

## 2.1. Brief description of the programme & programme aims

This is the student handbook for the companion programmes TU078 Higher Certificate Mathematics, TU079 BSc Ordinary Mathematics and TU080 BSc Honours Mathematics delivered by the School of Mathematics & Statistics, Technological University Dublin. Each is a 60 ECTS (European Credit Transfer System), single-stage programme at levels 6, 7 and 8 respectively on the National Framework of Qualifications (NFQ). They are offered on a part-time basis.

Students study four modules each year and each programme requires the successful completion of eight modules. The modules are delivered in the evenings, making the programme attractive to those in full-time employment. The programme is ideal for career development and upskilling and graduates will have enhanced employment opportunities in industry, commerce and the public services. Graduates are also eligible to proceed to the next programme, at the next NFQ level, and ultimately to postgraduate study via an MSc programme in the School, TU Dublin or elsewhere, or to research.

The programme aims and learning outcomes are summarised below, consistent with the award-type descriptor for the NFQ level of each programme (i.e. Higher Certificate; Ordinary Degree; Honours Degree).

### 2.1.1. TU078 Learning Outcomes

The programme Higher Certificate in Mathematics is designed for those with an interest in the mathematical sciences or who require a better understanding of mathematics for their jobs and wish to improve their mathematical skills for their future career. It is a single-stage, add-on programme and provides a solid background in the fundamentals of mathematics. The programme is suitable for individuals who have already studied some mathematics at third level within mathematics or another discipline.

#### **Knowledge – breadth & kind**

- Graduates of the programme will have a good understanding of the basic concepts of Linear Algebra, Geometry, Discrete Mathematics, Calculus, Analysis, Statistics and Numerical Methods.
- Graduates will have a detailed knowledge of how to apply the mathematical topics encountered to the formulation and solution of problems within that topic.

#### **Know-how and skill – range & selectivity**

On successfully completing this programme the learner will be able to:

- draw truth tables and apply logic to simple problems;
- solve problems using Euclidean and non-Euclidean geometry;
- solve application problems using differential and integral calculus;
- define and apply vector valued functions and vector calculus;
- use the rules of matrix algebra, calculate the inverse of a matrix and solve systems of linear equation;
- analyse problems using statistical inference;
- use standard numerical methods for solving nonlinear equations;
- find approximate numerical values for derivatives and integrals, and understand their limitations.

#### **Competence – context, role, learning to learn & insight**

Graduates of the programme will

- have an appreciation of how the fundamental concepts encountered can be applied in related areas;
- be able to solve a wide range of problems in Mathematics.

### 2.1.2. TU079 Learning Outcomes

The programme TU079 is a single-stage, add-on programme which offers a valuable BSc qualification in Mathematics and also provides the necessary mathematical foundations for entry to the BSc Honours Degree in Mathematics. A degree in mathematics is highly sought after by many employers and produces extremely flexible graduates. This programme provides a core of modern mathematics that is ideal for second-level teachers, professionals in industry, commerce and public services. The programme is suitable for those who have already studied a significant amount of mathematics, within various disciplines, at third level.

#### **Knowledge – breadth & kind**

- Graduates of the programme will have a good understanding of the basic concepts of Mathematics, Statistics and Numerical Methods.
- Have a detailed knowledge of how to apply the mathematical topics encountered to the formulation and solution of problems within that topic.

#### **Know-how and skill – range & selectivity**

On successfully completing this programme the learner will:

- have a good understanding of many more advanced concepts of Mathematics, Statistics and Numerical Methods;
- have a detailed knowledge of how to apply the mathematical topics encountered to solving problems in the different sectors;
- understand the interdependence between the individual topics encountered;
- be able to use mathematical packages and apply these packages to solve problems in each module;
- use matrices to determine solutions of linear equations and systems of linear differential equations;
- identify and perform simple operations on groups;
- use various discrete and continuous distributions to solve statistical problems;
- apply hypothesis testing and statistical inference where appropriate;
- solve first and second order differential equations including the use of the Laplace transform;
- differentiate and integrate functions of several variables;
- use Fourier series and Z- transforms;
- solve systems of linear equations and ordinary differential equations using numerical techniques;
- construct and use cubic splines;
- estimate eigenvalues and eigenvectors;
- employ several software packages to model and solve problems in the different areas covered in this stage.

#### **Competence – context, role, learning to learn & insight**

Graduates of the programme will:

- apply the theory and the techniques acquired to solve a wide range of problems;
- analyse problems and decide from experience on the methods required to solve them;
- learn from exposure gained in the wide spread of mathematical topics encountered;
- take steps to identify and correct learning needs.

### 2.1.3. TU080 Learning Outcomes

Advanced mathematical skills and the ability to apply mathematics to problems are extremely important modern graduate attributes. TU080 is a single-stage, add-on programme which studies a range of modern topics in pure and applied mathematics at honours-degree level. The programme is suitable for anyone with an interest in mathematics or who wishes to develop their mathematical understanding from general or pass degree to honours-degree level.

#### **Knowledge – breadth & kind**

On successfully completing this stage, the learner will:

- have acquired a substantial range and depth of understanding of the most useful topics in Mathematics;
- have a detailed knowledge of several specialized areas in Mathematics.

#### **Know-how and skill – range & selectivity**

On successfully completing this programme the learner will:

- analyse and solve differential and integral equations;
- understand and use the results and techniques of complex analysis and advanced vector calculus;
- identify the concepts of real analysis and extend them to normed linear spaces;
- develop the concepts of Banach and Hilbert spaces;
- apply the qualitative theory of differential equations to simple dynamical systems;
- understand the concepts associated with two chosen optional modules;
- adapt and use software packages to investigate problems encountered in various areas;
- produce and present rigorous and comprehensive reports.

#### **Competence – context, role, learning to learn & insight**

Graduates of the programme will:

- use advanced mathematical skills to conduct investigations into a range of applications;
- act in a range of different learning contexts;
- manage tasks and projects in an independent and professional manner;
- apply the knowledge acquired to enhance the level and extend the range of mathematical competence in a wide range of fields.

### 2.1.4. Programme title & award

Candidates registered on the programme TU078 who successfully complete 60 ECTS are eligible for the award:

#### **Higher Certificate Mathematics**

The award is made with classification (see Studying on the programme/Assessment/Award).

Candidates registered on the programme TU078 who successfully complete 60 ECTS are eligible for the award:

### **BSc Ordinary Mathematics**

The award is made with classification (see Studying on the programme/Assessment/Award).

Candidates registered on the programme TU078 who successfully complete 60 ECTS are eligible for the award:

### **BSc Honours Mathematics**

The award is made with classification (see Studying on the programme/Assessment/Award).

#### **2.1.5. NQAI level**

The programme TU078 is level 6 on the National Framework of Qualifications.

The programme TU079 is level 7 on the National Framework of Qualifications.

The programme TU080 is level 8 on the National Framework of Qualifications.

#### **2.1.6. Location**

The School of Mathematics & Statistics is responsible for mathematics and statistics across Technological University Dublin. It therefore engages in activities across TU Dublin's locations including on its campus locations in Grangegorman, Bolton Street, Tallaght, Blanchardstown, Aungier Street.

The School's main office and address for correspondence is in Central Quad on the Grangegorman campus.

Your programme is principally onsite, based on the Grangegorman campus, although individual activities may take place in other onsite locations or online platforms.