Engineering 1
Kehillah Jewish High School

Dr. Zachi Baharav

Room 213

zbaharav@kehillah.org

Course Description

Engineering 1 is a project based elective for students who are interested in integrating hardware and software into their projects. We will be using the Arduino, a palm-sized programmable microcontroller, to interface with various input sensors and output devices to create embedded systems that accomplish a given task. Students will be introduced to various aspects of engineering design and implementation, and will work on mini-projects throughout the semester. The mini-projects are designed to demonstrate the concepts learned, and to build student proficiency in designing with the Arduino platform. The students will build projects that require input devices (e.g. switches, light sensors, temperature sensors, distance sensors etc.) as well as output devices (e.g. motors, speakers, displays etc.). Some projects are very limited in scope and highlight specific subject, and will be done individually by the students. For example, using a temperature sensor and producing a visual output using light emitting diodes. Other projects are broader in scope, and more open in implementation, and will be done in collaborative manner within a small group. For example, using light sensor to direct a robot to follow a flashlight.

The course culminates with a final project, which will allow the students to demonstrate their creativity and mastery of the techniques. Students can collaborate in small groups (up to 3) on the final project. The project will include researching a subject, identifying risks and difficulties in implementation, planning budget and timeline, and following iterative prototyping process to explore tradeoffs. Some projects implemented in the past are electronic harp, interactive art exhibit, robot to solve a maze, and air-pollution monitoring.
The work on the final project will start early in the semester, in parallel to the course material, to allow enough time for the process. Throughout the process, the students will communicate their progress to the class, and will work to create a digital portfolio that showcases their original proposal, research, prototyping process, obstacles faced, refinements made, lessons learned and a demo of their project. The course will end with a final presentation of the team projects to the broader school community.

Availability and contacting me

I am open on blocks 1,2,8 and 9, and plan to be available during these times in room 213. Feel free to drop-in, or if you want to secure a specific date/time, Schoology message or email would work well. I am here to help.

Contacting me: Other than in person, the best way to reach me is through email at zbaharav@kehillah.org . I read emails daily on school-days, and will respond within 24-hours.

Required Materials

Textbook

The main book and kit we will be using:
"SparkFun Inventor's Kit Guide", by Sparkfun. Available online:
www.sparkfun.com/sikguide

Students need to purchase the kit, which contains also a booklet (also available as a PDF).

What to bring to class each day

1. Computer (Laptop on which you have installed the IDE, and on which you can write the programs)   ← You can either use your own, or let me know and we will arrange for one from the cart. BUT, you need to be consistent with your choice, and will need to have one in class!
2. The Arduino kit – We will have a place in class to store it, but if you do take it home, or work on it outside of class, you need to be sure to have it in here for class.

3. Enthusiasm and willingness to work and engage in class

Detailed course description

The course is project based, and in each unit the students complete an original project that demonstrates their understanding of the subjects learned. In addition, each project includes reading and research components, as well as writing and communication elements. The reports are shared on the course web-page by the students, and at times are also shared as oral presentations.
Each unit description below includes the following 5 elements:
- Topics covered
- Project   (as part of assignments)
- Research - Reading   (as part of assignments)

- Report   - Writing   (as part of assignments)
- Formal assessment

From Unit 03, an additional component is added to the assignments: Final project. The students will have each week assignment related to the Final-project, helping them to stay on track.

** MUCH more detailed description is available on the course webpage and Schoology. **

Unit 01 – Introduction to Arduino
Project: "Morse-code" – Modifying the Arduino program to transmit a pre-determined Morse code using the blinking LED.

Unit 02 – Circuits
Project: "Array of light emitting diodes" – A code controlled chain (or matrix) of light emitting diodes, and turning these on and off in a predefined sequence.

Unit 03 – Digital and Analog, potentiometer
Project: "Perceiving color using only red, green, and blue diodes" – Write a program that produces a predefined sequence of colors.

Unit 04 – Inputs: buttons, photoresistor, and temperature sensor
Project: "In-N-Out" – Combines input-and-output. The students will need to choose a project to demonstrate the concepts, and some of the possible projects are: Modify the Morse-code project to take the input from a push-button, and translate it to light emitting diode output; Use the color producing project to reflect input from a temperature sensor; Using light-sensing to detect line-breaking.

Unit 05 – Communication with Arduino: Liquid Crystal Display (LCD) and Processing
Project: Add to any of the previous projects a connection to either a liquid crystal display, or to Processing. For example, connect the light line-breaker (photoresistor project) to Processing to produce a sound every time the line of light is broken.
Learning goals: Reflection on and improvement of previous project.

Unit 06 – Motors and Servos- get things moving
Project: "Button controlled robot" – Build a robot, including at least one-motor, that can be controlled by buttons. More advanced robots can be controlled by light sources or the use of other sensors or other input methods (e.g, Processing).
Learning goals: Create a moving robot. Motion and control loops. Driving a high-power component.

Unit 07 – Final project focus
Preparing all the components for the final project conclusion: Working project, web-page, poster, and oral-presentation.

Academic Integrity
Academic integrity is essential to every academic institution. Students are expected to honor this value by acting honestly in every aspect of their academic lives. Violating academic integrity is contrary to Kehillah's core values and will be grounds for disciplinary action. Kehillah students are expected to perform and produce their own work. Substitution of another's work for one's own violates the school's expectation of academic integrity and impedes the intellectual growth of the student.
Academic Dishonesty Includes:

• Presenting as one's own an idea or statement taken in full or in part, or even paraphrased, from some other source – whether another person (such as a tutor or parent), a published work (including electronic and on-line publications), or another student's work.
• Using unauthorized notes or other aids in a test, or copying from or being influenced by another student's work (orally or visually) during a test, quiz, etc., or seeking unauthorized information about a test or quiz.
• Giving unauthorized aid to another student; allowing another student to copy or use one's test, paper, or homework; telling another student what was on a test that could be given to another student at a later time.
• Submitting papers or other work already produced for another course without the approval of both teachers.
• Obtaining help (from a parent, tutor, another teacher, or another student) on homework or take-home tests that exceeds the limits specified by the teacher assigning the work.

The Dean of Students will review the incident and determine the next steps which may include loss of credit for the assignment or test, an academic or disciplinary contract, suspension, and/or expulsion.

Assessment Methods

Grade Weighting
Formal assessments (tests and quizzes) – 20%
Homework – 40%
Final project – 25%
Timeliness – 10%
Class participation – 5%

1. Homework

Projects. Most include hardware implementation, coding, researching, writing and documenting. Please note the timeliness requirement!

2. Class participation

During class, you are expected to take an active part in the process of exploring and practicing. You ALWAYS have the option of saying 'pass' when asked, and skip your turn, and it will not count against you in any way, shape or form. Be sure though that you are not skipping your turn too often. Your answer is not evaluated for correctness, but rather for its intention and involved thought process.

4. Tests and quizzes

Tests will be cumulative throughout the year. At least a week notice will be given, and appropriate accommodations made. Quizzes are much shorter in time, and will be more frequent.

5. Collaboration

You are welcome (and are encouraged!) to collaborate on homework and class assignments, unless specifically otherwise specified.
However, you are required to submit your own original work. In this regard, giving your work for someone else to copy is NOT ok. Describing and explaining your work to them is encouraged.

6. Using web resources

You are expected and encouraged to use the Web as a tool in your learning. There are many very good tutorials available, as well as examples.
However, you need to clearly understand that COPYING an answer from the Web is plagiarism, and is not accepted. If in doubt, please come and see me first.

Class behavior guidelines

Students are expected to behave according to, and in a manner encouraging, our four commitments:

Our Four Commitments

1. Everyone counts.
2. Everyone has equal access to great learning.
3. Every person's unique talents are valued equally.
4. We take responsibility for ourselves, our learning, and our community.

I expect us all to be courteous and respectful to fellow community members. Specific items for my class:

1. Please NO FOOD or DRINKS in the classroom (during class, or when you come on open-block times).
2. Taking pictures of class material is ok, but no other cell-phone usage.
3. Working on computers and mobile devices when directed is ok, but please no un-related web-activity.
4. Raising your hand and asking to leave class is ok, but please don't leave without being dismissed.

Timeliness Policy

a. Assignments are given two separate grades: one on quality/content/ accuracy and the other on timeliness.
b. Timeliness as a category is 10% of the final semester grade.
c. Students have five school days past the agreed upon due date to turn in work. Past the five days, assignments are not accepted. At this point, the work receives a zero for both timeliness and content.
d. If an assignment is submitted by the due date, it receives 100% for timeliness and a separate grade for content. If an assignment is turned in after the due date, but before the five school day window has closed, it receives 60% for timeliness, but may receive up to 100% for the content of the assignment.
e. Tests and quizzes must also be completed within the five school day window after an excused absence. After the five-day window passes, students are no longer allowed to make up the test or quiz. If students arrange extensions with their teachers, the five-day countdown begins after the agreed-upon due date.

Grading Scale

93-100	A		73-76	C
90-92	A-		70-72	C-
87-89	B+		67-69	D+
83-86	B		63-66	D
80-82	B-		60-62	D-
77-79	C+		Below 60	F

===== Next page is signing page =====

------------- Syllabus signing page – Please return to teacher ------------------------------

I look forward to an exciting, productive, and enjoyable year.

Student Signature

I have read and understand the course syllabus and will adhere to the expectations of my **Engineering 1** class.

Name (print): _____   Block: _____

Signature: _____   Date: _____

Parent/ Guardian:

The following information will help me contact you, if the need should arise. Please select any or all of the following contact options:

Phone: _____
email: _____

I prefer to be contacted by way of: _____.

I have read the course syllabus and will contact Dr. Baharav if I have concerns or questions about the progress of my student in **Engineering 1** class.

Parent/Guardian (print):_____

Signature:_____ Date:_____

======== **End** =======