MEMBERS OF THE BOARD OF STUDIES OF SCIENCE

The first meeting of the Board of Studies of Science will be held on Tuesday 3 June 2008 at 2.15 pm in the ECNS Conference Room.

Any member of the Faculty of Life and Physical Sciences or the Faculty of Natural and Agricultural Sciences may attend the meeting as an observer, with speaking rights only, by prior arrangement with the Chair. A full copy of this Agenda (including attachments) is sent to all school secretaries for consultation by Faculty members.

Parts I and II of the Agenda are to be taken en bloc by motion of the Chair. Part III is for discussion. A member may request the removal of an item from Parts I or II to Part III.

Imelda Ooi
Administrative Officer, Faculty of Life and Physical Sciences
Secretary of the Board of Studies of Science  Email: imelda.ooi@uwa.edu.au

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<th>MEMBERS OF THE BOARD OF STUDIES OF SCIENCE</th>
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<td>Professor George Stewart (Chair)</td>
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<td>Professor Lyn Abbott</td>
<td>Interim Dean, FNAS</td>
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<td>Professor Robert Grove</td>
<td>Deputy Dean, LPS</td>
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<td>Associate Professor Geoff Hammond</td>
<td>Associate Dean, Teaching and Learning, LPS</td>
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<td>Dr Patrick Finnegan</td>
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<td>Dr Jane Emberson</td>
<td>Academic Student Adviser, LPS</td>
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<td>Ms Jenny Gamble</td>
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<td>Ms Marjan Heibloom</td>
<td>Senior Faculty Administrative Officer, FNAS</td>
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<td>Mrs Vickie Falcetta</td>
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Programme Co-ordinators

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<td>Associate Professor Nick Milne</td>
<td>Anatomical Sciences</td>
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<td>Associate Professor Michael Wise</td>
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<td>Dr Ralph James</td>
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<td>Professor Kingsley Dixon</td>
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<td>Associate Professor Myra Keep</td>
<td>Earth Science</td>
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<td>Dr Karl-Heinz Wywoll</td>
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<td>Professor Bruce Elliott</td>
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<td>Professor Colin Raston</td>
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<td>Dr Luis Filgueira</td>
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<td>Dr David Van Valkenburg and Dr Michael Weinborn</td>
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<td>Dr Nancy Longnecker</td>
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<td>Associate Professor Jingbo Wang</td>
<td>Scientific Computation</td>
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Heads of School

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<td>Dr Ben White</td>
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<td>Professor Linc Schmitt</td>
<td>Anatomy &amp; Human Biology</td>
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<td>Professor Graeme Martin</td>
<td>Animal Biology</td>
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<td>Professor Geoff Stewart</td>
<td>Biomedical, Biomolecular and Chemical Sciences</td>
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<td>Professor Peter Cawood</td>
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<td>Professor Hans Lambers</td>
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<td>Associate Professor David Morrison</td>
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Other Faculties/Schools

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<td>Dr Greg Acciaioli</td>
<td>Faculty of Arts, Humanities and Social Sciences</td>
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<td>A/Professor Les Jennings</td>
<td>School of Mathematics and Statistics</td>
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<td>Dr Richard Alcock</td>
<td>Faculty of Medicine &amp; Dentistry</td>
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Others

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<td>Mr Cameron Ritchie</td>
<td>Science Union - President</td>
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<td>Ms Matilda Oke</td>
<td>Science Union – Education Officer</td>
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AGENDA

PART I
ITEMS FOR COMMUNICATION TO BE DEALT WITH EN BLOC

1. There are no items.

PART II
ITEMS FOR DECISION TO BE DEALT WITH EN BLOC

2. PROPOSED CHANGE IN UNIT NAME FOR PATH3311 BIOOTHERAPEUTIC REGENERATION

The School of Pathology and Laboratory Medicine requests that the name of PATH3311 Biotherapeutic Regeneration be changed to “Biotherapeutics & Regenerative Medicine” as it feels that the new name will attract more students’ focus on the course and provide them with a better employment opportunity.

*The Chair recommends that the proposed name change of PATH3311 Biotherapeutic Regeneration to “Biotherapeutics & Regenerative Medicine” be endorsed.*

3. RESCISSION OF ANHB3308 DEVELOPMENTAL BIOLOGY REF: F5075

The School of Anatomy & Human Biology wishes to rescind ANHB3308 Developmental Biology due to lack of qualified staff to teach the unit and low enrolment numbers. The School advises that removing the unit from its major pathways does not prevent students from completing an ANHB Major and will have minimal impact on students as the unit has already been suppressed in January 2008.

*The Chair recommends that the rescission of ANHB3308 Developmental Biology be endorsed from 2009 onwards.*

4. TEACHING OF ANIM3315 FUNCTIONAL ZOOMORPHOLOGY

ANIM3315 Functional Zoomorphology is usually available every second year and is next due to be offered in 2009. The School of Animal Biology would like to change the next offering of this unit to 2010 to allow for changes in staff availability. The unit would thus be N/A for 2009.

*The Chair recommends that ANIM3315 Functional Zoomorphology, be listed as not available in 2009 and be offered in 2010.*

5. STAT3302 RESEARCH BIOSTATISTICS NOT AVAILABLE FOR 2009

The School of Animal Biology requests that the unit STAT3302 Research Biostatistics be made unavailable for 2009, with a decision to be made at a later stage about whether to cancel the unit. The class has been too small to be viable.

*The Chair recommends that STAT3302 Research Biostatistics be listed as not available in 2009.*

6. DISCONTINUATION OF EARTH SCIENCE MAJORS

The FNAS Teaching and Learning Committee has proposed that the following majors, within the Earth Science programme, be discontinued, effective immediately:
- Geographical Information Systems and Environmental Management
- Geoscience
- Earth Science Chemistry.

These majors have not been available for new enrolments for the last 2 years and currently only one student is (incorrectly) enrolled in any of these majors.

*The Chair recommends that the following majors — Geographical Information Systems and Environmental Management, Geoscience, and Earth Science Chemistry be discontinued, effective immediately.*
PART III
ITEMS FOR DISCUSSION AND DECISION

7. UWA HANDBOOK: SCIENCE FACULTIES' POLICY AND GUIDELINES

Dr Jane Emberson has suggested that changes be made to the Science Faculties’ policy and guidelines section of the UWA handbook as outlined in attachment A. The proposed changes have been considered at the Faculty’s Teaching and Learning Committee.

8. SCIENCE FACULTIES’ RULES

Dr Jane Emberson suggests that changes be made to Science Faculties’ Rules as follows:

Time Limits
9.2.1.2 Where a student is granted credit towards a bachelor’s degree course by virtue of work completed in another degree course at this or another institution, the student must complete the requirements for the new degree course within ten calendar years of the date on which that previous study began. [We have always applied this time-limit to credit derived from a prior diploma course as well as prior degree courses, so the word ‘degree’ appears inappropriately limiting. N.B. It does not affect the rules on course structure for entrants with a completed university degree.]

Course Structure
9.2.4.3 (1) The course consists of units to a minimum total value of 144 points and a maximum total value of 168 points comprising—

(a) one of the foundation packages set out in 9.2.5, comprising Level 1 units to the value of 48 points and including units leading to at least three of the Science majors listed in Rule 9.2.6.2, which must be in three different subject areas; [...] This has been the practice, but is not spelt out. It is already spelt out for the two different majors at Level 2.

Foundation Packages
There has been some suggestion of changing the foundation packages, because some now require only 24 points and some require 30-36 points. I’m not entirely convinced that it is necessary (given that the rule about three science majors already applies), but if we want to make a change we could add rules as follows:-

A. Mathematics & Computer Science Foundation Package
(d) Level 1 units to the value of 24 points, chosen in consultation with a Faculty Adviser, and including at least one pair of units from another Science Foundation Package and leading to a third science major.

B. Life Sciences (Human & Behavioural) Foundation Package
(a) two units from each of at least two of Groups A, B, C, D, E, F or G in Table 9.2.5f [...]—at least 24 points;
and
(b) if only 24 points have been taken under (a), one pair of units from another Science Foundation Package, leading to a third science major;
and
(c) if necessary to make up the required number of points, Level 1 units chosen in consultation with a Faculty Adviser—maximum of 12 points.

9. MAKING UNITS AVAILABLE AT 2 DIFFERENT LEVELS AND CHANGING UNIT CODES

The FNAS Teaching and Learning Committee has proposed to change the unit code for STAT2210 Biometrics 1 to STAT1110 Biometrics 1. This unit was traditionally taken in second year by students in the 4-year degrees. Currently most students take the unit in their first year. In level, the unit is in between STAT1510 Statistics A and STAT1530 Statistics B.

In addition, it is proposed to have the following units available at levels 2 and 3 (currently only level 3). This would allow students in the Environmental Management major (see also the Environmental Management Agenda Item) to take these units as part of their level 2 requirements:
ECON3323 and ECON2223 Business and the Environment
ECON3311 and ECON2224 Environmental and Resource Economics
The unit outlines would read as follows:
Students in both ECON2223 and ECON3323 will attend the same lectures. However, some aspects of the final exam will differ for students enrolled in ECON3323.

Similarly:
Students in both ECON2224 and ECON3311 will attend the same lectures. However, some aspects of the final exam will differ for students enrolled in ECON3311.

10. ENVIRONMENTAL CLIMATE CHANGE AND BIODIVERSITY

The Schools of Plant Biology and Earth & Geographical Sciences have proposed that the 12-point unit BIOL2262 Conservation Biology: Global Diversity Hotspots be replaced with (up to) two 6-point units, one of which is based upon ENVT2221 Global Climate Change and the Biosphere. A second 6-point unit may, in the future, be offered by the School of Animal Biology to complete the replacement of BIOL2262.

It is proposed that the name of ENVT2221 Global Climate Change and the Biosphere be changed to ENVT2221 Global Climate Change and Biodiversity to reflect the change in context and content. Attachment B provides a new unit checklist, a handbook entry and a lecture outline. The unit will be offered jointly by the Schools of Plant Biology and Earth & Geographical Sciences and will introduce the concept of global climate change as a historical driver of biodiversity. Because the content of the unit will be relevant to all conservation biology and climate studies students, it will be a core unit in the relevant programmes and majors.

It is proposed that this change is implemented for semester 2, 2008. The students currently enrolled in BIOL2262 Conservation Biology: Global Diversity Hotspots will be enrolled in ENVT2221 Global Climate Change and Biodiversity and will be asked to select one extra unit from:

- ENVT2210 Environmental Policy and Law
- ANIM2204 Vertebrate Zoology
- PLNT2204 Land Plant Diversity and Systematics
- GENE2240 Introduction to Genetics

Should, from 2009, the Animal Biology unit referred to above be available and should its content be suitable, the unit would become a core or an optional unit in the Conservation Biology major and programme.

11. INTRODUCTION OF A NEW MAJOR IN THE BSc 50110: CLIMATE AND ENVIRONMENT

The FNAS Teaching and Learning Committee has proposed that a Climate and Environment major is introduced, from 2009, into the 3-year BSc degree. This major would be relevant for students interested in the environmental sciences. The proposed major includes the climate-specific units from the (4-year) Bachelor of Science (Climate Studies), which was approved by Academic Council late 2007.

At level 2 the climate-specific units include:

- ENVT2220 The Climate Systems; Attachment C provides a new unit checklist, a handbook entry and a lecture outline
- ENVT2221 Global Climate Change and Biodiversity Attachment B provides a new unit checklist, a handbook entry and a lecture outline.

Attachment D provides the draft structure and the draft rules for the proposed major.

It is also proposed that the units ENVT2220 The Climate Systems and ENVT2221 Global Climate Change and Biodiversity be approved as BSc units.

12. PROPOSED CHANGES TO THE ENVIRONMENTAL MANAGEMENT MAJOR AND THE ENVIRONMENTAL SCIENCE PROGRAMME

In view of the introduction of the Climate and Environment major, the FNAS Teaching and Learning Committee has proposed to change the Environmental Management major with a view to make the management aspects of the major stronger. The more physical aspects are now included in the Climate and Environment major.
Attachment E provides the draft structure and the draft amended rules for the Environmental Management major. As the Environmental Management major is a core major in the Environmental Science Programme, the programme structure and rules will be amended similarly.

It is also proposed that the units:
- ECON1120 Environmental Economics
- ECON2221 Global Climate Change and Biodiversity
- ECON2223 Business and the Environment
- ECON2224 Environmental and Resource Economics
- ENVT3321 Climate Change Policy and Planning
- SCIE3366 Project and Risk Management
- SCIE3367 Management Decision Tools
be approved as BSc units.

13. PROPOSED CHANGES TO THE GEOGRAPHY MAJOR

It is proposed that the rules for the Geography major are simplified by removing the five streams. This does not impact on the structure of the major as one of the streams included all level 3 Geography units and the streams do not appear or the academic transcript. The streams will be provided for student guidance in the re-enrolment materials.

It is also proposed that the following units are added to the major as level 2 and level 3 options:
- ENVT2220 The Climate Systems (Attachment D refers); and
- ENVT2221 Global Climate Change and Biodiversity (Attachment C refers)
- ENVT3321 Climate Change Policy and Planning (from 2010 - subject to final unit approval; Attachment F provides a unit outline)
- ENVT3320 Climate Dynamics (from 2010 - subject to final unit approval; Attachment F provides a unit outline)

It is furthermore proposed that the units EART3324 Environmental Geomorphology of Sheltered Coasts and EART3325 Environmental Geomorphology: Streams & Catchments are consolidated into a single 6-point unit EART3333 Environmental Geomorphology of Coasts and Rivers (Semester 1). (Attachment G)

Attachment H provides the proposed rules for the Geography major.

14. PROPOSED CHANGES TO THE CONSERVATION BIOLOGY MAJOR AND PROGRAMMES

In view of the proposed introduction of ENVT2221 Global Climate Change and Biodiversity (6 points) and deletion of BIOL2262 Conservation Biology: Global Diversity Hotspots (12 points), the rules for the Conservation Biology major and programmes have to be amended. This amendment will also include the selection of the second 6 points from:
- ENVT2210 Environmental Policy and Law
- ANIM2204 Vertebrate Zoology
- PLNT2204 Land Plant Diversity and Systematics
- GENE2240 Introduction to Genetics

In addition, in 2007 it was decided to no longer run the units BIOL3362 CB: Threatening Processes Research Project Pt 1 (6 pts) and BIOL3363 CB: Threatening Processes Research Project Pt 2 (6 pts) and to replace this unit with 12 points selected from:
- ENVT3334/35 Land and Water Management Research Project –Pt 1/2 (12 pts)
- ENVT3333 Land and Water: Case Studies in Land and Water Management
- PLNT3306 Australian Vegetation
- ANIM3353 Wildlife Conservation and Management
It is recommended that this change be made permanent from 2009.

Attachment I provides the amended rules for the Conservation Biology major, the Conservation Biology programme in the BSc 50110 and the Conservation Biology and Management Programme in the BSc. 70100 will be amended accordingly.
UWA HANDBOOK: SCIENCE FACULTIES' POLICY & GUIDELINES

SUGGESTED NEW ENTRIES

Credit (Advanced Standing)

The Science Faculties' policy in principle is to grant credit for units of study passed in a degree course at a recognised tertiary institution, or a completed diploma course at AQF level, where the units are directly equivalent to units in a course in this Faculty, or are judged to be adequate in level and content to provide the prerequisite for units at a higher level. Granting of credit is entirely at the Faculties' discretion.

The amount of credit granted is limited by the rules and requirements of the particular course and program, and by the Faculties' time-limits for completion of prerequisites and for completion of a course in which advanced standing is granted. Credit will normally be granted only for units in which a clear pass has been achieved, without supplementary assessment. Unspecified credit may be granted within the points limits allowed by the standard structure of the particular course and program.

It is the responsibility of the student seeking credit to submit a request to the faculty on the appropriate form and to provide full details of the prior study for which credit is sought. See http://www.science.uwa.edu.au/studentnet/policies/standing for further details.

(This is based on the current policy of FLPS.)

Student Exchange

Science students may apply through the Student Exchange Program to undertake one or two semesters of study at a partner university overseas. In planning their studies abroad they should pay attention to practical (e.g. laboratory) components and to the need to meet any prerequisites for higher-level units they hope to take on their return. Units taken on exchange at an approved partner university may be permitted by the Faculty to count towards a science major if they are directly equivalent, in content and standard, to units offered in the major at this University. It is the student's responsibility to obtain approval in advance and to enrol in accordance with that approval.

Students may in some circumstances be given approval to complete part or all of the BSc (Honours) program at a formally approved exchange partner university. The proposed program must be approved by the relevant head of school or program coordinator. The student must have a supervisor at UWA approved by the Faculty, as well as approved supervision at the exchange institution. The honours dissertation will be assessed at UWA, as will any or all of the other components of the honours course, as approved by the Faculty.

(Par. 1 reflects what was decided in the Board of Studies a few years ago. Par. 2 is based on FLPS practice.)

Cross-institutional Enrolment

Applications for cross-institutional enrolment at another Australian university can be approved by the Faculty if the intended study is academically appropriate to the student's course. Students may be permitted, on the recommendation of the head of school or program coordinator, to count units taken under cross-institutional enrolment towards a science major, up to a maximum value of twelve points. Approval is unlikely to be granted for enrolment at another West Australian university in units equivalent to any unit offered at The University of Western Australia.

(This was discussed in the Board of Studies a year or two ago and has since then been informal policy in FLPS. The last sentence is long-standing UWA policy.)

Concurrent Enrolment in an Undergraduate Diploma

The Faculty may give approval for a student to apply for entry to a concurrent undergraduate diploma course at this University. The Faculty will not normally support a student's application for entry to the Diploma in Arts for the purpose of completing a major in a discipline available as a major in the Bachelor of Science course (e.g. anthropology). A student who completes the Diploma in Information
Technology course is not permitted to credit any units in computer science towards the Bachelor of Science.

[This reflects long-standing practice in FLPS; however, we have one student currently approved to take the Dip.Arts in anthropology.]

**Calculator Policy**  [copied from FECM policy section]

The list of calculators that may be used during examinations and tests is available at http://www.ecm.uwa.edu.au/for/students/policies/calculators. Calculators must have an ‘approved’ sticker attached to them to be taken into any examination or test. These stickers cannot be removed and placed on another calculator. They can be obtained from the Faculty office.

**SUGGESTED CHANGES TO CURRENT TEXT**  [suggested revisions underlined]

**Approved Leave**

Last sentence: Students in their first calendar year of enrolment are not normally eligible for approved leave and must re-apply for entry.  [Changed from 'in their first semester', as approved leave is now needed only for a whole academic year without enrolment. With the current wording a student could possibly withdraw from all units in the 1st semester, then in August withdraw from all units in 2nd semester and apply for approved leave for the year.]

**Special Consideration**

Par. 2: If preparation for, or performance in, an examination or other item of assessment is seriously impaired by illness or other exceptional circumstances beyond their control, students may apply to the Faculties for special consideration of these circumstances to be taken into account during the process of assessment. They should contact the relevant Faculty Office at the earliest possible opportunity to obtain a form to apply for special consideration. This form must be returned to the Faculty Office along with supporting documentation (e.g. a detailed medical certificate) and a written statement explaining the circumstances. Applications for special consideration can be submitted during the semester but must be received by the Faculty Office no later than three working days following the date of the examination. The Board of Examiners may agree to consider late applications if there are additional exceptional circumstances preventing application within that time-limit, but no applications will be accepted after final results have been recorded.

[The aim of this is to reinforce the Faculties’ current policy.]

**Deferred Examinations**

Add par.: Unless the Faculty permits otherwise in extreme mitigating circumstances, students who are granted a deferred examination are not permitted to defer the deferred examination.

[This is copied from Rule 4.1.3 of the Business School, where it applies to all courses. There has been a suggestion for a University committee of sub-deans/student advisers to decide on applications for second deferral, etc., but there is no indication whether this will go ahead.]

**Supplementary Assessment**

Add par.: Unless the Faculty permits otherwise in exceptional circumstances, students who are provided with an opportunity for supplementary assessment are not permitted to defer the supplementary assessment.

Add par.: Unless the Faculty permits otherwise in exceptional circumstances, students who fail a deferred examination in a unit are not provided with the opportunity for supplementary assessment in that unit. [This is a rule in the MBBS; there it has no provision for exceptions.]
Progress Status Categories — Unsatisfactory Progress Status
N.B. Any changes made to these categories would need to be made likewise in Science Rule 9.2.3.

ON PROBATION

(a) First-year students who have failed more than 50 per cent of the points undertaken in that year and have a weighted average of 30 per cent. [Unchanged.]

(b) Students who are granted a waiver of suspension or exclusion on grounds of exceptional circumstances and are permitted to re-enrol.

[An equivalent provision is in the Business School's policy section, though it doesn't seem to be spelt out in their rules.]

EXCLUDED

(a) Students who have failed to make satisfactory progress for a second time.

(b) Students who, by reason of successive failures of a core unit, are unable to complete the Bachelor of Science component of a combined course. Such students are eligible for transfer to the Bachelor of Science course, unless they have also made unsatisfactory progress in the combined course in terms of University General Rule 1.2.1.29.

[This is particularly to deal with students who fail MATH1010 or MATH1020 twice in the BSc/B. Engineering; they cannot possibly complete the course, under the Science Rules, but we have at present no rule that can make them transfer out of it. The suggested provision could be applied to the BSc/BComm and BSc/BEcons as well, as the have compulsory maths at level 1.]

HONOURS COURSE [Policy section on p.172 in Undergraduate Handbook 2008]

Suggested additions, copied from the policy section of the Business School (Undergraduate Handbook, p.74), and reflecting the views of the Science Honours Working Party when it discussed these issues:

Honours Satisfactory Progress and Progress Status

To make satisfactory progress in the course, students must pass all the units for which they are enrolled after the final withdrawal date. (Needs approval as exception to University General Rule 1.2.1.29.)

Progress Status

The Dean, on the recommendation of the Board of Examiners, may exclude a student who has failed to make satisfactory progress.
Credit: 6 points  Availability: Semester 2
Type of unit: [UG] i.e. undergraduate unit only

Short description (hardcopy only):

This unit introduces students to the concept that climate change drives the evolution of biodiversity. The unit aims to describe and create an understanding of processes that regulate the biosphere, the changes that are occurring and the human influence.
It covers the threats species may face and conservation efforts that are required. Lectures provide a geo-ecological, climatic and biological background of the development of the world's ecosystems, emphasising the Australian environment, in particular the Southwest. Students work in groups to develop a biodiversity conservation plan for major plant habitats for a specific area, given local changes in climate.

Outcomes:
Upon completion of the unit, students will understand and appreciate
- the geo-ecological, climatic and biological interplay that has created biodiversity;
- the geo-ecological history of Southwest Australia;
- how climate change has driven the emergence of groups of plant species;
- how present climate change affects biodiversity of Southwest Australia;
- what the major threats of climate change are to habitats;
- the diversity of its major habitats, the threats they face, and the conservation efforts put in place;
- the predictions of future climate change models and their consequences for the conservation of species and habitats;
- the importance of critically analysing and summarising information from a wide range of resources.

Content:
This unit focuses on the concept that climate change drives the evolution of biodiversity. The unit aims to describe and create an understanding of
- the interactive physical, chemical and biological processes that regulate the Earth's biosphere,
- the changes that are occurring in the biosphere, and
- how these changes are forced by human activities.

Emphasis is placed on understanding the effects of global climate change on biome function and plant diversity. Specific issues include:
- how the chemistry of the global atmosphere is regulated;
- the impact of global climate changes on terrestrial ecosystems;
- what can be learned from vegetation response to past climate changes;
- atmosphere - vegetation interactions;
- the threats biomes and species may face under projected greenhouse climates; and
the conservation efforts that are required.

Lectures provide a geo-ecological, climatic and biological background of the development of the world's ecosystems, eventually zooming in on the Australian environment and especially Southwest Australia.

Practicals are used for field trips and group work. The field trips emphasise the geology, hydrology and biodiversity of the major habitats in Southwest Australia (estuarine, coastal dune, freshwater wetland, urban bushland, and jarrah forest habitats), as well as the major threats they face. The practical component of the unit concludes with an overnight weekend trip to wheatbelt habitats (Dryandra Woodlands).

For the group work, students are allocated a particular geographical area and are expected to write a biodiversity conservation plan for the major habitats in this area, given local changes in climate. In the last week of the unit the groups present their work orally.

**Assessment:** This comprises a two-hour examination (50 per cent), case study report (40 per cent) and case study presentation (10 per cent). Supplementary assessment is not available in this unit except in the case of a bachelor's pass degree student who has obtained a mark of 45 to 49 and is currently enrolled in this unit, and it is the only remaining unit that the student must pass in order to complete their course.

**Unit co-ordinator(s):** Professor Hans Lambers and Dr Megan Ryan

**Location:** UWA (Crawley)

**Mode of offering:** on-campus

**Unit rules**

**Prerequisites:** A level 1 Biology unit (BIOL11xx) or a level 1 Earth unit (EART11xx)

**Co-requisites:**

**Advisable prior study:** ENVT2250 Introduction to Ecology or ENVT2220 The Climate System

**Incompatibility:**

**Approved quota:**

**Contact hours:** lectures: 2 hrs per week; lab/field: up to 4 hrs per week, including one overnight stay at Dryandra Woodlands (charges: cost of food and accommodation is borne by the student)

**Unit web page:**

**Notes:**

**Texts/Recommended Reading etc. (web only):**

**Text**

Provisional Lecture Outline

1. Introduction to the unit
2. Future global climate changes: a modeling perspective
3. The global carbon cycle (I)
4. The global carbon cycle (II)
5. Elevated CO2 and terrestrial vegetation
6. Long term climate changes as a background to global biological events (I)
7. Long term climate changes as a background to global biological events (II)
8. Global ecological changes over Milankovitch time scales - the dynamics of ecological response
9. Earth’s biomes and climates over the last 20 000 years (I)
10. Earth’s biomes and climates over the last 20 000 years (II)
11. Molecular perspective on evolution and climate (I)
12. Molecular perspective on evolution and climate (II)
13. Introduction to Climate Change and Biodiversity
14. Global climate change and the problems arising for C3 species
15. Global climate change and the evolution of C4 species
16. Global climate change and plant speciation in the southwest of Australia
17. Local changes in vegetation cover affecting climate in Kenya
18. Local changes in vegetation cover affecting climate in Western Australia
19. Plant species traits along a gradient of increasing soil age
20. Hostile soils and root adaptations: a global and a local perspective
21. Climate change and tree health in Western Australia: trees with contrasting strategies
22. Nowhere to run? Dispersal ability under localised climate and landscape changes
23. The ties that bind: Species linkages and the risks of breaking them
24. Winners and losers and knowing the difference: Factors that affect response to change
25. Modelling reserve systems under change and uncertainty
26. Summary
PROPOSALS FOR NEW UNITS

Core Questions for Checklists used by Faculties

All faculties must include the questions below in their checklists for new units. Faculties may add other questions as they see fit.

1. Unit Details

   (1) Please provide the following information:

       (a) the proposed name of the unit; (The character allowance for unit titles in Callista is 100 for long, 40 for short and 20 for abbreviated.)

       ENVT2221 Global Climate Change and Biodiversity

       (b) the proposed point value of the unit (NB. By Council Resolution 110/02, all units must have a points value of 6 unless granted exemption);

       6 points; semester 2

       (c) a very brief description, not exceeding one line in length, of the content/area of the unit;

       The relationships between Global Climate Change and Biodiversity

       (d) the names of the degree, diploma and/or certificate courses in which you intend to offer the unit;

       BSc 50110, BSc 70100, all associated combined degrees

       (e) the proposed quota on intake to the unit, if any, and the nature of the constraint on intake.

       No quota

   (2) Please give a succinct summary of the academic objectives of the unit.

       This unit introduces students to the concept that climate change drives the evolution of biodiversity. The unit aims to describe and create an understanding of processes that regulate the biosphere, the changes that are occurring and the human influence.

   (3) Please summarise what teaching and learning practices will be used to realise the academic objectives.

       Lectures, practicals and field trips

   (4) Please advise what technologies (if any) will be required to support the teaching and learning practices.

       Lectopia; WebCT

   (5) Please outline what steps have been taken to ensure that any technologies to be used are readily available to staff and students.

       Lectopia available in all lectures theatres

   (6) Please indicate whether the unit is the outcome of a school, course or other review.

       This unit forms part of the four units to be developed for the Bachelor of Science (Climate Studies) and other related majors and Programmes. The Bachelor of Science (Climate Studies) has been approved by Academic Council

   (7) Please advise whether the unit utilises any material from existing units. If so, please provide details.

       This unit replaces BIOL22612 Global Biodiversity Hotspots (12 points) and uses some of its content.

   (8) Please advise whether the unit is to be offered within standard semester dates. (If it is not, please attach a proposal form for a non-standard semester unit.)

       Semester 2

   (9) Please advise whether lecture outline has been provided.

       Yes

2. Demand

   (1) What are the estimated annual enrolments?

       25 initially, building up to 40-50 students

   (2) How has the estimate in (1) been arrived at?
Current enrolment in conservation biology, plus enrolments from students in Climate Studies and related majors and programmes.

(3) From which other units are students likely to move? From BIOL2261 which will be suppressed and it is hoped that the climate studies programme attracts additional students; other students may come from the Geography major and some of the related 4-year Science degrees

3. Assessment

(1) Please advise how many examinations there will be for the unit and how long each will last. (Note: By Academic Council R16/94 the Examinations Office administers only standard examinations of 2 or 3 hours duration).

(2) If you do not propose to use more than one means of assessment for this unit (as recommended in the University's Guidelines on Assessment (http://www.secretariat.uwa.edu.au/home/policies/assessment), please explain the reason for this.

4. Grading Schema for Unit

(1) Schools are required to ensure that final results\(^1\) for units in courses at all levels be produced as both percentage marks and letter grades wherever possible. However, a number of categories of unit\(^2\) are exempt from this requirement. The following exemptions categories are pertinent for this checklist:

(i) units where the involvement of external assessors makes it difficult to compare students' performance in an equitable manner and provide appropriately graded results for the units (for example, in-country units, cross-institutional enrolments and practicum units);

(ii) units involving group activity where the contribution of individual students cannot be distinguished (for example, participation in the University Chorale/Orchestra compulsory field tours);

(iii) specific skill-acquisition only units, which may be taken to be completed merely by attendance and participation (for example, use of medical equipment, legal skills such as negotiation and mediation).

(2) Please indicate if it is intended that the result for the unit be recorded as an ungraded pass or ungraded fail only.

**NO**

(3) If the answer is YES please indicate into which of the categories of exempt units listed above the unit belongs.

\(^1\)Results for supplementary assessment are recorded as Ungraded Pass or Ungraded Fail and the original mark remains. See University General Rule 1.2.1.28(3).

\(^2\)Please see policy applying to ungraded passes and fails available at http://www.secretariat.uwa.edu.au/home/policies/courseunit

5. Resource-related matters

(1) Please advise whether all the costs of the unit (e.g. including, if appropriate, those associated with teaching at the Albany Centre such as Library/computer software resources) will be met from school resources or whether the proposal is the subject of application for other funding (e.g. University Initiatives Fund).

**The costs will be met by School's Resources**
Please indicate whether the schools intend to suppress another unit to release resources for this one.

**BIOL2261 Conservation Biology: Global Diversity Hotspots (12 points)**

(3) Please name the staff members who are able to teach the unit.

**Hans Lambers, Karl-Heinz Wyrvoll, Kimberly Van Niel and Megan Ryan**

(4) Please confirm that you have attached a completed Library Consultation Form.

**Attached**

(5) Will the introduction of this unit give rise to any accommodation needs other than standard lecture theatres, tutorial rooms or laboratory space (e.g. office space, new kinds of laboratory space) which cannot be met from the School’s/Faculty’s existing space allocation? Please ensure that your understanding is consistent with that of the Dean.

**No**

If YES, please confirm that you have attached a completed Accommodation Planning Form (http://www.secretariat.uwa.edu.au/home/policies/courseunit/proposals).

(6) Will there be any ancillary student fees/charges associated with this unit? If so, please confirm that you have submitted details of these to the Dean.

(See http://www.teachingandlearning.uwa.edu.au/fit4/for_uwa_students2/policies/asfc3)

**No**

6. Consultation

Please provide details of the consultations you have had with various groups and individuals during the development of this proposal, including the following:

(a) heads of schools in cognate areas, which may have an interest in the unit content;
(b) students and graduates;
(c) employers and/or employer groups and professional bodies;
(d) other universities in WA which teach similar units;
(e) other leading universities in Australia or overseas which teach similar units.

The BSc (Climate Studies) for which this unit is core, has been developed by an inter-faculty working party consisting of:

**Faculty of Natural and Agricultural Sciences**
**Faculty of Engineering, Computing and Mathematics**
**Faculty of Life and Physical Sciences**
**Faculty of Arts, Humanities and Social Sciences**

7. Information Flow

Please confirm, by ticking the boxes and entering the date of action, that you have forwarded a copy of this proposal, either in hard copy or electronically, to:

- The Deans of all faculties involved, either through offering the unit in their degrees, or through resourcing your school.

<table>
<thead>
<tr>
<th>Faculty of</th>
<th>Engineering, Computing and Mathematics</th>
<th>Date</th>
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<tbody>
<tr>
<td>Faculty of</td>
<td>Life and Physical Sciences</td>
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<td>Arts, Humanities and Social Sciences</td>
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<td>Faculty of</td>
<td>Medicine, Dentistry and Health Sciences</td>
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<tr>
<td>Faculty of</td>
<td>Law</td>
<td>Date</td>
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</tbody>
</table>
• The Head of any school which teaches in a cognate area (specify below).

School of Environmental Systems Engineering
School of Biomedical, Biomolecular and Chemical Sciences
School of Social and Cultural Studies
School of Humanities
School of Business School

• The Librarian

☐ Date

8. **Confirmation by the Heads of School**

I confirm that the process leading to the proposal for the introduction of

**ENVT2221 GLOBAL CLIMATE CHANGE AND BIODIVERSITY** *(Name of new unit)*

has included appropriate consultation with all other schools, both internal and external to the faculty, with a potential interest in the proposed unit and that the proposed unit will not overlap significantly with any existing unit.

Have any objections to this proposal been raised during the consultation process? **NO**

*(If yes, please attach details of objection and response)*

Signature of Head
School of **Plant Biology**

Signature of Head
School of **Earth and Geographical Sciences**

Academic Secretariat
April 2008
(New_Unit_Checklist)
The University of Western Australia

LIBRARY CONSULTATION FORM

This form is for use by those preparing proposals for new units, or new honours courses (if not made up of units). As soon as it is possible to identify the content of a proposed new unit or honours course in sufficient detail for the purposes of assessment of the adequacy of Library holdings, the form should be forwarded to the Librarian with an outline of the proposed content of the new unit/course. The Librarian will complete and return the form to the sender, who should then attach it to the final proposal submitted to the Faculty Board.

To be completed by the proposer

Faculty: Natural and Agricultural Sciences  School: Plant Biology and Earth and Geographical Sciences
Contact Name: Hans Lambers  Extension: 7381  Email address: hans.lambers@uwa.edu.au

Name of new unit/honours course: ENVT2221 GLOBAL CLIMATE CHANGE AND BIODIVERSITY

To be completed by the Librarian

1. Assessment of current collection

<table>
<thead>
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<th>Minimal level 0-1</th>
<th>Basic level 2</th>
<th>Intermediate level 3a</th>
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2. Cost of additional material ($)

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</table>

3. Comments:

______________________________________________________________________________

Signature ____________________________ Date ____________________________

To be completed by the appropriate Dean

I have noted the above assessment and comments. □

Signature ____________________________

Name ____________________________ Faculty ____________________________ Date __________
PROPOSALS FOR NEW UNITS

Core Questions for Checklists used by Faculties

All faculties must include the questions below in their checklists for new units. Faculties may add other questions as they see fit.

1. Unit Details

   (1) Please provide the following information:

       (a) the proposed name of the unit; *(The character allowance for unit titles in Calilista is 100 for long, 40 for short and 20 for abbreviated.)*

       ENVT2220 The Climate System

       (b) the proposed point value of the unit *(NB. By Council Resolution 110/02, all units must have a points value of 6 unless granted exemption)*;

       6 points; semester 1

       (c) a very brief description, not exceeding one line in length, of the content/area of the unit;

       This unit introduces students to climate studies

       (d) the names of the degree, diploma and/or certificate courses in which you intend to offer the unit;

       BSc 50110, BSc 70100, all associated combined degrees

       (e) the proposed quota on intake to the unit, if any, and the nature of the constraint on intake.

       No quota

   (2) Please give a succinct summary of the academic objectives of the unit.

       This unit introduces students to climate studies, including: the origin of the atmosphere and climate events of the early Earth; physical and chemical processes in the atmosphere; the role of the biosphere and ocean; climate change over short- and long-time scales; and future climates and their impacts.

   (3) Please summarise what teaching and learning practices will be used to realise the academic objectives.

       Lectures, tutorials and projects

   (4) Please advise what technologies (if any) will be required to support the teaching and learning practices.

       Lecture; WebCT

   (5) Please outline what steps have been taken to ensure that any technologies to be used are readily available to staff and students.

       Lectopia available in all lectures theatres

   (6) Please indicate whether the unit is the outcome of a school, course or other review.

       This unit forms part of the four units to be developed for the Bachelor of Science (Climate Studies) and other related majors and Programmes. The Bachelor of Science (Climate Studies) has been approved by Academic Council

   (7) Please advise whether the unit utilises any material from existing units. If so, please provide details.

       No

   (8) Please advise whether the unit is to be offered within standard semester dates. *(If it is not, please attach a proposal form for a non-standard semester unit.)*

       Semester 1

   (9) Please advise whether lecture outline has been provided.

       Yes

2. Demand

   (1) What are the estimated annual enrolments?

       10-15 initially, building up to 40-50 students

   (2) How has the estimate in (1) been arrived at?
Estimated enrolments from students in Climate Studies and related majors and programmes.

(3) From which other units are students likely to move?

It is hoped that the climate studies programme attracts additional students; other students may come from the Geography major and some of the related 4-year Science degrees

3. Assessment

(1) Please advise how many examinations there will be for the unit and how long each will last. (Note: By Academic Council R16/94 the Examinations Office administers only standard examinations of 2 or 3 hours duration).

(2) If you do not propose to use more than one means of assessment for this unit (as recommended in the University's Guidelines on Assessment (http://www.secretariat.uwa.edu.au/home/policies/assessment), please explain the reason for this.

4. Grading Schema for Unit

(1) Schools are required to ensure that final results\(^1\) for units in courses at all levels be produced as both percentage marks and letter grades wherever possible. However, a number of categories of unit\(^2\) are exempt from this requirement. The following exemptions categories are pertinent for this checklist.

(i) units where the involvement of external assessors makes it difficult to compare students' performance in an equitable manner and provide appropriately graded results for the units (for example, in-country units, cross-institutional enrolments and practicum units);

(ii) units involving group activity where the contribution of individual students cannot be distinguished (for example, participation in the University Chorale/Orchestra compulsory field tours);

(iii) specific skill-acquisition only units, which may be taken to be completed merely by attendance and participation (for example, use of medical equipment, legal skills such as negotiation and mediation).

(2) Please indicate if it is intended that the result for the unit be recorded as an ungraded pass or ungraded fail only.

NO

(3) If the answer is YES please indicate into which of the categories of exempt units listed above the unit belongs.

\(^1\)Results for supplementary assessment are recorded as Ungraded Pass or Ungraded Fail and the original mark remains. See University General Rule 1.2.1.26(3).

\(^2\)Please see policy applying to ungraded passes and fails available at http://www.secretariat.uwa.edu.au/home/policies/courseunit

5. Resource-related matters

(1) Please advise whether all the costs of the unit (e.g. including, if appropriate, those associated with teaching at the Albany Centre such as Library/computer software resources) will be met from school resources or whether the proposal is the subject of application for other funding (e.g. University Initiatives Fund).

The costs will be met by School Resources
Please indicate whether the school intends to suppress another unit to release resources for this one.

No, this is a new unit

Please name the staff members who are able to teach the unit.

Karl-Heinz Wyrwoll and Jenny Hopwood

Please confirm that you have attached a completed Library Consultation Form.

Attached

Will the introduction of this unit give rise to any accommodation needs other than standard lecture theatres, tutorial rooms or laboratory space (e.g. office space, new kinds of laboratory space) which cannot be met from the School's/Faculty's existing space allocation? Please ensure that your understanding is consistent with that of the Dean.

No

If YES, please confirm that you have attached a completed Accommodation Planning Form (http://www.secretariat.uwa.edu.au/home/policies/courseunit/proposals).

Will there be any ancillary student fees/charges associated with this unit? If so, please confirm that you have submitted details of these to the Dean.

(See http://www.teachingandlearning.uwa.edu.au/tl4/for_uwa_students2/policies/asfc3)

No

6. Consultation

Please provide details of the consultations you have had with various groups and individuals during the development of this proposal, including the following:

(a) heads of schools in cognate areas, which may have an interest in the unit content;
(b) students and graduates;
(c) employers and/or employer groups and professional bodies;
(d) other universities in WA which teach similar units;
(e) other leading universities in Australia or overseas which teach similar units.

The BSc (Climate Studies) for which this unit is core, has been developed by an inter-faculty working party consisting of:

Faculty of Natural and Agricultural Sciences
Faculty of Engineering, Computing and Mathematics
Faculty of Life and Physical Sciences
Faculty of Arts, Humanities and Social Sciences

7. Information Flow

Please confirm, by ticking the boxes and entering the date of action, that you have forwarded a copy of this proposal, either in hard copy or electronically, to:

- The Deans of all faculties involved, either through offering the unit in their degrees, or through resourcing your school.

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</table>
• The Head of any school which teaches in a cognate area (specify below).

School of  Environmental Systems Engineering  ☐ Date
School of  Biomedical, Biomolecular and Chemical Sciences  ☐ Date
School of  Social and Cultural Studies  ☐ Date
School of  Humanities  ☐ Date
School of  Business School  ☐ Date

• The Librarian  ☐ Date

8. Confirmation by the Head of School

I confirm that the process leading to the proposal for the introduction of

ENVT2220 THE CLIMATE SYSTEM

has included appropriate consultation with all other schools, both internal and external to the faculty, with a potential interest in the proposed unit and that the proposed unit will not overlap significantly with any existing unit.

Have any objections to this proposal been raised during the consultation process? NO

(If yes, please attach details of objection and response)

Signature of Head
School of

Earth and Geographical Sciences

 Academic Secretariat
April 2008
(New Unit Checklist)
LIBRARY CONSULTATION FORM

This form is for use by those preparing proposals for new units, or new honours courses (if not made up of units). As soon as it is possible to identify the content of a proposed new unit or honours course in sufficient detail for the purposes of assessment of the adequacy of Library holdings, the form should be forwarded to the Librarian with an outline of the proposed content of the new unit/course. The Librarian will complete and return the form to the sender, who should then attach it to the final proposal submitted to the Faculty Board.

To be completed by the proposer
Faculty: Natural and Agricultural Sciences, School: Earth and Geographical Sciences
Contact Name: Karl-Heinz Wyrwoll Extension: 2714
Email address: wyrwoll@cyllene.uwa.edu.au

Name of new unit/honours course: ENVT2220 THE CLIMATE SYSTEM

To be completed by the Librarian
1. Assessment of current collection

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<th></th>
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</table>

3. Comments:

____________________________________________________________________________________

Signature ________________________________ Date __________________________

To be completed by the appropriate Dean

I have noted the above assessment and comments. [ ] Signature __________________________

Name ___________________________ Faculty ___________________________ Date __________
Credit: 6 points  Availability: Semester 1
Type of unit: [UG] i.e. undergraduate unit only

Short description (hardcopy only):
This unit introduces students to the origin of the atmosphere and outlines the major climate states that the Earth has experienced during its history. The physical and chemical processes of the atmosphere and ocean and their interactions are presented. The functioning of the climate system as an integrated whole is evaluated, with emphasis on the coupling of the ocean-atmosphere with biosphere-lithosphere processes and events. Climate change over short and long time scales is studied and linked to the controlling mechanisms. The impact of humans on climate and future climates are explored within the context of model predictions.

Outcomes:
On completion of this unit the student will have acquired:

- an understanding of the nature and function of the global climate system
- a familiarity with the climate record of global events and of future climate trends
- an appreciation of the use of climate model methods and complexities and uncertainties inherent in predicting future global climates
- the ability to interpret synoptic patterns from station model data and satellite images.

The unit encourages critical thinking and provides the opportunity for independent research and critical analysis of the scientific literature. At the completion of the unit the student will have the necessary skills and knowledge to progress to more advanced studies in climate science.

Content:
Consideration will be given to: methods for detecting climate change including ice cores and proxy data, instrumental records and time series analysis; physical and chemical processes in climate; biogeochemical cycles; anthropogenic impacts on the chemistry of the atmosphere; energy and water budgets of the global atmosphere; internal feedback mechanisms including ice, aerosols, water vapour, clouds and ocean circulation; climate forcing including orbital variations, volcanism, plate tectonics, and solar variability; climate models and mechanisms of variability including energy balance and global ocean and atmosphere models; and future climates in the Australian region. Practical work will draw on satellite data in the study of the circulation and climates of the southern hemisphere. Model experiments using a modified General Circulation Model will be used to explore the impact of variations in the forcing mechanisms of global climates. A project will provide the opportunity for students to deepen their appreciation of an aspect of interest.

Assessment:
This comprises a three-hour examination (50 per cent), practical exercises (40 per cent) and a special topic of study (10 per cent).
Ethical Scholarship:
Unit co-ordinator(s): Dr Karl-Heinz Wyrowoll and Dr Jenny Hopwood
Location: UWA (Crawley)
Mode of offering: on-campus

Unit rules
Prerequisites: Minimum TEE Discrete Mathematics

Co-requisites:
Advisable prior study:
Incompatibility:
Approved quota:
Contact hours: lectures: 2 hrs per week; practicals/tutorials: 2 hrs per week.

Unit web page:
Notes:

Texts/Recommended Reading etc. (web only):

Text

Lecture topics:
1. Introduction to the climate system and global climate states.
2. Physical processes in the atmosphere and ocean.
3. Chemical processes in the ocean and atmosphere
4. The general circulation of the atmosphere and global climates.
6. The long term climate record and its controls.
7. Humans and climate change.

Practical Projects/Tutorials: 2 hours/week:
1. Controls of Southern Hemisphere climates – satellite analyses and synoptic charts.
2. Introduction to the modeling of global climates – using edgcm.
3. Tutorial Projects
ATTACHMENT D

CLIMATE AND ENVIRONMENT (MJ-ENVMM)

in the Bachelor of Science (50110) and associated combined degrees
All units are 6 points; a full unit load is 48 points per year or 24 points per semester.
This major sequence consists of a minimum of 72 points.

LEVEL 1 CLIMATE AND ENVIRONMENT REQUIREMENTS
Complete the two level 1 core units from the table below:

<table>
<thead>
<tr>
<th>Semester 1</th>
<th>Semester 2</th>
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<tbody>
<tr>
<td>EART1105 Earth &amp; Environment: Dynamic Planet</td>
<td>BIOL1131 Plant and Animal Biology</td>
</tr>
<tr>
<td>BIOL1130 Core Concepts in Biology</td>
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and complete at least one of the units from the table below:

<table>
<thead>
<tr>
<th>Semester 1</th>
<th>Semester 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>EART1104 Earth &amp; Environment: Geological Perspectives</td>
<td>EART1108 Earth &amp; Environment: Geographical Perspectives</td>
</tr>
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</table>

Students who have completed TEE Discrete Maths only must complete the unit MATH1050 Calculus C.

LEVEL 2 CLIMATE AND ENVIRONMENT REQUIREMENTS
Complete the four level 2 core units from the table below:

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<thead>
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<tr>
<td>ENVT2220 The Climate System</td>
<td>ENVT2221 Global Climate Change and Biodiversity</td>
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and complete at least one of the units from the table below:

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<td>EART2222 Earth Surface Processes and Soils</td>
<td>ENVT2250 Introduction to Ecology</td>
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and complete at least one of the units from the table below:

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<th>Semester 2</th>
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<tbody>
<tr>
<td>EART2221 Coastal Geomorphology and Sediments</td>
<td>ENVT2251 Environmental Hydrology</td>
</tr>
</tbody>
</table>

LEVEL 3 CLIMATE AND ENVIRONMENT REQUIREMENTS
Complete the one level 3 core unit from the table below:

<table>
<thead>
<tr>
<th>Semester 1</th>
<th>Semester 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>EART3320 Environmental Change</td>
<td>ENVT3320 Climate Dynamics (from 2010)</td>
</tr>
</tbody>
</table>

and complete at least two units from the table below:

<table>
<thead>
<tr>
<th>Semester 1</th>
<th>Semester 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>BIOL3303 Conservation Biology and Restoration Ecology</td>
<td>ENVT3321 Climate Change Policy and Planning (from 2010)</td>
</tr>
<tr>
<td>EART3341 Marine Geology</td>
<td>ENVT3333 Land and Water: Case Studies in Land and Water Management</td>
</tr>
<tr>
<td>EART3333 Environmental Geomorphology of Coasts and Rivers</td>
<td>PLNT3306 Australian Vegetation</td>
</tr>
</tbody>
</table>
DRAFT RULES

Climate and Environment

9.2.6.13A The major sequence in Climate and Environment comprises—

(a) all units in Table 9.2.6(22A) (Climate and Environment Major Sequence Core units)—30 points

and

(b) at least one unit from Group A in Table 9.2.6(22B) (Climate and Environment Major Sequence Options)—at least 6 points

and

(c) at least one unit from Group B in Table 9.2.6(22B) (Climate and Environment Major Sequence Options)—at least 6 points

and

(d) at least one unit from Group C in Table 9.2.6(22B) (Climate and Environment Major Sequence Options)—at least 6 points

and

(e) at least one unit from Group D in Table 9.2.6(22B) (Climate and Environment Major Sequence Options)—at least 6 points

and

(f) at least one unit from Group E in Table 9.2.6(22B) (Climate and Environment Major Sequence Options)—at least 6 points

Table 9.2.6(22A)—Climate and Environment Major Sequence Core Units
All units have a value of six points unless otherwise stated.

EART1105 Earth and Environment: Dynamic Planet
ENVT2220 The Climate System
ENVT2221 Global Climate Change and Biodiversity
EART3320 Environmental Change
ENVT3320 Climate Dynamics (from 2010)

Table 9.2.6(22B)—Climate and Environment Major Sequence Options
All units have a value of six points unless otherwise stated.

Group A
EART1104 Earth and Environment: Geological Perspectives
EART1108 Earth and Environment: Geographical Perspectives

Group B
EART2222 Earth Surface Processes and Soils
ENVT2250 Introduction to Ecology

Group C
EART2221 Coastal Geomorphology and Sediments
ENVT2251 Environmental Hydrology

Group D
BIOL3303 Conservation Biology and Restoration Ecology
EART3341 Marine Geology
EART3333 Environmental Geomorphology of Coasts and Rivers

Group E
ENVT3321 Climate Change Policy and Planning (from 2010)
ENVT3333 Land and Water: Case Studies in Land and Water Management
PLNT3306 Australian Vegetation
ENVIRONMENTAL MANAGEMENT MAJOR (MJ-ENVMM)

in the Bachelor of Science (50110) and associated combined degrees
All units are 6 points; a full unit load is 48 points per year or 24 points per semester.

Environmental issues are many and varied and the problems involve processes that extend over several disciplines. An important aspect is to devise and manage the solutions to environmental problems. This major sequence consists of a minimum of 7266 points.

### LEVEL 1 ENVIRONMENTAL MANAGEMENT REQUIREMENTS

Complete the two level 1 core units from the table below:

<table>
<thead>
<tr>
<th>Semester 1</th>
<th>Semester 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>EART1105 Earth &amp; Environment: Dynamic Planet</td>
<td>EART1108 Earth &amp; Environment: Geographical Perspectives</td>
</tr>
<tr>
<td>ECON1120 Environmental Economics</td>
<td></td>
</tr>
</tbody>
</table>

and complete at least one of the units from the table below:

<table>
<thead>
<tr>
<th>Semester 1</th>
<th>Semester 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>MATH1025 Calculus and Matrix Methods</td>
<td>STAT1510 Statistics A</td>
</tr>
<tr>
<td>MATH1040 Calculus B</td>
<td>STAT1530 Statistics B</td>
</tr>
<tr>
<td>MATH1060 Calculus C</td>
<td>STAT2210 Biometrics 1</td>
</tr>
</tbody>
</table>

Students who have completed TEE Discrete Maths only must complete the unit MATH1050 Calculus C.

### LEVEL 2 ENVIRONMENTAL MANAGEMENT REQUIREMENTS

Complete the three/four level 2 core units from the table below:

<table>
<thead>
<tr>
<th>Semester 1</th>
<th>Semester 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>ECON2201 Environmental Economics</td>
<td>ENVT2210 Environmental Policy and Law</td>
</tr>
<tr>
<td>EART2201 Introduction to Geographic Information</td>
<td>ENVT2251 Environmental Hydrology</td>
</tr>
<tr>
<td>ENVT2250 Introduction to Ecology</td>
<td></td>
</tr>
</tbody>
</table>

and complete at least one unit from the table below:

<table>
<thead>
<tr>
<th>Semester 1</th>
<th>Semester 2</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>ENVT2221 Global Climate Change and Biodiversity</td>
</tr>
<tr>
<td></td>
<td>ECON2223 Business and the Environment</td>
</tr>
<tr>
<td></td>
<td>ECON2224 Environmental and Resource Economics</td>
</tr>
</tbody>
</table>

### LEVEL 3 ENVIRONMENTAL MANAGEMENT REQUIREMENTS

Complete the one level 3 core unit from the table below:

<table>
<thead>
<tr>
<th>Semester 1</th>
<th>Semester 2</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>EART3304 Environmental Planning, Management and Sustainability</td>
</tr>
</tbody>
</table>

and complete at least four/three units from the table below:

<table>
<thead>
<tr>
<th>Semester 1</th>
<th>Semester 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>EART3323 Land, Soil and Water Systems</td>
<td>EART3304 Environmental Planning, Management and Sustainability</td>
</tr>
<tr>
<td>EART3320 Environmental Change</td>
<td>EART3327 Rural Geography and Planning</td>
</tr>
<tr>
<td>SCIE3366 Project and Risk Management</td>
<td>EART3331 Marine &amp; Coastal Planning &amp; Management</td>
</tr>
<tr>
<td></td>
<td>ECON3322 Economics of Water Management</td>
</tr>
<tr>
<td></td>
<td>SCIE3367 Management Decision Tools</td>
</tr>
<tr>
<td></td>
<td>ENVT3321 Climate Change Policy and Planning</td>
</tr>
</tbody>
</table>
Environmental Management

9.2.6.16A The major sequence in Environmental Management comprises—

(a) all units in Table 9.2.6(26A) (Environmental Management Major Sequence Core Units)—3642 points

and

(b) at least one unit from Group A in Table 9.2.6(26B) (Environmental Management Major Sequence Options)—at least 6 points

and

(c) at least two units from Group B in Table 9.2.6(26B) (Environmental Management Major Sequence Options)—at least 642 points

and

(d) at least one-four units from Group C in Table 9.2.6(26B) (Environmental Management Major Sequence Options)—at least 246 points.

Table 9.2.6(26A)—Environmental Management

Major Sequence Core Units

All units have a value of six points unless otherwise stated.

Level 1

EART1105 Earth and Environment: Dynamic Planet
EART1108 Earth and Environment: Geographical Perspectives
ECON1120 Environmental Economics

Level 2

ECON2201 Environmental Economics
EART2210 Introduction to Geographic Information Systems
ENVT2210 Environmental Policy and Law
ENVT2250 Introduction to Ecology
ENVT2251 Environmental Hydrology

Level 3

EART3304 Environmental Planning, Management and Sustainability

Table 9.2.6(26B)—Environmental Management

Major Sequence Options

All units have a value of six points unless otherwise stated.

Group A

MATH1025—Calculus and Matrix Methods
MATH1040—Calculus B
MATH1050—Calculus C
STAT1510 Statistics A
STAT1530 Statistics B
STAT2210 Biometrics 1

Group B

ECON2221 Global Climate Change and Biodiversity
ECON22xx Business and the Environment
EART3320 Environmental Change
EART3323 Land, Soil and Water Systems
SCIE3366 Project and Risk Management

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>EART3304</td>
<td>Environmental Planning Management and Sustainability</td>
</tr>
<tr>
<td>EART3320</td>
<td>Environmental Change</td>
</tr>
<tr>
<td>EART3327</td>
<td>Rural Geography and Planning</td>
</tr>
<tr>
<td>EART3331</td>
<td>Marine and Coastal Planning and Management</td>
</tr>
<tr>
<td>ENVT3321</td>
<td>Climate Change Policy and Planning</td>
</tr>
<tr>
<td>SCIE3366</td>
<td>Project and Risk Management</td>
</tr>
<tr>
<td>SCIE3367</td>
<td>Management Decision Tools</td>
</tr>
<tr>
<td>EGON3322</td>
<td>Economics of Water Management</td>
</tr>
</tbody>
</table>

*Counts as a non-science unit under Rule 9.2.2.4.*
LEVEL 3 CLIMATE-SPECIFIC UNITS

ENVT3320 Climate Dynamics – Semester 2 – 2010
The unit provides an understanding of the physical functioning of the global climate system. The physical structure of the climate system is described and explained in terms of the fundamental principles that control the governing processes. The strengths and weaknesses of climate models in portraying atmospheric function and predicting future climate states will be evaluated. The unit emphasizes the scientific basis necessary to allow students to engage in the climate and global change debate. Consideration will be given to: solar radiation and the global energy balance; radiative transfer and climate; surface energy balance; the hydrological cycle and atmospheric function; atmosphere and oceanic circulation; natural variability; components of climate models; strengths and weaknesses of models; uncertainty and climate predictions.

Textbooks:

ENVT3321 Climate Change Policy and Planning – Semester 2 – 2010
This unit will outline the development of climate change policy-making and the growth in the role of the State at the national and supra-national level in directing environmental policy. The history and current trends in climate change policy in Australia will be studied. The value of the Kyoto protocol and its implementation mechanisms will be assessed with respect to achieving key principles, and the various possible post-Kyoto global scenarios outlined. Issues of policy-making and planning in the face of uncertainty will be discussed and related to the Australian political experience of the last decade. Australian climate change policy and planning will be examined in relation to energy, agriculture, water resources, biodiversity and coastal areas. The unit will conclude with an evaluation of the various post-Kyoto global scenarios, outlining the policy directions of states both individually and collectively, with particular reference to the role of the US, the European Union, India, China and Australia.

Textbooks:
- Faure, M., Gupta, J., Nentjes, A., eds. 2003: Climate change and the Kyoto Protocol: the role of institutions and instruments to control global change. Edward Elgar
EART333 ENVIRONMENTAL GEOMORPHOLOGY OF COASTS AND RIVERS

Credit: 6 points  Availability: Semester 1

Type of unit: [UG] i.e. undergraduate unit only

Short description (hardcopy only):
Environmental geomorphology is concerned with the application of geomorphological principles and techniques to environmental issues and problems related to Earth surface processes and landforms. The unit is concerned with the operation of geomorphological processes in river basin and coastal environments. The lectures, discussion groups and fieldwork exercise develop: (i) an understanding of geomorphological processes and their response to environmental and climate changes and (ii) problem-solving skills necessary for tackling research and applied issues of river basin and coastal environments.

Outcomes:
Upon completion of this unit students will have acquired:
- scientific understanding and technical skills in geomorphology
- the ability to assess the impact of climate change on river basins and coastal environments
- confidence in approaching field problems
- knowledge of how to formulate a research design
- the experience and skills necessary for group work
- the confidence and skill to present research findings
- the expertise to contribute to the solution of real-world issues related to river basin and coastal geomorphology through a sound understanding of the underlying principles and a realisation of how these translate into a research and natural resource management context.

Content:
This unit is concerned with providing an understanding of geomorphological processes and environments of river basin and coastal environments in the context of climate and environmental changes. The catchment processes that provide water and sediments are established and how these control river function and form is considered. The factors that lead to the formation of stable river environments are introduced, placing emphasis on the role of the sediment regime. This understanding is then used to demonstrate how rivers respond to climate change, and develop methods for predicting the responses.

Rivers are linked to coastal environments primarily through the transport of sediments. This link is established and coastal environments are described and placed within their large-scale environmental controls. The controls of waves and tides on beach processes and sedimentation are linked to coastal form and function. The processes and sediments of estuaries and tidal inlets and deltas are outlined and related to their sediment and morphodynamic controls. An understanding of the factors that govern sealevel changes are provided, with emphasis on predicted future sealevels and the coastal responses that these will provoke.

Throughout the lectures reference will be made to relevant applied geomorphology/environmental management case studies.
Assessment: This comprises a three-hour examination (50 per cent), two field project reports (40 per cent total) and two field project presentations (10 per cent total).

Ethical Scholarship:
Unit co-ordinator(s): Dr Karl-Heinz Wyrwoll
Location: UWA (Crawley)
Mode of offering: on-campus

Unit rules
Prerequisites: EART2222 Earth Surface Processes and Soils or EART2221 Coastal Geomorphology and Sediments or ENVT2251 Environmental Hydrology
Co-requisites:
Advisable prior study:
Incompatibility:
Approved quota:
Contact hours: lectures/discussion sessions: 3 hrs per week; fieldwork 5 days.

Unit web page:
Notes:

Texts/Recommended Reading etc. (web only):

Text

Weekly lecture topics:
- Catchment processes and their impact on river systems
- Stream sedimentology – channel morphology
- Floodplains and floodplain processes
- Stable river morphology
- Catchment and river responses to climate change
- Coastal environments – their large scale controls
- Sea level change, past and future
- Nearshore processes and morphodynamics
- Coastal dunes and sediment dynamics
- Estuarine process and sediments
- 12 Inlets and tidal deltas
- 13. Deltaic processes and sediments

The unit has no formal practical classes but involves a total of five days field work, which forms the basis of two research reports.
Geography

9.2.6.19 The major sequence in Geography comprises—

(a) at least one unit from Group A in Table 9.2.6(32) (Geography Major Sequence Options)—at least 6 points

and

(b) at least three units from Group B in Table 9.2.6(32) (Geography Major Sequence Options)—at least 18 points

and

(c) at least four units from Group C in Table 9.2.6(32) (Geography Major Sequence Options), fulfilling the requirements of one of the streams in Table 9.2.6(33) (Geography Major Streams)—at least 24 points.

Table 9.2.6(31)—Deleted

Table 9.2.6(32)—Geography Major Sequence Options

All units have a value of six points unless otherwise stated.

Group A

EART1105 Earth and Environment: Dynamic Planet
EART1108 Earth and Environment: Geographical Perspectives

Group B

EART2201 Introduction to Geographic Information Systems
EART2217 Geographies of Development
EART2218 Geographies of Cities
EART2221 Coastal Geomorphology and Sediments
EART2222 Earth Surface Processes and Soils
ENVT2210 Environmental Policy and Law
ENVT2220 The Climate System
ENVT2221 Global Climate Change and Biodiversity

Group C

EART3304 Environmental Planning, Management and Sustainability
EART3319 Geography of Australia and the Asia–Pacific
EART3320 Environmental Change
EART3324 Environmental Geomorphology of Sheltered Coasts
EART3325 Environmental Geomorphology: Streams and Catchments
EART3327 Rural Geography and Planning
EART3330 Geographic Information Systems and Remote Sensing
EART3331 Marine and Coastal Planning and Management
EART3332 Social Geography and Planning
EART3333 Environmental Geomorphology of Coasts and Rivers
ENVT3320 Climate Dynamics (from 2010)
ENVT3321 Climate Change Policy and Planning (from 2010)

Table 9.2.6(33)—Geography Major Streams
All units have a value of six points unless otherwise stated.

General Geography
At least four units from Group C in Table 9.2.6(32) (Geography-Major Sequence Options).

Environmental Geography
At least four units chosen from:
EART3304 — Environmental Planning, Management and Sustainability
EART3320 — Environmental Change
EART3324 — Environmental Geomorphology of Sheltered Coasts
EART3325 — Environmental Geomorphology: Streams and Catchments
EART3327 — Rural Geography and Planning
EART3330 — Geographic Information Systems and Remote Sensing
EART3331 — Marine and Coastal Planning and Management

Human Geography
At least four units chosen from:
EART3304 — Environmental Planning, Management and Sustainability
EART3310 — Geography of Australia and the Asia-Pacific
EART3327 — Rural Geography and Planning
EART3330 — Geographic Information Systems and Remote Sensing
EART3332 — Social Geography and Planning

Physical Geography
At least four units chosen from:
EART3320 — Environmental Change
EART3324 — Environmental Geomorphology of Sheltered Coasts
EART3325 — Environmental Geomorphology: Streams and Catchments
EART3330 — Geographic Information Systems and Remote Sensing
EART3331 — Marine and Coastal Planning and Management

Regional Development and Planning
At least four units chosen from:
EART3304 — Environmental Planning, Management and Sustainability
EART3324 — Environmental Geomorphology of Sheltered Coasts
EART3327 — Rural Geography and Planning
EART3330 — Geographic Information Systems and Remote Sensing
EART3331 — Marine and Coastal Planning and Management
EART3332 — Social Geography and Planning
CONSERVATION BIOLOGY MAJOR (MJ-CONBI)

in the Bachelor of Science (50110) and associated combined degrees
All units are 6 points; a full unit load is 48 points per year or 24 points per semester.

Conservation Biology is concerned with the conservation of plants and animals with the aim to minimise or reverse the extinction of irreplaceable biodiversity. It is also involved with the integration of biodiversity conservation into the fabric of mainstream human activities. The major has a substantial field component and includes a range of ecosystems. The Conservation Biology major consists of a minimum of 60 points.

LEVEL 1 CONSERVATION BIOLOGY REQUIREMENTS
Complete the two level 1 core units from the table below:

<table>
<thead>
<tr>
<th>Semester 1</th>
<th>Semester 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>BIOL1130 Core Concepts in Biology</td>
<td>BIOL1131 Plant and Animal Biology</td>
</tr>
</tbody>
</table>

Students who have completed TEE Discrete Maths only must complete the unit MATH1050 Calculus C.

LEVEL 2 CONSERVATION BIOLOGY REQUIREMENTS
Complete the three level 2 core units from the table below:

<table>
<thead>
<tr>
<th>Semester 1</th>
<th>Semester 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>BIOL2261 Introduction to Conservation Biology</td>
<td>BIOL2262 Conservation Biology: Global Diversity Hotspots (12 points)</td>
</tr>
<tr>
<td>ENVVT2250 Introduction to Ecology</td>
<td>ENVVT2221 Global Climate Change and Biodiversity</td>
</tr>
</tbody>
</table>

and complete at least 6 points from the table below:

<table>
<thead>
<tr>
<th>Semester 1</th>
<th>Semester 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>ANIM2204 Vertebrate Zoology</td>
<td></td>
</tr>
<tr>
<td>ENVVT2210 Environmental Policy and Law</td>
<td></td>
</tr>
<tr>
<td>GENE2240 Introduction to Genetics</td>
<td></td>
</tr>
<tr>
<td>PLNT2204 Land Plant Diversity and Systematics</td>
<td></td>
</tr>
</tbody>
</table>

LEVEL 3 CONSERVATION BIOLOGY REQUIREMENTS
Complete the level 3 core unit from the table below:

<table>
<thead>
<tr>
<th>Semester 1</th>
<th>Semester 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>BIOL3360 Conservation Biology: Saving Endangered Species</td>
<td></td>
</tr>
</tbody>
</table>

and complete at least 12 points from the table below:

<table>
<thead>
<tr>
<th>Semester 1</th>
<th>Semester 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>BIOL3362 CB: Threatening Processes Research Project Pt 1 (6 pts)</td>
<td>BIOL3363 CB: Threatening Processes Research Project Pt 2 (6 pts)</td>
</tr>
<tr>
<td>ENVVT3334 Land and Water Mgmt. Research Project–Pt 1 (6 pts)</td>
<td>ENVVT3335 Land and Water Management Research Project–Pt 2 (6 pts) 1</td>
</tr>
<tr>
<td></td>
<td>ENVVT3333 Land and Water: Case Studies in Land and Water Management</td>
</tr>
<tr>
<td></td>
<td>PLNT3306 Australian Vegetation</td>
</tr>
<tr>
<td></td>
<td>ANIM3353 Wildlife Conservation and Management</td>
</tr>
</tbody>
</table>

and complete at least one unit from the table below:

<table>
<thead>
<tr>
<th>Semester 1</th>
<th>Semester 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>ANIM3301 Animal Ecology</td>
<td></td>
</tr>
<tr>
<td>BIOL3303 Conservation Biology &amp; Restoration Ecology</td>
<td></td>
</tr>
</tbody>
</table>
Conservation Biology

9.2.6.14A The major sequence in Conservation Biology comprises—

(a) all units in Table 9.2.6(22A) (Conservation Biology Major Sequence Core Units)—54 points

and

(b) at least one unit selected from Group A in Table 9.2.6(22B) (Conservation Biology Major Sequence Options)—at least 6 points

and

(c) at least one unit from Group B in Table 9.2.6(22B) (Conservation Biology Major Sequence Options)—at least 6 points.

and

(d) at least 12 points from Group C in Table 9.2.6(22B) (Conservation Biology Major Sequence Options)

Table 9.2.6(22A)—Conservation Biology

Major Sequence Core Units

All units have a value of six points unless otherwise stated.

Level 1

BIOL1130 Core Concepts in Biology
BIOL1131 Plant and Animal Biology

Level 2

BIOL2261 Introduction to Conservation Biology
BIOL2262 Conservation Biology: Global Biodiversity Hotspots (12 points)
ENVT2221 Global Climate Change and Biodiversity
ENVT2250 Introduction to Ecology

Level 3

BIOL3360 Conservation Biology: Saving Endangered Species
BIOL3362 Conservation Biology: Threatening Processes Research Project Part 1
BIOL3363 Conservation Biology: Threatening Processes Research Project Part 2

* All parts must be completed to fulfil the requirements of the unit.

Table 9.2.6(22B)—Conservation Biology Major Sequence Options

All units have a value of six points unless otherwise stated.

Group A

ANIM2204 Vertebrate Zoology
ENVT2210 Environmental Policy and Law
GENE2240 Introduction to Genetics
PLNT2204 Land Plant Diversity and Systematics

Group B

ANIM3301 Animal Ecology
BIOL3303 Conservation Biology and Restoration Ecology

Group C

ENVT3334 Land and Water Management Research Project –Pt 1 (6 pts)
ENVT3335 Land and Water Management Research Project –Pt 2 (6 pts)
ENVT3333 Land and Water: Case Studies in Land and Water Management
PLNT3306 Australian Vegetation
ANIM3353 Wildlife Conservation and Management