| BIC6008-A module descriptor | |
|---|---|
| **Module Title** | Advanced Mathematical and Analytical Skills |
| **Credit Level** | 10 credits (FHEQ Level 6) |
| **Session** | 2026/7 academic year |
| **BDA occurrence** | Semester 1 available at University of Bradford |
| **BDA occurrence** | Semester 2 available at University of Bradford |
| **BDB occurrence** | Semester 2 available at University of Bradford |
| **BDA occurrence** | Semester 3 available at University of Bradford |

## Transparency notice

This specification for module code BIC6008-A has been generated automatically in advance of the academic year 2026/7. Every effort has been made to ensure that the information is accurate at the time of publication, but changes permitted by our Student Contract Terms and Conditions could be made in the interval between publishing and commencement of teaching; where changes impact the terms and conditions of an applicant's or student's offer, these are communicated to them as soon as possible.

## BIC6008-A module aims

As a student hoping to progress on to an engineering or computing degree, this module will strengthen and extend your mathematical skills.

It will give you a better understanding of the value and use of mathematics as an engineering tool and it will build up your level of competence in applying mathematical methods to solve engineering and computing problems.

| BIC6008-A module learning outcomes | |
|---|---|
| **No.** | **Students completing the module will be able to:** |
| **01** | Evaluate relevant mathematical concepts and their use. |
| **02** | Make calculations by hand and with the use of software tools. |
| **03** | Evaluate the use of mathematical tools and numerical techniques to the solution of engineering problems. |

| No. | Students completing the module will be able to: |
|---|---|
| **04** | Formulate a problem ready for computer simulation and drive commonly used industrial software. |

## BIC6008-A module outline syllabus

The module will cover the following:

Revision of basic mathematical manipulation

Vector Calculus: addition, subtraction, multiplication, dot product, cross product, divergence of vectors, vector projection on a plane, vector equations of lines and planes.

Matrix algebra: addition, subtraction, multiplication, trace, determinant, linear equations, linear transformations, decompositions, eigenvalues and eigenvectors, the polynomial method.

Laplace transform: definition, examples, transfer functions, stability of systems, application to solution of ODEs and PDEs

Fourier transform: Fourier series (discrete domain), definition, examples, link to Laplace transform, frequency domain, applications to SDOF

Computer Modelling Techniques: Application of MATLAB for engineers and computing problems.

Finite Element Analysis (FEA), Revision on matrix manipulation, flexibility method, stiffness method, interpolation functions, the shape function, element selection, discretisation of a domain, analysis type selection, building an FEA model, one-dimensional FEA.

Introduction to Computational Fluid Dynamic (CFD), flow models, forms of flow governing equations, integral approach, differential approach, conservation and non-conservation forms of the transport equations, discretisation methods

For more information, visit the VLE (**Canvas**) page, go to our **Reading Lists webpage for this module** or search **https://bradford.rl.talis.com** for this module.

## BIC6008-A module notional learning hours

- 50 hours Lectures
- 50 hours Directed Study

The overall expected hours may include contact time, scheduled learning activity, directed and independent study and any minimum expectations for placement learning. Most learning at the University of Bradford has some online content and sessions which are delivered fully by virtual means are labelled as "online".

## BIC6008-A module learning, teaching and assessment

Groups are small and classes are student-centred and interactive.

The classroom approach is explicitly designed to help international students acquire new knowledge and skills, to build their confidence and enable them to become more independent learners. By doing this consistently and across all modules, the programme provides them with a strong foundation for further study in their chosen subject area.

The approach is inclusive and recognises that students come from different backgrounds with a range of previous learning experiences and associated expectations, beliefs and behaviours. Teaching and learning methods are clearly explained so students understand why (where appropriate) they need to engage in new ways of learning and why those they have used or relied on up to this point may be less suited to supporting their ongoing development and their chances of success in UK Higher Education.

Formative work is an integral part of the approach. In class, students are set tasks that require them to apply their knowledge and skills, to think critically and solve problems. The level of challenge is gradually increased as the students grow in confidence and Tutors help them to see that experimentation, trial and error are central to the learning process, providing constructive feedback on both what has been achieved and how.

Students are also expected to engage in independent study, to reflect on their own performance and to discuss this with their module tutor or personal academic tutor, who will provide support and advice and, when necessary, draw the attention of Module and Programme Leads to a struggling student using the 'Students of concern' process.

The summative assessment consists of two parts. Part 1 is a portfolio of work compiled throughout the module evidencing the use of calculations and evaluation of the use of mathematical tools and numerical techniques to solve real-world engineering and computing problems. It is submitted at the end of the module. Part 2 consists of an unseen examination covering mathematical concepts and the formulation of a problem ready for computer simulation and drive commonly used industrial software.

## BIC6008-A mode of assessment

| Type | Mode | Assessment description | Weight |
|---|---|---|---|
| **Summative** | Coursework - Written | Portfolio of written evidence of exercises set during the module (1500 words) | 50% |
| **Summative** | Examination - Closed Book | Unseen examination, covering all aspects taught during the module (2 Hrs) | 50% |

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