Intro to Engineering
Course Syllabus 2025-26

Torah High School

Instructor
Ms. Phan
mytienphan.mtp@gmail.com

Class times
Tuesday/ Thursday 2:00-2:45PM
Friday 1:10-2:00PM
Room 306

Course Description

This hands-on elective introduces students to the core disciplines of engineering through engaging, real-world projects. Over the course of the year, students will explore mechanical, civil, electrical, environmental, aerospace, and robotics engineering while developing skills in problem-solving, design thinking, technical sketching, prototyping, tool use, electronics, programming, and data analysis.

Working both individually and in small teams, students will complete a series of major builds and design challenges. Students will learn to use the engineering design process to plan, build, test, and iterate their ideas to present to peers. By the end of the year, students will apply their accumulated skills to a self-directed capstone project that addresses a real-world problem or need.

Major Units of Study

- Unit 1 – Engineering Foundations: Machines & Structures
  - Learn the engineering design process and explore key engineering disciplines
  - Explore careers in engineering
  - Develop foundational hands-on skills in mechanical systems and structural design
  - Practice teamwork, problem-solving, and communication

- Unit 2 – Wired Up: Circuits & Programming
  - Understand electricity, circuits, and basic programming concepts
  - Work with Arduino microcontrollers, sensors, and input/ output systems
  - Apply coding to control simple electronic devices
- Unit 3 – Energy in Motion: Turbines & Robots
  - Explore renewable energy principles and aerodynamics
  - Learn robotics basics – including motors, sensors, and navigation
  - Integrate mechanical electrical, and programming skills in applied builds
- Unit 4 – Capstone Project
  - Work in teams on a self-directed engineering project
  - Apply the full engineering design process from concept to prototype
  - Test, refine, and present a final interdisciplinary design

Grading Policies & Expectations

Late Work

Late work will be accepted for a period of one week after the due date and time, with a 5% deduction on the final grade per day late. After the 7-day mark, it will be accepted for 50% max credit until the end of the quarter. Each quarter students have 1 late-work freebie, where there will be no deduction for up to one week late (limited to individual assignments only). If unused by the end of the quarter, they will receive extra credit (1%).

Grade Weights

Skills Labs	10%
Activities	10%
Discussions	20%
Quizzes	20%
Projects	40%

Skills Labs

In-class, hands-on sessions focused on building foundational skills or practicing techniques learned in lecture. Examples include measurement and tool safety, breadboard wiring, or materials testing.

Activities

Short assignments that serve as first-steps for upcoming projects, both in-class and as homework. They are mostly individual, though there might be an occasional group activity. These may include design sketches, ideations, or programming practice.

Discussions

Guided prompts to reflect on learning, share ideas, and connect concepts to real-world engineering. May include project reflections, lab findings, lecture review, or analyzing videos/ articles. Students are also required to respond to at least one classmate's post or comment.

Quizzes (7 total)

Assess understanding of lecture content, discussion activities, skills labs, and project learning outcomes. Quizzes may be a mix of multiple-choice, matching, short answer, and applied problem-solving questions.

Projects

The core of this course, including both individual and team builds. Projects range from short "mini" challenges to multi-week "major" builds, integrating skills from lectures, labs, and activities. Students will follow the engineering design process to plan, build, test, iterate, and present their work.

"Mini" Projects: 1-day duration

- ➔ Q1: Marshmallow Tower Challenge (Team)
- ➔ Q1: Engineering Career Pathways (Team)
- ➔ Q1: Bridge Redesign Challenge (Team)
- ➔ Q2: Paper Circuit Art (Individual)
- ➔ Q2: Lights On! Breadboard Challenge (Individual)

"Major" Projects: Multi-week duration

- ➔ Q1: Cardboard Automata + Technical Report + Presentation (Individual)
- ➔ Q1: Popsicle Stick Bridge + Technical Report (Team)
- ➔ Q2: Input-Output Device + Technical Report + Presentation (Individual)
- ➔ Q3: Wind Turbine + Technical Report + Presentation (Team)
- ➔ Q3: Robot Racer + Technical Report (Individual)
- ➔ Q4: Capstone + Technical Report + Presentation (Team)

"Major" Project Breakdown

Technical report	60%
Build Execution	20%
Participation & Engagement	20%

Required Materials

- ➔ Notebook or journal: for sketches, notes, and project planning
- ➔ Writing tools (ideally multiple colors): pens, pencils, erasers
- ➔ Ruler & Measuring tape: for accurate measurement and drawing
- ➔ Basic calculator (smartphone is fine)

Optional but helpful:

- ➔ Laptop or tablet for research and programming
- ➔ Personal USB drive: to save digital work and code
- ➔ Safety glasses
- ➔ Scientific calculator

Note: Most specialized tools and materials (electronic kits, craft supplies, Arduino boards, etc.) will be provided in class. Students should come prepared with their notebook and basic supplies every day (I will let them know what materials are needed for each assignment).

Tips for Success

Show up, jump in, and stay curious. Try your best every day, ask questions, and help your classmates when you can. Work together, share ideas, and be open to trying (and sometimes failing) new things. Stay on top of your work, and remember – the more you participate, the more you'll get out of the class.

Course Outline

Note: Subject to change.

Date	In-Class Topics	To-Do
Tues, Aug 26 **START OF SEMESTER I**	Welcome + Course syllabus	First Day questionnaire - **Due Fri, Aug 29**
Thurs, Aug 28	Lecture: Intro to Engineering & Design Thinking	
Fri, Aug 29	Project Session: Marshmallow Tower Challenge (Team)	Discussion: Project reflection - **Due Sun, Aug 31** QUIZ 1: What is Engineering & the Design Thinking Process? - **Due Sun, Aug 31**
Tues, Sep 2	Lecture: Machines & Mechanical Engineering Lecture: Measurement & Sketching Skills Lab: Measurement Accuracy	Reminder: Back to School Night (Wed, Sep 3 7PM)
Thurs, Sep 4	Skills Lab: Technical Sketching	Discussion: Visual Communication - **Due Fri, Sep 5**
Fri, Sep 5	Lecture: Basic Mechanisms (Cams & Followers) Start Activity: Automata design sketching	Activity: Automata design sketching - **Due Sun, Sep 7**
Tues, Sep 9	In-Class Activity: Automata design revisions Project Session: Automata Prototyping	
Thurs, Sep 11	Project Session: Automata Prototyping	
Fri, Sep 12	Project Session: Automata Prototyping	Discussion: Project reflection - **Due Sun, Sep 14**

Tues, Sep 16	Automata Peer Feedback Project Session: Automata Iterations	
Thurs, Sep 18	Project Session: Automata Iterations	Reminder: Prepare for Automata Presentations (**Fri, Sep 19**)
Fri, Sep 19	Automata Presentations	Automata Technical Report - **Due Sun, Sep 21** Discussion: Project reflection - **Due Sun, Sep 21** Team Feedback - **Due Sun, Sep 21**
Tues, Sep 23	NO SCHOOL - Rosh Hashana	
Thurs, Sep 25	Lecture: Engineering Disciplines	
Fri, Sep 26	Lecture: Career Talk	Discussion: Engineering Interests - **Due Sun, Sep 28** QUIZ 2: Engineering Disciplines - **Due Sun, Sep 28**
Tues, Sep 30	Project Session: Engineering Career Pathways (Team)	
Thurs, Oct 2	NO SCHOOL - Yom Kippur	
Fri, Oct 3	NO SCHOOL - Sukkot Break	
Tues, Oct 7	NO SCHOOL - Sukkot Break	
Thurs, Oct 9	NO SCHOOL - Sukkot Break	
Fri, Oct 10	NO SCHOOL - Sukkot Break	
Tues, Oct 14	NO SCHOOL - Sukkot Break	
Thurs, Oct 16	NO SCHOOL - Sukkot Break	
Fri, Oct 17	NO SCHOOL - Sukkot Break	

Tues, Oct 21	Lecture: What is Structural (Civil) Engineering? Skill Lab: Test Truss	Discussion: Lab findings - **Due Fri, Oct 24**
Thurs, Oct 23	Lecture: Blueprints Start Activity: Bridge Design Ideations	Activity: Bridge Design Ideations - **Due Fri, Oct 24**
Fri, Oct 24	Project Session: Bridge Blueprints (Team)	Bridge Blueprints - **Due Sun, Oct 26**
Tues, Oct 28	Project Session: Bridge Blueprint Revisions + Start Construction (Team)	
Thurs, Oct 30	Project Session: Bridge Construction (Team)	
Fri, Oct 31	Project Session: Bridge Construction (Team)	Discussion: Project reflection - **Due Sun, Nov 2**
Tues, Nov 4	Project Session: Bridge Construction (Team)	
Thurs, Nov 6	Project Session: Bridge Construction (Team)	
Fri, Nov 7	Project Session: Bridge Construction (Team)	Discussion: Project reflection - **Due Sun, Nov 9**
Tues, Nov 11	Bridge Load Test + Peer Feedback Project Session: Bridge Technical Report (Team)	Bridge Technical Report - **Due Thurs, Nov 13** Team Feedback - **Due Thurs, Nov 13**
Thurs, Nov 13	Project Session: Bridge Technical Report (Team)	
Fri, Nov 14 **END OF QI**	Project Session: Bridge Redesign Challenge (Team)	Discussion: Project reflection - **Due Sun, Nov 16**
Tues, Nov 18	Lecture: Quarter I Recap	QUIZ 3: Mechanical vs Civil Engineering - **Due Thurs, Nov 20**

Thurs, Nov 20	Lecture: Electricity 101 (Electrical Engineering) Skills Lab: Paper Circuits	Activity: Paper Circuit designs - **Due Fri, Nov 21** Reminder: Parent Conferences (TODAY - Thurs, Nov 20 7PM)
Fri, Nov 21	Project Session: Paper Circuit Art	Discussion: Project reflection - **Due Sun, Nov 23**
Tues, Nov 25	Lecture: Breadboard Basics Skills Lab: LED Circuits	
Thurs, Nov 27	**NO SCHOOL - Thanksgiving**	
Fri, Nov 28	**NO SCHOOL - Thanksgiving**	
Tues, Dec 2	Lecture: Series vs Parallel Circuits Skills Lab: Series LEDs	
Thurs, Dec 4	Skills Lab: Parallel LEDs	Discussion: Lab findings - **Due Fri, Dec 5**
Fri, Dec 5	Project Session: Lights On! Challenge	Discussion: Project reflection - **Due Sun, Dec 7**
Tues, Dec 9	Lecture: What is a microcontroller? Skills Lab: Arduino - Blink sketch (pt. 1)	
Thurs, Dec 11	NO CLASS (??) - Yom Iyun	
Fri, Dec 12	Skills Lab: Arduino - Blink sketch (pt. 2)	Discussion: Lab findings - **Due Sun, Dec 14**
Tues, Dec 16	Lecture: Sensors + Electrical Recap Skills Lab: Photoresistors	QUIZ 4: Electrical Review - **Due Thurs, Dec 18**
Thurs, Dec 18	Project Session: Input-Output Device Brainstorm + Materials List	
Fri, Dec 19	**NO SCHOOL - Winter Break**	
Tues, Dec 23	**NO SCHOOL - Winter Break**	

Thurs, Dec 25	NO SCHOOL - Winter Break	
Fri, Dec 26	NO SCHOOL - Winter Break	
Tues, Dec 30	NO SCHOOL - Winter Break	
Thurs, Jan 1	NO SCHOOL - Winter Break	
Fri, Jan 2	NO SCHOOL - Winter Break	
Tues, Jan 6	Project Session: Input-Output Device	
Thurs, Jan 8	Project Session: Input-Output Device	
Fri, Jan 9	Project Session: Input-Output Device	Discussion: Project reflection - **Due Sun, Jan 11**
Tues, Jan 13	Project Session: Input-Output Device	
Thurs, Jan 15	Input-Output Device Peer Feedback Project Session: Input-Output Device Iterations	
Fri, Jan 16	Project Session: Input-Output Device Iterations	Reminder: Prepare for Input-Output Device Presentations (**MIDTERM**)
Tues, Jan 20	Modified Schedule (MIDTERMS)	
Thurs, Jan 22	Modified Schedule (MIDTERMS)	
Fri, Jan 23 **END OF QII**	Modified Schedule (MIDTERMS)	Input-Output Device Technical Report - **Due Sun, Jan 25** Discussion: Project reflection - **Due Sun, Jan 25** Team Feedback - **Due Sun, Jan 25**
Tues, Jan 27 **START OF SEMESTER II**	Lecture: Must've been the wind... (Energy Conversion)	Discussion: Renewable Energy - **Due Fri, Jan 30**
Thurs, Jan 29	Lecture: It's not rocket science (jk it is - Aerodynamics)	

Fri, Jan 30	Skills Lab: Test Blades	Activity: Wind turbine design ideations - **Due Thurs, Feb 5**
Tues, Feb 3	**NO SCHOOL - Purim**	
Thurs, Feb 5	In-Class Activity: Wind turbine design ideations Project Session: Wind Turbine Prototyping (Team)	
Fri, Feb 6	Project Session: Wind Turbine Prototyping (Team)	Discussion: Project reflection - **Due Sun, Feb 8** QUIZ 5: Energy & Aerodynamics - **Due Sun, Feb 8**
Tues, Feb 10	Project Session: Wind Turbine Prototyping + Voltage Test 1 (Team)	
Thurs, Feb 12	Project Session: Wind Turbine Iterations (Team)	
Fri, Feb 13	Project Session: Wind Turbine Iterations + Voltage Test 2 (Team)	Discussion: Project reflection - **Due Sun, Feb 15**
Tues, Feb 17	Project Session: TWind urbine Iterations (Team)	
Thurs, Feb 19	Project Session: Wind Turbine Iterations + LED Test (Team)	
Fri, Feb 20	Project Session: Wind Turbine Final Optimizations (Team)	Reminder: Prepare for Wind Turbine Presentations (**Fri, Feb 27**) Discussion: Project reflection - **Due Sun, Feb 15**
Tues, Feb 24	Project Session: Wind Turbine Technical Report/ Presentation Prep (Team)	
Thurs, Feb 26	Project Session: Wind Turbine Technical Report/ Presentation Prep (Team)	

Fri, Feb 27	Wind Turbine Presentations	Wind Turbine Technical Report - **Due Sun, Mar 1** Discussion: Project reflection - **Due Sun, Mar 1** Team Feedback - **Due Sun, Mar 1**
Tues, Mar 3	Lecture: Intro to Robotics Skills Lab: Motors	Discussion: Lab findings - **Due Thurs, Mar 5**
Thurs, Mar 5	Skills Lab: Motors & Arduino	
Fri, Mar 6	In-Class Activity: Back & Forth (programming)	
Tues, Mar 10	Lecture: Robot Wayfinding	
Thurs, Mar 12	In-Class Activity: Color detection (programming)	
Fri, Mar 13	In-Class Activity: Testing + Debugging (programming)	QUIZ 6: Robot Basics - **Due Sun, Mar 15**
Tues, Mar 17	Project Session: Robot Assembly	
Thurs, Mar 19	Project Session: Robot Assembly	
Fri, Mar 20	Project Session: Robot Assembly Robot Track Test	Discussion: Project reflection - **Due Sun, Mar 1**
Tues, Mar 24	NO CLASS (??) - Yom Iyun	
Thurs, Mar 26	Project Session: Robot Iterations	
Fri, Mar 27 **END OF QIII**	Robot Race Track	Robot Technical Report - **Due Tues, Apr 14** Discussion: Project reflection - **Due Tues, Apr 14**
Tues, Mar 31	NO SCHOOL - Pesach Break	
Thurs, Apr 2	NO SCHOOL - Pesach Break	

Fri, Apr 3	NO SCHOOL - Pesach Break	
Tues, Apr 7	NO SCHOOL - Pesach Break	
Thurs, Apr 9	NO SCHOOL - Pesach Break	
Fri, Apr 10	NO SCHOOL - Pesach Break	
Tues, Apr 14	Modified Schedule (Yom Hashoah) Lecture: Skills & Knowledge Recap Lecture: Ethics in Engineering	Activity: Capstone Project Ideas - **Due Thurs, Apr 16**
Thurs, Apr 16	Project Session: Capstone Brainstorm (Team)	
Fri, Apr 17	Project Session: Capstone Brainstorm (Team)	Discussion: Project reflection - **Due Sun, Apr 19** QUIZ 7: Ethics & Impact - **Due Sun, Apr 19**
Tues, Apr 21	Modified Schedule (Yom Hazikaron) Project Session: Capstone Proposal Prep (Team)	
Thurs, Apr 23	Project Session: Capstone Proposal Prep (Team)	
Fri, Apr 24	Capstone Proposals + Material List	Discussion: Project reflection - **Due Sun, Apr 26**
Tues, Apr 28	Project Session: Capstone (Team)	
Thurs, Apr 30	Project Session: Capstone (Team)	
Fri, May 1	Project Session: Capstone (Team)	Discussion: Project reflection - **Due Fri, May 3**
Tues, May 5	(AP EXAMS) Project Session: Capstone (Team)	
Thurs, May 7	(AP EXAMS) Project Session: Capstone (Team)	

Fri, May 8	(AP EXAMS) Project Session: Capstone (Team)	Discussion: Project reflection - **Due Fri, May 10**
Tues, May 12	(AP EXAMS) Project Session: Capstone (Team)	
Thurs, May 14	(AP EXAMS) Project Session: Capstone (Team)	
Fri, May 15	(AP EXAMS) Project Session: Capstone (Team)	Discussion: Project reflection - **Due Fri, May 17**
Tues, May 19	Project Session: Capstone (Team) Functionality Checkpoint	Capstone Checkpoint Report - **Due Tues, May 26**
Thurs, May 21	**NO SCHOOL - Shavuot**	
Fri, May 22	**NO SCHOOL - Shavuot**	
Tues, May 26	Capstone Testing + Peer Feedback Project Session: Capstone Iterations (Team)	
Thurs, May 28	Project Session: Capstone Iterations (Team)	
Fri, May 29	Project Session: Capstone Iterations (Team)	Reminder: Prepare for Capstone Presentations (**FINAL**)
Tues, Jun 2	Modified Schedule (FINALS)	
Thurs, Jun 4	Modified Schedule (FINALS)	

Fri, Jun 5 **END OF SEMESTER II**	Modified Schedule (FINALS)	Capstone Technical Report - **Due Sun, Jun 7** Discussion: Project reflection - **Due Sun, Jun 7** Team Feedback - **Due Sun, Jun 7** Course Reflection - **Due Sun, Jun 7**
Mon, Jun 15	HAPPY GRADUATION!!! 🥳🥳🥳	