The Master of Engineering Program
In
Computer Science

Charlie Van Loan
Director
Administration
When are regular “walk-in” office hours?

CVL:  http://www.cs.cornell/cv
SAM:  If the door is open!
Administration

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Why use regular “walk-in” office hours?

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

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Why set up special appointments?

Cannot make regular hours, emergencies, matters that require confidentiality etc.
The Environment
The Cornell Environment

The University is particularly famous for

1. The way it respects breadth of education.
2. The way it promotes interdisciplinary research.

These can be attributes of YOUR MEng experience IF you choose.
The CS Environment

The CS Undergraduate Program

The 5th year idea.
Background-building

Take what you need from the local environment.

The CS PhD Program

Cutting-edge snapshots
How research works

The CS MEng Program
You
Things for you 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
- How to navigate “the system”
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.

From the job point of view, there is a WORLD shortage of computer scientists WHO CAN DO ONE OTHER THING
Aspiring Mindsets

1. 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
Aspiring Mindsets

2. The Algorithmic Mindset...

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

Think: Being the CS person in a lab.
Aspiring Mindsets

3. 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
Aspiring Mindsets

4. 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.
Take Charge of Your Career

Some Organizations:

Software Entrepreneurship & StartUp Engineering

The Cornell Entrepreneur Network

The Entrepreneurship and Innovation Institute

Entrepreneurship @Cornell

ehub Check it out on YouTube

Go to talks, the Job Fair, and the Career Center. Hang out and tout your CS Skills.
The Program
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.
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.
2. At least two of the CS courses must be at the 5000-level or higher.
3. CS seminars and CS 5999 do not qualify as “CS courses”.
4. NonCS courses must be technical* and approved.**
5. At least 28 credit hours must be for a letter grade.
6. For a course to count, the grade earned must be C- or higher.
7. For the project to count the project grade must be B or better.
8. Overall grade point must be 2.5 or higher.

* Some nontechnical business courses and S&TS courses are OK
** A list of pre-approved nonCS courses is on the MEng website.
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.
Practicalities: Your Schedule
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.
- Use courses and labs to develop both your writing and your presentation skills.
Course Numbering

- **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.

* this means A-level work in an elementary version of the course
For 1-paragraph course descriptions, Google “Cornell Courses of Study”

For time/place information, Google “Cornell Course and Time Roster”
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 it does on the actual course content and the “volume” of work required.
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 (made possible by AP credits & summer coursework)
Practicalities: CS Courses
<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>CS 5152</td>
<td>Open Source Software Engineering</td>
</tr>
<tr>
<td>CS 5223</td>
<td>Matrix Comp &amp; Numerical Optimization</td>
</tr>
<tr>
<td>CS 5300</td>
<td>Large Scale Information Systems</td>
</tr>
<tr>
<td>CS 5320</td>
<td>Databases</td>
</tr>
<tr>
<td>CS 5430</td>
<td>System Security</td>
</tr>
<tr>
<td>CS 5625</td>
<td>Interactive Computer Graphics</td>
</tr>
<tr>
<td>CS 5643</td>
<td>Physically-Based Animation</td>
</tr>
<tr>
<td>CS 5670</td>
<td>Computer Vision</td>
</tr>
<tr>
<td>CS 5740</td>
<td>Introduction to Natural Language Processing</td>
</tr>
<tr>
<td>CS 5752</td>
<td>Machine Learning for Data Science</td>
</tr>
</tbody>
</table>
### CS Courses This Term

<table>
<thead>
<tr>
<th>Course Code</th>
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<tbody>
<tr>
<td>CS 4300</td>
<td>Language and Information</td>
</tr>
<tr>
<td>CS 4152</td>
<td>Advanced Computer Game Architecture</td>
</tr>
<tr>
<td>CS 4752</td>
<td>Robotics</td>
</tr>
<tr>
<td>CS 4820</td>
<td>Algorithms</td>
</tr>
<tr>
<td>CS 4850</td>
<td>Math Foundations of the Information Age</td>
</tr>
<tr>
<td>CS 4860</td>
<td>Applied Logic</td>
</tr>
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<tr>
<td>CS 6110</td>
<td>Advance Programming Languages</td>
</tr>
<tr>
<td>CS 6115</td>
<td>Certified Software Systems</td>
</tr>
<tr>
<td>CS 6360</td>
<td>Educational Technology</td>
</tr>
<tr>
<td>CS 6764</td>
<td>Reasoning About Knowledge</td>
</tr>
<tr>
<td>CS 6780</td>
<td>Advanced Machine Learning</td>
</tr>
</tbody>
</table>
CS Courses: Cornell Tech

These are not open to Ithaca campus students
## Typical Fall Course Line-Up:

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>CS 5110</td>
<td>Programming Languages and Logic</td>
</tr>
<tr>
<td>CS 5150</td>
<td>Software Engineering</td>
</tr>
<tr>
<td>CS 5220</td>
<td>Defending Computer Networks</td>
</tr>
<tr>
<td>CS 5413</td>
<td>High Performance Computing/Networking</td>
</tr>
<tr>
<td>CS 5420</td>
<td>Advanced Architecture Computing</td>
</tr>
<tr>
<td>CS 5620</td>
<td>Computer Graphics</td>
</tr>
<tr>
<td>CS 5722</td>
<td>Heuristic Methods for Optimization</td>
</tr>
<tr>
<td>CS 5724</td>
<td>Evolutionary Computing</td>
</tr>
<tr>
<td>CS 5780</td>
<td>Machine Learning</td>
</tr>
<tr>
<td>CS 5860</td>
<td>Introduction to Formal Methods</td>
</tr>
</tbody>
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## Typical Fall Course Line Up

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<tr>
<td>CS 4154</td>
<td>Analytics-Driven Game Design</td>
</tr>
<tr>
<td>CS 4210</td>
<td>Numerical Solution Differential Equations</td>
</tr>
<tr>
<td>CS 4300</td>
<td>Information Retrieval</td>
</tr>
<tr>
<td>CS 4320(1)</td>
<td>Databases (Practicum)*</td>
</tr>
<tr>
<td>CS 4410(1)</td>
<td>Operating Systems (Practicum)*</td>
</tr>
<tr>
<td>CS 4420</td>
<td>Computer Architecture</td>
</tr>
<tr>
<td>CS 4700(1)</td>
<td>Artificial Intelligence (Practicum)*</td>
</tr>
<tr>
<td>CS 4744</td>
<td>Computational Linguistics</td>
</tr>
</tbody>
</table>

* The practicums are 1-credit companions to the corresponding lecture
The Weekly CS Colloquium

CS 7090 - Computer Science colloquium.

This can be taken each semester for 1 credit hour.

Time: Thursday 4:15-5:15

Preceded by an atrium reception.
Weekly Research Seminars

<table>
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<tr>
<th>Course Code</th>
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<tr>
<td>CS 7190</td>
<td>Seminar in Programming Languages</td>
</tr>
<tr>
<td>CS 7290</td>
<td>Seminar on Scientific Computing and Numerics</td>
</tr>
<tr>
<td>CS 7390</td>
<td>Database Seminar</td>
</tr>
<tr>
<td>CS 7490</td>
<td>Systems Research Seminar</td>
</tr>
<tr>
<td>CS 7670</td>
<td>Special Topics in Computer Vision</td>
</tr>
<tr>
<td>CS 7690</td>
<td>Computer Graphics Seminar</td>
</tr>
<tr>
<td>CS 7790</td>
<td>Seminar in Artificial Intelligence</td>
</tr>
<tr>
<td>CS 7794</td>
<td>Seminar in Natural Language Understanding</td>
</tr>
<tr>
<td>CS 7800</td>
<td>Topics in Theory of Computing</td>
</tr>
<tr>
<td>CS 7890</td>
<td>Seminar in Theory of Algorithms and Computing</td>
</tr>
</tbody>
</table>

Semester-long participation in the (white) lunch seminars is recommended. Usually no credit unless you give a talk.
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.

These guidelines are designed to promote a vibrant research environment.
Practicalities: The Project
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 CS faculty member or researcher.

- A 2-page 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, 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 (Cont’d)

- 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: 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.
Practicalities: Non-CS Courses
Use the Cornell Environment

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

Some sample Fall 2014 courses follow...
Information Science

INFO 4130  Health and Computation
INFO 4240  Designing Technology for Social Impact
INFO 4550  Deception in the Networked Age
INFO 6230  Games, Economic Behavior, and Internet
INFO 6310  Behavior and Information Technology
INFO 6710  Revolutions of the Mind
Electr. & 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

<table>
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<th>Course Code</th>
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<tr>
<td>OR&amp;IE 4152</td>
<td>Entrepreneurship for Engineers</td>
</tr>
<tr>
<td>OR&amp;IE 4350</td>
<td>Introduction to Game Theory</td>
</tr>
<tr>
<td>OR&amp;IE 4600</td>
<td>Introduction to Financial Engineering</td>
</tr>
<tr>
<td>OR&amp;IE 5580</td>
<td>Simulation Modeling and Analysis</td>
</tr>
</tbody>
</table>
Mathematics

MATH 4330  Linear Algebra
MATH 4410  Introduction to Combinatorics I
## Statistical Science

<table>
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<tbody>
<tr>
<td>STSCI 4740</td>
<td>Data Mining and Machine Learning</td>
</tr>
<tr>
<td>STSCI 5010</td>
<td>Applied Statistical Analysis</td>
</tr>
<tr>
<td>STSCI 5060</td>
<td>Database Management and SAS</td>
</tr>
<tr>
<td>STSCI 5080</td>
<td>Probability Models and Inference</td>
</tr>
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<td>-------------</td>
<td>------------------------------------------------</td>
</tr>
<tr>
<td>NCC 5500</td>
<td>Financial Accounting</td>
</tr>
<tr>
<td>NCC 5530</td>
<td>Marketing Management</td>
</tr>
<tr>
<td>NCC 5540</td>
<td>Managing and Leading in Organizations</td>
</tr>
<tr>
<td>NBA 5070</td>
<td>Entrepreneurship for Scientists &amp; Engineers</td>
</tr>
<tr>
<td>NBA 5640</td>
<td>Entrepreneurship and Business Ownership</td>
</tr>
</tbody>
</table>
Integrity
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 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 CVL or the Department Chair.
In Conclusion
The CS MEng is a professional degree program that emphasizes the practical application of CS ideas.
# What Is It All About?

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

<table>
<thead>
<tr>
<th><strong>True but...</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>Being professionally strong means more than just being technically strong.</td>
</tr>
<tr>
<td>Refine your communication skills and your ability to work with others.</td>
</tr>
</tbody>
</table>
The CS MEng is a professional degree program that emphasizes the practical application of CS ideas.

True but...

Practical applications sometimes 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 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 an undergrad.
Be Creative and Independent!

The project is your place to do something original and exciting.

The project is your place to exercise a measure of independence.

The project is your place to challenge to apply classroom knowledge.
Thanks
And
Let's Go!