CONFIDENTIAL

ENGINEERS AUSTRALIA

ENGINEERS AUSTRALIA
AUSTRALIAN ENGINEERING ACCREDITATION CENTRE

CONSIDERATION OF UNDERGRADUATE PROGRAMS LEADING TO THE

BACHELOR OF ENGINEERING

implemented in the

FACULTY OF ENGINEERING, COMPUTER AND MATHEMATICAL SCIENCES

at the

THE UNIVERSITY OF ADELAIDE

at the North Terrace Adelaide Campus

REPORT OF ACCREDITATION VISIT

15-16 May, 2007

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1 EXECUTIVE SUMMARY

This document reports on the consideration of Bachelor of Engineering programs implemented at The University of Adelaide. This scheduled general review accreditation visit followed the previous general review of programs conducted in September of 2001.

The report has been prepared by an Engineers Australia evaluation panel as follows:

1.1 Visiting team

Disciplines of Focus	Panel Members
Mechanical Engineering Mechatronic Engineering	**CHAIR** Professor Mike Cardew Hall Head Faculty of Engineering and Information Technology The Australian National University E: Michael.Cardew-Hall@anu.edu.au
Aerospace Engineering	**(Representing the Royal Aeronautical Society)** Mr Phiillip Campbell Air Systems Manager Echidna Project BAE Systems E: pcampbel56@yahoo.com.au
Automotive Engineering Mechanical Engineering	Professor Simon Watkins Automotive Engineering Mechanical and Manufacturing Engineering, RMIT University, E: simon@rmit.edu.au
Petroleum Engineering	**(Representing the Society of Petroleum Engineers)** Graham Bunn BSc Hons, ARCS Chief Petroleum Engineer Nexus Energy Ltd E: gbunn@nxs.com.au
Chemical Engineering (Pharmaceutical Engineering)	Associate Professor Ming Ang Department of Chemical Engineering Curtin University of Technology E: M.Ang@curtin.edu.au
Civil and Structural Engineering (Mining Engineering)	Professor John Wilson FIEAust CPEng, NPER-2005 Professor of Civil Engineering and Deputy Dean Faculty of Engineering and Industrial Science Swinburne University of Technology E: jwilson@swin.edu.au
Civil and Environmental Engineering	Mr Paul Mitchell FIEAust, CPEng Development Engineer Whittlesea City Council E; paulmitchell@whittlesea.vic.gov.au
Computer Systems Engineering Electrical and Electronic Engineering Telecommunications Software Engineering	**(Visit Manager)** Emeritus Professor Alan Bradley FIEAust CPEng Associate Director, Accreditation Australia Engineering Education Centre Engineers Australia E: abradley@engineersaustralia.org.au

Disciplines	Panel Members (Cont)
	Logistics Mrs Jill Kiley Accreditation Officer Australian Engineering Education Centre Engineers Australia E: jkiley@engineersaustralia.org.au
	NON-VISITING CONSULTANTS
Mining Engineering	**(Australasian Institute of Mining and Metallurgy (AusIMM) Nominee)** Jason Keily Bachelor of Mining Engineering Graduate Diploma of Management E: jfkeily1@bigpond.com.au
Pharmaceutical Engineering	Geoff Armstrong Senior Project Manager Commonwealth Serum Laboratories E: geoff.armstrong@csl.com.au

The panel was joined by representatives of the Australian Computer Society (ACS) to conduct an independent evaluation of the Bachelor of Engineering programs in Software Engineering, in Computer Systems Engineering and in Telecommunications Engineering.

ACS VISITING TEAM:

Associate Professor Paul Strooper
School of Information Technical and Electrical Engineering.
University of Queensland

Mr Bob Hart – Visit Manager and Panel Chair
Professional Standards Development Manager

The visit was conducted jointly with an accreditation of the BE (Chemical Engineering) by the Institution of Chemical Engineers in Australia (IChemE).

IChemE VISITING TEAM:

Mr Ainslie Just FIChemE (CHAIR)
Principal Chemical Engineer
Parsons Brinckerhoff Australia Pty Limited

Professor Dianne Wiley FIChemE
Dean
Faculty of Engineering
The University of New South Wales

Professor Geoffrey M Evans FIChemE
Chemical Engineering, School of Engineering
Faculty of Engineering and Built Environment
University of Newcastle

The conclusions of the Engineers Australia panel are based on a detailed consideration of accreditation documentation submitted by the University and the subsequent campus visit, conducted over the period 15-16 May, 2007.

This report has been prepared primarily to provide the Accreditation Board with the necessary background, depth of analysis and rationale to support the recommendations of the panel, but is also intended as a resource to the University.

In addition the report will serve as a record of events for future accreditation review cycles.

After setting out the recommendations on accreditation and program details, the report provides a background on the engineering education program offerings at the North Terrace campus of the University of Adelaide. Overall impressions and specific commendations are offered, followed by an analysis of the current engineering programs against the Engineers Australia accreditation criteria and from this the 2007 panel has derived specific recommendations on accreditation for the Accreditation Board.

Concluding recommendations to the Faculty are also distilled from this detailed performance analysis and intended as a reference guide in support of the processes of continuing quality improvement.

Attachment A provides the schedule of activities for the visit.

The Accreditation Board at its meeting on the 25 July, 2007 endorsed this draft visit report and the detailed recommendations of the panel. The Board asked that the draft report be released to the University for consideration of any errors of fact, or any perceptions of the panel that are felt to be seriously incorrect. A response was received from the University on 14 November, 2007. Minor amendments have been made to complete this Final Report. In correspondence with the University on 11 December, 2007, accreditation was confirmed in accordance with recommendations below.

2 RECOMMENDATIONS ON ACCREDITATION

The following recommendations on accreditation are made to the Engineers Australia Accreditation Board for programs offered by the University of Adelaide on the North Terrace campus.

2.1 Continuing full accreditation

Continuing full accreditation of the following programs be accorded at the level of Professional Engineer through to the first intake of students in 2013:

- Bachelor of Engineering (Chemical Engineering),
- Bachelor of Engineering (Computer Systems Engineering),
- Bachelor of Engineering (Telecommunications Engineering),
- Bachelor of Engineering (Civil and Environmental Engineering),
- Bachelor of Engineering (Civil and Structural Engineering),
- Bachelor of Engineering (Electrical and Electronic Engineering),
- Bachelor of Engineering (Mechanical Engineering),
- Bachelor of Engineering (Mechatronic Engineering),

including combined and double degree offerings as outlined in Section 4.3.2 below.

2.2 Full accreditation

Full accreditation of the following programs at the level of Professional Engineer be accorded through to the first intake of students in 2013:

- Bachelor of Engineering (Petroleum Engineering),
- Bachelor of Engineering (Aerospace Engineering),
- Bachelor of Engineering (Automotive Engineering),

including combined and double degree offerings as outlined in Section 4.3.2 below.

2.3 Provisional accreditation

Provisional accreditation of the following program be accorded until assessment for full accreditation can be carried out, following the emergence of the first representative group of graduates, for the:

- Bachelor of Engineering (Software Engineering).

2.4 Limited term provisional accreditation

Provisional accreditation of the following program be accorded for a limited term through to the end of 2008 for the:

- Bachelor of Engineering (Pharmaceutical Engineering).

The School of Chemical Engineering be asked to provide, by 30 June, 2008, a report addressing:

- the funding, development and implementation of the pharmaceutical containment laboratory facilities and necessary technical support staff;
- dedicated program level leadership of a cross-faculty teaching team;
- confirmed appointment of a core academic staff team, with qualifications/experience in the specialist field of pharmaceutical engineering;
- details of a broadened industry advisory mechanism addressing the pharmaceutical discipline;

and also containing:

- a set of course outline documents as will be distributed to students, as well as
- a set of CV's for newly appointed specialist staff and other staff contributing to the teaching of the program from outside of the School.

Extension of provisional accreditation beyond 2008 be considered by the Board on the basis of progress, as outlined in the above report.

2.5 Recommended deferral of the accreditation evaluation process

Accreditation of the:

- Bachelor of Engineering (Mining Engineering) and associated double degrees

not be accorded at this time. That provisional accreditation be re-considered by the Board once a decision is made on possible entry of the School of Civil and Environmental Engineering to the Mining

Education Australia (MEA) consortium, and following the submission of documented information addressing:

- confirmed details of the 3rd and final year program structure and content;
- the distribution of teaching responsibilities showing where courses will be delivered by staff from within the School, from other schools and faculties, from other universities and from industry;
- strategic management of the program and dedicated leadership of the academic teaching team;
- the mapping of individual course contributions to the delivery of targeted graduate outcomes for the program as a whole;
- any plans for broadening the industry advisory mechanism to embrace the Mining Engineering discipline;
- confirmed and planned academic staff recruitment in the field of Mining Engineering;
- details of funding, development and implementation of additional laboratory facilities to accommodate the needs of the 3rd and final years of the program;

and including also:

- a set of course outline documents for all courses within the program, and
- CV's of all staff internal and external to the university with teaching responsibilities in the program.

2.6 Interim reporting requirements

The Australian School of Petroleum Engineering be asked, by 30 June, 2008, to provide an interim report outlining:

- details of staff changes and appointments made since this visit;
- a capability analysis of the School' s academic staff profile at that time,
- a revised distribution of teaching responsibilities covering all courses, and identifying where delivery is by staff from within the School, from other schools and faculties, and from industry.

The Board review the status of accreditation, based on this report at that time.

The School of Computer Science be asked, by 30 June, 2008, to provide an interim report outlining establishment of an industry advisory mechanism and evidence of their endorsement of the program structure and content.

2.7 Ongoing development of the programs

The above accreditations include ongoing development of the programs over the accreditation period, subject to the provisions set out in the Accreditation Management System documents.

2.8 Next general review

The next general review of Bachelor of Engineering programs at The University of Adelaide be scheduled to take place in 2012.

3 PROPOSED WEBSITE ENTRY/CERTIFICATE DETAILS

As a consequence of the above recommendations, the proposed wording for the website listing of accredited programs at the level of Professional Engineer and for the certificate of accreditation is as follows.

University of Adelaide **(next general review 2012)**

The following programs are/were accredited for implementation at the University of Adelaide North Terrace campus Adelaide

Bachelor of Engineering in:

Aerospace Engineering	2004
Automotive Engineering	2005
Chemical Engineering	1980
Civil and Structural Engineering *(formerly Civil Engineering)*	1980
Civil and Environmental Engineering	1994
Computer Systems Engineering	1995
Electrical and Electronic Engineering	1980
Telecommunications Engineering	2005
Mechanical Engineering	1980
Mechatronic Engineering	1997
Petroleum Engineering	2002
Software Engineering	2007 (P)
Pharmaceutical Engineering	2007* (P)
Information Technology and Telecommunications	2001 – 2008

* Interim Review 2008

And double degrees with Science, Mathematics and Computer Science, Law, Economics and Finance as well as combined degrees with Science and Arts

Combined degrees allow a host Bachelor of Engineering program to be offered in combination with a major study stream from a Bachelor degree program in another discipline. The full requirements of the host Bachelor of Engineering program are satisfied. This program is thus the primary or dominant program of study. A single testamur that names both degree disciplines linked by 'and' is awarded.
Double degrees allow a host Bachelor of Engineering program to be offered in conjunction with a second Bachelor degree program in another discipline. The full academic requirements of both programs are satisfied. Testamurs for the two degrees completed are awarded.

Combined Bachelor of Engineering in:

- Civil and Structural Engineering & Civil and Environmental Engineering 2007
- Petroleum Engineering & Civil and Structural Engineering 2007
- Petroleum Engineering & Chemical Engineering 2007
- Petroleum Engineering & Mechanical Engineering 2007
- Petroleum Engineering & Civil and Environmental Engineering 2007

Transfer programs from INTI College Malaysia providing entry to the fourth year of the Adelaide University Bachelor of Engineering programs

Bachelor of Engineering in:

Civil Engineering	2001 – 2004
Computer Systems Engineering	2001 – 2004
Information Technology and Telecommunications Engineering	2001 – 2004
Electrical and Electronic Engineering	2001 – 2004
Mechanical Engineering	2001 – 2004
Mechatronic Engineering (entry to third year only)	2001 – 2004

4 GENERAL INFORMATION

4.1 The educational institution

Name of institution	University of Adelaide
Name of school or responsible entity within the institution	Faculty of Faculty of Engineering, Computer and Mathematical Sciences
Institution awarding the degrees	University of Adelaide

4.2 Key dates

Date of submission of request for accreditation	August, 2006
Date of receipt of initial documentation	April, 2007
Panel pre-visit teleconference	1 May, 2007
Panel pre-visit planning meeting	14 May, 2007
Panel campus visit	15-16 May, 2007

4.3 Programs submitted for accreditation

4.3.1 Programs at the level of Professional Engineer

Accreditation/continuing accreditation is sought for the following four year (full time) Bachelor degree programs such that graduates of these programs will be adjudged as adequately prepared for entry to the profession and for admission to Engineers Australia in the grade of Graduate Professional Engineer.

Full title of Program	Abbreviation of degree(s) title	Current accreditation status	Level of accreditation sought	Original accreditation date
Bachelor of Engineering in Aerospace Engineering	BE (Aerospace)	Provisional	Provisional	2004
Bachelor of Engineering in Automotive Engineering	BE (Automotive)	Provisional	Provisional	2005
Bachelor of Engineering in Chemical Engineering	BE (Chemical)	Full	Full	1980
Bachelor of Engineering in Computer Systems Engineering	BE (Computer Systems)	Full	Full	1995
Bachelor of Engineering in Civil and Environmental Engineering	BE (Civil & Environmental)	Full	Full	1994
Bachelor of Engineering in Civil and Structural Engineering *Previously Civil Engineering*	BE (Civil and Structural)	Full	Full	1980
Bachelor of Engineering in Electrical and Electronic Engineering)	BE (Electrical & Electronic)	Full	Full	1980

Full title of Program	Abbreviation of degree(s) title	Current accreditation status	Level of accreditation sought	Original accreditation date
Bachelor of Engineering in Mechanical Engineering	BE (Mechanical)	Full	Full	1980
Bachelor of Engineering in Mechatronic Engineering	BE (Mechatronic))	Full	Full	1997
Bachelor of Engineering in Mining Engineering	BE (Mining)	None	Provisional	
Bachelor of Engineering in Petroleum Engineering	BE (Petroleum)	Provisional	Full	2002
Bachelor of Engineering in Pharmaceutical Engineering	BE (Pharmaceutical)	None	Provisional	
Bachelor of Engineering in Software Engineering	BE (Software Engineering)	None	Provisional	
Bachelor of Engineering in Telecommunications Engineering Previously Information Technology and Telecommunications	BE (Telecommunications)	Full	Full	2001
Bachelor of Engineering in Civil Engineering *Current accreditation valid till 2008. Name changed to Civil and Structural Engineering*	BE (Civil)	Full	Discontinued	1980
Bachelor of Engineering in Information Technology and Telecommunications *Current accreditation valid till 2008. Name changed to Telecommunications Engineering*	BE (Information Technology and Telecommunications)	Full	Discontinued	2001

4.3.2 Combined and Double degrees

Accreditation is sought for combined degrees and double degrees such that graduates of these programs will be adjudged as adequately prepared for entry to the profession and for admission to Engineers Australia in the grade of Graduate Professional Engineer.

Combined degrees allow a host Bachelor of Engineering program to be offered in combination with a major study stream from a Bachelor degree program in another discipline. The full requirements of the host Bachelor of Engineering program are satisfied. This program is thus the primary or dominant program of study. A single testamur that names both degree disciplines linked by 'and' is awarded. Combined degrees of this nature require five or more years of study.

Double degrees allow a host Bachelor of Engineering program to be offered in conjunction with a second Bachelor degree program in another discipline. The full academic requirements of both programs are satisfied. Double degrees require five years or more of full time study and testamurs for the two degrees completed are awarded.

Combined and double degrees allow host Bachelor of Engineering programs to be combined with the Bachelor of Science, Bachelor of Mathematics and Computer Science, Bachelor of Laws, Bachelor of Economics, Bachelor of Finance, and Bachelor of Arts.

It is also possible over a 5-year time frame for a student to undertake a combined degree involving two separate Bachelor of Engineering outcomes, but with a single testamur awarded. Again there will be a primary or dominant program combined with a major study stream from a second engineering program. The following tables indicate the combined and double degree combinations which are permitted.

PERMITTED COMBINED AND DOUBLE DEGREES – BACHELOR OF ENGINEERING WITH ANOTHER DISCIPLINE *C – COMBINED D – DOUBLE*

	BSc	B Ma & Comp Sci	LLB	BEc	BFin	BSc (Specialised)	BA
Bachelor of Engineering in Aerospace Engineering	D	D		D			C
Bachelor of Engineering in Automotive Engineering		D					
Bachelor of Engineering in Chemical Engineering	D	D	D	D	D	D (Bio technology)	C
Bachelor of Engineering in Computer Systems Engineering		D	D	D	D		C
Bachelor of Engineering in Civil and Environmental Engineering	D	D	D	D	D		C
Bachelor of Engineering in Civil and Structural Engineering	D	D	D	D	D		C
Bachelor of Engineering in Electrical and Electronic Engineering		D	D	D	D	C (Physics)	C
Bachelor of Engineering in Mechanical Engineering	D	D	D	D	D		C
Bachelor of Engineering in Mechatronic Engineering		D		D			C
Bachelor of Engineering in Mining Engineering	D	D					
Bachelor of Engineering in Petroleum Engineering						C (Geology) C (Geo- Physics) C Physics)	
Bachelor of Engineering in Pharmaceutical Engineering							
Bachelor of Engineering in Telecommunications Engineering		D	D	D	D		C

PERMITTED COMBINED DEGREES BACHELOR OF ENGINEERING WITH A SECOND BACHELOR OF ENGINEERING OUTCOME

	BE (Civil & Structural)	BE (Chemical)	BE (Mechanical)	BE (Civil and Environmental)
Bachelor of Engineering in Aerospace Engineering				
Bachelor of Engineering in Automotive Engineering				
Bachelor of Engineering in Chemical Engineering				
Bachelor of Engineering in Computer Systems Engineering				
Bachelor of Engineering in Civil and Environmental Engineering				
Bachelor of Engineering in Civil and Structural Engineering				C
Bachelor of Engineering in Electrical and Electronic Engineering				
Bachelor of Engineering in Mechanical Engineering				
Bachelor of Engineering in Mechatronic Engineering				
Bachelor of Engineering in Mining Engineering				
Bachelor of Engineering in Petroleum Engineering	C	C	C	C
Bachelor of Engineering in Pharmaceutical Engineering				
Bachelor of Engineering in Telecommunications Engineering				

5 OVERVIEW

The Faculty of Engineering, Computer and Mathematical Sciences (ECMS) is one of five faculties in the University and comprises seven schools and three centres. Six of the schools individually host Bachelor of Engineering programs. The Dean of Engineering is assisted by four Associate Deans, the Academic Registrar and administrative staff. There is a total of 200 staff members in the Faculty with some 20% comprising technical and administrative support staff. This ratio of supporting staff does mean for small schools, the technical staff numbers can be very small and a clear strategy for sharing resources Faculty wide is clearly essential.

There is a Faculty Learning, Teaching and Curriculum Committee and what was perceived as a complex range of committees and organisational entities within schools that collectively manage curriculum development and program delivery.

Academic staff members tend to work in discipline teams or in teaching groups contributing localised input to the tasks of ongoing review and program improvement. The notion of a Program Leader, pro-actively leading an inclusive team of teaching staff through the processes of educational design and quality assurance was not evident. New program initiatives appear to be driven from the Head of School level and above in most cases. Cross school issues can supposedly be resolved through Faculty committees, but there does not appear to be strong cross representation on school organisational groups and internal program committees that would drive a holistic approach to curriculum design, review and evaluation at the individual program level.

An annual cycle of program monitoring and reporting by faculties is now required and from 2004 the University introduced a five year cycle of program reviews under the aegis of the Deputy Vice Chancellor (Academic). In May 2006 there was an external review of the ECMS Faculty. The review report raised general questions such as the rigour of business planning associated with new program implementations, the retention of students in double and combined degree programs, the level of technical and administrative support and the effectiveness of communications between academic staff and Faculty and University leaders. Key recommendations included a reduction in the number of programs being offered and also in the teaching workloads for staff.

The Centre for Learning and Professional Development (CPLD) provides university wide services assisting the improvement of teaching and learning through engagement with individual staff members. CPLD provides short courses and seminars, a Graduate Certificate in Higher Education and key assistance to new members of teaching staff.

Research performance within the Faculty is particularly strong and there are significant benefits to the teaching program such as the professional development of staff, student access to research facilities and resources, and involvement of undergraduate students through research based project activity. Sabbatical leave opportunities are very effectively utilised by academic staff to widen networks, build collaborative relationships and develop capabilities. A recent, university wide consolidation of research concentrations clearly embraces existing research directions of the Faculty. The Faculty will continue to contribute strongly to the overall research performance of the University.

There are innovative teaching initiatives underway in the various schools and numerous examples where industry engagement is bringing clear benefits to students. Examples are direct teaching input from industry professionals and industry based project opportunities. Specific industry partnerships have yielded very important benefits to particular Schools. Examples are the Santos sponsorship and Schlumberger links with the Australian School of Petroleum. The pursuit of industry sponsorship for Chair positions in the pharmaceutical and mining engineering fields is a key imperative in order to complete a satisfactory staff profile and level of leadership in these fields.

Strategic linkages with India will lead to an influx of articulation students from 2008 through twinning arrangements. International student numbers currently average 25-30%, but this proportion is likely to be exceeded in some schools.

A strategy in recent years has been to increase the range of Bachelor of Engineering programs with new specialist offerings such as in the fields of Aerospace, Automotive, Software, Pharmaceutical and Mining Engineering. Other than for Software Engineering, these programs are leveraged off existing offerings and involve much commonality in the early years of study. A key approach has been to extend the 'brand-name' of engineering to new fields such as the pharmaceutical domain. The Mining Engineering initiative is aligned with State of South Australia priorities. The prime objective of the Faculty is to attract those brighter students who perhaps would not have chosen engineering as a career direction, using what might appear as attractive and exciting new fields of study. In the now established Aerospace and Automotive programs, this strategy has worked, with significant increases in overall intake numbers and little if any reduction to the foundation Mechanical Engineering program intake. The Aerospace Engineering program is proving to be extremely popular with TER cut off scores of greater than 90 being achieved. The Pharmaceutical Engineering program is attracting significant interest from potential international students from Asia.

In the case of the Mining Engineering initiative, the program contains much commonality with the two long established Civil Engineering based programs. The structure and content of the 3rd and 4th years of the program are not finalised at this stage and are clearly dependent on the critical decision of engagement with Mining Education Australia (MEA). The University of Adelaide is considering the possibility of accepting the invitation to join this consortium and thus participating in delivery of the defined 3rd and 4th year curriculum. If the University decides not to proceed with this opportunity there will be a need to independently develop a 3rd and final year curriculum. By engaging with MEA, the University will leverage off the teaching input of the other University partners (The University of Queensland, University of New South Wales and Curtin University of Technology). The University of Adelaide would contribute in accordance with existing specialist capability, facilities and resources in the geo-technical engineering field. Some enhancement would be necessary for the provision of specialist laboratory, practical and project based learning. Some $½-1M is likely to be necessary to satisfactorily equip laboratory facilities under this scenario. Year 3 of the program will be first offered in 2009. Strong industry linkages will help facilitate access to live engineering sites and ensure that students are satisfactorily exposed to modern day mining engineering practice.

For the Pharmaceutical Engineering program, there is similarly a need for major investment in laboratory and practical learning facilities, in time for the first classes at 3rd year level in 2009. In this case major costs are involved in achieving appropriate levels of containment and sterility within the laboratory environment as well as the provision of specialist equipment items. Some $10-12M is likely to be required to establish an appropriate facility that would be shared across faculties and serve multiple purposes. The curriculum development effort must not be under estimated for such an initiative, with some 50% of the Pharmaceutical Engineering program comprising new courses.

The University will invest some $100M on replacement of the Mathematics building with an 8 storey development that will re-accommodate the Electrical Engineering School and significantly increase Faculty space. Construction work is about to start with a 2009 completion target.

Each School has an Industry Advisory Committee in place and a recent innovation has been to set up, in addition, a Faculty Industry Advisory Board. This Board includes key industry leaders and will provide advice and direction at the strategic level.

Twelve weeks of work experience is a requirement of the Faculty, with at least 6 weeks of supervision by a professional engineer. Students are encouraged to seek this experience in summer vacation periods in between years of study. A very simple reporting process requires sign off by the industry supervisor, but does not extend the student to seriously reflect on the contributions the experience has made to his or her professional and personal development, or to the attainment of the full range of outcomes targeted for graduates of the program.

A current university motivated restructuring of programs will lead to the introduction of a standardised 3 unit of credit structural model, assisting with the mobility of students across discipline boundaries. This offers new opportunity for the implementation of unified courses delivered into multiple programs with potential benefits of cross discipline student teams, exposure of students to broader fields of engineering practice and staff workload reduction through economies of scale and reduced duplication of effort.

Key personnel in the Faculty of Engineering are set out below:

Executive Dean of Engineering – Professor Peter Dowd

Associate Dean (Teaching and Learning) – Associate Professor Mark Jacksa

Associate Dean (International) – Associate Professor Cheng-Chew Lim

Associate Dean (Research) –Professor Valerie Linton

Associate Dean (Information Technology) – Associate Professor David Munro

Academic Registrar – Dr Max Bessell

Head – Australian School of Petroleum – Professor Peter Dowd (Acting)

Head – School of Chemical Engineering – Professor Keith King

Head - School of Civil and Environmental Engineering – Associate Professor Michael Griffith

Head – School of Computer Science – Professor Michael Brooks

Head – School of Electrical and Electronic Engineering – Associate Professor Michael Liebelt

Head – School of Mechanical Engineering – Professor Colin Hansen

6 PREVIOUS ACCREDITATION VISITS

This general review visit follows the previous general review of programs conducted in 2001. A one year extension of the accreditation term was negotiated with the University in order to facilitate alignment of accreditation visits with the IChemE. During the period 2001 through to 2006 a number of minor program name changes were recorded. During this time also, provisional accreditation was accorded for the new programs:

- Bachelor of Engineering (Automotive Engineering),
- Bachelor of Engineering (Aerospace Engineering).

Some of the key recommendations from the 2001 accreditation visit report included:

- strengthened development of generic attributes;
- reduction in program content end contact hours, with more focus on student empowerment and development of self directed learning capability;
- wider variety of assessment methods;
- improved effectiveness of first year learning transition;
- review of depth and variety of laboratory learning experiences;
- formal development of team and project management skills;
- improved benchmarking with other universities;
- strengthened balance of content between mechanical and electrical components of Mechatronics program;
- strengthened content of Computer Systems Engineering program in the areas of software engineering and system integration;
- consideration be given to the introduction of a 4-year Software Engineering program.

The 2005 report for the Bachelor of Engineering (Automotive Engineering) recommended that the School strengthen emphasis on Systems Engineering in a formal sense. For the Bachelor of Engineering (Aerospace Engineering) the 2005 evaluation panel initially had concerns with the balance of emphasis between space and aeronautical engineering aspects, but subsequent amendments to the program to some extent alleviated these concerns. The inclusion of the new final year course – 'Aeronautical Engineering 2' was applauded by the review panel at the time. Provisional accreditation of these new programs was confirmed by the Accreditation Board at its meeting in May of 2006.

6.1 Pre-visit teleconference

Initial documentation for the 2006 general review visit was received from the University some 8-weeks prior to the visit and distributed to panel members. A subset of the evaluation panel met via tele-conference on 1 May, 2007 to consider the initial documentation submitted by the ECMS Faculty.

The tele-conference provided an opportunity for panel members to share their initial findings and to highlight any matters of concern. Panel members were very pleased with the structural layout, quality and comprehensiveness of the submitted documentation.

Following analysis of the submitted materials the panel was able to compile a list of issues for further investigation during the visit. Both contextual issues and program specific matters were raised.

This list of issues was provided to the Faculty shortly after the teleconference.

The panel also asked that the Faculty supply, prior to the visit, the following items of additional information:

- A tabular analysis for each double degree to indicate deleted courses from the host Bachelor of Engineering program.
- For each program, a structural outline classifying where academic courses are being taught by staff from within the associated School, from within the Faculty, from outside of the Faculty or from outside of the University.
- For each school, names and affiliation details of members of the Industry Advisory Committee.
- For all programs, a printed set of course outline documents, as provided to students.
- For the Mining, Pharmaceutical and Software Engineering programs, an analysis of academic staff profile to indicate compliance (or a development strategy to achieve compliance) with Engineers Australia requirements.
- Any available data to indicate first year retention rates.

These additional materials were provided in full, in readiness for the panel's pre-visit planning meeting on the evening of 14 May, 2007.

7 COMMENDATIONS

The panel wishes to specifically congratulate the Faculty and schools on the following aspects of the undergraduate engineering programs.

- Strength of research activity and the opportunities and benefits it provides to undergraduate students through project involvement and advanced coursework.
- Efforts made to develop broad ranging communication skills in graduates. Also in particular the strengths of the ESL/EAL course for international students.
- Effective use of teaching input from industry professionals to strengthen the exposure of students to professional engineering practice.
- Industry based project opportunities for students.
- Collegiate operating environment within schools.
- Standard and depth of final year project work and the diversity of project based learning.
- Enthusiasm, energy and commitment of academic staff, despite overload conditions in many cases.
- Articulate and capable students, able to contribute significantly to the processes of educational improvement;
- Innovative approaches to laboratory and practical learning such as the project based emphasis in the School of Electrical and Electronic Engineering and the innovative facilities and approach to Software Engineering project activity in the School of Computer Science,

8 ACCOUNT OF VISIT PROCEEDINGS

A record of the visit schedule and the program of discussions held with the graduates, external stakeholders, the senior leadership team, academic staff and students is provided in Attachment A. Issues raised in these discussions are largely incorporated within the analysis to follow and specific recommendations for the University are provided in Section 9.

The Panel would like to thank the Vice Chancellor - Professor James Mc Wha, the Dean of ECMS Faculty - Professor Peter Dowd, the Associate Deans, the Academic Registrar - Dr Max Bessell and the Heads of School as well as the academic, technical and administrative staff and students for the warm hospitality and climate of cooperation that characterised the visit.

The panel very much appreciated the quality and systematic nature of the submitted documentation as well as the displayed supporting materials and samples of student work during the visit. The cooperation of the Academic Registrar and Heads of School in locating and presenting additional requested information was most appreciated. The range and depth of evidence provided in these displayed materials, other information gathered and the experiences of the visit were sufficient to formulate the final recommendations of the panel. The willingness of staff and students to engage in free and open discussion and the opportunity for in-depth dialogue with graduates and external stakeholders helped very much in the assessment process.

9 ANALYSIS OF PERFORMANCE AGAINST ACCREDITATION CRITERIA

The panel has determined, from a holistic perspective that the operating environment, the structure and content of the submitted programs, and the quality systems in place at The University of Adelaide comply with the accreditation criteria. The only exception case was the Mining Engineering program, primarily due to uncertainties related to the provision of the 3rd and final years of the program.

Observations and findings of the panel, referenced to the accreditation criteria, are presented in 'dot point form' below. Only salient issues have been discussed here, with some additional reporting of comments raised by individual panel experts.

Where aspects of the criteria are not referenced it can be assumed that the panel was satisfied with compliance.

Key suggestions for improvement are summarised in the associated recommendations of Section 10.

9.1 The operating environment

9.1.1 Issues of a general nature

- In the panel's view, discipline and teaching groups tend to be inward looking, focussing on vertical progression of technical content and inter-stream content relationships. In all schools, program teaching team meetings need to include all academic staff members who contribute teaching from both inside and outside of the School. This is particularly crucial in programs such as Mechatronic and Pharmaceutical Engineering which clearly bridge discipline, school and sometimes faculty boundaries. The panel recommends that the concept of a Program Leader, working with a cohesive and inclusive program teaching team on curriculum and quality assurance matters be fostered across the Faculty.
- There needs to be a strengthened focus by staff on the 'big-picture' task of setting, reviewing and monitoring the attainment of targeted graduate outcomes at the program level. It is felt that program teaching teams should be accountable for tracking the aggregation of learning experiences and assessment processes from all component courses and for systematically considering feedback and input from student and external stakeholders in the processes of continuing quality improvement.
- There is a need for further staff recruitment to satisfy minimum needs for specialist expertise in the fields of Mining and Pharmaceutical Engineering. The panel applauds the strategy to pursue industry sponsorship of discipline Chairs in each of these fields. These leadership positions, together with recent and planned academic level B/C appointments will achieve a satisfactory staff profile in each domain. Maintenance of staffing levels in the Australian School of Petroleum Engineering has been difficult with currently lucrative employment opportunities and consequent skill shortages in the petroleum engineering practice field, but a number of appointments are underway, mostly to overseas professionals willing to join the University. Deficiencies in staff numbers have caused significant overloads for remaining staff in recent times. Appointment of a permanent Head of School is crucial to restore leadership and rebuild healthy communication links between staff and the broader Faculty and University. Adjunct teaching from industry professionals is a vital resource that enriches the delivery of the Petroleum Engineering program.
- In all schools, staff teaching workloads seem to be high. To some extent this is a consequence of technically intensive, rigid program structures with only few examples of courses that are shared

across school boundaries. The Faculty claimed student to staff ratio is 18:1, but it was evident that the actual figure is likely to be higher than this in a number of schools. A proliferation of new program initiatives is clearly adding to workload in the early stages of implementation. The panel is concerned about the potential impact new and planned developments will have, if the recruitment of additional staff resources has to be delayed until financial viability is demonstrated. The impact will be both with staff workload as well as the potential availability of appropriate specialist expertise.

- All schools are financially viable and strive to retain 15% or more of budget for non-salaried expenditure, DEST fee income is allocated on a straight forward taught load basis. The prospect of a 90% or greater salary expenditure triggers a reconsideration of funding distribution to ensure that schools have adequate funding for consumables, equipment and facilities. Smaller schools tend to suffer from limited support capability, because funding ratios mean that only very small numbers of technical staff can be supported. This was apparent in the Schools of Chemical and Petroleum Engineering. Technical staff support in the School of Chemical Engineering is felt to be at a critical level, and in the view of the panel, must be augmented as the Pharmaceutical Engineering program implementation and its associated laboratory development progresses.
- The panel was a little concerned that there was not in place a clear solution for sourcing funds to support essential laboratory developments for both the Pharmaceutical and the Mining Engineering programs. Application to DEST for financial support for the Mining Engineering initiative under the MEA umbrella is applauded, but the panel understands, that at this stage there is no certainty of success.
- The panel was surprised to find some duplication of effort between engineering schools. This included courses with similar objectives but being delivered in different departments using differing titles and content detail. There seems to be little opportunity taken to identify common content that could be delivered through unified courses faculty wide. One example where this has been pursued successfully is the first year 'Engineering Planning Design and Communication' course, utilised in most, but not all programs. In the panel's view there is more opportunity for course commonality, particularly in the professional development and engineering application areas. There were also cases where specific discipline content was being delivered within schools, rather than using the logical source of expertise from outside of the School. An example was the delivery of electronic content by the School of Mechanical Engineering rather than using the expertise of the School of Electrical and Electronic Engineering. Although there were clear reasons given for this, the panel felt that the justifying issues need to be addressed and overcome in the interests of efficiency and for reduction of staff teaching loads. The panel recommends that the Faculty facilitate a broader sharing of good practices and resources across school boundaries, and encourage common approaches to educational design, content and delivery where these can be used to advantage stakeholders.
- The first year mentoring scheme is applauded by the panel, but there appear to be coordination factors such as the timing of the launch, communication of intent and the full engagement of academic staff. These factors appear to be impacting the potential of the program with scope for better coordination and engagement.
- The panel felt that there was scope for schools to more actively contribute to strategic planning with equipment and facilities development requirements prioritised and documented, thus facilitating budget allocation processes and funding submission development.
- The move to centralised IT support seems to be an issue in terms of maintaining quality of service. There were reports from several schools regarding the timely availability of specific software tools and the adequacy of systems support. Students reported in some cases that IT facilities were being accessed by students from other faculties, placing even more pressure on limited resources.
- There was not apparent any specific initiative for recruiting or supporting women engineering students.

9.1.2 Operating environment – comments from Individual panel specialists

SCHOOL OF CHEMICAL ENGINEERING

- School retreats provide an effective venue for curriculum discussions and continuing improvement. Academic staff members do work together as a cohesive and cooperative team, regularly discussing curriculum matters and quality improvement - but there is scope for a more systematic and holistic approach based on a formal mapping of course learning outcomes and assessment processes against a broad specification of graduate outcomes. Leadership from the Head of School is well regarded by the academic staff.
- Strong focus on laboratory safety, formal induction and risk assessment.
- Dedicated IT facilities provided for final year students, but limited number of workstations is impeding access. An adequate range of software based engineering support tools are provided. Faculty wide IT facilities (CAD suites) are shared by all schools, with some pressure on access.
- There remains scope for improving process control laboratory facilities and the range of practical learning experiences in this field - raised also in the 2001 visit report. This is particularly apparent at final year level.
- Staff teaching workloads are felt to be significantly higher than desirable. Staff claimed that new initiatives such as the course work masters have significantly impacted workload, with no extra help at this stage to compensate. Succession planning and long term planning of teaching accountabilities is encouraged as new program initiatives are implemented.

In the School's response to a draft version of this report, the panel was advised that two academic appointments have been made subsequent to the visit.

- Staff felt that communications with the university beyond the school level could be improved.

SCHOOL OF MECHANICAL ENGINEERING

- Electrical and Electronic Engineering teaching input to the Mechatronic program is still very much a minority contribution and delivered on a service teaching basis.
- Cohesive, committed and enthusiastic academic staff team working well under strong leadership from Head of School. Workload is a very significant issue and has the potential to become unmanageable with the impact of new program initiatives. There are signs of staff disillusionment with the pressures of new program directions and little additional resource to cope. There is also a student perception that staff members are overworked, but overall, students very satisfied with teaching performance and the programs.
- Aircraft structures still appears to be an area where there is opportunity for strengthening the profile of staff expertise through future appointment cycles.
- Curriculum development appears to be more discipline rather than program based. Annual retreats provide some opportunity for review at the program level, but it is not apparent that these thoroughly address the broad range of graduate outcomes and a systematic educational design methodology.
- Assessment follows traditional patterns with adequate moderation mechanisms.
- Industry acceptance of graduates clearly apparent.
- Laboratory space appears to be at a premium and will become more of an issue as increasing student numbers progress through the programs.
- There has been particular attention to address workplace safety issues in the laboratory environment.

- The technical support team seem to be particularly stretched in meeting the needs for laboratory and project support. Technical staff members provide valuable support to project students and this is encouraged. Pressures will become more intense as growing student numbers progress through the program years. There will be a need to address technical support needs as the off campus wind tunnel is commissioned.
- There are perceived difficulties with the move to centralised IT support reported by both staff and students, particularly in the timely availability of specialist software tools and levels of service.
- Computer access is an issue, with students from other faculties using computers in the School's laboratories.
- Quality of assessed Honours Project reports was deemed to be adequate, but the rigour of differentiating performance and assigning individual student contributions in some team based activities was perceived to be a possible issue.

SCHOOL OF ELECTRICAL AND ELECTRONIC ENGINEERING

- The panel questioned the effectiveness of role modelling, the culture of the academic staff team, and the ability of staff to engender in students an understanding of what it means to be an engineering professional.
- There is little evidence in submitted documentation of staff teaching teams holistically addressing program level outcomes. Management structures do not seem to foster 'big-picture' planning and review as a key ingredient to a systematic and cohesive educational design and on-going improvement process.

SCHOOL OF COMPUTER SCIENCE

- The panel was satisfied that the staff profile satisfied the basic needs for delivery of the Software Engineering program and encourages the School to use future recruitment opportunities that will emerge as student numbers grow, to attract key staff with specialist background and research interests complementing those of existing staff, and building strategic Software Engineering capability.
- The educational culture within the School was felt not to embrace a holistic and systematic approach to curriculum development and improvement. There was little evidence to demonstrate a committed Software Engineering Teaching team grasping a 'big-picture' outcomes specification for graduates and undertaking an educational design that rigorously tracks these deliverables through formal assessment and interaction with stakeholders.

SCHOOL OF PETROLEUM ENGINEERING

- Academic staff profile has a good balance of expertise and a strong team culture.
- There are frustrations amongst teaching staff however in relation to the filling of replacement academic positions, and in particular the Head of School position. There is also concern from staff for the recognition that their industry consulting, contract research and development and impressive levels of industry funding will receive within the era of the research quality framework and performance appraisal.

In the School's response to a draft version of this report, the appointment of Professor Richard Hillis as Head of School from 1 July, 2007 was confirmed.

- Staff interaction with external stakeholders and students appears to be satisfactory but there were concerns expressed for the effectiveness of communication with higher levels within the University. Again this difficulty is linked with the absence of a permanent Head of School.
- Students have high regard for the academic staff team and see staff members as valid role models of practising professionals.
- Impressive laboratory facilities, but time constraints of staff appear to be limiting utilisation in the undergraduate program. Commissioning of the test well is an issue raised by staff. Students made it clear that they want more hands-on laboratory experiences.

SCHOOL OF CIVIL AND ENVIRONMENTAL ENGINEERING

- Academic staff profile is adequately balanced with impressive research achievements. The team works well together and is strongly motivated, but individual accountability for systematic review and improvement is not always apparent at the individual or teaching team level. Staff members do understand the 'big-picture' perspective and the need for development of broad ranging capabilities in graduates, but the issue of holistic tracking of outcomes needs to be addressed by the program teaching team as such.
- Workloads are increasing for staff and this is a concern, as further rises can be expected with the progressive implementation of the Mining Engineering program.
- Program outcomes, graduate capabilities and tracking and assessment of targets do not appear to be formalised.
- Laboratory space is just adequate but will come under future pressure with building demolition, research activities and the impact of the Mining Engineering initiative.
- Laboratory equipment and facilities are adequate, but with cyclic updating of ageing equipment needed. Facilities are well supported by a strong technical staff team.
- There is a need for more dedicated project space to support collaborative learning activity.
- IT facilities tend to be insufficient in terms of workstation numbers.

9.2 The academic programs

9.2.1 Issues of a general nature

- Schools have developed clear objective statements and generic outcome targets for programs. In most cases there has been a significant effort to track delivery of generic outcomes through analysis of learning experiences and assessment strategies. As yet there does not appear to have been reference made to the Engineers Australia Generic Competency Standard for Professional Engineer. It is recommended that in the next iteration of program review that the Competency Standard be used as a framework for developing a detailed specification of targeted graduate outcomes for each program, customised with the specific technical competencies, engineering application skills and underpinning skills and knowledge appropriate to the domain of practice. Further that this be used as a basic reference for dynamically tracking contributions from course learning outcomes and individual assessment measures, and to aid students in gaining an appreciation of the nature of engineering practice and the philosophy of the curriculum design. Such a specification would also provide a fundamental reference for students self-reflecting on the progressive development of their personal and professional capabilities.
- Programs were found to be comparatively rigid in structure, with an intense focus on delivery of technical competence and engineering application skills. There are few elective options and little flexibility for students to adapt to specific needs. This becomes clearly obvious in the composition of double degree programs, where core courses are being dropped to allow for the second

degree outcome. The panel was not convinced that in all cases the knowledge and skill outcomes from deleted courses were satisfactorily delivered through alternative learning experiences. Rigid program structures also seem be creating timetabling complexities and are perhaps also a factor in the relatively high teaching loads. The panel suggests, as part of the restructuring processes that will soon occur to accommodate the 3-unit, simplified structural model, that the opportunity be taken to provide additional degrees of freedom through elective choices and reduced prescriptive content. It is also suggested that the opportunity be taken to consider more unified approaches and common courses that can bridge school boundaries.

- The panel has some concern with the notion of combined degrees. These are generally completed over a 5-year study period and cover two disciplines, either an engineering field combined with Arts or a combination of two separate engineering fields. Final testamurs and student transcripts infer balanced studies in the two discipline domains with an 'and' link between the stated discipline titles. Upon investigation, it was explained to the panel that the intention is more to deliver the full academic requirements of the first mentioned discipline outcome, with major studies included from the second discipline. From this viewpoint the intention is quite different to the double degree concept, where the full academic requirements are satisfied for both disciplines. In the panel's view the wording on testamurs and on final transcripts needs to more clearly express this objective of a dominant engineering outcome *with* supplementary studies in Arts or a second field of engineering.
- The panel was a little surprised to find a variance in the quantum and quality of laboratory and practical learning between schools. A differing philosophy on the appropriateness and value of laboratory learning in the first year of the Bachelor of Engineering was apparent between schools. For example, innovative and exciting laboratory activities based on a project theme in the School of Electrical and Electronic Engineering, contrast with the Mechanical Engineering programs, where the decision appears to have been made to largely abandon hands-on, traditional engineering laboratory experiences at first year level. Reasons given for this were the large student numbers and complexity of programs involved. It is understood that use is made of software simulation to provide some equivalence to hands-on practical activity in the statics/dynamics fields. The School of Petroleum Engineering is well equipped with experimental facilities, but in the panel's view these resources are very much under-utilised in the provision of practical learning experiences for students.
- A University regulation requiring differentiation of the Honours stream curriculum from that offered to Pass stream students has been addressed by differentiating the final year project activity. Honours stream students in most programs are required to take an 'Honours Research Project'. In most engineering programs, by far the majority of students gain entry to the Honours route. Not all of course achieve an Honours outcome. The small number who are not selected for Honours pursue a 'Pass' degree final year program. In most cases this involves deletion of the 'Honours Project' activity. In many cases this is substituted by a 'Design' course for the 'Pass' stream students. In the Civil Engineering program, 'Pass' students replace the 'Honours Project' with two specialist technical courses selected from an electives list. The panel is concerned that pass degree students are universally achieving the equivalent learning outcomes of a full, broad context capstone project activity that focuses on wide ranging skills development. The panel urges the University to reconsider the regulation which requires program differentiation. It is more common for Australian universities to base Bachelor of Engineering Honours simply on weighted performance across the full study duration without program differentiation.
- There needs to be more emphasis in the first year 'Engineering Planning, Design and Communication' course on what it means to be a professional engineer and to developing a better student perspective of the various specialisations offered. Also a perspective of the educational design philosophy referenced to the 'big-picture' delivery of targeted graduate outcomes. The course needs to have more of a *'discovering engineering'* flavour to set context and perspective.
- The panel was disappointed in the range and depth of reports that students submit following work experience placements. This appears to be limited to a simple proforma, and does not require the

student to substantially reflect on their experiences in the workplace and more importantly the impact on their own personal and professional development. The panel urges the Faculty to consider the benefits of student reflective analysis, using perhaps a journal or portfolio approach as an on-going discipline, assessing knowledge, skills and attributes development against a detailed specification of targeted graduate outcomes disseminated to students from the outset. Reflection could be based on the full range of learning experiences including exposure to professional engineering practice as well as work experience.

- Levels of exposure of students to professional engineering practice beyond the work experience program varies somewhat across schools. There are excellent examples where site visits, industry sponsored or industry based projects, guest lectures and sessional teaching from industry professionals are providing enrichment in the learning programs. The School of Mechanical Engineering structured industry visitation program was highly regarded by panel members. The panel encourages all schools to build on these good practices and to ensure that exposure to practice forms an integral part of the overall educational design.
- The panel noted some variance in the perceived rigour of business planning that underpinned the introduction of new programs. Commissioned research provided insight to the development of the Pharmaceutical Engineering program. The Mining Engineering program development has been motivated by skills shortages in the field and influenced by the curriculum structure available from MEA. The panel was not privy to any formal business planning that occurred prior to introduction of Aerospace and Automotive Engineering programs, but was made aware of consultations and advice that had been received from government and business interests at the local level.
- The panel noted some excellent examples of student project activity, some involving industry sponsorship or at least industry derived and some involving students working in structured teams and utilising formal peer evaluation processes with performance evaluated through both team and individual project contributions. Again these good practices are recommended for broader application across all schools. Again, the panel was impressed with the impact of strong research achievement with the opportunity for students to be engaged in research linked project work. Overall the panel was satisfied with the standard and quality of assessed project theses. Panel members were impressed with the excellence of senior level design project activity, particularly noted in the Chemical and Civil programs.
- The first year 'Engineering Planning and Communication' course, common to many programs, attempts to address a broad range of requirements in a 'catch all' fashion. The panel recommends a review of the learning outcomes, with perhaps a stronger emphasis on systematically exposing students to professional engineering practice in their chosen specialist field. Also a stronger focus on developing a 'big-picture' understanding of the profession of engineering, the specification of capabilities targeted for graduates and the need for reflecting on skills development as well as the philosophy of the educational design.
- The panel was impressed with the broad ranging and rigorous assessment and moderation processes that are in place for evaluation of final year project activity in the School of Mechanical Engineering and urges the Faculty to ensure that equivalent practices are employed across all programs.

9.2.2 Academic program – comments from Individual panel specialists

CHEMICAL ENGINEERING, PHARMACEUTICAL ENGINEERING

- Students are receiving no industry input at first year level, and only limited exposure to professional engineering practice in latter years. Students clearly appreciate presentations and lectures from practising industry engineers and there is potential to significantly expand this involvement. The site visit week in third year is particularly effective and highly regarded by students. Further site visit opportunities, such as those arranged by the Chemical Engineering Students Society are very much encouraged.

- The final year 'Plant Design Project' is extremely well managed with strong industry relevance and some direct industry input. The use of peer and self assessment processes is effective.
- Progressive opportunities throughout the second, third and final years provide effectively for team skills development.
- Pharmaceutical Engineering program is innovative in nature and already demonstrating strong student demand, particularly from Asia. Initial enrolment levels have been impressive. Curriculum details are still somewhat fluid. Provision of laboratory facilities for third year implementation in 2009 now critical.
- Students valued very much the experience gained from work experience, but reporting and evaluation processes lack depth, and the benefits of self reflection.

MECHANICAL ENGINEERING, AEROSPACE ENGINEERING, AUTOMOTIVE ENGINEERING, MECHATRONIC ENGINEERING

- Technically intense curriculum undoubtedly delivers a high standard of technical competence, but was felt on the other hand to encourage a culture of 'passing courses' rather than fostering a broad skills development agenda.
- The rigidity of program structures offers limited flexibility and limits the possibilities for students to take broadening courses from both within and external to the Faculty.
- On the other hand, project based activities are embedded through years 2 to 4 of the programs and provide a vehicle for the development of team skills and leadership as well as project and engineering management capabilities.
- Lack of perspective of the overall program design and the nature of the various specialisations offered is a significant issue with first and second year students.
- There are serious concerns for the quantum of laboratory and practical learning – varying significantly between courses, with some mechanical engineering courses offering no traditional laboratory learning component. Growing student enrolments will place even further pressure on limited facilities, with no indication that increased funding will be made available to address the issue. The dearth of traditional laboratory and practical experiences in the first year of studies is particularly of concern. There is a need for investment in duplicating existing laboratory sets, new laboratory equipment and additional space.

In the School's response to a draft version of this accreditation visit report, this point was subsequently challenged. A comprehensive review of laboratory activity in the Mechanical Engineering programs was undertaken in 2006 with input from the School's Industry Advisory Committee.

- Common first and second year limits the exposure of Aerospace students to aircraft and space related applications, and students claimed that this impacted motivation. The possibility of moving the 'Aeronautical Engineering 1' course to the 2nd year level should be investigated.
- There is some concern still for the sufficiency of aerospace structures treatment in this program. There is potential to extend the depth of the 'Aerospace Materials and Structures' course with further core studies in the final year. On the other hand, the need for 'Aerospace Navigation and Guidance' to be mandated as a compulsory final year course was questioned by the panel. The panel had suggested that this be replaced by a core course, building on the depth of the third year 'Aerospace Materials and Structures' activity. The panel was later advised that there were plans to do just this, through the introduction of an 'Aeronautical Engineering 3' course at the final year level.
- Field trips and guest lectures are highly regarded by students, but the organisation of these seems to be limited to the initiative of individual staff members in particular courses, rather than integrated within an overall educational design at the program level.

- In the Aerospace program there was some concern expressed for the need to systematically monitor the teaching content delivered by external industry presenters and sessionals, to ensure that this clearly matches the learning outcome targets, and does not deviate from the planned syllabus content. The 'Aerospace Propulsion 1' course was drawn to the panel's attention in this regard.
- Honours theses were deemed to be of acceptable standard, and of relevance to industry. Some explicitly addressed sustainability issues.
- Quality of work experience was variable and little evidence of feedback apparent.

ELECTRICAL AND ELECTRONIC ENGINEERING, COMPUTER SYSTEMS ENGINEERING, TELECOMMUNICATIONS ENGINEERING

- The planned Systems Engineering course development is encouraged by the panel.
- The panel encourages a broader context, project based learning approach in the 2nd and 3rd year 'Practical Design' courses, engaging students in a project lifecycle that includes aspects such as requirements analysis and critical design review, and emphasises a more open-ended problem solving context as well as the detailed design task.
- The focus on project management and formal review processes as part of the student's development experience is commended.
- Strong research activities in the School enrich the learning experience.
- Strength of team based project activity at 2nd, 3rd and 4th years is a key attribute of the programs offered by the School.
- Tracking of individual course contributions to the development and assessment of generic capabilities in graduates as described in the submission documents does not appear to be faithfully reflected in teaching practice and certainly not demonstrated in course outline documents. Although students were able to express a limited understanding of the nature of professional engineering practice, there was little awareness of any systematic approach to generic capabilities development. There is little evidence that students at any stage are asked to reflect on their own personal development. It was felt that students tend to be blindly following a program of study, with little awareness of a holistic educational design, or any sense of accountability for monitoring their own development against a targeted specification of outcomes.
- There was some concern that there was sufficient differentiation of the Computer Systems and Telecommunications programs from the Electrical and Electronic Engineering foundation program. Students appear to take design courses at 2nd and 3rd year levels that focus on the Electrical and Electronic domain, rather than the degree specialisation. Although the panel encourages the use of common course content where feasible, it encourages project work and application experiences which focus on the specialist telecommunication or computer systems discipline. In the Electrical and Electronic program, students felt the content was biased a little too far on the electrical side. This perhaps could be addressed with additional electronics electives.
- The panel felt that more attention could be given to developing student awareness and commitment to ethics and sustainability.
- The development of business and management skills was felt to be addressed, however the relevancy was not apparent to students. A more integrated approach, where the development of these skills is embedded more within an engineering project context may be appropriate.
- Other than for work experience, exposure to professional engineering practice appears to be limited. Students reported few guest presentations or field trips that are integrated as part of the overall learning design. The value of industry based projects is widely acclaimed by students.

SOFTWARE ENGINEERING

- The panel was impressed with the proposed staged development of student project and team skills in the Software Engineering program, with structured large scale, industry based software development projects at both 3rd and final year levels. The possibility of 4th year students taking a supervisory role with 3rd year project teams was agreed to have potential for further enhancing the learning experiences.
- There was some concern however for the uncertainties which still seem to be plaguing the structural design of the senior years of the program, with changes occurring over time. A particular issue of concern is the final year study pathway for Honours stream students, which appear to substitute the Honours Project for the Group Project 2 activity. The importance of a large scale software development task is emphasised. There appeared to be some lack of detail concerning planning at this stage.
- The program is characterised by a strong Computer Science foundation, and appears to adequately address the majority of the SWEBOK body of knowledge requirements and ACS/Engineers Australia Joint Board requirements.
- There is little evidence to show that the mapping of delivery of generic outcomes in graduates, as suggested in the table in the submission documents is followed through in the educational design and delivery of individual courses. There is little evidence to show that the delivery of and assessment of generic outcomes is seriously addressed by individual staff members in a systematic sense. There does not seem to be closure of the loop at either the program or individual course level that would track the delivery of a full range of targeted graduate capabilities.
- The intended use of a reflective evaluation instrument is highly encouraged.
- The panel was satisfied with the quality and standard of project reports and submitted work from students. Final year theses will be reviewed when the program is considered for full accreditation.
- Although the program provides elective slots at various year levels, the opportunity for students to pursue a cohesive study at adequate depth in a selected domain of software engineering application is questioned.
- Exposure to professional engineering practice through industry related activities was felt to be somewhat inadequate for this program. The planned industry based project activity and the proposed 'Software Engineering in Industry' elective are commended. Exposure to practice needs to be part of an integrated educational design, exploiting activities such as site visits, industry case studies, industry problem solving, and guest lectures and presentations by practising professionals.

PETROLEUM ENGINEERING

- Team skills development is a key theme throughout the program culminating in the final year project which focuses on a field development exercise.
- Field trips seem to focus more on geological activities, rather than visits to drilling sites or operational plants and this imbalance needs to be addressed. Case studies and guest presentations from industry professionals are very effective and highly regarded by students. External sessional teaching is effective, but from the viewpoint of students does suffer from the lack of access to the presenter outside of teaching sessions.
- Final year 'Honours Project' reports were of a satisfactory standard, with the better examples acceptable as professional industry publications.

CIVIL AND ENVIRONMENTAL ENGINEERING, CIVIL AND STRUCTURAL ENGINEERING, MINING ENGINEERING

- Lack of discipline based laboratory and practical learning experiences in the first year of the programs was again were felt to be a shortcoming.
- Impressive standard of final year Honours project reports, with real research outcomes delivered and opportunity for publication.
- Engineering design is a strong theme throughout the programs.
- Sustainability issues are strongly emphasised throughout the programs.
- Ethics covered in a number of courses, but the emphasis felt to be dependent on the individual member of teaching staff.
- Good team skills and leadership development through a host of group activities.
- Students, graduates and industry all appear to be impressed with the standard and quality of the programs.
- Exposure to professional engineering practice is achieved with 'real world' case studies and some limited use of external presenters and lecturers. Effective use is made of site visits within specific courses but there is perhaps potential for strengthening this aspect, as an integral part of the overall educational design.

9.3 Quality systems

9.3.1 Issues of a general nature

- The strategic role of the new Faculty level Industry Advisory Board is clearly acknowledged and endorsed by the panel. The panel questioned however, the effectiveness and level of engagement of industry advisory mechanisms at the individual program level. Each School has an Advisory Committee which supposedly spans the various program disciplines. The panel found that current discipline representation does not adequately address some of the newer program fields such as Pharmaceutical Engineering. Plans are in place to address this deficiency. In some cases the Advisory Committee or a sub-committee of the Advisory Committee will tackle specific projects such as in the School of Mechanical Engineering a focus on laboratory activity or project management. Although there is some evidence of advice on desirable graduate attributes such as communication and technical writing skills, and developmental approaches such as peer review of project activity, there is little evidence of a systematic approach that overviews the full range of outcomes and the effectiveness of delivery. There is scope for School Advisory Committees to engage more deeply with the design, delivery and attainment monitoring of graduate outcomes, providing more direct input to program teaching teams as they focus on a broad specification of graduate capabilities and mapping the delivery of these 'big-picture' outcomes through the component learning experiences and assessment processes of individual courses.

- Although the SELTS evaluation system provides an avenue of feedback, the frequency of evaluation can be as low as a two year cycle. Staff are required to feed back to students the action taken as a consequence of feedback, but the response times generally mean that improvements are of benefit only to following student cohorts.

- Schools have various processes of direct consultation with the student body, such as through Staff-Student Consultative Committees. Although such interaction provides a more immediate response mechanism for dealing with day to day delivery issues, there is little evidence that this exchange opportunity involves the student body formally in the processes of continuing improvement, or in a 'top-down' program review process that tracks the delivery of the graduate outcomes specification. There is opportunity to much more fully engage the student body as a partner in the quality improvement cycle. This could occur through consultative committees, focus groups, through direct representation on teaching teams and curriculum bodies or through

commissioned reports and presentations. The exit interview initiative in the School of Mechanical Engineering seemed to be an interesting possibility, but the panel was advised that this activity had been discontinued. Student input is obviously vital to a systematic and holistic quality improvement process, but is also an educational development experience in its own right.

- The panel was disappointed to find the wide variance in quality of published course outline documents. There are noteworthy features within the format used by individual schools and good practices need to be shared across the Faculty. In the panel's view, there is a need to develop a unified template that will ensure these documents do communicate the necessary advice to students. In particular the panel emphasises the need for these documents to convey a clear understanding of the educational design, closing the loop on learning outcomes, learning experiences and assessment measures at the specific course level. In addition, closing the loop at the program level, showing how the learning outcomes and assessments of the particular course contribute to the 'big-picture' specification of graduate outcomes at the program level. The course outline document is an ideal medium for conveying the educational design philosophy, mapping the delivery of graduate outcomes and demonstrating the rigour of tracking component contributions.

9.3.2 Quality systems – comments from Individual panel specialists

SCHOOL OF CHEMICAL ENGINEERING

- With SELTS evaluations of individual courses undertaken at the end of semester, there is little benefit that can be passed on to the current student cohort in terms of closing the loop on issues raised. There are strong and effective informal communications between staff and between staff and the student body.

In the Schools response to a draft version of this report it was pointed out that the School's Student Satisfaction Survey conducted in first semester each year provides feedback to students on actions taken in the second semester.

- Although the submission documentation provided some insight into how individual courses contribute to the delivery of generic outcomes in graduates, these methodologies are not clearly or adequately communicated to students in course outline documents. Nor is the delivery and assessment of broad ranging graduate capabilities systematically tracked through individual course contributions.
- The Industry Advisory Committee meets twice yearly and appears to have some interaction on curriculum changes. Discussions however do not extend to a systematic consideration or attainment monitoring of graduate outcome targets.
- Research project reports of adequate quality, given that these are based only on a single semester activity.

SCHOOL OF MECHANICAL ENGINEERING

- Informal staff-student linkages appear to address most day to day issues. It was not apparent that there were formal mechanisms for the student body to contribute in a significant way to 'big-picture' review and improvement processes. Student representation on School and Faculty boards/forums do not appear to be achieving significant outcomes that are obvious to the broader student body. Student focus groups or regular consultation sessions are encouraged as an integral part of the quality cycle, engaging with the 'big-picture' planning and educational design work of program teaching teams.

- Industry influences on curriculum seem to occur more on an informal basis, through networks and connections of individual members of academic staff, rather than through formal advisory processes, with the Advisory Committee meeting only once annually.
- Although course learning objectives are clearly specified, course outline documents do not formally close the loop on learning outcomes, learning experiences and assessment at the course level, nor do they map course contributions thoroughly to the delivery of targeted graduate outcomes.

SCHOOL OF ELECTRICAL AND ELECTRONIC ENGINEERING

- Students did not seem to express commitment or a sense of accountability for the processes of continuing improvement. There was the feeling that students were comfortable to be passive recipients of the education process.
- There was mixed reaction on the value of the SELTS system. 'Good' lecturers do use feedback to improve their delivery. Staff-student consultation meetings were reported by students to "address day to day operational matters, much like the secondary school SRC". There is occasionally some depth to discussion, exploring experiences, but there is clearly opportunity for student engagement to occur at a more strategic review and planning level.
- Although there is a school template for course outline documents, these documents fail to close the loop on course learning outcomes, learning experiences and assessment. There is also no closure of the loop at the program level to show how the course contributes to the delivery of targeted graduate outcomes.

SCHOOL OF COMPUTER SCIENCE

- The panel was disappointed by the level of industry engagement. There is little evidence to show that industry advisers are providing any input to setting, reviewing and assessing attainment of targeted graduate outcomes. There is little indication of any systematic evaluation of industry needs in software engineering or of any benchmarking of education program offerings from elsewhere. Although there is a wide range of research activity underway in the School, a formal industry advisory mechanism needs to be urgently addressed to underpin the specification and monitoring of graduate outcomes.
- Likewise feedback and input from the student body seems to be at a minimum obligatory level. There is no indication that Software Engineering staff work as a team, proactively engaging with student and external stakeholders to track the delivery of targeted graduate outcomes and systematically improving the educational design.
- Course outline documents in this school do not appear even to address the delivery of generic outcomes.

SCHOOL OF PETROLEUM ENGINEERING

- Year level student representative feedback system was reported by students to bring about useful improvements, but informal feedback processes tend to dominate rather than a systematic staff-student consultation mechanism.
- Industry advisory mechanism needs to be strengthened in terms of providing strategic input at the graduate outcomes level, but this is unlikely to occur until the School leadership matter is resolved. Staff felt that the advisory mechanism was currently not as effective as it had been in the past.

SCHOOL OF CIVIL AND ENVIRONMENTAL ENGINEERING

- The cycle of ongoing quality improvement relies upon university and Faculty based quality systems which include the gathering of survey data and other performance indicators. Formal student and graduate survey feedback data does not appear however to be a key driver for systematic continuous improvement efforts at the teaching team level.
- Annual Advisory Committee meetings provide useful advice at the strategic level, but it was not apparent that time permitted formal input to the processes of developing, reviewing and monitoring attainment of broad ranging graduate outcome targets in a systematic way.
- Academic staff members however were felt to be externally focussed, with a good overview of industry needs.
- Formal student liaison works in conjunction with informal communications to effectively address teaching issues. It was not clear that there was systematic engagement with student stakeholders in the processes of educational design and improvement in conjunction with either the program teaching teams or by the Learning, Teaching and Curriculum Committee.
- Course outline documents, although listing generic outcome targets, do not tend to close the loop on delivery of graduate outcomes, either at the course or program levels.
- Final year design and project outcomes were deemed to be of a high standard with group work assessment and peer review processes working effectively.

10 RECOMMENDATIONS TO THE FACULTY AND THE SCHOOLS

The following recommendations to the Faculty are intended to assist with the processes of continuing quality improvement and to summarise the outcomes arising from the above discussion.

R1 Ensure that all programs are supported by an active industry advisory body which provides tangible input to setting, reviewing and monitoring attainment of targeted graduate capabilities unique to the domain of practice and which contributes broadly to the educational design process.

R2 Develop a more complete specification of targeted graduate capabilities for each program using the Engineers Australia Stage 1 Generic Competency standard for Professional Engineers as a resource. Ensure that such a specification covers personal and professional capabilities, the range and depth of technical competence and engineering application skills identified as necessary for the field of practice as well as enabling skills and knowledge in mathematics, science and engineering science.

R3 For all programs, build on the generic attributes analysis work already undertaken to document the educational design philosophy, mapping the contributions individual courses are making to the attainment of the full range of targeted graduate outcomes. Use this documented program design as a tool for on-going tracking of the learning outcomes and assessment measures contributed by individual courses. Also as a basis for developing in students from first year, a better appreciation and engagement with delivery of the 'big picture' objectives and targeted graduate capabilities.

R4 Strengthen the concept, role and accountability of the Program Leader for leadership of an inclusive and engaged teaching team, crossing discipline, school and faculty boundaries where appropriate to drive a systematic and holistic educational design and review process.

R5 Ensure for all programs that there is meaningful and formal engagement with the student body as a stakeholder in the processes of continuing improvement. Ensure that students are contributing meaningful input through focus groups, staff-student consultation, and/or direct input to the work of the program teaching teams. Ensure that such engagement is embedded as part of the educational culture from the beginning of the study program.

R6 Improve the coordination and implementation of the first year mentoring scheme. Seek feedback from the student body on how to more successfully engage students and optimise the benefits of the scheme.

R7 Strategically address the factors and barriers which discourage cooperation between schools in the design and delivery of programs and in the sharing of best practices and resources.

R8 Rationalise the design of individual programs to:

- achieve a unified, 3 unit, simplified structural model;
- reduce the technical intensity and structural rigidity;
- provide capacity for broader study options and pathways;
- provide capacity for devising double degree implementations that minimise loss of material that is mandated as core to the host Bachelor of Engineering programs;
- reduce timetabling complexity;
- maximise opportunity for common approaches across Schools and the provision of faculty wide courses;
- eliminate duplication of effort;
- demonstrably reduce teaching loads for academic staff.

R9 Remove ambiguity of combined degree titles and testamurs such that the dominant engineering field and supplementary study stream are differentiated.

R10 Review the quantum and quality of practical and laboratory learning, particularly at early year levels to ensure consistency of provision across schools and programs. In particular check for perceived deficiencies noted by the panel in the first year of the programs offered by the Department of Mechanical Engineering and in the Petroleum Engineering program.

R11 Address the consequences of cumbersome program design conditions which mandate structural differentiation between Honours and Pass program streams, with the objective of attaining a simplified Honours assessment process that is based on academic performance alone and a common program sequence.

R12 Develop a Faculty wide, unified and consistent course outline document template that demonstrates closure of the loop at the course level through systematic linkages between learning outcomes, learning activities and assessment measures. Also to explicitly link the particular course outcomes and assessment measures to the 'big-picture' graduate outcomes for the program as a whole.

R13 Strategically and systematically address the planning of facilities and infrastructure at individual program level with prioritised equipment and facility rolling lists that clearly identify priorities for divestment of funds as they are made available.

R14 Consider introduction of a reflective, self assessment tool for students to self-monitor progressive skills development, and especially personal and professional skills development, against a detailed specification of targeted graduate capabilities. These contributions should be ideally tracked from both traditional on-campus learning as well as broad exposure to professional engineering practice and include the outcomes of work experience.

END REPORT

Attachment A to Follow

DRAFT

11 SCHEDULE OF ACTIVITIES

Attachment A

Tues 15 May	IChemE Panel	Engineers Australia Panel									ACS Panel		
TIME	(CHAIR) Mr Ainslie Just, Prof Dianne Wiley, Prof Geoffrey Evans & EA Panel Member Assoc Prof Ming Ang	Professor Mike Cardew-Hall (CHAIR) (Sub Panel 1)	Mr Phillip Campbell (Sub Panel 1)	Assoc Professor Simon Watkins (Sub Panel 1)	Professor John Wilson (Sub Panel 2)	Mr Paul Mitchell (Sub Panel 2)	Mr Jason Keily (Non-visiting Consultant)	Mr Graham Bunn (Sub Panel 3)	Ms Jill Kiley (Sub Panel 3)	Professor Alan Bradley (Sub Panel 4)	Professor Shirley Gregor (Sub Panel 4)	Assoc Professor Paul Strooper (Sub Panel 4)	Mr Bob Hart (Sub Panel 4)
0800 - 0930	**OPENING MEETING WITH SENIOR LEADERSHIP TEAM - Joint Panel meeting** - Venue: N123b												
0930 - 1000	**MORNING TEA WITH SENIOR LEADERSHIP TEAM - Joint Panel meeting - Venue: N123b (includes Morning Tea for 27 persons - Faculty Office to arrange)**												
1000-1100	**MEETING WITH PROGRAM LEADER/S - Joint Panel meeting with the Program Leaders for Chemical Engineering / Pharmaceutical Engineering Disciplines** - Venue: N123b												
1100-1200	**Meeting with Academic Staff - Discipline of Chemical Engineering** -	**MEETING WITH MEETING WITH PROGRAM LEADER/S - Civil & Structural, Civil & Environmental, Petroleum and Mining Engineering Disciplines** - Venue: N123b											
1200-1230		**PANEL PRIVATE SESSION - with access to displayed teaching, QA materials and student work** - Venue: S117 (Davis Room) (includes a light working lunch for 11 persons - Faculty Office to arrange)											
1230-1300	**Lunch with Chemical Engineering staff** -												
1300 -1330		**MEETING WITH PROGRAM LEADER/S - Mechanical, Mechatronic, Aerospace and Automotive Engineering Disciplines** - Venue: N123b											
1330 -1400	**Tour of Chemical Engineering facilities** -												
1400-1430		**MEETING WITH PROGRAM LEADER/S - Electrical & Electronic, Telecommunications, Computer Systems and Software Engineering Disciplines** - Venue: N123b											
1430-1500	**Design projects - discussion with Manager Design Projects** -												
1500-1530		**PANEL PRIVATE SESSION with access to displayed materials** - Venue: S117 (Davis Room) (includes a afternoon tea for 11 persons - Faculty Office to arrange)											
1530-1600	**Panel Private Session**	**Meeting with the Vice Chancellor, Professor James McWha and Professor Peter Dowd, Executive Dean** from 3.30 pm - 4.00 pm, Venue:											
1600-1700		**SUB PANEL 1 - MEETING WITH ACADEMIC STAFF - Mechanical, Mechatronic, Automotive and Aerospace Engineering Disciplines** - Venue: S225			**SUB PANEL 2 - MEETING WITH ACADEMIC STAFF - Civil & Structural, Civil & Environmental and Mining Engineering Disciplines** - Venue: N134		**SUB PANEL 3 - MEETING WITH ACADEMIC STAFF - Petroleum Engineering Discipline** - Venue: Lecture Room 108 (ASP)			**SUB PANEL 4 - MEETING WITH ACADEMIC STAFF - Electrical & Electronic, Telecommunications, Computer Systems and Software Engineering Disciplines** - Venue: Maths 112		
1700-1730	**Formal meeting with Industry Advisory group chairs/members** - Venue N123b												
1730 - 1830	**Joint Panel Meeting Informal Meeting with all external constituencies External Advisory Board members, employers and graduates as well as selected members of the Senior Leadership Team** - Venue: Staff Club (Includes refreshments for 54 persons - to be arranged by Faculty Office) NOTE: Engineers Australia Panel departs for hotel 1830 sharp.												
1830 - 2130	**IChemE Private Panel Dinner**	**Engineers Australia Private Panel Working Dinner**											

WED 16 MAY	IChemE Panel	Engineers Australia Panel									ACS Panel		
TIME	**(CHAIR) Ainslie Just, Prof Dianne Wiley, Prof Geoffrey Evans & EA Panel Member Assoc Prof Ming Ang**	**Mike Cardew-Hall (CHAIR)** (Sub Panel 1)	**Phillip Campbell** (Sub Panel 1)	**Simon Watkins** (Sub Panel 1)	**John Wilson** (Sub Panel 2)	**Paul Mitchell** (Sub Panel 2)	**Jason Keily (Non-visiting Consultant)**	**Graham Bunn** (Sub Panel 3)	**Jill Kiley** (Sub Panel 3)	**Alan Bradley** (Sub Panel 4)	**Shirley Gregor** (Sub Panel 4)	**Paul Stroope r** (Sub Panel 4)	**Bob Hart** (Sub Panel 4)
0830-0900	**LIBRARY PRESENTATION by Ms Kay Leverett Engineering Librarian** Venue: S117 (Davis Room)												
0900-0930	**Meeting with Chemical students** - Venue: N134 (Culver Room)	**SUB PANEL 1 - TOUR OF FACILITIES - Mechanical, Mechatronic, Automotive and Aerospace Engineering Disciplines** - pick up Davis Room at 9.00 am			**SUB PANEL 2 - TOUR OF FACILITIES - Civil & Structural, Civil & Environmental and Mining Engineering Disciplines** -pick up Davis Room at 9.00 am			**SUB PANEL 3 - TOUR OF FACILITIES - Petroleum Engineering Discipline** - pick up Davis Room at 9.00 am			**SUB PANEL 4 - TOUR OF FACILITIES - Electrical & Electronic, Telecommunications, Computer Systems and Software Engineering Disciplines** EEE (9.00 - 9.30 am) - pick up Davis Room at 9.00 am Comp Sci (9.30 - 10.00am) - pick up EEE School Office at 9.30 am		
0930-1000													
1000-1030	**MEETING WITH TECHNICAL and PROFESSIONAL STAFF - Morning Tea with selected Technical and Professional staff from all Disciplines** - Venue S225 (To include morning tea for 27 persons - Faculty Office to arrange) (												
1030-1100	**Panel private session (to include morning tea) - to develop findings and recommendations** Venue: N122	**SUB PANEL 1 - MEETING WITH STUDENTS - Mechanical, Mechatronic, Automotive and Aerospace Engineering Disciplines** - Venue: S225			**SUB PANEL 2 - MEETING WITH STUDENTS - Civil & Structural, Civil & Environmental and Mining Engineering Disciplines** - Venue: N134 (Culver Room)			**SUB PANEL 3 - MEETING WITH STUDENTS - Petroleum Engineering Discipline** - Venue: Lecture Room 108 (ASP)			**SUB PANEL 4 - MEETING WITH STUDENTS - Electrical & Electronic, Telecommunications, Computer Systems and Software Engineering Disciplines** - Venue: Maths 112		
1100-1130													
1130-1200		**ENGINEERS AUSTRALIA AND ACS PANELS PRIVATE SESSION - Compilation of findings** - Venue: S117 (Davis Room) (includes a light working lunch for 11 persons - Faculty Office to arrange)											
1200-1230	**IChemE Panel Report back to Senior Leadership Team** - Venue: N134												
1230-1300													
1300-1330	**IChemE Lunch** - Venue: N122												
1330-1400													
1400-1430	**IChemE Panel Departure**												
1430-15.00													
1500-1530		**EXIT INTERVIEW (MEETING) - with Senior Leadership Team** - Venue: S127 (Frank Bull Suite) **(NOTE: Engineers Australia and ACS Panels depart 15.30 sharp)**											

12 ADDITIONAL NOTES – MEETINGS WITH STUDENTS

Student representatives were found to be articulate and very willing to share their views, and to critically reflect on their learning experiences. Many useful comments and suggestions were received from sessions the sub-panel groups had with student representatives. This maturity of outlook confirmed the panel's observation that there is potential opportunity for the student body to contribute, in partnership, more concretely to the processes of continuing quality improvement.

CHEMICAL ENGINEERING, PHARMACEUTICAL ENGINEERING

- Mentoring system is not very effective. A better plan would be to use senior students in a mentoring role.
- Common first year would be beneficial to allow for change of specialist stream after introductory experiences.
- Final year activity would be better distributed over two semesters. Unit weighting for this activity is too low in comparison with effort involved.
- Sustainablity is not emphasised in early programs years.
- Pharmaceutical Engineering students very enthusiastic about the future study program.

MECHANICAL ENGINEERING, AEROSPACE ENGINEERING, AUTOMOTIVE ENGINEERING, MECHATRONIC ENGINEERING

- Some concerns for lack of sufficient hands-on practical learning.
- Lack of laboratory learning experience in first year is a concern. Overall impressions of first year - too much emphasis on theory and little attention to developing a big-picture understanding of engineering practice and the specialist disciplines available. First year tends to be 'boring'.
- More laboratory space and facilities are required to provide for adequate practical and 'hands-on' learning.
- Teaching staff are generally passionate about their field, and enthusiastic to help, but stretched in terms of available time and work load.
- TAFE five-day hands-on practice course – 'fantastic'.
- Strong consensus that first year Physics simply duplicates high school Physics with few challenges.
- Mechatronics program is felt to lack sufficient electronics and is over loaded with mechanical content. There needs to be more electives in the Mechatronics program that are oriented towards electrical and electronics.
- Aerospace and Automotive students want more discipline specific learning experiences in the early program years. Lack of identity is an issue.
- Computer access during day time is very difficult. IT facilities in general are very much in need of improvement. Architecture student load on workstations is a problem.
- Workshop facilities and technical support staff very much 'stretched' to cope with some 160 final year projects.

- Student workload is felt to be very heavy, with much time consumed in report writing.
- Students would like to see more choice in the programs through electives and/or other options.
- Final year project activity very rewarding, but unit weightings do not reflect work involved.
- Team skills development very effective through project work.
- There needs to be a much stronger linkage between project management teaching and actual project activity. Lecture attendance for "Engineering Management and Professional Practice' is poor.
- Head of School is very approachable and email provides a useful mechanism for direct feedback via this channel.
- Focus on engineering management and professional engineering practice needs strengthening.
- Lack of aerospace learning experiences in the first two years of the program is disappointing and a motivation issue.
- Some aspect of involvement of 1st year students in final year activity is suggested as a means of engagement.
- Treatment of aerospace structures topics is inadequate.
- There is little feedback to the student body as a result of student representatives serving on school committees. Engagement of students in the cycle of quality improvement is poor.

ELECTRICAL AND ELECTRONIC ENGINEERING, COMPUTER SYSTEMS ENGINEERING, TELECOMMUNICATIONS ENGINEERING, SOFTWARE ENGINEERING

- Prescribed, locked down nature of the program is limiting choice and elective options.
- Computer Systems Engineering program is too far biased towards Electrical Engineering – 'Electrical Engineering in disguise'. Similar concerns for Telecommunications program.
- There is scope to better integrate project management skills development with the final year project, rather than using a model project framework.
- There is little requirement for students to reflect and self evaluate their professional development.
- There is little introduction to the 'big-picture' of engineering practice in a wider sense or in the specific field of practice in the early program years. Students feel that the education environment still follows a 'lock step' learning mode, delivered in discrete steps, ticking off completion as it occurs. This is in contrast to a more open learning environment, with exposure to professional practice and complex, broad context problem solving, where students are empowered to take a genuine responsibility for their own development with conscious monitoring and self evaluation of progress towards a mutually understood target of graduate outcomes.
- Industry based projects provide an invaluable learning experience. Every effort needs to be made to broaden the opportunities for involvement in such projects.
- The first year 'Engineering Planning, Design and Communication' project takes students out of their natural comfort zone, but in the end is a highlight of the program and provides a most valuable learning experience. There does however need to be a stronger emphasis on engineering practice in this course.

- Staff student consultation processes are much like the 'SRC' system at school –deals with day to day issues with only occasional effort to engage with students in depth to explore experiences and opportunities for educational design improvement.

- There is a "massive" imbalance of workload between courses that does not appear to be monitored. Effort involved does not correlate with unit weighting.

- Teaching quality is variable. In some instances learning experiences are better with some young tutors, rather than senior lecturing staff members who tend to 'talk over' the students, and fail to engage. There is however a wide variance in the teaching skills of tutors. Again younger industry based teachers are found often to be very much more effective than older academic teaching staff.

- Combined/double degree timetabling is badly orchestrated with a perceived lack of cooperation between schools.

- Management of the program in the School of Computer Science is poor. Students do not know who to turn to at the program leadership level.

PETROLEUM ENGINEERING

- Students have a clear understanding of the field of practice and a commitment to becoming professional petroleum engineers.
- Excellent laboratory facilities, but disappointed that they are not utilised sufficiently in the undergraduate program.
- Teaching staff are seen to be excellent role models.
- Staff members are generally accessible, but block mode short courses need supplementary tutorial time.
- International exchange opportunities with other petroleum schools are seen as very positive and appreciated.
- Professional ethics is not felt to be effectively covered in the program.
- Team based learning is widely used and effective.

CIVIL AND ENVIRONMENTAL ENGINEERING, CIVIL AND STRUCTURAL ENGINEERING, MINING ENGINEERING

- Strengths of program are the good relationships between staff and students, the strong project content and positive learning experiences from 3rd year onwards.
- Concerns for limited physical facilities – lack of appropriate space for group and team activity and inadequate computer access in particular.
- Packed, compulsory curriculum leaves little scope for electives.
- Lack of focus on 'big-picture' understanding, particularly in the early years with little reference to the overall program plan and professional engineering practice in general.
- Teaching staff members are very well regarded and always accessible.
- Work placement provides mixed benefits.

- Laboratory learning component is not seen by students to be adequate. Hands-on learning experiences are extremely valuable and need to begin much earlier in the program.
- More program choice through electives or options.
- Timetable clashes are impacting double degree students.
- Students value access to staff members, but the mentoring system is not working. Contact with 4th or 5th year students would be effective also as a mentoring approach.