

# **GENG-8030 Computational Methods & Modeling for Engineering Applications**

## **Final Project Report Instructions**

### **Summer - 2023**

**Note that the final report and project presentations are worth 20% of your grade in the course. However, the project will be graded out of 100 points then converted to 20 points.**

This report is a continuation from your primary report. It is expected that you extend your primary report to prepare your final report, see instructions below. Please make sure you visit the GAs to know where you lost points in your primary report so that you can adjust those parts in your final report.

#### **Introduction:**

- Read these instructions carefully, these are also provided to you under the Assignments link in Brightspace.
- Prepare your final report according to the instructions provided below.
- **The deadline for submitting the softcopy report for both sections is midnight Monday, July 24, 2023.**
- **Hardcopy to be submitted on the day you demonstrate your projects:**
  - o **Section 2: Tuesday, July 25, 2023**
  - o **Section 3: Wednesday, July 26, 2023**
- Write in your own words.
- Note that these reports will be scanned through a plagiarism software and a similarity rate over 20% is not acceptable and the students will be penalized.
- Start early so you can finish your project on time.

#### **Final Project Report:**

Your project should follow the following formatting guidelines:

- Use Font: Times New Roman, 12 points.
- Line 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 the table of content page, starting at 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.

Your project should have the following sections:

- 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
- Complete pseudocode of your control system.
- Timeline and any limitations/risks you may have faced in your project. For this part prepare in a table format
- Circuit diagram for your project
- Detailed explanation on how your circuit works.
- Testing scenarios to test your circuit, it is expected that you add more scenarios than what is provided in the project description sheet (if applicable)
- Complete MATLAB code
- Lessons Learned
- 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>

#### **Bonus:**

- You could receive up to 10% bonus on your project if you do two of the following:
- Build your circuits using TinkerCAD, simulate it and provide the code.
- Created a Graphical User Interface in MATLAB for your project.
- Added two more features to your project.

#### **Submission:**

- Submit a softcopy of your final report on Monday, July 24, 2023, by midnight. In a zip folder include all required files for the final project: final report, circuit diagrams, simulation file (if applicable) and MATLAB code file (.m).
- Submit a hard copy of your report on the project demonstration day:
  - o Section 2: Tuesday, July 25, 2023
  - o Section 3: Wednesday, July 26, 2023

#### **Project Presentations:**

- Project presentations are scheduled during the tutorial and lecture times. For those who will demonstrate during week 11 (refer to syllabus), a spreadsheet will be posted before the presentation dates so that you can choose the time to present your project. Students may demonstrate earlier during the GA office hours with permission from the course instructor given that the final report (soft and hard copies) is submitted on the day of the project demonstration. Please email me and cc the GAs if you are interested in doing this and then we will provide you with a form to fill in and select the time and date for your presentations.
- All group members must be present during the presentation of the project.
- Note that any group or member of a group who does not present their project and only submitted their project report, their project will be graded out of 50% of the grade allotted for the whole project, i.e., the maximum a student would receive in this case is 12.5 points this includes their primary report grade.
- In your project you should display a welcome message, then show your group number, and names.
- It is expected you test your project with different scenarios.

### Assessment:

- Working Circuit → [10 points]
- LCD – welcome message + displaying group number and names of students → [5 points]
- Testing different scenarios → [10 points]
- Project presentation: MATLAB code explanation → [15 points]
- Correct circuit diagram → [10 points]
- Final report → [50 points]
- Extra features and simulation [**BONUS**] → [maximum 10 points]

# 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>
  - 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 process to be done by the Arduino.
  - 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.

- 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.

PROJECT INSTRUCTIONS GENG-8030 Dr. Alginahi