

Further Engineering Mathematics and Statistics

Module Code:	ENM5005-B
Academic Year:	2018-19
Credit Rating:	20
School:	(OUT OF USE FROM 2018/9) School of Engineering
Subject Area:	Engineering Mathematics
FHEQ Level:	FHEQ Level 5

Pre-requisites:

Co-requisites:

Contact Hours

Type	Hours
Lectures	40
Tutorials	24
Laboratory	8
Directed Study	110
Other (DO NOT USE)	3
Examinations DO NOT USE	15

Availability Periods

Occurrence	Location/Period
NLA	Namal College / Academic Year (Sept - May)
BDA	University of Bradford / Academic Year (Sept - May)

Module Aims

To establish an appreciation and working knowledge of the premise that analytical (deterministic) and statistical tools are components of a larger integrated tool kit for addressing and evaluating multiple solutions to a variety of engineering-based problems.

Outline Syllabus

Functions:

a. Special functions (Sinc, Bessel, Error, Delta).

b. Multivariate functions:

Partial derivatives, differentials, small increments, turning points & their classification when applied to general & specific (chemical/civil/electrical/industrial/mechanical/medical) engineering problems.

Multiple integration, change of order, change to polar coordinates, applications to general & specific (chemical/civil/electrical/industrial/mechanical/medical) engineering problems.

Linear algebra: eigenvalues and eigenvectors.

Vector calculus: grad, div, curl & associated formulas.

Laplace transforms:

a. Standard transforms, shift theorems, transforms of derivatives & integrals;

b. Solution of ODEs including systems;

c. Transforms of step, delta and periodic functions, convolution.

Fourier analysis:

a. Fourier Series: Waves, representation of periodic functions by trigonometric series, half range series, complex form of the Fourier series, solutions of the two dimensional heat & wave equations.

b. Fourier transforms: periodic transforms, convolution.

Statistics:

a. The engineering method & statistical thinking; data collection & presentation; modelling random behaviour; estimation & testing; building empirical models through linear regression analysis; design of engineering experiments; introduction to response surface methodology; application to statistical quality control & life data analysis.

Specific (chemical/civil/electrical/industrial/mechanical/medical) engineering applications & context will be explored.

Module Learning Outcomes

On successful completion of this module, students will be able to...

- 1 Formulate the mathematical principles for handling analytical and statistical aspects of the course of study.
Understand variability underpinning engineering experiment, will have the knowledge required to plan & design engineering experiments to collect data, to carry out a variety of statistical tests and types of analysis on the data, to interpret the results, and to develop and validate theoretical and empirical models of engineering processes.
- 2 Apply a range of mathematical and statistical techniques to the formulation and solution of general and specific (chemical, civil, electrical, industrial, mechanical, medical) engineering problems.
Apply a range of statistical tests to engineering data, use statistical modelling techniques to derive empirical models for engineering systems, apply statistical models to process control, and utilise a specialised software package.
- 3 Use mathematical and statistical methods for systematic problem solving.
Use a range of advanced transferable skills in mathematical model development and statistical data presentation and interpretation.

Learning, Teaching and Assessment Strategy

Knowledge (theory, calculation methodology, application, interpretation) is disseminated in lectures and is practiced in exercise classes, with further practice and both general and

specific (chemical, civil, electrical, industrial, mechanical, medical) engineering context being established in discipline tutorial groups.

Statistical skills are taught and practiced in computer laboratory sessions.

Oral feedback is given during computer laboratory sessions, exercise classes, and tutorial groups. Written feedback will be provided with marked in-session assessments (class test / SEM1, coursework / SEM 2).

The assessment diet reflects module content and summative requirements:

- a. Mathematical discipline skills are assessed in a class test (supports written feedback);
- b. Statistical skills are assessed in computer laboratory sessions (supports written feedback);
- c. The wider learning outcomes of the module are assessed in a final closed-book examination.

Mode of Assessment

Type	Method	Description	Length	Weighting	Final Assess'
Summative	Examination - closed book	Semester 1, Examination - closed book - 1hr	1 hour	25%	No
Summative	Examination - closed book	Semester 2, Examination - closed book - 2hrs	2 hours	35%	No
Referral	Examination - closed book	Supplementary Assessment: Exam-closed book :6 questions; 4 are compulsory; 2 of these allow additional assessment of LOs	3 hours	100%	Yes
Summative	Classroom test	Semester 1, Classroom Test (maths) under examination conditions - 1 hr	1 hour	25%	No
Summative	Classroom test	Minitab Report under examination conditions - open book		15%	Yes

Legacy Code (if applicable)

ENG2307L

Reading List

To view Reading List, please go to [rebus:list](#).