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Summary

Typical Day

1 hour – Pre-class independent study

- Watch pre-recorded presentations or read short documents that explain new content. Each video is short and has built-in quiz questions to test your understanding.
- Test your knowledge with simple practice problems.
- Reach out to teachers by Microsoft Teams chat with questions.
- Develop questions to ask during the synchronous class meeting.

3 hours – Class meeting

- Join the synchronous video call with all teachers and students at the same time each weekday.
- Participate in three 50-minute sessions with 15-minute breaks between them.
- Work in small groups to solve practice problems or complete hands-on labs, projects, and design activities.
- Get to know your classmates.
- Receive real-time support from teachers or classmates when you have a question.

1.5 hours – Homework

- Demonstrate your understanding of the content through individual activities.
- Activities include design challenges, quantitative and/or qualitative analysis, and short essays.

Deliverables Due at the Beginning of Class

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<td>Group Elec Proj Elect assign</td>
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## Summary of Time Allocated Each Day

<table>
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<th>Time</th>
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<td>Class wk 1</td>
<td>Introductions</td>
<td>Orientation</td>
<td>Fermi Units pract</td>
<td>TeCom practice Mouse Design</td>
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<td>HW</td>
<td>Mouse Design</td>
<td>Units assign</td>
<td>Mouse Design</td>
<td>Excel assign</td>
<td>Tension Lab</td>
</tr>
</tbody>
</table>

| Pre  | Matr 2 lect/qz          | Matr 3 lect/qz            | Error lect/qz            | Ethics lect/qz            |
| Class wk 2 | Bending Lab                 | Buckling Lab             | Error practice Buckling Lab Error assign | Ethics practice Ethics Project |
| HW   | Bending Lab              | Buckling Lab             | Error assign             | Ethics Project            |

| Pre  | Static 1 lect/qz         | Static 2 lect/qz         | Group Bridge             | Indiv Bridge              | Finance lec/qz          |
| Class wk 3 | Statics pract            | Statics pract            | Group Bridge             | Indiv Bridge              | Finance pract Finance assign |
| HW   | Indiv Bridge             | Statics assign           | Statics assign           | Indiv Bridge              | Indiv Bridge            |

| Pre  | Indiv Bridge             | Elec 1 lect/qz           | Elec 2 lect/qz           | Group Electr              | Indiv Electr            |
| Class wk 4 | RFP                    | Elec practice            | Elec practice            | Group Electr              | Indiv Electr            |
| HW   | Indiv Bridge             | Indiv Bridge             | Electr assign            | Electr assign             | Indiv Electr            |

| Pre  | Indiv Electr             | Indiv Electr             | Chem Pr lec/qz           | Chem Pr assig             | Elec peer rev            |
| Class wk 5 | Indiv Electr              | RFP                     | Chem Pr pract            | Chem Pr assig             | RFP present Closeout     |
| HW   | Indiv Electr             | RFP                     | Chem Proc Lab            | CP Lab + assign           | Course Eval             |
Week 1 Monday

Learning Objectives

a. List the steps in the Engineering Design Process.
c. Identify the relevant Engineering Design Process step for a given action.
d. Apply the Engineering Design Process to solve an open-ended engineering challenge.
e. Create visual and/or written instructions for a simple engineering design (physical device, process, or computer program).

Lab Kit Materials

Independent study: None

Class meeting: None

Homework: View the Mousetrap Design Project for a list of materials.

Activities

Independent study: Read the syllabus. Watch the Engineering Design video lectures and complete the quiz.

Class meeting agenda:

1. [10 min] Welcome to EEI and technology check.
2. [15 min] Icebreaker
3. [10 min] Teacher introductions.
4. [15 min] Review the syllabus and course policies.

5. [35 min] Introduction to Canvas, Microsoft Teams, and Microsoft Office.
6. [15 min] Start work in small group breakout rooms to complete the Engineering Design practice problems.

7. [35 min] Continue work in small group breakout rooms to complete the Engineering Design practice problems.
8. [15 min] Review answers to the Engineering Design practice problems as a class.

Homework: Find the Circuit Playground Express (CPX) in your lab kit (Electronics) and plug it into your computer. Check the bootloader on your CPX and make plans to update it, if necessary. You will need the CPX in week 4. Then, start the Mousetrap Design Project.

Due Soon

The Mousetrap Design Project is due before Thursday’s class.
Week 1 Tuesday

Learning Objectives

a. Differentiate between the concepts of dimensions and units.
b. List at least three primitive dimensions.
c. Identify common units for length, mass, time, force, pressure, stress, energy, and power in the SI and English measurement systems.
d. List examples of dimensionless variables.
e. Convert values from one set of units to another.
f. Check the dimensional consistency of a physical measurement.
g. Check the dimensional consistency of an equation.
h. Determine the units or dimensions of an undefined variable, given a valid equation containing that variable.
i. Calculate the power (exponent) of a variable necessary to make an equation dimensionally consistent.
j. Choose which units (including unit system and prefix) are most appropriate for a given engineering context.

Lab Kit Materials

Independent study: None

Class meeting: None

Homework: None

Activities

Independent study: Watch the Units and Dimensions video lectures and complete the quiz.

Class meeting agenda:

1. [15 min] Icebreaker
2. [35 min] Work in small group breakout rooms to complete the Units and Dimensions practice problems.
3. [15 min] Review answers to the Units and Dimensions practice problems as a class.
4. [35 min] Work in small group breakout rooms to complete the Fermi problems.
5. [15 min] Review answers to the Fermi problems as a class.
6. [35 min] Work on the Units and Dimensions Assignment in small group breakout rooms. Every student should complete their own work, but the small group and teachers are available to help.

Homework: Complete the Units and Dimensions Assignment and upload it to Canvas.

Due Soon

The Units and Dimensions Assignment is due before tomorrow’s class. The Mousetrap Design Project is due before Thursday’s class.
Week 1 Wednesday

Learning Objectives

a. Explain how to document an engineering analysis so that it is reproducible.
b. Explain the purpose of each section in a lab report.
c. Identify the audience and their expectations for a given situation.
d. Create tables, figures, and equations with labels and captions (tables/figures only) and use the labels when referencing the object.
e. Explain engineering analysis by writing out equations prior to substituting values, defining all variables, stating assumptions, and including units in all calculations.

Lab Kit Materials

**Independent study:** None

**Class meeting:** View the Mousetrap Design Project for a list of materials.

**Homework:** View the Mousetrap Design Project for a list of materials.

Activities

**Independent study:** Watch the Technical Communication video lectures and complete the quiz.

**Class meeting agenda:**

1. [15 min] Icebreaker
4. [25 min] Review answers to the Technical Communication practice problems as a class.
5. [50 min] Continue work on the Mousetrap Design Project.

**Homework:** Complete the Mousetrap Design Project and upload it to Canvas.

Due Soon

The Mousetrap Design Project is due before tomorrow’s class.
**Week 1 Thursday**

**Learning Objectives**

a. Demonstrate an understanding of best practices in technical communication by providing constructive feedback on engineering work.

b. Construct a data table in Excel that is clearly labeled and includes units.

c. Plot data using scatter charts, line charts, pie charts, column charts and/or bar charts using Excel.

d. Demonstrate use of Excel’s sorting and filtering features.

e. Choose number formatting (number, date, percent, etc.) and quantity of decimal places that best represents the data.

f. Determine power-law relationships using log-log plots.

g. Determine exponential relationships using semi-log plots.

h. Plot data in an Excel scatter chart with a linear line of best fit and determine the equation for the fit line.

i. Calculate the mean and standard deviation for a set of data using Excel.

j. Calculate values in Excel using mathematical operators (+-*/^) and basic functions (sum, count, average, stdev, min, max, if, sumif, maxifs, abs, sin, cos, …).

k. Calculate a value using bi-linear interpolation.

**Lab Kit Materials**

**Independent study:** None

**Class meeting:** View the Mousetrap Build Project for a list of materials.

**Homework:** None

**Activities**

**Independent study:** Watch the Excel video lectures and complete the quiz.

**Class meeting agenda:**

1. [15 min] Icebreaker
2. [35 min] Work in small group breakout rooms to complete the Excel practice problems.

3. [15 min] Review answers to the Excel practice problems as a class.
4. [35 min] Work on the Mousetrap Build Project in small breakout rooms. This is an individual activity, but the small group and teachers are available to answer any questions.

5. [50 min] Continue working on the Mousetrap Build Project. Once that is complete you can begin work on the Excel Assignment.

**Homework:** Complete the Excel Assignment and upload it to Canvas.

**Due Soon**

The Mousetrap Build Project is due before tomorrow’s class. The Excel Assignment is also due before tomorrow’s class.
Week 1 Friday

Learning Objectives

a. Define ultimate tensile strength and yield strength.
b. State the dimensions and common units of the following material properties: stress, strain, ultimate tensile strength, and yield strength.
c. List the parameters that affect the strength of a material in tension.
d. Calculate stress and strain in a material sample.
e. Calculate ultimate tensile strength and/or yield strength from a stress-strain curve.
f. Compare ultimate tensile strength and/or yield strength between two or more stress-strain curves.
g. Determine the conditions for a specific material sample to fail in tension.
h. Compare tensile strengths between material samples with differing dimensions.
i. Determine if a material is in tension in a real-world scenario.
j. Design an experiment to determine the ultimate tensile strength of a material.
k. Design a structural member to minimize the total material while still supporting the required load.
l. Determine power-law relationships using log-log plots.
m. Plot data in an Excel scatter chart with a linear line of best fit and determine the equation for the fit line.
n. Calculate the mean and standard deviation for a set of data using Excel.
o. Calculate values in Excel using mathematical operators (+-/*^) and basic functions (sum, count, average, stdev, min, max, if, sumif, maxifs, abs, sin, cos, …).
p. Create a concise, organized, and technically accurate report for a lab or project.

Lab Kit Materials

Independent study, Class meeting, Homework: None

Activities

Independent study: Watch the Materials 1 video lectures and complete the quiz.

Class meeting agenda:

1. [15 min] Icebreaker
2. [10 min] Teachers introduce the Materials Tension Lab activity.
3. [25 min] Work on the Materials Tension Lab in small breakout rooms. Every student should complete their own lab report and submit it to Canvas, but small group collaboration is encouraged.

4. [50 min] Continue working on the Materials Tension Lab in small breakout rooms.

5. [50 min] Continue working on the Materials Tension Lab in small breakout rooms.

Homework: Complete the Materials Tension Lab and upload it to Canvas.

Due Soon

The Materials Tension Lab is due before the next class.
Week 2 Monday

Learning Objectives

a. Define Young's modulus and explain how it characterizes a material.
b. List the parameters that affect the strength of a material in bending.
c. Explain how stress is distributed in a material undergoing bending.
d. Explain why some beams are shaped into I-beams, box girders, or hollow tubes.
e. Calculate stress, strain, or Young's Modulus using Hooke's Law.
f. Calculate Young's modulus from a stress-strain curve.
g. Compare properties of materials (Young’s modulus, ultimate tensile strength, yield strength, elastic/plastic deformation regions) from two or more stress-strain curves.
h. Calculate area moment of inertia for a circular beam or for another cross-section if the equation is provided.
i. Compare bending strengths between material samples with differing dimensions.
j. Calculate a load, dimension, or material property using the beam bending equation.
k. Determine if a material is in bending in a real-world scenario.
l. Design an experiment to determine the Young's modulus of a Hookean material.
m. Design a structural member to minimize the total material while still supporting the required load.
n. Determine power-law relationships using log-log plots.
o. Plot data in an Excel scatter chart with a linear line of best fit and determine the equation for the fit line.
p. Calculate the mean and standard deviation for a set of data using Excel.
q. Calculate values in Excel using mathematical operators (+-*/^) and basic functions (sum, count, average, stdev, min, max, if, sumif, maxifs, abs, sin, cos, …).
r. Create a concise, organized, and technically accurate report for a lab or project.

Lab Kit Materials

Independent study: None

Class meeting, Homework: View the Materials Labs (Bending) for a list of materials.

Activities

Independent study: Watch the Materials 2 lectures and complete the quiz.

Class meeting agenda:

1. [15 min] Icebreaker
2. [10 min] Teachers introduce the Materials Bending Lab activity.
3. [25 min] Work in small group breakout rooms on the Materials Bending Lab. Every student should complete their own lab report and submit it to Canvas, but small group collaboration is encouraged. Each student should collect data for one type of pasta and one span length, then share that data with their group.

4. [50 min] Continue working on the Materials Bending Lab in small breakout rooms.
5. [50 min] Continue working on the Materials Bending Lab in small breakout rooms.
Homework: Complete the Materials Bending Lab and upload it to Canvas.

Due Soon

The Materials Bending Lab is due before the next class.

Week 2 Tuesday

This is a federal holiday, so there is no class.

Week 2 Wednesday

Learning Objectives

a. List two ways that materials can fail in compression.
b. List the parameters that affect the strength of a material in compression.
c. Calculate area moment of inertia for a circular column or for another cross-section if the equation is provided.
d. Compare buckling strengths between material samples with differing dimensions.
e. Calculate a load, dimension, or material property using the Euler buckling equation.
f. Calculate the load needed to crush a material sample.
g. Determine if a material is in compression in a real-world scenario.
h. Design an experiment to determine the Young's modulus of a Hookean material.
i. Design a structural member to minimize the total material while still supporting the required load.
j. Create a concise, organized, and technically accurate report for a lab or project.
k. Create tables, figures, and equations with labels and captions (tables/figures only) and use the labels when referencing the object.
l. Explain engineering analysis by writing out equations prior to substituting values, defining all variables, stating assumptions, and including units in all calculations.
m. Construct a data table in Excel that is clearly labeled and includes units.
n. Determine power-law relationships using log-log plots.
o. Plot data in an Excel scatter chart with a linear line of best fit and determine the equation for the fit line.
p. Calculate the mean and standard deviation for a set of data using Excel.
q. Calculate values in Excel using mathematical operators (+-*/^) and basic functions.

Lab Kit Materials

Independent study: None

Class meeting, Homework: View the Materials Labs (Buckling) for a list of materials.

Activities

Independent study: Watch the Materials 3 video lectures and complete the quiz.

Class meeting agenda:

1. [15 min] Icebreaker
2. [10 min] Teachers introduce the Materials Bending Lab activity.
3. [25 min] Work in small group breakout rooms on the Materials Buckling Lab. Every student should complete their own lab report and submit it to Canvas, but small group collaboration is encouraged.

4. [50 min] Continue working on the Materials Buckling Lab in small breakout rooms.

5. [50 min] Continue working on the Materials Buckling Lab in small breakout rooms.

**Homework:** Finish writing your Materials Buckling Lab. You will have some time during the next class to review your work and ask any final questions before the lab is due.

**Due Soon**

The Materials Buckling Lab is due before Friday’s class.

**Week 2 Thursday**

**Learning Objectives**

a. Describe the concept of a frequency distribution.
b. Define mean and standard deviation.
c. Describe the two statistical values that characterize a Gaussian distribution.
d. Understand the difference between accuracy and precision.
e. Define systematic error and random error.
f. Describe strategies to reduce systematic and random errors.
g. Distinguish between error and uncertainty.
h. Determine the appropriate number of significant figures for a calculated or measured value.
i. Calculate relative uncertainty for a measurement given the absolute uncertainty or vice versa.
j. Estimate the maximum uncertainty for a calculation based on uncertainties in individual measurements.
k. Design an experiment or measurement to reduce measurement error.

**Lab Kit Materials**

**Independent study:** None

**Class meeting:** View the Error and Uncertainty Assignment for a list of materials.

**Homework:** View the Error and Uncertainty Assignment for a list of materials.

**Activities**

**Independent study:** Watch the Error and Uncertainty video lectures and complete the quiz.

**Class meeting agenda:**

1. [15 min] Icebreaker
2. [35 min] Work in small group breakout rooms to complete the Error and Uncertainty practice problems.

3. [15 min] Review answers to the Error and Uncertainty practice problems as a class.
4. [35 min] Work in small group breakout rooms to review and revise the Materials Buckling Lab
5. [50 min] Work on the Error and Uncertainty Assignment in small group breakout rooms. Every student should complete their own work, but the small group and teachers are available to help.

**Homework:** Complete the Materials Buckling Lab and upload it to Canvas. Also work on the Error and Uncertainty Assignment.

**Due Soon**

The Materials Buckling Lab is due before tomorrow's class. The Error and Uncertainty Assignment is due before Monday's class.

**Week 2 Friday**

**Learning Objectives**

- a. Describe the difference between morals, ethics, and laws.
- b. Describe the six fundamental cannons of the National Society of Professional Engineers (NSPE) Code of Ethics.
- c. Describe the importance of argumentation in engineering.
- d. Identify the NSPE Code of Ethics’ fundamental canons that apply to a given situation.
- e. Apply the NSPE Code of Ethics' fundamental canons to propose an ethical course of action for a given situation.
- f. Describe potential ethical factors in an engineering scenario, including, but not limited to, accessibility, health, sustainability, etc.

**Lab Kit Materials**

**Independent study, Class meeting, Homework:** None

**Activities**

**Independent study:** Watch the Ethics video lectures and complete the quiz.

**Class meeting agenda:**

1. [15 min] Icebreaker
2. [35 min] Work in small group breakout rooms to complete the Ethics practice problems.
3. [15 min] Review answers to the Ethics practice problems as a class.
4. [35 min] Work on the Ethics Project in small group breakout rooms. Every student should complete their own work, but the small group and teachers are available to help.
5. [50 min] Continue working on the Ethics Project in small group breakout rooms.

**Homework:** Complete the Error and Uncertainty Assignment and the Ethics Project and upload them to Canvas.

**Due Soon**

The Error and Uncertainty Assignment and Ethics Project (not including peer review) are due before Monday’s class.
Week 3 Monday

Learning Objectives

a. Demonstrate an understanding of best practices in technical communication by providing constructive feedback on engineering work.

b. Describe vector magnitude and vector direction.

c. Explain why forces in a static system must sum to zero at each point.

d. Distinguish between distributed loads and point loads on a structure.

e. Solve for the resulting force when two or more vectors are added, subtracted, or multiplied by a constant (either graphically or algebraically).

f. Calculate the perpendicular components of a vector (decompose the vector).

g. Calculate the vector force required to establish equilibrium in a two-dimensional system.

h. Calculate a reaction force needed to balance moments about a point.

Lab Kit Materials

Independent study: None

Class meeting: None

Homework: View the Spaghetti Bridge Project for a list of materials.

Activities

Independent study: Watch the Statics 1 video lectures and complete the quiz.

Class meeting agenda:

1. [15 min] Icebreaker
2. [35 min] Work in small group breakout rooms to complete the Statics 1 practice problems.

3. [15 min] Review answers to the Statics 1 practice problems as a class.
4. [35 min] Work on the Ethics Project Peer Review.

5. [50 min] Begin work on the Spaghetti Bridge Project (Group) in small group breakout rooms.

Homework: Complete the Ethics Project Peer Review and spend time on the Spaghetti Bridge Project. Make a few glue joints to see how long it takes to dry and how well it adheres to the spaghetti.

Due Soon

The Ethics Project peer review is due before tomorrow’s class. The Spaghetti Bridge group project is due before Thursday’s class and the individual project is due next week before Wednesday’s class.
Week 3 Tuesday

Learning Objectives

a. Define truss, joint (also called node), and member.
b. List examples of real-world applications that use trusses.
c. Describe the reaction forces that can be applied by fixed, pinned, and rolling supports.
d. Categorize truss supports as pinned, horizontal rolling, or vertical rolling based on their reaction forces or diagrams.
e. List the Method of Joints assumptions.
f. Determine if a truss is rigid.
g. Determine if truss members are in tension or compression.
h. Calculate external reaction forces on a rigid truss.
i. Calculate tensile and compressive forces in a truss using the Method of Joints.
j. Determine if a truss configuration is solvable by the truss simulator software (using the Method of Joints) and justify your decision.
k. Determine the types of forces (tension, bending, compression, or other) that are applied within a real-world system and create a corresponding free-body diagram.
l. Apply the Engineering Design Process to solve an open-ended engineering challenge.
m. Design a structural member to minimize the total material while still supporting the required load.

Lab Kit Materials

Independent study: None

Class meeting: None

Homework: None

Activities

Independent study: Watch the Statics 2 video lectures and complete the quiz.

Class meeting agenda:

1. [15 min] Icebreaker
2. [35 min] Work in small group breakout rooms to complete the Statics 2 practice problems.
3. [15 min] Review answers to the Statics 2 practice problems as a class.
4. [35 min] Work on the Spaghetti Bridge Project (Group) in small group breakout rooms.
5. [50 min] Continue working on the Spaghetti Bridge Project (Group) in small group breakout rooms.

Homework: Start working on the Statics Assignment.

Due Soon

The Statics Assignment and Spaghetti Bridge group project are due before Thursday’s class.
Week 3 Wednesday

Learning Objectives

a. Apply the Engineering Design Process to solve an open-ended engineering challenge.
b. Design a truss to hold a given load while reducing the weight and/or size of the truss.
c. Design a structural member to minimize the total material while still supporting the required load.
d. Create an audio-visual item to describe an engineering product or service.

Lab Kit Materials

Independent study: None

Class meeting: None

Homework: None

Activities

Independent study: Continue working on the Spaghetti Bridge Project (Group).

Class meeting agenda:

1. [15 min] Icebreaker
2. [35 min] Continue working on the Spaghetti Bridge Project (Group) in small group breakout rooms.
3. [50 min] Continue working on the Spaghetti Bridge Project (Group) in small group breakout rooms.
4. [50 min] Continue working on the Spaghetti Bridge Project (Group) in small group breakout rooms.

Homework: Complete the Statics Assignment and upload it to Canvas.

Due Soon

The Statics Assignment and Spaghetti Bridge group project are due before tomorrow’s class. The Spaghetti Bridge individual project is due before next Wednesday’s class.
Week 3 Thursday

Learning Objectives

a. Apply the Engineering Design Process to solve an open-ended engineering challenge.
b. Design a truss to hold a given load while reducing the weight and/or size of the truss.
c. Create visual and/or written instructions for a simple engineering design (physical device, process, or computer program).
d. Create an audio-visual item to describe an engineering product or service.

Lab Kit Materials

Independent study: View the Spaghetti Bridge Project for a list of materials.

Class meeting: View the Spaghetti Bridge Project for a list of materials.

Homework: View the Spaghetti Bridge Project for a list of materials.

Activities

Independent study: Continue working on the Spaghetti Bridge Project (Individual).

Class meeting agenda:

1. [15 min] Icebreaker
2. [35 min] Begin working on the Spaghetti Bridge Project (Individual) in small group breakout rooms. Every student should complete their own project, but small group collaboration is encouraged.
3. [50 min] Continue working on the Spaghetti Bridge Project (Individual) in small group breakout rooms.
4. [50 min] Continue working on the Spaghetti Bridge Project (Individual) in small group breakout rooms.

Homework: Continue working on the Spaghetti Bridge Project (Individual).

Due Soon

The Spaghetti Bridge individual project is due before next Wednesday’s class.
Week 3 Friday

Learning Objectives

a. Define simple interest and compound interest.
b. Explain when simple interest is preferable to compound interest (and vice versa).
c. Define present value and future value.
d. Define economic inflation.
e. Explain the concept of “time value of money”.
f. Define down payment and give an example of a purchase that commonly requires a down payment.
g. Define annuity, installment loan, and sinking fund.
h. Calculate the future value of a one-time investment.
i. Calculate the present value needed for a deposit to accumulate to a specified amount due to simple or compound interest.
j. Calculate the future value of a sinking fund.
k. Calculate the monthly payment, interest rate, and/or total cost associated with an installment loan.
l. Calculate an effective interest rate given a nominal annual rate for interest that compounds more than once per year.
m. Calculate monthly payments for a loan.

Lab Kit Materials

Independent study: None

Class meeting: None

Homework: View the Spaghetti Bridge Project for a list of materials.

Activities

Independent study: Watch the Finance video lectures and complete the quiz.

Class meeting agenda:

1. [15 min] Icebreaker
2. [35 min] Work in small group breakout rooms to complete the Finance practice problems.
3. [15 min] Review answers to the Finance practice problems as a class.
4. [35 min] Work on the Finance Assignment in small group breakout rooms. Every student should complete their own work, but the small group and teachers are available to help.
5. [50 min] Continue working on the Finance Assignment in small group breakout rooms.

Homework: Complete the Finance Assignment and upload it to Canvas. Continue working on the Spaghetti Bridge Project (Individual).

Due Soon

The Finance Assignment is due before Monday’s class.
Week 4 Monday

Learning Objectives

a. Apply the Engineering Design Process to solve an open-ended engineering challenge.
b. Create a persuasive and technically accurate pitch for a new engineering product or service.
c. Create an audio-visual item to describe an engineering product or service.
d. Estimate total cost of a product or service (including initial cost, installment cost, maintenance cost, insurance cost, residual value, etc.).
e. Explain the factors one should consider when making the decision to lease/rent or buy property, equipment, and vehicles.
f. List best practices for delivering a technical presentation.
g. Identify the audience and their expectations for a given situation.
h. Demonstrate a basic understanding of copyright law by correctly citing the visual and written work of others.

Lab Kit Materials

Independent study: View the Spaghetti Bridge Project for a list of materials.

Class meeting: None

Homework: View the Spaghetti Bridge Project for a list of materials.

Activities

Independent study: Continue working on the Spaghetti Bridge Project (Individual).

Class meeting agenda:

1. [15 min] Icebreaker
2. [35 min] Begin working on the Request for Proposal Project in small group breakout rooms.
3. [50 min] Continue working on the Request for Proposal Project in small group breakout rooms.
4. [50 min] Continue working on the Request for Proposal Project in small group breakout rooms.

Homework: Continue working on the Spaghetti Bridge Project (Individual).

Due Soon

The Spaghetti Bridge individual project is due before Wednesday’s class.
Week 4 Tuesday

Learning Objectives

a. List at least three examples of inputs to electronic devices.
b. List at least three examples of outputs to electronic devices.
c. Explain the concept of a computer program event.
d. Explain the concept of a threshold value for a sensor.
e. Explain the concept of a computer program variable.
f. Explain how and why functions are used in computer programming.
g. Program an Adafruit Circuit Playground Express by writing code in MakeCode and downloading this code to the device.
h. Program an Adafruit Circuit Playground Express to react to light, sound, motion, capacitive touch, or a button press.
i. Program using variables and arrays.
j. Program an Adafruit Circuit Playground Express to write data to the console.
k. Apply debugging strategies while writing code.
l. Describe the behavior of an electronic device in a real-world scenario, given the code (pseudocode or MakeCode) and description of input and output signals.

Lab Kit Materials

Independent study: None

Class meeting: View the Electronics Project for a list of materials.

Homework: View the Spaghetti Bridge Project for a list of materials.

Activities

Independent study: Watch the Electronics 1 video lectures and complete the quiz.

Class meeting agenda:

1. [15 min] Icebreaker
2. [35 min] Work in small group breakout rooms to complete the Electronics 1 practice problems.
3. [15 min] Review answers to the Electronics 1 practice problems as a class.
4. [35 min] Begin working on the Electronics Project (Group) in small group breakout rooms.
5. [50 min] Continue working on the Electronics Project (Group) in small group breakout rooms.

Homework: Continue working on the Spaghetti Bridge Project (Individual).

Due Soon

The Spaghetti Bridge individual project is due before tomorrow’s class. The Electronics group project is due before Friday’s class.
Week 4 Wednesday

Learning Objectives

a. Explain the concept of a computer program loop.
b. Explain the concept of a computer program conditional.
c. Program an Adafruit Circuit Playground Express to output light and/or sound.
d. Program using conditional loops (while loops).
e. Program using indexed loops (for loops).
f. Program using conditional statements (if-then-else statements).
g. Check whether inputs to a given computer program will result in a desired output.
h. Describe the behavior of an electronic device in a real-world scenario, given the code (pseudocode or MakeCode) and description of input and output signals.
i. Create specific, measurable design specifications from a general description of desired behavior.
j. Create a verification procedure to test whether a device or program meets design specifications.
k. Design a computer program in MakeCode that passes a given verification procedure.

Lab Kit Materials

Independent study: None

Class meeting: View the Electronics Project for a list of materials.

Homework: None

Activities

Independent study: Watch the Electronics 2 video lectures and complete the quiz.

Class meeting agenda:

1. [15 min] Icebreaker
2. [35 min] Work in small group breakout rooms to complete the Electronics 2 practice problems.

3. [15 min] Review answers to the Electronics 2 practice problems as a class.
4. [35 min] Continue working on the Electronics Project (Group) in small group breakout rooms.

5. [50 min] Continue working on the Electronics Project (Group) in small group breakout rooms.

Homework: Start working on the Electronics Assignment.

Due Soon

The Electronics Assignment and Electronics group project are due before Friday's class.
Week 4 Thursday

Learning Objectives

a. Determine the problem statement, given a description of the situation.
b. Determine the constraints, given a description of the situation.
c. Explain the design and operation of computer code through inline comments.
d. Design a computer program in MakeCode that passes a given verification procedure.

Lab Kit Materials

Independent study: View the Electronics Project for a list of materials.

Class meeting: View the Electronics Project for a list of materials.

Homework: None

Activities

Independent study: Continue working on the Electronics Project (Group)

Class meeting agenda:

1. [15 min] Icebreaker
2. [35 min] Continue working on the Electronics Project (Group) in small group breakout rooms.
3. [50 min] Continue working on the Electronics Project (Group) in small group breakout rooms.
4. [50 min] Finish working on the Electronics Project (Group) in small group breakout rooms. Upload the deliverables to Canvas.

Homework: Complete the Electronics Assignment and upload it to Canvas.

Due Soon

The Electronics Assignment and Electronics group project are due before tomorrow's class.
Week 4 Friday

Learning Objectives

a. Create specific, measurable design specifications from a general description of desired behavior.
b. Create a verification procedure to test whether a device or program meets design specifications.
c. Design a computer program in MakeCode that passes a given verification procedure.
d. Apply the Engineering Design Process to solve an open-ended engineering challenge.
e. Explain the design and operation of computer code through inline comments.
f. Create visual and/or written instructions for a simple engineering design (physical device, process, or computer program).

Lab Kit Materials

Independent study: View the Electronics Project for a list of materials.

Class meeting: View the Electronics Project for a list of materials.

Homework: View the Electronics Project for a list of materials.

Activities

Independent study: Start working on the Electronics Project (Individual).

Class meeting agenda:

1. [15 min] Icebreaker
2. [35 min] Continue working on the Electronics Project (Individual) in small group breakout rooms. Every student should complete their own project, but small group collaboration is encouraged.
3. [50 min] Continue working on the Electronics Project (Individual) in small group breakout rooms.
4. [50 min] Continue working on the Electronics Project (Individual) in small group breakout rooms.

Homework: Continue working on the Electronics Project (Individual).

Due Soon

The Electronics individual project is due before Tuesday’s class.
Week 5 Monday

Learning Objectives

a. Create specific, measurable design specifications from a general description of desired behavior.

b. Create a verification procedure to test whether a device or program meets design specifications.

c. Design a computer program in MakeCode that passes a given verification procedure.

d. Apply the Engineering Design Process to solve an open-ended engineering challenge.

e. Explain the design and operation of computer code through inline comments.

f. Create visual and/or written instructions for a simple engineering design (physical device, process, or computer program).

Lab Kit Materials

Independent study: View the Electronics Project for a list of materials.

Class meeting: View the Electronics Project for a list of materials.

Homework: View the Electronics Project for a list of materials.

Activities

Independent study: Continue working on the Electronics Project (Individual).

Class meeting agenda:

1. [15 min] Icebreaker

2. [35 min] Continue working on the Electronics Project (Individual) in small group breakout rooms. Every student should complete their own project, but small group collaboration is encouraged.

3. [50 min] Continue working on the Electronics Project (Individual) in small group breakout rooms.

4. [50 min] Continue working on the Electronics Project (Individual) in small group breakout rooms.

Homework: Continue working on the Electronics Project (Individual).

Due Soon

The Electronics individual project is due before tomorrow’s class.
Week 5 Tuesday

Learning Objectives

a. Apply the Engineering Design Process to solve an open-ended engineering challenge.
b. Create a persuasive and technically accurate pitch for a new engineering product or service.
c. Create an audio-visual item to describe an engineering product or service.
d. Estimate total cost of a product or service (including initial cost, installment cost, maintenance cost, insurance cost, residual value, etc.).
e. Explain the factors one should consider when making the decision to lease/rent or buy property, equipment, and vehicles.
f. List best practices for delivering a technical presentation.
g. Identify the audience and their expectations for a given situation.
h. Demonstrate a basic understanding of copyright law by correctly citing the visual and written work of others.

Lab Kit Materials

Independent study: View the Electronics Project for a list of materials.

Class meeting: None

Homework: None

Activities

Independent study: Complete the Electronics Project (Individual).

Class meeting agenda:

1. [15 min] Icebreaker
2. [35 min] Continue working on the Request for Proposal Project in small group breakout rooms.
3. [50 min] Continue working on the Request for Proposal Project in small group breakout rooms.
4. [50 min] Continue working on the Request for Proposal Project in small group breakout rooms.

Homework: Continue working on the Request for Proposal Project.

Due Soon

The Request for Proposal group presentation slides are due before tomorrow’s class.
Week 5 Wednesday

Learning Objectives

a. Explain the difference between reactions and separation processes.
b. List properties of substances that can be used in a separation process.
c. Define distillation.
d. Define enzyme.
e. Define efficiency.
f. Define specific heat.
g. Calculate mass from number of moles, or vice versa.
h. Calculate concentration as mass% or mole%.
i. Describe the laws of conservation of mass and conservation of energy.

Lab Kit Materials

**Independent study:** None

**Class meeting:** None

**Homework:** View the Chemical Processes Lab for a list of materials.

Activities

**Independent study:** Watch the Chemical Processes video lectures and complete the quiz.

**Class meeting agenda:**

1. [15 min] Icebreaker
2. [35 min] Work in small group breakout rooms to complete the Chemical Processes practice problems.
3. [15 min] Review answers to the Chemical Processes practice problems as a class.
4. [35 min] Begin working on the Chemical Processes Assignment in small group breakout rooms. Every student should complete their own assignment, but small group collaboration is encouraged.
5. [50 min] Begin working on the Chemical Processes Lab in small group breakout rooms. Every student should complete their own lab, but small group collaboration is encouraged.

**Homework:** Collect data for the Chemical Processes Lab and continue working on the Chemical Processes Assignment.

Due Soon

The Chemical Processes Lab and Chemical Processes Assignment are due before Friday’s class.
Week 5 Thursday

Learning Objectives

a. Estimate the mixture fraction of a distillate given the mixture fraction of the original liquid (or vice versa) using a vapor-liquid equilibrium curve.

b. Describe the chemical process to convert cornstarch to sugar.

c. Measure the sugar content of a substance using a refractometer.

d. Calculate percent conversion for a chemical reaction.

e. Calculate the amount of energy needed to raise the temperature of a substance a specified amount.

f. Calculate the electrical energy input to a system and the energy efficiency of the process.

g. Perform a mass and/or energy balance on a closed system.

h. Apply the laws of conservation of mass and energy to a real-world system and justify any discrepancies that result from experimental measurements.

Lab Kit Materials

Independent study: None

Class meeting: None

Homework: View the Chemical Processes Lab for a list of materials.

Activities

Independent study: Continue working on the Chemical Processes Assignment and Chemical Processes Lab.

Class meeting agenda:

1. [15 min] Icebreaker
2. [35 min] Continue working on the Chemical Processes Assignment in small group breakout rooms.
3. [50 min] Continue working on the Chemical Processes Assignment and Chemical Processes Lab in small group breakout rooms.
4. [50 min] Continue working on the Chemical Processes Assignment and Chemical Processes Lab in small group breakout rooms.

Homework: Complete the Chemical Processes Assignment and Chemical Processes Lab.

Due Soon

The Chemical Processes Lab and Chemical Processes Assignment are due before tomorrow’s class. The Electronics Project peer review is also due before tomorrow’s class.
Week 5 Friday

Learning Objectives

a. Demonstrate an understanding of best practices in technical communication by providing constructive feedback on engineering work.

Lab Kit Materials

Independent study: View the Electronics Project for a list of materials.

Class meeting: None

Homework: None

Activities

Independent study: Complete the Electronics Project Peer Review.

Class meeting agenda:

1. [5 min] Prepare for Request for Proposal Project presentations.
2. [15 min] Group 1 RFP 10-minute presentation, Q&A, and transition.
4. [15 min] Group 3 RFP 10-minute presentation and Q&A.
7. [15 min] Group 6 RFP 10-minute presentation and Q&A.
9. [15 min] Group 8 RFP 10-minute presentation and Q&A.
10. [20 min] Wrap-up

Homework: Complete the Course Evaluation survey.