REPORT ON EXAMINATIONS

M.Sc. in Mathematical Modelling and Scientific Computing 2021-22

Part I

A. Statistics

- **Numbers and percentages in each class**

	Number				Percentage			
	2021/22	2020/21	2019/20	2018/19	2021/22	2020/21	2019/20	2018/19
Distinction	7	8	11	6	39	32	50	22
Merit	7	7	5	5	39	28	22	19
Pass	2	10	4	14	11	40	18	52
Fail	1	0	2	2	5.5	0	10	7
Incomplete	1	0	0	0	5.5	0	0	0

- **Vivas**
  The 17 candidates who submitted dissertations were examined by *viva voce*.

- **Marking of scripts**
  Written examinations were sat in Weeks 0 of Hilary and Trinity Terms 2022. Scripts were single-marked by assessors followed by a script check carried out by the Course Director. Finalisation of marks by the examiners took place during an examiners' meeting in week 3 of each term. Special topics and case studies were double-marked by assessors. In cases where marks varied over the pass/fail borderline, or the difference in marks was greater than ten, the assessors were asked to meet and reconcile their marks. All marks were approved by the examiners during the meetings held in week 7 of Hilary Term and week 8 of Trinity Term, as well as at the final examiners' meeting, before being released to the candidates. All dissertations were read and marked by at least two examiners; marks were approved by all examiners at the final examiners' meeting.

B. New examining methods and procedures
In light of the ongoing Covid-19 pandemic, all written examinations were sat as open-book online examinations. Both the Hilary Term Week 0 papers and the Trinity Term Week 0 papers were issued via Inspera. Students were given 30 minutes of technical time in addition to the 2.5 hours to complete the paper.

C. Changes in examining methods etc. which the examiners would wish the faculty/department and the divisional board to consider
The written examinations will be in person, partially open book exams in the academic year 2022-23. Students will be permitted to take one A4 sheet of notes into the exam, which they have prepared themselves, with adjustments in cases of disability.

D. How candidates are made aware of conventions

The conventions are posted on the course website and electronic copies are circulated to the students. The Course Director discusses the conventions with the candidates and the candidates are reminded of them by email on several occasions during the year. The candidates are notified via email about any changes to the examination conventions and amended conventions are uploaded to the course website.

Part II

A. General comments on the examination

The examiners would like to convey their grateful thanks for their help and cooperation to all those who assisted with this year's examination, either as assessors or in an administrative capacity. In addition, the internal examiners would like to express their gratitude to Prof Katerina Kaouri for carrying out her duties as external examiner in a constructive and supportive way during the year, and for valuable input at the final examiners' meeting.

Setting and checking of papers

Following established practice, the questions for each paper were initially set by the course lecturer, with a qualified person involved as checker before the first drafts of the questions were presented to the Chair of Examiners and the External Examiner. The course lecturers also acted as assessors, marking the questions on their course(s).

Determination of University Standardised Marks

The examiners followed established practice in determining the University standardised marks (USMs) reported to candidates for the written examinations. The algorithm converts raw marks to USMs for each paper separately. For each paper, the algorithm sets up a map $R \rightarrow U$ (R = raw, U = USM) which is piecewise linear. The graph of the map consists of three line segments which join the points (0,0), (P,50), (D,70) and (100,100). The values of P and D are chosen so that the resulting USMs are in line with the mark descriptors in the Examination Conventions. Particular attention is paid to the scripts that lie around class borderlines after the mapping has been applied. The values of P and D for each of the four written examinations in 2021-22 is given in the table below.

Paper	P	D
A1	50	70
A2	50	70
B1	46	70
B2	38	61

B. Equal opportunities issues and gender breakdown

The breakdown of results by gender is given in the tables overleaf.

Class	Number							
	2021-22		2020-21		2019-20		2018-19	
	Female	Male	Female	Male	Female	Male	Female	Male
Distinction	2	5	2	6	2	9	1	5
Merit	0	6	3	4	2	3	0	5
Pass	0	2	4	6	3	1	7	7
Fail	0	1	0	0	1	1	2	0
Incomplete	0	2	0	0	0	0	0	0
Total	2	16	9	16	8	14	10	17

Class	Percentage							
	2021-22		2020-21		2019-20		2018-19	
	Female	Male	Female	Male	Female	Male	Female	Male
Distinction	100	31.25	22.2	37.5	25	64.3	10	29.4
Merit	0	37.5	33.3	25.0	25	21.4	0	29.4
Pass	0	12.5	44.4	37.5	37.5	7.1	70	41.2
Fail	0	6.25	0	0	12.5	7.1	20	0
Incomplete	0	12.5	0	0	0	0	0	0
Total	100	100	99.9	100	100	99.9	100	100

C. Candidates' performance in each part of the examination

This course administers examinations internally in January and April, with each student sitting 4 papers. Each of the two sets of examinations is split into Paper A (Mathematical Methods) and Paper B (Numerical Analysis). Both sets of examinations went smoothly this year, with a good distribution of marks between failure and distinction ranges.

Paper	Number of Candidates	Avg RAW	StDev RAW	Avg USM	StDev USM
A1	17	68.00	19.79	68.00	19.79
A2	17	65.00	13.53	65.00	13.53
B1	18	64.28	15.17	65.72	13.95
B2	17	51.06	15.97	60.47	14.59

The tables that follow give the question statistics for each paper.

Paper A1: Mathematical Methods I

Question	Mean mark		StDev	Number of attempts	
	All	Used		Used	Unused
Q1	11.00	11.00	6.00	2	0
Q2	12.00	12.00	4.93	12	0
Q3	6.88	6.86	2.03	7	1
Q4	18.00	18.67	3.79	15	1
Q5	22.44	22.44	3.57	16	0
Q6	21.64	21.64	3.31	14	0

Paper A2: Mathematical Methods II

Question	Mean mark		StDev	Number of attempts	
	All	Used		Used	Unused
Q1	17.53	17.53	2.25	15	0
Q2	18.08	18.08	6.20	13	0
Q3	19.19	19.19	4.22	16	0
Q4	10.43	10.43	3.66	7	0
Q5	4.00	4.00	2.00	2	0
Q6	14.60	14.60	6.04	15	0

Paper B1: Numerical Solution of Partial Differential Equations and Numerical Linear Algebra

Question	Mean mark		StDev	Number of attempts	
	All	Used		Used	Unused
Q1	12.73	12.73	5.74	15	0
Q2	14.50	14.50	6.58	4	0
Q3	12.50	13.00	1.50	3	1
Q4	16.59	16.59	4.94	17	0
Q5	17.00	17.50	5.92	16	1
Q6	19.19	19.19	4.49	16	0

Paper B2: Numerical Linear Algebra and Continuous Optimisation

Question	Mean mark		StDev	Number of attempts	
	All	Used		Used	Unused
Q1	11.62	11.62	5.14	13	0
Q2	10.89	12.00	7.51	8	1
Q3	14.60	14.60	3.56	10	0
Q4	13.00	13.00	4.52	15	0
Q5	9.67	10.63	4.40	8	1
Q6	15.00	15.00	3.68	13	0

Performances on the case studies, special topics and dissertations also ranged from fail to distinction level.

D. Distribution of special topics

Of the 24 topics listed this year, 10 failed to attract any students.

Special Topic Course	**Passed**	**Failed**
Approximation of Functions	5	0
C++ for Scientific Computing	5	1
Elasticity and Plasticity	1	0
Finite Element Methods for Partial Differential Equations	4	0
*Further Case Study in Scientific Computing	2	0
Further Mathematical Biology	4	0
*Machine Learning	2	0

Mathematical Geoscience	3	0
Mathematical Models of Financial Derivatives	3	0
Networks	6	0
Optimisation for Data Science	3	0
Python in Scientific Computing	5	1
Solid Mechanics	2	0
Stochastic Modelling of Biological Processes	3	0
Theories of Deep Learning	1	0
Viscous Flow	2	0

Courses labelled * were offered by special approval**.**

E. Names of members of the board of examiners

Examiners:
Prof. S.J. Chapman (Chair)
Prof. R. Baker
Prof. C. Cartis
Prof. P. Farrell
Prof. K. Kaouri (External Examiner)

Assessors:
Prof. R. Baker
Prof. H. Byrne
Prof. C. Cartis
Prof. S.J. Chapman
Prof. S. Cohen
Prof. P. Dellar
Prof. R. Erban
Prof. P. Farrell
Dr B. Fehrman
Prof. A. Fowler
Dr K. Gillow
Dr D. Gomez Castro
Prof. A Goriely
Prof. I. Griffiths
Prof. R. Hauser
Prof. P. Howell
Dr K. Hu
Dr F. Lafond
Prof. R. Lambiotte
Prof P. Maini
Prof. I. Moroz
Prof. D. Moulton
Prof. A. Münch
Prof. Y. Nakatsukasa
Dr H. Oliveri
Dr S. Palmer
Dr J. Pitt-Francis

Prof. C. Reisinger
Prof. E. Süli
Prof. L.N. Trefethen
Prof. D. Vella