Inaugural Robotics Program Kickoff

- Hello!
- Program Overview
- Faculty Introductions
- Meetup
Hello and Welcome!

- You are the **Inaugural Student Group** of Mines | Robotics program!
  - 15 total
    - 1 PhD
    - 5 MS-Thesis
    - 9 MS-NT
  - Many were/are Mines undergraduates

- Welcome one and all!
The word “robot” was introduced in R.U.R. (Rossum's Universal Robots), a 1920 science fiction play by Karl Čapek.

The play begins in a factory that makes 'artificial people' - they are called robots ... closer to the modern idea of androids or even clones, creatures who can be mistaken for humans.

They can plainly think for themselves, though they seem happy to serve. At issue is whether the "robots" are being exploited and, if so, what follows?

Many people think of “arms” or “humanoids” when they think of robotics, but we can also consider more generally "autonomous systems"
So – Who’s who?

- Breakout groups in pairs, determine partner’s:
  - Name
  - UG degree
  - Where they are from
  - Their favorite robot or autonomous system from popular culture

- 5 minutes
- Come back and share about your partner’s name and favorite robot
Welcome to Robotics!

Graduate Advising Contacts

Carolyn Freedman, Graduate Program Manager – Advisor who can help you with degree requirements, Mines policies, steps to graduation and more!

cfreedman@mines.edu, Alderson Hall 451
Schedule appointments at: https://adviseme.as.me/CarolynFreedman

Nanci Goldberg, Graduate Programs Coordinator – webpage and more!
ngoldberg@mines.edu, Alderson Hall 451

Your faculty advisor – career advice & networking, course selection, research opportunities.

You – As a graduate student, we expect you to utilize the resources available to you to be informed of deadlines, degree requirements, & forms.
Mines Vocabulary

You’ll hear these words often as you progress towards your degree

**Census Day** – the last day to change your course schedule, apply to graduate, etc

**The Catalog** – Our contract with you which lists official requirements for every degree and academic policies

**OGS** – The Office of Graduate Studies, located in 451 Alderson Hall.

**Degree Audit** – this is a form due the semester before you want to graduate listing all the credits that you plan to use towards your degree. Your advisor, committee, and program manager need to approve.

**Reduced Registration** – Allows thesis-based students who are done with all required course credits, and only have research to complete, to register for 4 credits/term and remain a full-time student

Slide Carolyn Freedman
# Advising Roles

<table>
<thead>
<tr>
<th>Graduate Program Manager (Carolyn)</th>
<th>Faculty Advisor</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Intentional advising for students who are struggling</td>
<td>• Advise on best electives to bolster students’ resumes</td>
</tr>
<tr>
<td>• Expert on catalog curriculum, policies, procedures, substitutions</td>
<td>• Give career advice from industry regarding how to make students more marketable</td>
</tr>
<tr>
<td>• Serve as neutral student advocate to communicate issues to faculty and administration for needed change</td>
<td>• Assist students with networking for internships, full-time, or part-time employment</td>
</tr>
<tr>
<td>• Point person for connecting students to resources/offices on campus</td>
<td>• Connect students with research opportunities</td>
</tr>
<tr>
<td>• Point person for offices to contact department (e.g. Admissions, ISSS, etc)</td>
<td>• Advise on the appropriate degree program for students’ goals (MS-NT/MS-Thesis/PhD)</td>
</tr>
</tbody>
</table>
Home Departments (for thesis students)

Where your advisor is based--- ME, EE, CS….

Develop contracts to pay your stipend, tuition, fees and insurance.

Assign office space when available, arrange access to buildings, labs and offices via blastercards or hard keys.

Inclusion in Department communications and events.
Important Dates/Deadlines

Career Day

Last Fall day: Wednesday, Oct. 14 from 10AM-3PM

You’ll be able to meet and interact with hundreds of company representatives through text and video chat using the Brazen virtual platform.

More info at https://www.mines.edu/careers/career-day/

Degree Audit Form Deadlines
November 1 – for May graduation
March 1 – for August graduation
May 1 – for December Graduation
Mines Robotics Program

M.S.

- Thesis
  - Research careers
  - 21 hr coursework
  - 9 hr thesis

- Non-Thesis
  - Industry careers
  - 30 hr coursework

Graduate Certificate

- Professional training
- 12 hours coursework

Ph.D.

- Research careers
- 36 hr coursework
- Thesis research

Slide elements courtesy Neil Dantam
Curriculum Overview/Degree Requirements

**Robotics Core – Breadth**
- One from each focus area
- Breadth across topics

**Robotics Elec. – Depth**
- More robotics courses
- Depth in interest

**Technical Elec.**
- CSCI/EENG/MEGN
- Flexibility

### Component Table

<table>
<thead>
<tr>
<th>Component</th>
<th>MS</th>
<th>MS-NT</th>
<th>Cert.</th>
<th>PhD</th>
</tr>
</thead>
<tbody>
<tr>
<td>Robo. Core</td>
<td>12</td>
<td>12</td>
<td>12</td>
<td>12</td>
</tr>
<tr>
<td>Robo. Elec.</td>
<td>6</td>
<td>6</td>
<td>0</td>
<td>12</td>
</tr>
<tr>
<td>Tech. Elec.</td>
<td>3</td>
<td>12</td>
<td>0</td>
<td>12</td>
</tr>
<tr>
<td>Thesis</td>
<td>9</td>
<td>0</td>
<td>0</td>
<td>*</td>
</tr>
</tbody>
</table>
Mines Robotics – 4 Focus Areas

Slide elements courtesy Neil Dantam
# Robotics Focus Area Courses

<table>
<thead>
<tr>
<th>Permutation</th>
<th>Core</th>
<th>Course Code</th>
<th>Course Title</th>
<th>Timing</th>
</tr>
</thead>
<tbody>
<tr>
<td>Perception</td>
<td>CSCI507</td>
<td>INTRODUCTION TO COMPUTER VISION</td>
<td>Every Fall</td>
<td></td>
</tr>
<tr>
<td></td>
<td>CSCI573</td>
<td>HUMAN-CENTERED ROBOTICS</td>
<td>Every Spring</td>
<td></td>
</tr>
<tr>
<td></td>
<td>EENG519</td>
<td>ESTIMATION THEORY AND KALMAN FILTERING</td>
<td>Odd Springs</td>
<td></td>
</tr>
<tr>
<td>Elective</td>
<td>CSCI508</td>
<td>ADVANCED TOPICS IN PERCEPTION AND COMPUTER VISION</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cognition</td>
<td>CSCI404</td>
<td>ARTIFICIAL INTELLIGENCE</td>
<td>Every Spring</td>
<td></td>
</tr>
<tr>
<td></td>
<td>CSCI575</td>
<td>MACHINE LEARNING</td>
<td>Every Spring</td>
<td></td>
</tr>
<tr>
<td></td>
<td>CSCI534</td>
<td>ROBOT PLANNING AND MANIPULATION</td>
<td>Every Spring</td>
<td></td>
</tr>
</tbody>
</table>
### Robotics Focus Area Courses -2

<table>
<thead>
<tr>
<th>Action</th>
<th>Core</th>
<th>Elective</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>MEGN540 MECHATRONICS</td>
<td>EENG411 INTRODUCTION TO ROBOTICS</td>
</tr>
<tr>
<td></td>
<td>MEGN544 ROBOT MECHANICS: KINEMATICS, DYNAMICS, AND CONTROL</td>
<td>EENG417 MODERN CONTROL DESIGN</td>
</tr>
<tr>
<td></td>
<td>MEGN545 ADVANCED ROBOT CONTROL</td>
<td>EENG515 MATHEMATICAL METHODS FOR SIGNALS AND SYSTEMS</td>
</tr>
<tr>
<td></td>
<td>EENG517 THEORY AND DESIGN OF ADVANCED CONTROL SYSTEMS</td>
<td></td>
</tr>
</tbody>
</table>

- MEGN540: MECHATRONICS - Every Spring
- MEGN544: ROBOT MECHANICS: KINEMATICS, DYNAMICS, AND CONTROL - Every Fall
- MEGN545: ADVANCED ROBOT CONTROL - Every Spring
- EENG517: THEORY AND DESIGN OF ADVANCED CONTROL SYSTEMS - Even Springs
- EENG411: INTRODUCTION TO ROBOTICS - Every semester
- EENG417: MODERN CONTROL DESIGN - Every Fall
- EENG515: MATHEMATICAL METHODS FOR SIGNALS AND SYSTEMS - Every Fall
## Robotics Focus Area Courses - 3

<table>
<thead>
<tr>
<th>Interaction and Society</th>
<th>Core</th>
<th>Every Fall</th>
<th>Every Spring</th>
</tr>
</thead>
<tbody>
<tr>
<td>CSCI5XX</td>
<td>HUMAN-ROBOT INTERACTION</td>
<td></td>
<td></td>
</tr>
<tr>
<td>CSCI532</td>
<td>ROBOT ETHICS</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Elective</th>
<th>CSCI5XX</th>
<th>LINGUISTIC HUMAN-ROBOT INTERACTION</th>
<th>Occasional</th>
</tr>
</thead>
</table>
## Robotics Elective Courses

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Offered In</th>
</tr>
</thead>
<tbody>
<tr>
<td>CSCI406</td>
<td>ALGORITHMS</td>
<td>Every Semester</td>
</tr>
<tr>
<td>CSCI561</td>
<td>THEORY OF COMPUTATION</td>
<td>Every Fall</td>
</tr>
<tr>
<td>CSCI562</td>
<td>APPLIED ALGORITHMS AND DATA STRUCTURES</td>
<td>Every Spring</td>
</tr>
<tr>
<td>CSCI565</td>
<td>DISTRIBUTED COMPUTING SYSTEMS</td>
<td></td>
</tr>
<tr>
<td>CSCI572</td>
<td>COMPUTER NETWORKS II</td>
<td></td>
</tr>
<tr>
<td>EENG411</td>
<td>DIGITAL SIGNAL PROCESSING</td>
<td></td>
</tr>
<tr>
<td>EENG511</td>
<td>CONVEX OPTIMIZATION AND ITS ENGINEERING APPLICATIONS</td>
<td></td>
</tr>
<tr>
<td>EENG521</td>
<td>NUMERICAL OPTIMIZATION</td>
<td></td>
</tr>
<tr>
<td>MEGN586</td>
<td>LINEAR OPTIMIZATION</td>
<td></td>
</tr>
<tr>
<td>MEGN587</td>
<td>NONLINEAR OPTIMIZATION</td>
<td></td>
</tr>
<tr>
<td>MEGN588</td>
<td>INTEGER OPTIMIZATION</td>
<td></td>
</tr>
<tr>
<td>MEGN686</td>
<td>ADVANCED LINEAR OPTIMIZATION</td>
<td></td>
</tr>
<tr>
<td>MEGN688</td>
<td>ADVANCED INTEGER OPTIMIZATION</td>
<td></td>
</tr>
</tbody>
</table>
A few last items

- **Prerequisites** are Differential Equations and Data structures
  - You should clear these in your first semester
  - Consult your advisor if you are not sure what you need to do

- For questions consult your advisor and the catalog

- Also note the [webpage at https://robotics.mines.edu/](https://robotics.mines.edu/)
  - News
  - Blogs *(Contact Tom Williams if you want to contribute!)*

- Community
  - Get to know your classmates
  - Attend seminars
  - Discord channel: [https://discord.gg/9n2m4k7](https://discord.gg/9n2m4k7)
Faculty Introductions

Neil Dantam (CS)
Kevin Moore (EE)
Tom William (CS)
Xiaoli Zhang (ME)
Katie Johnson (EE)
Andrew Petruska (ME)
Hao Zhang (CS)
Faculty Introductions

Qi Han (CS)
Bill Hoff (CS)
Tyrone Vincent (EE)
Qin Zhu (HASS)