The Master of Engineering Program in Computer Science

Dexter Kozen
Director

22 August 2016
Welcome!
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<td><strong>Assistant Director</strong></td>
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<td>Stephanie A. Meik</td>
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<td>436 Gates</td>
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<td><a href="mailto:kozen@cs.cornell.edu">kozen@cs.cornell.edu</a></td>
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**Are there regular walk-in office hours?**

**Dexter:** visit http://www.cs.cornell.edu/~kozen

**Stephanie:** if the door is open!
Administration

Director
Dexter Kozen
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kozen@cs.cornell.edu
255-9209

Assistant Director
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Special MEng only hours:
today & tomorrow 2–4pm
When to use regular walk-in office hours?

course selection, course issues, project issues, career issues, workload issues, ...
# Administration

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**When to make special appointments?**

Cannot make regular hours, emergencies, confidential matters, ...
The Cornell Environment
The Cornell Environment

Cornell is particularly known for

- respect for breadth of education
  
  "I would found an institution where any person can find instruction in any study." —Ezra Cornell

- promotion of interdisciplinary research
The Cornell Environment

Cornell is particularly known for

▪ respect for breadth of education
  “I would found an institution where any person can find instruction in any study.” —Ezra Cornell

▪ promotion of interdisciplinary research

These can be attributes of your MEng experience if you choose!
The CS Environment

CS undergrad program

5th year

CS MEng program

CS PhD program

cutting-edge research

Take what you need from the local environment!
You
Things to Think About

- How to set the stage for the career I want
- How to take full advantage of Cornell
- How to fulfill program requirements
- How to choose the right courses
- How to design an interesting project
What you can emerge with

- A broader set of CS-related skills
- A deeper knowledge of an application area
- An ability to work with others
- A set of entrepreneurial skills
- An ability to communicate technical ideas in everyday language
Making a difference between this . . .
...and this:
Aspiring Mindsets

The Entrepreneurial Mindset

Being able to

1. identify CS problems of interest to society and
2. develop solutions that have economic value

Think: Startup company!
Aspiring Mindsets

The Algorithmic Mindset

Being able to
1. identify CS problems of interest to scientists and engineers and
2. develop efficient algorithms for their solution

Think: Being the CS person in a lab
Aspiring Mindsets

The Intrapreneurial Mindset

Being able to

1. identify CS problems of interest to your company and
2. develop solutions that have economic value

Think: Working in R&D for a large company
Aspiring Mindsets

The Social Entrepreneurial Mindset

Being able to

1. identify CS problems of interest to society and
2. develop solutions that have social impact

Think: Laptops for education in poverty areas
Interested in Entrepreneurship?

Some Organizations

- Software Entrepreneurship & StartUp Engineering
  cornellsense.com
- Cornell Entrepreneur Network
  cen.cornell.edu
- Entrepreneurship and Innovation Institute
  johnson.cornell.edu/entrepreneurship-and-innovation-institute
- Entrepreneurship @ Cornell
  eship.cornell.edu
Take Charge of Your Career!

Go to talks by company recruiters

Career Center

- Career Fair Days **August 30–31, September 7–8**
- “Navigating a Career Fair” prep session hosted by Elleta Kershaw from IBM, **Wednesday, August 24, 4:45pm, 155 Olin**
- Small group sessions:
  - Managing offers – requesting extra time, etc
  - Negotiating the terms of an offer
  - Career Fair prep and other networking
  - Job search
The Program
The Requirements in a Nutshell

- 30+ credit hours of coursework
- including 15+ credit hours from CS
- including a 3–6 hour project

Most courses are 4 credit hours
so this translates to 6 courses + project
The Requirements – Fine Print

30+ credit hours, 15+ from CS, a 3–6 hour project

- All courses must be at the 4000-level or higher
- At least two CS courses at the 5000-level or higher
- CS seminars and CS 5999 do not qualify as “CS courses”
- Non-CS courses must be technical* and approved**
- At least 28 credit hours must be taken for a letter grade
- The grade earned in any course must be C– or higher
- The project grade must be B or better
- Overall GPA must be at least 2.5

*Some nontechnical business courses and S&TS courses are ok
**A list of approved non-CS courses is on the MEng website. Not on the list? Send us a course description.
Course Selection

- At the start, map out a course plan that covers both semesters
- Carefully balance breadth and depth
- Carefully balance compute-intensive courses with those that are not
- Use courses and labs to develop your writing and presentation skills

You have the freedom to structure your course selection and project so that what you learn resonates with your career aspirations
Course Selection

If more courses interest you than you plan to take, *shop around!*

Sit in during the first week or two, then make an informed decision

**Note:** Formal enrollment in some courses is not routine due to oversubscription – attend such courses for details on enrollment protocols
Course Info

Online Course Info

- Courses of Study – short course descriptions
- Course and Time Roster – times, locations

Course Numbering

- 4000-level Typically for juniors, seniors and MEng students who wish to fill a gap in their background
- 5000-level Classic Meng courses. Note: some are doubly listed, e.g. CS 4740 and CS 5740. Usually exactly the same course. Take the 5000 version
- 6000-level Typically for PhD students and exceptionally well prepared* undergrads and MEng students

*E.g., A-level work in an elementary version of the course
Two-Semester Balance

- Aim for 14–18 hours in first semester
- Nice load: 2 heavy courses + 1 light course + project
- Nice load: 3 heavy courses + 1 light course
- Plan ahead

The definition of “light” and “heavy” depends as much on your background as on the actual course content and volume of work required
How long do I have?

- Most students finish in 2 semesters
- 2 semesters + summer is not uncommon
- A few students need 3 semesters to fill gaps in their background – this is better than trying to take courses when you are not prepared
- Maximum of 4 semesters, but this is very rare
- Some Cornell students complete ugrad+MEng in 9 semesters – made possible by AP credits & summer coursework
Courses
Fall Courses

- CS 5110 Programming Languages and Logics
- CS 5320-5321 Databases*
- CS 5414 Distributed Computing
- CS 5420 Advanced Computer Architecture
- CS 5727 Optimization Methods
- CS 5740 Natural Language Processing
- CS 5750 Foundations of Robotics
- CS 5785 Applied Machine Learning
- CS 5786 Machine Learning for Data Science

*The practicums are 1-credit companions to the corresponding lecture
Fall Courses

- CS 4110 Programming Languages and Logics
- CS 4210 Numerical Analysis and Differential Equations
- CS 4320-4321 Introduction to Database Systems*
- CS 4410-4411 Operating Systems*
- CS 4420 Computer Architecture
- CS 4700-4701 Foundations of Artificial Intelligence*
- CS 4740 Natural Language Processing
- CS 4750 Foundations of Robotics
- CS 4775 Computational Genetics and Genomics
- CS 4812 Quantum Information Processing
- CS 4860 Applied Logic

* The practicums are 1-credit companions to the corresponding lecture
Cornell Tech Courses

Not open to Ithaca campus students

- CS 5091 Conversations in the Studio
- CS 5092 Startup Ideas
- CS 5356 Startup Systems Design and Engineering
- CS 5422 Physical Computing
- CS 5435 Security and Privacy Concepts in the Wild
- CS 5660 Signal Processing
- CS 5854 Markets and Networks
Spring Courses (tentative!)

- CS 5120-5121 Introduction to Compilers
- CS 5223 Numerical Analysis: Linear and Nonlinear Problems
- CS 5430-5431 System Security
- CS 5670 Introduction to Computer Vision
- CS 5682 HCI and Design
- CS 5830 Cryptography
Spring Courses (tentative!)

- CS 4152 Advanced Topics in Computer Game Architecture
- CS 4220 Numerical Analysis: Linear and Nonlinear Problems
- CS 4300 Language and Information
- CS 4654 Virtual Reality Design
- CS 4670 Introduction to Computer Vision
- CS 4754 Human Robot Interaction - Research and Design
- CS 4810 Introduction to Theory of Computing
- CS 4820 Introduction to Analysis of Algorithms
- CS 4850 Mathematical Foundations for the Information Age
- CS 4852 Networks II: Market Design
CS Colloquium

- CS 7090 – CS colloquium
- Typically outside speakers
- Can be taken each semester for 1 credit
- Thursdays 4:15-5:15
- Preceded by a reception
Weekly Research Seminars

- CS 7190 Seminar in Programming Languages
- CS 7290 Seminar on Scientific Computing and Numerics
- CS 7390 Database Seminar
- CS 7490 Systems Research Seminar
- CS 7670 Special Topics in Computer Vision
- CS 7690 Computer Graphics Seminar
- CS 7790 Seminar in Artificial Intelligence
- CS 7794 Seminar in Natural Language Understanding
- CS 7800 Topics in Theory of Computing
- CS 7890 Seminar in Theory of Algorithms and Computing
Colloquium/Seminar Etiquette

The CS colloquium is preceded by a reception with food. It is not ok to attend the reception without going to the talk.

Regular attendance/participation at a research seminar is fine subject to the approval of the faculty in charge. Sporadic attendance is discouraged.
The Project
The MEng Project

- At least 3 and no more than 6 credits of CS 5999
- If you take (say) 10 credits of CS 5999, only 6 can count toward your degree
- Typically an application of computer science techniques to practice
- All projects supervised by a CS faculty member or researcher
- A final report or poster is required
Types of Projects

- Participate in a faculty member’s research group
- Build upon a project started within an advanced course
- One-on-one project with faculty
- Large team project/challenge, e.g. CUAUV, Robotics Challenge
- A team project to explore an idea for a startup (often from business courses)
- Systems built on behalf of non-CS groups with challenging problems
- External projects from company, military, government
- Ideas of your own!

All projects need approval and faculty supervision
Finding a Project is Your Responsibility

- Stephanie maintains an online directory of projects submitted by faculty from CS and other departments
- Every MEng project must be approved by a CS faculty member
- Complete a project approval form and have the project advisor sign
- If you are interested in doing a project with a faculty member not in the CS field, you will need to get a supervising CS advisor
- It is helpful to talk to other MEng students about projects
- If you enjoy a course project, you can often find a way to grow it into a more ambitious MEng project
Non-CS Courses

You can take 2-3 courses in nearby areas, e.g.:

- Information Science
- Electrical and Computer Engineering
- Operations Research
- Mathematics
- Statistical Science
- Johnson Graduate School of Management
Information Science

- INFO 4130 Health and Computation
- INFO 4240 Designing Technology for Social Impact
- INFO 4430 Teams and Technology
- INFO 4550 Deception in the Networked Age
- INFO 6230 Games, Economic Behavior, and Internet
- INFO 6260 Networks, Crowds, and Markets
- INFO 6310 Behavior and Information Technology
- INFO 6350 Text Mining History and Literacy
- INFO 6710 Revolutions of the Mind
Other Fields

Electrical & Computer Engineering
- ECE 5470 Computer Vision
- ECE 5630 Fundamentals of Information Transmission
- ECE 5650 Statistical Signal Processing and Learning
- ECE 5775 High-Level Digital Design Automation

Operations Research
- OR&IE 4152 Entrepreneurship for Engineers
- OR&IE 4350 Introduction to Game Theory
- OR&IE 4600 Introduction to Financial Engineering
- OR&IE 5580 Simulation Modeling and Analysis

Mathematics
- MATH 4330 Linear Algebra
- MATH 4410 Introduction to Combinatorics I
Other Fields

Statistical Science

- STSCI 4030 Linear Models and Matrices
- STSCI 4090 Theory of Statistics
- STSCI 4740 Data Mining and Machine Learning
- STSCI 5080 Probability Models and Inference
- STSCI 5110 Stat Methods for the Social Sciences

Johnson Graduate School of Management

- NCC 5500 Financial Accounting
- NCC 5530 Marketing Management
- NCC 5540 Managing and Leading in Organizations
- NBA 5070 Entrepreneurship for Scientists & Engineers
- NBA 5640 Entrepreneurship and Business Ownership
Integrity
Academic Integrity

- We take it very seriously
- Penalties for cheating in a course or misrepresenting your contribution to a project are severe
- Guard against lapses of judgment that occur toward the end of the semester when you are stressed
- When in doubt, talk to a TA or a faculty member
Social Integrity

- Everybody in the program is equal regardless of background, work experience, religion, ethnicity, citizenship, gender, or sexual orientation.
- **Zero tolerance** for any disrespect that targets a student or any member of the staff or faculty.
- If you are harassed or made to feel unwelcome or disrespected by anyone, please contact Stephanie or Dexter.
- If you become aware of anyone else being harassed or disrespected, please contact Stephanie or Dexter.
In Conclusion
What Is It All About?

The CS MEng is a professional degree program that emphasizes the practical application of CS ideas.
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The CS MEng is a professional degree program that emphasizes the practical application of CS ideas.

But ... 

Being professionally strong means more than just being technically strong.

Refine your communication skills and your ability to work with others.
What Is It All About?

The CS MEng is a professional degree program that emphasizes the **practical** application of CS ideas.

But ... 

**Practical applications** often require **theoretical foundations**.

Pay attention to your mathematical, statistical, and logical talents.
Be Adventurous!

- Take a course in Information Science, ECE, Operations Research, or the Business School
- Take a research-oriented CS 6xxx course if you are well prepared
- Take a CS 4xxx class in some totally new direction that you know nothing about
- Take a more modern version of a course that you took as an undergrad

Be Creative!

- The project is your place to do something original and exciting
- The project is your place to exercise your creativity
- The project is your place to apply classroom knowledge
Above All, Have Fun!
Thanks, and Let’s Go!