

1E1 ENGINEERING MATHEMATICS I [5 credits]

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Module organisation

The module runs for the first half (12 weeks) of the academic year and comprises of three lectures and one tutorial per week (total of 44 hours contact time).

Module description, aims and contribution to programme

Engineering Mathematics I is a half-year module taken by all Junior Freshman Engineering and Engineering with Management students. It starts with the calculus of functions of one real variable, formalising and building on Leaving Certificate mathematics. The module emphasises both theoretical foundations of calculus and application of mathematical methods and is intended to enable students to recognise mathematical structures in practical problems, to translate problems into mathematical language and to apply differentiation and integration to solve them.

Learning outcomes

Upon completion of this module, students will be able to:

- recognise mathematical structures in practical problems, translate problems into mathematical language, and analyse problems using methods from one-dimensional calculus;
- solve problems involving concepts of calculus;
- apply differentiation to find minima and maxima of a wide range of functions of one real variable;
- use standard computer input for mathematical expressions.

Course content

- Functions: definition, domain and range, operations with functions, inverse function, graphs, notions of rational, algebraic, and trigonometric functions;
- Limits and Continuity: Two-sided, one-sided, and infinite limits, limit at infinity and asymptotes; continuity, delta-epsilon language, intermediate-value and squeezing theorems;
- Differentiation of functions of one variable;
- Derivatives in graphing;
- Antiderivatives and introduction to integration.

Teaching strategies

The teaching strategy is a mixture of lectures and problem-solving tutorials. The format of lectures is conventional, however, the atmosphere is informal, and interaction and discussion is normal. Students are encouraged to ask questions in

the lectures. In the tutorials, the students work on problems to practise and apply the methods introduced in the lectures. Discussion of problems in small groups is encouraged and facilitated. On-line homework submission and information system is used for personalised weekly homework assignments and provides immediate feedback and support materials.

Assessment

Weekly continuous assessment contributes 20% towards the final grade with the end-of-year final written two-hour examination contributing 80%.

Required textbook

Calculus: Late Transcendentals Single Variable, Howard Anton, Irl Bivens, Stephen Davis (be sure to purchase the appropriate Book/Access Code package made specifically for this module at Hodges and Figgis on Dawson Street (it should have the following ISBN number: ISBN 9780470487976).

Further information

<http://www.maths.tcd.ie/~cherkis/1E01>

<http://www.maths.tcd.ie/~don/>

<http://www.tcd.ie/Engineering/undergraduate/baiyear1/modules/1E1.pdf>