Middlesex County Academy for Science, Mathematics and Engineering Technologies

- Magnet STEM HS in Edison, NJ
- Founded in 2000
- Housed on campus of Middlesex County College
- 44 students per grade
- Engineering career majors
- One of 5 MCVTS campuses

- Founded in 1915
- Five campuses:
  - Edison Academy
  - Woodbridge Academy
  - East Brunswick
  - Piscataway
  - Perth Amboy
- Serve residents of 25 towns of Middlesex County

ACCEPTANCE CRITERIA

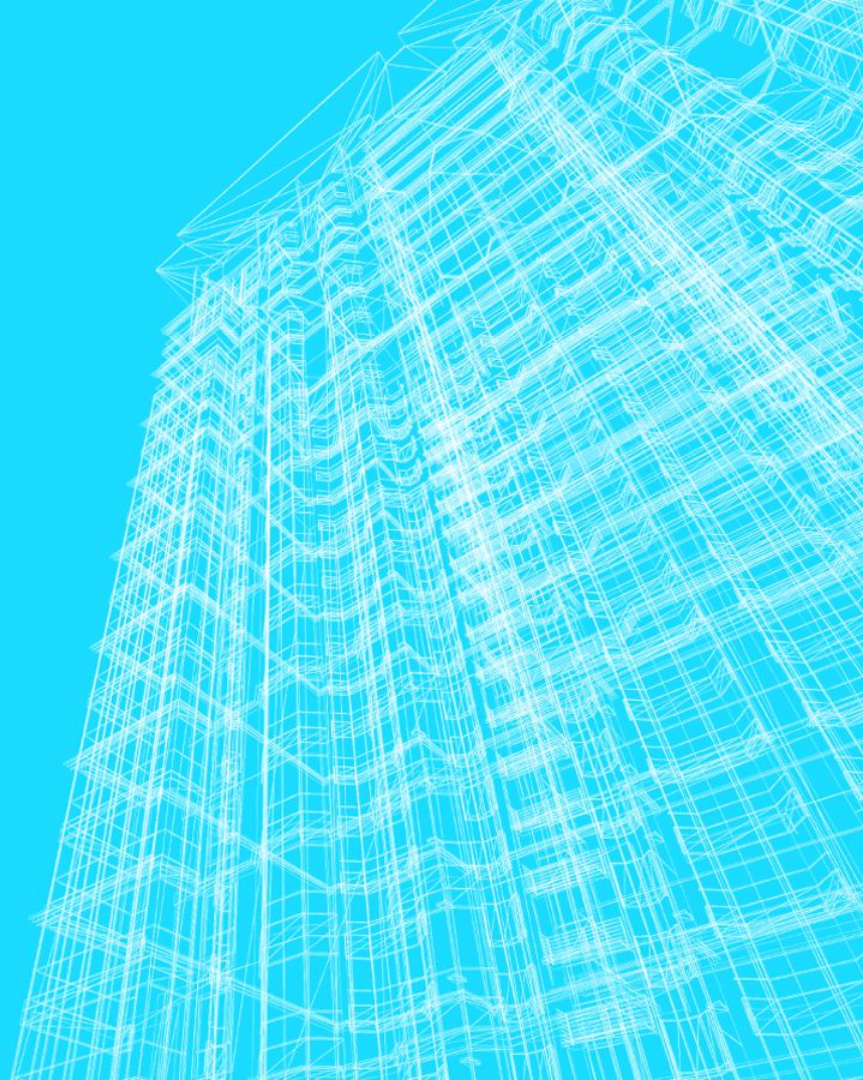
7th Grade Final Grades
8th Grade 1st MP Grades
6th or 7th Grade Standardized Test Scores
Entrance Exam Results
Attendance Record
Disciplinary Record

Everyone will be notified on qualification to the next stage (interview).

For those who are interviewed, admissions decisions will be made around **mid-March**

CIVIL / MECHANICAL ENGINEERING TECHNOLOGIES

An Academy Major



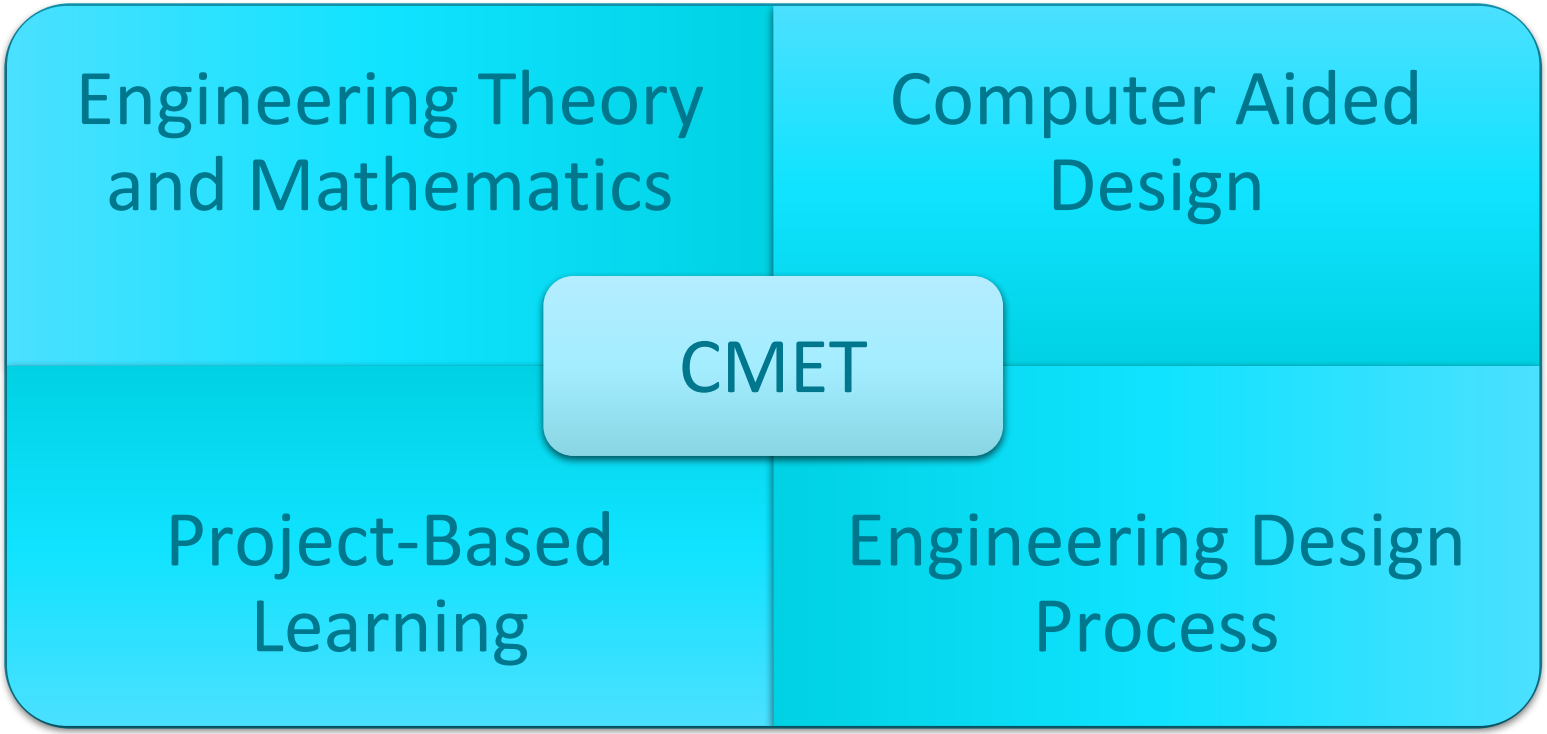
WHAT IS CMET?

The Civil & Mechanical Engineering Technologies Program:

- Develops the skills and knowledge that are prerequisites for success in engineering studies and career development.
- Uses projects as platforms to teach the basics of:
  - Engineering design and development
  - Manufacturing
  - Materials
  - Project planning and management
  - Team dynamics and communications

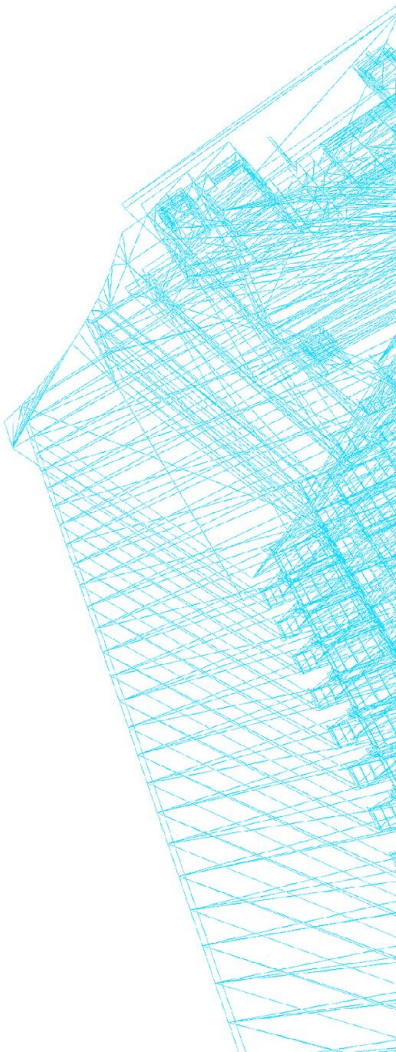
C M E T
Civil and Mechanical Engineering Technologies

FOUR AREAS OF LEARNING



C M E T
Civil and Mechanical Engineering Technologies

ENGINEERING THEORY AND MATHEMATICS



Civil and Mechanical Engineering Technologies

9TH GRADE

- Study the forces on everyday structures such as bridges and skyscrapers
  - Linear Stress and Strain
  - Torsional Stress and Strain
- Project Management
- Engineering Design Process
- Engineering tools and language

Civil and Mechanical Engineering Technologies

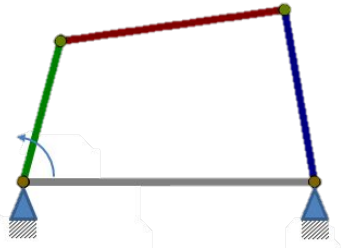
10TH GRADE

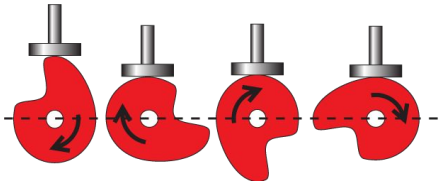
- Statics
  - Distributed and point loading
  - Truss analysis (MoJ & MoS)
  - Hydrostatics
- Simple Machines
- Manufacturing Systems - Metal
- Thermodynamics
  - 1st and 2nd laws
  - Heat transfer

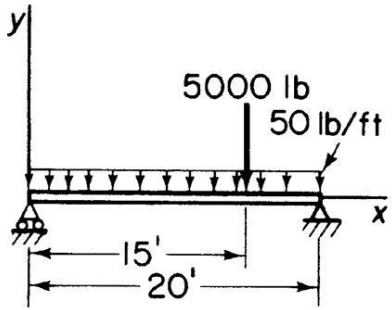
C M E T
Civil and Mechanical Engineering Technologies

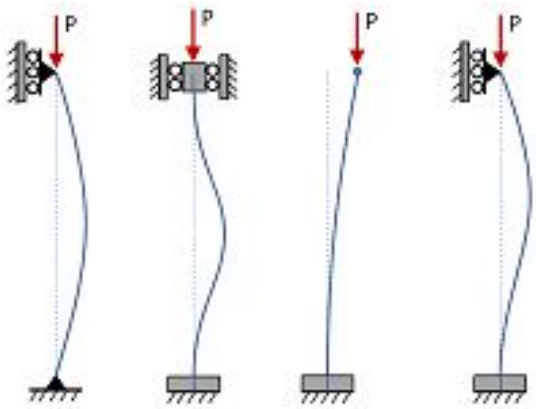
11TH GRADE

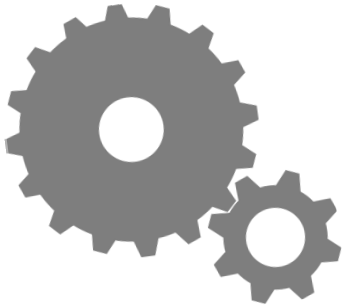
- Mechanism analysis and design
- Beam and column analysis
- Manufacturing systems – Plastics











C M E T
Civil and Mechanical Engineering Technologies

12TH GRADE

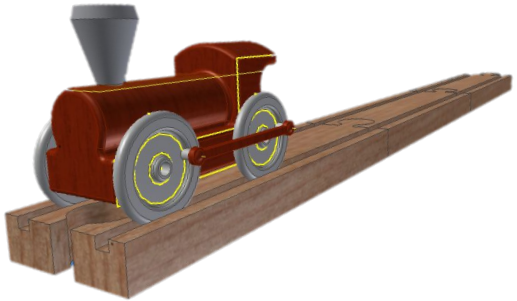
- Self-guided year-long team design project
- Integrate past years' engineering knowledge
  - Engineering design
  - Project planning
  - Stress analysis
  - Mechanism synthesis
  - Manufacturing and Assembly

Civil and Mechanical Engineering Technologies

COMPUTER AIDED DESIGN

Using Industry leader: SolidWorks

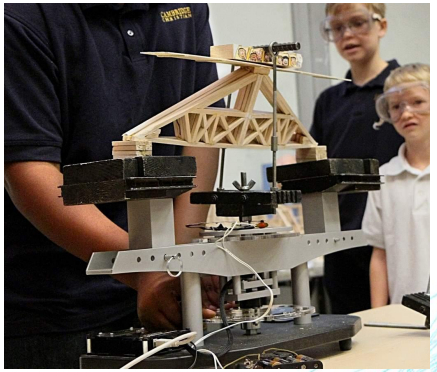
- 9th Grade: Understanding creation of single parts
- 10th Grade: Creating assemblies
- 11th Grade: Animating assemblies
- 12th Grade: Prototyping on CAD



Civil and Mechanical Engineering Technologies

PROJECT BASED LEARNING

- 9th Grade: Testing balsa wood bridges
- 10th Grade: Friction lab & teardown
- 11th Grade: Linkages lab & teardown
- 12th Grade: Year-long senior capstone project

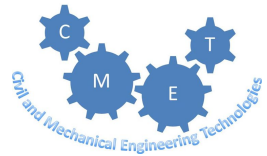


Civil and Mechanical Engineering Technologies

THE ENGINEERING DESIGN PROCESS

Students gain more experience in engineering design

- Freshmen: Chocolate project
  - Working in teams
- Sophomores: Ball sorter
  - Working in teams with a larger project and subassemblies
- Juniors: Rube Goldberg machine
  - Working in teams with interacting steps
- Seniors: Capstone project



SENIOR CAPSTONE PROJECT

- Incorporates four learning areas into a year-long project
- Aimed to solve a problem or innovate on an existing product
- End of the year presentation at the Senior Showcase to students, faculty and other invitees

C M E T
Civil and Mechanical Engineering Technologies

SENIOR PROJECT EXAMPLES

- Walking robot
- Mechanical Music Box
- Laser light show
- Factory robot for object mobility and reorientation
- Efficient composting machine

Civil and Mechanical Engineering Technologies

SENIOR MENTORSHIP PROGRAM

- 5-10 day unpaid internship
- Students gain experience in a STEM-related workplace
- Complements technical skills learned in school
- Students work with MCVTS coordinator to identify appropriate internships

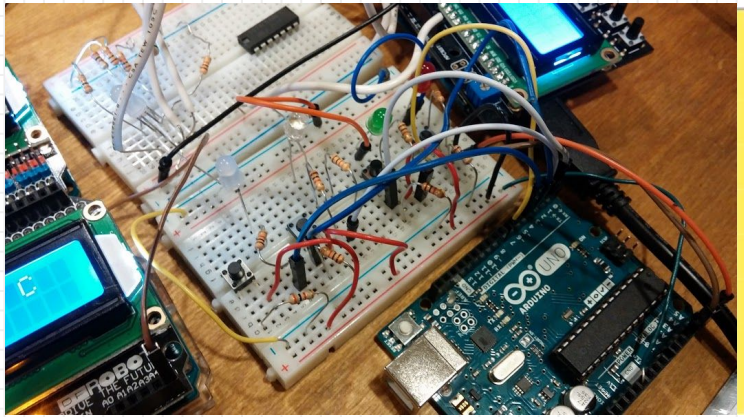
Some past student internships:

- Rutgers Research Internship
- NJIT Research Internship
- NASA
- Government Internships
- Startup Companies
- Local municipal civil engineering firm

Electrical & Computer Engineering Technologies

What is ECET?

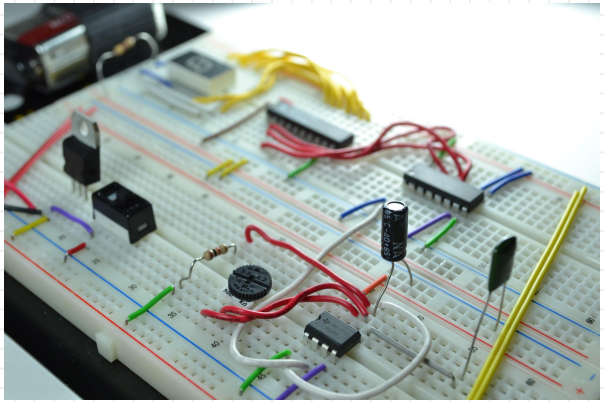
- ✘ Undergraduate-level electrical engineering and computer science
- ✘ Emphasizes problem solving and application

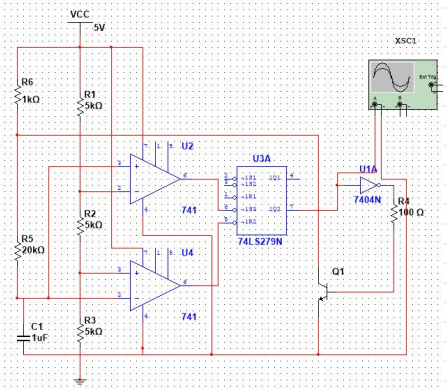


```
#import <iostream>
using namespace std;

int main() {

    cout << "Hello World!" << endl;

    return 0;
}
```

Course Information

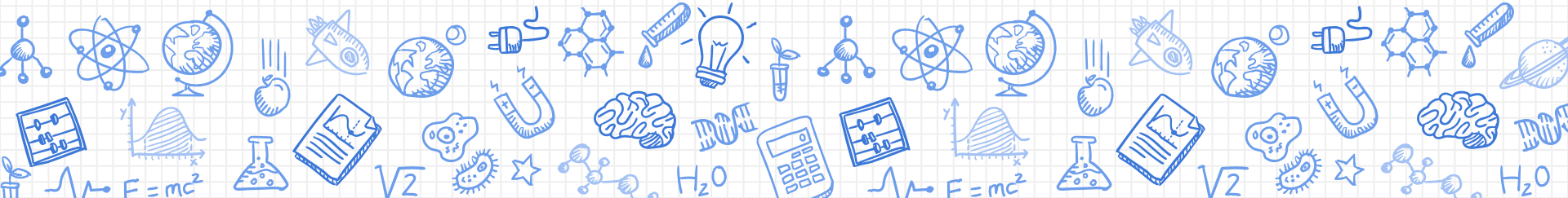
- ✘ Taught by Mr. Enzo Paterno
- ✘ Class meets for 1 block daily
- ✘ Lecture-based instruction
- ✘ Labs, Project-Based Learning





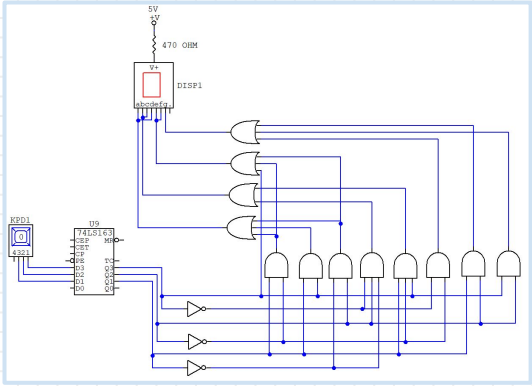
CURRICULUM

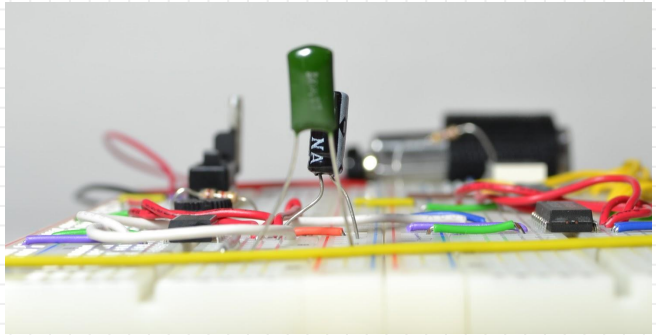
Freshman exploratory to senior capstone projects

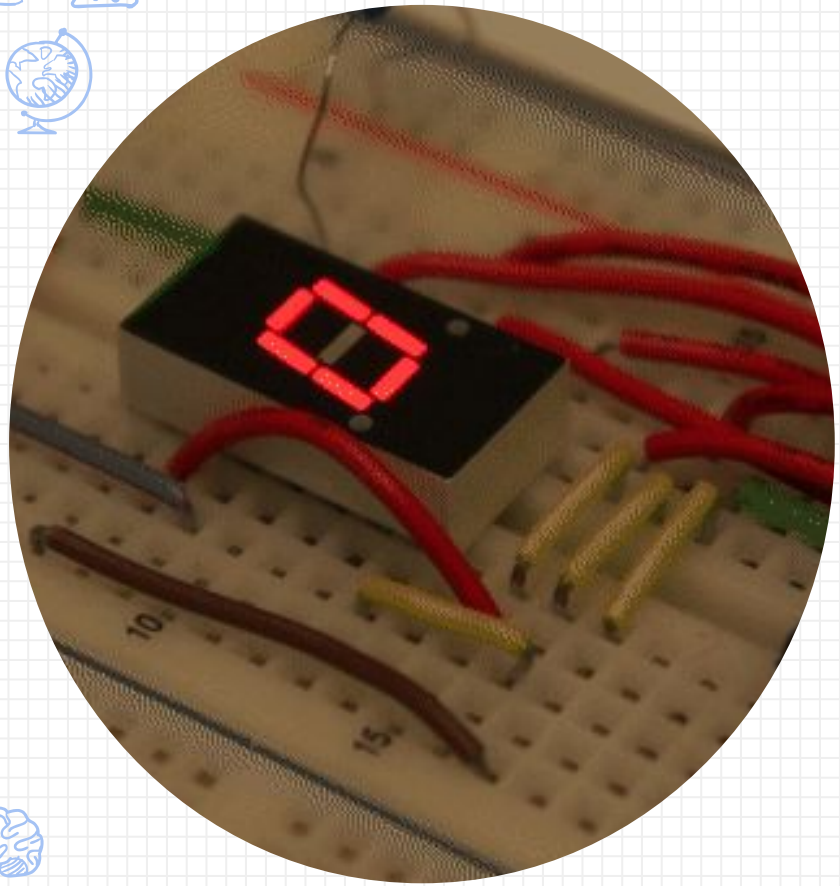


Exploratory Program

- ✘ One marking period each of ECET/CMET
- ✘ Freshmen explore interests and select desired program
  - ✘ Placement based on preference & performance
- ✘ Students matriculate after MP2
- ✘ ~22 students/program







Birthday Circuit Project

- Introductory project
- Circuit that displays your birthday
- Integration of hardware and software

Freshman to Junior Year

Freshman (9th)

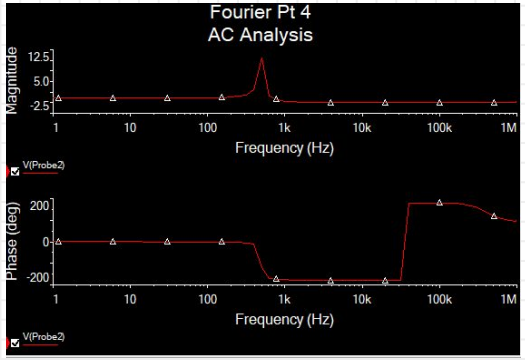
- ✘ Logic circuit design
- ✘ C++ (procedural)
- ✘ DC Circuit Analysis

Sophomore (10th)

- ✘ Semiconductors
- ✘ Sequential logic
- ✘ Memory devices
- ✘ Microcontrollers & assembly language

Junior (11th)

- ✘ C++ (OOP)
- ✘ AC Circuit Analysis
- ✘ Signal processing
- ✘ Communication systems

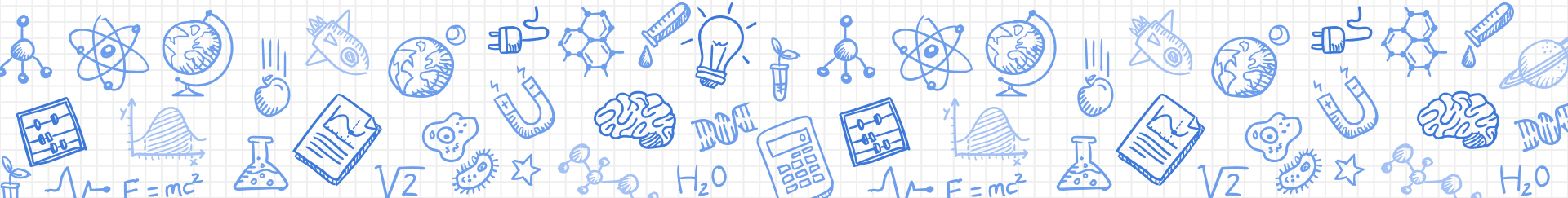


Senior Capstone Project

- ✘ Culmination of three years of ECET instruction
- ✘ Develop product from start to finish
- ✘ Use microcontrollers, 3D printing, PCB, etc.
- ✘ Examples: Automatic Page Turner, Recyclable Sorter

Extracurricular Activities

Ways student apply engineering outside of class



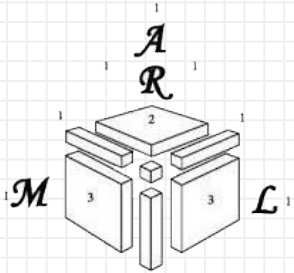
Activities and Clubs

MIDDLESEX COUNTY ACADEMY

Art Club

TECHNOLOGY STUDENT ASSOCIATION

PENN APPS



FBLA

SCIENCE OLYMPIAD

JSA

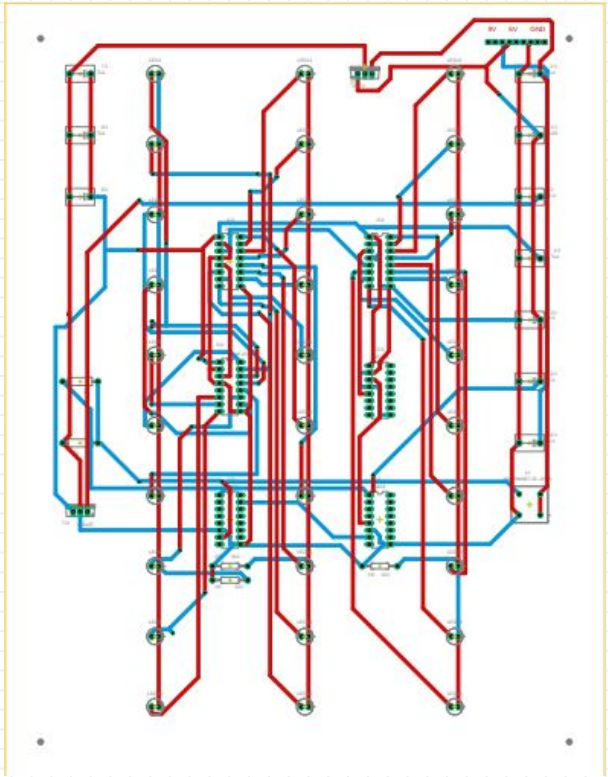
BE THE PEOPLE

ZERO ROBOTICS

ISS PROGRAMING CHALLENGE

girls who CODE

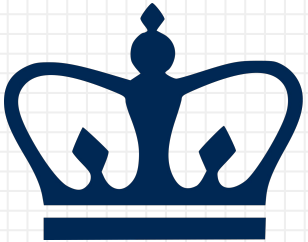
Collaboration with NBPD

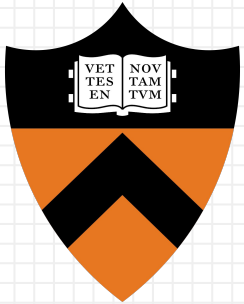


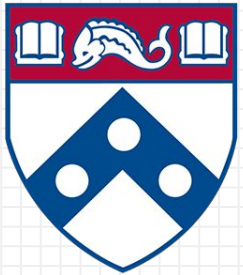
- ✘ Computer Science Club developed timing device for forensic video processing
- ✘ Determine actual frame rate of surveillance cameras
- ✘ Used successfully in three cases

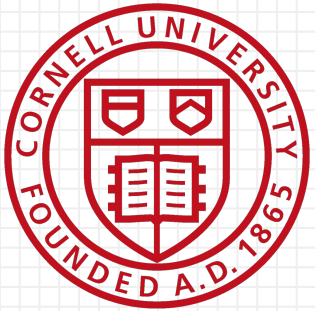
NEW BRUNSWICK
PROBITAS
POLICE
N. J.

Some Colleges our Graduates Attend









Carnegie Mellon University

Some Companies Where Our Alumni Work