
FACULTY OF ENGINEERING, SCIENCE AND THE BUILT ENVIRONMENT

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| Unit title: | Further Mathematics and Statistics | |
| Unit number: | BCE/2/120 | |
| Unit Level: | 2 | |
| Unit value: | 1.0 | |
| Unit co-ordinator: | I Kraincanic | |
| Contact time: | Lectures | 20 hours |
| | Computer Sessions | 6 hours |
| | Tutorials | 13 hours |
| | Assessment | 3 hours |
| Private study time: | 108 hours | |
| Total study time: | 150 hours | |
| Unit pre-requisites: | None. | |

SHORT DESCRIPTION

Further mathematics and introductory statistics and probability are covered. Emphasis in this unit is on application of mathematical tools in solution of complex civil engineering problems.

AIMS

To provide students with mathematical tools for engineering analysis and design.

LEARNING OUTCOMES

The student should be able to:

- appreciate the use of statistics in the analysis of data,
- understand the role of probability in engineering design,
- apply multiple integration to find areas, volumes, moments,
- solve partial differential equations
- recognise where the numerical methods should be used.

TEACHING AND LEARNING PATTERN

Lectures, computer sessions and tutorials supplemented by printed handouts.

INDICATIVE CONTENT

Statistics

Data and representation of data; sample mean, median, mode and standard deviation; use in civil engineering as a measure of risk;

Probability

Binomial, Poisson and normal distribution; t-distribution, errors.

Hyperbolic functions

Definitions; calculus; examples in civil engineering, catenary.

Multiple Integration

Double and triple integrals, change of order of integration; applications in civil engineering, moments, centre of mass.

Partial differential equations

Method of separating variables; sound waves as example

Numerical methods

Jacobian determinant; finite difference method.

ASSESSMENT METHOD

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| 70% | 3 hour end of unit examination |
| 30% | Coursework consisting of two pieces of work. |

INDICATIVE SOURCES

Core

Boas, M. Mathematical methods in the physical sciences, J. Wiley, 1998.
Stroud, K.A., Advanced engineering mathematics, Palgrave, Macmillan, 2003.
Soong T.T., Fundamentals of probability and statistics for engineers, Wiley, 2004.

Background

Arfken, G., Mathematical methods for physicists, Academic Press, 1999.
Bostock, L. and Chandler, S., Pure mathematics, Stanley Thornes Ltd, 1979.
Ziemer, R.E., Elements of engineering probability and statistics, Prentice Hall, 1997.