Course Outline

Code: ANM103
Title: Animal Form, Function and Evolution

School of: Science & Engineering
Teaching Session: Semester 2
Year: 2019
Course Coordinator: Dr Dominique Potvin
Course Moderator: Dr Scott Burnett

Please go to the USC website for up to date information on the teaching sessions and campuses where this course is usually offered.

1. What is this course about?
   1.1 Description
   In this course you will learn the principles of evolution as they relate to animal ecology. This course will introduce you to major concepts underlying the study of animal biology, including molecular and population genetics, selection, adaptation, physiology, and how these concepts among others contribute to our understanding of the diversity of animal life. You will learn about the history of experimental evolution, and design and perform your own experimental simulations in a laboratory context.

   1.2 Course topics
   In this course you will:
   1. Learn the fundamentals of genetics (on molecular, organismal and population levels) as they relate to animal evolution;
   2. Gain an understanding of evolutionary theory and its role in explaining animal diversity;
   3. Compare various physiological and behavioural adaptations that have enabled different taxa to survive in a range of environments;
   4. Perform experiments demonstrating processes of evolution and learn how to analyse them.

2. What level is this course?
100 level Introductory - Discipline knowledge and skills at foundational level, broad application of knowledge and skills in familiar contexts and with support. Normally associated with the first full-time year of an undergraduate program

3. Unit Value
12 units
4. **Specific Learning Outcomes**

On successful completion of this course you should be able to:

| Demonstrate and apply knowledge in the discipline of comparative animal physiology | Task 1 | Knowledgeable
| Critical analyse and solve problems in physiology by collecting, accurately recording, interpreting, drawing conclusions from and presenting data, according to scientific conventions. | Task 1 | Creative and critical thinking
| Research, organise, scientifically communicate and present information about comparative physiology in a creative and informative way. | Task 2 | Empowered

<table>
<thead>
<tr>
<th>Assessment Tasks</th>
<th>Graduate Qualities or Professional Standards mapping</th>
</tr>
</thead>
<tbody>
<tr>
<td>You will be assessed on the learning outcome in task/s:</td>
<td>Completing these tasks successfully will contribute to you becoming:</td>
</tr>
<tr>
<td>Task 1</td>
<td>Knowledgeable</td>
</tr>
<tr>
<td>Task 2</td>
<td>Creative and critical thinking</td>
</tr>
<tr>
<td>Task 3</td>
<td>Empowered</td>
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</table>

5. **Am I eligible to enrol in this course**

Refer to the USC Glossary of terms for definitions of “pre-requisites, co-requisites and anti-requisites”.

5.1 **Enrolment restrictions**

Students must be enrolled in AB101, SB303, SC320, ED112, UC103, UU301, UU302 or XU301

5.2 **Pre-requisites**

Nil

5.3 **Co-requisites**

Nil

5.4 **Anti-requisites**

Nil

5.5 **Specific assumed prior knowledge and skills (where applicable)**

High School level science

6. **How am I going to be assessed?**

6.1 **Grading scale**

Standard – High Distinction (HD), Distinction (DN), Credit (CR), Pass (PS), Fail (FL)

6.2 **Details of early feedback on progress**

In week 5 you will be given an online quiz with multiple choice questions based upon course content, which reflect the style and detail required for the end of semester exam. These questions are non-weighted and are there to provide early feedback on the course.
### Assessment tasks

<table>
<thead>
<tr>
<th>Task No.</th>
<th>Assessment Tasks</th>
<th>Individual or Group</th>
<th>Weighting %</th>
<th>What is the duration / length?</th>
<th>When should I submit?</th>
<th>Where should I submit it?</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Laboratory-activity worksheets and report</td>
<td>Individual</td>
<td>40</td>
<td>11 x 200 words + 1 x 1200 words</td>
<td>Week 13</td>
<td>Blackboard</td>
</tr>
<tr>
<td>2</td>
<td>Animal adaptation presentation</td>
<td>Group</td>
<td>30</td>
<td>5 min narration ≥ 350 - 500 words</td>
<td>Week 10</td>
<td>Blackboard</td>
</tr>
<tr>
<td>3</td>
<td>End-of-semester Examination</td>
<td>Individual</td>
<td>30</td>
<td>2 hr (≥1000 words)</td>
<td>Centrally scheduled exam period</td>
<td>Examination venue</td>
</tr>
</tbody>
</table>

### Assessment Task 1 – Laboratory-activity worksheets & report 40%

**Goal:** Demonstrate and apply knowledge of evolution and genetics activities performed in the scheduled laboratory classes.

**Product:** Completed laboratory-activity worksheets, one report.

**Format:** You will individually complete twelve laboratory-activity worksheets during scheduled laboratory classes. Worksheets may include written responses to questions, scientific drawings, calculations, graphing and interpretation of experimental results. You will then choose one of these laboratories to write a complete report, including an Introduction, Methods, Results and Discussion.

**Criteria**

You will be assessed on your ability to:
1. Solve problems in zoology; and
2. Communicate your understanding of theoretical concepts or your interpretation of experimental results in an accurate manner.

### Assessment Task 2 – Animal adaptation presentation, 30%

**Goal:** Compare and contrast the adaptations of two or more animals to a shared environmental challenge

**Product:** A digital presentation of a physiological system between two animal groups.

**Format:** In groups of 2-3 students, you will produce a digital presentation comparing a behavioural or physiological adaptation for survival or reproduction between two animal groups that share a specific environmental challenge, e.g., salt-excretion methods in marine fish and sea turtles, or wings in butterflies and bats. Suggested topics will be provided on Blackboard and you will inform the Course Coordinator of your choice. You will produce a 5-minute movie (you can use software such as iMovie or Windows Movie maker) that is informative, interesting and scientifically based. A written copy of your referenced narration (approximately 350-500 words, Harvard style referencing) must be submitted to SafeAssign on Blackboard by the due date. The movie file will also be uploaded to Blackboard. Further instructions and resource material will be supplied on Blackboard.

**Criteria**

You will be assessed on your ability to:
1. Research a scientific topic and understand the relevant content; and
2. Demonstrate and communicate your scientific understanding in a professional manner.
Assessment Task 3 – End-of-semester Examination, 30%

<table>
<thead>
<tr>
<th>Goal:</th>
<th>Demonstrate your understanding of and ability to apply and communicate your knowledge regarding animal form, function and evolution.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Product:</td>
<td>A written invigilated examination.</td>
</tr>
<tr>
<td>Format:</td>
<td>The final exam is a comprehensive, two (2) hour final examination, consisting of multiple choice questions. The examination is closed book. Formative fortnightly multiple choice style quizzes will be available on Blackboard to help you to gauge your progress with your learning in the course and familiarise yourself with the level of expectation of content knowledge.</td>
</tr>
</tbody>
</table>
| Criteria | You will be assessed on your ability to:  
1. Demonstrate and communicate knowledge of evolutionary theory as relates to animal ecology. |

7. What are the course activities?

7.1 Directed study hours

The directed study hours listed here are a portion of the workload for this course. As a 12 unit course it will have a total of 150 learning hours which will include directed study hours (including online if required), self-directed learning and completion of assessable tasks. Directed study hours may vary by location. Student workload is calculated at 12.5 learning hours per one unit.

<table>
<thead>
<tr>
<th>Location: Specific Campus(es) or online:</th>
<th>Directed study hours for location:</th>
</tr>
</thead>
<tbody>
<tr>
<td>USC Sunshine Coast</td>
<td>2-hr online lecture each week</td>
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<tr>
<td></td>
<td>1 hr tutorial each week</td>
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<tr>
<td>USC Fraser Coast</td>
<td>2 hr laboratory each week</td>
</tr>
</tbody>
</table>

7.2 Course content

<table>
<thead>
<tr>
<th>Week # / Module #</th>
<th>What key concepts / content will I learn?</th>
</tr>
</thead>
</table>
| 1                | **Lecture**: Evolution: a combination of history, geology and biology  
Case studies, Darwin, history of evolutionary thought, estimating time, fossils, dawn of life, animals, taxonomy, phylogeny, physiology.  
**Laboratory**: Introduction to labs/tutorials, report writing, application downloads and preparation.  
Skills practice for week 2.  
**Readings**: Zimmer Chapters 2, 3 and 4 |
| 2                | **Lecture**: DNA and molecular genetics  
Proteins, RNA, DNA, translation, transcription, sequences, recombination, polyploidy, mutations, PCR & techniques  
**Laboratory**: Extracting DNA and performing PCR  
**Readings**: Zimmer Chapter 5 |
| 3                | **Lecture**: Mendelian Genetics  
Gene expression, genotypes, phenotypes, heredity, environment-genetic interactions, plasticity.  
**Laboratory**: Gel electrophoresis and analysis  
**Readings**: Zimmer Chapter 5 and extra readings from Freeman and Herron Quantitative genetics (provided on Blackboard) |
| 4                | **Lecture**: Cells, organs and systems  
Animal cells, organs and organ systems including digestive, reproductive, excretory, respiratory and cardiovascular  
**Laboratory**: Digestive system and associated enzymes  
**Readings**: Online Readings |
| 5                | **Lecture**: Coordination and communication  
Within-animal communication and coordination: neural systems, enzymes, hormones; between-animal communication: pheromones, sensory abilities  
**Laboratory**: Metabolic rates |
# Course Outline: ANM103 Animal Form, Function and Evolution

<table>
<thead>
<tr>
<th>Week</th>
<th>Lecture</th>
<th>Readings</th>
<th>Laboratory</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>6</td>
<td>Sex, reproduction and development</td>
<td>Online readings</td>
<td>Convergent evolution</td>
<td>Zimmer Chapter 12</td>
</tr>
<tr>
<td></td>
<td>Reproduction strategies, evolution of sexual reproduction, reproductive physiology, recombination, life cycles, sexual dimorphism, mate choice, sexual selection, ornamentation, fitness, mating systems, sperm competition, sexual conflict</td>
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<tr>
<td></td>
<td>Adaptations</td>
<td></td>
<td>Ecomorphs virtual lab</td>
<td></td>
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<tr>
<td></td>
<td>Physiological &amp; morphological trait evolution, gene recruitment, natural selection, constraints, studying adaptation, case studies, convergent evolution, imperfections</td>
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<tr>
<td></td>
<td></td>
<td>Eat Prey Live app game</td>
<td></td>
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</tr>
<tr>
<td>7</td>
<td>Life History and Kin</td>
<td>Zimmer Chapter 12</td>
<td>Reservoir crabs virtual lab</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Parental strategies, sex ratios, inclusive fitness, investment, life history strategies, maturity, ageing, kin selection, altruism, eusociality, parent-offspring conflict, death</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>Adaptations</td>
<td>Zimmer Chapter 8</td>
<td>Ecomorphs virtual lab</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Physiological &amp; morphological trait evolution, gene recruitment, natural selection, constraints, studying adaptation, case studies, convergent evolution, imperfections</td>
<td></td>
<td></td>
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<tr>
<td>9</td>
<td>Population genetics</td>
<td>Zimmer Chapter 8</td>
<td>Applying Hardy-Weinberg</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Mutation, drift, selection, alleles, inbreeding, linkage, quantitative traits, population variation, gene flow, fixation, bottlenecks &amp; founder effects, null models, conservation genetics, quantitative genetics</td>
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<td></td>
<td></td>
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<tr>
<td>10</td>
<td>Coevolution</td>
<td>Zimmer Chapter 6</td>
<td>Eat Prey Live virtual lab</td>
<td></td>
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<tr>
<td></td>
<td>Predation, parasitism, immunity, mutualism, commensalism, arms races, competition, endosymbiosis</td>
<td></td>
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<tr>
<td>11</td>
<td>Ancestry &amp; Methods in evolutionary biology</td>
<td>Zimmer Chapter 11</td>
<td>Phylotile and making phylogenies virtual lab</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Common ancestry, trees, molecular clocks, cladistics, systematics, evo-devo, phylogeny, patterns, genomics, sequencing, experimental evolution</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>12</td>
<td>Speciation, biodiversity and extinction</td>
<td>Zimmer Chapter 9, 10 &amp; 14</td>
<td>No lab – preparing your report</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Origins of life, earth history, extinctions, radiations, biogeography, distribution patterns, macroevolution, physiological diversity, divergence, speciation pathways, cryptic species, hybrids</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>13</td>
<td>Into the future &amp; Revision</td>
<td>TBA</td>
<td>No lab – preparing your report</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Teaching evolution, controversies, unsolved problems, future experiments, evolutionary medicine, revision</td>
<td></td>
<td></td>
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</tr>
</tbody>
</table>
8. **What resources do I need to undertake this course?**

Please note that course information, including specific information of recommended readings, learning activities, resources, weekly readings, etc. are available on the course Blackboard site. Please log in as soon as possible.

8.1 **Prescribed text(s)**


8.2 **Specific requirements**

You must wear a lab coat, enclosed shoes, and safety glasses during laboratory classes. You must either purchase and bring to lab classes a copy of the Introduction to Animal Physiology laboratory manual, or alternatively print out the manual from Blackboard. The lab manual is available for purchase from Mail and Print Services (MaPS). Some labs will utilize both student's own mobile devices, and/or on-site computers.

9. **Risk management**

Risks in this course are associated with that of a PC1 laboratory. Risk assessments have been performed for each experimental. There is a moderate level of health and safety risk. You must wear a lab coat, enclosed shoes, and safety glasses during laboratory classes. Materials safety data sheets (MSDS) are available at relevant laboratory class.

10. **What administrative information is relevant to this course?**

10.1 **Assessment: Academic Integrity**

Academic integrity is the ethical standard of university participation. It ensures that students graduate as a result of proving they are competent in their discipline. This is integral in maintaining the value of academic qualifications. Each industry has expectations and standards of the skills and knowledge within that discipline and these are reflected in assessment.

Academic integrity means that you do not engage in any activity that is considered to be academic fraud; including plagiarism, collusion or outsourcing any part of any assessment item to any other person. You are expected to be honest and ethical by completing all work yourself and indicating in your work which ideas and information were developed by you and which were taken from others. You cannot provide your assessment work to others. You are also expected to provide evidence of wide and critical reading, usually by using appropriate academic references.

In order to minimise incidents of academic fraud, this course may require that some of its assessment tasks, when submitted to Blackboard, are electronically checked through SafeAssign. This software allows for text comparisons to be made between your submitted assessment item and all other work that SafeAssign has access to.

10.2 **Assessment: Additional requirements**

**Eligibility for Supplementary Assessment**

Your eligibility for supplementary assessment in a course is dependent of the following conditions applying:

a) The final mark is in the percentage range 47% to 49.4%

b) The course is graded using the Standard Grading scale

c) You have not failed an assessment task in the course due to academic misconduct

10.3 **Assessment: Submission penalties**

Late submission of assessment tasks will be penalised at the following maximum rate:

- 5% (of the assessment task’s identified value) per day for the first two days from the date identified as the due date for the assessment task.
10% (of the assessment task's identified value) for the third day
20% (of the assessment task's identified value) for the fourth day and subsequent days up to and including seven days from the date identified as the due date for the assessment task.
A result of zero is awarded for an assessment task submitted after seven days from the date identified as the due date for the assessment task.
Weekdays and weekends are included in the calculation of days late.
To request an extension, you must contact your Course Coordinator and supply the required documentation to negotiate an outcome.

10.4 Study help
In the first instance, you should contact your tutor, then the Course Coordinator. Additional assistance is provided to all students through Academic Skills Advisers. To book an appointment or find a drop-in session go to Student Hub.
Contact Student Central for further assistance: +61 7 5430 2890 or studentcentral@usc.edu.au

10.5 Links to relevant University policy and procedures
For more information on Academic Learning & Teaching categories including:
- Assessment: Courses and Coursework Programs
- Review of Assessment and Final Grades
- Supplementary Assessment
- Administration of Central Examinations
- Deferred Examinations
- Student Academic Misconduct
- Students with a Disability
Visit the USC website:
http://www.usc.edu.au/explore/policies-and-procedures#academic-learning-and-teaching

10.6 General Enquiries
In person:
- USC Sunshine Coast - Student Central, Ground Floor, Building C, 90 Sippy Downs Drive, Sippy Downs
- USC South Bank - Student Central, Building A4 (SW1), 52 Merivale Street, South Brisbane
- USC Gympie - Student Central, 71 Cartwright Road, Gympie
- USC Fraser Coast - Student Central, Building A, 161 Old Maryborough Rd, Hervey Bay
- USC Caboolture - Student Central, Level 1 Building 1, Cnr Manley and Tallon Street, Caboolture
Tel: +61 7 5430 2890
Email: studentcentral@usc.edu.au