

# GENG-8030 Computational Methods & Modeling for Engineering Applications

Summer – 2023

## Primary Project report Instructions

### Introduction:

- Read the instructions provided to you under the Projects link in Bright Space.
- Prepare your primary report according to the instruction provided below.
- The submission dates are:
  - Section 2: Tuesday, June 27, 2023.
  - Section 3: Wednesday, June 28, 2023
- Write in your own words and do not attempt to copy the project description from the outline provided to you. Note that these reports will be scanned through a plagiarism software and a similarity rate over 20% is not acceptable.
- Start early so you can finish your project on time.
- Follow the guidelines provided below to prepare your primary report.
- Follow the instruction below to get more information on the project and how to start. Few resources are provided for to get a head start on the project.

### Primary Project Report:

Your project should follow the following guidelines:

- Use Font: Times New Roman, 12 points.
- Lines spacing: 1.5
- Margins: 1" top-bottom-left-right.
- Number your report pages, no number on cover page.
- Provide a table of content after the cover page. Start numbering from this page, with number 1. Your page numbers should be in the center bottom of each page and use (page \_\_ of \_\_) numbering style.
- In the header of each page provide your names.
- All sections and sub-sections' headings should be Font size 14 and bold.

### Report content:

- Cover page - Should contain, course name and code, group members' names, group number as given to you in Bright Space, date of submission, University logo, your department name, instructor name. (Font New Times Roman– 16 points)
- Introduction (In your introduction provide an overview on the project, its objectives, and outcomes).
- Hardware components and software (provide images where applicable)
- Methodology – provide a block diagram for your control system you are going to implement and a brief discussion of the different processes/steps in your methodology.
- Preliminary pseudocode of your control system. (I do not expect you to have the MATLAB code ready, however, do your best to provide a pseudocode)

- Timeline and any limitations/risks you think you could face in your project. For this part prepare it in a table format:
  - Milestones completed so far (Per semester weeks)
  - Milestones to complete (Per semester weeks)
- Conclusion
- References: The references should be on a separate page. Cite and reference all resources you used in your project, use the IEEE referencing guidelines.  
<https://iee-dataport.org/sites/default/files/analysis/27/IEEE%20Citation%20Guidelines.pdf>  
<https://www.mybib.com/tools/ieee-citation-generator>
- Submit a softcopy and a hardcopy of your primary report at the beginning of class on:
  - Section 2: Tuesday, June 27, 2023.
  - Section 3: Wednesday, June 28, 2023

### **Final project report submission instruction:**

The final project report submission instructions will be posted close to Reading Week. For both sections 2 and 3, a softcopy of your final project report is due to Bright Space on Monday July 24, 2023. On the project demonstration day in week 11 you are required to bring a hardcopy of your final report on July 25 (Tuesday's section) and July 26 (Wednesday's section). Note that during week 11, there will not be a lecture and you will be required to show up at a certain time to demonstrate your projects, a schedule will be posted before the demonstration dates.

## **PROJECT INSTRUCTIONS**

- **HARDWARE NEEDED:**
  - Smart Parking Management System:
    - PUSH BUTTONS – 2
    - SERVO MOTOR
    - COMMON CATHODE RGB LED
    - RESISTORS
    - PCB OR BREADBOARD
    - LCD DISPLAY
    - JUMPER WIRES
    - ARDUINO UNO
    - BATTERY
    - BATTERY CONNECTOR CABLE
    - ARDUINO CONNECTION CABLE
    - Potentiometer
  - Adaptive Cruise Control:
    - LCD DISPLAY
    - ARDUINO UNO
    - PUSH BUTTONS- 5
    - ULTRASONIC SENSOR
    - RESISITORS
    - Battery
    - Battery Connector Cable
    - Jumper wires
    - PCB or Breadboard
    - Potentiometer

- Project Flow:
  - Step 1: Go through the project description and understand the requirements of the project.
  - Step 2: Order the Arduino Kit
    - Link: <https://tinyurl.com/yk563vmv>
    - This kit has everything needed for performing an Arduino Project.
  - Step 3: Install ARDUINO Support Package for MATLAB
    - <https://tinyurl.com/44rhmf26>
    - Go to MATLAB addons in the toolbar and search for “Arduino”. In the search results, select “MATLAB Support Package for Arduino Hardware version 19.2.2” and download. You will have to enter your MATLAB account credentials.
    - Complete the installation of all the 3<sup>rd</sup> party packages and toolboxes during the process.
  - Step 4: Learning to program an Arduino using MATLAB.
    - Understanding the pin diagram of an Arduino and learn modules used in the project (Ex: Sensors, LCD’s, Oscilloscopes, Motors etc)
    - Learn the basic examples found on the Internet regarding Arduino programming using MATLAB.
      - Initializing an Arduino.
      - Defining and declaring libraries to be used
      - Understanding the functionality and interfacing of the modules (Libraries)
      - Initialize the variables, input, and output pins of the Arduino
      - Create a loop and write the functionalities and list of processes to be done by Arduino.
      - Sometimes the folder for “+ExampleLCD” is missing from Arduino addon folder. To fix this go to the following path  
**“C:\ProgramData\MATLAB\SupportPackages\R20xx(any version you are using)\toolbox\matlab\hardware\supportpackages\arduinoio\arduinoioexamples\SDKExampleLCD\+arduinoioaddons\+ExampleLCD”** make a copy of “+ExampleLCD” and paste it in the following directory:  
**“C:\ProgramData\MATLAB\SupportPackages\R2019b\toolbox\matlab\hardware\supportpackages\arduinoio\+arduinoioaddons”**
  - Step 5: Make a clear circuit diagram of the project (Pin connections, Sensor connections, resistors etc.)
  - Step 6: Using the help of the diagram, make the connections on breadboard.
    - To find the proper configuration setup, go to the help section by clicking on “?” icon and search “LCD”. Select “Create LCD add-on” and the schematics to connect the LCD to Arduino should be there.
  - Step 7: Connecting Arduino to PC/Laptop., Run the MATLAB Code and execute the project.
- Resources/References:
  1. “ARDUINO PROGRAMMING USING MATLAB”, by Agus Kurniawan
  2. “MATLAB SUPPORT PACKAGE FOR ARDUINO HARDWARE USER’S GUIDE”, by MATHWORKS.

**Submission:**

Submit a hardcopy of your primary report at the beginning of class on:

- Section 2: Tuesday, June 27, 2023.
- Section 3: Wednesday, June 28, 2023

Submit a softcopy of your report to Bright Space, only the leader of the groups submits the report. Otherwise, you will receive a 100% similarity from the plagiarism software. You can submit this softcopy by midnight on the due date.

PROJECT INSTRUCTIONS GENG-8030 Dr. Alginahi