Final Assessment Lab Session (delivered online through blackboard collaborate)

Dr Edward Smith

This will be a virtual session for many students even if we can get into a computer room. Therefore, if you have questions:

1) Log onto blackboard collaborate
    a. Feel free to join this chat and listen to the ongoing discussion
    b. Ask a question by typing (on the everyone group or directly as private message to lecturers or tutors) or raising hand and making sure you have microphone on. Please also turn on video if you feel comfortable
2) Post your question in the blackboard Q&A outside of these sessions and I will answer as soon as possible (this ensures all students can see the answers)

In addition, if you get stuck you can read the lecture slides, look at the suggested class textbook (http://tinyurl.com/yy53shga) or use MATLAB's excellent help functions.

You have 8 hours of tutorials for this final assessment and you will see no new material in the programming part of the course for the next 2 weeks.

Final Assessment Exercise

The single MATLAB grader question asks you to write a solver for the following equation,

$$\frac{\partial u}{\partial t} = \nu \left[\frac{\partial^2 u}{\partial x^2} + \frac{\partial^2 u}{\partial y^2} \right]$$

This will be inside a function with the following form,

```
function u = solve_unsteady_diff(uinitial, Lx, Ly, Mx, My, ...
                                 nu, maxIter, dt, ...
                                 xperiodic, yperiodic, ...
                                 tBC, bBC, lBC, rBC, ...
                                 showplot)
```

with the meaning of the various inputs are described on the grader problem (and match the expressions seen in the various lectures). The grader part carries roughly 50% of the mark for the final assessment and is split into parts of increasing difficulty.

In addition, you will submit a document of NO MORE THAN 2 pages (Arial size 11). This should be in the format of a readme file for the code (no need for standard report format). This should be written for a new user but with the aim of demonstrating you understand how the code works, how it should be used and what problems it can physically solve. It must include the following information (rough weighting are shown next to each part):

1) You should describe the interface of the function including what each of the inputs mean, the shape/format they should be in and the shape/format of the returned variable u (5%)
2) You should write a "quickstart" example explaining how a user would call the function, including a discussion of the physical/ engineering problems which can be solved. Include

some plots here showing how the solution changes with different initial and boundary conditions (15%)

3) Add a few snippets of the code you have written and explain what they do, highlighting the key parts such as solving the equation, applying boundary conditions and plotting (10%)
4) A discussion of how you have verified and validated the code, please note that the GRADER exercise can be considered as part of this verification (in the form of unit tests written in a test-driven development manner) but you should discuss what is tested and how this ensures the code works. You should also mention possible validation cases (10%)
5) Finally, include some suggestions for some possible extensions to the code and briefly explain how you would implement them (applied force, convection, other boundaries, GUI, etc) (10%)

The full code with all comments should be included in the appendix (this is not included in the 2 page limit but nothing else except code can go in the appendix). Make sure the comments are descriptive as this will support 3 above and may allow partial credit if you have not passed part of the GRADER.

You must complete BOTH the grader exercise online AND submit the report on wiseflow by the deadline of 27/11/20 at 23:59. Please raise any problems in the tutorial sessions or well before the deadline. It will not be possible to deal with last minute issues.