

Liverpool John Moores University

Title: ANALYTICAL METHODS
Status: Definitive
Code: **4002BEHN** (102269)
Version Start Date: 01-08-2016

Owning School/Faculty: Applied Mathematics
Teaching School/Faculty: Applied Mathematics

| Team | Leader |
|------------------|--------|
| Vincent Kwasnica | Y |
| Lesley Wright | |
| Ian Malabar | |

Academic Level: FHEQ4 **Credit Value:** 12 **Total Delivered Hours:** 50
Total Learning Hours: 120 **Private Study:** 70

Delivery Options

Course typically offered: Standard Year Long

| Component | Contact Hours |
|-----------|---------------|
| Lecture | 36 |
| Tutorial | 12 |

Grading Basis: BTEC

Assessment Details

| Category | Short Description | Description | Weighting (%) | Exam Duration |
|----------|-------------------|--------------------------|---------------|---------------|
| Exam | AS1 | Closed book | 50 | 2 |
| Report | AS2 | Minimum of 2 assignments | 50 | |

Aims

To enable students to use fundamental mathematical processes in the solution of Construction problems.

Learning Outcomes

After completing the module the student should be able to:

- 1 Apply analytical methods to the management and production of construction processes and operations.
- 2 Apply analytical methods to surveying, testing and control problems in construction.
- 3 Analyze and model construction situations using statistics and probability.
- 4 Apply analytical methods to analyze structural and building engineering systems and supply appropriate design solutions.

Learning Outcomes of Assessments

The assessment item list is assessed via the learning outcomes listed:

| | | | | |
|------|---|---|---|---|
| EXAM | 1 | 2 | 3 | 4 |
| CW | 1 | 2 | 4 | |

Outline Syllabus

Analytical methods - management and production:

Algebra: linear, simultaneous and quadratic equations, laws of indices and logarithms, common and Naparian logarithms, indicial equations, direct and inverse proportion, inequalities, functional notation and manipulation of algebraic problems. Graphical representation: functions, points of intersection between two graphs, graph sketching (straight line, polynomial, exponential and logarithmic), fit lines to experimental data using least squares method.

Space, time and motion: plot space/time and velocity/time diagrams, determine displacement, velocity and acceleration. Laws of motion, momentum, impulse and projectiles.

Matrices: multiplication, transposition and inversion, applications.

Analytical methods - surveying, testing and control

Trigonometry: basic trigonometric ratios and their inverses, trigonometric ratios for the four quadrants, solution of triangles, calculisation of areas and volumes of solids Determination of co-ordinates in 2-d and 3-d geometry.

Trapezoidal and Simpson's rule

Statistics and probability

Tabular and graphical form: data collection methods, histograms, bar charts, line diagrams, cumulative frequency diagrams, scatter plots.

Central tendency and dispersion: introduction to the concept of central tendency and variance measurement, mean, median, mode, standard deviation, variance and interquartile range, application to construction.

Probability: interpretation of probability, probabilistic models, empirical variability, events and sets, mutually exclusive events, independent events.

Analytical methods- analysis of structural and building engineering systems; trigonometric methods: to solve problems such as static forces, relative motion, frameworks, metrology, friction torque, electrical and mechanical energy problems.

calculus: to differentiate and integrate simple equations and demonstrate applications of calculus.

Learning Activities

Lectures, tutorials and problem solving sessions.

Notes

The module provides students with the mathematical tools to enable them to use fundamental mathematical processes in the solution of Construction problems.