Programme Specification (Postgraduate)
For students entering in 2018/19
Date amended: July 2018

1. Programme Title(s):
MSc/PGDip*/PGCert* Applied Computation and Numerical Modelling

*Exit awards only

2. Awarding body or institution:
University of Leicester

3. a) Mode of study
Full time

b) Type of study
Campus-based

4. Registration periods:
The normal period of registration is 12 months.
The maximum period of registration is 24 months.

5. Typical entry requirements:
2:2 UG degree in Mathematics, Physics or Engineering from a British university or equivalent as defined under regulations.

Standard College English language requirements, in line with Senate Regulation 1.

6. Accreditation of Prior Learning:

None.

7. Programme aims:

The programme aims to provide a route for students in their transition from undergraduate study to industrial employment. It provides the opportunity to gain practical experience in computational modelling and a rigorous understanding of the mathematics underlying commonly used numerical methods, both within the context of typical industrial applications.

In particular it aims to

- foster confidence, convey knowledge and develop expertise in computational modeling;
- provide an advanced education in the fundamental mathematics of commonly used numerical methods;
- develop the ability to produce rigorous justifications of assertions by logical arguments;
- enhance the ability to model the world using mathematics, and to be able to produce innovative, cost-effective, and robust solutions to real-world problems;
- stimulate intellectual development and hone powers of critical analysis, problem solving, written communication skills and improve presentational skills;
- foster the skill of developing innovative tools
- develop the ability to communicate solutions to problems using language appropriate to any target audience;
- enhance practical computing skills by learning languages and software relevant to industry;
- raise students' expertise and understanding to a point where they could embark upon doctoral interdisciplinary study or enter knowledge-led industrial sectors;
- develop project-management skills (MSc only);
- develop the ability to complete independent project work (MSC only).

8. Reference points used to inform the programme specification:

- QAA Framework for Higher Education Qualifications in England, Wales and Northern Ireland
- QAA Benchmarking Statement Mathematics, Statistics and Operational Research (MMath)
- QAA Annex to subject benchmark statement: Mathematics, statistics and operational research (2009)
- Master's Degree Characteristics
- PDR report (April 2011)
- University Learning Strategy
- University Employability Strategy
- Graduate Survey (2014)
- First Destination Survey
- External Examiner's Reports
- Informal concept document used to aid discussion with partner departments.

9. Programme Outcomes:

Intended Learning Outcomes	Teaching and Learning Methods	How Demonstrated?
(a) Subject and Professional skills		
Knowledge		
Advanced knowledge of fundamental theories and techniques for ODE and PDE solutions, and other techniques depending on option choices.	Lectures. Problem classes. Practical sessions. Coursework.	Written examinations. Assessed coursework.
Knowledge and understanding of key techniques and algorithms in numerical modeling. Ability to modify and innovate.	Lectures. Problem classes. Practical sessions. Coursework. Project (MSc only).	Written examinations. Assessed coursework. Project (MSc only). Written examinations.
Familiarization with common industrial applications of computational modeling and commonly used techniques.	Lectures. Problem classes. Practical sessions. Coursework. Project (MSc only).	Assessed coursework.
Practical knowledge of relevant computing languages (FORTRAN, C, C++, MATLAB), and software where appropriate (FLUENT).	Lectures. Problem classes. Practical sessions. Coursework.	Assessed coursework.
In depth practical knowledge and ability to modify numerical software.	Project (MSc only).	Project (MSc only).

Concepts		
Knowledge of the basics from mathematical physics, including the mathematical setting of many classical PDE problems, derivation of some of them, and their properties.	Lectures. Problem classes. Coursework.	Written examinations. Assessed coursework.
Rigorous understanding of relevant methods for solutions of ODEs and PDEs. Other methods depending on option choices. In particular:	Lectures. Practical sessions. Coursework.	Written examinations. Assessed coursework.
Knowledge of basic functional analysis and its relevance in PDE theory. Rigorous understanding of the mathematical foundation of finite elements error analysis	Lectures. Problem classes. Coursework. (MA7091 only)	Written examinations. Assessed coursework.
Ability to propose standard finite difference schemes for the solution of a given PDE taking into consideration the concepts of consistency, stability, and convergence.	Lectures. Problem classes. Coursework. (MA7011 only)	Written examinations. Assessed coursework. Project (MSc only).
Practical understanding of computational implementation of algorithms for the numerical solution of equations.	Practical sessions. Coursework. Project (MSc only).	Assessed coursework. Project (MSc only).
Techniques		
Ability to code algorithms in a range commonly used languages (FORTRAN, C, C++, MATLAB).	Practical sessions. Project (MSc only).	Assessed coursework. Project (MSc only).
Familiarity with freely available finite element libraries.	Practical sessions. (MA7091 only) Project (MSc only).	Assessed coursework. Project (MSc only).
Ability to develop and apply strategies to solve problems.	Project (MSc only).	Project (MSc only).
Ability to use commonly used commercial software (FLUENT).	Practical sessions. Project (MSc only).	Assessed coursework. Project (MSc only).
Critical analysis		
Analysis of problem and development of appropriate solution strategy. Analyze and solve `messily defined' industrial problems.	Lectures. Problem classes. Feedback on assessed coursework. Project (MSc only).	Written examinations. Assessed coursework. Project (MSc only).
Presentation		
Presentation of concepts, algorithms and solutions.	Practical sessions. Project (MSc only).	Assessed coursework. Project MSc only).

Intended Learning Outcomes	Teaching and Learning Methods	How Demonstrated?
Appraisal of evidence		
Critical appraisal of algorithms and solutions.	Course work. Project (MSc only)	Written examinations. Assessed coursework. Project (MSc only).
(b) Transferable skills		
Research		
Conduct background research and literature surveys. Summarize content from information sources.	Coursework. Project (MSc only)	Assessed coursework. Project (MSc only).
Communication		
Response to questioning. Scientific communication (written and oral). Project presentation (written and oral.)	Practical sessions. Coursework. Project (MSc only).	Mini-projects. Project (MSc only). Assessed coursework and mini- projects. Project (MSc only). Assessed coursework. Project (MSc only).
Data presentation		
Project presentation (written and oral.)	Practical sessions. Coursework. Project (MSc only).	Assessed coursework. Project (MSc only).
Information technology		
Various computer languages and specialist software. (FORTRAN, C, C++, MATLAB, FLUENT). Office software.	Throughout. Coursework. Project (MSc only).	Assessed coursework. Project (MSc only).
Problem solving		
Analysis, breakdown, synthesis, critical examination. Computational modeling skills.	Practical sessions. Coursework. Project (MSc only). Coursework. Practical sessions. Project (MSc only).	Written examinations. Assessed coursework. Project (MSc only). Assessed coursework. Project (MSc only).
Working relationships		
Scientific discussion.	Problem classes. Practical sessions. Project (MSc only).	Project (MSc only).
Managing learning		
Study skills. Independence and time management. Information retrieval.	Throughout. Structured support decreasing through year. Project (MSc only). Coursework. Project (MSc only).	Written examinations. Assessed coursework. Project (MSc only). Meeting deadlines. Assessed coursework. Project (MSc only).

Intended Learning Outcomes	Teaching and Learning Methods	How Demonstrated?
Career management		
Scientific discussion. Organisation. Time management. Careers and business awareness.	Problem classes. Practical sessions. Project (MSc only). Structured support decreasing through year. Project (MSc only). Careers workshops and guest speakers (Wednesday PM sessions). Industry-led project (MSc only).	Project (MSc only). Meeting deadlines. Destination data. Student feedback.

Transferable and practical skills are traditionally developed and assessed during the MSc project. However, the practical nature of this programme means that the majority of modules have the development of such skills implicit within them and incorporated into their coursework assessments (see module specs). For example, core module PA7081 *Practical Programming* is assessed using three mini-projects. It is clear that exit-award students (PGDip and PGCert) will have been assessed on learning outcomes consistent with those of the MSc project (but on a smaller scale).

10. Special features:
This is an interdisciplinary programme, using expertise from across the College. Emphasis is on the practical implementation and transferable skills in coursework assessment of most modules. Industry-linked MSc projects. Simulated conference to showcase student project work (linked to project assessment).

11. Indications of programme quality:
Letters of support to be sought from industry. External examiners' reports.

12. Scheme of Assessment
As defined in Senate Regulation 6: Regulations governing Taught Postgraduate Programmes of Study (see Senate Regulations)

13. Progression points
As defined in Senate Regulation 6: Regulations governing Taught Postgraduate Programmes of Study (see Senate Regulations)

In cases where a student has failed to meet a requirement to progress he or she will be required to withdraw from the course and a recommendation will be made to the Board of Examiners for an intermediate award where appropriate.

14. Rules relating to re-sits or re-submissions:
As defined in Senate Regulation 6: Regulations governing Taught Postgraduate Programmes of Study (see Senate Regulations)

15. Additional information [e.g. timetable for admissions]

16. External Examiners
The details of the External Examiner(s) for this programme and the most recent External Examiners' reports can be found here.

Appendix 1: Programme structure (programme regulations)

All programmes to formally include range of non-credit bearing attendance only activities for careers, student support etc.:

MA7903 – House hours

MA7902 – VBA

	Code	Title	Credits
Semester 1			
Core modules			
	PA7081	Practical Programming	15
	MA7012	Scientific Computing	15
Options			
30 credits selected from:			
	MA7032	Equations of Mathematical Physics	15
	EG7026	Advanced Fluid Mechanics	15
	EG7037	Advanced Solid Mechanics	15
	MA7077	Operational Research	15
	PA7111	Methods in Mathematical Physics	15
	MA7080	Mathematical Modelling	15
Semester 2			
Core modules:			
Either	MA7011	Computational Partial Differential Equations with Applications	15
or	MA7091	Computational Partial Differential Equations with Finite Elements	15
Options			
45 credits selected from:			
	MA7022	Data Mining	15
	EG7029	Computational Fluid Dynamics	15
	EG7060	Dynamics of Mechanical Systems	15
	EG7016	Design of Discrete Systems	15
	EG7017	Real-time signal processing	15
	MA7041	Methods of Molecular Simulation	15
	MA7061	Topics in Mathematical Biology	15
Summer			
Core modules			
	MA7099	Individual Project	60
Total			180

Appendix 2: Module Specifications

See module specification database http://www.le.ac.uk/sas/courses/documentation