

**Group Project**

**Purpose:**

There are two main purposes for this activity:

1. Help you define an engineering challenge by gathering data and then using the data to prepare a short report on a specific challenge.
2. Provide you with the opportunity to applying your programming skills to a data set.

**Overview:**

The National Academy of Engineers has identified 14 Grand Challenges for Engineering that will need to be addressed to ensure the 21st Century challenges are properly addressed. The main challenges are to deal with the increasing population while still improving the quality of life. Details regarding the Grand Challenges can be found at the following website:

<http://www.engineeringchallenges.org/cms/8996.aspx>

The website provides a nice overview of the Grand Challenges as a general topic and also about each of the 14 individual titles.

Understanding these challenges is important for any Engineer trying to address an individual topic. When trying to understand a challenge, it is important to quantify the problem. Non-scientific approaches tend to just say things in general, but data is much more powerful when trying to understand why these are Grand Challenges. To help you quantify these challenges, a website created by the UN is ideal for downloading data related to many global issues. The website can be retrieved at:

<http://data.un.org/Explorer.aspx>

**Procedure:**

Your project is to download a few datasets from the UN website and then generate a user-friendly script file(s) for processing the data. The data does not have to come from the UN website, however you will be responsible with other datasets to understand how to download them using a MATLAB script file. Also, some Grand Challenges are not easy to find datasets for, however it is your job to define the problem, not solve the problem. Many of these problems can be described through the provided data.

The script file(s) must cover 7 out of the 9 Lecture topics from class (see topics below). Each team member is responsible for at least two of the topics below. The topics we are referring to include:

1. Input statements
2. Output statements
3. Reading data from Excel into Matlab (xlsread)
4. Graphing in MATLAB (use both the plot, imshow, or bar commands)
   * Try to have at least two figures generated from graphing
5. Curve Fitting and Interpolation
6. Conditional Statements (if-elseif-else-end / switch-case)
7. Loops (For / While)
8. Work with data as Array
9. Array Applications (Handling Data Files, this is easy since it is the project topic)

In your code, you must identify with comment lines where you actually apply the above topics and which team member is in charge of this portion of the code.

**Schedule and Milestones:**

1. 1st Meeting (lab week 12):
   1. Project Assigned.
   2. Form teams.
   3. Choose a team leader. Exchange contact information
   4. Choose a few datasets and begin generating Matlab script files to analyze data.
2. 2nd Meeting (lab week13)
   1. Work on Project
   2. Team Leader: Submit Progress Report #1 by week 13 Friday.
3. DATE FOR SUBMISSION (Thursday of week 14).

A narrated video of your project (in PowerPoint or screen capture from MATLAB itself). In 3 minutes describe your project and show your work. This video will be presented at the STEM Expo.

1. 3rd Meeting Final Report (lab week 15):
   1. Team Submission: The following files should be downloaded to Blackboard by the team leader:
      1. Your script file(s) in .m format
      2. The data files saved in excel format and Matlab (.mat) format.
      3. Short report of your project (around 4 pages)
   2. Introduction: short paragraph identifying topic
   3. Procedure: How to run your code with a general description of inputs and outputs
   4. Results: All plots, tables and pictures generated by your script file
   5. Discussion: Discuss your outputs and how the results are helping define the Grand Challenge.
   6. What worked well in your group concerning team work? What would you do differently next time?
   7. Conclusion: Paragraph discussing what was learned from this project (about Grand Challenges and about generating your own script files from scratch).
   8. Appendix: List the script and data files used for the project, be sure to include citations for each database.
   9. Individual Submission: The peer-evaluation form should be filled out and submitted separately on blackboard. The peer-evaluation form is filled out individually to assess the participation of all team members.

Attendance at Meeting sections is mandatory. If a team member misses a meeting section due illness or some other unavoidable circumstance, the team member must contact his/her team and arrange to work on some portion of the project outside of class to make up for the absence. The team must document the makeup-work done by the missing team member in the final report (as an additional appendix section). If the missing team member does not make up for the missed session, that member will lose 10 points (out of 100) from the final project grade. Any team member who misses two sessions and cannot document a serious illness or other verifiable emergency will be expected to complete the project individually.