2.009 welcome

a “weightless” gardening cart
are YOU ready?
a mini quiz!

put your name on the top of an index card
which object is different from all the others?

a b c d e

a b c d e
a mini quiz!

which object is different from all the others?

b

Congratulations! the only one with all straight lines
a mini quiz!

which object is different from all the others?

C

Congratulations! the only one that is asymmetric
a mini quiz!

which object is different from all the others?

a

Congratulations! the only one with no points
a mini quiz!

which object is different from all the others?

Congratulations! the only one made with line and an arc
a mini quiz!

which object is different from all the others?

the only one that is the projection of a triangle onto a curved surface

Congratulations!
2.009

welcome

a place where there are many right answers

muscular sclerosis
products for the developmentally disabled
there are many right answers
...and even more wrong answers

welcome
...and even more wrong answers
it's not easy

but we will all help each other to succeed

media coordinators

+ 30 mentors!
team!
**team!**

a product development firm!

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**lab (product development activity)**

<table>
<thead>
<tr>
<th>2 instructors</th>
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</tr>
</thead>
<tbody>
<tr>
<td>20 students</td>
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<td>20 students</td>
</tr>
</tbody>
</table>

mentors: ~4 design 1 comm.

- discipline-specific mentors
- 2 course librarians
- 4 lab staff

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**class (development process and design methods)**

<table>
<thead>
<tr>
<th>1 course instructor</th>
</tr>
</thead>
</table>

- course TAs

---

- technical managers
- design teams
- consultants
- consultants
- consultants
- consultants
- CEO
- aides
the team drill! opportunity to prototype

motivation create drive and energy

creativity many ideas lead to a good idea

put your name on the top of an index card!

how to place a sheet of paper so that when two people stand on it, it is not possible to touch.

*cutting or tearing the paper is not allowed*
*tying up the people is not allowed*

i locked door    ii infinite paper    iii people that can’t move
the team drill! opportunity to prototype

motivation create drive and energy

creativity many ideas lead to a good idea

informed craft knowing and doing

process
process

why so important?

a collection of strategies to help ensure that you have a high likelihood of being successful

on time, every time
the team drill! opportunity to prototype

motivation create drive and energy

creativity many ideas lead to a good idea

informed craft knowing and doing

to achieve successful outcomes reliably process
opportunity to prototype

develop new product ideas
experience the need-finding, innovating, prototyping, and business development cycle
in a simulated but very realistic environment

improve our design skills
practice seamless transitions between creative and analytical thinking in engineering design problems

improve our modeling skills
representing and testing our ideas in many ways

execute processes
learn strategies to increase the likelihood of success and apply them to product development
while working in large teams
Process
Process opportunity brief

opportunities

production

r&d

patents

markets
Process 2.009 view
Process opportunity phase
Process opportunity phase
idea generation a warm-up!

put your name on the top of the sheet of paper

climate change is upon us

as many ways to mitigate climate change 4 minutes
Process opportunity phase
Three ideas presentation
September 24, during class
3 ideas per section

Mockup review
October 21
2 mockups per section

Assembly review
November 1 & 3
1 assembly

Final presentation
December 6
1 alpha prototype

Sketch model review
October 7
3 models per section

Final selection
October 26-28
1 concept per team

Technical review
November 15
1 (almost) prototype

Process ideas presentation
Three ideas presentation
September 24, during class
3 ideas per section

Process ideas presentation
Three ideas presentation
September 24, during class
3 ideas per section

Skiff

3 models

Process ideas presentation
Process: concept generation

- Three ideas presentation: September 24, during class. 3 ideas per section.
- Sketch model review: October 7. 3 models per section.
- Mockup review: October 21. 2 mockups per section.
- Assembly review: November 1 & 3. 1 assembly.
- One team.
- Final presentation: December 6. 1 alpha prototype.
Process concept generation
Process concept generation
**Process**

concept generation
Process concept generation
Process sketch model review

Oct 7
Three ideas presentation
September 24, during class
3 ideas per section

Sketch model review
October 7
3 models per section

Process sketch model review
Process sketch model review
Process technical mockups
Process mockup review

**Oct 21**

- **Three ideas presentation**
  - September 24, during class
  - 3 ideas per section

- **Mockup review**
  - October 21
  - 2 mockups per section

- **Assembly review**
  - November 1 & 3
  - 1 assembly

- **Final presentation**
  - December 6
  - 1 alpha prototype

- **Sketch model review**
  - October 7
  - 3 models per section

- **Final selection**
  - October 26-28
  - 1 concept per team

- **Technical review**
  - November 15
  - 1 (almost) prototype
Process: decision week
Process concept selection
Process detail design
Process detail design
Process detail design
Process detail design

- **Three ideas presentation**
  - September 24, during class
  - 3 ideas per section

- **Mockup review**
  - October 21
  - 2 mockups per section

- **Assembly review**
  - November 1 & 3
  - 1 assembly

- **Final presentation**
  - December 6
  - 1 alpha prototype

- **Sketch model review**
  - October 7
  - 3 models per section

- **Final selection**
  - October 26-28
  - 1 concept per team

- **Technical review**
  - November 15
  - 1 (almost) prototype

- **Final presentation**
  - December 6
  - 1 alpha prototype

- **Nov 1**
Process detail design
Process detail design

- **Process**
  - **Three ideas presentation**
    - September 24, during class
    - 3 ideas per section
  - **Mockup review**
    - October 21
    - 2 mockups per section
  - **Assembly review**
    - November 1 & 3
    - 1 assembly
  - **Sketch model review**
    - October 7
    - 3 models per section
  - **Final selection**
    - October 26-28
    - 1 concept per team
  - **Technical review**
    - November 15
    - 1 (almost) prototype

**Nov 15**
Process detail design
Process product launch
Process prototype launch
**Process**

**Prototype Launch**

- **Three ideas presentation**
  - September 24, during class
  - 3 ideas per section

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  - October 21
  - 2 mockups per section

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  - November 1 & 3
  - 1 assembly

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  - December 6
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  - October 7
  - 3 models per section

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  - October 26-28
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  - November 15
  - 1 (almost) prototype

Dec 6
there are a lot of moving parts

how do I know what to do?
2.009
Product Engineering Processes

Welcome, Fall 2021 class!

- **To-Do**
  - by Friday: obtain your [design notebook](#)
  - by Sat, 5 PM: [sign up](#) for a team (lab section)

- **Coming up...**
  - Fri, 9/10, 5 PM: optional sketching tutorial in Rm 3-370

- **Lectures**
  - MWF 1-2PM, in 10-250

- **Team Meetings**
  - Tue 2-5PM, Tue 7-10PM, Wed 9AM-12PM, Wed 2-5PM, Wed 7-10PM, Thu 9AM-12PM, or Thu 2-5PM

[web.mit.edu/2.009](web.mit.edu/2.009)
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web.mit.edu/2.009
<table>
<thead>
<tr>
<th><strong>MILESTONE</strong></th>
<th><strong>DATE</strong></th>
<th><strong>TIME</strong></th>
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</thead>
<tbody>
<tr>
<td>Theme reveal</td>
<td>Fri, September 10</td>
<td>during class</td>
</tr>
<tr>
<td>Lab section preferences due</td>
<td>Sat, September 11</td>
<td>5:00 PM</td>
</tr>
<tr>
<td>Project idea fair</td>
<td>Mon, September 13</td>
<td>7:00 - 8:00 PM</td>
</tr>
<tr>
<td>3 ideas presentation</td>
<td>Fri, September 24</td>
<td>during class</td>
</tr>
<tr>
<td>Sketch model review</td>
<td>Thu, October 7</td>
<td>7:00 - 10:00 PM</td>
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<tr>
<td>Build challenge</td>
<td>Fri, October 8</td>
<td>during class</td>
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<tr>
<td>Mockup review</td>
<td>Thu, October 21</td>
<td>7:00 - 10:00 PM</td>
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<tr>
<td>Selection of final product idea</td>
<td>week of October 25</td>
<td>during team lab</td>
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<tr>
<td>Assembly review</td>
<td>Mon, November 1 &amp; Wed, November 3</td>
<td>during class</td>
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<tr>
<td>Technical review</td>
<td>Mon, November 15</td>
<td>7:00 - 10:00 PM</td>
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<td>Final design review</td>
<td>Fri, November 19</td>
<td>1-5 PM</td>
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<td>Final presentation</td>
<td>Mon, December 6</td>
<td>7:00 - 10:30PM</td>
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<td>Class wrap-up and dinner</td>
<td>Wed, December 8</td>
<td>1:00 - 5:00 PM</td>
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<tr>
<td>Instructor grades meeting</td>
<td>Tue, December 14</td>
<td>12:00 PM</td>
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</table>

[web.mit.edu/2.009](web.mit.edu/2.009)
### Grading

Some components of your grade are individual, some are common to your team section, and others are shared by your entire team. The [project workflow](#) illustrates how and when a team’s sections combine to make a team. In order to receive section and team-wide grade components, an individual must actively contribute to the milestone.

<table>
<thead>
<tr>
<th>DELIVERABLE</th>
<th>% COURSE GRADE</th>
<th>ASSIGNED TO</th>
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</thead>
<tbody>
<tr>
<td>Ideation</td>
<td>5</td>
<td>Individual</td>
</tr>
<tr>
<td>Design notebook</td>
<td>10</td>
<td>Individual</td>
</tr>
<tr>
<td>Peer review</td>
<td>10</td>
<td>Individual</td>
</tr>
<tr>
<td>Instructor leverage</td>
<td>5</td>
<td>Individual</td>
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<tr>
<td>3-Ideas review</td>
<td>5</td>
<td>Section*</td>
</tr>
<tr>
<td>Sketch model review</td>
<td>15</td>
<td>Section*</td>
</tr>
<tr>
<td>Mockup review</td>
<td>15</td>
<td>Section*</td>
</tr>
<tr>
<td>Assembly model</td>
<td>5</td>
<td>Team</td>
</tr>
<tr>
<td>Technical review</td>
<td>20</td>
<td>Team</td>
</tr>
<tr>
<td>Final presentation</td>
<td>10</td>
<td>Team</td>
</tr>
</tbody>
</table>
## Syllabus

<table>
<thead>
<tr>
<th>CLASS/EVENT</th>
<th>ASSIGNED</th>
<th>DUE</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>SEP 8 Wed</strong></td>
<td>Lecture 1: Welcome to 2.009!</td>
<td><strong>Team signup</strong></td>
</tr>
<tr>
<td></td>
<td>(absolutely, most definitely required! We do not use registrar section assignments)</td>
<td>due at 5 PM</td>
</tr>
<tr>
<td></td>
<td>Design Notebook</td>
<td></td>
</tr>
<tr>
<td><strong>SEP 10 Fri</strong></td>
<td>Lecture 2: Creativity, innovation, strategy, and the theme</td>
<td>Idea Fair</td>
</tr>
<tr>
<td></td>
<td>Workshop: Idea sketching 5-6 PM in 1-390.</td>
<td>ideation</td>
</tr>
<tr>
<td><strong>SEP 11 Sat</strong></td>
<td></td>
<td></td>
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<tr>
<td><strong>SEP 13 Mon</strong></td>
<td>Lecture 2: Team building</td>
<td>Timesheets</td>
</tr>
<tr>
<td></td>
<td>Event: Idea Fair 7-8 PM, rooms TBA.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Tutorial: Slack and Project Management</td>
<td>ideation</td>
</tr>
<tr>
<td><strong>SEP</strong></td>
<td>Lab 1: Electing officers and opportunity</td>
<td></td>
</tr>
</tbody>
</table>
Friday
the project theme
2.009