University College Dublin

Periodic Quality Review

UCD School of Chemical and Bioprocess Engineering

March 2009

Table of Contents

1. Introduction and Overview of the UCD School of Chemical and Bioprocess Engineering (CBE)

Introduction

1. This Report presents the findings of a quality review of the UCD School of Chemical and Bioprocess Engineering (CBE), at University College Dublin. The review was undertaken in March 2009.

The Review Process

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 Universities Act 1997, and international good practice. Quality reviews are carried out in academic, administrative and support service units.

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 opportunities
   - 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 provide an opportunity for units to test the effectiveness of their systems and procedures for monitoring and enhancing quality and standards
   - To provide a framework within which the unit can continue to work in the future towards quality improvement
   - To identify shortfalls in resources and provide an externally validated case for change and/or increased resources
   - Identify, encourage and disseminate good practice – to identify challenges and address these
   - 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 review procedures also 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.

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.

5. The composition of the RG for the UCD School of Chemical and Bioprocess Engineering was as follows:

- Professor Michael Monaghan, UCD Project Manager, UCD Science District Development (Chair)

- Professor Grace Mulcahy, UCD Dean of Veterinary Medicine (Deputy Chair)

- Professor Michael McGlinchey, UCD School of Chemistry and Chemical Biology

- Dr. Greg Foley, School of Biotechnology, Dublin City University

- Professor Gary Lye, Department of Biochemical Engineering, University College London

6. The RG visited the School from 30th March to 2nd April 2009 and had meetings with School staff, University students and staff, including: the Head of School; College Principal; SAR Co-ordinating Committee; School academic staff; School support staff; employers of graduates; research postgraduate students; recent graduates; undergraduate students. The Head of School conducted a tour of the facilities for the RG. The School response to this Report is attached at Appendix 1. The site visit schedule is attached as Appendix 2.

7. In addition to the Self-assessment Report, the RG considered documentation provided by the School and the University including the School strategic plan, student notes, examination scripts, student project reports, reports from Engineers Ireland, the Institution of Chemical Engineers and the School web pages.

Preparation of the Self-assessment Report

8. On October 20th the School held a launch meeting for the preparation of the Self-assessment Report. The School appointed teams which prepared drafts on the following:

- School Structures

- Teaching, Learning and Assessment

- Research

- Management of Quality and Enhancement

The final report was based on the work done by these teams.

The University

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

10. The current University Strategic Plan (2005-2008) states that the University's Mission is:

    "to advance knowledge, pursue truth and foster learning, in an atmosphere of discovery, creativity, innovation and excellence, drawing out the best in each individual, and contributing to the social, cultural and economic life of Ireland in the wider world".

    The University is organised into 35 Schools in five Colleges;

    - UCD College of Arts and Celtic Studies
    - UCD College of Human Sciences
    - UCD College of Life Sciences
    - UCD College of Engineering, Mathematical and Physical Sciences
    - UCD College of Business and Law

11. There are currently over 22,000 students registered on University programmes, including over 3,000 international students from more than 110 countries.

12. As the largest university on the island of Ireland, UCD supports a broad, deep and rich academic community in Science and Engineering. UCD alone accounts for over 25% of the national PhD population (over 1,500 enrolled), of which 1,200 are in the Science, Engineering and Technology areas. Given this rich and diverse base of expertise, UCD has moved in its recent restructuring to enable new synergies to emerge in teaching, research and innovation.

UCD School of Chemical and Bioprocess Engineering (CBE)

13. The School of Chemical and Bioprocess Engineering grew out of the Department of Chemical Engineering at UCD which was established in 1956 and is currently the oldest and largest school/department of its kind within the Republic of Ireland.

14. The School is host to two undergraduate programmes: Chemical Engineering (established in 1952 with the first graduates being conferred in 1956 as noted above) and Bioprocess Engineering (established in 2006 and unique to 3rd level education in Ireland). In collaboration with the School of Biotechnology (DCU), the School of Pharmacy and Pharmaceutical Sciences (TCD) and the National Institute for Bioprocessing Research and Training (NIBRT), the School also co-ordinates a recently established taught Masters in Biopharmaceutical Engineering. This Masters programme is also unique to the Irish higher education sector.

15. The School of Chemical and Bioprocess Engineering at UCD is one of the smaller Schools in University College Dublin and in many respects its undergraduate and postgraduate Programmes are unique in Ireland. The undergraduate BE degree, with approximately 35-45 graduates each year,

has been the subject of professional accreditation by both Engineers Ireland (formerly the Institution of Engineers in Ireland) and the Institution of Chemical Engineers in the United Kingdom (with the BE accredited at Masters level) on a regular 5 yearly basis since the early 1960s. The graduates from the undergraduate programmes within the School are widely sought after by industry and business both nationally and internationally as well as research programmes in eminent academic Institutions in Europe and the United States. The research activity within the School has grown rapidly within the last few years, most notably due to the very significant growth in research funding available through national agencies such as Science Foundation Ireland as well as the EU Framework Programmes. The number of postgraduate and postdoctoral researchers is 49 at this time and there is a significant cohort of postgraduate students (53 students) enrolled in taught programmes. Research funding to the School is currently the highest in Europe for Schools/Departments in the field of Chemical and/or Bioprocess Engineering. The curricula within the School are continually under internal review and the last three years have seen substantial change with the introduction of the UCD Horizons undergraduate modular structure. The postgraduate programmes have also been placed on a structured footing ensuring the timely completion by the postgraduate students of their studies and research work. Much of this has been assisted by the establishment of new administrative structures within the School, the College and University.

2. Organisation and Management

16. The School is one of seven within the College of Engineering, Mathematics and Physical Sciences. There are currently twelve full-time academic staff, seven technical staff and 1.5 administrative staff. In addition, there is a research cluster manager on a three-year externally-funded contract.

17. There are appropriate procedures in place to ensure an equitable distribution of teaching and administrative loads. Staff and students expressed strong support for the management and organisation of the School. The executive committee includes a representative of technical staff as well as administrative staff, and the School council, which meets quarterly, includes all staff. A member of staff acts as co-ordinator of graduate education and liaises with the College Graduate School as appropriate. Although there is not a formal workload model in place, the HOS ensures that there is an equitable distribution of workload.

18. Undergraduate students spoke highly of the extent to which the academic staff were accessible and their responsiveness to requests for assistance. The peer tutoring system in operation was seen to be beneficial for both junior and senior students.

19. The School works closely with National Institute of Bioprocessing Research and Training (NIBRT) and has taken opportunities to avail of collaborative opportunities in both education and research with that organisation and with others including Dublin City University and Trinity College.

20. The administrative support available is currently marginal. Given the School's activity profile and the likely loss of a half-time appointment in the short-term, administrative support for the School will be under-resourced.

21. The School is concerned with the implications of the Fixed Term Worker's act for its research programmes. The RG understands that the University is currently addressing this issue.

22. Despite the School's obvious success in developing high-quality teaching and research programmes it carries a financial deficit of approximately €0.5 million. Such deficits are also carried by a number of other schools in the College.

Commendations

- The strong identity and reputation of the School and the loyalty of both students and staff came across very strongly. It is clear that the School has been very successful in maintaining its identity while at the same time adapting to changing needs and priorities in education and research.

- The inclusive style of management of the HOS, commended by all grades of staff.

- The School strategic planning process has clearly identified and acted upon opportunities in collaboratively-taught graduate education. A good example of this is the MSc in Biopharmaceutical Engineering run in collaboration with DCU, TCD and NIBRT. In addition, the School is currently reviewing options to introduce a Masters in Nanotechnology and Materials Modelling.

Recommendations

- The School has been very productive and successful in attracting research funding and should continue to advance its case for availability of funding from overhead income received in order to maintain and enhance its research equipment and infrastructure.

- In order to capitalize on opportunities in research and education, the administrative support available to the School requires to be maintained at least at its current level.

- Options for increasing income and the cost benefit of each should be considered. The RG suggests that the School consider defining an appropriate portfolio of the following:

    - Capitalising on the School's international reputation to attract a cohort of full-fee-paying international students
    - Increasing undergraduate student numbers
    - Increasing post-graduate student numbers
    - Provision of modules which would be attractive as electives to students outside the School
    - Working with the Development Office to enhance relationships with alumni (especially those of high net worth) with a view to philanthropic support.

3. Staff and Facilities

23. This is a small but highly active School currently comprised of 12 academic staff, 7 technical staff and 1.5 administrators. In addition, a Professor of Solar Energy funded by SFI/Airtricity will join the School in July 2009. The entire

group clearly functions as a team with shared objectives. Consequently the School is 'punching above its weight' in terms of both teaching and research.

24. Students at all levels commented on the level of academic staff commitment, their approachability and availability. This underpinned a very high level of student satisfaction with the School and the manner in which it operates.

25. The RG felt that a lack of funding for staff at all levels was a key issue in relation to taught course provision and maintenance of a critical mass of research activity. The School faces significant challenges in the short term due to loss of key academic and administrative staff and in the medium term due to retirements.

26. Overall the School has a good range of research and teaching facilities. The majority of the research equipment is modern and state of the art.

27. The establishment of the Conway Institute and the forthcoming relocation of NIBRT to the UCD campus offer a number of significant opportunities with respect to both staffing and access to facilities for research and training. The School has positioned itself well to take full advantage of these and has already begun to do so.

28. Access to appropriate workshop facilities will be crucial for the maintenance of teaching equipment and the underpinning of research activities.

Commendations

- The School is to be commended for taking an increasingly multidisciplinary approach to the recruitment of academic staff in order to address both School and College strategic research objectives. Also of note, is the way in which the School has been pro-active in generating support for important academic positions e.g. via competitively-won SFI programmes.

- The Head of School is commended for actively engaging Technical Staff in the shared achievement of School objectives. Equally, the technical staff are commended for their imaginative and entrepreneurial approaches to the maintenance of equipment and facilities essential for research and teaching, and to self-development.

- The School is to be commended for maintaining well equipped laboratory and analytical facilities as required for the provision of an accredited Chemical Engineering degree programme and for the shared use of advanced research equipment for delivery of its teaching programmes.

Recommendations

- Once the financial situation improves, the College should seek to match the School's success in competitively won staff funding by allowing the replacement of academic staff and provision of one to two new academic staff positions. These appointments will be essential in order to achieve the planned increase in research activity and to maintain critical mass.

- The School should continue to embrace the PMDS scheme, with which it is already engaged, as a mechanism for the annual review and development of staff. This review process should also cover the training needs of staff in relation to achievement of the School's research and teaching objectives.

- The School should consider increasing the use of its growing population of research students and Research Fellows in the delivery of taught degree programmes. This would benefit academic staff by freeing up more of their time for research and innovation and would also benefit the researchers by providing opportunities to develop a broader range of skills and experience.

- The College needs to address the inadequate administrative and technical support available to the School. At a minimum there is the need for one extra administrator and one technical Research Manager.

- The School, together with the College, should seek to achieve an appropriate level of workshop provision.

- The School should develop a plan for the phased replacement and updating of key teaching equipment and implement it once appropriate resources become available. Consideration should be given to engaging industry and alumni in the support of equipment replacement.

4. Teaching, Learning and Assessment

Undergraduate

29. The School, as evidenced by the SAR, continues to attract high calibre students and this is at least partly due to its strong emphasis on marketing the profession to school leavers. The degree programme in Chemical Engineering remains a challenging one and has maintained the strong emphasis on core skills traditionally associated with this discipline.

30. Conversations during the site visit with current and past students (undergraduate and research postgraduate) showed that students hold the School and its staff in very high regard and consistently praise them for their approachability and helpfulness. Those students who have had experience of study abroad were especially complimentary of the helpfulness of School staff in comparison with their international counterparts. Equally, employers have expressed a high degree of satisfaction with the technical capabilities of the School's graduates.

31. While the research commitments of the School have increased hugely in recent years, it has maintained an admirable emphasis on Teaching and Learning, an essential requirement if the School is to maintain its MEng accreditation by the IChemE.

32. Although some graduates felt that they were less familiar with large-scale engineering equipment than some of their peers from other universities and colleges, they felt that their superior grasp of fundamentals more than compensated for this.

Commendations

- There is excellent opportunity for informal student input and feedback via the Student-Staff Consultative Council (SSCC). More formal feedback is attained from each class through a single web-based survey thus minimising 'survey fatigue'.

- The School is innovative in its use of teaching methods such as problem based learning (PBL), peer-assisted learning (PAL) and group-based problem solving.

- In keeping with international trends, there has been a shift towards increased use of continuous assessment. This has been well-planned. Assignments from different modules are spread appropriately and students are given advance warning of all assignments at the start of the semester.

- Students had a high degree of awareness and understanding of the issue of plagiarism.

- There is a strong emphasis on communication and writing skills which addresses the stated wishes of the employers for well-rounded students with a broad range of the 'softer' skills.

- Despite the age of much of the equipment in the undergraduate laboratories, it remains in good condition and this is a tribute to the dedication of the technical staff.

- It is particularly welcome to see that the final year students are getting the opportunity to take part in real cutting-edge research and it is commendable that in recent years, six final year projects have contributed to publications.

- Graduates of the School were very complimentary about the extent to which the strong theoretical basis of their degree prepares them for industry, especially the design and consultancy sector.

- Graduates felt that they were well-prepared for the team environment of industry through their work on their design projects and other group-based activities.

Taught Postgraduate

33. The School delivers a part-time MEngSc in Biopharmaceutical Engineering in conjunction with DCU, TCD and Sligo IT. This programme is now in its third year. Formal Assessment of the programme takes place using student and lecturer questionnaires and the outcomes of these are discussed at staff meetings. There was no representative from the student body of this programme available during the site visit.

Research Postgraduate

34. The number of research postgraduate students has increased rapidly in recent years. This increase in numbers has so far been well-managed as conversations with a number of these students indicated that there is a high degree of satisfaction with the level of supervision and training. Research students see the introduction of formal training within the PhD framework as very welcome, especially to boost skills in key areas like practical biology.

Commendations

- Every effort is made to ensure that postgraduates receive similar stipends.

- All postgraduates do a required amount of laboratory demonstrating / tutoring as part of their training and there is general satisfaction among the students with this arrangement. Indeed, they recognise that their contributions in this area are valuable for career development.

- Postgraduate students are generally very happy with the breadth of their training and appear to have sufficient opportunities to attend conferences and short courses as required.

5. Curriculum Development and Review

Undergraduate

35. The need for professional accreditation, especially the desire to maintain MEng level accreditation by the IChemE, is the main driver of the curriculum. Nonetheless, the School has continued to fine-tune its curriculum within the constraints imposed by the accrediting bodies. The role of Bioprocess Engineering has clearly been in a state of flux and henceforth will be offered as an option after Stage 2. The RG endorses this decision, given current levels of awareness of this discipline amongst school leavers.

Commendations

- The introduction of a new module, CHEN30040, to inform students of the role of chemical engineers in industry and to better prepare students for industrial placements is particularly welcome and will go a long way towards addressing some of the employers concerns about the preparedness of students for industry.

- The ongoing commitment to the introduction of non-traditional teaching methods is particularly welcome given the significant demands that such innovations place on academic time.

- The move to a 'four plus one' degree structure under Bologna will allow for the summer internship to be expanded and formalised, a move that will be welcomed by industry and will make the School's graduates more competitive with those of other established programmes.

Recommendations

- Students embarking on the BE in bioprocess engineering should be strongly encouraged to take options in biological sciences.

- Planned introduction of bioprocessing experiments, notably in fermentation should be introduced as a matter of priority.

- Funding for new undergraduate teaching equipment is urgently required and priority should be given to the purchase of equipment for bioseparations, especially membrane filtration and chromatography.

- The appointment of a technical officer with skills in the biological sciences should be a priority.

- While there are some restrictions within the accreditation framework for introducing new modules, consideration should be given to developing courses in drug formulation and delivery, an area felt by some of the

external panel who met the RG to offer substantial opportunities to other student cohorts across UCD. Such a development would capitalise on existing research activity.

Research Postgraduate

36. There has been a move to a more structured PhD approach and the School plans to introduce three themed programs in forthcoming years. At present PhD students are required to take 30 credits of formal study (including seminar attendance) in addition to their research work.

37. For every student there is a *Doctoral Studies Panel* consisting of the thesis supervisor, the HOS and a third academic.

Commendations

- The School has appointed a postgraduate coordinator who acts as a focal point for all academic issues relating to research students within the School.

- Students can, and are strongly encouraged, to take courses related to their research work, including courses in practical techniques.

- The MSc to PhD transfer process is now well-established in the School and consists of a short report, oral presentation and examination which a student must pass before progressing to PhD candidate status. This is usually held between 12-18 months of study. Of the nine students who have undergone this process so far, eight have progressed successfully.

Recommendations

- Development of a themed PhD program in Bioprocess Engineering which ensures that students have a sufficiently deep understanding of relevant topics in Biology by completing appropriate modules available in the University.

- Consideration should be given to the establishment of a Staff Student Consultative Council for postgraduate students.

- Membership of doctoral studies panel should be more evenly spread among the academic staff to relieve some of the workload on academic staff and, in particular, on the Head of School.

6. Research Activity

38. The School has been successful in expanding its research activity in recent years in a way that aligns well with the key research priorities identified by the College and the wider UCD research community. These are important in addressing key socio-economic needs particularly in the healthcare and energy sectors.

39. Metrics of the School's success in terms of research income and publications show that the staff team is performing at a level comparable to, or better than, leading international schools of a similar size.

40. The School has a large number and wide range of industrial links and the full support of industry concerning the research topics being addressed. The

School plans to further expand its interaction with industry by actively engaging with its growing number of alumni, many of whom now occupy key positions in industry.

41. The School has ambitious plans to further increase its level of research activity with well defined objectives and clear metrics by which to gauge success.

42. The PG research students expressed a high degree of satisfaction with the level of training and supervision they receive. This is reflected in the high PhD completion rates and the subsequent uptake of doctoral students by industry.

43. Maintenance of the current levels of research activity and the planned expansion will be crucially dependant upon adequate levels of support for academic and technical staff (as described in Section 3, page 8-9).

Commendations

- The School is commended for the significant increase in research activity in recent years. Also of note is the way the School has been keen to benchmark its activities in relation to key international competitors.

- The School is to be commended for actively engaging with the industrial user community and in meeting their needs both in research and training.

- The School is commended for the adoption of structured doctoral programmes which represent current 'best practice'. Training provided in research techniques and access to taught courses are increasingly important in multidisciplinary research areas.

Recommendations

- The Head of School should consider the implementation of an academic work load model in order to formalise what seems to be a fair and appropriate balance of staff involvement in teaching and research.

- The School should periodically review both the quality and impact of its research outputs in consultation with the industrial user community.

- The School should establish formal mechanisms for consultation with the PG research students as a means of obtaining and documenting important feedback. This will be increasingly important as the number of PG research students and Research Fellows increases.

7. Management of Quality and Enhancement

44. The School's engineering programmes are accredited by both Engineers Ireland and UK Institution of Chemical Engineers and these processes complement the University's own quality improvement mechanisms. The most recent reports of both accreditation bodies were made available to the RG and it was clear from these that the educational programmes are highly regarded both nationally and internationally.

45. The School also uses a number of other indicators to keep track of the quality and external regard of its education and research programmes. These

include the CAO points level of students at entry, first destinations of graduates, and student evaluations at module, stage and programme level.

46. The School monitors its research performance through benchmarking against comparable organisations in terms of research funding per academic staff member, number of graduate students per staff member, and publication measures (H-indices, impact factors). There are clear targets set, for example, to increase the number of research students per staff member from 3.5 to 4.

47. Informal mechanisms are in place whereby graduate students can contribute to the development of the School or raise issues that are important to them as a group.

Commendations

- The provision of student support, and responses to issues raised by students, is clearly given a high priority by staff, and it is evident that the School has maintained the quality of the student experience while at the same time increasing its research focus and activity.

- It was clear to the RG that the staff is committed to providing quality education and this was reflected in the enthusiastic, articulate and strongly supportive views of the students.

Recommendations

- The RG endorses the School view that an electronic register of its graduates be developed so that not only their first destination, but also complete career pathways, can be documented.

- The School should be more forthright in highlighting to all stakeholders (staff, students, employers, policy-makers) the extent to which it is highly ranked and regarded for its educational provision and research quality.

8. Support Services

48. Support facilities within UCD, but outside the control of the School, include the central computing facility and also the Library. IT Services provide access to a broad range of standard software packages via the network to a large number of terminals all across campus. Moreover, there are over 70 PC's located within the Engineering and Material Sciences building; these are used very extensively by students within the School. While the Library currently provides electronic access to most of the major journals and databases in the areas relevant to the School, subscription costs are rising at an alarming rate and there are serious fears about the continuation of this service. The possibility of sharing resources among the universities in the Dublin area was raised.

49. Members of the School also take advantage of the major facilities available in the Conway Institute but, of course, on a cost recovery basis. Nevertheless, such services are becoming even more crucial with the continuing expansion of the biological aspects of many of the School's activities. Moreover, the instrumentation in Conway supports a range of collaborative biomedical research projects with colleagues in the Institute.

50. The UCD Library currently provides electronic access to most of the major journals and databases in the areas relevant to the research activities of the School. Moreover, the undergraduate programme is appropriately supported with relevant textbooks, handbooks and other specialised materials.

51. IT Computer Services provide students with access to e-mail, internet, course materials, data storage, laser printing and a broad range of standard software packages via the network to a large number of terminals all across campus.

Commendations

- The School has assembled a separate and impressive array of High Performance Computing Clusters that provide an essential service for a wide variety of undergraduate and postgraduate projects.

Recommendations

- In conjunction with Library staff, the School should consider the possibility of sharing resources among the Universities in the Dublin area as a way of dealing with increasing subscription costs.

- The constant upgrading of the School's computational facilities would benefit greatly from the appointment of a High Performance Computation specialist who could also serve a number of other Schools, and ways to fund such a position should be explored.

- As the School's teaching and research activities in the biotechnological areas increase, it may be appropriate for students to take greater advantage of the availability of courses offered by Schools associated with the Conway Institute

9. External Relations

52. The School has an active programme for developing and maintaining contact with industry which includes invited lectures by engineers from industry, student placements/internships and facilitation of contact and interviews with employers.

53. Employer representatives confirmed the regularity of contact, although the group met by the RG felt that most of the contact was initiated from outside the School. However, this may be an artefact related to the sample of employers available on the day.

54. Employers confirmed that technical capabilities of graduates were comparable with the best available anywhere, but that more work could be done on the development of generic skills; in particular, it was felt that if graduates were more aware of the international standing of the School, it would enhance their confidence. In addition they felt that students could be better informed on structures and functions within organisations and the overall chemical industry landscape.

55. Employers felt that it would be helpful for them to receive a set of learning objectives, as provided by some continental schools, when planning student placements.

56. It was apparent that employers across the spectrum valued graduates at bachelors, masters and PhD levels. Some of the employers were not

convinced of the value of the PhD in their particular settings, although this was based on the assumption that the PhD was based exclusively on detailed work in a very narrow field.

57. The employers and graduates greatly enjoyed the celebrations associated with the 40th and 50th anniversaries of the School and would welcome further such opportunities (and would be prepared to pay for them).

58. The School has good links with other schools and research institutes locally and internationally.

Commendations

- The School has an active and valuable programme in place for developing the technical and generic skills required of its graduates and for staying in touch with industry.

- The School website and in particular the videos on careers in Chemical Engineering is excellent.

Recommendations

- The School should consider developing more events of a social nature to further develop informal contacts with graduates and employers. This will help cement existing relationships and develop new ones and, with time, can develop into fund-raising opportunities.

10. Summary of Commendations and Recommendations

a. Organisation and Management

Commendations

- The strong identity and reputation of the School and the loyalty of both students and staff came across very strongly. It is clear that the School has been very successful in maintaining its identity while at the same time adapting to changing needs and priorities in education and research.

- The inclusive style of management of the HOS, commended by all grades of staff.

- The School strategic planning process has clearly identified and acted upon opportunities in collaboratively-taught graduate education. A good example of this is the MSc in Biopharmaceutical Engineering run in collaboration with DCU, TCD and NIBRT. In addition, the School is currently reviewing options to introduce a Masters in Nanotechnology and Materials Modelling.

Recommendations

- The School has been very productive and successful in attracting research funding and should continue to advance its case for availability of funding from overhead income received in order to maintain and enhance its research equipment and infrastructure.

- In order to capitalize on opportunities in research and education, the administrative support available to the School requires to be maintained at least at its current level.

- Options for increasing income and the cost benefit of each should be considered. The RG suggests that the School consider defining an appropriate portfolio of the following:

    - Capitalising on the School's international reputation to attract a cohort of full-fee-paying international students
    - Increasing undergraduate student numbers
    - Increasing post-graduate student numbers
    - Provision of modules which would be attractive as electives to students outside the School
    - Working with the Development Office to enhance relationships with alumni (especially those of high net worth) with a view to philanthropic support.

b. Staff and Facilities

Commendations

- The School is to be commended for taking an increasingly multidisciplinary approach to the recruitment of academic staff in order to address both School and College strategic research objectives. Also of note, is the way in which the School has been pro-active in generating support for important academic positions e.g. via competitively-won SFI programmes.

- The Head of School is commended for actively engaging Technical Staff in the shared achievement of School objectives. Equally, the technical staff are commended for their imaginative and entrepreneurial approaches to the maintenance of equipment and facilities essential for research and teaching, and to self-development.

- The School is to be commended for maintaining well equipped laboratory and analytical facilities as required for the provision of an accredited Chemical Engineering degree programme and for the shared use of advanced research equipment for delivery of its teaching programmes.

Recommendations

- Once the financial situation improves, the College should seek to match the School's success in competitively won staff funding by allowing the replacement of academic staff and provision of one to two new academic staff positions. These appointments will be essential in order to achieve the planned increase in research activity and to maintain critical mass.

- The School should continue to embrace the PMDS scheme, with which it is already engaged, as a mechanism for the annual review and development of staff. This review process should also cover the training needs of staff in relation to achievement of the School's research and teaching objectives.

- The School should consider increasing the use of its growing population of research students and Research Fellows in the delivery of taught degree programmes. This would benefit academic staff by freeing up more of their time for research and innovation and would also benefit the researchers by providing opportunities to develop a broader range of skills and experience.

- The College needs to address the inadequate administrative and technical support available to the School. At a minimum there is the need for one extra administrator and one technical Research Manager.

- The School, together with the College, should seek to achieve an appropriate level of workshop provision.

- The School should develop a plan for the phased replacement and updating of key teaching equipment and implement it once appropriate resources become available. Consideration should be given to engaging industry and alumni in the support of equipment replacement.

c. Teaching, Learning and Assessment

Undergraduate

Commendations

- There is excellent opportunity for informal student input and feedback via the Student-Staff Consultative Council (SSCC). More formal feedback is attained from each class through a single web-based survey thus minimising 'survey fatigue'.

- The School is innovative in its use of teaching methods such as problem based learning (PBL), peer-assisted learning (PAL) and group-based problem solving.

- In keeping with international trends, there has been a shift towards increased use of continuous assessment. This has been well-planned. Assignments from different modules are spread appropriately and students are given advance warning of all assignments at the start of the semester.

- Students had a high degree of awareness and understanding of the issue of plagiarism.

- There is a strong emphasis on communication and writing skills which addresses the stated wishes of the employers for well-rounded students with a broad range of the 'softer' skills.

- Despite the age of much of the equipment in the undergraduate laboratories, it remains in good condition and this is a tribute to the dedication of the technical staff.

- It is particularly welcome to see that the final year students are getting the opportunity to take part in real cutting-edge research and it is commendable that in recent years, six final year projects have contributed to publications.

- Graduates of the School were very complimentary about the extent to which the strong theoretical basis of their degree prepares them for industry, especially the design and consultancy sector.

- Graduates felt that they were well-prepared for the team environment of industry through their work on their design projects and other group-based activities.

Research Postgraduate

Commendations

- Every effort is made to ensure that postgraduates receive similar stipends.

- All postgraduates do a required amount of laboratory demonstrating / tutoring as part of their training and there is general satisfaction among the students with this arrangement. Indeed, they recognise that their contributions in this area are valuable for career development.

- Postgraduate students are generally very happy with the breadth of their training and appear to have sufficient opportunities to attend conferences and short courses as required.

d. Curriculum Development and Review

Undergraduate

Commendations

- The introduction of a new module, CHEN30040, to inform students of the role of chemical engineers in industry and to better prepare students for industrial placements is particularly welcome and will go a long way towards addressing some of the employers concerns about the preparedness of students for industry.

- The ongoing commitment to the introduction of non-traditional teaching methods is particularly welcome given the significant demands that such innovations place on academic time.

- The move to a ‘four plus one’ degree structure under Bologna will allow for the summer internship to be expanded and formalised, a move that will be welcomed by industry and will make the School’s graduates more competitive with those of other established programmes.

Recommendations

- Students embarking on the BE in bioprocess engineering should be strongly encouraged to take options in biological sciences.

- Planned introduction of bioprocessing experiments, notably in fermentation should be introduced as a matter of priority.

- Funding for new undergraduate teaching equipment is urgently required and priority should be given to the purchase of equipment for bioseparations, especially membrane filtration and chromatography.

- The appointment of a technical officer with skills in the biological sciences should be a priority.

- While there are some restrictions within the accreditation framework for introducing new modules, consideration should be given to developing courses in drug formulation and delivery, an area felt by some of the external panel who met the RG to offer substantial opportunities to other student cohorts across UCD. Such a development would capitalise on existing research activity.

Research Postgraduate

Commendations

- The School has appointed a postgraduate coordinator who acts as a focal point for all academic issues relating to research students within the School.

- Students can, and are strongly encouraged, to take courses related to their research work, including courses in practical techniques.

- The MSc to PhD transfer process is now well-established in the School and consists of a short report, oral presentation and examination which a student must pass before progressing to PhD candidate status. This is usually held between 12-18 months of study. Of the nine students who have undergone this process so far, eight have progressed successfully.

Recommendations

- Development of a themed PhD program in Bioprocess Engineering which ensures that students have a sufficiently deep understanding of relevant topics in Biology by completing appropriate modules available in the University.

- Consideration should be given to the establishment of a Staff Student Consultative Council for postgraduate students.

- Membership of doctoral studies panel should be more evenly spread among the academic staff to relieve some of the workload on academic staff and, in particular, on the Head of School.

e. Research Activity

Commendations

- The School is commended for the significant increase in research activity in recent years. Also of note is the way the School has been keen to benchmark its activities in relation to key international competitors.

- The School is to be commended for actively engaging with the industrial user community and in meeting their needs both in research and training.

- The School is commended for the adoption of structured doctoral programmes which represent current 'best practice'. Training provided in research techniques and access to taught courses are increasingly important in multidisciplinary research areas.

Recommendations

- The Head of School should consider the implementation of an academic work load model in order to formalise what seems to be a fair and appropriate balance of staff involvement in teaching and research.

- The School should periodically review both the quality and impact of its research outputs in consultation with the industrial user community.

- The School should establish formal mechanisms for consultation with the PG research students as a means of obtaining and documenting important feedback. This will be increasingly important as the number of PG research students and Research Fellows increases.

f. Management of Quality and Enhancement

Commendation

- The provision of student support, and responses to issues raised by students, is clearly given a high priority by staff, and it is evident that the School has maintained the quality of the student experience while at the same time increasing its research focus and activity.

- It was clear to the RG that the staff is committed to providing quality education and this was reflected in the enthusiastic, articulate and strongly supportive views of the students.

Recommendations

- The RG endorses the School view that an electronic register of its graduates be developed so that not only their first destination, but also complete career pathways, can be documented.

- The School should be more forthright in highlighting to all stakeholders (staff, students, employers, policy-makers) the extent to which it is highly ranked and regarded for its educational provision and research quality.

g. Support Services

Commendations

- The School has assembled a separate and impressive array of High Performance Computing Clusters that provide an essential service for a wide variety of undergraduate and postgraduate projects.

Recommendations

- In conjunction with Library staff, the School should consider the possibility of sharing resources among the Universities in the Dublin area as a way of dealing with increasing subscription costs.

- The constant upgrading of the School's computational facilities would benefit greatly from the appointment of a High Performance Computation

specialist who could also serve a number of other Schools, and ways to fund such a position should be explored.

- As the School's teaching and research activities in the biotechnological areas increase, it may be appropriate for students to take greater advantage of the availability of courses offered by Schools associated with the Conway Institute

h. External Relations

Commendations

- The School has an active and valuable programme in place for developing the technical and generic skills required of its graduates and for staying in touch with industry.

- The School website and in particular the videos on careers in Chemical Engineering is excellent.

Recommendations

- The School should consider developing more events of a social nature to further develop informal contacts with graduates and employers. This will help cement existing relationships and develop new ones and, with time, can develop into fund-raising opportunities.

Appendix 1

UCD School of Chemical and Bioprocess Engineering Response to the Review Group Report

The UCD School of Chemical and Bioprocess Engineering views the Quality Review report as a very welcome outcome from what we believe was a very constructive process. In the coming months, the recommendations of the Review Group will be directly addressed in the Quality Improvement Plan. The strong endorsement by the Review Group of the School in its efforts to enhance both the undergraduate experience and to expand research activities within the School's three major strategic areas is also very much appreciated. Lastly, the School would like to express its deep appreciation to the members of the Review Group for their exceptional efforts in the completion of a comprehensive and objective Report and to the UCD Quality Office for its significant help during this process.

Appendix 2

Schedule for Review Visit to

UCD School of Chemical and Bioprocess Engineering

30 March – 2 April 2009

Monday, 30 March 2009

17.15-18.45	Private meeting of RG ***only*** at hotel to agree work schedule and assignment of tasks for the site visit.
19.30	Dinner for the RG, hosted by the UCD Registrar and Deputy President

Tuesday, 31 March 2009
Venue: Room 204, UCD Engineering and Materials Science Centre

09.00-09.30	Private meeting of Review Group (RG)
09.30 – 10.15	RG meet with **College Principal**
10.15-10.30	Break
10.30 –11.15	RG meet with **Head of School** and other members of senior staff nominated by the Head of School
11.15 – 11.30	Tea/coffee break
11.30 – 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**
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 **support staff representatives** (e.g. administrative / technical etc)
16.30-16.45	RG review key observations
16.45-17.30	**Tour of facilities**
17.30	RG depart

Wednesday, 1 April 2009
Venue: Room 204, UCD Engineering and Materials Science Centre

09.15-10.00	RG meet for private meeting
10.00-11.00	RG meet with a representative group of **postgraduate students** (taught and research) **and recent graduates** (PG and UG)
11.00-11.15	RG tea/coffee break
11.15-12.15	RG meet with the **School Research Committee** or equivalent (and other staff members of nominated by the HoS)
12.15-12.45	Break - RG review key observations and prepare for lunch time meeting
12.45-13.45	Working lunch (buffet) - RG meet with **representative group of undergraduate students**
13.45-14.15	RG private meeting - review key observations
14.15-15.00	**Optional meeting** should RG wish to meet other categories of School or College staff and/or specified University staff
15.00-15.20	Break
15.20-17.15	RG private meeting – review key preliminary observations/findings – begin drafting RG Report
17.15	RG depart

Thursday, 2 April 2009
Venue: Room 204, UCD Engineering and Materials Science Centre

09.00-09.30	Private meeting of RG
09.30-10.30	(Optional) RG meet with Head of School or specified University staff to clarify any outstanding issues or continue preparing draft RG Report
10.30-10.45	Break
10.45-12.30	RG continue preparing draft RG Report
12.30-13.15	Lunch (Review Group + 1)
13.15-15.30	RG finalise first draft of RG Report and feedback commendations/recommendations
15.30-15.45	Break
15.45-16.00	RG meet with Head of School to feedback initial outline commendations and recommendations
16.15	Exit presentation to all available staff of the unit –made by an extern member of the Review Group summarising the principal commendations/recommendations of the Review Group
16.30	Review Group depart