



University College Dublin

Periodic Quality Review

UCD School of Mechanical & Materials Engineering

December 2014

Accepted by the UCD Governing Authority at its meeting on 20 October 2015

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Summary Findings of the Review Group

The Review Group was satisfied that the UCD School of Mechanical and Materials Engineering is performing well, notwithstanding the impact of the current financial constraints under which it is operating.

Examples of Good Practice

The Review Group identified a number of commendations, in particular:

- Hard working and dedicated staff overall, delivering high class education and research in spite of a high work load.
- All staff (academic, technical and administrative) are strongly committed to providing a high quality learning experience for both undergraduate and postgraduate students. This is even more commendable with the increasing number of students without a corresponding increase in staff numbers.
- The Review Group commends the School for identifying a vision for their future and for developing a strategic plan to achieve that vision.

Recommendations for future improvements

The full list of recommendations is set out in Chapter 10, however, the Review Group would suggest that the following be prioritised:

- Given the importance attributed to non-EU student recruitment and philanthropy as potential solutions to the School's financial challenges, the School should consider tasking individuals with advancing these areas in conjunction with College and University-wide actions.
- The Review Group recommends that the College, when reviewing the stage 1 curriculum, consider the following points.
 - (i) Modules should be modified to take into account the new math curriculum in the Leaving Certificate.
 - (ii) A computer programming module, which includes MATLAB, should be added as a core module in Stage 1. The programme should be taught by a member of academic staff within the UCD College of Engineering and Architecture.
- Additional technical staff should be made available to the School to reduce potential Health & Safety risks and to ensure that the learning outcomes for students are not negatively affected by a reduction in experimentation opportunities in laboratory settings.
- Research interests and applications within the School should be broad enough to be able to adjust to changes in financing opportunities.
- The Review Group would encourage the University to reconsider the current academic qualification requirements for technicians for enrollment and promotion. Such requirements are not common internationally.

- The School should consider setting up an Industry Advisory Board.
- Consider dedicated administrative support for developing the Alumni relations activity. This could happen at College level.

1. Introduction and Overview of UCD School of Mechanical & Materials Engineering

Introduction

1.1 This Report presents the findings of a quality review of the School of Mechanical & Materials Engineering, University College Dublin, which was undertaken on 2-5 December 2014. The School response to the Review Group Report is attached as Appendix 1.

The Review Process

1.2 Irish Universities have collectively agreed a framework for their quality review and quality improvement systems, which is consistent with both the legislative requirements of the Qualifications and Quality Assurance (Education and Training) Act 2012, and international good practice (e.g. Standards and Guidelines for Quality Assurance in the European Higher Education Area, 2007). Quality reviews are carried out in academic, administrative and support service units.

1.3 The purpose of periodic review is to assist the University to assure itself of the quality of each of its constituent units, and to utilise learning from this developmental process in order to effect improvement, including:

- To monitor the quality of the student experience, and of teaching and learning.
- To monitor research activity, including: management of research activity; assessing the research performance with regard to: research productivity, research income, and recruiting and supporting doctoral students.
- To identify, encourage and disseminate good practice, and to identify challenges and how to address these.
- To provide an opportunity for units to test the effectiveness of their systems and procedures for monitoring and enhancing quality and standards.
- To encourage the development and enhancement of these systems, in the context of current and emerging provision.
- To inform the University's strategic planning process.
- The output report provides robust evidence for external accreditation bodies.
- The process provides an external benchmark on practice and curriculum.
- To provide public information on the University's capacity to assure the quality and standards of its awards. The University's implementation of its quality procedures enables it to demonstrate how it discharges its responsibilities for assuring the quality and standards of its awards, as required by the Universities Act 1997 and the Qualifications and Quality Assurance (Education and Training) Act 2012.

1.4 Typically, the review model comprises four major elements:

- Preparation of a self-assessment report (SAR)
- A visit by a review group (RG) that includes UCD staff and external experts, both national and international. The site visit normally will take place over a two or three day period
- Preparation of a review group report that is made public
- Agreement of an action plan for improvement (quality improvement plan) based on the RG report's recommendations. The University will also monitor progress against the improvement plan

Full details of the review process can be found on the UCD Quality Office website: www.ucd.ie/quality.

1.5 The composition of the Review Group for the UCD School of Mechanical & Materials Engineering was as follows:

- Professor Michael Monaghan, UCD College of Agriculture, Food Science and Veterinary Medicine (Chair)
- Dr Diane Payne, UCD School of Sociology (Deputy Chair)
- Professor Martin J. Corless, Purdue University, USA (Extern)
- Professor Solveig Melin, Lund University, Sweden (Extern)

1.6 The Review Group visited the School from 2-5 December 2014 and held meetings with School staff; undergraduate and postgraduate students; the SAR Co-ordinating Committee; other University staff, including the College Principal. The site visit schedule is included as Appendix 2.

1.7 In addition to the Self-assessment Report, the Review Group considered documentation provided by the School and the University during the site visit.

Preparation of the Self-assessment Report (SAR)

1.8 Following a briefing from the UCD Quality Officer in March 2014, a Self-assessment Report Coordinating Committee (SARCC) was put in place. Members of the committee, in consultation with staff members and students, drafted sections of the Self-assessment Report. Committee membership and responsibility for Report chapters are set out below:

Professor Michael Gilchrist	Professor, Head of School	Overall review. Chaps. 1, 2, 10
Dr William O'Connor	Senior Lecturer; Chair SARCC	All chapters. Managing, drafting & editing
Mr Oran O'Rua	School Office Manager	Administration staff

		representative. Appendices.
		Secretarial support
Dr Donal Finn	Senior Lecturer	Chap. 3: Staff & facilities
Dr William Smith	Lecturer; School Head of Teaching & Learning	Chap. 4: Teaching, learning, assessment
Dr David Timoney	Senior Lecturer; former Dean	Chap. 5: Curriculum development & review
Professor Denis Dowling	Associate Professor	Chap. 6: Research
Dr Vincent Hargaden	Lecturer (above the bar)	Chap. 7: Manage quality enhancement
Dr Neal Murphy	Lecturer (above the bar)	Chap. 8: Support services
Dr Eamonn Ambrose	Lecturer (above the bar)	Chap. 9: External relations
Professor Alojz Ivankovic	Professor, Head of Mechanical Engineering discipline	Chap. 10: Summary & recommendations
Mr Paul Bright	Senior Technical Officer	Technical staff representative
Dr Kevin Roche	Recent doctoral graduate	Student/graduate representative
Ms Jennifer McGowan	School office	Non-member: secretarial support

1.9 The committee met several times between March and October 2014. Progress was also reviewed regularly at meetings of the School Executive Committee. The committee members responsible for each chapter, where appropriate, also held smaller meetings with relevant staff members, to discuss the content of each chapter. In some cases they also conducted surveys and consulted people within the School, across the University, industry, and in the wider community. A close-to-final draft of the SAR was then circulated to other staff of the School not directly involved, inviting contributions, comments and corrections, which were then incorporated.

The University

1.10 University College Dublin (UCD) is a large and diverse university whose origins date back to 1854. The University is situated on a large modern campus about 4 km to the south of the centre of Dublin.

1.11 The University Strategic Plan (to 2020) states that the University's mission is: "to contribute to the flourishing of Dublin, Ireland, Europe and the world through the excellence and impact of our research and scholarship, the quality of our graduates and our global engagement; providing a supportive community in which every member of the University is enabled to achieve their full potential".

The University is currently organised into 38 schools in seven colleges¹:

- UCD College of Arts and Celtic Studies
- UCD College of Human Sciences

¹ This reflects the University structure at the time of the review, however, the University structures will be re-organised in September 2015.

- UCD College of Science
- UCD College of Engineering and Architecture
- UCD College of Health Sciences
- UCD College of Business and Law
- UCD College of Agriculture, Food Science and Veterinary Medicine

1.12 As one of the largest universities on the island of Ireland, UCD supports a broad, deep and rich academic community in Science, Business, Engineering, Health Sciences, Agriculture, Veterinary, Arts, Law, Celtic Studies and Human Sciences. There are currently more than 26,000 students in our UCD campus (approximately 16,300 undergraduates, 7,800 postgraduates and 2,200 Occasional and Adult Education students) registered on over 70 University degree programmes, including over 6,300 international students from more than 121 countries. The University also has over 5,400 students studying UCD degree courses on campuses overseas.

UCD School of Mechanical & Materials Engineering

1.13 The UCD School of Mechanical & Materials Engineering (SMME) was established in September 2011, having originated from what was previously the UCD Department of Mechanical Engineering and, from 2005-11, the UCD School of Electrical, Electronic & Mechanical Engineering. SMME is the largest of six engineering schools within the UCD College of Engineering & Architecture. The College comprises the Schools of: Architecture; Biosystems Engineering; Chemical & Bioprocess Engineering; Civil, Structural & Environmental Engineering; Electrical, Electronic & Communications Engineering; and Mechanical & Materials Engineering.

1.14 The School is responsible for UCD's offering of taught bachelors and masters programmes in mechanical engineering, biomedical engineering, energy systems engineering, materials science & engineering, engineering with business, and engineering management. The school has a strong balance between teaching and research in various aspects of mechanical engineering, with four key areas being identified as priority themes, namely (i) *energy*, (ii) *materials*, (iii) *design & manufacturing*, and (iv) *biomedical engineering*.

2. Organisation and Management

2.1 The Review Group was satisfied that the School has good management structures in place, including a School Executive Committee, a Teaching & Learning Committee, a Research Committee and *ad hoc* sub-committees for specific projects, for example, the Quality Review, Accreditation etc. The committee structure is appropriate to the size and composition of the School and the School has ensured that committee membership is representative. All decisions are communicated to staff in a transparent and timely manner. School meetings take place three times a year and all staff attend.

- 2.2 The School has reacted positively to perceived gaps in its management structures. For example, the recent growth in new programmes has led to the establishment of a number of Programme Steering Committees within the School, each of which is chaired by the corresponding Programme Director, and is supported administratively by the School Office. In addition, a School Research Committee was recently constituted to address changed needs within the School.
- 2.3 The School is also proactive in developing sub-committees to address the future needs of the School, for example, the Head of School has established a Search Committee, comprised of the School professoriate, specifically to identify prospective professorial appointments that could be funded by non-exchequer sources. Specific areas of priority have been identified in line with the Schools Strategic Plan and the committee may extend its remit to address other important development priorities for the School.
- 2.4 The School links in to the organisational structure of the College and the School is represented on relevant committees, including: the College Executive Committee, the Engineering Programme Board (which oversees all of the engineering related undergraduate and taught Masters programmes) and other committees with responsibility for student recruitment, health & safety and graduate studies.
- 2.5 Responsibility for day-to-day management, budgetary oversight and resourcing decisions within SMME is exercised by the Head of School with administrative support from the School Office. All School Office staff routinely provide assistance with all other support matters where possible. The Review Group was impressed with the volume and quality of the support provided by the School Office especially considering the small cohort of staff involved – see also 3.7 below.
- 2.6 The Review Group was pleased to see that there is a detailed, transparent workload model in place, however, this model shows that there are significant variation in workload among staff members, for example, not all academic staff are active in both teaching and research. In addition, early stage academic staff have significant administrative workloads.
- 2.7 The School refers to a number of initiatives to address staff shortages and inadequate resourcing, but the list of staff responsibilities does not include mention of these initiatives.

Commendations

- 2.8 The School has a good, operational Strategic Plan that informs their activities.
- 2.9 The School has an effective, appropriate, inclusive committee structure in place.
- 2.10 The School is well embedded into the management structures of the College.
- 2.11 The Review Group was impressed that when the School has identified a gap in their management structures, they have acted to address them.
- 2.12 A detailed work-load model has been developed to help even out work burden between staff members.

Recommendations

- 2.13 The School should continue to develop the workload model and use it to reduce inequities in workload.
- 2.14 The School should consider student representation on the School Executive and Teaching & Learning committees.
- 2.15 Given the importance attributed to non-EU student recruitment and philanthropy as potential solutions to the school's financial challenges, the School should consider tasking individuals with advancing these areas in conjunction with College and University-wide actions.

3. Staff and Facilities

- 3.1 The staffing complement of the School comprises 17.5 members of academic staff, 5 members of technical staff and 1.5 members of administrative staff (3 members of staff shared with the UCD School of Electrical, Electronic and Communications Engineering). The administrative and technical staff cohorts are supplemented by one JobBridge administrative assistant and 2 technical toolmaker apprentices (FAS supported 9-month internship), respectively.
- 3.2 The student/staff ratio has been increasing in recent years and is quite high in comparison to other Schools in the College.
- 3.3 While, the National Employee Control Framework has had an impact on the ability of the School to recruit and promote staff in recent years, the Review Group was pleased to note that these restrictions appear to be easing. The School has recently recruited three members of academic staff (contract appointments) and the University held one academic staff promotion round in 2013-14.
- 3.4 Newly recruited staff reported high satisfaction with the mentoring provided by the School. These supports are predominantly provided by the current Head of School. The Review Group was concerned that School structural changes could result in less support being available for early career academics and is of the opinion that putting more formal mentoring structures in place in the School would be beneficial.
- 3.5 The recent appointment of adjunct and occasional staff is a welcome development, strengthening the staff without additional budgetary requirements. In 2014, the School benefitted from this measure with seven adjunct staff offering their expertise and skills to the teaching programme. The School also engages up to 13 part-time lecturers, mainly on one of their graduate taught programmes.
- 3.6 The Review Group noted that there haven't been any promotions available for technical or administrative staff since 2007. While the Personal Promotion Scheme for Administrative staff and promotion of technical roles have been frozen since 2009, a Staff Internal Mobility Scheme has been in operation since 2013, whereby all promotional posts for technical or administrative staff are advertised in the first instance internally only.
- 3.7 The Review Group was surprised at the academic qualifications required for the promotion of technical staff to the Chief Technical Officer grade, as such qualifications are not common internationally. The

Review Group noted that the academic qualification for CTOs was set out in a nationally agreed Expert Group report from 2006 and that UCD is currently looking at whether flexibility exists to re-examine qualification criteria.

- 3.8 The administrative staff support of two schools, including this one, is provided by only three people. The three administrative staff currently provide an excellent service to the two schools, however, there is a danger of these supports becoming over-burdened if one of these staff goes on leave, is ill or if the student numbers of either school increase significantly.
- 3.9 The Review Group was impressed at the level of collegiality in the School. They also noted that despite the pressures from the increasing numbers of students and reduced staff resources, good working and co-operative relationships within the School are maintained amongst academic and administrative staff, as well as the technical staff. Considering the high student:academic staff and students:technical staff ratios, the teaching is working very well and the students are satisfied with both the theoretical and experimental teaching.
- 3.10 Overall, the facilities in the School are satisfactory, however, the Review Group identified a diversity of quality in the equipment and facilities available to staff and students in the School. In particular, the Review Group noted:
- outstanding and state-of-the-art machine-shop facilities.
 - state-of-the-art and one-of-a-kind equipment for research and projects.
 - some of the equipment for undergraduate teaching is outdated and there is usually only one copy of the equipment.
 - the laboratory equipment in material science is outstanding but needs to be upgraded as regards student setups and basic mechanical materials properties testing equipment.

Commendations

- 3.11 Hard-working and dedicated staff overall, delivering high class education and research in spite of a high work load.
- 3.12 Very skilled technical staff carrying a high work load serving both students and researchers.
- 3.13 Good cooperation between technical staff members in sharing expertise.
- 3.14 New academic staff members are required to have a strong research focus supporting the ongoing research directions of the department.
- 3.15 Early career academic staff seem to be embedded in already ongoing research projects and are introduced to established academic and industrial contact networks.
- 3.16 The School has been creative in the recent appointment of adjunct and occasional staff.

Recommendations

- 3.17 The Review Group recommends that the schools that are sharing the administrative staff develop a plan to address the risk of this shared support becoming overburdened by development in either/both schools or by the absence of one of the members of administrative staff. This is particularly relevant with the increase in postgraduate student numbers.
- 3.18 When recruiting academic staff, the School should emphasise both active research engagement and strong teaching qualifications.
- 3.19 The Review Group recommends that the School try to reduce the administrative workload for early career academics to enable them to focus on developing a research base.
- 3.20 The Review Group would strongly recommend that the School, when recruiting new academic staff, ensure that the qualified teaching of core mechanical engineering subjects is covered.
- 3.21 When recruiting early-career academic staff, the School should allocate funding to facilitate attendance at international conferences and, where practicable, the purchase of some experimental equipment.
- 3.22 The School should formalise the peer mentoring supports provided for early career academic staff. Mentoring for postdocs should also be considered.
- 3.23 The Review Group would encourage the University to encourage the re-examination at a national level of the current academic qualification requirements for technicians for enrollment and promotion. Such requirements are not common internationally. The University could also consider ways of addressing these issues internally, for example, through additional training and education supports for technical staff.
- 3.24 The School should develop a plan for future laboratory equipment upgrade requirements, including student setups and basic mechanical materials properties testing equipment.

4. Teaching, Learning and Assessment

- 4.1 The School currently delivers 63 modules (and a further 13 project or professional work experience modules). The Review Group was pleased to note that in his 2014 report, the external examiner remarked that “The breadth, depth and rigour of the courses offered and delivered with great enthusiasm is laudable.”
- 4.2 Lectures constitute the primary delivery mechanism for modules within the School, and account for the bulk of student contact hours. Laboratory work takes place in two- or three-hour sessions, in which students conduct – or in a small number of cases observe – experiments designed to reinforce, clarify, or expand upon material covered in lectures. The laboratory activities are usually designed by the Module Coordinator and are typically delivered by Teaching Assistants (TAs).

- 4.3 A range of assessment methods are employed across the School. A written, 2-hour, end of semester exam constitutes a significant part of the total assessment in most modules and continuous assessment exercises, related to laboratory work or tutorials, are assessed in many modules. Each student completes an individual report on their laboratory work, which is submitted to the School Office within 1-2 weeks of the laboratory activity being completed.
- 4.4 In the Review Group interviews with current undergraduates, the students were unanimously in favour of more continuous assessment within modules. They said that timely return of in-semester assignments provides useful feedback and helps them prepare for final exams. It would reduce last-minute intensive preparation for exams which is not conducive to long-term retention of the course material.
- 4.5 Undergraduates were generally pleased with the practical component of modules. However, on occasion the course material associated with an experiment had not been covered before the experiment. In a few modules, the practical experience consisted only of observation. On at least one occasion the lab experiment was cancelled due to defective equipment.
- 4.6 The Review Group was concerned with the relationship between letter grades and numerical scores. If a student received an A+ the student might not be sure that s/he mastered the material as an A+ starts at the low value of 78%. This could also lead to confusion for study abroad students and incoming international students.
- 4.7 In meetings with the Review Group, the students reported that the staff are very accessible and create a supportive environment.

Commendations

- 4.8 All staff (academic, technical and administrative) are strongly committed to providing a high quality learning experience for both undergraduate and postgraduate students. This is even more commendable with the increasing number of students without a corresponding increase in staff numbers.
- 4.9 Lab equipment and workshop facilities available for student projects are very impressive. Some of this equipment is one-of-a-kind in the country.

Recommendations

- 4.10 The School should increase the amount of continuous assessment in modules. This could be in the form of exams during the semester or graded homework assignments. This would require additional resources such as postgraduate tutors.
- 4.11 The Review Group recommends that the School increase the quality and quantity of lab equipment associated with teaching modules. This would be important in the context of recruiting international students.
- 4.12 Increase technical support staff for undergraduate modules, and undergrad/postgrad projects.

- 4.13 Change the current relationship between letter grades and numerical scores, especially in modules where assessments are based on questions or problems with well-defined answers or solutions. Since an A+ should indicate that the student answered nearly everything correctly, this should correspond to numerical score in the 95-100% numerical range.
- 4.14 The Review Group recommends that the School consider carefully their international student recruitment policies and activities to include not only year-abroad study opportunities but students taking the three and four-year programmes.

5. Curriculum Development and Review

- 5.1 The first year of the Engineering programme at UCD (Stage 1) is common to all engineering students and, at the end of that year, students can choose one of the core branches of engineering for Stages 2 and 3. Later, after a total of three years of study, students can choose to transfer to an ME (Master of Engineering) programme (subject to an entry requirement), remain in the BE (Bachelor of Engineering) programme, or graduate with a BSc (Bachelor of Science) degree in Engineering Science.
- 5.2 The ME degree programmes are designed as stand-alone 2-year degree programmes, and are open to direct entry of suitably qualified students from outside UCD as well as UCD students.
- 5.3 The School offers two MEngSc (Master of Engineering Science) programmes, mostly aimed at the international market [MEngSc (Engineering Management) and MEngSc (Materials Science and Engineering)].
- 5.4 The Review Group noted that a change in the secondary level math syllabus is taking place in Ireland. This transition to 'Project Maths' is changing the knowledge-level of future students. The School needs to review the curriculum taking this into account.
- 5.5 The Review Group noted that although an elective module is available, currently, undergraduate Engineering students don't have to do any computer programming in Stage 1. The postgraduate students who met the Review Group indicated that they wished programming that would be relevant to later employment, for example, MATLAB had been taught to them earlier in the curriculum. The College is currently reviewing the curriculum for Stage 1 and the Review Group would strongly support the early introduction of computer programming to students.
- 5.6 ME students must take a professional work experience (PWE) module, where they undergo a structured (and formally assessed) placement within a company. The Review Group is supportive of the inclusion of practical work experience in the ME as it provides a significant opportunity for students to appreciate the professional engineering world. It also enhances links between industry and the School. However, the Review Group believes that some students might benefit more from the opportunity to take additional modules in fourth year rather than having to take a PWE module.

Commendations

- 5.7 The provision of a wide spectrum of programmes along with flexibility for students to enter the School at different stages of their academic career.
- 5.8 In addition to a rigorous grounding in the basic areas of mechanical and materials engineering, the curriculum provides several design-build-test opportunities for undergraduates. These are really appreciated by undergraduates.
- 5.9 The fourth year project provides a significant opportunity for undergraduates to develop as an autonomous independent engineer.
- 5.10 The ME project is a significant opportunity for students to develop their skills as independent investigators and engineers. In many cases it provides further opportunities to interact with industry.
- 5.11 Lots of positive feedback from employers and students as is evidenced in accreditation documentation.

Recommendations

- 5.12 PWE should be optional rather than a mandatory for students. This could allow students who decide not to avail of PWE to study additional modules in their fourth year.
- 5.13 The Review Group recommends that the College, when reviewing the stage 1 curriculum, consider the following points.
 - (i) Modules should be modified to take into account the new math curriculum in the Leaving Certificate.
 - (ii) A computer programming module, which includes MATLAB, should be added as a core module in Stage 1. The programme should be taught by a member of academic staff within the UCD College of Engineering and Architecture.
- 5.14 The School should develop a mechanism to allow undergraduate students (especially BE students) to have some interaction with industry. While the Review Group acknowledges that internship as part of their programme is not really feasible, some possible approaches include field trips to 'plants' and/or visits by recent graduates and other more senior industry representatives.

6 Research Activity

- 6.1 The School research focus is in energy, materials, design & manufacturing and biomedical engineering. The School has a clear vision and strategy for the development of its future research activity. It is important that the research focus should remain broad enough to allow the School to benefit from changes in external financing opportunities. The Review Group was pleased to see that the School has strategically recruited new staff to strengthen the ongoing research activities of the School.

- 6.2 It was evident that only around 60% of the current academic staff are research-active, as measured by the University. There are many reasons for this and the Workload Allocation Model discussed in Chapter 2 above, will help the School to balance the research, teaching and administrative activities of the staff in as equitable a manner as possible.
- 6.3 There is scope to more closely align the ME student projects to research activities in the School. Students could benefit from seeing research in action and the School could achieve savings from shared investment in facilities/equipment.
- 6.4 As discussed in Chapter 3, there is some variability in the laboratory facilities available for research - those in materials science are outstanding whereas mechanical properties and testing equipment seems insufficient.

Commendations

- 6.5 Several staff members are very productive and well-recognised internationally.
- 6.6 The Review Group commends the School for identifying a vision for their future and for developing a strategic plan to achieve that vision.
- 6.7 All newly recruited members of academic staff have strong research focuses strengthening ongoing research initiatives at the School.

Recommendations

- 6.8 Research interests and applications within the School should be broad enough to be able to adjust to changes in financing opportunities.
- 6.9 ME projects should to some extent be aligned with ongoing research activities at the School to financially benefit the laboratories in e.g. sponsoring regular maintenance or purchase of materials.

7. Management of Quality and Enhancement

- 7.1 The School has a clear strategic vision and aims to move into the top 200 Engineering schools in international ranking on research and teaching in the next five years and into the top 100 in the next 10 years. The School engages in appropriate quality mechanisms to support these endeavours including, *inter alia*, clear management structures, curricular review and development, external examiners, external accreditation, strategic planning and appropriate recruitment.
- 7.2 The School has had a recent intake of new early stage academics and engages in active school academic planning.
- 7.3 Accreditation by professional engineering organisations is an important external validation of the quality of the educational programmes in the School and the delivery of learning outcomes. Since 2010 the School has been subject to two accreditation site visits (2010, 2013) by Engineers Ireland and one by the Institute

of Materials, Minerals and Mining (IOM³). As a result, the following programmes are fully accredited by Engineers Ireland/IOM³ and EUR-ACE as a “Second Cycle” or Masters level professional engineering degree: ME Energy Systems Engineering, ME Mechanical Engineering, ME Biomedical Engineering, ME with Business, ME Materials Science and Engineering. ME Materials Science and Engineering is also the only programme in Ireland accredited by IOM³.

- 7.4 The School’s ME programmes won national recognition and were awarded the "Best in Class" Education Award at the 2014 Engineers Ireland Excellence Awards. In addition, for the core technical content and for being Bologna compliant, the award also acknowledged “enhanced design thinking, industry engagement and internationalisation”. The MSc in Bioengineering programme was also awarded a “Best in Class” Education Award in 2012.
- 7.5 The School effectively engages with External Examiners to assure the academic standards of its modules and awards.
- 7.6 The current low number of technical staff in the School has the potential to increase Health & Safety risks within the School, especially in the delivery of student laboratory lessons. The School has had to change some laboratory lessons to observation rather than experimentation as a result. The Review Group was concerned that using observation rather than experimentation long-term has the potential to negatively affect the learning outcomes for students.

Commendations

- 7.7 Staff members actively participate in internal committees to review and develop improvements in undergraduate and postgraduate curricula.
- 7.8 Active and successful engagement with external formal review and accreditation procedures for ensuring the School can deliver internationally recognised training to undergraduate and postgraduate students.
- 7.9 The School has engaged in measures to reduce potential Health & Safety risks by limiting some laboratory lessons to observation rather than experimentation as a result of the reduced numbers of technical staff available.
- 7.10 The Review Group was impressed that the School has been awarded a number of Engineers Ireland Excellence Awards.

Recommendations

- 7.11 Additional technical staff should be made available to the School to reduce potential Health & Safety risks and to ensure that the learning outcomes for students are not negatively affected by a reduction in experimentation opportunities in laboratory settings.

8. Support Services

- 8.1 The School engages with a number of supports provided by the College and the University. Overall these supports appear to be effective and work well.
- 8.2 The School has a good relationship with the Programme Office. The Programme Office administers the day-to-day operation of the degree programmes. The Programme Office also plays a key role in supporting Programme Coordinators when processing EU and non-EU applications for admission to taught postgraduate programmes, along with administering the 6-month internship component of the ME programmes. The appointment of an Internship Co-ordinator is a positive development.
- 8.3 Feedback from students on the Student Services was very positive. The current Student Advisor is highly respected by School staff and greatly valued by the students in the School. The Student Peer Mentoring Programme is particularly effective.
- 8.4 Issues with the resource allocation model that was in operation in the University appear to have been addressed by a review and revision of the model. The School is satisfied with the financial and budgetary advice provided by the staff in the College Office.
- 8.5 Engineering staff and students make excellent use of the Library resources and School staff use of the Research Repository is strong and increasing over time.
- 8.6 A number of issues with recruitment processes for the appointment of post-doctoral research staff were highlighted in the Self-assessment Report. When appointments are made, the School reported experiencing significant delays in setting up new employees on the system, issuing contracts, etc.
- 8.7 While the University provides induction for newly recruited staff, the Review Group was concerned that new staff may be in post for up to 6 months before an induction programme become available. At that stage, much of the content may no longer be relevant. While much of this information is available on the University website, new staff members have to search for it. UCD Human Resources has developed a checklist and other information outlining key initial steps for newly recruited staff, including *inter alia* how to get a staff card, access to a workstation, etc. This information could be supplemented by School specific information, including a key contact person for queries, who to contact to order supplies etc.
- 8.8 The College has developed a strong expertise in identifying international opportunities for student intake. The School could benefit from additional support from the College international recruitment supports to further develop their recruitment planning.

Commendations

- 8.9 Excellent support structure and services provided by the Student Advisor.
- 8.10 Staff engagement with the Research Repository is a positive development.
- 8.11 Positive engagement at College level with opportunities for international student recruitment.

Recommendations

- 8.12 UCD Human Resources has streamlined the processes for the recruitment and set up of post-doctoral research staff, including the provision of service level agreements for the recruitment of research-funded staff. UCD Human Resources could further develop the communication of such developments to Schools.
- 8.13 The comprehensive induction information for new staff, provided on the UCD Human Resources website, should be supplemented at School-level by relevant local information.
- 8.14 The School should consider engaging in a strategic planning exercise, with College international student recruitment inputs, to develop their thinking in respect of international student recruitment.

9. External Relations

- 9.1 While the School has extensive positive engagements with industry and alumni contacts, these links are quite varied across staff/research areas. The School is aware of their potential importance to the national economy but they could communicate it better. The School could benefit from thinking about how they manage their outward profile including developing a communications plan with input from the College and the University Relations Office.
- 9.2 Discussions during the site visit suggest that industry partners are willing to build on the current research and training collaboration with the School, including increasing targeted financial and in-kind support. There is scope for the School to further develop its links with industry. To that end, the School could consider initiatives such as:
- Setting up an Industry Advisory Board, with representation from the IDA, small, medium and large industry representatives. The Board could assist the School to identify future industry trends and developments as well as identifying possible non-exchequer funding opportunities including contributions towards/sponsorship of posts and technical equipment and investment in early stage research through IRC partnerships.
 - The internship programme for ME students is very positive. The School could consider developing internship and networking opportunities for undergraduate students by inviting industry representatives to visit the School and meet students informally.
 - The School could formalise its continuing professional education provision.
- 9.3 The School's engagement with its alumni is equally important. While the College has made progress in developing its alumni contacts there is considerable potential to enhance and develop the alumni links back to the School. The School could consider initiatives such as:
- An annual distinguished alumnus award.
 - Targeted communications including, for example, a dedicated page on the School website featuring alumni news, events and achievements, along with a newsletter for alumni.

Commendations

- 9.4 The School has extensive positive links with industry and alumni.
- 9.5 Industry collaboration is very successful in particular cases and industry partners very well disposed to the school.

Recommendations

- 9.6 Develop a communications plan, with input from the College and the University Relations Office.
- 9.7 Consider setting up an Industry Advisory Board.
- 9.8 Consider dedicated administrative support for developing the Alumni relations activity. This could happen at College level.

10. Summary of Commendations and Recommendations

A. Organisation and Management

Commendations

- A.1 The School has a good, operational Strategic Plan that informs their activities.
- A.2 The School has an effective, appropriate, inclusive committee structure in place.
- A.3 The School is well embedded into the management structures of the College.
- A.4 The Review Group was impressed that when the School has identified a gap in their management structures, they have acted to address them.
- A.5 A detailed work-load model has been developed to help even out work burden between staff members.

Recommendations

- A.6 The School should continue to develop the workload model and use it to reduce inequities in workload.
- A.7 The School should consider student representation on the School Executive and Teaching & Learning committees.
- A.8 Given the importance attributed to non-EU student recruitment and philanthropy as potential solutions to the school's financial challenges, the School should consider tasking individuals with advancing these areas in conjunction with College and University-wide actions.

B. Staff and Facilities

Commendations

- B.1 Hard-working and dedicated staff overall, delivering high class education and research in spite of a high work load.
- B.2 Very skilled technical staff carrying a high work load serving both students and researchers.
- B.3 Good cooperation between technical staff members in sharing expertise.
- B.4 New academic staff members are required to have a strong research focus supporting the ongoing research directions of the department.
- B.5 Early career academic staff seem to be embedded in already ongoing research projects and are introduced to established academic and industrial contact networks.
- B.6 The School has been creative in the recent appointment of adjunct and occasional staff.

Recommendations

- B.7 The Review Group recommends that the schools that are sharing the administrative staff develop a plan to address the risk of this shared support becoming overburdened by development in either/both schools or by the absence of one of the members of administrative staff. This is particularly relevant with the increase in postgraduate student numbers.
- B.8 When recruiting academic staff, the School should emphasise both active research engagement and strong teaching qualifications.
- B.9 The Review Group recommends that the School try to reduce the administrative workload for early career academics to enable them to focus on developing a research base.
- B.10 The Review Group would strongly recommend that the School, when recruiting new academic staff, ensure that the qualified teaching of core mechanical engineering subjects is covered.
- B.11 When recruiting early-career academic staff, the School should allocate funding to facilitate attendance at international conferences and, where practicable, the purchase of some experimental equipment.
- B.12 The School should formalise the peer mentoring supports provided for early career academic staff. Mentoring for postdocs should also be considered.
- B.13 The Review Group would encourage the University to encourage the re-examination at a national level of the current academic qualification requirements for technicians for enrollment and promotion. Such requirements are not common internationally. The University could also consider ways of addressing these issues internally, for example, through additional training and education supports for technical staff.

- B.14 The School should develop a plan for future laboratory equipment upgrade requirements, including student setups and basic mechanical materials properties testing equipment.

C. Teaching, Learning and Assessment

Commendations

- C.1 All staff (academic, technical and administrative) are strongly committed to providing a high quality learning experience for both undergraduate and postgraduate students. This is even more commendable with the increasing number of students without a corresponding increase in staff numbers.
- C.2 Lab equipment and workshop facilities available for student projects are very impressive. Some of this equipment is one-of-a-kind in the country.

Recommendations

- C.3 The School should increase the amount of continuous assessment in modules. This could be in the form of exams during the semester or graded homework assignments. This would require additional resources such as postgraduate tutors.
- C.4 The Review Group recommends that the School increase the quality and quantity of lab equipment associated with teaching modules. This would be important in the context of recruiting international students.
- C.5 Increase technical support staff for undergraduate modules, and undergrad/postgrad projects.
- C.6 Change the current relationship between letter grades and numerical scores, especially in modules where assessments are based on questions or problems with well-defined answers or solutions. Since an A+ should indicate that the student answered nearly everything correctly, this should correspond to numerical score in the 95-100% numerical range.
- C.7 The Review Group recommends that the School consider carefully their international student recruitment policies and activities to include not only year-abroad study opportunities but students taking the three and four-year programmes.

D. Curriculum Development and Review

Commendations

- D.1 The provision of a wide spectrum of programmes along with flexibility for students to enter the School at different stages of their academic career.
- D.2 In addition to a rigorous grounding in the basic areas of mechanical and materials engineering, the curriculum provides several design-build-test opportunities for undergraduates. These are really appreciated by undergraduates.

- D.3 The fourth year project provides a significant opportunity for undergraduates to develop as an autonomous independent engineer.
- D.4 The ME project is a significant opportunity for students to develop their skills as independent investigators and engineers. In many cases it provides further opportunities to interact with industry.
- D.5 Lots of positive feedback from employers and students as is evidenced in accreditation documentation.

Recommendations

- D.6 PWE should be optional rather than a mandatory for students. This could allow students who decide not to avail of PWE to study additional modules in their fourth year.
- D.7 The Review Group recommends that the College, when reviewing the stage 1 curriculum, consider the following points.
 - (iii) Modules should be modified to take into account the new math curriculum in the Leaving Certificate.
 - (iv) A computer programming module, which includes MATLAB, should be added as a core module in Stage 1. The programme should be taught by a member of academic staff within the UCD College of Engineering and Architecture.
- D.8 The School should develop a mechanism to allow undergraduate students (especially BE students) to have some interaction with industry. While the Review Group acknowledges that internship as part of their programme is not really feasible, some possible approaches include field trips to 'plants' and/or visits by recent graduates and other more senior industry representatives.

E. Research Activities

Commendations

- E.1 Several staff members are very productive and well-recognised internationally.
- E.2 The Review Group commends the School for identifying a vision for their future and for developing a strategic plan to achieve that vision.
- E.3 All newly recruited members of academic staff have strong research focuses strengthening ongoing research initiatives at the School.

Recommendations

- E.4 Research interests and applications within the School should be broad enough to be able to adjust to changes in financing opportunities.
- E.5 ME projects should to some extent be aligned with ongoing research activities at the School to financially benefit the laboratories in e.g. sponsoring regular maintenance or purchase of materials.

F. Management of Quality and Enhancement

Commendations

- F.1 Staff members actively participate in internal committees to review and develop improvements in undergraduate and postgraduate curricula.
- F.2 Active and successful engagement with external formal review and accreditation procedures for ensuring the School can deliver internationally recognised training to undergraduate and postgraduate students.
- F.3 The School has engaged in measures to reduce potential Health & Safety risks by limiting some laboratory lessons to observation rather than experimentation as a result of the reduced numbers of technical staff available.
- F.4 The Review Group was impressed that the School has been awarded a number of Engineers Ireland Excellence Awards.

Recommendations

- F.5 Additional technical staff should be made available to the School to reduce potential Health & Safety risks and to ensure that the learning outcomes for students are not negatively affected by a reduction in experimentation opportunities in laboratory settings.

G. Support Services

Commendations

- G.1 Excellent support structure and services provided by the Student Advisor.
- G.2 Staff engagement with the Research Repository is a positive development.
- G.3 Positive engagement at College level with opportunities for international student recruitment.

Recommendations

- G.4 UCD Human Resources has streamlined the processes for the recruitment and set up of post-doctoral research staff, including the provision of service level agreements for the recruitment of research-funded staff. UCD Human Resources could further develop the communication of such developments to Schools.
- G.5 The comprehensive induction information for new staff, provided on the UCD Human Resources website, should be supplemented at School-level by relevant local information.
- G.6 The School should consider engaging in a strategic planning exercise, with College international student recruitment inputs, to develop their thinking in respect of international student recruitment.

H. External Relations

Commendations

- H.1 The School has extensive positive links with industry and alumni.
- H.2 Industry collaboration is very successful in particular cases and industry partners very well disposed to the school.

Recommendations

- H.3 Develop a communications plan, with input from the College and the University Relations Office.
- H.4 Consider setting up an Industry Advisory Board.
- H.5 Consider dedicated administrative support for developing the Alumni relations activity. This could happen at College level.

UCD School of Mechanical & Materials Engineering Response to the Review Group Report

The UCD School of Mechanical and Materials Engineering is very grateful to the Review Group for their work in reviewing our Self-assessment Report, visiting the School, and preparing their Review Group Report. The amount of work involved was considerable, and is much appreciated. We were also impressed by the diligence and thoroughness of the Review Group members.

Having studied the Report, the School welcomes it, is grateful for the commendations, and agrees with the recommendations.

The School will now work to implement the recommendations as far as possible, in consultation with other relevant parties where appropriate.



Review Visit Timetable

UCD School of Mechanical and Materials Engineering
2nd - 5th December 2014

Pre-Visit Briefing Prior to Site Visit

- 17.00-19.00 RG meet in the hotel to review preliminary issues and to confirm work schedule and assignment of tasks for the site visit – **RG and UCD Quality Office only**
- 19.00 Dinner hosted for the RG by the UCD Registrar and Deputy President – **RG, UCD Deputy President and UCD Quality Office only**

Day 1: Wednesday, 3rd December

Venue: UCD Engineering and Materials Science Centre, Room 206

- 09.00-09.30 Private meeting of Review Group (RG)
- 09.30 – 10.30 RG meet with **Head of School**
- 10.30 – 11.15 Tea/coffee break
- 11.15 – 12.15 RG meet with **SAR Coordinating Committee**
- 12.15-12.45 Break – RG review key observations and prepare for lunch time meeting
- 12.45-13.45 Working lunch (buffet) – meeting with employers (and/or other external stakeholders)
- 13.45-14.15 RG review key observations
- 14.15-15.30 RG meet with **representative group of academic staff** – primary focus on Teaching and Learning, and Curriculum issues

15.30-15.45	RG tea/coffee break
15.45-16.30	RG meet with School support staff representatives (administrative and technical)
16.30-16.35	Break
16.35-17.05	RG meet UCD Programme Dean and representatives of the Programme Office
17.05-17.15	Break
17.15-19.15	Tour of facilities conducted by Head of School and SARCC Chair
19.30	RG depart

Day 2: Thursday, 4th December

Venue: UCD Engineering and Materials Science Centre, Room 206

08.45-09.15	Private meeting of the RG
09.15-10.00	RG meet relevant support service representatives , including: Student Advisor, Facilities Manager, Assistant Librarian and College HR Partner
10:00-10:20	RG meet with College Principal
10.20-11.00	Review Group meet with postgraduate students and graduates
11.00-11.15	RG tea/coffee break
11.15-12.15	RG meet with the School Research Committee
12.15-12.30	Break - RG review key observations
12.30-13.15	Lunch – Review Group only
13.15-14.00	RG meet with representative group of undergraduate students
14.00-14.15	RG private meeting - review key observations
14.15-15.00	RG meet with College Finance Manager, UCD Bursar's Office Management Accountant and Head of School to outline School's financial situation
15.00-15.15	Break
15.15-16.15	RG meet with recently appointed members of staff
16.15-16.25	RG available for private individual meetings with staff

16.30-16.45	RG meet representative of Teaching & Learning Committee for additional discussion of Curriculum issues
16.45-18.00	RG private meeting – review key observations/findings
18.00	RG depart

Day 3: Friday, 5th December

Venue: UCD Engineering and Materials Science Centre, Room 206

09.00-09.30	Private meeting of RG
09.30-10.30	RG begin preparing draft RG Report
10.30-10.45	Break
10.45-12.00	RG continue preparing draft RG Report
12.00-12.30	RG finalise first draft of RG Report and feedback commendations/recommendations
12.30-13.15	Lunch
13.30-13.45	RG meet with Head of School and College Principal to feedback initial outline commendations and recommendations
14.00	Exit presentation to <u>all available staff of the unit</u> summarising the principal commendations/recommendations of the Review Group
14:30-16.30	Review Group continue preparing draft RG Report