4.3. Programme structure

The programmes, BSc (Hons) Mathematics & Statistics and BSc (Hons) Mathematics & Statistics for Data Science, are four-stage, 240 ECTS programmes, with each stage consisting of 60 ECTS. ECTS denotes European Credit Transfer and Accumulation System and is a measurement of the student workload associated with a module. It is used within TU Dublin to denote the learning credits associated with any module. A total of 5 ECTS is equivalent to a student study workload of 100 hours. These hours are a combination of contact with lecturers (through lectures, tutorials, practical sessions, laboratory sessions and group study sessions) and self-study. Contact may include elements of remote learning.

The programme is full-time and is in modular form. Lectures are delivered Mondays – Fridays and the timetable for the delivery of modules is available via the online student timetable system. Some elements of delivery may be online via the University's student learning system, Brightspace.

In Stage 3 of the programme students will normally undertake a six-month work placement from mid/late January to July. If it is not possible to provide a work placement for all students, an alternative will be provided. The student, while on work placement, will be required to maintain weekly logs detailing the nature of their work and their experiences. The student will submit the weekly logs along with a written report summarising their work experience at the end of the placement, which will contribute towards their assessment. In addition, the student will be required to make a formal presentation, which will also contribute towards their assessment. Work placement procedures are described in the appendix of this document.

In Stage 4 students undertake a major project involving independent study and research supervised by an academic member of staff. The project is assessment includes a written report and presentation. Project procedures are described in the appendix of this document.

Below is a summary of the modules, including their learning and assessment requirements, for each stage. The detailed syllabus for all modules are given in the Syllabus section. (CA indicates Continuous Assessment component.)

4.3.1. Stage 1

List of modules for Stage 1 TU874 Mathematics & Statistics & TU873 Mathematics & Statistics for Data Science

Module	Title	Semester	ECTS
MATH 1801	Fundamental Mathematics	1	5
MATH 1802	Calculus	1	5
MATH 1803	Discrete Mathematics	1	5
MATH 1804	Linear Algebra	2	5
MATH 1805	Statistics	2	5
MATH 1812	Mathematical Thinking	1	5
MATH 1810	Introduction to Scientific Python	1	5
MATH 1811	Mechanics	2	5
MATH 1808	Mathematical Modelling	1&2	5
MATH 1078	Mathematics for Sustainability	2	5
MATH 1809	Data Analysis & Professional Reporting	1&2	5
PROF 1801	Professional Development I	1&2	5
TOTAL			60

Description of module workload and Assessment

Module	Lecture (hrs)	Tutorial/ Lab (hrs)	Self-study (hrs)	Total (hrs)	Assessment
MATH 1801 Fundamental Mathematics	26	13	61	100	2 hr Exam (70%) CA(30%)
MATH 1802 Calculus	39	13	48	100	2 hr Exam (70%) CA(30%)
MATH 1803 Discrete Mathematics	26	13	61	100	2 hr Exam (70%) CA(30%)
MATH 1804 Linear Algebra	26	13	61	100	2 hr Exam (70%) CA(30%)
MATH 1805 Statistics	26	13	61	100	2 hr Exam (70%) CA(30%)
MATH 1812 Mathematical Thinking	26	13	61	100	2 hr Exam (70%) CA(30%)
MATH 1810 Introduction to Scientific Python	26	26	48	100	CA(100%)
MATH 1811 Mechanics	26	13	61	100	2 hr Exam (70%) CA(30%)
MATH 1808 Mathematical Modelling		52	48	100	CA(100%)
MATH 1809 Data Analysis & Professional Reporting		52	48	100	CA(100%)
MATH 1078 Mathematics for Sustainability	26	13	61	100	CA(100%)
PROF 1801 Professional Development I	26	26	48	100	CA(100%)

4.3.2. Stage 2

List of modules for Stage 2 TU874 Mathematics & Statistics & TU873 Mathematics & Statistics for Data Science

Module	Title	Semester	ECTS
MATH 2814	Multivariable Calculus	2	5
MATH 2816	Real Analysis	1	5
MATH 2802	Vector Spaces & Linear Transformations	1	5
MATH 2811	Logic, Number Theory & Graph Theory	2	5
MATH 2804	Operations Research	2	5
MATH 2805	Probability Models & Statistical Inference	1	5
MATH 2806	Numerical Methods & Computational Mathematics	2	5
MATH 2812	Introduction to Ordinary Differential Equations through Python	2	5
MATH 2813	Practical Computing for Mathematics	1	5
MATH 2809	Mathematical & Computational Modelling	1&2	5
MATH 2810	Geometry	1	5
PROF 2801	Professional Development II	1&2	5
TOTAL			60

Description of module workload and Assessment

Module	Lecture (hrs)	Tutorial/ Lab (hrs)	Self-study (hrs)	Total (hrs)	Assessment
MATH 2814 Multivariable Calculus	26	26	48	100	2 hr Exam (70%) CA(30%)
MATH 2816 Real Analysis	26	13	61	100	2 hr Exam (70%) CA(30%)
MATH 2802 Vector Spaces & Linear Transformations	26	13	61	100	2 hr Exam (70%) CA(30%)
MATH 2811 Logic, Number Theory & Graph Theory	26	13	61	100	2 hr Exam (70%) CA(30%)
MATH 2804 Operations Research	26	13	61	100	2 hr Exam (70%) CA(30%)
MATH 2805 Probability Models & Statistical Inference	26	13	61	100	2 hr Exam (70%) CA(30%)
MATH 2806 Numerical Methods & Computational Mathematics	26	13	61	100	2 hr Exam (70%) CA(30%)
MATH 2812 Introduction to ODE's through Python	26	13	61	100	2 hr Exam (50%) CA(50%)
MATH 2813 Practical Computing for Mathematics	26	13	61	100	CA(100%)
MATH 2809 Mathematical & Computational Modelling		52	48	100	CA(100%)
MATH 2810 Geometry	26	13	61	100	2 hr Exam (70%) CA(30%)
PROF 2801 Professional Development II	26	26	48	100	CA(100%)

4.3.3. Stage 3

List of modules for Stage 3 TU874 Mathematics & Statistics

Module	Title	Semester	ECTS
MATH 3801	Advanced Numerical Methods & Approximation	1	5
MATH 3802	Methods for Ordinary Differential Equations	1	5
MATH 3803	Regression & Likelihood Based Statistical Models	1	5
MATH 3811	Mathematics Practical	1	5
MATH xxxx	Option 1	1	5
MATH xxxx	Option 2	1	5
MATH xxxx	Option 3	1	5
MATH 3812	Work Placement	2	25
TOTAL			60

List of modules for Stage 3 TU873 Mathematics & Statistics for Data Science

Module	Title	Semester	ECTS
MATH 3801	Advanced Numerical Methods & Approximation	1	5
MATH 3802	Methods for Ordinary Differential Equations	1	5
MATH 3803	Regression & Likelihood Based Statistical Models	1	5
MATH 3811	Mathematics Practical	1	5
MATH 3808	Introduction to Financial Mathematics	1	5
MATH 3814	Bayesian Learning	1	5
MATH xxxx	Option	1	5
MATH 3812	Work Placement	2	25
TOTAL			60

Full list of module options in Stage 3

(NB only a limited selection of modules from this list will be offered in any given year)

Module	
MATH 3807 Group Theory	
MATH 3806 Classical Mechanics	
MATH 3808 Introduction to Financial Mathematics	*(not optional for TU873)*
MATH 3813 Network Analysis & Transportation	
MATH 3814 Bayesian Learning	*(not optional for TU873)*
MATH 3815 Introduction to Mathematics for Machine Learning	
MATH 3804 Metric Spaces	
MATH 3805 Complex Analysis	
MATH 4805 Rings & Fields	

Description of module workload and Assessment

Module	Lecture (hrs)	Tutorial/ Lab (hrs)	Self-study (hrs)	Total (hrs)	Assessment
MATH 3801 Advanced Numerical Methods & Approximation	26	13	61	100	2 hr Exam (70%) CA (30%)
MATH 3802 Methods for Ordinary Differential Equations	26	13	61	100	2 hr Exam (70%) CA (30%)
MATH 3803 Regression & Likelihood Based Statistical Models	26	13	61	100	2 hr Exam (70%) CA (30%)
MATH 3811 Mathematics Practical		39	61	100	CA (100%)
MATH 3807 Group Theory	26	13	61	100	2 hr Exam (70%) CA (30%)
MATH 3806 Classical Mechanics	26	13	61	100	2 hr Exam (70%) CA (30%)
MATH 3808 Introduction to Financial Mathematics	26	13	61	100	2 hr Exam (70%) CA (30%)
MATH 3813 Network Analysis & Transportation	26	13	61	100	2 hr Exam (70%) CA (30%)
MATH 3814 Bayesian Learning	26	13	61	100	CA (100%)
MATH 3804 Metric Spaces	26	13	61	100	2 hr Exam (70%) CA (30%)
MATH 3815 Introduction to Mathematics for Machine Learning	26	13	61	100	2 hr Exam (50%) CA (50%)
MATH 3805 Complex Analysis	26	13	61	100	2 hr Exam (70%) CA (30%)
MATH 4805 Rings & Fields	26	13	61	100	2 hr Exam (70%) CA (30%)
MATH 3812 Work Placement					CA (100%)

4.3.4. Stage 4

List of modules for Stage 4 TU874 Mathematics & Statistics

Module	Title	Semester	ECTS
MATH 4801	Partial Differential Equations & Applications	1	5
MATH xxxx	Option 1 from Group A modules	1	5
MATH xxxx	Option 2 from Group A modules	1	5
MATH xxxx	Option 3 from Group A modules	1	5
MATH xxxx	Option 4 from Group A modules	1	5
MATH xxxx	Option 5 from Group B modules	2	5

MATH xxxx	Option 6 from Group B modules	2	5
MATH xxxx	Option 7 from Group B modules	2	5
MATH xxxx	Option 8 from Group B modules	2	5
MATH 4824	Project	1&2	15
TOTAL			60

List of modules for Stage 4 TU873 Mathematics & Statistics for Data Science

Module	Title	Semester	ECTS
MATH 4801	Partial Differential Equations & Applications	1	5
MATH 4807	Financial Derivative Pricing	1	5
MATH 4808	Predictive Analytics with Regression Models	1	5
CMPU 4011	Machine Learning for Data Analytics	1	5
MATH xxxx	Option 1 from Group A modules	1	5
MATH 4818	Financial Calculus	2	5
MATH 4821	Advance Predictive Analytics: Modelling Time-to-Event Data	2	5
MATH 4827	Case Studies in Industrial Modelling	2	5
MATH xxxx	Option 2 from Group B modules	2	5
	Choice of **either**: MATH 4824 Project (15 ECTS) **OR** *both of* Planning & Reporting for Industry Projects (5 ECTS) Mathematical Project (10 ECTS)	1&2	15
TOTAL			60

Full list of module options in Stage 4

(NB only a limited selection of modules from this list will be offered in any given year)

Module	Prerequisites
Group A Modules	
MATH 3807 Group Theory	*)*
MATH 4802 Banach Spaces with Applications	
MATH 4803 Fluid Dynamics	
MATH 4804 Coding Theory	
MATH 4805 Rings & Fields	
MATH 4806 Advanced Numerical Methods for Differential Equations	
MATH 4807 Financial Derivative Pricing	*(not optional for TU873)*
MATH 4808 Predictive Analytics with Regression Models	*(not optional for TU873)*
MATH 4809 Linear Programming	
MATH 4825 Queuing Theory & Markov Processes	*(not optional for TU873)*
MATH 4811 Dynamical Systems and Chaos	
MATH 4813 Quantum Mechanics	MATH 3806 Classical Mechanics
MATH 4828 Case Studies in Mathematics for Machine Learning	MATH3815 Introduction to Mathematics for Machine Learning
Group B Modules	
MATH 4815 Differential & Integral Equations	
MATH 4817 Cryptology	
MATH 4818 Financial Calculus	*(not optional for TU873)*
MATH 4819 Statistical & Machine Learning for Classification	MATH 4808 Predictive Analytics with Regression Models
MATH 4820 Integer Programming	MATH 4809 Linear Programming
MATH 4821 Advance Predictive Analytics: Modelling Time-to-Event Data	*(not optional for TU873)*
MATH 4827 Case Studies in Industrial Modelling	*(not optional for TU873)*

Description of module workload and Assessment

Module	Lecture (hrs)	Tutorial/ Lab (hrs)	Self-study (hrs)	Total (hrs)	Assessment
MATH 3807 Group Theory	26	13	61	100	2 hr Exam (70%) CA (30%)
MATH 4801 Partial Differential Equations & Applications	26	13	61	100	2 hr Exam (75%) CA (25%)
MATH 4802 Banach Spaces with Applications	26	13	61	100	2 hr Exam (100%)
MATH 4803 Fluid Dynamics	26	13	61	100	2 hr Exam (100%)
MATH 4804 Coding Theory	26	13	61	100	2 hr Exam (100%)
MATH 4805 Rings & Fields	26	13	61	100	2 hr Exam (70%) CA (30%)
MATH 4806 Advanced Numerical Methods for Differential Equations	26	13	61	100	2 hr Exam (75%) CA (25%)
MATH 4807 Financial Derivative Pricing	26	13	61	100	2 hr Exam (100%)
MATH 4808 Predictive Analytics with Regression Models	26	13	61	100	2 hr Exam (75%) CA (25%)
MATH 4809 Linear Programming	26	13	61	100	2 hr Exam (100%)
MATH 4825 Queuing Theory & Markov Processes	26	13	61	100	2 hr Exam (75%) CA (25%)
MATH 4811 Dynamical Systems and Chaos	26	13	61	100	2 hr Exam (100%)
MATH 4813 Quantum Mechanics	26	13	61	100	2 hr Exam (100%)
MATH 4815 Differential & Integral Equations	26	13	61	100	2 hr Exam (75%) CA (25%)
MATH 4817 Cryptology	26	13	61	100	2 hr Exam (75%) CA (25%)
MATH 4818 Financial Calculus	26	13	61	100	2 hr Exam (100%)
MATH 4819 Statistical & Machine Learning for Classification	26	13	61	100	2 hr Exam (75%) CA (25%)
MATH 4820 Integer Programming	26	13	61	100	2 hr Exam (100%)
MATH 4821 Advance Predictive Analytics: Modelling Time-to-Event Data	26	13	61	100	2 hr Exam (75%) CA (25%)
MATH 4824 Project		20	280	300	CA (100%)
MATH 4827 Case Studies in Industrial Modelling	13	26	61	100	CA (100%)
MATH 4828 Case Studies in Mathematics for Machine Learning	26	23	61	100	CA (100%)