

School of Mathematics

Course 1E1 – Engineering Mathematics 1
(JF Engineers & JF MSISS & JF MEMS)

2008-09

Lecturer: Dr. D.P. O'Donovan

Requirements/prerequisites:

Duration: 12 weeks (first semester)

Number of lectures per week: 3 lectures and 1 tutorial per week.

Assessment: The Course grade will be a maximum of 20% Assignments, 20% Midterm and 60% Final Exam and 100% Final Exam.

End-of-year Examination: 2 hour end of year examination.

Description:

Engineering Mathematics I is a half year course taken by all Junior Freshman Engineering students. It starts the calculus of functions of one real variable, formalising and building on Leaving Certificate mathematics. The course 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 course, 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.

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 integration;
- applications of integration (volumes by slicing, volumes of solids of revolution, volumes by cylindrical shells, lengths of plane curves, of parametric arcs, moments and centres of mass of thin rods);

- trigonometric and hyperbolic functions, and the corresponding inverse functions; logarithmic function, exponential function;
- modelling with differential equations;

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 practice and apply the methods introduced in the lectures. Discussion of problems in small groups is encouraged and facilitated.

Textbooks:

Calculus: Late Transcendentals Single Variable, 8th Edition Howard Anton, Irl Bivens, Stephen Davis ISBN: 0-471-728608 John Wiley & Sons.

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