PROPOSAL TO INTRODUCE A NEW PROGRAM

(formerly known as course)
Updated 14 January 2003
incorporating NSS terminology

1. MAIN FEATURES OF PROPOSAL

1.1 Proposed name of the program

Bachelor of Engineering in Bioinformatics/Bachelor of Science

1.2 Proposed abbreviation of the program

BE/BSc

1.3 Program code

3755

1.4 Staff Contact

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1.5 Program Authority

School: School of Computer Science and Engineering
Faculty: Engineering
AOU code: E250

1.6 Reason for the proposal

The need for the program

Bioinformatics is an emerging discipline at the intersection of life sciences and computational sciences. Bioinformatics is a truly cross–disciplinary field that is being shaped by the input of scientists in many areas including molecular biology, genetics, medicine, mathematics, statistics, computer science, engineering, chemistry and physics. The Bachelor of Engineering (Bioinformatics) introduced by UNSW in 2001 is attracting an increasing number of students interested in combining biological sciences and computer science. However the program structure limits the number of science courses that students can enrol in, especially in areas that are useful but not absolutely essential to bioinformatics such as mathematics and physics (useful for in–depth modelling and statistics), chemistry (useful for the development of biomolecular structure prediction methods) and medical sciences (for applying bioinformatics to medical problems). There is therefore a need for a combined degree that would allow good students to add a stronger science component to their bioinformatics program and explore in more details the various disciplines that contribute to bioinformatics.

Program objectives

- To provide a framework for interested and capable students to supplement their studies in bioinformatics with a strong exposure to other relevant scientific disciplines, so they can apply this knowledge to the present and future developments in bioinformatics.
- To enhance the professional education of students anticipating a career in bioinformatics
- To increase the flexibility of the BE program to attract talented students with a broad range of interests to UNSW.

Relationship to the Faculty of Engineering corporate plan

Combined BE/BSc programs already exist in most schools in the Faculty of Engineering. This proposal brings the BE (Bioinformatics) in line with the other BE programs offered by the faculty and the school of computer science and engineering.

Relationship to UNSW corporate plan

The combined program contributes to additional collaboration between the various schools in Science and Engineering.

Relationship to enrolment plans

This proposal does not impact the current enrolment plans for the University and the faculty (other than attracting more quality students), since students taking the combined program will be drawn from existing BE and BSc enrolments.

Educational principles
The principles are the same as those of the existing BE (bioinformatics). The additional science components of the combined program allow students to be exposed to a range of scientific disciplines that impact or are impacted by bioinformatics.

Expected student demand
Approximately 3–5 students per year, drawn from enrolments in the BE (bioinformatics) program

Consultation with industry/professional association
The industry needs identified in the preparation of the BE (bioinformatics) program also apply to this combined program. The additional science component of the combined program should provide the graduates with an even broader understanding of the various disciplines that contribute to bioinformatics.

Details of similar programs
The Bachelor of Science (Bioinformatics) offered by the University of Sydney offers the possibility of studying a broader range of science courses (however this is at the expense of computer science courses or biology courses). The Bachelor of Science (bioinformatics/chemical informatics) at the University of Western Sydney includes IT and biology together with chemistry. La Trobe University is offering a Bachelor of Bioinformatics/Bachelor of Science double degree.

Strengths of the proposed program
This combined program offers all the strengths of the existing BE program, including its high integration, sound engineering training and its dedicated bioinformatics component, research project and industry training. These strengths are combined with the versatility of the Bachelor of Science program to provide the students with a broad exposure to different scientific areas thus enhancing their interdisciplinary training (necessary for the development of new and creative approaches in bioinformatics) and career opportunities.

	Tick relevant box: **YES**	**NO**
1.7 Authorisation		
Principal Librarian		
Registrar's Nominee		
Dean		
1.8 Consultation Process	X	
1.9 Planning Office	X	
1.10 Units of Credit	X	
1.11 General Education Program (<u>for undergraduate programs only</u>)	X	

2. PROGRAM DETAILS

2.1 Conditions governing the award

2.2 Is it proposed that this program will replace an existing program?

YES

NO X

2.3 CURRENT ENTRY IN THE FACULTY HANDBOOK

2.4 PROPOSED ENTRY IN THE FACULTY HANDBOOK

3755
Bioinformatics/Bachelor of Science – Full Time Program

Bachelor of Engineering in Bioinformatics, Bachelor of Science

The combined Bachelor of Engineering in Bioinformatics/Bachelor of Science program allows students to study additional science courses in their bioinformatics program to gain a broader understanding of the various scientific disciplines that contribute to bioinformatics (such as mathematics, statistics and chemistry) or constitute major application areas of bioinformatics (for example, medical sciences or biotechnology).
Students must meet the entry requirements for the BE (Bioinformatics) program and the Bachelor of Science program, and must complete the courses and electives required by the bioinformatics program (3647) as well as 60 additional units of credit in science courses, including an approved major sequence of 42uoc at stages 2 and 3. Combined programs are exempt from the General Education requirement. Approved majors are listed in Table A of the BSc program (3970).
The stages of a generic combined program are shown below. It should be noted that it is possible to adapt the program by moving courses, subject to prerequisite requirements and overall program requirements.
The School of Computer Science and Engineering Student Office can supply examples of specific combined programs.

Stage 1		***UOC***	
		S1	***S2***
COMP1011/COMP1711	Computing 1A or Higher Computing 1A	6	–
COMP1021/COMP1721	Computing 1B or Higher Computing 1B	–	6
MATH1131/MATH1141	Mathematics 1A or Higher Mathematics 1A	6	–
MATH1231/MATH1241	Mathematics 1B or Higher Mathematics 1B	–	6
BIOS1201	Molecules, Cells and Genes	6	–
CHEM1011/CHEM1031	Fundamentals of Chemistry 1A or Higher Chemistry 1C	6	–
BIOS1101/CHEM1021/ CHEM1041	Evolutionary and Functional Biology# or Fundamentals of Chemistry 1B or Higher Chemistry 1D	–	6
BINF1001	Bioinformatics 1	–	6
Total		24	24

 # Students who have completed HSC Biology with a mark of 75 or above may replace BIOS1101 by any of BIOS2021 or BIOS2621 in stage 1. Students who complete BIOS2201 or BIOS2621 in stage 1 will choose an elective in stage 2

Stage 2			
MATH1081	Discrete Mathematics	6	–
LIFE2101	Introductory Biochemistry and Microbiology	6	–
MATH2901/2801	[Higher] Theory of Statistics	6	–
BIOC2201/BIOC2291	Principles of Molecular Biology/Fundamentals of Molecular Biology#	–	6
COMP2041	Software Construction: Techniques and Tools	–	6
BIOS2021/BIOS2621	Genetics or Advanced Genetics	–	6
	Science major level 1 or 2	6	–
	Science major level 1 or 2	–	6
Total		24	24

BIOC2201 is the recommended choice. Students who choose BIOC2291 must obtain a credit or better in order to qualify for level 3 molecular biology courses

Stage 3

BIOC3121	Molecular Biology of Nucleic Acids	6	–
COMP2011/COMP2711	Data Organisation or Higher Data Organisation	6	–
COMP3311	Database Systems	–	6
BINF2001	Bioinformatics 2	–	6
	Science major level 2	6	–
	Science major level 2	–	6
	2 electives* from		
COMP2021	Digital Systems Structures	6	–
COMP3331	Computer Networks and Applications	–	6
BIOC3281	Recombinant DNA Techniques	–	6
BIOC3291	Genes, Genomes and Evolution	–	6
BIOT3011	Biotechnology A	6	–
BIOT3061	Biopharmaceuticals	–	6
BIOC3111	Molecular Biology of Proteins	–	6
BIOC3151	Human Genetics and Variation	–	6
MICR3021	Microbial Genetics	–	6
Total		24	24

Stage 4

COMP3121	Algorithms and Programming Techniques	6	–
COMP3710	Software Project Management	–	3
BINF3001	Bioinformatics 3	–	6
BINF4920	Professional Issues and Ethics	–	3
	4 Science major level 3	12	12
	1 elective* from stage 3 list or from:		
COMP3111	Software Engineering	6	–
COMP3411	Artificial Intelligence	6	–
Total		24	24

** Overall, electives in stage 3 and 4 must include at least one computer science elective and one life sciences electives*

Stage 5

COMP3720	Total Quality Management	3	–
BINF4910	Bioinformatics Thesis A	3	–
BINF4911	Bioinformatics Thesis B	–	12
	Industrial Training		
	2 Science major level 3	6	6
	3 electives* from stage 3/4 list or from:		
BIOT3071	Commercial Biotechnology	–	6
MICR3011	Microbial Physiology – a Molecular Approach	–	6
COMP3151	Foundations of Concurrency	–	6
COMP3221	Microprocessors and Embedded Systems	–	6
COMP3511	Human–Computer Interactions	–	6
COMP9316	e–Commerce Systems Implementation	–	6
COMP9333	Advanced Computer Networks	6	–
COMP9314	Next generation database systems		
COMP9417	Machine Learning	–	6

COMP9444	Neural Networks	–	6
Total		24	24

** Level 3 MATH electives and other level 3/4/9 COMP electives may be also considered. Electives must include at least one life science elective and at least one COMP course*

2.5 Units of credit

Stage 1	48
Stage 2	48
Stage 3	48
Stage 4	48
Stage 5	48

Total units of credit for the program 240

Full–time program load equivalence (EFTSU) 5

2.6 Admission Requirements

Same admission requirements as the Bachelor of Engineering (Bioinformatics), plus any requirements of desired level 1 science courses.

2.6.1 Articulation Rules

2.7 Program attendance mode

Internal	YES
External	NO
Combination	NO

2.8 Program attendance type

Full–time	YES
Part–time	YES
Both	YES

2.9 Program of study (stream) (POS) available in this program

Available majors are those listed in Table A of the Undergraduate Handbook, detailing available majors in the BSc program. These are:

Anatomy
Biochemistry
Biological Science
Biomechanics
Biotechnology
Chemistry
Ecology
Environmental Earth Science

Environmental Systems
Food Science and Nutrition
Genetics
Geography
Geology
Marine Science (Marine Biology)
Marine Science (Physical Oceanography)
Marine Science (Marine Geology)
Materials Science
Mathematics
Medical Microbiology and Immunology
Microbiology
Molecular Biology
Physical Oceanography/Meteorology
Pharmacology
Philosophy
Physics
Physiology
Psychology
Safety Science
Science and Technology Studies
Statistics

2.10 Next Program Review Date

2004

2.11 For Undergraduate Programs only

2.11.1 Program Prerequisites

YES x

NO

Same prerequisites as for the BE (Bioinformatics): MATH1131/1141 assumes 3u or 4u HSC mathematics, and CHEM1031 assumes 2u Chemistry at HSC

2.11.2 UAC Code

No, the program will use the same code as the BE Bioinformatics

2.11.3 General Education program

(i) 12 units of credit in General Education courses

As a combined program this program is exempt from the General Education requirements

(ii) 56 hours of instruction in professional ethics and social responsibility of graduates

This requirement is to be met as part of the course BINF4920 Professional issues and ethics in bioinformatics as well as COMP3710 Software Project Management and COMP3720 Total Quality Management

2.11.4 Honours

YES x

NO

Same as for the BE (Bioinformatics) program: determined by meritorious performance throughout the program as determined by the student's weighted average mark on completion of the program

Students may be awarded Honours in the BSc by successful completion of an Honours year, provided the entry requirements into this Honours year are met.

2.11.5 University Medal

YES x

NO

2.12 For Postgraduate Programs only

2.13 For Double, Combined or "Fast Track" Programs only

2.13.1 Completion requirements for the degree/degrees

Completion of the requirements of the BE Bioinformatics degree
Completion of 60 additional uoc of science including a major sequence (42uoc)

2.13.2 Transfer arrangements to either of the single degrees

Students who transfer from the combined program to the BE will need to complete the normal requirements of the BE program including General Education courses.
Students who transfer from the combined program to the BSc program will receive advanced standing for BE courses in accordance with normal Science policy and must satisfy the BSc rules including General Education requirements.

2.13.3 Award of Honours in the degree/degrees

See section 2.11.4

2.13.4 General Education program

See section 2.11.3

2.13.5 Program Authority

See section 1.5

2.14 For Alternative Delivery Programs only

2.14.1 Alternative Delivery Arrangements
2.14.2 University resources required by students

2.15 Information Technology Requirements for students (for all proposed programs)

Students are not expected to have their own computing platform as they will have access to School of Computer and Engineering laboratories. It is anticipated that many students will nevertheless have their own personal computer, and dial–in access to the CSE computing facilities will be supported.

3. CROSS REFERRAL

3.1 Academic Units with Potential Interest

The academic units with potential interest were identified and consulted in the development of the BE Bioinformatics program. The Faculty of Science was consulted again in the development of this combined program.

3.2 Material Overlap and Service Teaching

Same overlap as the BE Bioinformatics.

3.3 Academic Cross–referral

Note: *this section of the Proposal must be signed by any interested parties*

(the Dean and/or Presiding Member of the consulted Faculty/Faculties), stating:
OR
alternatively, attach copies of correspondence of consultation.

I have examined the Program Proposal and have no concerns with the matter proceeding.

Further Comments:

Dean or Presiding Member of consulted Faculty/Faculties
/ /2002

3.4 Administrative Units or External Organisations with Interest

3.5 Administrative Cross–referral

Note: *the Registrar's Division needs to be consulted on the Program Proposal and this section of the Proposal must be signed by the Registrar's Nominee, stating:*

I have examined the Program Proposal and have no administrative concerns with the matter proceeding.

Further Comments:

Registrar's Nominee
/ /2002

4. COURSE DETAILS

4.1 Summary of Handbook Course Descriptions

No new or revised courses are included in this program proposal. For details of existing courses, refer to the University Undergraduate Handbook

5. RESOURCE STATEMENT

5.1 Resource Impact Summary

This section to be completed in consultation with the Dean of the Faculty.

		Year 2000			Year 2001			Year 2002	
	DETYA Funded	International	Other Funded	DETYA Funded	International	Other Funded	DETYA Funded	International	Other Funded
Student Numbers									
Total Enrolments Generated by this Program									
Total EFTSU Generated by this Program									
Additional Faculty Resources Required									
Budget – Operating	$	$	$	$	$	$	$	$	$
– Capital	$	$	$	$	$	$	$	$	$
Accommodation	M^2	M^2	M^2	M^2	M^2	M^2	M^2	M^2	M^2
Additional University Infrastructure Costs									
Library	$	$	$	$	$	$	$	$	$
Laboratories	$	$	$	$	$	$	$	$	$
Computing	$	$	$	$	$	$	$	$	$
Accommodation	M^2	M^2	M^2	M^2	M^2	M^2	M^2	M^2	M^2

5.2 Enrolment Planning

Estimated or proposed enrolments for the next three years.

2002: 4

2003: 4

2004: 4

5.3 Details of Fees

Has the Business Plan been submitted to the Business Office?

YES

NO X

No longer required

In the case of International Students, has the International Programs Office been consulted?

YES X

NO

Proposed fee: Same fee structure as other BE/BSc combined programs

$ for non–award enrolment (local)

$ for non–award enrolment (international)

$ for full fee–paying program enrolment (local students)

$ for full fee–paying program enrolment (international students)

5.4 Teaching/Staff Commitments

No additional commitments compared to the BE (bioinformatics) and BSc programs

5.4.1 Teaching Format

No change in teaching hours compared to BE (bioinformatics) and BSc programs.

Hours per Week per Student:

Session 1	Session 2
Lectures	Lectures
Tutorials	Tutorials
Laboratories	Laboratories
Seminars	Seminars
Other	Other
Total hours per week	Total hours per week

(add Summer and/or Winter Session if relevant)

5.4.2 Staffing Requirements

No additional staffing requirements above those for the BE(Bioinformatics) and BSc programs

Hours per week

Full−time Academic Staff

Part−time Teaching Staff

General Staff

5.4.3 Support Requirements
No additional support requirements above those for the BE(Bioinformatics) and BSc programs

Laboratories

Equipment

Other

5.5 Accommodation

No additional facilities required X

OR

Space/facilities required but can be provided from own resources and/or existing allocation

OR

Space is required amounting to m^2 on:
(i) temporary basis for years
(ii) permanent basis

5.6 Materials Requirements
No materials requirements in addition to those of the existing BE (Bioinformatics) and BSc programs

5.7 Equipment Requirements

(i) Expenditure on new or replacement equipment

(ii) Annual maintenance on new equipment.

5.8 Computing Requirements

5.9 Library Requirements

6. AUTHORISATION

6.1 Principal Librarian's Endorsement

Note: *this section of the Proposal must be signed by a Library representative, stating:*

I have examined the Library needs related to the above proposal and certify that existing Library holdings, staffing, services and accommodation are adequate / inadequate (delete one) to cover the demands that are inherent in it.

Appropriate arrangements for the use of digitised material to support this program have been made by the Program Authority with the Principal Librarian.

Further Comments:

Principal Librarian
/ /2002

6.2 Dean's Approval

Note: *this section of the Proposal must be signed by the Dean, stating:*

I have examined the resource implications of the above proposal in regard to staff, space, materials, equipment, capital funds, and computing, and certify that:

(Tick whichever is applicable)

6.2.1 (i) the proposal involves no additional resources. (A statement from the Head of School explaining how this can be achieved must be provided below); or

(ii) the proposal involves additional resources and it is proposed to redeploy existing resources within the faculty. (A statement from the Head of School explaining how this will be achieved must be provided below); or

(iii) the proposal involves additional resources to be obtained as set out below; or

(iv) the additional resources essential to bring the proposal into effect cannot be found within resources available to the faculty.

6.2.2 **Fees** (delete if not applicable):

- a fee will not be charged for this program (other than HECS)
- a fee will be charged for this program for local fee–paying students
- a fee will be charged for international students

If a fee is to be charged the Dean certifies as follows:

I have ensured that the Vice–Chancellor has been advised of the proposed fee arrangements, and note that approval of fee arrangements is needed before the new program can be implemented.

6.2.3 the proposal conforms to the University's commitment to Equal Opportunity in Education.

Statement from Head of School on Source of Additional Resources and/or Further Comments:

Dean
/ /2002