Approximation of Functions

Michaelmas Term 2020
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This Course
This course is aimed at Part C (4th year) and OMMS Mathematics students (C6.3) and also students in the MSc in Mathematical Modelling and Scientific Computing. It presents the foundations on which all of numerical mathematics is built.

Instructor, tutor and TA
Nick Trefethen, `trefethen@maths.ox.ac.uk`. I am happy to talk with students at any time; contact me by email and I will probably respond very quickly. The tutor is Nicolas Boullé (`boulle@maths.ox.ac.uk`) and the TA is Maike Meier (`maike.meier@maths.ox.ac.uk`).

Textbook
The course is closely tied to my textbook *Approximation Theory and Approximation Practice, Extended Edition,* SIAM 2020, `http://people.maths.ox.ac.uk/trefethen/ATAP` (the first six chapters are online at this web site). All students are required to use this book. You can access it readily online through the Oxford libraries (SOLO). If you prefer a hardcopy (as I always do for books I am going to study carefully), I have a few I would be happy to sell (below cost) for £30, or £20 for the 2013 edition (same page numbers and exercises though a few misprints) — send me a message and we'll sort it out.

Lectures
There will be 20 lectures online, tied to chapters 1–11, 13–19, and 23–24 of the book. If you want to learn this material, it helps enormously to watch the lectures. Most of them are about 25 minutes long.

Problem sheets and classes for Part C and OMMS students
There will be four 90-minute classes in L3 (`https://minerva.maths.ox.ac.uk/perl/classlists.pl`):

Class 1: Week 2, Wed 21 Oct 2:30–4:00
Class 2: Week 4, Wed 04 Nov 2:30–4:00
Class 3: Week 6, Thu 19 Nov 2:30–4:00
Class 4: Week 8, Wed 02 Dec 2:30–4:00

For each class, a set of seven exercises from the textbook will be due at 9am on the Monday before. Turn in the first sheet to Ms. Meier by email (see above); the procedure may change for sheets 2–4. Underlined problems require computing. Note that some exercises have been corrected from the 2013 edition to the 2019 "extended" edition, so it's important to take exercises from the latter.

Due Oct. 19: 2.1, 2.2, 3.1, 3.5, 3.9, 4.2, 4.3.
Due Nov. 02: 5.4, 5.9, 6.1, 6.5, 6.7, 7.3, 8.4
Due Nov. 16: 9.2, 9.4, 10.4, 10.5, 10.6, 11.4, 13.2.
Due Nov. 30: 15.7, 15.9, 16.3, 17.5, 18.7, 19.9, 23.2.

Assessment
For Part C and OMMS students, by exam in Trinity Term, which will cover the 20 chapters listed above (141 pages total). For MSc MMSC students, by Special Topic, due Monday week 1, Hilary Term. There is great flexibility of topics you may choose.

MATLAB and Chebfun
We will make constant use of Chebfun (`www.chebfun.org`), which is built on MATLAB. It is not possible to understand this course fully without participating in this side of things. Accordingly, each problem sheet contains a mix of theory and computation. The exam will involve no MATLAB or Chebfun, so in theory one could get away with paying no attention to computing, but that's unlikely to be true in practice, for your understanding of the material will be shallow.

Access to MATLAB and Chebfun
MATLAB is available from `https://register.it.ox.ac.uk/self/software`. To get Chebfun, go to `www.chebfun.org` and click on Download for instructions.

Course web page
`https://courses.maths.ox.ac.uk/node/49601`.