

UNITED STATES NAVAL ACADEMY

WEAPONS, ROBOTICS, AND CONTROL ENGINEERING



EW200

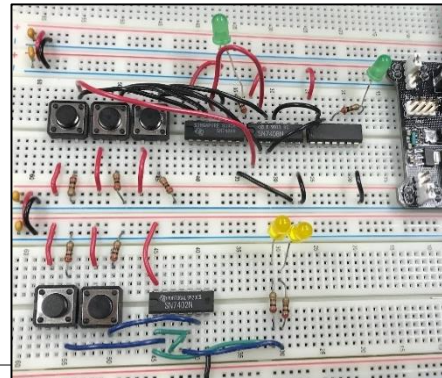
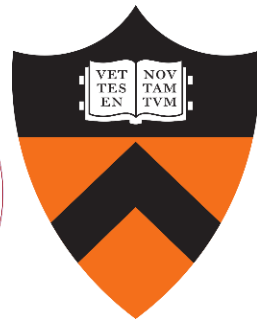
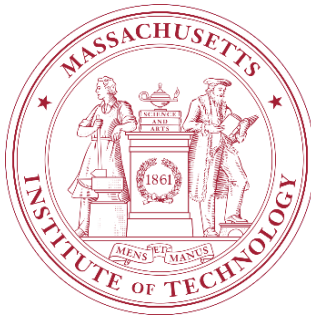
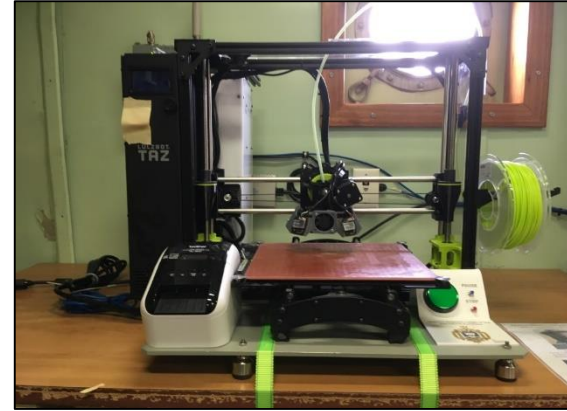
Introduction to Programming and Design



- B.S.E. Princeton University
Electrical Engineering

- US. Army: 50th Signal Battalion
Platoon Leader
Director of Network Plans and Projects OIF

- Ph.D. Massachusetts Institute of Technology
Electrical Engineering



Admin Material

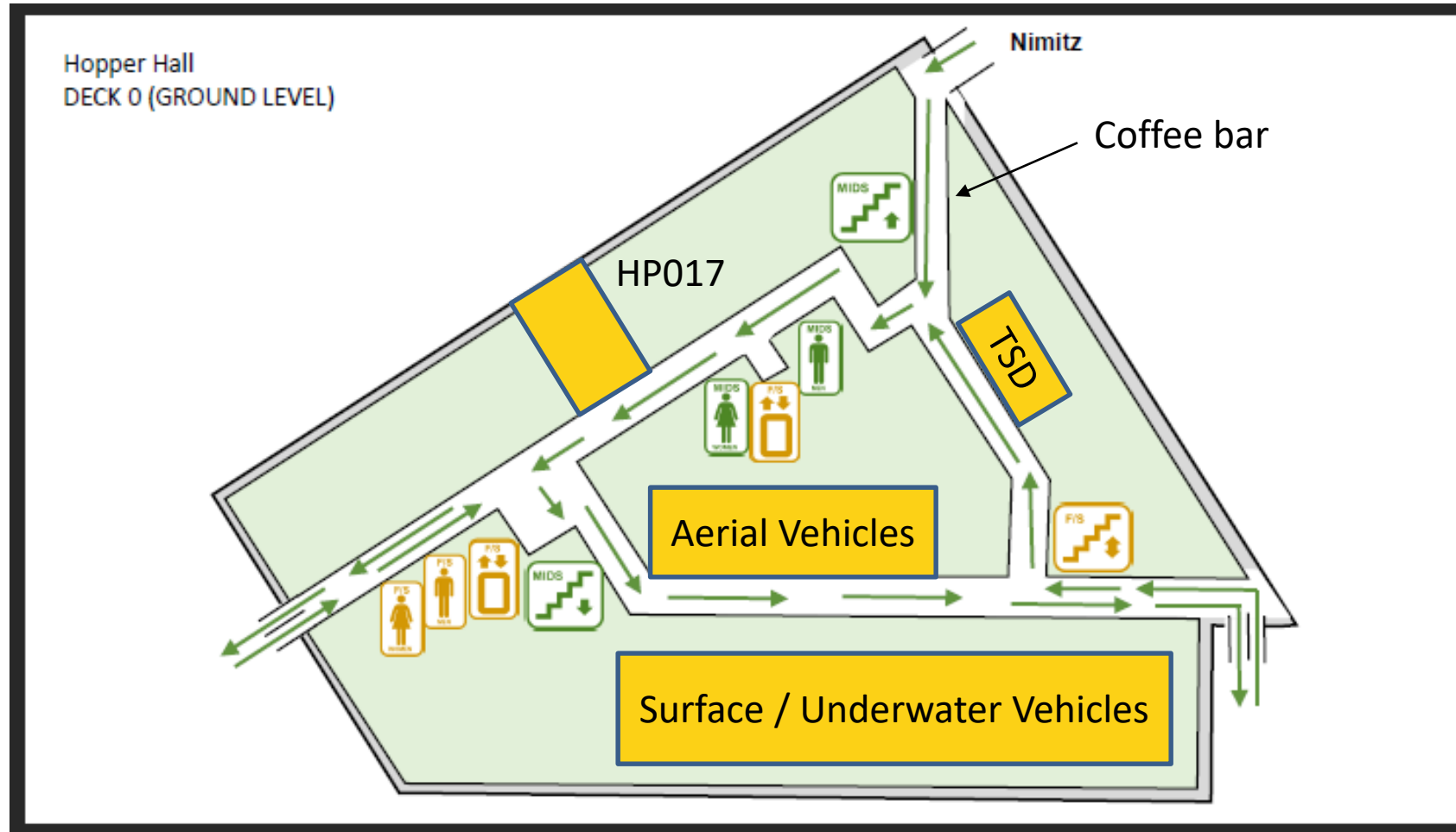


- Roll
- Syllabus
- Course Policy

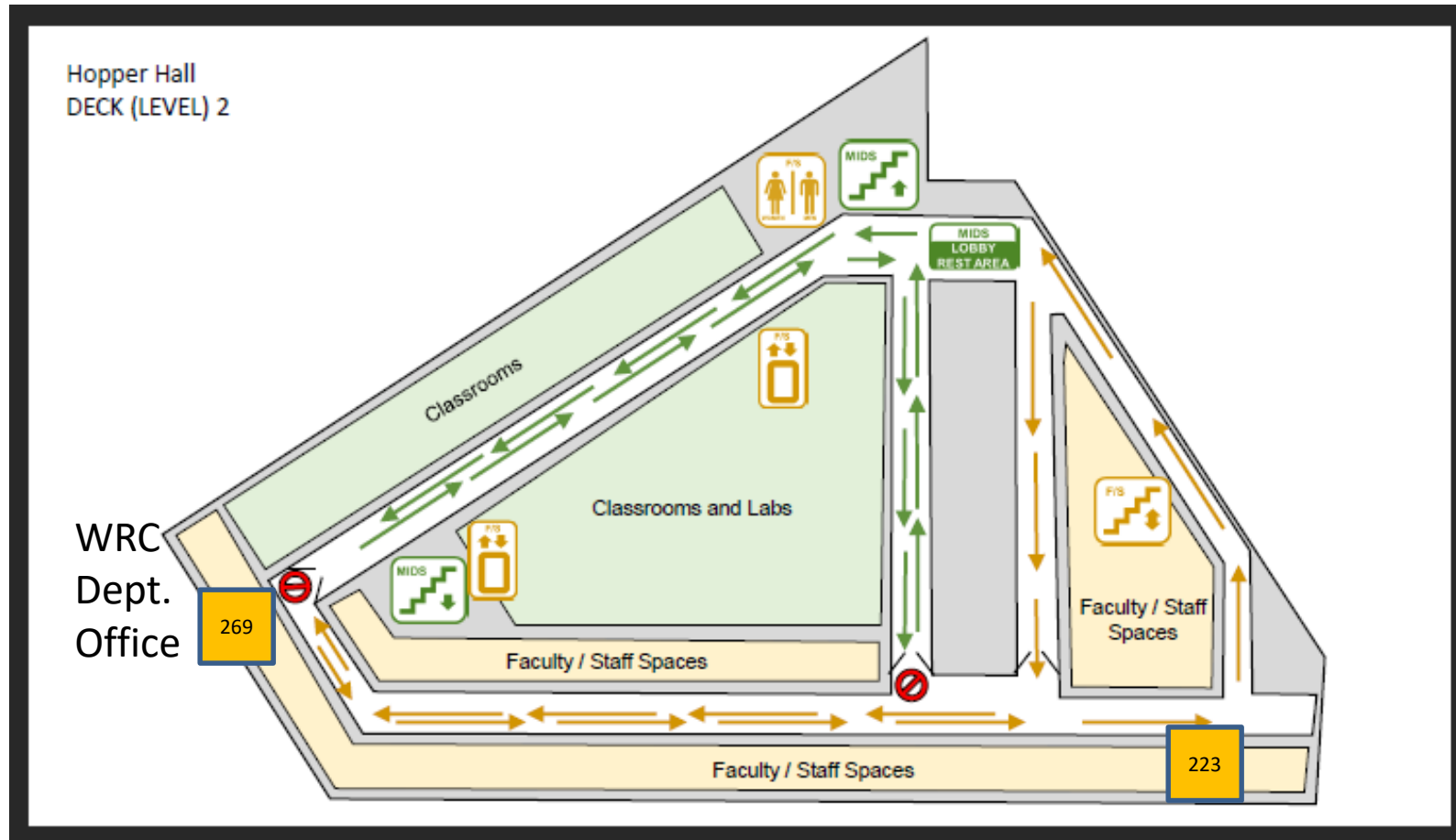
| Week | Lectures (MW) | | Lab (T or R) * | Quiz (F) |
|---------------|-------------------|--------------------|--------------------|--------------------|
| 22 AUG | Variables | Simple Types | Intro To Python | |
| 29 AUG | Introducing Lists | Working with Lists | LED S-O-S | Jupyter Notebooks |
| 5 SEP | If Statements | | LED Heart Beat | Lists |
| 12 SEP | Dictionaries | Input & Loops | RGB Color Mixer | If Statements |
| 19 SEP | Functions | | HSV Color Mixer | Dictionaries |
| 26 SEP | Summary Lecture | Exam Review | Video Game | 6 Week Exam |
| 3 OCT | Classes | | Video Game | While Loops |
| 10 OCT | Columbus Day | Classes | Solder PCB | Functions |
| 17 OCT | Files | Exceptions | Space Invaders I | Classes |
| 24 OCT | Testing | | Space Invaders II | Files & Exceptions |
| 31 OCT | Summary Lecture | Exam Review | Space Invaders III | 12 Week Exam |
| 7 NOV | Class Game | | Class Game | Testing |
| 14 NOV | Class Game | | Class Game | PyGame |
| 21 NOV | Video Game | | Video Game | PyGame |
| 28 NOV | Video Game | | Video Game | -- none -- |
| 5 DEC | Video Game | Arcade Day (F) | Video Game | -- none -- |

* Labs are offset (Tuesday is one week behind) from SEP6 – NOV24 due to federal holidays

Know Your Way Around Hopper Hall



Know Your Way Around Hopper Hall



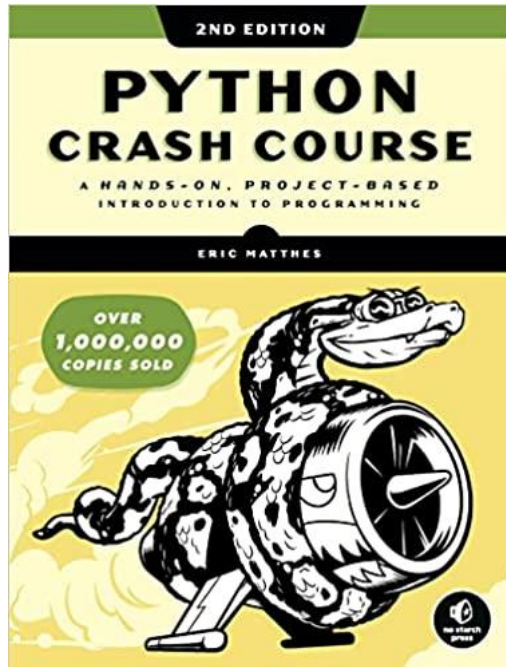
My office

EW200 Textbook



Python Crash Course (2nd Ed) by Eric Matthes

[Amazon Link](#)



A physical copy of the book is required.

Book Check this Friday (Quiz 0)

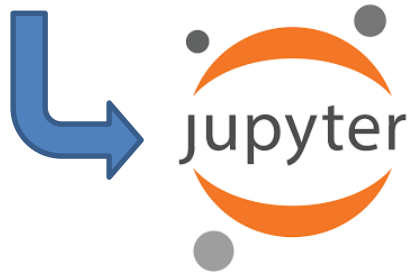
EW200: Software



*Install from **Anaconda** and **Mu** from Software Center before next class*



Anaconda provides a Python Environment for your Laptop



Jupyter Notebooks allow you to run Python code interactively



Mu allows you to run Python code on a microcontroller (Pico)

Google Classroom



See Google Classroom for:

Basic admin (syllabus, course policy, etc.)

HW assignments and solutions

Lab assignments

Lectures

Policy on Collaboration*

**see course policy document for full and official details*



Robotics & Control Engineering is a **community**

All out-of-class work can be done collaboratively with these caveats:

You may get *assistance* from others, but you may **not copy** their work

You are responsible for all of the skills and techniques utilized on out-of-class work

You may be tested or evaluated *individually*

You must cite all assistance on each assignment

Devices in the Classroom



You should always be working on EW200 related materials during class

Laptops should be shut (unless you are programming or working on an assignment)

Manage email, your social media presence, your Navy Federal account, and your online bingo games outside of class

What is This Major About?



Autonomous: Robotics & Control Engineers make automated machines
ex. robot, unmanned vehicle, autopilot, smart munitions,
automated spacecraft, smart homes, etc.

Interdisciplinary: Use Electrical, Mechanical, and Computer Eng.
sensors + motors + computers = smart devices

Control and Sensing:

A science in their own right. Systems that understand and respond to environment.

Image Processing, Sensor Fusion, System Modeling, etc.

Your Community



- Website:

<http://intranet.usna.edu/WRC/>

- Facebook:

Robotics & Control Engineering at the US Naval Academy

<https://https://www.facebook.com/Robotics.and.Control.Engineering.at.USNA/>

ERC Major



Typical Matrix

| 3/c | | 2/c | | 1/c | |
|--|-------------------------------------|---------------------------------------|--|---------------------------------|-------------------------------------|
| Fall | Spring | Fall | Spring | Fall | Spring |
| NN210 Basic Navigation | NE203 Ethics and Moral Reasoning | NN310 Advanced Navigation | NL310 Leadership: Theory and Applications | | NS43x Junior Officer Practicum |
| SP211 General Physics I | SP212 General Physics II | | | | NL400 Law for the Junior Officer |
| SM221 Calc III with Vector Fields | SM212 Differential Equations | EE331 Circuits | EC312 Applications of Cyber Engineering | HH216 West in Modern World | EW300 Weapons |
| HH215 A, M, or P Asia, Mid East or Modern World | | | | HUM/SS Elective | HUM/SS Elective |
| EM211 Statics | EM232 Dynamics | SM316 Eng Math with Prob and Stat | | | |
| | | EM316 ThermoFluids I | EM317 ThermoFluids II | EW401 Eng Design Methods | EW404 CAPSTONE |
| EW200 Intro to Prog & Design | EW202 Mechatronics | EW301 Linear Sys & Control | EW309 Guided Design | MAJOR ELECTIVE II | MAJOR ELECTIVE V |
| | | EW305 Modeling / Simulation | EW306 Modern Controls | MAJOR ELECTIVE III | |
| | | | MAJOR ELECTIVE I | MAJOR ELECTIVE IV | |

Major Electives

Estimation & Control

EW413 Digital Control Systems
EW456 Autonomous Vehicles
EW418 Optimal Control and Estimation

Cyber Physical Systems

EW430 Embedded Systems
EW432 Internet of Things

Engineering Management

EW461 Quantitative Methods for Management
EW464 Engineering Economics
EW462 Emerging Technologies

Robotics (select at least one)

EW450 Introduction to Robotic Systems
EW456 Autonomous Vehicles
EW451 Mobile Robot Design
EW452 Advanced Topics in Robotics
EW453 Introduction to Computer Vision

Signal Processing

EE432 Digital Signal Processing
EW453 Introduction to Computer Vision

Additional Major Elective Courses:

EW470 Desktop Manufacturing
EW485A Lasers in a Maritime Environment
EW485B Control of Multi-Agent Networks
EW485D Control of Physiological Systems
EW486D Advanced Topics in Naval Weapons
EW486A Data Science & AI for Robotics & Control
EW486F Experimental Implementations for Unmanned Systems
EW495/6 Robotics & Control Engineering Research

Other Offerings and Special Topics:

EW281C "School of Drones" – quadrotors
EW282C "School of Drones" – fixed wing
EW282 Intro to Laser Research
EW481/482/495 Midshipman research & special topics

Computer Programming



By Alan Light - Own work by the original uploader, CC BY-SA 3.0,
<https://commons.wikimedia.org/w/index.php?curid=20299>

Programming is like Chess

1. **Understand the Rules**
2. **Learn some Strategy**
3. **Play It!**

Textbook Chapters 1-11

Class Video Game- Space Invaders

Build your own Video Game

Programming is ***not*** like Chess



By Senior Airman John Ennis - <https://www.dvidshub.net/image/6806710/technology-integration-agile-liberty-21-2>, Public Domain, <https://commons.wikimedia.org/w/index.php?curid=112759077>

Hello World



Write your first Python Program

<https://replit.com/languages/python3>

A screenshot of a Replit Python REPL interface. At the top left, there is a dark blue button with the Python logo and the text 'Python'. To its right is a green square button with a white play icon. Below these buttons is a dark blue text area containing the code '1 print('Hello, world!')'. The text area has a light blue highlight on the first line.

Why Python? Try some of the other languages (Java, C) from the drop down menu...