

EECS 101
An Introduction to Computer Science
for Everyone

Introduction

March 29, 2011

Ming-Yang Kao

Faculty Coordinator for This Course

Outline for Today's Discussion

1. an overview of the course
2. the course home page
3. the syllabus
4. the reading list
5. starting our technical discussions

What Is This Class about?

Our primary goal is to answer three basic questions:

- 1. What is Computer Science?**
- 2. What do computer scientists do?**
- 3. How does Computer Science interact with the rest of the world?**

Who Should Take This Class?

1. All students at Northwestern who are interested in learning about what Computer Science is.
2. Freshmen and those who are thinking about pursuing the Computer Science majors/minors.
3. Computer Science students.
4. Computer Engineering students.
5. Weinberg students, for whom this course satisfies the Area III Distribution requirement.

Prerequisites

- **None.**
- **No prior knowledge of Computer Science is needed.**
- **All students at Northwestern are welcome.**
- **There is no programming in this course.**

Faculty Instructors

1. [Ming-Yang Kao](#) (coordinator; weeks 1, 2, 10)
2. [Jason Hartline](#) (weeks 3 and 4)
3. [Goce Trajcevski](#) (weeks 5 and 6)
4. [Bryan Pardo](#) (week 7)
5. [Robby Findler](#) (week 8)
6. [Jack Tumblin](#) (weeks 9 and 10)

Faculty Instructors



Ming-Yang Kao



Jason Hartline



Goce Trajcevski



Bryan Pardo



Robby Findler



Jack Tumblin

Instructor Office Hours

1. [Ming-Yang Kao](#) -- Tech M324, 2:00-3:00 PM Monday, Tuesday, and Thursday, or by appointment.
2. [Jason Hartline](#) -- by appointment.
3. [Goce Trajcevski](#) -- by appointment.
4. [Bryan Pardo](#) -- by appointment.
5. [Robby Findler](#) -- by appointment.
6. [Jack Tumblin](#) -- by appointment.

Teaching Assistants

1. Elham Beheshtizavareh
2. Joseph Friedman



TA Office Hours

- 1. Elham Beheshtizavareh:** Annenberg Hall, Room 222, 2:00-4:00, Wednesday, or by appointment.
- 2. Joseph Friedman:** Tech M316, 9:30-10:30, Tuesday and Thursday, or by appointment.

Undergraduate Assistants

To be announced.

UA Office Hours

No office hours.

Grading

1. 20% -- **class participation** informed by reading, including participation in (1) the recitation/discussion sessions and (2) the online discussion group.
2. 40% -- **two essays**, 20% for each essay.
3. 20% -- **midterm**.
4. 20% -- **final**.

Recitation/Discussion Sessions:

- **Optional, but very strongly encouraged.**
- **To be announced.**

Online Discussion for This Course

1. Google Group:

[CS 101 - Northwestern University](#)

1. You are required to join the group and be an active participant.

Computer Science Student Community

1. the [ACM Student Group](#) at Northwestern
2. You are very strongly encouraged to join the group and be an active member.

Assignment 1

1. Topic: **Essay on a Personality in Computer Science.**
2. Date: PDF file due by email by noon Friday, 4/22/2011.
3. Format: 10 pages, single-spaced, done in groups of two.
4. Coverage: A list of personalities will be provided for you to choose one for your essay.
5. Optional: You are encouraged to create a movie for your essay using the tool at <http://www.xtranormal.com/>.

Three Demos of xtranormal Movies

1. <http://www.xtranormal.com/watch/11553387>
2. <http://theoryclass.wordpress.com/2011/01/11/an-advertisement/>
3. <http://agtb.wordpress.com/2011/03/05/xtranormal-advertisement-for-multi-unit-auction-paper/>

Midterm Exam

- 1. Dates: to be distributed by email on Thursday, 4/28/2011; PDF file due by email by noon Monday, 5/2/2011.**
- 2. Format: take-home.**
- 3. Coverage: the first five weeks.**

Assignment 2

1. Topic: **Essay on a Topic in Computer Science.**
2. Date: PDF file due by email by noon Friday, 5/27/2011.
3. Format: 10 pages, single-spaced, done in groups of two.
4. Coverage: A list of computer science topics will be provided for you to choose one for your essay.
5. Optional: You are encouraged to create a movie for your essay using the tool at <http://www.xtranormal.com/>.

Final Exam

- 1. Dates: to be distributed by email on Thursday, 6/2/2011; PDF file due by email by noon Monday, 6/6/2011.**
- 2. Format: take-home.**
- 3. Coverage: the last five weeks.**

Week 1: Introduction

Dates: 3/29/2011, 3/31/2011.

Instructor: [Ming-Yang Kao](#).

Outline:

- The long arc from the Antikythera mechanism to today.
- Historical roots of modern computer science in mathematics, electrical engineering, and psychology.
- **A look at the big questions.**
- Structure of the field (the core areas).
- What computer scientists do (how people are employed).

Week 2: Fundamental Theories – the core ideas and how they are evolving

Dates: 4/5/2011, 4/7/2011.

Instructor: [Ming-Yang Kao](#).

Outline:

- Discrete mathematics and logic (these areas of Mathematics, not calculus, form the mathematical basis of Computer Science).
- Theory of computation and its surprising facts.
- Theory of communication and its ubiquity.
- Classical computers.
- Simple “laws”: Moore, Gilder, Murphy.

Week 3: Algorithms, Tractability, and Intractability

Dates: 4/12/2011, 4/14/2011.

Instructor: [Jason Hartline](#).

Outline:

- Tractability of problems.
- Algorithms.
- Data structure concepts.
- Simulation and its impact.

Week 4: Networks, Markets, and Crowds - - reasoning about a highly connected world

Dates: 4/19/2011, 4/21/2011.

Instructor: [Jason Hartline](#).

Outline:

- Structure of the web.
- Sponsored search.
- Small world phenomena.
- Social contagion.
- Information cascades.

Week 5: Security and a Bit of Law and Politics

Dates: 4/26/2010, 4/28/2011.

Instructor: [Goce Trajcevski](#).

Outline:

- Cryptography.
- Cracking the uncrackable.
- Secure protocols and their magic.
- Intrusion detection.

Week 6: Computer Systems – raising the abstraction

Dates: 5/3/2010, 5/5/2011.

Instructor: [Goce Trajcevski](#).

Outline:

- Architecture.
- Operating systems.
- Databases.
- Networking.
- Middleware.

Week 7: Artificial Intelligence – making minds and solving problems we don't know how to solve

Dates: 5/10/2011, 5/12/2011.

Instructor: [Bryan Pardo](#).

Outline:

- Turing test.
- Are people fancy computers?
- Logic-based approaches.
- Heuristic search.
- Vision and image understanding.
- Robotics.
- Machine learning – statistics as if computers existed.

Week 8: More Systems, Languages, and Software Engineering

Dates: 5/17/2011, 5/19/2011.

Instructor: [Robby Findler](#).

Outline:

- Compilers.
- Software Engineering.
- Mathematical thinking about grammar and semantics.
- Computation as understanding languages.
- Formal language design.
- Programs and proofs.
- Language design and implementation in practice and its convergence with theory.

Week 9: Human Computer Interaction and Graphics

Dates: 5/24/2011, 5/26/2011.

Instructor: [Jack Tumblin](#).

Outline:

- Applied geometry on a computer.
- Issues in interface design.
- Psychology of using computers.
- Where your PC came from, and where it might go...

Week 10: The Bleeding Edge and Crazy Ideas and/or Slack Time

Dates: 5/31/2011, 6/2/2011.

Instructors: [Jack Tumblin](#) and [Ming-Yang Kao](#).

Outline:

- Quantum computing.
- Digital Physics.
- Biological computing with DNA.
- Smart Dust.
- More.

Let's Take a Look at ...

1. Course Home Page

nucs101.org

1. Syllabus – accessible from the home page.

2. Reading List – accessible from the home page.

Starting Our Technical Discussion ...

Our three basic questions for this course:

- 1. What is Computer Science?**
- 2. What do computer scientists do?**
- 3. How does Computer Science interact with the rest of the world?**

What is “Computer Science”?

1. What is a “computer”?
2. What “machinery” can “compute”? What “machinery” can be used to “compute”?
3. What is “computing”? What is “computation”?
4. Where can we find these things?
5. Who create them? How are they created?
6. Who use them? What are they used for? What can they be used for?
7. More ...

What Does a Computer Scientist Do?

- Who is a “computer scientist”?
- What did **yesterday’s** “computer scientists” do with computer science knowledge?
- What do **today’s** “computer scientists” do with computer science knowledge?
- What can **tomorrow’s** “computer scientists” do with computer science knowledge?
- More ...

How Does Computer Science Interact with the Rest of the World?

- What do we mean by “the world”?
 - What can “Computer Science” interact with?
 - How can “Computer Science” interact with it?
1. Our society?
 2. The academia?
 3. Our economy?
 4. The Universe?
 5. Arts?
 6. A biological cell?
 7. More ...

What to Do Next?

- **Think about these questions.**
- **Read the required readings for this week and think about the points made in them.**
- **We will continue our discussion next time.**