

### **Comment from School of Education and Community Studies**

The only unit we teach with a large component of maths (as opposed to maths education) is Reconstructing Mathematical Understanding, unit 4802, to first year BEd students. However this is very much review of content necessary for early childhood and primary teaching, and prepares students for Mathematics Education 1 and 2. It treats content in a different way to that normally done in maths and stats units, in that it looks at solving problems using various representations, particularly visual. This deep knowledge of simple concepts is essential for teachers. One of the principal aims of the unit is to develop confidence in maths, rather than to teach proficiency at mathematical techniques (although this is also important).

### **Comment from School of Professional Communication**

We have no need for and do not teach large components of maths and stats. Quantitative research methods are addressed in the ug unit Communication and Media Research and the hons unit Advanced Communication Research H, but have a minor emphasis compared to qualitative methods. Learning outcomes aim at students' understanding of the "main elements of quantitative and qualitative research methods", eg research design and issues of reliability and validity without actually going into number crunching.

### **Units taught by the Maths & Stats Group in the School of IS&E**

<b>School</b>	<b>Unit code</b>	<b>Unit name</b>
Information Sciences & Engineering	4470/1564	Computing Mathematics 1 + Finite Mathematics G
	4471	Computing Mathematics 2
	5056	Differential Equations
	5058	Linear Algebra
	577/ 6553/1127	Mathematical Methods + General Mathematics G / G1
	4844	Mathematical Structures
	575	Mathematics 1
	576	Mathematics 2
	4458	Mathematics 5
	4459	Mathematics 6
	5031	Multivariate Calculus
	5032	Numerical Analysis
	4847	Quantitative Decision Making
	5392	Research Project BSc
	5023	Truth, Belief & Science
	Tba	Business & Financial Mathematics
	6538/6550	Business Decision Models + G
	4842/7146	Coding Theory + PG
	6698/6699	Discrete Mathematics + G
	7098/7088	Mathematics for Information Sciences + Computing Mathematics G
5123	Business Statistics	

**Units taught by the Maths & Stats Group in the School of IS&E**

<b>Unit code</b>	<b>Unit name</b>	<b>Student count 2005</b>	<b>EFTSL 2005</b>
4470	Computing Mathematics 1	0	0
1564	Finite Mathematics G	0	0
4471	Computing Mathematics 2	16	2.005
5056	Differential Equations	17	1.411
5058	Linear Algebra	25	1.992
577	Mathematical Methods	28	3.505
6533	General Mathematics G	0	0
1127	General Mathematics G1	0	0
4844	Mathematical Structures	11	1.826
575	Mathematics 1	0	0
576	Mathematics 2	0	0
4458	Mathematics 5	0	0
4459	Mathematics 6	0	0
5031	Multivariate Calculus	14	1.162
5032	Numerical Analysis	19	1.494
4847	Quantitative Decision Making	6	0.977
5392	Research Project BSc	3	0.485
5023	Truth, Belief & Science	39	6.474
TBA	Business & Financial Mathematics		
6538	Business Decision Models	0	0
6550	Business Decision Models G	0	0
4842	Coding Theory	10	1.66
7146	Coding Theory PG	1	0.125
6698	Discrete Mathematics	62	7.745
6699	Discrete Mathematics G	0	0
	Mathematics for Information		
7098	Sciences	69	8.63
7088	Computing Mathematics G	0	0
5123	Business Statistics	400	50.235
	<b>TOTAL</b>	<b>720</b>	<b>89.726</b>

source: UC statistical website

Number of FTE staff in Maths & Stats Group = 5.6

Ratio of EFTSL : FTE =  $89.726/5.6 = 16.0225$

**Audit of units having a large component of mathematics or statistics (other than those taught by Maths & Stats Group)**

(source: Heads of School)

School	Unit code	Unit name
Business & Government	4836	Commercial Bank Management
	4224	Portfolio Theory & Investment Analysis M
	3393	International Finance
	4839	Financial Management 1
	4840	Financial Management 2
	6224	Business Finance PG
	3965	Marketing Research Methods
	6608	Management Research Methods
	6396	Business Forecasting
Creative Communication	-	-
Design & Architecture	-	-
Education & Community Studies	4802	Reconstructing Mathematical Understanding
Health Sciences	4740	Integrated Studies of Disease
	6469	Epidemiology and Principles of Research PG
	6286	Introduction to Health Informatics G
	Tba	A Scientific Basis for Health Services G
	Tba	Health Systems Operation and Impact G
	6288	EBM, Decision Support & Artificial Intelligence PG
	6611	Introduction to Psychological Research
	4312	Psychology 202
	6105	Psychology 202G: Experimental Psychology
	4315	Psychology 301
	6108	Psychology 301G: Methods & Design
	6790	Research Methods and Professional Ethics PG
Information Sciences & Engineering	-	-
Languages, Int'l Studies & Tourism	-	-
Law	-	-
Professional Communication	-	-
Resource, Environmental & Heritage Sciences	5529	Biometry
	5842	Biometry G
	5844	Classification & Ordination G
	1809	Data Analysis in Science
	5843	Experimental Design & Sampling G

13. The audit of units having a large component of maths & stats – both those taught by the Maths & Stats group and those taught by others – arose from a concern that it was unlikely to be cost-effective to have multiple maths & stats units with a significant overlap of content taught across the campus. The panel found, however, that there appeared to be little duplication. Quantitative units taught outside the Maths & Stats group were highly contextualised. There was no indication that current requirements for teaching would change when projected into the future.

14. The financial statements seen by the panel suggested that income and expenditure of the Maths & Stats group could just about balance over the year following the departure of two staff from the University. However, the panel was cautious about drawing a definitive conclusion from incomplete financial data or a single year's figures.

15. The panel was aware that the University aims to be an employer of choice. Another set of questions that might be considered are accordingly the following. What would be required to develop and maintain a vibrant, healthy working environment for mathematicians and statisticians at the University of Canberra? Where does the group see itself going professionally and how can the University assist the staff to achieve their goals?

### **Recommendations**

16. The panel believes that UC needs a strong and viable teaching program in maths & stats. It makes the following recommendations:

- (a) That the Maths & Stats group remain in the School of IS&E and be recognised as a formal organisation unit at the level of Discipline for the purpose of resource management;
- (b) That a head of this Discipline be appointed to provide academic leadership;
- (c) That the Discipline establish a formal mechanism for consultation with user groups from its client courses;
- (d) That the Discipline be responsible for all teaching of maths & stats at UC except in units where maths & stats is a tool and the principal focus of the unit is in a different academic area;
- (e) That the Discipline ensure its expertise is available to the University as a whole, not solely through the units that it teaches, and that up to 0.2 FTE of statistical consultation be available (and known to be available) to researchers within the University on request.

necessary. The submissions that had been made were overwhelmingly in favour of building up and maintaining a strong Maths & Stats group. The panel took the view that a submission from the Divisional Executive was needed to give it a context and a direction for its deliberations. A request for a written submission was accordingly made to Prof Dowling but he declined to make one, commenting that the review had not been requested by him and that it was being undertaken by the University, not by BLIS. At its second meeting, the panel noted the Pro Vice-Chancellor's response.

7. Also at the first meeting, the panel decided to request Heads of School to identify units taught in their Schools that had a large component of maths or stats. This information was made available at the second meeting, except in relation to one School that had not responded to requests (latest information attached). At the second meeting, the panel decided to seek information on which courses the students taking units taught by the Maths & Stats group were enrolled in.

8. An interim report was submitted to the Vice-Chancellor on 17 August and a draft final report on 9 September.

### **Assessment**

9. The decision of the BLIS Divisional Executive not to make a submission to the review hampered the work of the panel. It took the view, however, that it had to work with the input it could obtain.

10. The panel affirmed the fundamental importance of maths & stats in underpinning a wide range of disciplines at the University. There can be no question of maths & stats not being taught at UC. The questions are: who should teach it, professional mathematicians or quantitatively-oriented specialists from other academic areas; whether mathematicians and statisticians should be co-located in a specialised Maths & Stats group or dispersed among the Schools; and whether the 'right sort' of maths & stats is being taught. The overwhelming consensus of the submissions made to the review is that maths & stats should be taught by specialists grouped in a single organisational unit.

11. The panel acknowledged that there are several ways in which the teaching of maths & stats at the University could be organised (retaining the Maths & Stats group in IS&E, moving it to another School, distributing it among several Schools, or shutting it down and leaving each School to make its own arrangements). However, the panel received no negative submissions about the current model and saw nothing to justify imposing a change to the status quo.

12. Other stakeholders did not criticise the work of the group, but there is a question about whether it is teaching the 'right sort' of maths & stats, especially to students of Business & Government. Maths & stats covers as broad a range of fields as does science. Elsewhere, traditional calculus-based maths is gradually yielding ground to stats-based modelling. UC's emphasis is in application areas not in pure maths research. To ensure a good match between teaching and expectations, a formal mechanism for consultation between the Maths & Stats group and user groups from its client Schools is needed.

## Submissions

5. Submissions to the review were invited from inside and outside the University, from staff, students and others, including organisational units and discipline and program groups. Submissions were called for on 15 April and were requested by 13 May. On 10 May the due date was extended to 27 May. Excluding one submission that was withdrawn on 31 May, a total of 34 submissions were received. All the submissions, except for three from individuals that were made in confidence, were published on the review website.<sup>1</sup> The non-confidential submissions were made by the following:

ACT Board of Senior Secondary Studies  
Australian Mathematical Sciences Institute  
Australian Mathematical Society  
Australian Mathematics Trust  
Discipline of Software Engineering and Artificial Intelligence, University of Canberra  
School of Business and Government, University of Canberra  
School of Education and Community Studies, University of Canberra  
School of Health Sciences, University of Canberra  
School of Information Sciences and Engineering, University of Canberra  
Dr Frank Barrington, University of Melbourne  
Prof Robert Bartnik, Monash University  
A/Prof John Campbell, University of Canberra  
A/Prof George Cho, University of Canberra  
Prof Paul Edwards, University of Canberra  
Emeritus Prof Joe Gani, Australian National University  
Prof Arthur Georges, University of Canberra  
Prof Peter Hall, Australian National University  
Ms Mary Hewett, University of Canberra  
Prof John Hutchinson, Australian National University  
Ms Gay Landau, University of Canberra  
Mr John Maindonald, Australian National University  
A/Prof Craig McDonald, University of Canberra  
A/Prof Peter Morgan, University of Canberra  
Dr Sajal Palit, University of Canberra  
Mr Jonathan Palmer, Australian Bureau of Statistics  
A/Prof John Rayner, University of Canberra  
Mr Dennis Trewin, Australian Statistician  
Dr Joelle Vandermensbrughe, University of Canberra  
Ms Janelle Wallace, Radford College  
Prof Alan Welsh, Australian National University  
Dr Graham Williams, Australian Taxation Office

## Meetings

6. The panel met twice – on 17 June and again on 9 August. At its first meeting, the panel noted that the BLIS Divisional Executive had decided against making a submission. The panel agreed that this was problematical because it meant that the concerns that had led to the review had not been articulated. There was nothing in the triggers or terms of reference to indicate why a special review had been considered

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<sup>1</sup> <http://www.canberra.edu.au/divisions/learning-teaching/quality/special-reviews>

# Special purpose academic review of the Discipline of Mathematics and Statistics

## *Final Report – October 2005*

### **Introduction**

1. In September 2004 the University of Canberra (UC) established a process for conducting reviews of areas of its academic activities outside the regular cycle of course group reviews. Such special purpose reviews are to address issues that require immediate attention. The process is designed to be open and transparent and is agreed to by the university community. It allows for adequate input by all interested parties and has an agreed authority for decision making.

### **Triggers**

2. In April 2005 VCAC identified a need for a special purpose academic review of the Discipline of Mathematics and Statistics. The triggers for the review were:
- (a) The shift in the discipline's role from providing award courses to (largely) servicing the quantitative needs of students whose primary academic focus is elsewhere.
  - (b) The question of whether the new role can best be filled by continuing to offer generic units in mathematics and statistics or by developing customised units in mathematics and statistics appropriate for education, for business, for science, etc.

### **Terms of reference**

3. The terms of reference for the review were:
- (a) To review the current and projected requirements for the teaching of mathematics and statistics across the University with respect to:
    - (i) Courses in mathematics or statistics at the UG or G level
    - (ii) Majors and minors in mathematics or statistics
    - (iii) Specific units at the UG or G level
  - (b) To review the current delivery of mathematics and statistics across all the Divisions of the University and to make recommendations with respect to their delivery in the future.
  - (c) To review the economic viability based on the recommended delivery model(s).

### **Review panel**

4. The review panel was made up of the following people:  
Prof J. Dearn, Pro Vice-Chancellor (Academic) – Chair  
Dr R. Foxwell, Chair of Academic Board  
Prof D. Goodrum, School of Education and Community Studies  
Prof R.H. Norris, School of Resource, Environmental and Heritage Sciences  
Mr A. Sinclair provided secretariat services to the review.