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

DELIVERY LEVEL
Undergraduate: Yes  Postgraduate Taught: Yes  Postgraduate Research: No

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.
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.

## COURSE RELATIONSHIPS

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## LOCATION AND ASSESSMENT METHODS

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