

FACULTY OF ENGINEERING

**ACADEMIC BOARD VISIT TO REVIEW
TEACHING, LEARNING AND
RESEARCH TRAINING**

TUESDAY APRIL 23 2002

**FINAL REPORT AND
RECOMMENDATIONS**

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1 Introduction

- 1.1 The following Academic Board Review Team visited the Faculty of Engineering on Tuesday 23 April 2002 as part of the review and evaluation of teaching, learning and research training in all faculties within the University.

Professor Judyth Sachs (Chair)	<i>Chair, Academic Board</i>
Professor Paul Ramsden	<i>Pro-Vice-Chancellor (Teaching and Learning)</i>
Assoc. Professor Russell Ross	<i>Deputy Chair, Academic Board</i>
Dr Greg Ryan	<i>Faculty of Medicine</i>
Dr Stephen Cattle	<i>Faculty of Agriculture</i>

Secretary

Rachel Symons	<i>Quality Assurance Officer (Teaching and Learning)</i>
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Observers

Dr Scott Kable	<i>Faculty of Science</i>
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- 1.2 During the visit the Team interviewed the following groups of staff and students:

- Dean Professor Judy Raper and the Faculty Management Team:¹
 - Assoc Professor John Small, Associate Dean, Postgraduate Studies
 - Assoc Professor Geof Barton, Associate Dean, Undergraduate Studies
 - Professor Jim Petrie, Head of Department, Chemical Engineering
 - Assoc Professor Rob Wheen, Head of Department, Civil Engineering
 - Professor Branka Vucetic, Head of School, Electrical and Information Engineering
 - Professor Assaad Masri, Head of School, Aerospace, Mechanical and Mechatronics Engineering
- Undergraduate students (10) and Postgraduate Coursework students (4)
- Postgraduate Research students (10)
- Academic and general staff (9)²
- Open session (individual appointments with staff and students)

- 1.3 In preparation for a visit by the Academic Board Review Team, each Faculty is asked to prepare a self evaluation report on their teaching and learning and research training activities. The findings of the Review Team in relation to these activities are included in the following report.

2 Achievements and hallmarks of the Faculty

- 2.1 The mission of the Faculty of Engineering is *to be the premier Engineering Faculty in Australia, to be the first choice for undergraduate and postgraduate students, to attract the best quality academic staff and research personnel, and to be ranked and benchmarked with the World's best engineering faculties*. The achievements mentioned by the senior staff, and confirmed during all subsequent interviews, suggest that the Faculty is substantially meeting its mission.
- 2.2 The Review Team was told that the Faculty is second best in research training completions in the University, and that many postgraduates were moving into either academia or industry. Most of

¹ Referred to as 'senior staff' within the report

² Referred to as 'staff' within report

the postgraduate students who were interviewed expressed the wish to go into academia, either on completion of their studies, or after working for a while in industry. The Faculty suggested that there is improved perception of the undergraduate course within the community, especially since the introduction of combined degrees, specialisations and the Advanced Education program. The Faculty told the Team that they had a long history of producing the best engineering graduates in Australia. The Dean informed the Team that one of the hallmarks of the Faculty was excellence in research which fed into research training, and which hopefully also fed into the undergraduate program.

- 2.3 Information regarding the Faculty's achievements is disseminated via a number of channels including staff meetings; informal and formal debate on topics of interest, including teaching and learning; committees such as the Teaching and Learning Committee, which includes members from across the Faculty; staff/student liaison committees; research information sessions; and school competitions. The Faculty may resurrect its monthly newsletter. Community liaison activities include high school visits and Foundation meetings.

Recommendation 1

The Review Team recommends that consideration be given to resuming the staff newsletter that was introduced when the current Dean commenced in the Faculty.

3 Faculty structure, communication and integration

- 3.1 The Review Team was interested in finding out how the structure of the Faculty into two departments and two schools impacted on staff and student integration, and communication across the Faculty. In particular the Team was concerned about the weakness the Faculty itself identified in the Teaching and Learning Plan – viz *One of the current weaknesses resulting from the degree structure is that requirements and teaching for the BE degree are done relatively independently by departments running the specialisations*³.
- 3.2 The Review Team perceived a tendency within the Faculty for staff to identify with their Department at the expense of any sense of Faculty cohesion. The Team gained the impression that the relative autonomy of each of the Faculty's four Departments resulted in significant variation in practice between Departments in terms of teaching, learning and research training.
- 3.3 While integration across Departments is encouraged for students in the Advanced Engineering stream, general student feedback suggested that cross-fertilisation was taking place and that structures were not in place to encourage it, although they would have been welcome. Both students and staff noted that the Departments tended to operate as discrete units with little opportunity for inter-disciplinary activity. Faculty-wide committees offered some opportunities for inter-departmental communication.
- 3.4 Senior staff told the Review Team that coordination within the Faculty was mainly through the Undergraduate Studies, Postgraduate Studies, Research and Teaching and Learning Committees, as well as the Dean's Advisory Committee. Staff felt that being on committees gave them the opportunity to be involved in policy development, and that there was a strong degree of discussion and consultation.

³ *Faculty of Engineering Strategic Plan for Teaching and Learning 2000-2004 Performance WRT Plan: Weaknesses.* Page 3

Recommendation 2

It is recommended that the Faculty should look at ways of improving communication between departments and between staff and students.

- 3.5 Integration of the departments and specialisations was found to be vertical rather than horizontal. The Team was told that Electrical and Information Engineering had more in common with the Science Faculty than other departments within the Faculty of Engineering. Course structures did not facilitate student transfers across specialisations.

Recommendation 3

The Review Team recommends that the Faculty investigate a program to develop student flexibility if they want to change direction mid degree.

Recommendation 4

The Review Team recommends that the development of a professional practice program be considered. This could cover both core and generic theoretical concepts with application for each discipline in the concurrent practice program. It would help students develop a sense of what it meant to be their type of engineer.

4 Implementation of Academic Board policies

- 4.1 The Faculty Self-Evaluation Report indicated that the Teaching and Learning Committee and the Undergraduate and Postgraduate Studies Committees ensured Faculty implementation of University policies and guidelines. The Review Team was further advised that the Dean's Advisory Committee also plays a part in disseminating Academic Board policy and that Faculty seminars on University policy are held from time to time, such as the recent seminar on the policy on *Academic Honesty (Plagiarism) in Coursework*. The Faculty had recently introduced a new Faculty policy in line with Academic Board policy on awarding Honours. The policy on *Generic attributes of graduates* was applied to courses across the Faculty. The Team found that there was some variation across the Faculty's Departments in the application of and compliance with University policy. For example, both staff and students indicated a range of awareness of the University policy on *Postgraduate supervision*.

5 Graduate attributes, aims and outcomes

- 5.1 The University expects all its graduates to possess specific attributes on graduating. These include knowledge skills, thinking skills, personal skills, personal attributes and practical skills. The Review Team asked the Faculty how they mapped these skills to their curriculum, and how they were communicated to students.
- 5.2 They found that through the accreditation process with the Institution of Engineers, Australia, the Faculty was required to think carefully about all elements of their courses, and to articulate aims, objectives and expectations to an external audience. The Institution had its own attributes, which match closely with the University's, and include teamwork, management, communication and leadership. The lack of management courses which was noticed during the last but one accreditation process, had led to the inclusion of such a course in the Bachelor of Engineering/Bachelor of Commerce joint degree. The Review Team was impressed with the focus groups between students and industry groups. Students had found that these helped them to identify

where the bits of knowledge gained in their courses came together and led to being a good engineer.

- 5.3 All parties acknowledged that most of the generic skills are implicitly embedded into the courses, rather than explicitly explained. Students were able to tell the Team about skills they had learnt either directly or indirectly in the course of their studies – these included problem solving, presentation skills, lateral thinking, ethics and group work. The Team felt that the junior staff, who had taken workshops at the Institute of Teaching and Learning, showed strong support for the mapping of generic skills into the curriculum. However, the Team detected a lesser level of explicit support from some of the more senior staff in relation to the imparting of skills to students.
- 5.4 All staff told the Review Team that the integration and mapping of commonality across courses had been under discussion in the Faculty for the past two years. The senior staff mentioned that, due to specialised and combined degrees, the process was complex and a challenge.

Commendation 1

The Review Team commends the Faculty on the way in which it maps both the university's generic skills and those of the Institution of Engineers, Australia, into the curriculum. There was strong support for these skills from both staff and students, though not so much from the senior staff. All parties were able to identify skills that were implicitly embedded into units of study rather than explicitly explained. These included team work, communication, lateral thinking, ethics, presentation skills and problem solving.

6 Assessment

- 6.1 Issues of concern to the Review team within the area of assessment included the range of assessment tasks and the provision of feedback to the large student numbers within the Faculty.
- 6.2 The Team was told of variations in the assessment process across the schools, of tests announced the previous day, of rolling assessments, and of competency based marking with students given the option of increasing marks above Credit by undertaking a take-home exam. Senior staff felt that there was a mixed response within the student cohort regarding the workload issue, with some students preferring exams over other assessment tasks. Senior staff also seemed to be aware that assessment load varied enormously across the Faculty, but did not offer any strategies to remedy this situation. Some staff told the Team that they were more comfortable giving exams as this eliminated the question of plagiarism; others said that the combination of assignments and exams did not contribute to the learning environment since students crammed for exams. Students thought that marks were awarded for ranking rather than achieving a certain standard. Some staff had received advice on assessment through the Institute of Teaching and Learning.
- 6.3 Senior staff told the Review Team feedback was provided as soon as possible to students, usually through the tutors who were trained in the marking schemes required by the Faculty. Students had varying experiences of feedback from both tutors and lecturers. Some gave personal feedback, and others identified common errors during lectures. The Team was told by the students who were interviewed that no feedback was provided for large groups, and that some units did not have tutorials. Feedback to students was variable and they did not feel the use of tutors was the right mechanism for providing feedback.

Recommendation 5

The Review Team recommends that the Faculty look at the assessment process across all departments to ensure consistency and quality. Staff should also be reminded of the Academic Board policy requiring all assessment tasks to be announced on Day One.

Recommendation 6

Since students did not consider that tutorials were the right mechanism, the Review Team recommends that the Faculty looks at alternate methods. The Faculty is advised to consider ways of informing students about the assessment process, in particular what criteria are used, how marks are awarded, and workload issues.

7 Evaluation and feedback

7.1 The Faculty Self-Evaluation Report stated that all units of study were evaluated every year with responses interpreted by academic staff and reported to Heads of departments, and the Teaching and Learning Committee, with further feedback processed through the staff-student liaison meetings. The Review Team was interested in learning more about the evaluation process, in particular its key focus and what the Faculty was trying to achieve, and improvements made as a result of student evaluations, and the staff-student liaison meetings.

7.2 Evaluation

7.2.1 Senior staff explained that each department had a different system of evaluation. The key focus of evaluations was to try and ensure that each student knew what they were receiving from the teaching, and to have good unit of study outlines which related to the rest of the course. They had recently moved from Faculty-generated questionnaires to those provided by the Institute of Teaching and Learning since the latter were more aligned with the SCEQ. However the Faculty had found the response rate from the Institute of Teaching and Learning to be slow. Staff provided the Team with information about informal evaluations through industry review committees, as well as a follow-up program with the most recent graduates where they were able to see how parts of the course fitted into their careers. Staff were able to provide the Team with some good examples of how courses had been changed based on student evaluations. The Team noted that student experiences of changes resulting from their evaluations varied from department to department. They often heard about changes resulting from their evaluations from the following student cohort, not from the lecturers.

Recommendation 7

While welcoming the Faculty's activities in some areas in terms of collecting student feedback and industry feedback, through the industry review committees, the Review Team recommends that the Faculty consider ways to further improve the evaluation process, especially in terms of achieving greater consistency across the Faculty and introducing mechanisms to ensure that students are advised of changes that have been made as a result of their feedback.

7.3 Staff-student liaison meetings

7.3.1 The Review Team found that there was a mixed response from both staff and students regarding the usefulness of staff-student liaison meetings. Depending on the department, some students indicated that there was no clear evidence that their input was taken on board, and they expressed disappointment in the lack of commitment to improvement that was shown by some heads of

departments. Some of the staff interviewed saw these meetings merely as student complaint sessions.

Recommendation 8

The Review Team recommends that the Faculty give consideration to improving the effectiveness and profile of staff-student liaison meetings with staff and students; and to setting different parameters for their operation.

8 Quality of teaching and learning

8.1 In this area of the evaluation, the Review Team was interested in obtaining information about the teaching culture of the Faculty, the use and acceptance of on-line learning, and benchmarking engineering education and curriculum.

8.2 Teaching and teaching culture

8.2.1 The Review Team was impressed with the way the Faculty had raised the profile of excellence in teaching within the Faculty, and the development of a teaching culture. All staff reported that there had been a noticeable change in the value attributed to good teaching around the Faculty. Attendance at seminars and teaching advances organised by the Teaching and Learning Committee had increased over the last five years. These seminars were highly regarded by staff as vehicles for imparting good practices in teaching and learning, and disseminating Academic Board policy issues. Staff told the team that the Teaching and Learning Committee was making an impact because anyone could attend, and it was seen as the key policy making body in the Faculty. All new staff were required to attend the Institute of Teaching and Learning workshops and this was evident in their responses to questions posed during the review visit.

8.2.2 Staff told the Team that good teaching was more recognised than previously, though the students thought more recognition should be given to both staff and tutors. The Review Team noted that strategic use of the Institute of Teaching and Learning had contributed to some excellent examples of good teaching across the Faculty.

Commendation 2

The Team commends the Faculty on the evident improvement in the teaching culture. The establishment of the Teaching and Learning Committee is seen as a good initiative in the development of this culture. There is improved attendance at seminars and teaching advances organised by the Teaching and Learning Committee. There are some excellent examples of good teaching with strategic use made of the Institute of Teaching and Learning particularly by younger staff.

Recommendation 9

To reinforce the message that teaching and learning is important, the Team recommends that consideration be given to the establishment of the position of Associate Dean, Teaching and Learning

Recommendation 10

The Team noted that there was sharing of teaching materials in some disciplines and suggests that this practice be formalised across the Faculty.

8.3 On-line learning

- 8.3.1 The uptake of on-line learning across the Faculty varied from lecturer to lecturer. The Review Team was told by students that some lecturers put everything on-line; while others did not. Students expressed a desire for greater consistency of practice in this regard, and also expressed the view that some staff did not take advantage of the benefits of making course information and notes available on-line (for example spending class time reading out the notes.)
- 8.3.2 The Team was told by both staff and students of inherent problems with on-line learning, mostly from lack of resources within the university and technical problems such as blackouts and slowness of access. Students told the Team that some of them, who did not have computers at home, would be disadvantaged if all unit of study outlines were mounted on the web.
- 8.3.3 Advantages for on-line learning which were identified by the staff included students being able to access material whenever they wanted, which was especially important for those who worked; individual assessments could be assigned to students thus reducing the possibilities of plagiarism; the emphasis on team work when completing assignments; and the use of comments input on-line to build up a knowledge base for the following year.

Recommendation 11

The Review Team recommends that, in view of the above differences, the Faculty consider ways to further develop on-line learning. It should also investigate ways in which the need of students for consistency and for identification of material relevant to their particular discipline can be answered.

8.4 Benchmarking engineering education and curriculum

- 8.4.1 The Review Team found that within Australia the Faculty was actively benchmarking with Go8 universities, plus the universities of Newcastle and Wollongong. Internationally the Faculty has a formal benchmarking process with the University of Michigan. Visits have taken place between the Faculty and Michigan and accreditation documents exchanged, resulting in an awareness of trends in engineering education.

Recommendation 12

The Team recommends that the Faculty investigates further international trends in engineering education and curriculum and continues to benchmark against universities in Australia and overseas in this area.

8.5 Laboratory supervision

- 8.5.1 It was noted that the issue of standards of tutoring and laboratory support was often raised at staff-student liaison meetings. Staff voiced concerns regarding the level of support available to students in their 3rd and 4th years in laboratory work. At this level a high standard of expertise was demanded. Whereas, in the past, technicians had been employed to provide laboratory support, it was now provided by tutors and it was a challenge to ensure the appropriate level of expertise.

8.6 Specialist staff in aerospace engineering

- 8.6.1 Student comments that they would welcome the appointment of a staff member with specialist expertise in aerospace engineering were noted.

9 Research-led teaching

- 9.1 Regarding the issue of the integration of research into teaching, there were mixed views of the experience from staff and students. Some staff were of the opinion that it was good for students to know about the research being undertaken in the Faculty as it made the subject more interesting. This was confirmed by the students, who expressed the opinion that it would be good if more staff told them about their research. Other staff felt that there was a fine line between wanting to let the students know about research and pushing them too much.
- 9.2 Senior staff informed the Team that work on implementation of ‘Redesigning the Engineering Experience’ was still in progress. The Faculty is looking at introducing a design component into the first year. The Faculty places importance on fostering innovation and creativity. The Team was told that Engineering graduates from the University were employed because of their ability to be innovative.

10 Advanced Engineering program

- 10.1 In the Self-Evaluation Report the Faculty highlighted the Advanced Engineering program as an example of integration of the Faculty’s high tradition of research excellence into the curriculum offered to students. The Review Team were told that the program was working well despite being resource intensive. It was only offered to a selected number of students, as it was felt that not all could cope with the demands of the course. Based on grades during first year, additional students were invited to join the program. Students who were interviewed, and who were involved in the program, were enthusiastic about the opportunities it gave them. They appreciated the high levels of motivation of their student group; however they expressed concern about missing out on some subjects, such as Mathematics, which affected their ability to understand later subjects.
- 10.2 The Review Team was told by the staff that it was difficult logistically to offer inquiry-based learning, such as that used in the Advanced Engineering program, to other students. The huge spread of attitudes and abilities would also hinder its success. The Team heard from staff and students that those students not offered a place in the Advanced Engineering program were generally not aggrieved by their omission.

Commendation 3

The Review Team congratulates the Faculty on the success of the Advanced Engineering program, especially in relation to the use of problem based learning, the fact that it is interdisciplinary in focus, and that it fosters creative design and teamwork.

Recommendation 13

The Review Team recommends that the Faculty should investigate ways in which gaps in student learning, occasioned by missing out on core subjects in first year, can be overcome.

11 Research supervision and training

- 11.1 It was evident to the Team that research supervision and training within the Faculty is of an excellent standard and the first choice as a place to study for many of the research students. The completion rates are good, and there is positive feedback about supervisors from their students. It is also noted that a high proportion of postgraduates are interested in pursuing an academic career. The Team was pleased to note that the Faculty is actively implementing the College of Science and Technology 10-point plan on research training.

- 11.2 Students were pleased with the support they receive in terms of computers, accommodation, and funding to attend conferences. They found that their supervisors were approachable and willing to help in terms of obtaining necessary resources. On the subject of being colleagues with their supervisors, they commented that it depended on the supervisor. They said that during their candidature the relationship changed from being a student working with a supervisor who was the expert with knowledge, to being more equal partners.
- 11.3 The annual review of research students was found to be working well. Students in most departments were interviewed without their supervisors, thus enabling them to highlight any problems in the supervisory relationship. The frequency of the interviews varied between departments, though all of them held them for first year students. Students told the Review Team that the review was helpful in resolving problems.

Commendation 4

The Review Team congratulates the Faculty on its excellent standard in research supervision and training, and on the fact that all processes are working well. It commends them on the implementation of the College of Science and Technology's 10-point plan on research training.

12 Student progression

- 12.1 The Review Team was particularly concerned about the identification of and help provided for at-risk students, the high Faculty appeal rate against exclusions, and the possibility of a common first year for Engineering students.
- 12.2 All students undertake exams in the middle of their first year and it is at this stage that at-risk students are identified and mentored. No students were excluded during their first year, though the Faculty did try to divert some to the Science Faculty. Senior staff said that they had worked hard in this area, comparing exclusions by Faculty to see if there was a reason for the high appeal rate. They told the Team that one reason was that in Science, which had a low exclusion rate, students had the opportunity to divert into another area of study. This option was not available to Engineering students since they specialised from day one. When the Team floated the possibility of a common first year with the staff group, the predominant view was that it would not work due to the specialised nature of the degree programs: students needed to think of themselves as a particular type of engineer from the beginning of the degree.
- 12.3 The students who were interviewed saw benefits in the mentoring scheme for first years. They saw them as being useful for both academic and general problems. The Team found that the mentorship scheme was not available in all departments. On the subject of year advisors, the undergraduate students mentioned that it would be a good idea if they introduced themselves during lectures and explained their role.

Recommendation 14

The Review Team recommends that the Faculty investigate the introduction of a common first year for students, as well as the introduction of flexibility into the program which would allow students to change specialisations during their degree.

13 Concluding comments

- 13.1 After the visit the Review Team concluded that there were a number of areas of good practice in teaching and learning and research training within the Faculty of Engineering. These included improvement in the teaching culture and support of the work of the Teaching and Learning Committee, bedding of generic skills into the curriculum, the Advanced Engineering program and excellence in research training and supervision. These go a long way to support the Faculty mission of being the premier Engineering Faculty in Australia, and the first choice for undergraduate and postgraduate students. Some of the areas which might be considered for improvement include Faculty structure and integration, assessment, on-line learning, staff-student liaison meetings and benchmarking engineering education.
- 13.2 These findings were communicated to the Dean of the Faculty of Engineering at the conclusion of the visit and through the *Summary Report of the Findings of the Review Team* which was sent to the Faculty on 29 May 2002.

14 Areas of good practice (Commendations)

Based on the Self Evaluation Report, the Teaching and Learning Plan and the findings of the Review Visit, the following areas of good practice in teaching, learning and research training have been identified within the Faculty of Engineering.

Commendation 1

The Review Team commends the Faculty on the way in which it maps both the university's generic skills and those of the Institute of Engineers, Australia, into the curriculum. There was strong support for these skills from both staff and students, though not so much from the senior staff. All parties were able to identify skills that were implicitly embedded into units of study rather than explicitly explained. These included team work, communication, lateral thinking, ethics, presentation skills and problem solving. (See Section 5-5.4)

Commendation 2

The Team commends the Faculty on the evident improvement in the teaching culture. The establishment of the Teaching and Learning Committee is seen as a good initiative in the development of this culture. There is improved attendance at seminars and teaching advances organised by the Teaching and Learning Committee. There are some excellent examples of good teaching. Younger staff members in particular make strategic use of the Institute of Teaching and Learning. (See Section 8.2)

Commendation 3

The Review Team congratulates the Faculty on the success of the Advanced Engineering program, especially in relation to the use of problem based learning, the fact that it is interdisciplinary in focus, and that it fosters creative design and teamwork. (See Section 10)

Commendation 4

The Review Team congratulates the Faculty on its excellent standard in research supervision and training, and on the fact that all processes are working well. It commends them on the implementation of the College of Science and Technology's 10-point plan on research training. (See Section 11)

15 Areas of consideration for improvement (Recommendations)

The Review Team identified a number of areas for consideration for improvements, and makes the following recommendations to the Faculty.

Recommendation 1

The Review Team recommends that consideration be given to resuming the staff newsletter that was introduced when the current Dean commenced in the Faculty. *(See Section 2.3)*

Recommendation 2

It is recommended that the Faculty should look at ways of improving communication between departments and between staff and students. *(See Section 3.4)*

Recommendation 3

The Review Team recommends that the Faculty investigate a program to develop student flexibility if they want to change direction mid degree. *(See Section 3.5)*

Recommendation 4

The Review Team recommends that the development of a professional practice program be considered. This could cover both core and generic theoretical concepts with application for each discipline in the concurrent practice program. It would help students develop a sense of what it meant to be their type of engineer. *(See Section 3.5)*

Recommendation 5

The Review Team recommends that the Faculty look at the assessment process across all departments to ensure consistency and quality. Staff should also be reminded of the Academic Board policy requiring all assessment tasks to be announced on Day One. *(See Section 6)*

Recommendation 6

Since students did not consider that tutorials were the right mechanism, the Review Team recommends that the Faculty looks at alternate methods. The Faculty is advised to consider ways of informing students about the assessment process, in particular what criteria are used, how marks are awarded, and workload issues. *(See Section 6)*

Recommendation 7

While welcoming the Faculty's activities in some areas in terms of collecting student feedback and industry feedback, through the industry review committees, the Review Team recommends that the Faculty consider ways to further improve the evaluation process, especially in terms of achieving greater consistency across the Faculty and introducing mechanisms to ensure that students are advised of changes that have been made as a result of their feedback. *(See Section 7.2)*

Recommendation 8

The Review Team recommends that the Faculty give consideration to improving the effectiveness and profile of staff-student liaison meetings with staff and students; and to setting different parameters for their operation. *(See Section 7.3)*

Recommendation 9

To reinforce the message that teaching and learning is important, the Team recommends that consideration be given to the establishment of the position of Associate Dean, Teaching and Learning. *(See Section 8.2)*

Recommendation 10

The Team noted that there was sharing of teaching materials in some disciplines and suggests that this practice be formalised across the Faculty. *(See Section 8.2)*

Recommendation 11

The Review Team recommends that, in view of the above differences, the Faculty consider ways to further develop on-line learning. It should also investigate ways in which the need of students for consistency and for identification of material relevant to their particular discipline can be answered. *(See Section 8.3)*

Recommendation 12

The Team recommends that the Faculty investigates further international trends in engineering education and curriculum and continues to benchmark against universities in Australia and overseas in this area. *(See Section 8.4)*

Recommendation 13

The Review Team recommends that the Faculty should investigate ways in which gaps in student learning, occasioned by missing out on core subjects in first year of the Advanced Education program, can be overcome. *(See Section 10)*

Recommendation 14

The Review Team recommends that the Faculty investigate the introduction of a common first year for students, as well as the introduction of flexibility into the program which would allow students to change specialisations during their degree. *(See Section 15)*

Judyth Sachs
Chair, Review Team
Chair, Academic Board

1 August 2002

APPENDIX A: SUMMARY REPORT OF FINDINGS OF REVIEW TEAM

FACULTY OF ENGINEERING ACADEMIC BOARD REVIEW VISIT

TUESDAY 23 APRIL 2002

SUMMARY REPORT OF THE FINDINGS OF THE REVIEW TEAM

The Academic Board Review Team, chaired by Professor, Judyth Sachs, visited the Faculty of Engineering on Tuesday 23 April 2002 to review and evaluate academic planning and quality assurance systems within the Faculty. Interviews were held with the following groups:

- Dean Judy Raper and senior academic staff
- Undergraduate and postgraduate coursework students
- Postgraduate research students
- Other academic and general staff

There was also an open session at the end of the visit at which staff were invited to come and speak to the Review Team individually.

This report is a short summary of the main findings of the Review Team as reported to the Dean of Faculty, Professor Judy Raper, at the end of the visit.

AREAS OF GOOD PRACTICE

Teaching and teaching culture:

- Importance of teaching has improved.
- Sense of presence of teaching culture from both staff and students, though not as strong from the Executive.
- Establishment of Teaching and Learning Committee a good initiative which is strongly supported by staff.
- Excellent examples of teaching with strategic use of the Institute of Teaching and Learning, especially by the younger staff.
- But would be useful to have an Associate Dean, Teaching and Learning to give the message that teaching and learning is important.

Generic skills:

- Strong support from junior staff and students, but not so much from senior staff.
- Students and staff agree that most or all of the Generic Skills are attended to in the Units of Study, but are implicitly bedded into the units rather than explicitly explained.

Research training and supervision:

- Excellent.
- Good completion rates.
- Positive feedback about PhD supervisors from students.

- Larger proportion of postgraduates than previously want to become academics.

Areas of consideration for improvement

Faculty structure and communication:

- Lot of variability across departments.
- Little or no communication between departments – staff and students.
- Silo departments with heads that are highly resistant to change.
- Significant differences between different degree programs.

Advanced Engineering stream:

- Positive in that it is interdisciplinary and uses team work, as well as using problem based learning and being evidence based.
- Some students feel that they miss out on some subjects (particularly mathematics) and discovered gaps in their learning for later subjects. Might be useful to look at where the gaps occur and provide help in these areas.

Assessment:

- Variability of tasks with different weightings across the schools.
- Clear variation in terms of articulating goals which are not clearly linked with assessment.
- Feedback to students variable – slippage between expectations of students and time of staff to complete, especially in the case of group work assessment.
- Students did not feel that tutorials were the right mechanism for feedback.
- Students want an indication of what assessment means.
- Some students are concerned that marks are awarded for ranking students, rather than for achieving a certain standard.
- Some students felt there was too much assessment; others that some units rely too heavily on one or two assessment tasks resulting in too much pressure for students.
- There are too many small units.

Integration:

- Vertical rather than horizontal.
- Need to think about possibility of changing structures. For example the Electrical and Information Engineering Department felt that they have more in common with the Faculty of Science than other Engineering departments. This may act as a lever for change within the Faculty.
- Useful to think about developing a professional practice stream to integrate core units. Include core/generic concepts with application for each discipline in the concurrent practice strand. Help students develop sense of what it is to be their type of engineer.
- Need to put together program to develop student flexibility if want to change direction – cannot change strands at the moment if they find they are in the wrong specialisation.

Benchmarking:

- Need to look at comparisons with other Go8 universities for trends in engineering education and curriculum.

Online learning:

- Need to develop principles on how to develop online learning.
- Students want consistency and to see what is relevant to their discipline.

Staff /student liaison committees:

- Students had no clear evidence that their complaints are responded to.
- Staff felt they were complaint sessions.
- Need to improve and set different parameters.
- Inconsistency across departments.

Communication:

- A need to improve communication between staff and students. One student commented that *“Given that they want students to learn communication skills, lecturers should learn them too.”*

Judyth Sachs
Chair, Review Team
Chair, Academic Board

29 May 2002

APPENDIX B: LIST OF SUPPLEMENTARY DOCUMENTATION FOR THE VISIT

1. reDESIGNing the USyd engineering EXPERIENCE. A proposal for the 2001 Teaching Improvement Fund.
2. Faculty Organisation chart
3. Faculty of Engineering profile: guide to the Faculty.
4. Course outline for Chemical Engineering Computations
5. 2001 Student Course Experience Questionnaire: Faculty of Engineering – answers to open questions.

APPENDIX C: FACULTY SELF-EVALUATION REPORT

Academic Quality Assurance Faculty of Engineering Self-Evaluation Report 2001

Introduction

The Faculty of Engineering is located within the College of Science and Technology. Its mission is to be the premier Engineering Faculty within Australia and in doing so be the first choice of undergraduate and postgraduate students, attract and retain top-quality academics and researchers and to be ranked among the World's best Engineering Faculties.

The Faculty consists of 2 schools and 2 departments that offer degree programs in a wide array of Engineering specialities, such as Aeronautical, Civil, Chemical, Electrical, Computer/Software, Mechanical, Mechatronic, Mechanical/Biomedical, and Telecommunications. Within each of these specialities students may choose from a range of streams to allow for further tailoring to suit their career aspirations and learning needs.

As part of the process of assuring the quality of the Faculty's degree programs, together with the teaching and learning within these programs a number of key mechanisms exist. These will be discussed in this report in response to the focus questions provided by the University. However, three are worthy of mention at the outset, being the Teaching and Learning Committee, the and the Faculty Teaching and Learning Plan.

The Teaching and Learning Committee is the Faculty's policy advisory group that provides guidance and feedback to the Faculty and its schools and departments with regard to teaching and learning issues within existing courses and degree programs. It provides a stimulus for the ongoing evolution and improvement of teaching and learning practices within the faculty.

The Undergraduate and Postgraduate Studies Committees have the role of vetting prospective courses within degree programs and ensuring that their learning aims and objectives, as well as their proposed teaching and learning strategies are consistent with degree programs, the expected standard of Faculty courses, and the professional accreditation responsibilities of the Faculty.

The Faculty Teaching and Learning Plan is the guiding document as to the direction of Teaching and Learning policy and practices. It is administered jointly by the Faculty and its schools and departments. It is overseen by the Teaching and Learning Committee to ensure that the teaching and learning development goals are achieved.

Self Evaluation Focus Questions

1. *How does the Faculty ensure that each course and unit has an appropriate set of aims and outcomes, clearly communicated to and understood by students, including generic as well as disciplinary skills?*
 - a. *Systems for informing students about course and unit expectations and ensuring that students understand them:*

The Faculty has a range of mechanisms in place to ensure that students are adequately informed about course and unit expectations. This information stems from the accreditation process and documentation (last compiled and submitted 9/2000) that the Faculty undertakes with the Institute of Engineers, Australia. The value of this documentation and the process that it requires is that the Faculty has to think carefully about all elements of its courses and units, and to articulate its aims, objectives, and expectations to an external audience of its peers.

The nature of the IE Aust. Accreditation is complementary to the existing processes that the Faculty undertakes within the university for the benefit of informing students. All units of study (UoS) are outlined in the Faculty handbook which is readily available to students.

The process of developing unit of study outlines, that are in turn made available to students is managed in differing ways, depending on whether the UoS is a new or existing one. New units are scrutinised by the Undergraduate or Postgraduate Studies committees to ensure that information given to students is complete and complies with university policy. The criteria for this include disciplinary relevance, and the compilation of course objectives and outcomes.

The Teaching and Learning (T&L) Committee is currently endeavouring to enhance existing UoS outlines in the Faculty. This is being done through an audit of existing UoS outlines, and a process of consultation and professional development with academics and ITL to improve the consistency and quality of information in existing UoS outlines by ensuring that they are compliant with the Institute of Teaching and Learning UoS template. The development of a Faculty template, consistent with the Institute of Teaching and Learning template aims to embody, and thus ensure compliance, with this aspect of university policy.

Ensuring student understanding of course and unit expectations is primarily managed by Faculty academics who articulate expectations to students. Academics encourage student questions and provide feedback to further enhance understanding. Monitoring of the T&L activities of academics at the undergraduate level is undertaken by the T&L Directors within the individual Faculty schools and departments. This involves T&L Directors being involved in monitoring student feedback on courses that becomes available as a result of course evaluations, and issues raised in staff-student liaison meetings.

b. Ways in which relations between generic and disciplinary skills in the curriculum are monitored.

The undergraduate and postgraduate studies committees and the individual schools/departments ensure that the student attributes required by the university of all its courses are included in the offerings of the Faculty. This is monitored when courses are proposed and when they are reviewed by departments. The review mechanisms throughout the Faculty are both internal, to ensure compliance with the University's policies, and external, to allow for the needs of industry and the profession to be actively considered.

The external professional peer review and consultation processes that are built into the Faculty's operations are paramount in the determination of the relationship between generic and disciplinary skills in the Engineering curriculum.

The accrediting professional body, IE Aust., has a comprehensive series of graduate skills attributes. The guidelines for these attributes are demonstrably built into the curriculum and as such are scrutinised as part of the professional accreditation process.

At the school and department level, industry review panels are in operation. These bodies meet at least annually to liaise as to the skills required by the industry of graduates and the feedback is

incorporated into the evolutionary development of individually UoS. At regular intervals, usually 5 years, thorough reviews of courses are undertaken in consultation, with input from these industry panels. Recommendations as to student skill development are incorporated into the respective curricula.

c. Methods for ensuring that courses and units of study enable students to achieve intended learning outcomes.

Both formal and informal methods exist to ensure that intended student learning outcomes are achieved. Student work is assessed against standards developed by individual academics that reflect the outcomes desired. Monitoring of this by academics allows judgements to be made as to the success in achieving learning outcomes, and for remediation to be undertaken where appropriate. Examiners meetings at the close of each academic year review student progression rates and note the extent of failure rates in UoS. Large failure rates become the subject of scrutiny and review. Feedback from both student UoS evaluations and industry review committees area also used to determine whether learning outcomes are being achieved. Informal mechanisms such as professional conversations among staff also take placed during staff meetings, staff-student liaison meetings and in regular Faculty T&L seminars allow for the discussion of the achievement of learning outcomes.

d. Methods for providing coherence between units of study and courses.

Coherence between UoS is attempted in a range of ways. The proposal of a new UoS involves questioning in the Undergraduate and Postgraduate Studies Committees, as to the ‘fit’ of such units within degree programs. Academics in existing courses are encouraged to clearly articulate to students the relationship between their UoS and others in the programs. To assist in this the T&L committee has raised the possibility of UoS mapping to aid in this process. Additionally, final year design courses across the Faculty are structured in such a way that skills and knowledge from across the range of UoS are integrated into the design process. The success of this strategy is monitored by the supervising academic, Heads of School/Department and Teaching and Learning Directors.

2. How does the Faculty ensure integration of research, including both disciplinary research and evidence about effective teaching and learning, into its undergraduate and postgraduate courses?

a. How are the links between current disciplinary research and the research expertise of staff and the curriculum managed:

The Faculty of Engineering has a proud tradition of research excellence and has been able to successfully blend this capability into the curriculum offered to students. A prominent example of this are the suite of Advanced Engineering courses, coordinated by the Dean.

The Advanced Engineering stream operates in all undergraduate years and is offered to high achieving students. These students have the opportunity to work in teams, with supervising academics on realistic engineering and innovation research problems, and to present the products of such research to a variety of audiences. These subjects are keenly sought after by students. Students feel that they are treated as junior colleagues and partners in academic enquiry and relish the reality and responsibility of this type of learning.

Elective UoS are offered to final year students. These electives are closely aligned to staff research interests and as such students benefit from the depth of research knowledge and experience of staff in these UoS. Additionally, final year research theses are a blend of student interest and staff research expertise. Students work with staff in such a way to confirm, complement or extend aspects of academic research.

b. How are links between developments in the theory and practice of university teaching and learning and the curriculum managed:

The links between T&L theory and practice and the curriculum are managed in a multi-layered fashion in an attempt to enhance the activity of academics in T&L research and to give the Faculty members adequate opportunity to be exposed to developments in T&L theory and practice. The success of these links is monitored through feedback from participants that is both formal and informal. These links assist in raising the profile of teaching within the Faculty, and facilitate the exchange of ideas about T&L and the adoption of desirable practice.

The Teaching and Learning Committee holds regular open meetings to which any Faculty member is welcome to attend. These meetings feature spirited debate concerning T&L policy, practice and philosophy. This cross fertilisation of views is further developed through regular T&L seminars and Teaching Advances.

Seminars are held approximately every six weeks and are given by guest external presenters, Faculty members and sometimes students. They are generally well attended by Faculty members. The Teaching Advance is held annually in the guise of a half-day workshop and is open to all Faculty academics. Workshop themes are decided by the Teaching and Learning Committee, to address a Faculty-wide issue, and are either facilitated by T&L members or academics from ITL.

Links with ITL are gainfully used by the Faculty to enhance exposure to developments in T&L theory and practice. ITL academics attend all Faculty Teaching and Learning Committee meetings and their input is actively sought. As previously stated these links are the key to ITL input into T&L events held in the Faculty.

The Faculty encourages academics to undertake T&L research, and to publicise innovation in T&L that has been achieved. This is done through the use of the annual Dean's Awards for Teaching, the fostering of links with, and conference presentation at, the Australian Association for Engineering Education, encouragement of submissions for Teaching Improvement Fund (TIF) grants, and encouragement for university T&L showcase selection.

3. How does the Faculty ensure that student assessment is effective and contributes to learning and that the assessment process is well understood by students?

a. Methods for ensuring that assessment enables students to achieve intended learning outcomes.

A variety of assessment regimes are used in the Faculty to ensure that assessment reflects student learning outcomes. The assessment regimes selected assist in focusing student learning by giving the outcomes greater definition and clarity as the work is being undertaken. In most UoS a mixed mode of assessment is undertaken, covering both examination and student assignments. Assignment style is determined by the nature of the content knowledge, and by a desire to allow students with differing learning styles an opportunity to display their talent.

b. Methods for ensuring that assessment practices and standards are fair and equitable.

Assessment is first determined at the appropriate studies committee when a UoS is proposed. This ensures that the workload, and the assessment strategies are appropriate for the course. Once the UoS has been put into place the primary method for ensuring that assessment practices are fair and equitable lie with the quality assurance process in the production of exams, where individual academics engage in peer review of exam questions, instructions and solutions as they are being set.

- c. Methods for ensuring that assessment provides students with prompt and effective feedback on their progress.*

Blockages in procuring student feedback from academics are highlighted at staff-student liaison meetings that are held in schools and departments on a semester basis. This is dealt with by respective T&L Directors and their respective Heads of School/Department.

However the ability of the Faculty academics to offer appropriate feedback has been questioned in the 2001 SCEQ results and this is obviously an area for further attention. Given that this has been highlighted the quality processes with the Faculty will ensure that attention is given to this issue through the Teaching and Learning Committee, Departmental Advisory committee (Heads of School/Department and the Dean), and through staff development mechanisms such as the Teaching Advance.

- d. How information from assessments is used to improve teaching and learning.*

Assessments and their results highlight areas for academic staff to highlight to students in terms of knowledge deficiencies. These areas are then available for staff and students to undertake remedial learning.

This is particularly the case for 1st year students who undergo mid-semester assessments with the results used to indicate students at risk. Identified students at risk of failure are then counselled by year advisors and Heads of School/Department as to their academic performance. This counselling seeks to clarify the underlying causes of poor performance and to assist the student to rectify this situation either personally or through referral to appropriate academic staff and University support services.

- e. Methods for ensuring that students understand assessment processes*

Ensuring student understanding of assessment processes is managed by Faculty academics who articulate expectations to students. This is often done in tandem with the clarification of UoS expectations. Academics encourage student questions and provide feedback to further enhance understanding. This is monitored by Heads of School/Department, and the T&L Directors. This situation is further monitored through the staff-student liaison process.

- 4. How does the Faculty ensure the quality of its teaching and recognise good teaching?*

- a. Methods for monitoring the breadth, depth, pace, variety and challenges in teaching.*

A range of mechanisms exist for this to take place. UoS evaluations are administered at the conclusion of formal classes. These are both departmental, or ITL derived instruments and are reviewed by the T&L Directors and Heads of schools/department to ensure that quality teaching occurs. Additionally curriculum review committees, and the staff-student liaison process are valuable sources of information in these areas. Recognition for success in overcoming some of the challenges of T&L are implicit in the Dean's Awards. Likewise student-pollled awards give some indication of this.

- b. How decisions about the selection of particular teaching strategies in relation to student learning outcomes are monitored.*

These decisions are primarily made by individual academics, and are subject to informal peer review through professional conversations. Decisions concerning T&L strategies are reviewed formally during academic promotions. At this time academics must outline their teaching strategies through the development and critique of their teaching portfolios.

c. Methods used to enhance the quality of teaching, including staff development, mentoring and peer review.

All staff new to Faculty schools and departments must participate in the Institute of Teaching and Learning three-day academic teaching introductory course. Following this preparatory experience academics are encouraged to pursue further formal T&L training through participation in the Institute of Teaching and Learning Graduate Certificate in Higher Education Teaching. Within Schools/Departments mentoring and peer review of T&L is primarily the role of the T&L Director, with support from Heads and senior academic staff.

Additionally, the Teaching and Learning Committee sanctioned T&L seminars and Teaching Advance are offered to improve the level of staff development in T&L issues.

d. How the Faculty supports, recognises and rewards good teaching

As previously mentioned the Faculty supports good teaching through its annual awards. These awards have a travel grant attached to them to allow recipients to attend international T&L conferences. The academic promotion process also places a greater emphasis on T&L criteria and as such the Faculty uses promotion to deliberately encourage and reward professional teaching.

5. What arrangements does the Faculty have in place to monitor and support student progression?

a. Arrangements for identifying students at risk of non-completion or failure and the processes used to intervene in these cases.

Student progression is monitored in a range of ways.

Students are not permitted to over enrol in any year of their degree program, with 54 credits being the maximum allowable. This has the effect of ensuring that students are not 'spread too thinly' in their studies.

Student year advisors monitor academic progress and initiate both informal and formal mechanisms to maximise student progression. A poor performing student may be asked to explain their situation, through informal conversation to alert the student to their potential progression problem. Academics will counsel students and direct them to university support services where appropriate so as to mitigate the chances of non-completion. This is particularly the case with 1st years. In extreme cases a student may be asked to 'show cause' as to why their progression should be allowed. The reasons are reviewed, in a supportive fashion, by the Undergraduate Studies Committee who show every consideration to the students needs.

b. The use of learning resources and academic support to assist student learning outcomes.

To facilitate student progression a number of support mechanisms are made available to the students both through the Faculty and the university.

Students with specific learning difficulties are encouraged to avail themselves of the services of the Learning Assistance Centre and the Mathematics Learning Centre. Additionally report writing and

communications classes are provided in schools and departments to help ensure students gain the skills necessary to complete their studies.

6. *How does the Faculty ensure the quality of research supervision and training?*

a. *Arrangements for ensuring high standards of supervision.*

The Faculty's tradition and culture of excellence in research ensures that a comprehensive range of mechanisms are in place to ensure high standards of research supervision.

All postgraduate issues are dealt with through the postgraduate studies committee, which is chaired by the Associated Dean for Postgraduate Studies (also Director of the Graduate School of Engineering). Postgraduate issues are also monitored by the Dean and school/department Heads who liaise regularly with postgraduates and their representatives, to ensure that the University's policies on supervision are adhered to.

All research students are monitored by two supervisors to ensure adequate support and communications are available. The structure of research with students often working in teams on differing aspects of the same project also acts to develop support mechanisms for individual students.

Additionally, the Faculty also provides a Postgraduate Induction and Leadership Program. These programs assist the transition of students to the postgraduate research process, and to later assist students to better manage research and supervisory arrangements. Both of these programs aim to maximise the effectiveness of research students at key stages of their postgraduate experience. These programs are well regarded by participating students.

b. *Mechanism in place for ensuring effective completion and retention.*

Research students are subject to an annual formal review of progress. This review is handled by a committee of three academics, other than their supervisors. This is to enable free and frank discussion and the illumination of problem areas in the supervisory relationship. A process to act on the results of these reviews is in place with the Schools/Departments, and is monitored by the Associate Dean (Postgraduate).

c. *How the research climate for students and the provision of resources to support research are monitored.*

Research students are able to access relatively generous grants to provide for equipment, resources and conference travel. These are monitored by supervisors and through the review process.

d. *The use of student and/or graduate views to improve the experiences of research higher degree students*

The review process provides scope for students to feedback their views to allow for improvement of the research experience.

7. *What are the Faculty's arrangements for evaluation and quality improvement, including the used of student and graduate feedback and other performance indicator data to monitor and enhance performance? How does it recognise good teaching?*

a. *Mechanisms in place for collecting and acting on the results of student and graduate feedback on teaching, units of study and courses*

All UoS are evaluated every year. Responses from evaluations are interpreted by academic staff and reported to T&L Directors and Heads, where poor feedback is acted upon. Results of the SCEQ are reported to the Dean, Heads and the T&L Committee for identification of areas of issues. SCEQ information is addressed by and through the T&L committee and the Departmental Advisory Committee. Further feedback is processed from the staff-student liaison meetings to allow for the improvement in UoS and in teaching performance.

b. Arrangements for applying university performance indicator data to improving educational quality.

Performance indicator data is provided to the Dean, Heads, T&L Directors and the Teaching and Learning Committee, and is disseminated to academics by them. This data is examined to determine trends and for action to be taken in UoS. This is monitored by the heads of schools/departments and the T&L directors.

c. Consistency between university requirements and Faculty QA and improvement mechanisms.

The Teaching and Learning Committee (through its Teaching and Learning Plan) and the Undergraduate and Postgraduate Studies Committee ensure the Faculty follows university guidelines and policies.

d. Methods used to monitor progress towards goals specified in the Faculty's Teaching and Learning Plan

The Faculty Teaching and Learning Plan has within it both responsibility and timeframes for action. These act as indicators for progress in achieving the desired outcomes of the Teaching and Learning Plan. Periodic reviews are carried out by the Teaching and Learning Committee and the T&L Directors to gauge Faculty performance in achieving outcomes and to highlight areas of success and concern.

Supporting documentation:

Faculty Teaching and Learning Plan 2000-2004
IE Aust Accreditation Application 9/2000
Faculty of Engineering Handbook 2001

APPENDIX C: FACULTY TEACHING AND LEARNING PLAN

FACULTY OF ENGINEERING

STRATEGIC PLAN FOR TEACHING AND LEARNING 2000-2004

PERFORMANCE WRT PLAN

MISSION

To be the premier Engineering Faculty in Australia, to be the first choice for undergraduate and postgraduate students, to attract the best quality academic staff and research personnel, and to be ranked and benchmarked with the World's best engineering faculties.

We are on the way to meeting these goals and anticipate meeting them at least by the end of this 5 year period. International benchmarking with universities such as The University of Michigan demonstrates research and teaching and learning outcomes of world standard.

BACKGROUND

The Faculty of Engineering is located in the College of Sciences and Technology, allowing optimisation of synergies with the other faculties in the college, particularly the Faculty of Science. In 2001 the student load in the Faculty included about 1400 undergraduate EFTSU, 30 postgraduate coursework EFTSU and 180 research EFTSU. The Faculty comprises 237 effective full-time staff of whom 94 are academic staff and 22 are research-only staff.

STRENGTHS

As a result of major restructuring in our programs over the last three years, the Faculty of Engineering offers coursework degrees in the following: Bachelor of Engineering (BE); Master of Engineering Studies (MES); Master of Engineering Practice (MEP); Master of Environmental Engineering Practice (MEEP); Master of Mechatronic Engineering (MmtE); and Master of Project Management (MPM).

The bachelor of Engineering Degree can be taken in one of the following specialisations: Aeronautical Engineering; Chemical Engineering; Civil Engineering; Project Engineering and Management (Civil); Mechanical Engineering; Mechanical (Biomedical) Engineering; Mechatronic Engineering; Electrical Engineering; Computer Engineering; Telecommunications Engineering; and Software Engineering.

The BE degree can also be taken in combination with Science, Commerce, Arts or Law. Further combined degrees will be offered in the near future with Music, Medical Science and Architecture.

Within each specialisation there are advanced streams as follows:-

- 4 streams in Civil Engineering: Environmental; Construction; Geotechnical; Structural
- 4 streams in Chemical Engineering: Process Systems; Bioprocess; Environmental; Management
- 2 streams in Mechanical Engineering: Biomedical; Management
- 2 streams in Aeronautical Engineering: Space; Management
- 1 stream in Electrical Engineering: Management

The Management stream in each degree is a Faculty run stream, avoiding duplication in teaching and allowing for interdisciplinary focus. The specialist degrees and streams together with the availability of combined degrees have proved to be one of the Faculty's major strengths in attracting outstanding school leavers. Another strength in this area have been the introduction of the Advanced Engineering Stream which introduces engineering project work to high achieving 1st year students in semester 1 of their first year. The numbers in this program are increasing with each year (1998 - 24; 1999 - 26; 2000 - 54). This program has been successful in attracting the brightest students to engineering at Sydney University.

The faculty has focussed heavily on teaching and learning over the last few years. We have had three "Teaching Advances", one in 1998, 1999 and 2001. At each we were able to highlight and plan aspects of our undergraduate programs which would strengthen the teaching and learning in the faculty. Outcomes from the 1998 Advance included:-

- development of the Advanced Engineering Program throughout the four years of the engineering courses
- introduction of more group and project work into the curricula
- decision to remove course material to enable students to have more time to think and to learn generic skills
- emphasis on "deep approaches to learning" - ensuring our students understand the basics very well, giving them the skills and motivation to pick up more specialised material on their own.

The outcomes of the 1999 teaching advance were the emergence of a set of principles for an Engineering approach to Flexible Learning. These were to:-

- discover and better understand student learning needs, particularly around current learning arrangements and student-centred learning
- utilise a variety of learning strategies and assessment regimes to cater for the range of student learning styles and assessment regime
- develop an appropriate mix of face-to-face and IT approaches to course delivery

- develop into a learning community through the further development of an academic and professional culture aimed at improving the initial professional preparation of students
- improve the integration of knowledge and skills across courses, both with the Faculty, and service-teaching providers
- ensure that all moves to Flexible Learning have as their goals the demonstrable improvement of student learning outcomes.

The Teaching advance in 2001 worked closely with the Institute for T&L to examine the development of Unit of Study outlines. In doing so the construction of outcomes statements that complemented existing UoS objective statements were worked on. Additionally the concept of grade descriptors was introduced to further facilitate efforts on the introduction of criteria-based assessment. The major outcome from this Advance was the development of Unit of Study Outlines for Semester 2, 2001 and Semester 1, 2002 Units of Study.

WEAKNESSES

The major obstacles to improving teaching and learning have been the declining funding base precluding the introduction of major resource intensive initiatives; and the decline in the number of students choosing physical sciences at HSC level leading to fewer students being well equipped to study Engineering.

One of the current weaknesses resulting from the degree structure is that requirements and teaching for the BE degree are done relatively independently by departments running the specialisations. This has led to some duplication of teaching effort.

Numbers of students in the Master's programme have dropped dramatically as a result of fees being introduced as some courses may not be seen as financially benefiting students directly.

The Faculty has also seen a decline in Research Student numbers due to falling staff numbers.

OPPORTUNITIES

Over the last few years, the Faculty of Engineering has been concentrating on improving teaching quality and ensuring our programs are attractive to incoming students together with adequate marketing to lift the profile in the community. Whilst we have seen considerable success, this needs to continue over the next 5 years to ensure the undergraduate experience in Engineering is the best it can be.

Restructuring the undergraduate programs together with offering combined degrees and the advanced engineering program have seen our entry UAI cut-offs increase from (TER =61 in 1997) to UAIs ranging from 80 to 99.1.

The SCEQ data for Engineering offer major challenges in turning around student assessment of our teaching. Since only 26% are in agreement on the Good Teaching Scale and 53% disagree that their workload is appropriate, the Faculty must implement strategies to improve these statistics and the overall satisfaction (-9.2 compared to the national average) in our courses.

THREATS

The Faculty must continue to work within diminishing government funding, together with aging infrastructure. Additionally the state of New South Wales has the highest ratio of University engineering places per capita in the country. We must maintain our competitive advantage by the quality of programs we offer.

Master's courses face increasing competition from other Universities in the area, and this is partly due to their cheaper fee structures, and a more varied offering of Units of Study.

GOALS

The major goal related to teaching quality in the University's Strategic Plan is to:

"The University of Sydney will maintain and enhance its position as an outstanding provider of high quality undergraduate and postgraduate teaching, both in Australia and Internationally".

In line with this goal, The Faculty of Engineering's Strategic Plan has the goal:-

"produce graduates with engineering, technical and generic skills which are recognised nationally and internationally as being of the highest calibre"

This can be achieved through a number of complementary strategic initiatives, which are part of the University's objectives.

OBJECTIVE 1: Attract, foster and graduate an increasing proportion of the most intellectually able students

The Faculty's reputation as a provider of leaders in the Engineering profession relies on the fact that we attract good high school leavers and also that we educate them to a high standard. We believe that our education is enhanced by attracting the best students into our courses. Further we will be able to attract students by providing a better experience to our undergraduates, particularly in first year, as our reputation improves.

ONGOING STRATEGIES:

1.1 Continue to provide specialist degree paths and combined degrees whilst maintaining flexibility of choice [indicator: intake numbers and UAI cut-offs] (*2 new degrees to be in place by 2001*)

PERFORMANCE COMPLETED

The new E-Commerce path has been introduced, giving 4 specialist paths each with 3 combined degrees.

The new combined Engineering/Medical Science degree took its first students in 2001

1.2 Improve the first year experience by increasing opportunities for project work, introducing more engineering content into 1st year, expand the Parent Night concept to other Departments [indicators: number of activities for 1st years and parents; amount of project work in Year 1, SCEQ] (*project and group work to be in place in all departments for year 1 students by 2002; Parent Night or equivalent in all departments by 2002*)

Parent night has been extended to 2 departments, whilst other departments have 1st year

social functions instead. All departments have some component of group work in year 1. There is a major Teaching improvement project underway investigating how to increase the design component also.

NEW STRATEGIES:

1.3 Actively consider alternatives to large lectures, such as small group teaching, and where large lectures remain, encourage the introduction of more interactive student centred teaching methods [indicators: size of lectures; SCEQ, documented instances of new interactive teaching methods] (*changes to 20% of units of study with large group lectures by 2003*)

All engineering 1st year courses are run in parallel streams and contain small group teaching in groups.

1.4 Mentoring by later year students and personal advisors; models for peer support in other faculties will be investigated to see if they are appropriate for Engineering [indicators: number of mentoring schemes introduced, SCEQ] (*mentoring schemes in all departments by 2003*)

Working models are still being to be investigated in several departments.

In Civil Engineering the students have set up Sydney University Civil Engineers (SUCE) society of which increased socialisation across years (and with staff) is a major goal.

Separate societies already exist in other Departments.

1.5 In order to attract high quality students to Master's programs, efforts will be made to advise our own undergraduates of the opportunities to carry out postgraduate study. Cooperation with Universities in China is also being discussed as a way of obtaining more students and students of high quality, especially in the Project Management area.

OBJECTIVE 2: Foster continuous improvement in quality and continuous innovation in teaching and learning, supported by appropriate resources and adequate recognition

The quality of teaching and learning depends on the processes and resources available as well as the motivation and initiative shown by academic staff. The Faculty is committed to ensuring that all these aspects of quality teaching and learning are met in its programs.

ONGOING STRATEGIES:

2.1 Ensure all Departments have a Director of Undergraduate Studies and a Director of Teaching & Learning with well-defined responsibilities and accountabilities, and that these work with the Head of Department to develop and implement an operational Plan for Teaching and Learning in line with the Faculty and University Plans. [indicators: structures and plans in place] (*in place by 2001*)

Directors of Undergraduate Studies and Directors for Teaching & Learning have been appointed in all Departments. Departmental Plans are yet to be completed.

2.2 Ensure all departments have Staff/student liaison meetings at least every Semester and follow up as required. Continue to conduct qualitative research on Teaching and Learning issues to ensure that the Faculty is better informed of student's views of their learning experiences and to complement the information delivered in quantitative performance measures such as the SCEQ. [indicators: processes in place, SCEQ] (*in place by 2000*)

Completed. Staff student liaison meetings are formally set-up in all Departments. Action on previous items are reported at next meeting.

2.3 Enable students to take responsibility for their own learning and continue to head off poor performance by early review and warning systems and mentoring [indicators: SCEQ, progression rates] (*review processes in place by 2001*)

Early review and warning systems are in place. Students at risk are contacted and helped. Mentoring systems are implemented in some departments.

Students are encouraged to take responsibility in so far as contact hours are being reduced and examination processes, systems and rules are clearly articulated to students well in advance.

2.4 Continue to reward and encourage good teaching by the Dean's Awards for Teaching Excellence, hold annual Teaching Advances, and Teaching and Learning seminars to ensure that staff have available avenues to discuss teaching and learning issues and innovations. Provide incentives to staff to attend Teaching and Learning Seminars by making them rewarding both socially and in terms of transfer of teaching experiences. [indicators: number and diversity of recipients, teaching and learning seminars, outcomes from Teaching Advances] (*in place in 2000*)

Completed and in place.

2.5 Continue to embark on Flexible Learning initiatives with use of the WEB as a resource base as well as development of Engineering Laboratory Simulations and Internet Learning Opportunities. [indicators: documented actions regarding the availability of lecture and tutorial material on the WEB, new IT based resources] (*3 major initiatives in place by 2003*)

All courses use the web in varying degrees, with web-based assessment, chat rooms, simulations, tutorials and information distribution. Major initiatives have been in Project Management and in Process Control.

The web based delivery of Master's degrees, Diplomas and Certificates in Project Management will be continued and new markets will be developed. The most promising areas are China, Hong Kong and Singapore.

2.6 Continue to upgrade facilities to provide appropriate teaching spaces with up to date computer and audio-visual facilities, and manage Faculty facilities to respond to changing needs with regards to requirements for new methodologies of teaching [indicators: condition of lecture theatres, flat teaching spaces available, SCEQ] (*refurbishment of Faculty lecture theatres by 2000; of departmental lecture theatres by 2004; redevelopment of faculty workstation laboratory by 2001*)

The PNR Lecture theatres have been refurbished (2000) . A new computer Lab was opened in AMME in 2001 and Civil Engineering is upgrading its departmental computer laboratory with new computers.

NEW STRATEGIES

2.7 Standardise Unit of Study Outlines across the Faculty, ensuring each unit of study has learning outcomes and assessment requirements outlined at front end of course, and that these are made explicit to the students, and that they include criteria in line with the University policy on criteria-based assessment [indicators: no. of Unit of Study Outlines available on WEB, SCEQ] (*90% of unit of study outlines on WEB by 2003*)

Some departments have outlines on web for all Units of Study (AMME & EIE) whilst in others outlines are handed out. 50% of Unit of Study Outlines will be on the faculty Website with hotlinks where appropriate by the end of 2001.

2.8 Encourage teaching staff to review course content and focus more on teaching processes to ensure a student-centred, inclusive learning environment for students of diverse backgrounds and come to agreement with students that overall performance is a two-way contract dependent on both the Faculty's teaching and their own learning. Provide teaching relief for at least 1 academic in each department for 1 semester each year to enable them to work, in collaboration with ITL, on a teaching development project. [indicators: SCEQ, progression rates] *(20% of academic staff to have had teaching relief by 2005)*

No staff have yet requested teaching relief.

2.9 Encourage all new staff, by providing teaching relief, to undertake ITL training courses, including the 'New University Teachers' Program, and to develop their own strategies and methodologies for continuous improvement in teaching, and encourage staff to take teaching sabbaticals either at ITL or abroad to spend time developing teaching methods [indicators: ITL courses taken, teaching sabbaticals taken, participation in Faculty Teaching and Learning Committee activities] *(90% of new staff to attend NUT program by 2003)*

Conditions of appointment of all new staff require attendance at ITL training course. Some New staff have tried but been unable to attend New Teachers program because the course has been full. Apparently problems with communication re places with ITL.

OBJECTIVE 3: Support students in developing Engineering and the University's generic attributes

The University has identified generic skills appropriate for its graduates. Similarly the Institution of Engineers, Australia has suggested those appropriate for graduating engineers. The Faculty must ensure that appropriate generic skills are identified and that our graduates gain these in order to be a leader in engineering education.

ONGOING STRATEGIES

3.1 Articulate generic attributes appropriate to engineering graduates in line with University's generic attributes and those identified by The Institution of Engineers [indicator: appropriate set of generic attributes for all courses] *(in place by 2001)*

Departments have been discussing generic attributes with varying degrees of agreement.

3.2 Build generic skills into the learning outcomes for each unit of study, ensuring both curriculum content and assessment practices contribute to the development of these skills [indicators: learning outcomes in study outlines on WEB] (*50% of unit of study outlines containing generic skills by 2003*)

In progress. Generic attributes identified in UoS outlines.

In Chemical Engineering, 'Generalist exams' for first-years started in 2001. From 2002, the first of these exams (there are two) will also look at English reading and comprehension skills - aims to pick up students who need remedial work here. Planned to extend such generalist exam testing to second year students in 2002.

NEW STRATEGIES

3.3 Implement testing of students' generic skills at entry and graduation to monitor progress in this area [indicator: generic skills monitoring] (*in place by 2003*)

OBJECTIVE 4: Provide curricula that are informed by current research, scholarship and professional practice and result in graduates well equipped to contribute to the Engineering profession

Our graduates are in full employment generally within 6 month of graduation. It is important that our curricula allow our graduates to make significant contributions to industry both immediately and in the long term in order to rise to leadership positions in the profession

ONGOING STRATEGIES:

4.1 Ensure employers are happy with quality of our graduates by ensuring each department has an industry curriculum advisory committee. This will be achieved by an incremental and iterative process of discussion and feedback. [indicators: no. of industrial advisory committees, employer surveys] (*curriculum advisory committees in place by 2001*)

Curriculum advisory committees in place in 3 Departments. The AMME Foundation is currently being developed.

4.2 Establish meaningful exchange programs and ensure our students are benchmarked against highly regarded international schools [indicators: benchmarking results] (*5% of students to go on exchange by 2005*)

Several Meaningful exchange programs have been established. Currently approximately 1.5% of students are on exchange with highly regarded international institutions.

NEW STRATEGIES

4.3 Survey graduates and employers 5 years after graduation to assess whether their degrees have equipped them well for their career development [indicator: 5 year out CEQ] (*employer survey developed and administered by (2002)*)

4.4 Programmes will be put in place to attract more students of higher quality into the Master's degree courses. New initiatives are a Certificate in Greenhouse Gas Emissions, new courses in Automation in field Robotics and the participation in the Master of Information Technology degree (in conjunction with Science) and the Master of Information Systems degree (in conjunction with the Faculties of Science and Commerce and Business). Once the MIT and MIS degrees are established, the MES degree will be phased out in Electrical and Information Engineering. The introduction of the Master of Business and Technology degree (jointly with the Business School) and cooperation with AGSEI (Australian Graduate School for Engineering Innovation) are projects currently being considered. Recruitment of students from China into the Master of Project Management degree as well as the MES degree are also strategies for increasing student numbers.

**FACULTY OF ENGINEERING OPERATIONAL PLAN
FOR TEACHING AND LEARNING 2000-2001**

OBJECTIVE 1: Attract, foster and graduate an increasing proportion of the most intellectually able students

TARGETS: Increase UAI cut-offs so that most courses have cut-offs >90; Increase % students eligible to join Advanced Engineering Program, i.e. UAI >98; Increase % female students

STRATEGY 1.1: Continue to provide specialist degree paths and combined degrees whilst maintaining flexibility of choice

Operational Plan: Develop combined degrees: Engineering/Medical Science and specialisations in eCommerce in the combined Engineering/Commerce.

Timing: Planned during 2000, all new degrees to be in place by 2001

Responsibility: Associate Dean for Undergraduate Studies, Committee for Undergraduate Studies

Performance: Completed

STRATEGY 1.2: Actively consider alternatives to large lectures, such as small group teaching, and where large lectures remain, encourage the introduction of more interactive student centered teaching methods

Operational Plan: Propose trials of different teaching methods by holding teaching and learning seminars and encouraging staff to discuss methods that have been successful for them. These seminars are social as well as informative occasions with lunch provided in order to encourage staff to attend. Begin discussions with students about their experiences with group work and what they think about alternatives to large lecture classes. The Faculty will continue to work with ITL in staff development through seminars and workshops.

Timing: At least 6 Teaching and learning Seminars and 5 focus group discussions to be completed by end 2000. Alternatives to large lectures be trialled in at least three Units of Study in 2001.

Responsibility: Chair, Teaching and Learning Committee, Directors of Undergraduate Studies.

Performance: Partially Completed

OBJECTIVE 2: Foster continuous improvement in quality and continuous innovation in teaching and learning, supported by appropriate resources and adequate recognition

TARGETS: Professional culture; Rewards for good practice; Improve Student feedback and CEQ results; Improve Retention Rates; Improve Progression Rates; Introduction of Criteria Based Assessment

STRATEGY 2.1: Ensure all Departments have a Director of Undergraduate Studies and a Director for Teaching & Learning with well-defined responsibilities and accountabilities, and that these work with the Head of Department to develop and implement an operational Plan for Teaching and Learning in line with the Faculty and University Plans

Operational Plan: Appoint Director for Undergraduate Studies for each Department with assigned responsibilities and accountabilities

Timing: In place in all departments by end 2000

Responsibility: Dean, Heads of Departments

Performance: Completed

STRATEGY 2.2: Enable students to take responsibility for their own learning and continue to head off poor performance by early review and warning systems and mentoring

Operational Plan: Come to agreement with students in 1st year that they must take responsibility for their own learning. Monitor results through diagnostic assessments by mid Semester 1 and Semester 1 Examinations and review students at risk of failure, ensuring that these students are made aware of the risks they are facing and given support for improvement.

Timing: Review process in place in 2000, mid-semester reviews in place 2001

Responsibility: Heads of Departments, 1st Year Advisers

Performance: Partially Completed

STRATEGY 2.3: Continue to embark on Flexible Learning initiatives with use of the WEB as a resource base as well as development of Engineering Laboratory Simulations and Internet Learning Opportunities.

Operational Plan: Invest in the development of a Virtual Faculty of Engineering on the internet through which Laboratory experiments can be conducted by distance education. The development is an extension of the existing modules in Process Systems

Engineering in the Department of Chemical Engineering. Further development of the PMOutreach program to cover Project Management across all engineering disciplines will also be carried out.

Timing: PMOutreach expanded to other engineering disciplines by end 2000. Virtual Laboratory concept developed throughout 2000/2001. Chemical Engineering component complete by June 2001

Responsibility: Associate Dean for Undergraduate Studies, PM coordinating group, Virtual Laboratory Coordinating Group

Performance: Chemical Engineering component completed.

STRATEGY 2.4 Standardise Unit of Study Outlines across the Faculty, ensuring each unit of study has learning outcomes and assessment requirements outlined at front end of course, and that these are made explicit to the students, and that they include criteria in line with the University policy on criteria-based assessment

Operational Plan: Develop a standard unit of study outline for all units of study in the Faculty. Ensure that the outline contains learning outcomes with respect to generic attributes as well as unit of study specific material. Hold seminars on criteria-based assessment to enable staff to set appropriate criteria and to ensure these are in the unit of study outlines and available on the WEB.

Timing: Standard unit of study outline to be developed by end 2000. Standard unit of study outlines for 50% of units of study in the Faculty to be placed on WEB by end 2001

Responsibility: Teaching and Learning Committee, Heads of Department, Undergraduate Studies Coordinators

Performance: Outlines completed or on Web: not all standardised.

OBJECTIVE 3 Support students in developing Engineering and the University's generic attributes

TARGETS: Appropriate generic attributes: Generic attributes built into all Units of Study

STRATEGY 3.1:

Articulate generic attributes appropriate to engineering graduates in line with University's generic attributes and those identified by The Institution of Engineers

Operational Plan: Initiate Departmental discussions on the appropriateness of the University and Institution generic attributes for each course.

Timing: Departments to have identified appropriate generic attributes by end 2001

Responsibility: Teaching and Learning Committee, Heads of Department, Undergraduate Studies Coordinators

Performance: Partially completed

STRATEGY 3.2: Implement testing of students' generic skills at entry and graduation to monitor progress in this area

Operational Plan Work with PVC (Teaching & Learning) to allow our students to be samples for testing generic assessment techniques

Timing: during 2000/2001

Responsibility: Associate Dean, Undergraduate Studies; Teaching and Learning Committee

Performance: Implemented in one department

OBJECTIVE 4: Provide curricula that are informed by current research, scholarship and professional practice and result in graduates well equipped to contribute to the Engineering profession

TARGETS: Ensure graduates obtain the jobs they want; Improvement in CEQ and GD surveys; Feedback surveys from employers

STRATEGY 4.1: Ensure employers are happy with quality of our graduates by ensuring each department has an industry curriculum advisory committee

Operational Plan: Work with Foundations to ensure each has a curriculum advisory committee, actively engaged in feedback with Departments. Establish a Foundation for Aerospace, Mechanical and Mechatronics Engineering

Timing: Curriculum Advisory Committees to be established by end 2000. Foundation for Aerospace, Mechanical and Mechatronics Engineering to be established by end 2001

Responsibility: Heads of Department, Directors of Foundations

Performance: Partially completed: on track

STRATEGY 4.2 Establish meaningful exchange programs and ensure our students are benchmarked against highly regarded international schools

Operational Plan: Develop a benchmarking exercise with the College of Engineering, University of Michigan, including exchange of statistics and examination papers. Encourage staff and student visits and exchanges.

Timing: Benchmarking to be complete by end 2001

Responsibility: Dean, Heads of Department

Performance: Commenced one department well on track

STRATEGY 4.3 Survey graduates and employers 5 years after graduation to assess whether their degrees have equipped them well for their career development

Operational Plan: Develop; in collaboration with ITL staff a CEQ type survey to be sent to graduates five years after completion of their degrees. This will require the update of our graduate database to ensure they can be found at the right time.

Timing: Questionnaire to be developed by June 2001, sent by end 2001

Responsibility: Heads of Department, Directors of Undergraduate Studies

Performance: Commenced but still need to develop Faculty-wide questionnaire.