Approximation of Functions

Michaelmas Term 2019
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This Course
This course is aimed at Part C and OMMS (4th year) 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, Wiles S2.27, 615317, `trefethen@maths.ox.ac.uk`. To speak with me, you can make an appointment by contacting me by email. The tutor is Yuji Nakatsukasa (`nakatsukasa@maths.ox.ac.uk`) and the TA is Nicolas Boullé (`boulle@maths.ox.ac.uk`).

Textbook
The course will be closely tied to my textbook *Approximation Theory and Approximation Practice,* SIAM 2013, `http://www.maths.ox.ac.uk/chebfun/ATAP/` (the first six chapters are online at this web site). All students are required to use this book. Copies are available for £20 in the first two lectures and can also be found in various libraries. (SIAM charges $39.20 even with the SIAM member discount.)

Lectures
There will be 16 lectures in the Andrew Wiles Building: 9:00–10:00 Wednesdays and Thursdays in L4. If you want to learn this material, it is important to attend all the lectures.

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

Class 1: Week 3, Tue 29 Oct 17:00-18:30 in L6
Class 2: Week 4, Wed 06 Nov 12:00-13:30 in C4
Class 3: Week 6, Wed 20 Nov 12:00–13:30 in L6
Class 4: Week 8, Wed 04 Dec 11:00-12:30 in C4

For each class, a sheet of problems from the textbook will be due before 3:00 on the previous Friday (AWB mezzanine, pigeonhole near L2). Underlined problems require computing.

Due Fri 25 Oct: 2.1 (just through "tic" and "toc"), 2.5, 2.6, 3.1, 3.6 (change $k-1$ to $(k-1)/2$), 3.11 (change `chebpolyplot` to `plotcoeffs`), 4.2, 4.7
Due Fri 01 Nov: 5.6, 5.7, 5.8, 5.12, 6.2, 6.4, 6.5.
Due Fri 15 Nov: TBA
Due Fri 29 Nov: TBA

Assessment
For Part C and OMMS students, by exam in Trinity Term. 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/42786`.