

This document gives an overview of expected BSc level prior knowledge for the MSc programme Environmental Engineering. Applicants should meet all criteria and may be rejected should one criteria be insufficient or missing.

Fluid Mechanics

- Properties of fluids
- Hydrostatics
- Hydrodynamics
- Pipe flow
- Open channel flow
- Friction
- Gradually varied flow

Computer Programming (Python, Matlab, C++)

- Variables, Constants, Operators and Expressions
- Common data types (e.g., int, float, strings, chars, boolean)
- Basic data structures: lists, tuples, dictionaries and sets
- Basic read/write operations from text files
- If/then/else statements
- Loops
- Functions
- Importing packages
- Numpy arrays: 1-D, 2-D and N-D arrays, array creation
- Numpy basic operations: addition, subtraction, multiplication, division, dot product, matrix multiplication
- Numpy array manipulation: sorting, indexing and slicing, reshaping and transpose, joining arrays
- Basic plotting with matplotlib

Calculus, linear algebra, differential equations, numerical mathematics covering at least the following:

- Integration (multiple integrals) and differentiation (incl. partial derivatives, numerical)
- Matrix algebra (sum, product, inverse, transpose)
- Eigenvalues and eigenvectors, determinants
- Taylor series
- Complex numbers
- Inner products
- Numerical differentiation and integration, truncation errors
- Ordinary Differential Equations and basic Partial Differential Equations solutions
- Gaussian elimination and LU decomposition
- Solution of linear systems
- Least squares method
- Nonlinear solution, bisection and Newton's methods

Statistics and probability

- Set theory and fundamental probability rules
- Basic continuous probability distributions (Gaussian, binomial, exponential, uniform)
- Basic discrete probability distributions (uniform, binomial, geometric)
- Probability density function, cumulative distribution function
- Conditional probability, independence
- Expectation, variance and standard deviation, covariance and correlation