

MODULE SPECIFICATION PROFORMA

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| Module Title: | Civil Engineering Maths | Level: | 5 | Credit Value: | 20 |
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| Module code: | AUR533 | New <input checked="" type="checkbox"/> | Code of module being replaced: | AUR523 |
| | | Existing <input type="checkbox"/> | | |

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| Cost Centre: | GABE | JACS3 code: | G160 |
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| Trimester(s) in which to be offered: | 1, 2 | With effect from: | September 18 |
|---|------|--------------------------|--------------|

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| School: | Applied Science, Computing & Engineering | Module Leader: | Maria Kochneva |
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| Scheduled learning and teaching hours | 48 hrs |
| Guided independent study | 152 hrs |
| Placement | 0 hrs |
| Module duration (total hours) | 200 hrs |

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| Programme(s) in which to be offered | Core | Option |
| BSc Civil Engineering Studies | <input checked="" type="checkbox"/> | <input type="checkbox"/> |

Office use only

Initial approval September 18

APSC approval of modification *Enter date of approval*

Have any derogations received SQC approval?

Version 1

N/A

Module Aims

To enable students to apply mathematical principles including algebra, trigonometry, differential equations, calculus and statistics and their relevance to civil engineering, providing a mathematical base for civil engineering theory and application studies.

To develop the ability to use the results of analysis to solve engineering problems, apply technology and implement engineering processes.

To demonstrate problem-solving skills and an ability to generalise and transfer ideas, appropriate to engineering applications of mathematical concepts.

To develop an ability to analyse data for linear trends and statistical properties to provide an understanding of commercial and economic context

To develop an ability to apply quantitative methods and computer software relevant to their engineering technology discipline.

Intended Learning Outcomes

Key skills for employability

- KS1 Written, oral and media communication skills
- KS2 Leadership, team working and networking skills
- KS3 Opportunity, creativity and problem solving skills
- KS4 Information technology skills and digital literacy
- KS5 Information management skills
- KS6 Research skills
- KS7 Intercultural and sustainability skills
- KS8 Career management skills
- KS9 Learning to learn (managing personal and professional development, self-management)
- KS10 Numeracy

| At the end of this module, students will be able to | | Key Skills | |
|---|---|------------|-----|
| 1 | Apply trigonometric functions and polar coordinates systems to solve surveying / construction civil engineering problems. | KS1 | KS3 |
| | | KS10 | KS5 |
| 2 | Solve algebraic equations relating to construction/ civil engineering problems. | KS1 | KS3 |
| | | KS10 | KS5 |
| 3 | Apply knowledge and understanding of differential equations to solve construction/ engineering problems. | KS1 | KS3 |
| | | KS10 | KS5 |

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|--|---|------|-----|
| 4 | Apply knowledge and understanding of calculus to support application of key engineering principles in construction and civil engineering. | KS1 | KS3 |
| | | KS10 | KS5 |
| 5 | Apply knowledge and understanding of statistical techniques to construction/civil engineering problems using appropriate computer software. | KS1 | KS3 |
| | | KS10 | KS4 |
| Transferable/key skills and other attributes | | | |
| Problem Solving Analytical application | | | |

Derogations

Credits shall be awarded by an Assessment Board for those modules in which a pass mark (40%) has been achieved, **with a minimum mark of 35% in each element of assessment.**
None

Assessment: Please give details of indicative assessment tasks below.

Assessment 1 will comprise of a series of construction / engineering / surveying scenario problems to be solved using analytical methods via an in-class test and will account for 50% of the total allocated marks.

Assessment 2 will comprise of an In-class test, a timed online quiz, undertaken via the VLE and will account for 50% of the total allocated marks.

| Assessment number | Learning Outcomes to be met | Type of assessment | Weighting (%) | Duration (if exam) | Word count (or equivalent if appropriate) |
|-------------------|-----------------------------|--------------------|---------------|--------------------|---|
| 1 | 1,5 | In-class test | 50% | 2hrs | |
| 2 | 2,3,4 | In-class test | 50% | 2hrs | |

Learning and Teaching Strategies:

Lectures and problem solving sessions will be delivered to provide the underlying knowledge of the subject. Students, in general will work individually but group work may be beneficial for statistical sessions. The delivery of this module will be enhanced by use of appropriate maths software (Mathscad) and VLE quizzes.

Syllabus outline:

Trigonometric functions: graphs; sum waves; identities.

Polar Coordinate systems relating to Surveying/ setting out problems.

Linear algebraic equations: matrix form of simultaneous linear equations; solution of linear simultaneous equations, inverse matrices, Gaussian elimination

Non-linear algebraic equations: bisection.

Calculus: partial differentiation; integration; by parts, substitution and partial fractions: stationary points; Areas and volumes: calculation using definite integrals to solve Construction/Structural/Engineering problems.

Differential equations: modelling using differential equations; solutions (eg analytical solutions of linear constant coefficient differential equations, initial and boundary conditions, numerical solutions of differential equations, Euler's method.

Statistical techniques: sampling; linear regression (including line of best fit); confidence intervals; discrete and continuous distributions (binomial, Poisson, normal) to provide solutions for material testing, quality control, forecasting, commercial / economic decision making.

Bibliography:

Essential reading

Jordan, D. and Smith, P. (2008) *Mathematical Techniques: An Introduction for the Engineering, Physical, and Mathematical Sciences*, 4th Edn., Oxford: Oxford University Press.

Stroud, K.A., Booth, D.J. (2013) *Engineering Mathematics*, 7th Edn., Basingstoke: Palgrave MacMillan.

Stroud, K.A., Booth, D.J. (2011) *Advanced Engineering Mathematics*, 5th Edn., Basingstoke: Palgrave MacMillan.

Other indicative reading

Key Website References:

<http://mathworld.wolfram.com/>

mathcentre - Mathematics resources: <http://www.mathcentre.ac.uk/>;

sigma – Network for excellence in mathematics and statistics support:
<http://sigma-network.ac.uk/>;

Engineering Maths First-Aid Kit:

<http://www.nationalstemcentre.org.uk/elibrary/collection/1287/engineering-maths-first-aid-kit>;

HELM – Helping Engineers Learn Mathematics: <http://www.lboro.ac.uk/research/helm/>;
Mathematics Learning Support Centre at Loughborough University:

<http://mlsc.lboro.ac.uk/resources.php>

<http://www.strath.ac.uk/mathsskills/mathresources/>

<http://www.caerdydd.ac.uk/mathssupport/>

www.ihsti.com

Other indicative reading will be made available via the VLE.