



UNIVERSITY of LIMERICK

O L L S C O I L L U I M N I G H

Quality Review of the

Department of Mechanical, Aeronautical & Biomedical Engineering

The University of Limerick (UL), through its membership of the Irish Universities Quality Board (IUQB), follows an established process for Quality Assurance (QA) and Quality Improvement (QI). 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 has 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/>

| | |
|----------------------|--|
| Issued by QSU | 3 rd October 2012 |
| Review Date | 24 th - 27 th September 2012 |
| Quality Review Group | Appendix A |
| UL-QSU Web Site | www.quality.ul.ie |
| Web Site | www.mabe.ul.ie |
| IUQB Web Site | www.iuqb.ie |

Copyright © – University of Limerick, September 2012

This report is the property of the University of Limerick and may be printed and distributed for personal use only. The document must not be redistributed or republished, in part or whole, without the express permission of the University of Limerick.

Table of Contents

| | | |
|-----|--|----|
| 1.0 | Background | 3 |
| 1.1 | Legislative Framework..... | 3 |
| 1.2 | The Irish Universities Quality Board..... | 3 |
| 1.3 | The Quality Review Process..... | 4 |
| 1.4 | Management of Quality in the University..... | 4 |
| 2.0 | The Department of Mechanical, Aeronautical and Biomedical Engineering (MABE) | 5 |
| 3.0 | The Follow-up Process..... | 6 |
| 4.0 | Preliminary Comments of the Peer Review Group (PRG)..... | 7 |
| 5.0 | The Report of the Peer Review Group..... | 8 |
| 5.1 | Mission | 8 |
| 5.2 | Design and Content of Curriculum | 9 |
| 5.3 | Teaching, Learning and Assessment..... | 10 |
| 5.4 | Facilities and Learning Resources | 11 |
| 5.5 | Staff..... | 12 |
| 5.6 | Student Guidance and Support..... | 13 |
| 5.7 | Research Activity | 14 |
| 5.8 | Department Organisation and Management | 15 |
| 5.9 | Quality Improvement Plan..... | 16 |
| | Appendices | 17 |
| A | Membership of the Peer Review Group: | 17 |
| B | Membership of the Department Quality Team: | 17 |
| C | Contact..... | 17 |

1.0 Background

1.1 Legislative Framework

The University of Limerick, in common with all the universities in the Republic of Ireland, falls within the Universities Act, 1997. This Act specifies 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 requires 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, (IUQAC). 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.

More detail is available at www.quality.ul.ie/The_Act.htm and www.iuqb.ie

1.2 The Irish Universities Quality Board

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 are:

- 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). More detail is available at www.iuqb.ie. The IUQB is now being replaced by a new body QQI (Quality and Qualifications Ireland).

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 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

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 .

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

2.0 The Department of Mechanical, Aeronautical and Biomedical Engineering (MABE)

Mechanical engineering was one of the earliest disciplines introduced in UL in the 1970s. The Department of Mechanical and Aeronautical Engineering was established in 1996 when the Department of Mechanical and Production Engineering split into two departments. It was renamed as the Department of Mechanical, Aeronautical and Biomedical Engineering (MABE) in January 2011. The department offers Bachelors of Engineering in Mechanical, Aeronautical and Biomedical Engineering and in Computer-Aided Engineering and Design. It also offers taught masters programmes in Mechanical and Aeronautical Engineering, and a Graduate Diploma and Master of Technology in Computer-Aided Engineering Product Design. Finally, the department offers masters and Ph.D. programmes by research as well as a structured Ph.D. programme in Biomedical Engineering and Regenerative Medicine in association with NUI Galway and UCC.

The MABE department typically graduates approximately 100-120 undergraduate students a year, 20 taught masters students a year, and has approximately 70 students studying for a Ph.D. at present. Approximately 20 postdoctoral fellows work within the department. Almost all academic staff are members of one of four research institutes/centres: the Materials and Surface Science Institute (MSSI), the Stokes Research Institute (SRI), the Centre for Applied Biomedical Engineering Research (CABER) and the Irish Centre for Composites Research (ICOMP).

The department has seen strong growth in teaching and research in recent years, with a first year undergraduate cohort of 160-170 students in 2012-13, a fourfold increase in the annual number of publications in the last 10 years, strong growth in citations and Ph.D. graduations, and over €32 million in research funding in the last decade.

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.

| Date | Action |
|----------------|---|
| 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. |
| + 2/3 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 | Director, 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 Mechanical, Aeronautical and Biomedical Engineering (MABE) to be a very clear account of the department's activities and a thoughtful and insightful analysis of MABE'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 MABE, 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 very strong team spirit, and 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 and professionalism demonstrated by the staff we met. We also noted a widespread recognition, both within the University of Limerick (UL) and among students and external stakeholders, that MABE has a strong reputation for the calibre of its courses and its research activities.

MABE, 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 it is clear that resource shortfalls will continue to be challenging, particularly in relation to staffing reductions, budget reductions and pressure on staff time. Given the national funding position, some of this is inevitable, but we feel that the current position carries a risk that staff become distracted by "fire fighting" a continuing series of problems and challenges. We think there is scope for the department to take a more strategic approach which identifies key priorities, and to take collective action to address these priorities. That may involve some hard choices about what is sustainable and what is not, but we feel that a more proactive approach would help the members of the department to be and feel more in charge of their own collective fate. We would encourage senior management at UL to review their approach to communication and consultation with the academic community in order that staff feel 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 programme curricula which are attractive to prospective students and valued by the employers of MABE graduates.

- 5.1.2 The high quality of MABE research with its impact in the scientific community.

- 5.1.3 The high level of engagement of MABE with relevant industries.

Recommendations

The PRG recommends the following:

- 5.1.4 At UL level, review the resource allocation model to ensure that the university's increasing emphasis on research is appropriately incorporated.

- 5.1.5 At department level, review the workload allocation model to ensure that research activity is incentivised.

- 5.1.6 At university level, provide administrative support to the department in areas such as the promotion of programmes, financial management and recruitment, in order that staff can more efficiently address the key goals of the mission.

- 5.1.7 Endeavour to participate in additional international networks of postgraduate programmes.

- 5.1.8 At faculty level, engage the department in assessing the merits of a common first semester for engineering students with a view to expediting a decision on implementation.

5.2 Design and Content of Curriculum

Commendations

The PRG commends the following:

5.2.1 The recognition by the department of the value of keeping programmes current by bringing the latest research perspectives into teaching.

5.2.2 The well-structured programmes which cover relevant topics with appropriate focus on mechanics and mathematics.

5.2.3 The high level of satisfaction expressed by students with the overall quality of lectures.

5.2.4 The Cooperative Education initiative which is an asset of the undergraduate programmes and which is greatly valued by both students and employers.

Recommendations

The PRG recommends the following:

5.2.5 Make student assessment of teaching mandatory for all modules and for all students.

5.2.6 Meet periodically with representatives of relevant industries to obtain feedback on the curriculum and module syllabi as well as contribution to the programmes – for example, in relation to final year project (FYP) supervision and visiting lecturers for relevant modules.

5.2.7 Consider increasing the focus on Fracture Mechanics in the BE or MEng in Aeronautical Engineering programmes.

5.2.8 At UL level, implement a faster, more efficient method to approve modifications to programme curricula.

5.2.9 At UL level, review the question of appropriate funding for the Flight Mechanics module.

5.3 Teaching, Learning and Assessment

Commendations

The PRG commends the following:

- | | |
|-------|--|
| 5.3.1 | The high percentage of students achieving 1:1 and 2:1 level degrees, across a wide spectrum of CAO points achieved. |
| 5.3.2 | The increasingly high scores in student evaluations being achieved by MABE lecturers and modules relative to the UL average. |
| 5.3.3 | The successful implementation of the team-based project format for the two aircraft design modules in year 4. |
| 5.3.4 | The student guidance document and the revised marking scheme prepared for FYPs. |
| 5.3.5 | The successful Introduction to Engineering 1 & 2 modules to address generic and transferrable skills. |

Recommendations

The PRG recommends the following:

- | | |
|-------|---|
| 5.3.6 | At faculty level, conduct a review into the impact on student progression, student difficulties and the use of the Maths Learning Centre of weaker students being admitted to engineering programmes. |
| 5.3.7 | At department level, assign a staff member to take responsibility for teaching methods and standards and to act as the primary contact with the UL Centre for Teaching & Learning (CTL) with the objective of disseminating best practice among the department staff. |
| 5.3.8 | Explore expanding the successful pilot of team-based project modules in year 4 of the BEng Aeronautical programme to years 3 and 4 in each of the MABE disciplines. |

5.4 Facilities and Learning Resources

Commendations

The PRG commends the following:

- 5.4.1 The pleasing campus environment and the infrastructure to support teaching and research.

- 5.4.2 The dedicated laboratories and equipment for teaching and research in all three streams of the department.

- 5.4.3 The library service and the dedicated computer-based teaching laboratories for students.

Recommendations

The PRG recommends the following:

- 5.4.4 Consider ways to house all MABE academic staff in closer proximity.

- 5.4.5 Plan for upgrading equipment in the MABE teaching laboratories.

- 5.4.6 At UL level, improve the timetabling and room allocation service for lectures and AV provision.

- 5.4.7 Examine ways to utilise current laboratory space more effectively.

- 5.4.8 Review the balance of technical support for teaching and research activities so that postgraduate research students are more appropriately supported.

5.5 Staff

Commendations

The PRG commends the following:

- | | |
|-------|---|
| 5.5.1 | The range and depth of expertise of staff for teaching and research in Mechanical, Aeronautical and Biomedical Engineering. |
| 5.5.2 | The effective staff-student interaction in teaching, and the high level of student satisfaction. |
| 5.5.3 | The leading position of some MABE staff in a number of research themes either nationally or internationally. |
| 5.5.4 | The Bernal Chairs initiative which will bring high-calibre academic leaders to the department. |

Recommendations

The PRG recommends the following:

- | | |
|--------|---|
| 5.5.5 | In filling the approved academic posts, ensure that appropriate weight is given to the need to enhance the department's strengths in research. |
| 5.5.6 | Resolve, as a matter of urgency, the current shortfall in technical support for laboratories and find a sustainable solution to ensure that all laboratory and workshop activities can be suitably supported. |
| 5.5.7 | At university level, design and deliver an appropriate training programme to address the development needs of postgraduate students including teaching and project management skills. |
| 5.5.8 | At department level, ensure that the allocation of teaching duties to TAs matches their disciplinary background and level of expertise. |
| 5.5.9 | At UL level, consider additional ways to recognise staff demonstrating exceptionally high performance in teaching and/or research. |
| 5.5.10 | At UL level, consider applying a workload model to optimise the deployment of staff. |

5.6 Student Guidance and Support

Commendations

The PRG commends the following:

- 5.6.1 MABE's positive engagement with the First Seven Weeks programme.

- 5.6.2 The assignment of senior students as mentors for all departmental undergraduates.

- 5.6.3 The use of LinkedIn to actively network with alumni to share job opportunities and advice with fourth-year students and recent graduates.

- 5.6.4 The many effective channels for open and honest communication between faculty and students.

- 5.6.5 The proactive attitude of the department in addressing the main issues raised in student surveys and the feedback of external reviewers and examiners.

Recommendations

The PRG recommends the following:

- 5.6.6 Invite taught postgraduate representatives to meet with course directors on a regular basis.

- 5.6.7 Use the Kemmy Business School (KBS) MBA in Aviation and the MABE LinkedIn groups to maximise relevant co-op placement and employment opportunities.

- 5.6.8 Ensure access to specialist software is available to students as required.

5.7 Research Activity

Commendations

The PRG commends the following:

- | | |
|-------|---|
| 5.7.1 | The successful implementation of the research institute/centre strategy, as illustrated by the level of funding, Ph.D. output, publication and citations related to the four institutes/centres within the MABE department. |
| 5.7.2 | The dramatic increase in the number of Ph.D. students in the department over the last 10 years, which has been achieved with effectively the same number of academic staff. |
| 5.7.3 | The fourfold increase in the annual number of publications from MABE academic staff over the same 10-year period, which are increasingly being published in journals with a higher impact factor. |
| 5.7.4 | The high citation levels achieved by MABE academics, with the Irish Centre for Composites Research (ICOMP) and the Centre for Applied Biomedical Engineering Research (CABER) being particularly successful in this regard. |
| 5.7.5 | The level of success in securing research funding, in particular the achievements of the Stokes Research Institute (SRI) in licencing and commercialising their research. |

Recommendations

The PRG recommends the following:

- | | |
|--------|---|
| 5.7.6 | At university level, address the low value given to research activity in the resource allocation model. |
| 5.7.7 | At university level, conduct a review of the effectiveness of the administrative support functions (e.g. HR, Finance, Research) in supporting the primary goals of the university, which are teaching and research. |
| 5.7.8 | At department level, assign a staff member with responsibility for the postgraduate researcher cohort to support the development of a departmental strategy for matters such as mentoring, peer group interaction, and teaching and other capability development. |
| 5.7.9 | At department level, determine which non-specialist administrative support requirements could be met by the Science & Engineering faculty administrative pool. |
| 5.7.10 | At university level, consider the need for a 'Front Office' initial point of contact for industry approach for collaboration and research opportunities. |

5.8 Department Organisation and Management

Commendations

The PRG commends the following:

- 5.8.1 The successful student exchange programme with two US universities.

- 5.8.2 The implementation of online systems for administrative tasks such as claiming expenses.

- 5.8.3 The strong sense of cohesion and team spirit across the department.

Recommendations

The PRG recommends the following:

- 5.8.4 Actively engage with UL management to ensure academic concerns are fully considered as an integral part of strategic planning processes.

- 5.8.5 Implement the department's plans to create a repository of teaching materials and dual cover arrangements to minimise the effect of lecturer absence.

- 5.8.6 Consider establishing a senior management team in the department.

- 5.8.7 Create opportunities for more staff to take sabbaticals.

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.

- 5.9.2 The ways in which academic staff had opportunities to contribute to and comment on the draft SAR, which helped to develop a strong consensus on the views expressed in the SAR.

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

Recommendations

The PRG recommends the following:

- 5.9.4 Take a more proactive approach to communicating and engaging with central services and UL's management structures in order to enhance the department's capability to address many of the issues underlying the problems identified in the SAR.

- 5.9.5 Reflect on the role for a more formal management structure within MABE which could provide support for the head of department, offer development opportunities for staff, and enhance the department's capacity to engage with longer-term strategic issues.

- 5.9.6 Seek to quantify or specify more precisely the resource implications (money, staff inputs and facilities) associated with key actions in the plan.

- 5.9.7 At faculty level, reflect on the scope for developing a better shared understanding of the ways in which resources are allocated to departments, in order that departments can see more clearly how they can work to optimise their future resource allocations.

- 5.9.8 At UL level, reflect on whether there is scope to enhance mechanisms for liaison and relationship building between central services and academic departments, so that both groups can better appreciate the impact of their actions on each other.

Appendices

A Membership of the Peer Review Group:

| | |
|----------------------|---|
| Ms. Ruth Bagnell | Aeronautical Inspector, Irish Aviation Authority. |
| Prof. Pedro Camanho | Professor Associado, DEMec- Faculdade de Engenharia, Universidade do Porto. |
| Dr. Bill Harvey | Director, QAA Scotland (PRG Chair) |
| Ms. Ailish O'Farrell | Independent technical writer (PRG Recording secretary) |
| Mr. Declan Slemon | Director of Research and Development Aerogen Ltd |
| Prof. Wen Wang | Dean for Research & Faculty Executive, Faculty of Science and Engineering, Queen Mary, University of London |

B Membership of the Department Quality Team:

| | |
|------------------------|---|
| Dr. Reena Cole | Lecturer, MABE and Course Director M.Eng. (Mechanical Eng) |
| Ms. Sarah Fitzgibbon | Senior Administrator, MABE |
| Dr. Pat Frawley | Lecturer, MABE |
| Dr. Conor McCarthy | Lecturer, MABE and Course Director M.Eng. (Aeronautical Eng) |
| Prof. Michael McCarthy | Quality Team leader |
| Prof. Tim McGloughlin | Head of Department, MABE |
| Dr. Jeremy Robinson | Senior Lecturer, MABE |
| Dr. Walter Stanley | Lecturer MABE and Asst Dean of Academic Affairs, Faculty of S&E |

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.

END OF REPORT