2.1. Brief description of the programme & programme aims

This is the student handbook for the companion programmes, TU874 BSc (Honours) Mathematical Sciences and TU873 BSc (Honours) in Industrial Mathematics. These programmes were previously delivered under the codes DT205 and DT220 respectively. They are delivered by the School of Mathematics & Statistics, Technological University Dublin.

The full programme consists of four stages that can be completed in a minimum of four years. The first two years of the programmes are common. In Stage 3 and Stage 4 the programmes differ in the number of optional or elective modules available to students. On successful completion of stage 4, students registered on TU874 are awarded a BSc (Hons) Mathematical Sciences and students registered on TU873 are awarded a BSc (Hons) Industrial Mathematics.

In some circumstances, on successful completion of stage 3, students may exit with a BSc (Ord) Industrial Mathematics or BSc (Ord) Mathematical Sciences.

The general structure of the programmes are illustrated in the following tables:

Table showing the structure of the full-time undergraduate programme TU874 BSc (Hons) Mathematical Sciences

STAGE 1	Hrs/Wk			STAGE 2	Hrs/Wk			STAGE 3	Hrs/Wk			STAGE 4	Hrs/Wk		
	L	P/T	ECTS		L	P/T	ECTS		L	P/T	ECTS		L	P/T	ECTS
Algorithms (S1)	2	1	5	Calculus II (S1)	2	2	5	Mathematics Practical (S1)	–	2	5	Partial and Differential Equations (S1)	2	1	5
Discrete Mathematics I (S1)	2	1	5	Geometry (S1)	2	1	5	Numerical Analysis & Applications (S1)	2	1	5	Option 1 (S1)	2	1	5
Foundation Mathematics (S1)	4	2	10	Linear Algebra II (S1)	2	1	5	Ordinary Differential Equations (S1)	2	1	5	Option 2 (S1)	2	1	5
Introduction to Scientific Python (S1)	2	2	5	Practical Computing for Mathematics (S1)	2	1	5	Statistics III (S1)	2	1	5	Option 3 (S1)	2	1	5
Calculus I (S2)	3	1	5	Statistics II (S1)	2	1	5	Option 1 (S1)	2	1	5	Option 4 (S1)	2	1	5
Introduction to Mechanics with Python (S2)	2	2	5	Discrete Mathematics II (S2)	2	1	5	Option 2 (S1)	2	1	5	Option 5 (S2)	2	1	5
Linear Algebra I (S2)	2	1	5	Introduction to Analysis (S2)	2	1	5	Option 3 (S1)	2	1	5	Option 6 (S2)	2	1	5
Statistics I (S2)	2	1	5	Introduction to ODEs through Python (S2)	2	1	5	Work Placement (S2)	–	–	25	Option 7 (S2)	2	1	5
Mathematics Laboratory	–	2	5	Numerical Methods (S2)	2	1	5					Option 8 (S2)	2	1	5
Mathematical Modelling I	–	2	5	Operations Research (S2)	2	1	5					Seminar (S2)	2	–	–
Professional Development I	1	1	5	Professional Development II	1	1	5					Project	1	–	15
				Mathematical Modelling II	–	2	5								
TOTAL:	**10.5**	**10.5**	**60**		**11**	**8.5**	**60**		**12**	**8**	**60**		**11**	**4.5**	**60**
Note: Total hours is weekly average over the full year.				**Note:** Total hours is weekly average over the full year.				**Note:** Students pick three optional subjects. Total hours is the weekly average over the first semester.				**Note:** Students pick eight optional subjects (four in semester 1 and four in semester 2. Total hours is the weekly average over the full year.			

Table showing the structure of the full-time undergraduate programme TU873 BSc (Hons) Industrial Mathematics

STAGE 1	Hrs/Wk			STAGE 2	Hrs/Wk			STAGE 3	Hrs/Wk			STAGE 4	Hrs/Wk		
	L	P/T	ECTS		L	P/T	ECTS		L	P/T	ECTS		L	P/T	ECTS
Algorithms (S1)	2	1	5	Calculus II (S1)	2	2	5	Introduction to Financial Mathematics (S1)	2	1	5	Financial Mathematics I (S1)	2	1	5
Discrete Mathematics I (S1)	2	1	5	Geometry (S1)	2	1	5	Mathematics Practical (S1)	–	2	5	Partial and Differential Equations (S1)	2	1	5
Foundation Mathematics (S1)	4	2	10	Linear Algebra II (S1)	2	1	5	Numerical Analysis & Applications (S1)	2	1	5	Queuing Theory & Markov Processes (S1)	2	1	5
Introduction to Scientific Python (S1)	2	2	5	Practical Computing for Mathematics (S1)	2	1	5	Ordinary Differential Equations (S1)	2	1	5	Regression I (S1)	2	1	5
Calculus I (S2)	3	1	5	Statistics II (S1)	2	1	5	Statistics III (S1)	2	1	5	Option 1 (S1)	2	1	5
Introduction to Mechanics with Python (S2)	2	2	5	Discrete Mathematics II (S2)	2	1	5	Stochastic Mathematical Modelling (S1)	2	1	5	Case Studies in Industrial Modelling (S2)	2	1	5
Linear Algebra I (S2)	2	1	5	Introduction to Analysis (S2)	2	1	5	Option (S1)	2	1	5	Financial Mathematics II (S2)	2	1	5
Statistics I (S2)	2	1	5	Introduction to ODEs through Python (S2)	2	1	5	Work Placement (S2)	–	–	25	Industrial Statistics: Survival Analysis (S2)	2	1	5
Mathematics Laboratory	–	2	5	Numerical Methods (S2)	2	1	5					Option 2 (S2)	2	1	5
Mathematical Modelling I	–	2	5	Operations Research (S2)	2	1	5					Seminar (S2)	2	–	–
Professional Development I	1	1	5	Professional Development II	1	1	5					Project	1	–	15
				Mathematical Modelling II	–	2	5								
TOTAL:	**10.5**	**10.5**	**60**		**11**	**8.5**	**60**		**12**	**8**	**60**		**11**	**4.5**	**60**
Note: Total hours is weekly average over the full year.				**Note:** Total hours is weekly average over the full year.				**Note:** Students pick one optional subject. Total hours is the weekly average over the first semester.				**Note:** Students pick two optional subjects (one in semester 1 and one in semester 2. Total hours is the weekly average over the full year.			

Stages 1 and 2 of the programmes are common and consist of core subjects which build on the Leaving Certificate mathematics syllabus. A foundation module provides the basic mathematics required for all other aspects of the programme and is designed to facilitate the transition from school to third-level mathematics. The other modules give a solid grounding in general mathematics and in the programme's core subjects of mathematical modelling, operations research and mathematical statistics. Stage 2 builds upon these foundations and includes rigorous mathematical modules in Analysis and Algebra. There is a substantial emphasis on laboratory-based work and problem-based learning throughout the programme and many modules introduce and make use of mathematical software and tools to solve practical problems and support learning. Important mathematical concepts essential to modern technologies, such as algorithms and numerical methods, are also featured. Professional development modules during stages 1 and 2 concentrate on written and oral communication skills, effective team work strategies and project management. These modules are designed to developing students and preparing them for their future careers as mathematicians and statisticians.

Stages 3 and 4 consist of advanced modules and students have the opportunity to study topics in mathematical modelling, financial mathematics, operations research and mathematical statistics. Many of these topics are compulsory for students on the programme TU873. However, both programmes allow students to choose optional modules as set out in the programme structure tables. The availability of optional subjects will be decided by the Programme Team and may vary from year to year. A minimum number of students will be required for a particular optional subject to be offered.

Stage 3 of the programme includes a six-month work placement. All reasonable efforts will be made to provide an appropriate work placement for each student. However, if it is not possible to provide a work placement for all students, an alternative series of assessments and project work will be provided.

A major feature of the fourth stage is the final stage project where the skills and knowledge gained in the programme are brought to bear on a research problem of an industrial/commercial or academic nature. The aim of the seminar series in the second semester of the fourth stage is to invite experts in various fields to address the students on recent developments in those fields.

2.1.1. TU874 Learning Outcomes

Knowledge – breadth & kind

On successfully completing this programme, the learner will

- have a good understanding of Mathematics, Statistics and their applications;
- have good analytical and problem solving skills in a technical and scientific context;
- have acquired an understanding of a wide range of mathematical models and techniques and will have the tools required to build applied mathematical and statistical models.

Know-how and skill – range & selectivity

On successfully completing this programme the learner will:

- have strong computer programming skills;
- be familiar with a range of modern mathematical and statistical software;

- have a rigorous and professional approach to problem solving at a scientific level;
- have strong mathematical and analytical problem-solving skills.

Competence – context, role, learning to learn & insight

Graduates of the programme will:

- have the ability to communicate orally and in written form in a clear, precise and professional manner;
- have first -hand experience of a team-work approach to solving typical problems encountered in industry or in the state sector;
- be equipped with the mathematical and statistical modelling and analytical skills set required for technical professional roles in industry and research;
- be highly qualified professionals with advanced analytical and problem-solving skills.

2.1.2. TU873 Learning Outcomes

Knowledge – breadth & kind

On successfully completing this programme, the learner will

- have knowledge of a wide range of specialised topics necessary for a career in business and industrial mathematics, including a deep understanding of industry relevant techniques for mathematical modelling, financial mathematics, operations research and mathematical statistics;
- have a good understanding of mathematical theory and the interaction between theory and application;
- have the ability to confidently apply a broad repertoire of mathematical skills to novel problems arising in industry and to formulate appropriate mathematical solutions.

Know-how and skill – range & selectivity

On successfully completing this programme the learner will:

- have experience of up-to-date programming and technical software packages used by professionals and strong computer programming skills;
- have a professional approach to mathematical problem solving and be able to work confidently either independently or as part of a team;
- be able to effectively communicate the methods and results of advanced mathematical techniques to both technical and non-technical audiences.

Competence – context, role, learning to learn & insight

Graduates of the programme will:

- have the ability to communicate orally and in written form in a clear, precise and professional manner;
- have first -hand experience of a team-work approach to solving typical problems encountered in industry or in the state sector;

- have the ability to confidently apply a broad repertoire of mathematical skills to novel problems arising in industry and to formulate appropriate mathematical solutions;
- be highly qualified professionals with advanced analytical and problem-solving skills.

2.1.3. Progression & transfer

Students who complete these programmes and have reached the appropriate standard may apply to a range of masters degrees or PhD programmes at TU Dublin.

2.1.4. Programme title & award

Candidates registered on the programme TU874 who successfully complete 240 ECTS are eligible for the award:

BSc (Honours) in Mathematical Sciences.

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

Candidates registered on the programme TU873 who successfully complete 240 ECTS are eligible for the award:

BSc (Honours) in Industrial Mathematics.

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

2.1.5. NQAI level

The programme 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.