

School of Mathematics

Course 1S11 — Mathematics for JF Science

2008–09

(JF Mathematics as a whole subject within the Science Moderatorships. JF Human Genetics. JF Computational Chemistry. JF Medicinal Chemistry. JF Physics & Chemistry of Advanced Materials.)

Lecturer: Dr. C. Houghton, Prof. R. Timoney

Requirements/prerequisites: None

Duration: 24 weeks

Number of lectures per week: This is the first semester module of a two semester sequence. It continues as module MA1S12 in the second semester. (Together MA1S11 and MA1S12 make 20 ECTS.) For the first semester, there will be 6 lectures, 2 tutorials and, for several of the weeks, 1 computer practical.

Assessment: Practical work, assignments, tutorial work and computer lab assignment results will count for 25% of the marks, There will be final examination in June counting for the remaining 75%.

End-of-year Examination: Three hour exam. Result is combined with results of 1S12.

Description:

Calculus with applications for Scientists

The lecturer for this part will be Dr. Houghton. See <http://www.maths.tcd.ie/~houghton> for additional information about this part. The main textbook will be [Anton] and the syllabus will be approximately Chapters 1-7 of [Anton].

Chapter headings are

- Functions;
- Limits and Continuity;
- The Derivative;
- The Derivative in Graphing and Applications;
- Integration;
- Exponential, Logarithmic and Inverse Trigonometric Functions;

Discrete Mathematics for Scientists

The lecturer for this part will be Prof. Timoney. See <http://www.maths.tcd.ie/~richardt/1S11> for additional information about this part.

The order of the topics listed is not chronological. Some of the topics listed below linear algebra will be interspersed with linear algebra.

- *Linear algebra* This reference for this part of the course will be [AntonRorres]. For 2008–9 the syllabus will be approximately chapters 1, 3 section 4.1 of [AntonRorres].
 - Vectors, geometric, norm, vector addition, dot product
 - Systems of linear equations and Gauss-Jordan elimination;
 - Matrices, inverses, diagonal, triangular, symmetric, trace;
 - selected application in different branches of science.
- *Mathematica*. Introduction to the computer algebra (symbolic mathematics) system. Uses for calculus, graphing, matrix calculations. Exercises could include applications of ideas from Maths 1S1 (graphing, Newton’s method, numerical integration via trapezoidal rule and Simpsons rule).
- *Spreadsheets*. A brief overview of what spreadsheets do.
- *Numbers*. Binary, octal and hexadecimal numbers and algorithms for converting between them.

Essential References

- [**Anton**] Calculus : Howard Anton, Irl Bivens, Stephen Davis. (Author Anton, Howard; 8th ed; Publisher New York : Wiley, c2005). [Hamilton 515 P2*7, S-LEN 515 P2*7]
- [**AntonRorres**] Howard Anton & Chris Rorres, Elementary linear algebra : applications version. (Author Anton, Howard; 8th ed.; Publisher New York ; Chichester : John Wiley, 2000). [Hamilton 512.5 L32*7-2, S-LEN 512.5 L32*7-2]

Recommended reference

- [**Thomas**] Thomas’ calculus. Author Weir, Maurice D. Edition 11th ed / based on the original work by George B. Thomas, Jr., as revised by Maurice D. Weir, Joel Hass, Frank R. Giordano Publisher Boston, Mass., London : Pearson/Addison Wesley, c2005. [Hamilton 515.1 K82*10;*]

October 7, 2008