ENAS S130 – Introduction to Computing for Engineers and Scientists (Summer 2017)
Professor Roman Kuc

Parsing the title:

- Introduction – Although there are no formal prerequisites, some previous programming experience is helpful but not necessary. The course starts with basic principles using Matlab, which is a new programming language for most students. Matlab is taught following the course text, with modifications to have similarities to the c language. The c language is taught using Web resources, which the typical method of obtaining information after having some familiarity with a language.
- Computing – Different from *programming*, computing is the subset of computer programming techniques that are employed for numerical calculations typically encountered for processing, analyzing, displaying, and simulating data. The course does not cover a *complete* version of a computer language, but rather a subset that forms a firm foundation that can be extended for computing tasks that are peculiar to a discipline. Developing an *algorithm* to determine how to structure instructions to solve a problem is stressed.
- Engineers – Verbs that typically describe engineering activity include *design, control, invent, and optimize.* Computer programs will illustrate techniques for optimizing system performance under specified constraints and quantifying its behavior.
- Scientists – Verbs that typically describe scientific activity include *observe, probe, examine, and simulate.* Computer programs will illustrate techniques for evaluating formulas, simulating physical systems and analyzing their behavior.

Educational Objectives. Students who successfully complete ENAS130 will be able to

- Apply different computational approaches to problem solving.
- Compose Matlab and C programs to solve computational problems on the PC or Mac.
- Implement computational tasks that combine the benefits of Matlab and the c language running on an Arduino UNP microcontroller.

Course structure. The course has three main parts:

- The first part teaches basic programming and problem-solving techniques using Matlab, a user-friendly and complete computer language that is widely used in science and engineering because of its graphic capabilities and features to access real data. This part follows the text and illustrates approaches using real-world data including microphone speech and digital images.
- The second teaches programming in the c language. The c language forms the basis for many other programming languages and is useful for programming microcontrollers. Programs are composed on the Arduino UNO microcontroller. The programming tasks will be similar to those implemented in Matlab during the first part to illustrate their common aspects and differences.
- The third part teaches data exchange over the serial port between Matlab and the UNO for distributed processing and interactions between an operating system on the PC with a real-time microcontroller. Advanced Matlab display techniques, such as surface and 3D plots for data interpretation will be taught.

Grading:

- Scores on three tests, each covering a main part of the course – 30% each
- Homework programs – 10%

Required for class:

- A laptop – either Windows 10, or Mac OSX.
- Arduino UNO R3 microcontroller. Recommended: Saintsmart Arduino R3 with cable https://www.amazon.com/SainSmart-ATmega328P-Development-Board-Cable/dp/B00E5WJSHK/ref=sr_1_1?s=electronics&ie=UTF8&qid=1481388575&sr=1-1&keywords=Sainsmart+Arduino+UNO+r3
- Text: *Matlab – Programming for engineers (Fifth edition)* by Stephen Chapman. Cengage Learning 2016. ISBN-13: 978-1-111-57671-4. ISBN-10: 1-111-57671-8.