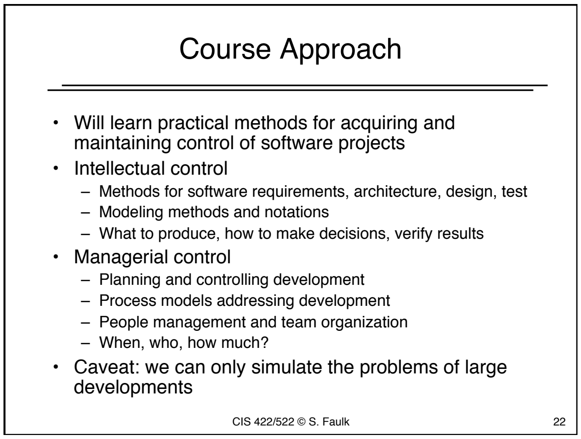
View of SE in this Course

- The ***purpose of software engineering*** is to *gain* and *maintain* intellectual and managerial control over the products and processes of software development.
  - "Intellectual control" means that we are able make rational choices based on an understanding of the downstream effects of those choices (e.g., on system properties).
  - Managerial control similarly means we are able to make rational choices about development *resources* (budget, schedule, personnel).
- Memorize this!



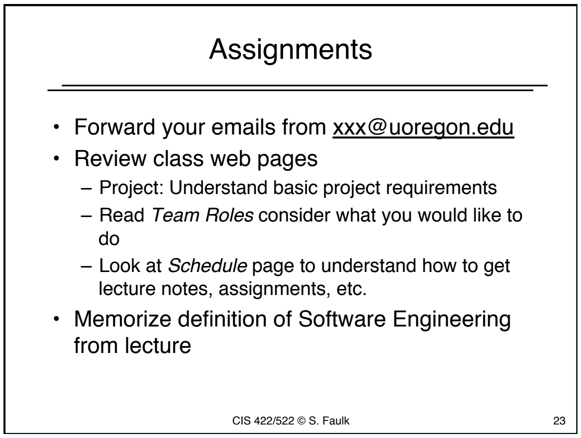
Both are necessary for success!

- Intellectual control implies
  - We understand what we are trying to achieve
  - Can distinguish good choices from bad
  - We can reliably and predictably build to our goals
    - Functional behavior
    - Software Qualities (reliability, security, usability, etc.)
- Managerial control implies
  - We make accurate estimations
  - We deliver on schedule and within budget
- Assertion: managerial control is not really possible without intellectual control (no matter what the Harvard School of Business says)



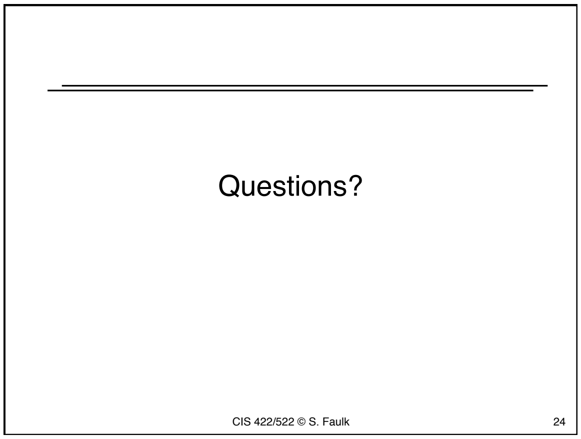
Course Approach

- Will learn practical methods for acquiring and maintaining control of software projects
- Intellectual control
  - Methods for software requirements, architecture, design, test
  - Modeling methods and notations
  - What to produce, how to make decisions, verify results
- Managerial control
  - Planning and controlling development
  - Process models addressing development
  - People management and team organization
  - When, who, how much?
- Caveat: we can only simulate the problems of large developments



Assignments

- Forward your emails from xxx@uoregon.edu
- Review class web pages
  - Project: Understand basic project requirements
  - Read *Team Roles* consider what you would like to do
  - Look at *Schedule* page to understand how to get lecture notes, assignments, etc.
- Memorize definition of Software Engineering from lecture



Questions?