Summer Reading List
MSc in Advanced Aeronautical Engineering

If you have accepted an offer of a place on our programme it is a good idea to prepare for your studies. Our MSc students come from a range of different backgrounds, and at the start of the programme there will be a range of non-examined modules to fill in any gaps you may have but it would also be a good idea for you to look at some of the references below to make sure you are up to speed when you start your programme. The reading list below is far too large to be covered by you in full, instead please identify the topic(s) that you are least familiar with and concentrate on them.

The background knowledge desirable to possess at the start of the programme consists of 5 main parts (in random order, all are equally important):

1. Fluid Dynamics
2. Programming and numerical analysis
3. Mathematics
4. Flight Mechanics
5. Structural Mechanics

1. Fluid Dynamics
   - Basic fluid mechanics, Navier-Stokes equations.
   - Low-speed aerofoil aerodynamics: Kutta condition, Glauert solution,
   - aerodynamic center.(http://ocw.mit.edu/courses/aeronautics-and-astronautics/16-100-aerodynamics-fall-2005/lecture-notes/)

And here is the book:


2. Programming and numerical analysis
   - Matlab (http://en.wikipedia.org/wiki/MATLAB) is used in teaching some important modules.
Knowledge of high-performance computing languages (Fortran, C, etc) will be a definite advantage, especially in coursework. Introduction to Fortran (probably the easiest high-performing language to learn) will be given, but, again, it is worth to start early: download a free Fortran compiler from here (Salford Fortran compiler): [http://www.silverfrost.com/32/ftn95/ftn95_personal_edition.aspx](http://www.silverfrost.com/32/ftn95/ftn95_personal_edition.aspx) or any other Fortran compiler ([http://www.thefreecountry.com/compilers/fortran.shtml](http://www.thefreecountry.com/compilers/fortran.shtml)).

Learn how to compile and run programs.

A very good basic book is: Fortran90 for Engineers and Scientists by Larry R. Nyhoff and Sandford C. Leestma, published by Prentice Hall. There are two editions (same title), one fatter and more expensive than the other. If this proves difficult to buy, Fortran 90/95 for Scientists and Engineers by Stephen Chapman is also very good. This is published by McGraw Hill.

Google 'Fortran' for free online materials. There are plenty.

The desirable background on numerical analysis is at the level of Numerical Analysis, R. L. Burden and J. D. Faires, Brooks/Cole 2001.


3. Mathematics

- Ordinary differential equations (ODE). Solution of homogenous and non-homogenous ODEs, particularly n-th order linear ODEs. Linear stability.
- Vector calculus: gradient, divergence, curl, Gauss theorem, Stokes theorem etc.
- Functional analysis: Fourier transform, Laplace transform.
- Linear algebra: Definition of matrix-vector multiplication, definition of orthogonal matrices and symmetric matrices, eigenvalues, eigenvectors, the characteristic equation, diagonalization, similarity, determinants, rank, solution of linear equations, change of coordinates/basis.

Freely downloadable books for linear algebra:

[http://joshua.smcvt.edu/linearalgebra/](http://joshua.smcvt.edu/linearalgebra/)
Basic algebra, calculus and ordinary and partial differential equations is well covered in reference [1] or any book on "Advanced engineering mathematics" such as [2,3] that also include some basic numerical analysis.


4. Flight Mechanics
A basic understanding of aircraft flight and flight mechanics would be advantageous before starting the course. A couple of good introductions to the subject are,


5. Structural Mechanics
- Basic stress analysis (this will be covered in the Revision Stress Analysis course given to all MSc students in the first two weeks of the Autumn term)

A basic understanding of structural mechanics would be useful for some of the modules, a couple of books which might be of interest are,


Seems too much? Do what you can and we will try to teach you the rest.

Good luck and see you all in September.