IAM 550 Introduction to Engineering Computing
Computer Lab 2/3
Combustion engine, plotting, scripts
J. Raeder, September 10/12 and 17/19 2019

Objectives:

- Be able to use arrays/vectors.
- Be able to create and use scripts.
- Be able to produce simple line plots.
- Learn and practice how to write a proper report.

This is a somewhat more complex assignment that should be completed over two lab sessions. You should finish part a) and a simple version (plot without the extras) of part b) in the first week, and complete everything in the second week. Deliverables:

- A MATLAB diary for each of your entire laboratory session (25% of your laboratory grade). Each one should be submitted via canvas as an assignment within 2 days after the session.
- A lab report summarizing your results and including all required files. Make sure your name is on *all* pages of your lab report. **This report is due at the beginning of your next lab session the following week (9/24 or 9/26).**

Engine/Compression II

Before you begin: Initialize a MATLAB diary: LastnameFirstinitial_Diary_LabX.txt, where X is 2 or 3.

We continue with the combustion engine.

(a)   Derive an expression for the compression ratio $r(L)=d_{BOT}/d_{TOP}$ as a function of L. Invert that expression to get L as a function of r.
(b)   Produce a script (plot_p.m) that creates a single plot with 4 lines of the pressure as a function of ω for the compression ratios 5, 10, 15, 20. The range of ω should be 0 to 360 degrees. Make sure the plot is properly labelled and visually appealing.
(c)   Produce another script (plot_T.m) that shows $T(\omega)$ for the same 4 compression ratios.
(d)   Discuss what the curves tell you. What compression ratios would be good for a diesel engine and which ones would be good for a gasoline engine? You may need to read up a bit about engines.
(e)   The world's largest diesel engine (find rtac_tr.pdf) has a maximum compression pressure of 140 bar. From your plots, make a rough estimate of the compression ratio.

You need to understand the following concepts at a basic level:

- Vector operations.
- How to create plots with multiple lines, markers, font sizes, labels, legends, etc..
- How to save plots as pdf files.
- How to create, run, and modify m-files.

When you finish: Don't forget to retrieve your diary file and submit them via canvas.