### School of Mathematics

Course 1S12 — Mathematics for JF Science (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, Dr. A. Ilderton, Dr. C. Ó Dúnlaing

**Requirements/prerequisites:** None

**Duration:** 24 weeks

Number of lectures per week: This is the second semester module of a two semester sequeence. It continues from module MA1S11 in the first semester. (Together MA1S11 and MA1S12 make 20 ECTS.) For the second semester, there will be 6 lectures and 2 tutorials per week.

Assessment: Assignments and tutorial work will count for 20% of the marks. There will be final examination in June counting for the remaining 80%.

End-of-year Examination: Three hour exam. Result is combined with results of 1S11.

### **Description:**

# Calculus with applications for Scientists

The lecturers for this part will be Dr. C. Houghton (first 5 weeks) and Dr. A. Ilderton. The main textbook will be [Anton] and the syllabus will be approximately Chapters 8-11

of [Anton] plus a brief introduction to partial derivatives (sections 14.1, 14.3 of [Anton]).

Chapter headings are

- Applications of the definite integral in geometry, science, and engineering;
- Principles of integral evaluation;
- Mathematical modelling with differential equations;
- Infinite series;
- Analytic geometry in calculus.

## **Discrete Mathematics for Scientists**

The lecturer for this part will be Dr. C. Ó Dúnlaing.

• Linear algebra This reference for this part of the course will be [AntonRorres]. For 2008–9 the syllabus will be approximately chapters 2, 7, sections 4.2, 9.1 and 9.3 and a selection of application topics from chapter 11 of [AntonRorres].

2008-09

- Determinants, evaluation by row operations and Laplace expansion, properties, vector cross products, eigenvalues and eigenvectors
- Introduction to vector spaces and linear transformations. Least squares fit via linear algebra.
- Differential equations, system of first order linear equations, linear second order equations;
- selected application in different branches of science.
- *Probability.* Basic concepts of probability; Sample means; Expectation and standard deviation for discrete random variables; Continuous random variables; Examples of common probability distributions (binomial, Poisson, normal) (sections 24.1–24.3, 24.5–24.8 of [Kreyszig]).

### 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 references

- [Kreyszig] Erwin Kreyszig, Advanced engineering mathematics (9th edition), Wiley, 2006 [Hamilton 510.24 L21\*8, S-LEN 510.24 L21\*8]
- [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