



UNIVERSITY of LIMERICK

OLLSCOIL LUIMNIGH

Quality Review  
of the  
**Department of  
Mathematics and Statistics**

The University of Limerick (UL), follows an established process for Quality Assurance (QA) and Quality Improvement (QI) in line with that developed jointly by IUA and IUQB. This involves a seven-year cycle during which all Departments work to improve the quality of their programmes and services, undergo a rigorous self-evaluation prior to a quality review by internationally recognised experts in the field.

The process itself evolved as a result of the Universities Act, 1997 in which the responsibility for QA/QI was placed directly with the individual universities. The UL Quality Support Unit (QSU) web site provides an elaboration of this process and the state of progress.

The broader picture is described in the publication *A Framework for Quality in Irish Universities* which can be downloaded from the IUQB web site: <http://www.iuqb.ie/>

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Quality Review Group	Appendix A
UL-QSU Web Site	<a href="http://www.quality.ul.ie">www.quality.ul.ie</a>
Web Site	<a href="http://www.maths.ul.ie">www.maths.ul.ie</a>
QQI Web Site	<a href="http://www.qqi.ie">www.qqi.ie</a>
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## **1.0 Background**

### **1.1 Legislative Framework**

The University of Limerick, in common with all the universities in the Republic of Ireland, fell within the Universities Act, 1997 until recently. This Act specified the responsibilities of universities in Ireland for Quality Improvement and Quality Assurance. Section 12 stipulates that, 'The objects of a university shall include - ... to promote the highest standards in, and quality of, teaching and research'.

Section 35 (1) of the Act further required that each university Governing Authority 'shall...require the university to establish procedures for quality assurance aimed at improving the quality of education and related services provided by the university'. The Act provides a framework for the universities to develop their quality processes. Section 35 requires each university to review the quality of the work of all faculty, academic Departments and service (including administrative) Departments on a ten-year cycle. In particular 'The procedures shall include ... assessment by those, including students, availing of the teaching, research and other services provided by the university'.

Although each university is free to develop its own procedures in fulfilling its obligations under the Act, close co-operation has been achieved through the co-ordinating role of the Irish Universities Association Quality Committee, (IUAQC). Accordingly, the universities have developed a framework comprising a set of common principles and operating guidelines for quality improvement and quality assurance. These principles and guidelines have been integrated into each of the universities procedures, which ensure coherence through the university system, while maintaining the autonomy of each university and its individual institutional culture.

In late 2012 the Qualifications and Quality Assurance (Education and Training) Act 2012 superseded the Universities Act 1997 in respect of quality assurance matters in the universities and the IUQB was subsumed into the new Quality and Qualifications Ireland agency. There will be a consultative process during 2013 and it will be some time before changes to QA and QI practice are reflected in the universities.

### **1.2 The IUQB / QQI**

The Governing Authorities of the seven Irish universities established the Irish Universities Quality Board (IUQB) in February 2003. This board comprises representatives of the Conference of Heads of Irish Universities (CHIU) and a number of external members.

The aims of the IUQB were:

- To increase the level of inter-university cooperation in developing Quality Assurance processes
- To represent the Irish universities nationally and internationally on issues relating to quality assurance and quality improvement
- To articulate, on behalf of the Governing Authorities of the universities, the resource implications of recommendations for quality improvement.

The IUQB subsumed the roles and functions formerly carried out by the IUQSC (Irish Universities Quality Steering Committee) and has since been subsumed into Quality and Qualifications Ireland (QQI). More detail is available at [www.qqi.ie](http://www.qqi.ie)

### **1.3 The Quality Review Process**

The common framework adopted by the Irish universities for their Quality Assurance/Quality Improvement systems consistent with both the legislative requirement of the Universities Act 1997 and international good practice comprise the following stages:

1. Preparation of a self-assessment report by the unit taking into account feedback from students and customers.
2. Quality (Peer) Review involving external experts, both nationally and internationally, who have visited the Department, met the students and studied the Self Assessment.
3. Quality Review Report, made publicly available by the Governing Authority of the university, incorporating the reactions and quality improvement plans of the Division and University.
4. Continuing improvement through implementation within the resources available to the university.

More detail is available at [www.quality.ul.ie](http://www.quality.ul.ie)

### **1.4 Management of Quality in the University**

The Vice President Academic and Registrar has overall responsibility for implementation of Quality Assurance/Quality Improvement policy and implementation at the University of Limerick. Implementation is carried out by the Director of Quality. The planned schedule of Quality Review of both academic and support departments was commenced in the year 2000, with the first full cycle of units within the University being reviewed within a seven-year cycle.

Academic departments are reviewed against international standards as described in the document "A Guide to the Quality Review Process for Academic Departments", which is available on the UL website at [www.quality.ul.ie](http://www.quality.ul.ie) .

In 2006, the university decided to implement a bespoke quality management system (QMS) and developed a suitable template with the assistance of external quality experts. This system is described in the document "Quality Management Systems – Standard Framework for Support Departments".

More detail is available at [www.quality.ul.ie](http://www.quality.ul.ie)

## **2.0 The Department of Mathematics and Statistics**

The Department of Mathematics and Statistics was established in 1983. Prior to that, the mathematicians in the then National Institute for Higher Education formed a group within the Department of Electronics. The Department of Mathematics and Statistics currently comprises 18 full-time academics, eight researchers, two administrative staff and one technical support person. The main disciplines within the department are applied mathematics, statistics and mathematics education.

The majority of students in UL take mathematics as part of their academic programmes, and almost all mathematics, statistics and mathematics pedagogy modules are delivered by the Department. The four Bachelor of Science programmes offered by the Department are: Mathematical Sciences, Financial Mathematics, Economics and Mathematical Sciences and Mathematics and Physics, where the latter two are co-owned with the Department of Economics and the Department of Physics and Energy, respectively. In addition, the Department launched a 12-month taught MSc in Mathematical Modelling in 2009, and this has already come to play a very important role in procuring students for PhD research degrees.

The Department has an active research culture and is committed to promoting internationally recognised research. There are three research centres in each of the Department's primary areas: MACSI (the Mathematics Applications Consortium for Science and Industry), the Centre for Biostatistics and the NCE-MSTL (National Centre for Excellence in Mathematics and Science Teaching and Learning). The Department has an international profile which is evidenced by hosting annual workshops such as ESGI (European Study Groups with Industry), attracting EU and international students to both the MSc in Mathematical Modelling and individual modules in their areas of interest, and facilitating staff to attend conferences and take sabbaticals to reinvigorate their teaching and research. Research is published by staff members in international peer-reviewed journals and this helps to raise the global profile of the department and to attract overseas students at both undergraduate and postgraduate level.

The Department also contributes to the community, both at a national and local level. Activities include delivering popularisation lectures in mathematics and statistics to local schoolchildren and to the wider population, writing newspaper articles to show how mathematics works in the world, hosting summer schools in mathematical modelling aimed at senior-cycle second-level school students from all over Ireland and delivering mathematical enrichment classes (mathematical Olympiad training).

### **3.0 The Follow-up Process**

The Quality Review process occurs on an approximately seven-year cycle at the University of Limerick. An average of five academic Departments are reviewed annually. Once the Peer Review Group report is finalised, the Department concerned immediately sets about planning its response to the issues raised therein.

The self-evaluation process is intended to be a reflective exercise in which a Department/Division should identify many of its strengths and weaknesses and develop plans to strengthen and grow as appropriate. Quite often, the Peer Review Group (PRG) will reinforce these issues and may identify areas of concern that were overlooked. In many cases, the PRG will also highlight the strengths of the Department and encourage faculty and staff to take advantage of these.

After the department and the university have been given time to respond to the issues raised; the Peer Review Group's report will be made available to the wider community through the University's web site. Normally, the report is available within the University less than four weeks after the PRG visit. Responses and plans for action are incorporated into the report and are subject to the approval of the University's Governing Authority Strategic Planning and Quality Assurance Committee. Presentation to the committee usually follows within six months of the PRG visit. The Governing Authority will publish the Peer Review report, including reactions and plans, following approval.

It is expected that a review of progress in implementing recommendations and investigating issues raised would occur quarterly for the two years following the Peer Review Visit. Progress Reports will be published as deemed appropriate.

<b>Date</b>	<b>Action</b>
Date of review	Department is issued with Peer Review Group report and required to prepare reactions and plans for Quality Improvement as appropriate. The report is circulated to all members of Management Committee for comment.
Date of review	PRG Report, incorporating reactions, is presented to UL Executive Committee for discussion, as appropriate.
+ 2 months	Reactions and plans incorporated into the Quality Improvement Action Plan and circulated to GA Strategic Planning and Quality Assurance committee. PRG Report with Responses and Quality Improvement Action Plan are tabled at GA-SPQAC meeting for discussion.
+ 1 year	Head of Dept, Dean, Vice President Academic & Registrar and Director of Quality discuss progress with resolution of recommendations and outstanding items are referred to Executive Committee, Academic Council and/or Governing Authority as appropriate.

## **4.0 Preliminary Comments of the Peer Review Group (PRG)**

The PRG found the self-assessment report (SAR) of the Department of Mathematics and Statistics (M&S) to be a clear account of the department's activities and a thoughtful and insightful analysis of M&S's current situation. The report was supported by a wide range of relevant evidence and we are grateful for the helpful way in which the department responded to our requests for additional evidence. The SAR included many constructive proposals for future action and this formed a very helpful basis for our engagement with the department.

In our discussions with members of M&S, we found staff to be very helpful, open and reflective. They engaged actively with all the issues we raised, answered our questions clearly and patiently, and provided us promptly and efficiently with all the additional information we requested.

The department demonstrated a clear and consistent commitment to teaching and research. They showed a strong commitment to the wellbeing and development of their students and graduates, and this was confirmed by our meetings with a range of students, graduates and employers. As members of the PRG, we wish to express our gratitude for the hospitality and cooperation we received, and our admiration for the dedication, professionalism and strong team spirit demonstrated by the staff we met.

Our overall impression is that staff in M&S are working hard to deliver a good service to their students and, through their service teaching, to students on a very wide range of programmes across the university, while at the same time developing impressive research, industrial links and a wide range of outreach activities. The department, along with UL as a whole, is now in a difficult period where resources are constrained by public expenditure restrictions. This has had a significant impact on the work of the department and there have been particular difficulties in relation to opportunities for promotion and career development.

The department sees particular challenges in dealing with student intakes with a wide range of mathematical ability, and changes to the school curriculum are likely to exacerbate this issue. The PRG felt that there was a risk that staff become distracted by "fire fighting" a continuing series of resource-related problems and challenges. We think there is scope for the department to take a more strategic approach to its teaching delivery, particularly in relation to the portfolio of programmes and modules, the structure of choices, pathways and electives, and the pedagogic model for first year teaching. We think that investment in a strategic review of these areas has the potential to enhance the effectiveness and efficiency of the department's teaching delivery and, in the medium term, could free up staff time for other priorities; we would urge the university to consider ways in which such a review could be encouraged and supported.

It was clear to the PRG that staff in the department did not feel able to influence strategic decision making in an appropriate way. The reasons for this are complex, but we feel there are two main areas where arrangements could be improved. First, we feel that there is scope for the department to enhance its internal capacity for strategic planning and to develop new structures to promote academic leadership. Second, we would encourage senior management at UL to review its approach to communication and consultation with academic departments and to the wider dissemination of metrics and information, in order that staff feel more informed about, and hence more engaged with, the university's operations and policies and develop a stronger sense of shared ownership of the university's strategic development.

## **5.0 The Report of the Peer Review Group**

### **5.1 Mission**

#### **Commendations**

The PRG commends the following:

5.1.1 The department's established and consistent position as one of the best applied mathematics departments in Ireland.

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5.1.2 The department's evident commitment to the two-way transfer of knowledge between academia and industry.

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5.1.3 The department's strong and manifest commitment to teaching and student wellbeing.

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5.1.4 The wide-ranging, high-quality outreach activities of the department.

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#### **Recommendations**

The PRG recommends the following:

5.1.5 At UL level, review the relationship between intake targets and Admissions Office strategy for making offers in order to avoid a repetition of recent very high unexpected fluctuations in intake and to embed an improved system in future years.

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5.1.6 Initiate a strategic evidence-led review of entry requirements for maths in order to test the hypothesis that higher entry requirements will result in improved matching of student qualifications to the demands of the maths degrees offered by the department, taking into account the consequences of Project Maths in the secondary school system.

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5.1.7 Revisit the department mission statement to ensure it captures what is truly distinctive about the work of M&S.

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5.1.8 Build on the successful 2012 strategy day by making this an annual event.

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## 5.2 Design and Content of Curriculum

### Commendations

The PRG commends the following:

- 5.2.1 The extent to which industrial mathematics links inform the syllabus.

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- 5.2.2 The strong links between FYPs and staff research interests.

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- 5.2.3 The Co-op experience in year 3 which is highly valued by students and employers.

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- 5.2.4 The good employability rates of M&S graduates.

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### Recommendations

The PRG recommends the following:

- 5.2.5 Conduct a feasibility study on ways to further streamline the year 1 curriculum so that all students on BSc Mathematical Sciences, BSc Financial Mathematics, BSc Economics & Mathematical Sciences and BSc Mathematics & Physics programmes cover a common core of mathematics content.

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- 5.2.6 Put in place a coherent curricular structure for probability and statistics with a view to rationalisation and coordination across undergraduate degree programmes.

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- 5.2.7 Introduce systematic delivery of training in key maths skills for the FYP (such as writing for maths, giving presentations and critical analysis of results) at the start of the project period.

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- 5.2.8 Ensure that the planned review of the computing modules fully considers the merits of a single year 1 substantial programming option.

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- 5.2.9 Consider whether Mathematics Laboratory (MS4101) should be replaced by other components that would further enhance the students' mathematical skills.

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- 5.2.10 Fully exploit the potential of the NUIG alliance through increased use of shared modules through video links, particularly for advanced modules.

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## 5.3 Teaching, Learning and Assessment

### Commendations

The PRG commends the following:

- 5.3.1 The approachability and accessibility of staff which is valued by students.

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- 5.3.2 Students' easy access to additional help through online resources, the Maths Learning Centre (MLC) and the provision of student-led support tutorials.

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- 5.3.3 The use of modern technology in teaching, including YouTube, MathsCasts and the video courses used in alliance with NUIG.

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### Recommendations

The PRG recommends the following:

- 5.3.4 Set up a staff-student liaison committee which would systematically collate and discuss student-related academic issues, report to the HoD and receive responses from the HoD.

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- 5.3.5 Institute a compulsory programme of postgraduate tutor training and observation.

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- 5.3.6 Consider widening the pool of tutors through the use of senior undergraduates.

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- 5.3.7 Review the department's use of the peer observation programme to ensure full participation across the department and ways of sharing good practice arising from the process.

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- 5.3.8 Investigate how best to monitor year 1 students in the first semester, with an early warning system for students at risk of failure and an early response mechanism in place.

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- 5.3.9 Investigate alternative ways to gauge student opinion with a view to responding to any student concerns about teaching.

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- 5.3.10 Consider making it departmental good practice that lecturers make student evaluation of teaching (SET) scores public.

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## 5.4 Facilities and Learning Resources

### Commendations

The PRG commends the following:

- 5.4.1 The internationally recognised MACSI (Mathematics Applications Consortium for Science and Industry) centre, which has been attracting resources and facilities to UL.

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- 5.4.2 The computer labs under the direct control and operation of the department, which are a vital resource for the development of mathematicians, especially those addressing practical problems.

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- 5.4.3 The library and its praiseworthy infrastructure and facilities, which provide a high-quality hub for student learning.

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### Recommendations

The PRG recommends the following:

- 5.4.4 Formalise the arrangements with Buildings & Estates and other service divisions and put service level agreements in place to deal with relevant issues.

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- 5.4.5 Use the proposed staff student committee to obtain evidence and support for resolving issues and problems relating to facilities.

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- 5.4.6 Develop and deliver a strategy for sustainable upgrading of the department's physical resources, hardware and software.

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- 5.4.7 Make the activities and research interests of the department more visible to undergraduate students by initiatives such as displaying posters of recent research work in student computer labs.

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- 5.4.8 Establish more systematic procedures to ensure that available financial resources such as the department book fund are used in a timely and appropriate manner.

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## 5.5 Staff

### Commendations

The PRG commends the following:

- |       |   |
|-------|---|
| 5.5.1 | The broad range of service teaching carried out by the department to approximately 6,000 students annually in business, education, engineering, science and information technology.                   |
| 5.5.2 | The expertise of applied mathematics staff in industrial, financial and numerical modelling and the integration of this expertise into undergraduate modules and FYPs.                                |
| 5.5.3 | The development by the department of the MLC which provides a range of online services and MathsCasts in addition to face-to-face support services for students of mathematics across the university. |
| 5.5.4 | The established long-term links of staff with industry and financial firms which enhance opportunities for research, outreach activities and student placements for Co-op.                            |
| 5.5.5 | The commitment of staff to provide support to students, which is recognised and valued by the students.   |

### Recommendations

The PRG recommends the following:

- |       |  |
|-------|--|
| 5.5.6 | Considering the major concern about understaffing in statistics, ensure at university level that the sanctioned posts are ring-fenced if there is any delay in filling the positions advertised currently. |
| 5.5.7 | At university level, adopt a more flexible recruitment policy to allow for appointment at the grade of the departing post-holder.  |
| 5.5.8 | Rapidly introduce a more systematic work allocation teaching model to ensure that the department can be more strategic in how teaching is assigned.  |
| 5.5.9 | Implement the PDRS system for all staff members as good practice for the provision of feedback on annual performance and to support the professional development of staff.                                 |

## 5.6 Student Guidance & Support

### Commendations

The PRG commends the following:

- 5.6.1 The impressive range of student support services available at institutional level to facilitate the transition to university and to support students who may be under stress.
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- 5.6.2 The learning centres which cover a broad range of areas where students may have difficulties and which provide a key set of learning resources and supports to address specific learning issues.
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- 5.6.3 The strong sense of pastoral care felt by students and the general feeling that department staff are available to listen to student concerns and to address any issues that arise.
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### Recommendations

The PRG recommends the following:

- 5.6.4 Create a more robust and effective triage system that connects students experiencing learning problems with the learning centres so that appropriate supports can be put in place to avoid a learning crisis.
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- 5.6.5 Review and improve the operation of the student advisor system so that it operates as a strong mechanism to initiate and maintain contact between advisors and their students from the first weeks in year 1.
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- 5.6.6 Engage with the MLC to provide tailored support for more difficult and advanced maths topics.
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- 5.6.7 Review the potential impact of known and planned changes in student numbers and the typical academic preparation of entrants on the work of the MLC and other support resources to ensure that this work is appropriately resourced.
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- 5.6.8 Ensure that staff are fully aware of the facilities provided by Student Affairs for students registered with Disability Support Services.
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- 5.6.9 At university level, review the policy in relation to mid-term exams, so that support for students registered with Disability Support Services is no longer financed by the department.
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## 5.7 Research Activity

### Commendations

The PRG commends the following:

- 5.7.1 The success of MACSI in obtaining in excess of €11 million in external funding from various funding bodies since its foundation.

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- 5.7.2 The graduation of 21 PhD and 12 MSc students since 2006.

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- 5.7.3 The establishment of good links by MACSI with local industries, some of which are investing back into MACSI and thus providing vital funding to UL, and the embedding of research ideas into Irish industry.

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- 5.7.4 The involvement by the MLC in educational research projects with Loughborough University in the UK and Swinburne University of Technology in Australia.

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### Recommendations

The PRG recommends the following:

- 5.7.5 As a matter of urgency, obtain university funding for a MACSI administrator.

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- 5.7.6 Increase the visibility and impact of M&S research by publishing in high-impact journals, placing publications on ArXiv and using online networking services such as ResearchGate, LinkedIn and Google Scholar.

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- 5.7.7 Increase participation in national and international conferences, research advisory panels and other networking opportunities to ensure that the research profile of the department remains high.

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- 5.7.8 Support and advise junior members of staff in research funding applications and monitor their success.

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- 5.7.9 Ensure that undergraduates are made aware of PhD and MSc opportunities at an early stage in their final year.

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## 5.8 Department Organisation and Management

### Commendations

The PRG commends the following:

- 5.8.1 The open, collaborative and mutually supportive ethos of the department.

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- 5.8.2 The willingness of certain department members to undertake departmental citizenship and managerial roles despite heavy workloads.

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### Recommendations

The PRG recommends the following:

- 5.8.3 Devise and implement a managerial structure to strengthen and broaden the department's capacity for leadership and decision taking.

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- 5.8.4 Formulate and implement a mechanism for strategic, forward-looking thinking on future challenges - for example, via ad hoc or standing working groups.

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- 5.8.5 Ensure that senior members and professors in the department engage constructively in the management of the department's activities and its wider relations with the university.

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- 5.8.6 Ensure that the department workload allocation model accurately reflects the effort expended on administrative, managerial and leadership tasks.

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- 5.8.7 Use the workload allocation model as an active management tool to ensure optimal, fair and transparent allocation of staff resources.

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- 5.8.8 In implementing all of the above, seek to make decisions based on evidence and seek advice and cross-fertilisation of ideas from other departments, industrial and other contacts outside of UL, and business school case studies.

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## 5.9 Quality Improvement Plan

### Commendations

The PRG commends the following:

- 5.9.1 The thoughtful and well-written analysis of the department's situation as described in the SAR.

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- 5.9.2 The wide range of activities identified for action, supported by clear identification of persons responsible and appropriate timeframes for action.

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### Recommendations

The PRG recommends the following:

- 5.9.3 In implementing the quality improvement plan (QIP), consider the scope for a small number of strategic development projects around the issues of curriculum design and pedagogic models, which would permit more holistic and proactive ways of addressing a wide range of identified problems.

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- 5.9.4 Ensure that the progression of each action in the QIP is the responsibility of a specific individual and, where possible, subdivide actions into smaller tasks with clear milestones for implementation.

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- 5.9.5 Consider the scope for a more systematic approach to project management in taking forward the department's plans.

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## **Appendices**

### **A Membership of the Peer Review Group:**

Dr Bill Harvey	Chairperson, Director, QAA, Scotland
Dr Gavin Hurley	Baringa Partners LLP, London.
Dr Gerard Keogh	Statistician, INIS, Dublin
Ms Ailish O'Farrell	Technical writer, Limerick. (secretary)
Dr Francesca Shearer	Queen's University, Belfast
Prof Alastair Spence	University of Bath, UK

### **B Membership of the Department Quality Team:**

Dr. Sarah Mitchell	Chair of Quality Team, Lecturer, Applied Mathematics
Mr. Kevin Burke	Postgrad representative
Dr. Mark Burke	Head of Department, Lecturer, Applied Mathematics
Dr. Olivia Fitzmaurice	Lecturer, Mathematics Education
Dr. Eugene Gath	Lecturer, Applied Mathematics
Prof. James Gleeson	Professor of Applied and Industrial Mathematics

### **C Contact**

The Peer Review Group were given the opportunity over three days to talk to the department Quality Team both formally and informally. Meetings with staff, postgraduate & undergraduate students and others were scheduled as group sessions. The Review Group was given the opportunity to meet all staff during a visit to the facilities of the department and this was most helpful.

All the meetings provided extremely useful additional information to support the SAR.

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