MIT WOMEN'S TECHNOLOGY PROGRAM
MECHANICAL ENGINEERING

WTP MISSION

To spark interest in the future study of engineering among high school rising seniors who are unsure about their future plans.

ABOUT THE PROGRAM

Promoting gender inclusivity in STEM is pivotal for driving innovation. Studies show that women's participation enriches perspectives, leading to improved research outcomes. Despite this, women earn only about 24% of undergraduate engineering degrees—a figure that has remained stagnant for the past three decades. To narrow this gap, critical steps include increasing mentorship and role model support, which have been identified as crucial for motivating young women to pursue careers in engineering.

The Women's Technology Program (WTP) inspires talented high school students, particularly those who may not have previously considered engineering, to pursue engineering in college and beyond. WTP is a four-week residential program for talented students who excel in math and science but have limited experience in mechanical engineering. This immersive experience enables them to explore the discipline through hands-on projects while being mentored by enthusiastic MIT graduate and undergraduate students.

HANA SHINZAWA

WTP Class of 2023

"Learning about different mechanical engineers who all used their degrees differently was incredibly interesting to me; I realized that engineering was a way to combine aspects of all the STEM classes I've loved. The more I learned about and experienced what it meant to be an engineer, the more I realized that I wanted to major in mechanical engineering"

Grounded in research-based teaching methodologies, participants dive into dynamic, active learning activities. This approach transcends traditional teaching and learning, helping to build confidence not only in the high school participants but also in the MIT teaching assistants. Staff have the opportunity to reconnect with their love of engineering by mentoring younger students; many report increased interest in making teaching and mentoring a part of their future plans. As students brainstorm innovative solutions through team-based projects, they develop critical skills in problem-solving, teamwork, and creative thinking, essential for their pursuit of excellence in engineering.

WTP

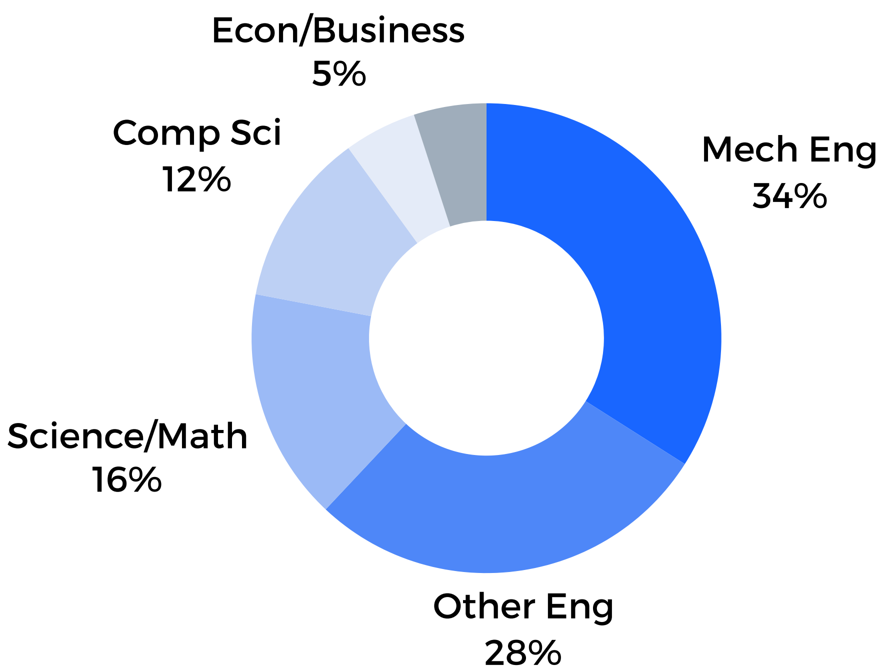
Application Deadline: Dec 15 (annually)
2026 Program Dates: 6/27 - 7/25

SHAPING THE FUTURE OF ENGINEERING

WTP's high demand is evident each year, with hundreds of applicants vying for just 20 coveted spots. Since its establishment in 2006, the program has positively influenced the lives of nearly 360 students and 150 staff. Among those WTP alumni who have declared their college majors, more than 70% have opted for engineering or computer science. So far, 75 students have matriculated at MIT, with an impressive 80% selecting majors within the School of Engineering.

The program's alumni include Maha Haji, now an assistant professor of mechanical and aerospace engineering at Cornell University. Another standout, Madeline Salazer MIT '13, was recently recognized by Forbes 30 Under 30 for her outstanding contributions as technology manager for additive and digital manufacturing at Northrup Grumman. Catlin Reyda MIT '11, SM '14, an engineering program manager at Lumafield, credits WTP-ME for her career trajectory. "The program taught me that mechanical engineering has a much broader scope than I had ever imagined," she says. "Without WTP, I might not be pursuing the career I am today. The program really changed my life."

WTP ALUMNI UNDERGRADUATE MAJORS

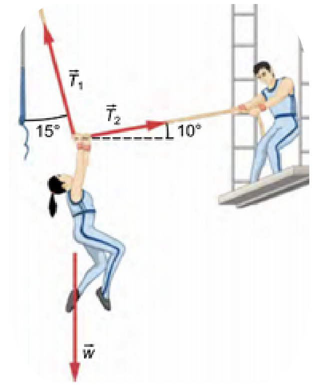


The impact of WTP extends beyond individual success stories. By nurturing the next generation of engineers from diverse gender backgrounds, the program not only promotes equity but also enhances the engineering field with a greater range of viewpoints. This diversity is crucial for solving the world's greatest challenges.

Coursework

Program Overview

Students are invited to take part in their own active learning.

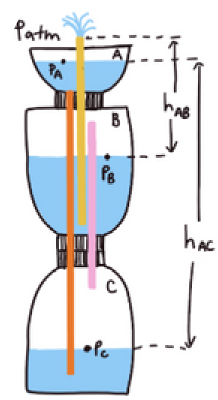


Forces & Free Body Diagrams

1. Become familiar with identifying and organizing relevant information in engineering problems
2. Become familiar with making assumptions and modeling real systems
3. Understand how to analyze physical systems of forces

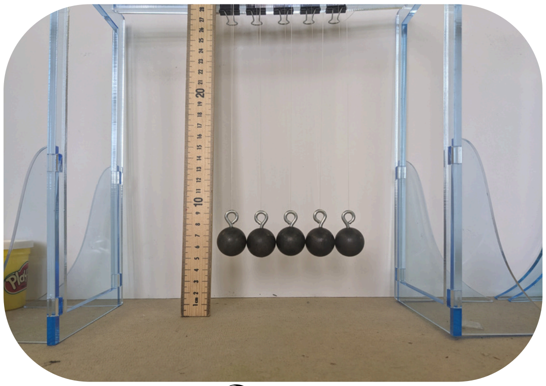
Trajectories

1. Explain the relationships between position, velocity, and acceleration
2. Apply kinematic equations to given scenarios
3. Solve two-dimensional problems using kinematics



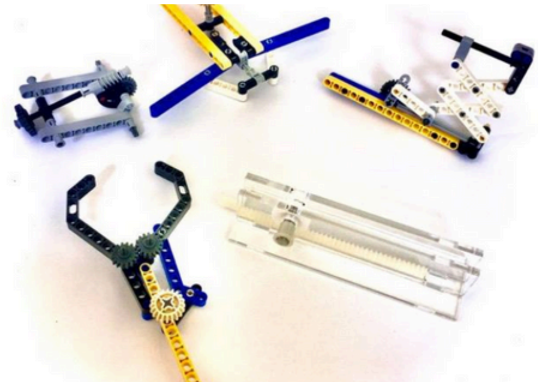
Fluids

1. Gain intuition for fluids systems and the relationships between fluid speed and pressure.
2. Conduct back-of-the-envelope calculations using assumptions to approximate real world conditions.



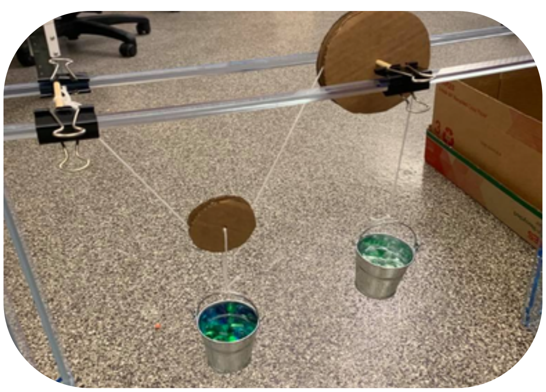
Energy & Momentum

1. Describe the relationship between mass, velocity, linear momentum, and energy
2. Analyze how mass, velocity and linear momentum, and energy change in different types of collisions
3. Design systems of objects and predict how they will behave



Rotational Motion

1. Use polar coordinates to find angular displacements, velocities, and accelerations.
2. Use periods and frequency to describe and design rotational systems.
3. Understand how a large or small moment can affect the dynamics of a design.

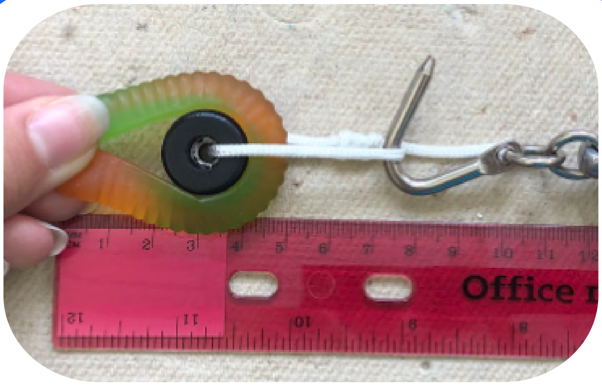


Static Torque

1. Describe the connection between forces and torques
2. Find the magnitude and direction of a torque.
3. Analyze simple static equilibrium problems using FBDs, and create similar real life systems that behave as expected

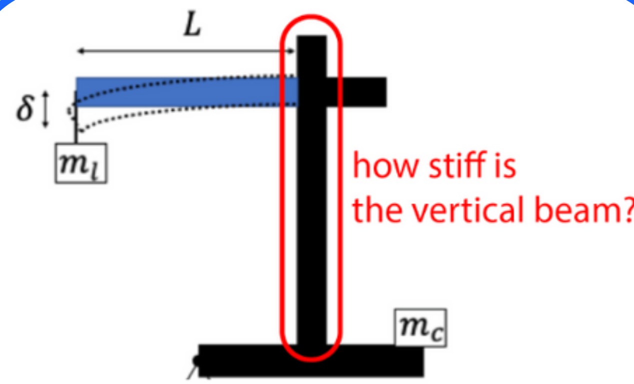
Motors & Gears

1. Learn basic principles of a DC motor
2. Select an appropriate DC motor
3. Understand gear ratios



Materials

1. Understand, calculate, and estimate stresses and strains
2. Identify elastic and plastic deformation
3. Characterize a material by its stress and strain relationship



Structures

1. Determine reaction forces and moments at beam supports
2. Compare area moments of inertia between different shaped beams
3. Compete the deflection from bending of a beam

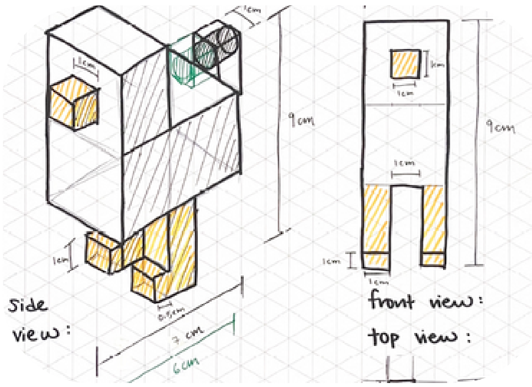
Crane Building

First Week Capstone Project

Students apply theoretical structures knowledge to physical design, practice their creativity and brainstorming skills in a group setting, and learn about the limitations of theoretical calculations in practice while building foam cranes

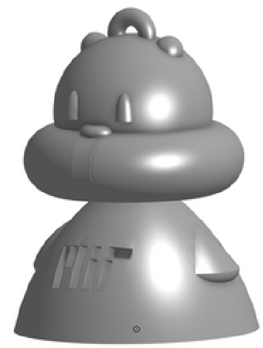
Creativity & Brainstorming

1. Enhance creativity and problem-solving skills
2. Become familiar with the idea generation process
3. Become familiar with the engineering design process



Drawing

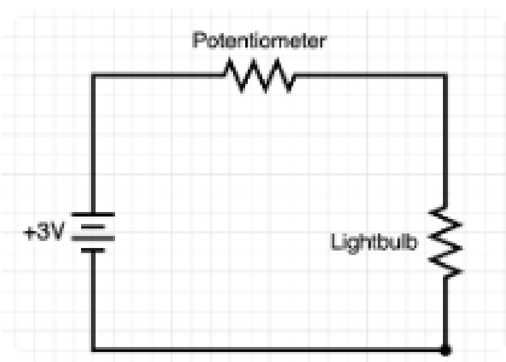
1. Understand the purpose and value of sketching
2. Understand the purpose and value of technical drawing
3. Read and create dimensioned drawings



Computer Aided Design

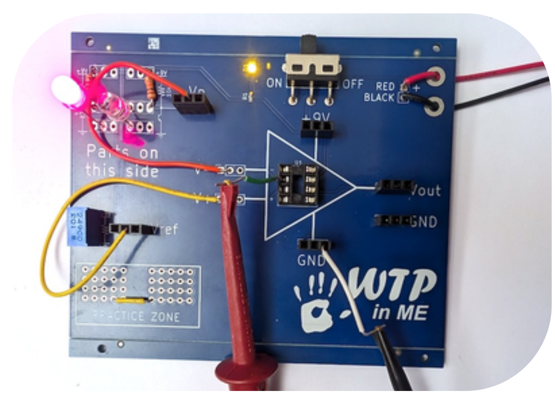
1. Introduction to CAD software tools and best practices
2. Learn how to create 3D models based on technical drawings

CAD drawings 3D printed for a take-home souvenir



Electronics & Circuits

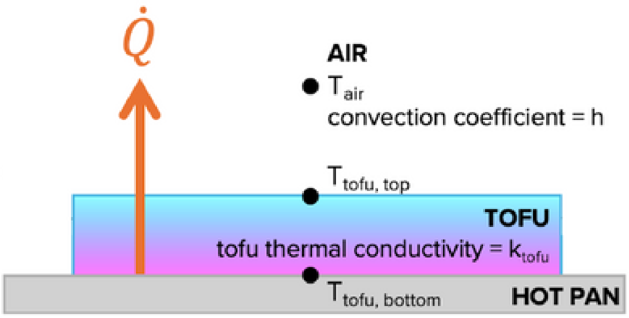
1. Understand the concepts of resistance and power in circuits
2. Learn about different configurations of circuits
3. Understand how to create simple circuits



Circuit Construction

Students learn to use a soldering iron safely and effectively while building a simple circuit they can understand and take home as a souvenir .

For more info, visit wtp.mit.edu



Heat Transfer

1. Gain intuition for the path heat is most likely to take in a system and the effect that heat will have
2. Conduct back-of-the-envelope calculations using assumptions to approximate real world conditions

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MAKE PLOTS
for d, ax in zip(d_values, axs.flatten()):
  # plot horizontal and vertical centerlines
  ax.hlines(y = 0, xmin = -R, xmax = R, linewidth = 1
  ax.vlines(x = 0, ymin = -R, ymax = R, linewidth = 1

  # plot spirographs
  x, y = spirograph(R, r, d) # calculate the x- and y
  color = random_RGB()       # sample a color by call
  ax.plot(x, y, color = color, lw = 3)

  ax.set_box_aspect(aspect = 1) # make sure the plot
```

Programming - Applying Equations to Real Systems

1. Explore diverse applications of computation
2. Use computation to balance competing requirements
3. Use numerical computation to predict performance from equations

Manufacturing

1. Learn about some commonly used manufacturing methods and processes
2. Think about tradeoffs between manufacturing methods
3. Understand the role of the supply chain in manufacturing

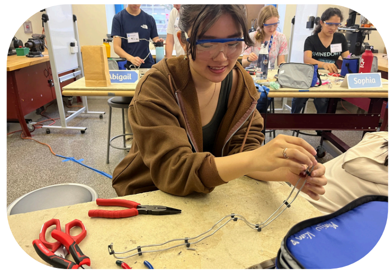
Take Apart

Students work in pairs to learn about some commonly used manufacturing methods and processes and how to think about tradeoffs between them.

Workshops & Showcases

Foam Cutter Build

Students gain confidences in their maker skills while building a hot wire foam cutter



Wire Bending

Students develop new fabrication skills while building a phone holder and a marble run.

Cardboard & Woodworking

Students are introduced to the drill press, band saw, and disk sander as they build a rotating marble track, which can be used in their Rube Goldberg machines.

Portfolios

Students learn how to showcase their work for future college and job applications.

Engineering Showcase

Students meet local engineers and learn about their work.

Tours & Activities

Shop Tour

Students receive a tour of the Pappalardo Lab and learn about the different machines and what kinds of manufacturing processes they perform.

Forge & Glass Lab Tour

Students receive a tour of the MIT glass lab and the Department of Material Science and Engineering Blacksmithing shop.

Visit Local Companies

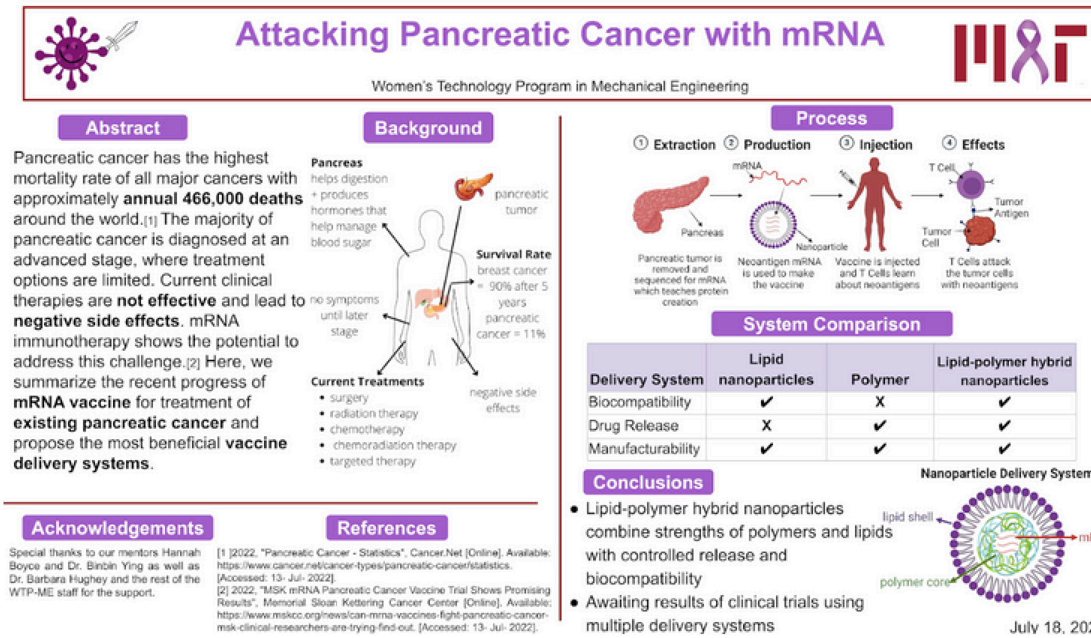
Students visit local engineering companies to learn more about what it looks like to practice engineering. Past tours have gone to Google, EPAM Continuum, and Pickle Robotics.

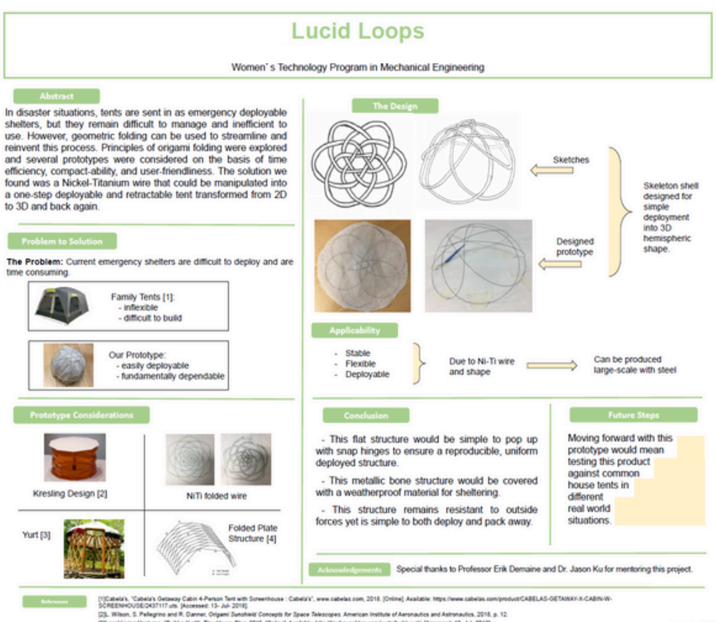
Measurement Activity

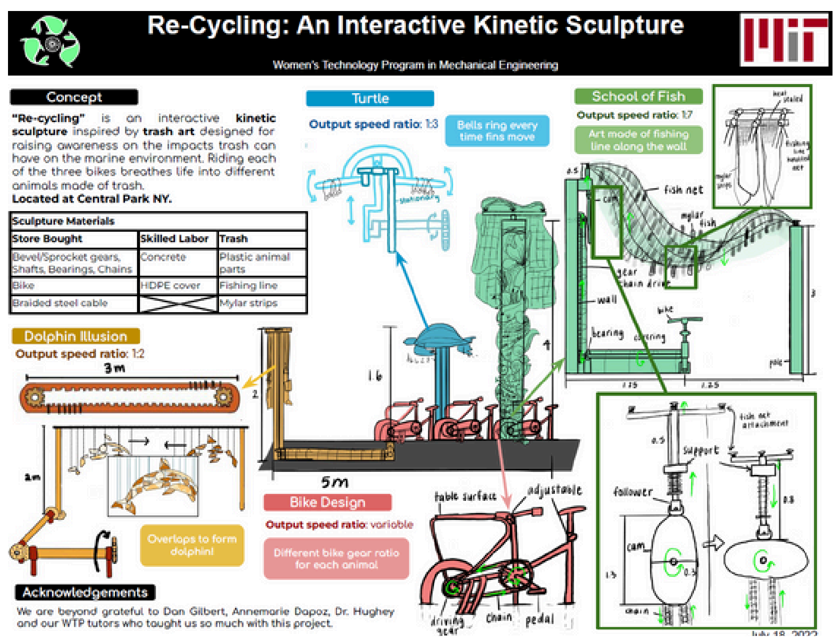
Students learn how to ask questions about the world around them and find answers using sensors and data processing.

Poster Project

WTP students work in pairs with MIT mentors on projects in a wide range of areas tailored to their interests. The poster project is an opportunity for students to combine interests in other areas with mechanical engineering, such as combining art with engineering to design a kinetic sculpture that includes recycled elements. Students can also connect to issues back home, such as designing rapid deployment shelters for disaster relief.







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Rube Goldberg Design Challenge

In this capstone project, students apply their knowledge from coursework to design, build, test (and re-design) a Rube Goldberg Machine, a complex machine that performs a simple task. Students also get to apply their maker skills and gain confidence in their ability to perform hands on work in teams.

Weekly Schedule

Week 1				
Monday	Tuesday	Wednesday	Thursday	Friday
Coursework				

Week 2				
Monday	Tuesday	Wednesday	Thursday	Friday
Coursework		Poster Projects and Tours		

Week 3				
Monday	Tuesday	Wednesday	Thursday	Friday
Poster Projects and Tours				

Week 4				
Monday	Tuesday	Wednesday	Thursday	Friday
Rube Goldberg Machine Design				