

# Software Architecture and Design 1

## *CSSE 374: First Class*

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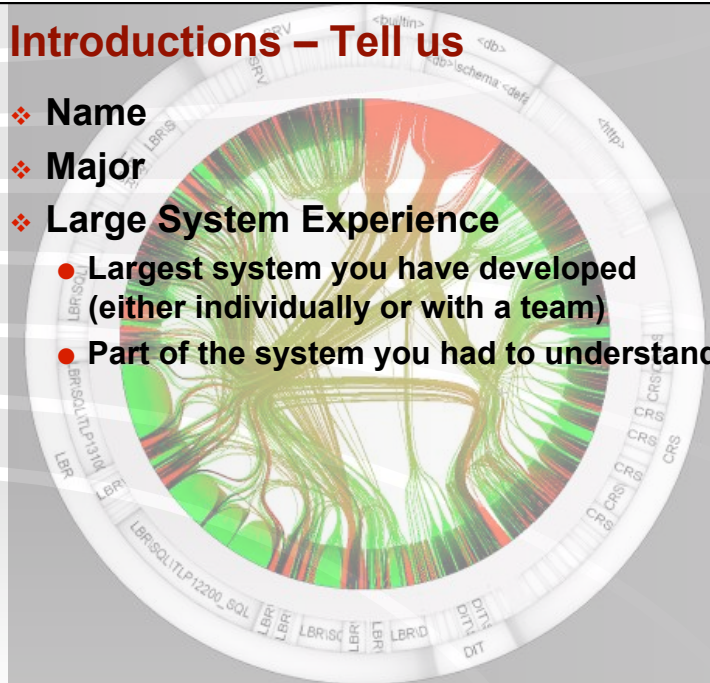
## **Agenda**

- ❖ **Introductions**
- ❖ **Software Design - What is it?**
- ❖ **Course Outcomes**
- ❖ **Guidelines and Expectations**
- ❖ **Semester Schedule**
- ❖ **Homework Assignment**



## Introductions – Tell us

- ❖ Name
- ❖ Major
- ❖ Large System Experience
  - Largest system you have developed (either individually or with a team)
  - Part of the system you had to understand



Q1

<http://www.laquso.com/services/analysis/sourcecode.html>

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## Question? So, what is Design?

- ❖ Art?
- ❖ Engineering?
- ❖ Mix of the both?

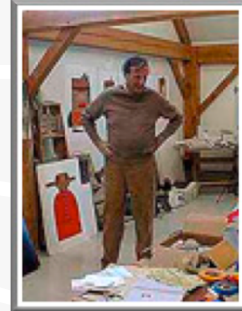


Q2

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## Is Design Creative Problem Solving?

**“Design is directed toward human beings. To design is to solve human problems by identifying them and executing the best solution.”**



*Ivan Chermayeff*

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## Is Design what Innovators do?

**“In most people's vocabularies, design means veneer. It's interior decorating. It's the fabric of the curtains, of the sofa. But to me, nothing could be further from the meaning of design. Design is the fundamental soul of a human-made creation that ends up expressing itself in successive outer layers of the product or service.”**



*Steve Jobs*

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## Is Design what Architects do?

Some architects have a preconceived notion of what a building should be — they design from the outside like the building is a piece of sculpture. I prefer to patiently search through extensive discovery until I find a seam somewhere, crack it open and discover the art inside of the process.

*Curtis W. Fentress*

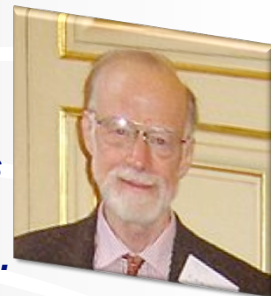
<http://www.businesswire.com/multimedia/home/20090106005735/de/1739565>

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## Couple Software Design Perspectives

*"There are two ways of constructing a software design: One way is to make it so simple that there are obviously no deficiencies, and the other way is to make it so complicated that there are no obvious deficiencies. The first method is far more difficult."*

*-C.A.R. Hoare*



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## Engineering Design – A Simple Definition

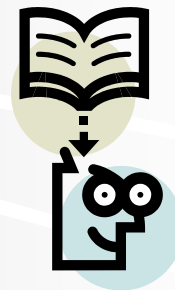
- ❖ “Design” specifies the strategy of “how” the Requirements will be implemented
- ❖ Design is both a “Process” ... and an “Artifact”



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## Where do Software Designs Come From?

- ❖ Intuition/Evolution
- ❖ Adoption
- ❖ Engineering



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## Software Design has Evolved!

### Structured Design

(Data flow, modules, ...)

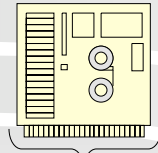
**Computing** = Centralized

**Systems** = Stove-piped

**Change focus** = Code

**Trade-offs** = Efficiency

(Memory, processing time...)



1976

2009



**Software Programmers**  
(Database, Algorithm...)

### Engineering Design

(Inter/Multidisciplinary...)

### Human Centered Design

(Usability, Customer...)

### Model-Based Design...

**Computing** = Pervasive

**Systems** = Distributed

**Change Focus** = Architecture

**Trade-Offs** = Effectiveness

(Product-Line, Changeability, Platform...)



### Software Disciplines

(Database, HCI, Web...)

### Computer Disciplines

(Network, Embedded, Sensors...)

### Application Domain Disciplines

(Aerospace, Telecommunications, ...)

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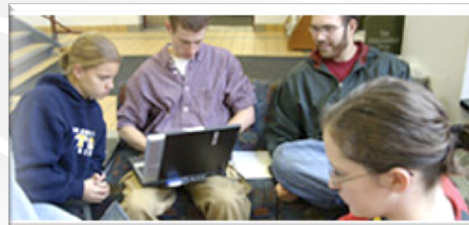
## Course Mechanics

- ❖ Taught in concert with Curt Clifton's Section that follows 7<sup>th</sup> Period
- ❖ Find most material:  
<http://www.rose-hulman.edu/class/csse/csse374-201020-01/>
- ❖ Grades and some assignments will be on Angel

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## Learning Outcomes: Teams

**Work effectively with a team of software project stakeholders, including customers and members of the development team.**



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## Learning Outcomes: Object-Oriented Design

**Demonstrate object-oriented design basics like domain models, class diagrams, and interaction (sequence and communication) diagrams.**



Q3

<http://enterprisegeeks.com/blog/2009/07/>

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## Learning Outcomes: TDD and Refactoring

Demonstrate a working knowledge of test-driven development (TDD) and refactoring.



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<http://tshirts.codesmack.com/tshirts/programming>

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## Learning Outcomes: Problems and Solutions

- ❖ Recognize the differences between problems and solutions and deal with their interactions.



Q3

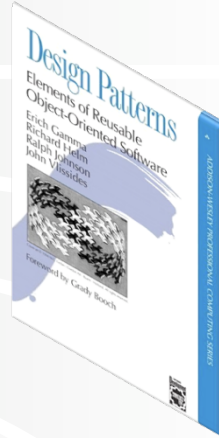
[http://www.geekologie.com/2007/02/rubiks\\_cube\\_for\\_the\\_lazy\\_perso.php](http://www.geekologie.com/2007/02/rubiks_cube_for_the_lazy_perso.php)

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## Learning Outcomes: Fundamental Design

Use fundamental design principles, methods, patterns and strategies in the creation of a software system and its supporting documents.



Q3

<http://www.amazon.com/Design-Patterns-Elements-Reusable-Object-Oriented/dp/0201633612>

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## Learning Outcomes: Patterns, Frameworks,...

Identify criteria for the design of a software system and select patterns, create frameworks, and partition software to satisfy the inherent trade-offs.



Q3

<http://www.autocult.com.au/NewsDetail.aspx?id=372>

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## Learning Outcomes

Analyze and explain the feasibility and soundness of a software design.



Q3

<http://en.wikipedia.org/wiki/File:Wrightfallingwater.jpg>

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## Guidelines and Expectations



- ❖ **Demanding Course ALERT:** 9+ hours/week outside of class
- ❖ **Read the assigned material before class**
  - Note: quizzes may also cover reading assignment
- ❖ **Check email, Angel, and the course website daily**
- ❖ **Be mindful of the CSSE Honesty Policy**
- ❖ **Electronic Distraction Policy**
  - Strongly encourage you to turn off IM and email and only use laptop for things directly related to class. If you choose to use non-class-related software during class, then you must sit in the back row. Doing so will prevent your classmates from being distracted by what is on your screen.

Q4

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## Grading and Evaluation

- ❖ **35% Theory**
  - Exam 1 (15%), Exam 2 (15%)
  - Quizzes/Discussion (5%)
- ❖ **65% Practicum**
  - Homework (20%),
  - Final Project (35%)
  - Project Meetings (10%)

### Grade Scale

The usual point scale will apply (subject to curve).

### Statute of Limitations

Any questions (or concerns) about the evaluation of an assignment must be raised within two weeks of the posting of score information.



## Late Work

- ❖ **Legitimate reasons for late work, but must be acknowledged before due date**
- ❖ **Late buffer of 2 assignments**
  - Can spend 1 on any non-project assignment
  - Can earn 1 per assignment
  - Use survey on ANGEL before the assignment deadline to spend/earn late days



## Deadlines

- **Deadlines temperamental beasts, ... you hug one too close and it's liable bite you!**



## Rewarding Contributions

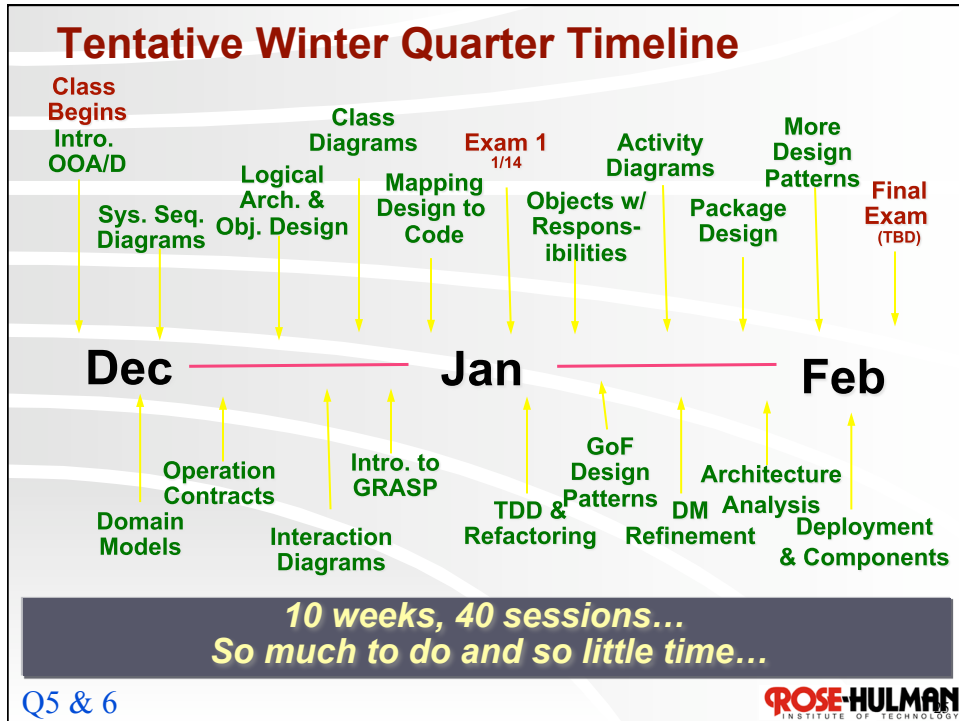
- ❖ **Fairness Principle**
  - Reward extraordinary contributions
  - Discourage freeloading
- ❖ **Mechanism: Performance Evaluations**

	Shawn	Curt	Sriram
Shawn	<del>8</del> 10	8	8
Curt	8	9	8
Sriram	7	10	8
Individual Avg.	7.67	9	8
Team Avg.	8.22	8.22	8.22
Raw Weight	93%	109%	97%
Clamped Weight	93%	105%	100%

## Course Textbook and Readings

- ❖ **Required Textbook**
  - Applying UML and Patterns: An Introduction to Object-Oriented Analysis and Design and Iterative Development (3ed)''
  - by Craig Larman; Printice Hall PTR (2004).
  - ISBN-13: 978-0131489066
- ❖ Readings may be also be assigned from relevant papers.





## Homework Assignment for 12/1/09

- ❖ Read Chapters 1, 3, & 8 in text
- ❖ Establish Time for Weekly Team meetings
- ❖ Complete Pre-Course Assessment
  - Due by 5:00pm on Tuesday, December 1st, 2009

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