IME 100

Interdisciplinary Design and Manufacturing
Course Introduction

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Assistant Professor of Industrial and Manufacturing Engineering

Summer 2022

Kettering University

Agenda

- Review Syllabus
- Course Policies
- Introductions
- Project Introduction
- Lab Safety
- Software

Course Coordinator

- Instructor: Dr. Abishek Balsamy Kamaraj
  Assistant Professor, Industrial and Manufacturing Engineering

- E-Mail (preferred contact method): abalsamykamaraj@kettering.edu

- Office Hours [Virtual/In-Person]:
  - Wednesday 4:30 PM – 5:30 PM or by appointment
  - 1-700K AB (Inside IME Department Office)
  - Free coffee for IME and BSE Students!

Lab Technician

Mr. Doug Richardson

- drichard@kettering.edu
- Office: 1-700L AB

What do you expect to learn in this class?

- Write down the topics you are looking forward to learning in this class on the white board

Course Description

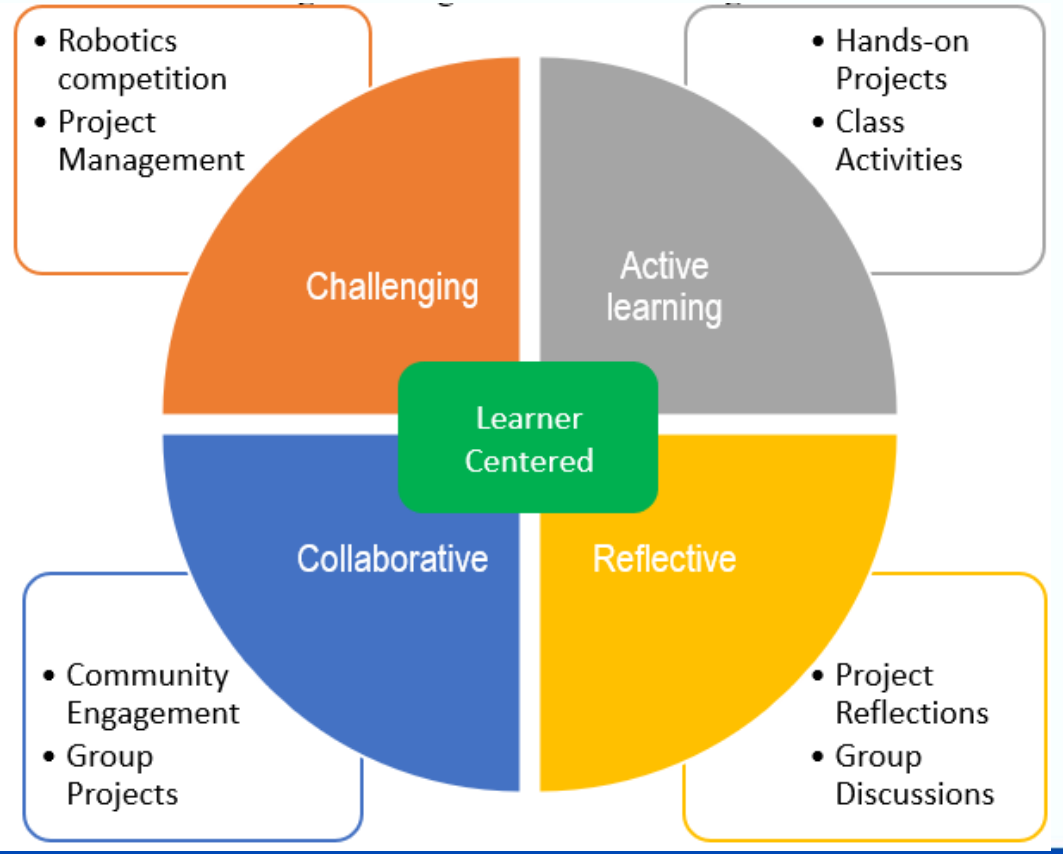
This introductory class exposes students to basic design principles, the materials of manufacture, their structure and properties, and methods of processing them into everyday products. Laboratory experiences provide hands-on experience in many of these processes. An additional laboratory provides experience in engineering design.

Topics covered:

- Basic design principles
- Computer aided design and manufacturing (CAD/CAM)
- Robotic assembly, programming, and control
- Materials of manufacture
- Manufacturing processes

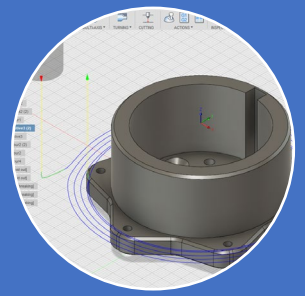
Course Outcomes and Philosophy

- Use CAD/CAM software to design and manufacture innovative and complex products.
- Manufacture products utilizing state-of-the-art manufacturing process.
- Demonstrate basic robot design, assembly, and control.



IME 100 Weekly Class Structure

Wednesday



Engineering Design

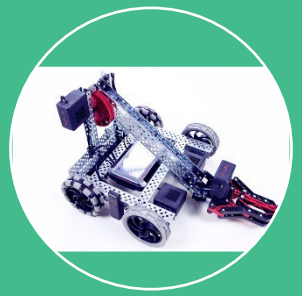
Lecture

Materials

Project management

CAD/CAM

Thursday



Robotics

Lab

Robot Competition

Design Portfolio

Teamwork

Monday

Manufacturing

Lab

CNC Machining

3D Printing

Finishing Operations

2 lab sessions and 1 lecture every week

Course Delivery and Safety policy

Monday AB 1209	Wednesday AB1210	Thursday AB1209
Manufacturing Lab	Lecture	Robotics Lab
In-Person	In-Person	In-Person

University wide COVID-19 safety restrictions will be enforced for in-person sessions.
Students are required to use the hand sanitizing station placed at the entrance while entering the classroom
Frequent hand sanitizing is encouraged especially when handling parts, equipment, and tools that are shared
Check https://www.kettering.edu/covid-19 for all the covid related safety policies from the universityUniversity-wide

Grading Policy (more later)

- Students will be expected to attend and actively participate in class discussions. Late assignments will not be accepted, except at the discretion of the instructor pending student contact.
- Attendance/Class Participation = 50 points
  (5 points each week; -2 for each missed session)
- Manufacturing Projects = 75 points
  (25 points each)
- Robot Re-Design Project = 75 points
- Total = 200 points

Additional assignments may be given that contribute to Manufacturing and Robot projects. Failure to complete any one of the projects will result in a failing grade for the class.

Attendance, Prep & Participation

- Students are **responsible** for all material presented in class discussions, assigned readings, written assignments, announcements, syllabus corrections, etc.
- Regular **attendance** and active **participation** is required.
- Regular **Blackboard** and **email** monitoring are expected outside of the classroom using the @kettering.edu email address.
- Students who are unable to attend a class are responsible to contact the instructor and get course material from a peer in the class. When necessary, students must provide sufficient proof of their inability to attend class at the scheduled time.
- Students are expected to **review** assigned material **in advance** of class, arrive with **prepared thoughts**, and **actively participate** in classroom activities discussion.

Blackboard

All course information, assignments and many important university resources are on the IME 100 Blackboard course site. It is critical that students be familiar with this tool and review all information posted, to aide in a smooth and successful transition to Kettering University.

Accessibility and Ethics Statements

- The University strives to make all learning experiences as accessible as possible. If you anticipate or experience academic barriers based on your disability (include mental health, chronic or temporary medical conditions), please let me know immediately so that we can privately discuss options. To establish reasonable accommodations, I may request that you register with the Wellness Center - Office of Disability Services. After registration, make arrangements with me as soon as possible to discuss your accommodations so that they may be implemented in a timely fashion. Wellness Center contact information: wellness@kettering.edu; 810.762.9650; 1-701 Campus Center.
- Common Statement on Ethics in the University and Academic Integrity

For more information, refer to the Student Life section of the current Undergraduate Catalog. Undergraduate catalogs are located at http://www.kettering.edu/undergraduate. This information is also noted in the Student Handbook.

Introductions

Partner with one other classmate (Someone next to you)

Write down the following information about your partner.

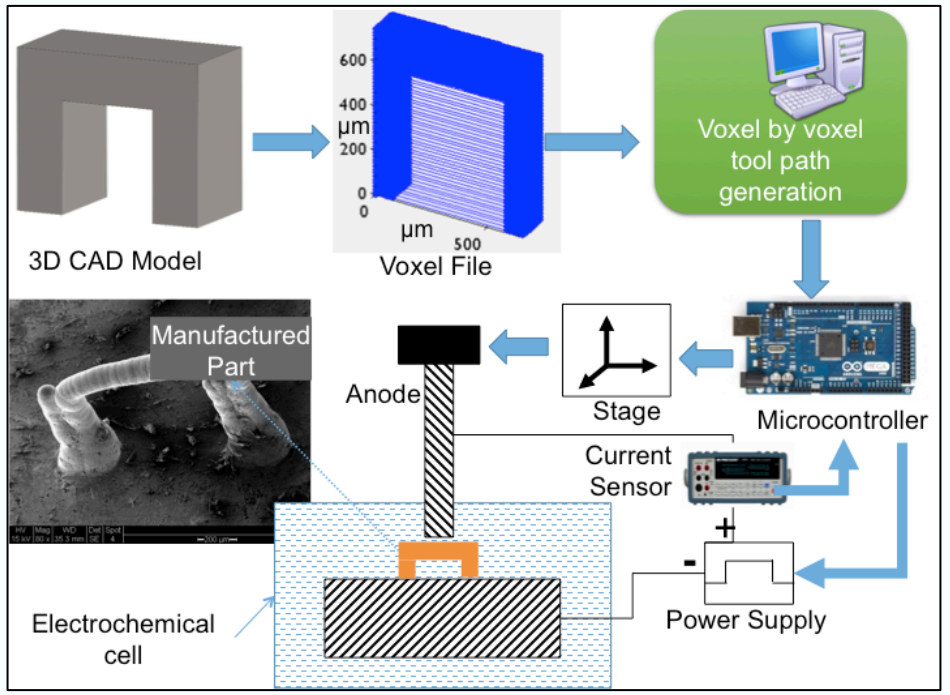
- Name
- Major
- Why are they in this class? [I like to build things, I like to design stuff, Learn about 3D-Printing, I was told to…,]
- Previous design or manufacturing experience [Co-op, high school, at home projects, courses…]
- Fun fact about themselves

You have 10 minutes

When I call your name out you shall **introduce your partner** to the class.

About Me

- 9 Years experience with Additive Manufacturing.
- Invented a new metal additive manufacturing process.
- 4 Years of Teaching and Course development experience at Kettering University, Cincinnati State, University of Cincinnati, and in India.



Kamaraj, A. B., & Sundaram, M. (2018). A study on the effect of inter-electrode gap and pulse voltage on current density in electrochemical additive manufacturing. *Journal of Applied Electrochemistry*, *48*(4), 463-469.

Manufacturing Projects

CNC machine a Coaster

Manufacture Toys for Toddlers

Manufacture a Musical Instrument

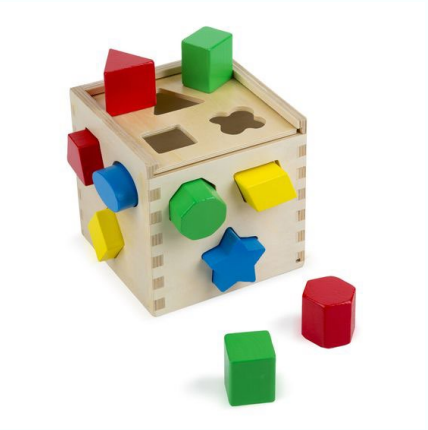
Manufacturing Projects

- Coaster Project
  - Greek Letters
  - Car Logos
  - Movies, etc.

Form your group of two and sign up on Blackboard using the link in week 1

Manufacturing Projects

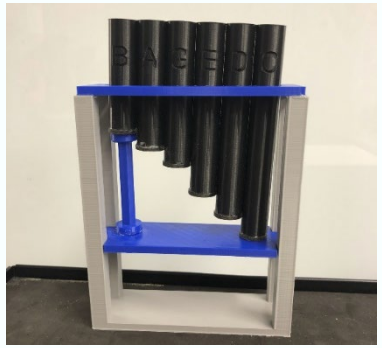
- Toy Project



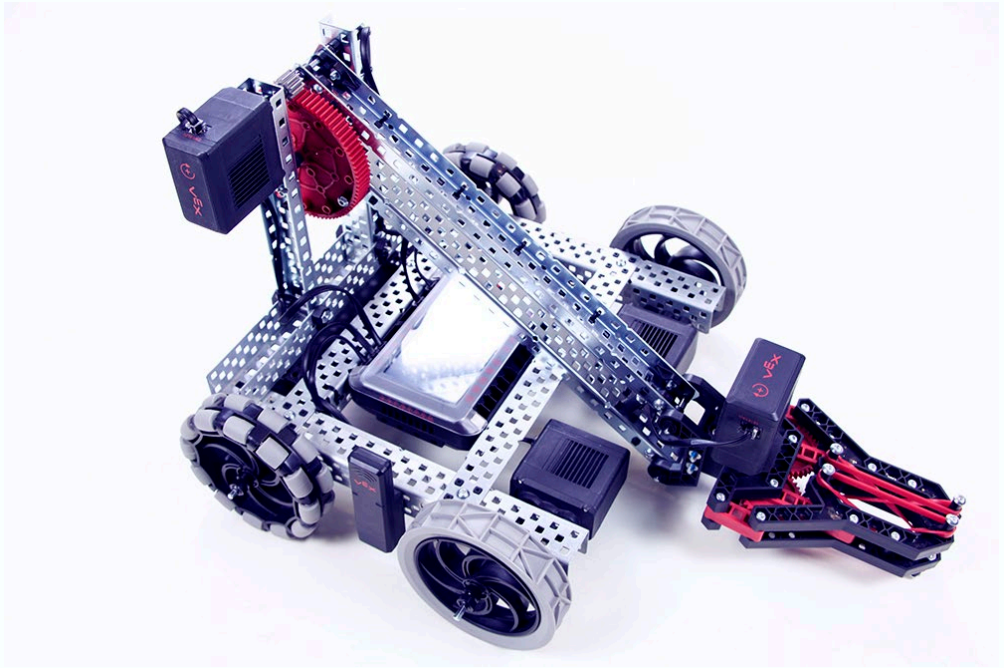
https://www.educareflint.org/

Manufacturing Projects

- Musical Instrument

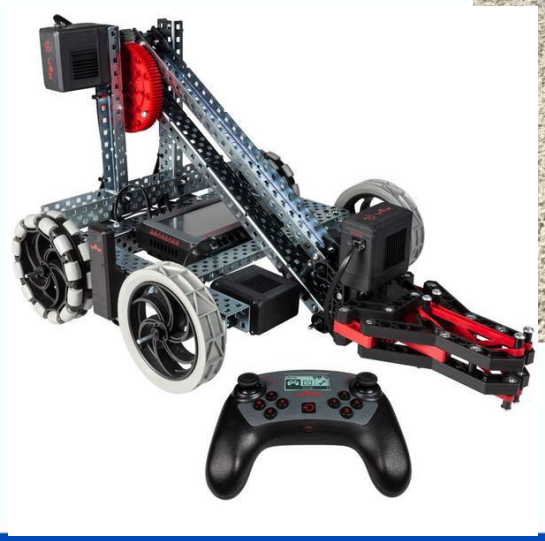


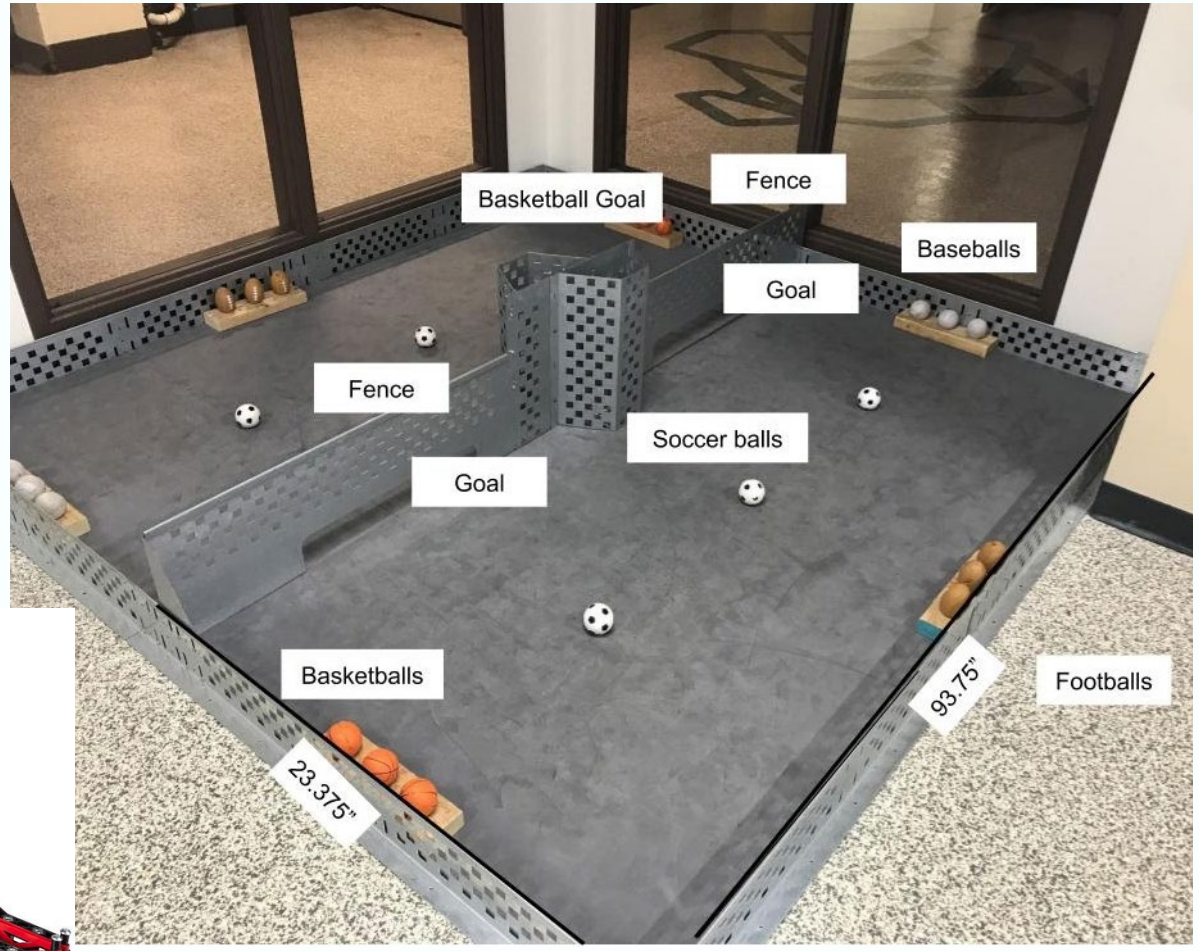
VEX EDR V5 Clawbot



Robot Re-Design Project

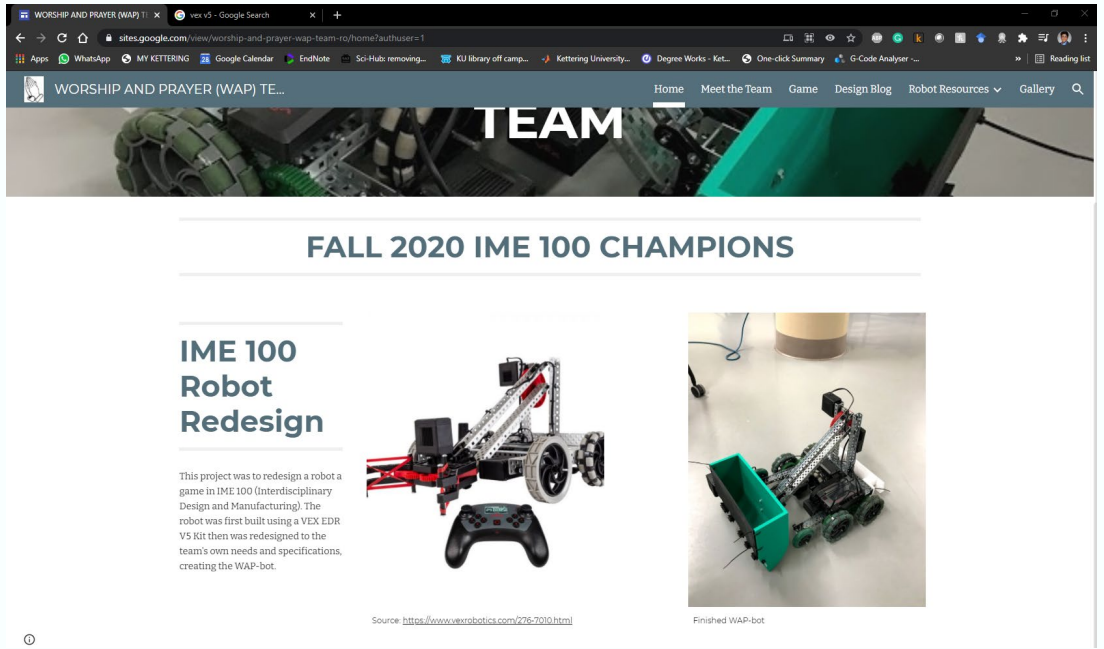
- Start with Vex V5
- Original bot is not good enough to play the game
- Points scored in autonomous mode are triple the regular points





Deliverables

- Design Log
- Engineering Drawings
- Manufacturing Complexity Statement
- Innovation Statement
- Design Summary
- Reflection document
- Portfolio as a website
- Autonomous Code



Team Website
https://sites.google.com/view/worship-and-prayer-wap-team-ro/home?authuser=1

Software Tutorials and VEX Hardware

- Fusion360 Tutorial for Absolute Beginners
  https://www.youtube.com/channel/UCo29kn3d9ziFUZGZ50VKvWA

- Getting Started with Fusion360 Tutorials
  https://f360ap.autodesk.com/courses

- Clawbot Kit and Accessories
  https://www.vexrobotics.com/vexedr/products/v5-products
  https://help.vex.com/category/121-getting-started

Assignment

Watch the following videos on the IME 100 YouTube channel

- Safety Playlist https://www.youtube.com/watch?v=MoVjIWchHvg&list=PLPTbJLn2NGLkYobcLlk0TzClgAec_el2Q
- Lab Tour Playlist https://www.youtube.com/watch?v=vdn-TpB50Vo&list=PLPTbJLn2NGLlm5ShNKySllOX-3pcLVFM-

We will have a quiz on these videos in the next class on Wednesday!

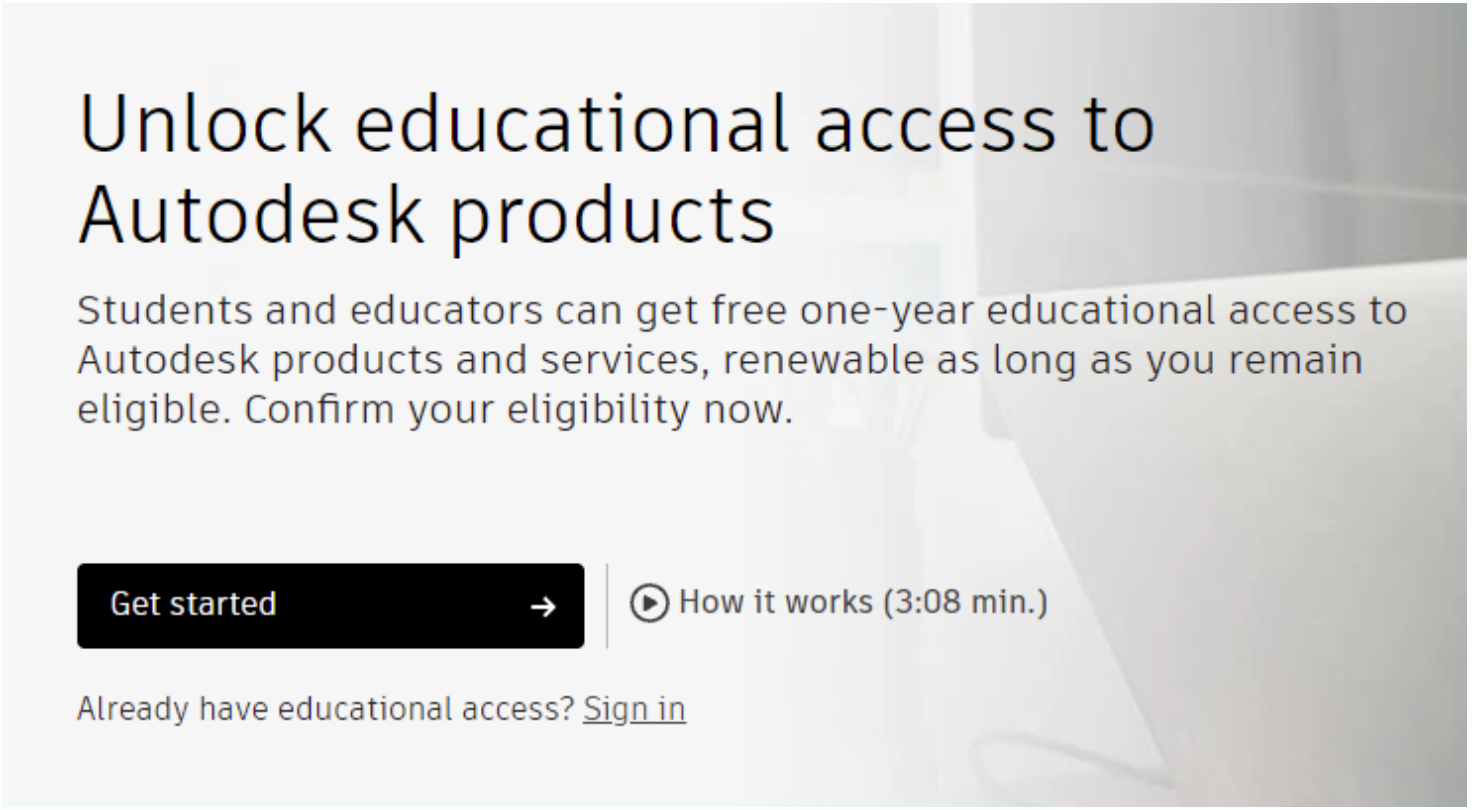
Assignment – Install Fusion 360

- Create an account at https://www.autodesk.com/products/fusion-360/students-teachers-educators
  using your **Kettering Email**
- After creating the student account you should be able to download the fusion 360 CAD software
- Follow the instructions to download and install.

*note that it will give you an autoexec file. Some computer (security software) will not allow that so you might need to manually extract/unzip the file and then run “Streamer”

Download Fusion 360

https://www.autodesk.com/products/fusion-360/students-teachers-educators



Next Class on Wednesday Lecture

AB-1210

Welcome to Kettering!