The Master of Engineering Program
In Computer Science

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Stephanie’s Office Hours
TBA
Themes in this Presentation

- The MEng – Why?
- Taking full advantage of Cornell
- Requirements
- Thinking about Courses
- Thinking about the Project
- Practical Matters
A total of at least 30 credit hours that includes a 3-6 credit hour project and at least 15 credit hours of CS coursework.

Most courses are four credit hours so this roughly translates into six courses and the project.
The Key Attribute: Flexibility

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

… depends on what you enter with. Everybody enters the program with their own mix of strengths.
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From the job point of view, there is a shortage of computer scientists.
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From the job point of view, there is an acute shortage of computer scientists who can do one other thing.
Impact of Nearby Degree Programs

The CS Undergraduate Program
The CS PhD Program
The CS MEng Program

The 5th year idea.
Background building

Forefront snapshots
How research works
The Cornell Environment

The University is particularly famous for

1. The way it achieves the aims of liberal education.

2. The way it promotes interdisciplinary research.

Breadth is the common denominator.
And it can be an attribute of YOUR MEng if you choose.
The CS MEng is a professional degree program that emphasizes the practical application of CS ideas.
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True but…

Being professionally strong means more than just being technically strong.
Refine your communication skills and your ability to work with others.
The CS MEng is a professional degree program that emphasizes the \textit{practical} application of CS ideas.

True but...

\textbf{Practical applications sometimes require theoretical foundations.}

Pay attention to your mathematical, statistical, and logical talents.
Mindsets that Relate to the MEng

The Entrepreneurial Mindset...

Being able (a) to identify CS problems of interest to society and (b) to develop solutions that have economic value.

Think: Start-Up Company
Mindsets that Relate to the MEng

The Algorithmic Mindset…

Being able (a) to identify CS problems of interest to scientists and engineers and (b) to develop efficient algorithms for their solution.

Think: Being the CS person in a lab.
Mindsets that Relate to the MEng

The Intrapreneurial Mindset…

Being able (a) to identify CS problems of interest to your company and (b) to develop solutions that have economic value.

Think: Working in development for a big company
Mindsets that Relate to the MEng

The Social Entrepreneurial Mindset…

Being able (a) to identify CS problems of interest to society and (b) to develop solutions that have social value.

Think: Laptops for education in poverty areas.
A total of at least 30 credit hours that includes a 3-6 credit-hour *project* and at least 15 credit-hours of *CS coursework*.

1. All courses must be at the 4000-level or higher and approved.
2. At least two of the CS courses must be at the 5000-level or higher.
3. CS seminars and independent studies do not qualify as CS coursework.
4. At least 28 of the credit hours must be for a letter grade.
5. For a course to count, the grade earned must be C- or higher.
6. For the project to count the project grade must be B or better.
7. Overall grade point must be 2.5 or higher.

With the exception of several JGSM and STS courses, all approved courses are technical. A list of approved courses is on the MEng website.
How long do I have?

- Most students finish in 2 semesters.
- A few students need 3 semesters to fill gaps in their background. This is better than trying to take courses when you aren’t prepared.
- Maximum of 4 semesters, but very rare for a full-time student to take this long.
- Some Cornell students complete Ugrad+MEng in 9 semesters.
Thinking about Courses

- Carefully balance breadth versus depth.
- Carefully balance compute-intensive courses with those that are not.
- At the start, you should map out a course plan that covers both semesters.
- Take every opportunity to develop both your writing and your presentation skills.
Some CS Courses (Fall 2013)

CS 4410  Operating Systems
CS 4300  Information Retrieval
CS 4700(1)  Intro AI (Practicum)
CS 5120(1)  Compilers (Practicum)
CS 5150  Software Engineering
CS 5320(1)  Database Systems (Practicum)
CS 5142  Scripting Languages  ¬ NEW
CS 5434  Defending Computer Networks  ¬ NEW
CS 5620(1)  Computer Graphics (Practicum)
CS 5670  Computer Vision
CS 5724  Evolutionary Computing
CS 5740  Heuristic Methods for Optimization
CS 5780  Machine Learning
Some CS Courses (Fall 2013)

CS 6110 - Advanced Programming Languages
CS 6210 – Matrix Computations
CS 6113 – Language Based Security
CS 6410 – Advanced Systems

6000-level CS courses are typically for PhD students and exceptionally well-prepared undergrads and MEng students.

exceptionally well-prepared = taken a related Ugrad version of the course and done well.
Course Numbering Review

- **4000-level** CS courses are typically for juniors, seniors and MEng students who wish to fill a gap in their background.

- **5000-level** CS courses are “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** CS courses are typically for PhD students and exceptionally well-prepared ugrads and Meng students.
The Weekly CS Colloquium

CS 7090 – Computer Science colloquium.

This can be taken each semester for one credit hour.

Time: Thursday 4:15-5:15

Preceded by an atrium 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
CS 7893 - Cryptography Seminar

Semester-long participation in the (white) lunch seminars is recommended. Usually no credit unless you give a talk.
Many non-CS courses that you can take for credit to strengthen your MEng record. Nearby areas include...

- Information Science
- Electrical and Computer Engineering
- Operations Research and Industrial Engineering
- Mathematics
- Statistical Science
- Johnson Graduate School of Management
- Science and Technology Studies
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<tr>
<th>Course Code</th>
<th>Course Title</th>
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<tbody>
<tr>
<td>INFO 4400</td>
<td>Human-Computer Interaction Design</td>
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<tr>
<td>INFO 4500</td>
<td>Language and Technology</td>
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<tr>
<td>INFO 5150</td>
<td>Culture, Law, and Politics of the Internet</td>
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<tr>
<td>INFO 6140</td>
<td>Cognitive Psychology</td>
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<td>INFO 6648</td>
<td>Speech Synthesis by Rule</td>
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Electrical & Computer Engineering

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<tr>
<td>ECE 5220</td>
<td>Nonlinear System Analysis and Computations</td>
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<td>ECE 5470</td>
<td>Computer Vision</td>
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<tr>
<td>ECE 5480</td>
<td>Digital Image Processing</td>
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<tr>
<td>ECE 5660</td>
<td>Fundamentals of Networks</td>
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<tr>
<td>ECE 5670</td>
<td>Digital Communications</td>
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<tr>
<td>ECE 5750</td>
<td>Advanced Microprocessor Architecture</td>
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<tr>
<td>ECE 5780</td>
<td>Computer Analysis of Biomed Images</td>
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<tr>
<td>OR&amp;IE 4350</td>
<td>Introduction to Game Theory</td>
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<tr>
<td>OR&amp;IE 4370</td>
<td>Computational Optimization</td>
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<tr>
<td>OR&amp;IE 5140</td>
<td>Applied Systems Engineering</td>
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<tr>
<td>OR&amp;IE 6500</td>
<td>Applied Stochastic Processes</td>
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Mathematics

MATH 4240  Wavelets and Fourier Series
MATH 4330  Honors Linear Algebra
MATH 4340  Honors Introduction to Algebra
MATH 4370  Computational Algebra
MATH 4410  Introduction to Combinatorics I
MATH 4420  Introduction to Combinatorics II
MATH 4550  Applicable Geometry
Statistical Science

STSCI 4740    Data Mining and Machine Learning
STSCI 5010 - Applied Statistical Analysis
STSCI 5060 - Database Management and SAS High Performance Computing with DBMS
STSCI 5080 - Probability Models and Inference
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<tr>
<td>NCC 5500</td>
<td>Financial Accounting</td>
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<td>NCC 5530</td>
<td>Marketing Management</td>
</tr>
<tr>
<td>NCC 5560</td>
<td>Managerial Finance</td>
</tr>
<tr>
<td>NBA 5070</td>
<td>Entrepreneurship for Scientists and Engineers</td>
</tr>
<tr>
<td>NBA 5640</td>
<td>Entrepreneurship and Business Ownership</td>
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<tr>
<td>NBA 6010</td>
<td>Electronic Commerce</td>
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Science and Technology Studies

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<tr>
<td>STS 4071</td>
<td>Law, Science, and Public Values</td>
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<tr>
<td>STS 6241</td>
<td>Science, Technology, and International Security</td>
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<tr>
<td>STS 6261</td>
<td>Seminar in the History of Technology</td>
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<td>STS 6321</td>
<td>Inside Technology</td>
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<tr>
<td>STS 6661</td>
<td>Public Engagement in Science</td>
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Some CS Courses (Spring 2014)

- CS 4152: Advanced Topics in Computer Game Architecture
- CS 4820: Algorithms
- CS 4850: Math Foundations of the Information Age
- CS 5152: Open Source Software Engineering
- CS 5221: Numerical Analysis: Linear and Nonlinear Problems
- CS 5220: Applications of Parallel Computers
- CS 5412: Cloud Computing
- CS 5643: Physically Based Animation
- CS 5846: Decision Theory
“But I already know everything”

Well then….

- Take a course in Information Science, ECE, Operations Research, or the Business School.
- Take a research-oriented CS6xxx course, provided you are exceptionally well-prepared.
- Take a CS4xxx class in some totally new direction that you don’t know anything about.
- Take a more modern version of a course that you took as a ugrad.
The MEng Project

- At least 3 credit hours and no more than 6 credit hours via CS 5999.
- If you take (say) 10 credit hours of CS 5999, only 6 can count towards your degree.
- Typically an application of computer science techniques to practice.
- All projects must be supervised by a Computer Science faculty member or researcher.
- All projects must include a final report.
Types of Projects

- Participate in a faculty member’s research group
- Build upon a project started within an advanced course, perhaps in collaboration with other students from that course
- A few faculty members advertise one-on-one project openings—this might either be a smaller project or a test-run for a larger initiative
- Work as a member of one of the College’s large team efforts—there are an increasing number of these relatively high-profile projects
Types of Projects

- A team project designed to explore an idea for a startup (often from business courses)
- Systems built on behalf of non-CS groups with challenging problems
- Projects brought to Cornell from company or military or government settings, with appropriate permissions
- Ideas of your own, but for this you still need a faculty supervisor.
Finding a Project is Your Responsibility

- Stephanie keeps 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 to insure your expectations match.
- 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. (Check with Stephanie)
- It is helpful to talk to other MEng students, about projects.
- If you enjoy a course project, you can often find ways to grow it into a more ambitious MEng project.
Two-Semester Balance

• Aim for about 15 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 it does on the actual course content and the “volume” of work required.
Gates Hall Move-In: January 2014
Gates Hall Move-In: January 2014
Every year we hold a fair during the spring semester to show off independent work by students.

Recruiters come from all over the country.

Consider being a presenter. The theme could be something that you have done earlier or it could be ongoing work related to your MEng-Project.

* CIS = Computing and Information Science
About Academic Integrity…

- Be advised that the penalty for cheating in a course or misrepresenting your contribution to a project is severe.
- Guard against lapses of better judgment that occur towards the end of the semester when you are stressed.
- When in doubt about violations, talk to a TA or a faculty member.
About Academic Integrity...

If you find yourself about to submit work which you realize you ended up working with others in ways that are against that course's academic integrity rules, agree with those you worked with to put a note to that effect in your work.

It's like putting a list of references to your work. You may well get no points for that work, but at least will have avoided an academic integrity hearing.
About Social Integrity…

Everybody in the program is EQUAL regardless of undergraduate background, work experience, ethnicity, citizenship, gender, or sexual orientation.

Zero toleration for any disrespect that targets a student or any member of the staff or faculty.

If you spot problems in this regard then contact Stephanie or myself.