

# EE 1410: Data Structures

## Teaching Methodology

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**Abstract**—This manual shows how to introduce C and Python programming and data structures to beginners through a hands on approach. The philosophy of the course is to teach students to use programming as a tool to solve problems.

### 1 REQUIREMENTS

- 1) The course is of 2 credit and the hands on module should be completed in 30 hours.
- 2) Ideally, there should be no more than 40 students in the class.
- 3) Each student should have access to a Linux computer and the TLC Arduino kit.
- 4) The hands on sessions should span over 10 days, with a 3 hour session every day.
- 5) At least 4 Teaching Assistants (TAs) are required. These can be senior UG students or PG students.

### 2 HANDS ON SESSIONS

Hands on sessions are conducted through the following manuals.

- 1) [1] introduces the concept of hardware and software. This is done by using an arduino to drive a seven segment display to obtain a decade counter.

- 2) [2] introduces basic programming concepts like conditional statements, loops, functions and arrays. This is done by using an arduino to drive a seven segment display to obtain a decade counter. The arduino IDE follows the C language syntax, so the student learns how to program using C.
- 3) [3] introduces Python by solving selected problems from the JEE mains mathematics paper through Python programming. For examples, problems related to coordinate geometry can be easily visualized through computations using *numpy* and *scipy* and plotting through *matplotlib*.
- 4) Through [4], the student converts the computational part of the Python code in [3] to C code and the output data is stored in files. This data is then plotted in Python. This helps the student learn file handling in C.
- 5) [5] introduces the student to pointers, lists and trees through polynomial operations.

### 3 EVALUATION

- 1) [6] is a collection of unsolved problems from the JEE 2017 mathematics mains paper. The students are expected to use the scripts in [3] to generate their own python scripts for [6].
- 2) The next assignment for the students is to convert the python codes for [6] to C.
- 3) For data structures, each student is asked to write the code for polynomial addition and multiplication and another student is asked to document the syntax and logical errors and get the code running. Through this approach, students learn to read, write and debug code.
- 4) Multiple exams with equal weightage should be conducted on the above lines.

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