**COURSE DETAILS**

**Course Code:** F18NA  
**Full Course Title:** Numerical Analysis A  
**SCQF Level:** 8  
**SCAF Credits:** 15  
**Available as Elective:** No

**DELIBERY LEVEL**

<table>
<thead>
<tr>
<th>Undergraduate:</th>
<th>Yes</th>
<th>Postgraduate Taught:</th>
<th>Yes</th>
<th>Postgraduate Research:</th>
<th>No</th>
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</thead>
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**Additional Information:**

**COURSE AIMS**

To give an introduction to some of the basic methods of numerical analysis and the scientific computing package Python.

**LEARNING OUTCOMES – SUBJECT MASTERY**

- Understand basic methods of numerical analysis and the numerical approximation of solution to mathematical problems.
- Become familiar with the concept of numerical approximation.
- Use mathematical techniques which are required to approximate the solution of single nonlinear equations.
- Use mathematical techniques which are required to interpolate data.
- Use mathematical techniques which are required to approximate integrals.
- Use mathematical techniques which are required to approximate derivatives.
- Become familiar with the basics of the computer package Python.
- Understand the concept of conditionals in programming.
- Understand the concept of iteration in programming.
- Solve specific problems from the applied sciences using Python.

**LEARNING OUTCOMES – PERSONAL ABILITIES**

- Demonstrate the ability to learn independently.
- Demonstrate knowledge of an area of mathematics.
- Manage time, work to deadlines and prioritise workloads.

**SYLLABUS**

**Introduction:** What is numerical analysis? Approximate versus exact solutions of mathematical problems.
**F18NA Numerical Analysis A**

**Introduction to Python:** Basic operations, vectors and matrices, plotting graphs of functions, loops, conditional statements.

**Solution of nonlinear algebraic equations:** Approximating solutions of \( f(x)=0 \) using, e.g., the bisection, Newton and fixed-point methods.

**Polynomial Interpolation:** Approximating functions of one variable by interpolating polynomials.

**Numerical Integration:** Approximating integrals of functions of one or more variables using, e.g., Newton-Cotes methods, composite quadrature rules, Gaussian quadrature.

**Numerical Differentiation:** Approximating derivatives using finite differences, e.g., forward, backward and central difference methods.

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<thead>
<tr>
<th>Course Code</th>
<th>Level</th>
<th>Title</th>
<th>School</th>
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<tbody>
<tr>
<td>F17CA</td>
<td>7</td>
<td>Calculus A</td>
<td>School of Math and Comp Sci.</td>
<td>Pre-Requisite</td>
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<td>F17CB</td>
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<th>LOCATION AND ASSESSMENT METHODS</th>
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