

Course Outline

Code: ANM203

Title: Statistics with Teeth: Understanding Ecological Data

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| School of: | Science & Engineering |
| Teaching Session: | Semester 2 |
| Year: | 2020 |
| Course Coordinator: | Associate Professor David Schoeman |
| Course Moderator: | 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

During this course, you will learn how to use fundamental statistical programming techniques to solve numerical problems in Animal Ecology. You will consolidate your skills in manipulating and summarising data, before progressing towards building your own simple ecological models of the type that underpin modern research in Animal Ecology. Most approaches will be explored from the context of the general linear model, gradually building sophistication to culminate in explanatory and predictive techniques, including generalized linear models, classification trees and regression trees.

1.2 Course topics

An introduction to the philosophy of science, a review of data handling and manipulation, the fundamentals of statistical programming in R, working with Normal data (general linear modelling), working with non-Normal data (generalized linear modeling), pattern-recognition (classification and regression trees).

2. What level is this course?

200Level – Developing: Applying broad and/or deep knowledge and skills to new contexts. May require pre-requisites and introductory level knowledge/skills. Normally undertaken in the 2nd or 3rd year of an undergraduate program

3. Unit value

12 units

4. How does this course contribute to my learning?

| Specific Learning Outcomes On successful completion of this course you should be able to: | Assessment Tasks You will be assessed on the learning outcome in task/s: | Graduate Qualities or Professional Standards mapping Completing these tasks successfully will contribute to you becoming: |
|-------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------|
| Demonstrate scholarly good practice in acquiring, manipulating, analyzing, storing and presenting data. | Tasks 1 - 3 | Ethical. Creative and critical thinkers. |
| Connect concepts from different disciplines and apply relevant theory to identify and solve problems. | Tasks 1 - 3 | Creative and critical thinkers. Knowledgeable. |
| Identify and solve problems systematically, demonstrating the ability to select from among a range of techniques. | Tasks 1 - 3 | Empowered. Creative and critical thinkers. |
| Employ logical reasoning and empirical support to arrive at independent conclusions. | Tasks 1 - 3 | Creative and critical thinkers. Empowered. |
| Communicate effectively and coherently in written and oral forms, using correct terminology, appropriate formats. | Tasks 1 - 3 | Empowered. Ethical. |

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

Nil

5.2 Pre-requisites

SCH110 or BUS101

5.3 Co-requisites

Nil

5.4 Anti-requisites

Nil

5.5 Specific assumed prior knowledge and skills (where applicable)

You will have prior knowledge and skills in: basic design of quantitative research; foundational statistical concepts (measures of central tendency and dispersion, sampling, graphs); and elementary statistical tests (t-tests, chi-square tests, and correlation).

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

Over the first four Weeks of this Course, you will work with your peers in a group setting to develop a document outlining a survey or experimental design for a real-world research problem. During this process, you will receive formative feedback from your peers about your level of understanding of the introductory concepts required by this Course. Summative assessment (assigned marks) of your submitted Research Design (see Task 1, below), will be accompanied by extensive formative feedback.

6.3 Assessment tasks

| Task No. | Assessment Tasks | Individual or Group | Weighting % | What is the duration / length? | When should I submit? | Where should I submit it? |
|----------|------------------------|---------------------|-------------|---------------------------------------|-----------------------|---------------------------|
| 1 | Research Design | Group | 30 | 1000 words \pm 15 % | Friday of Week 4 | Blackboard (Safe Assign) |
| 2 | Data Analysis Script 1 | Individual | 20 | 1000 words \pm 15 % | Friday of Week 8 | Blackboard (Safe Assign) |
| 3 | Data Analysis Script 2 | Individual | 50 | 3000 words \pm 15 % | Friday of Week 13 | Blackboard (Safe Assign) |
| | | | 100% | <i>No more than 5000 words, total</i> | | |

Assessment Task 1: Research Design

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| Goal: | In this Task, you will demonstrate your understanding of the philosophy and practice of ecological science by articulating a problem as a research question, by developing a conceptual model that will yield predictions, by converting these predictions into testable hypotheses, by specifying such hypothesis, and by explaining how you would go about designing a survey or experiment that would yield real-world data with which you may be able to test your hypotheses. This Task will comprise both formative and summative elements. |
| Product: | Working in groups of two or three, you will provide a short, written report, with illustrations (as needed) outlining how you would go about solving a real-world ecological problem in practical animal ecology. |
| Format: | From the list of problems provided, select ONE, and prepare a short, written report of 1000 words \pm 15% that outlines your survey/experimental design. You may include diagrams/illustrations, where these are necessary to elaborate the points you wish to make. |
| Criteria | You will be assessed on: <ul style="list-style-type: none"> • Appropriateness of your research questions; • Precision and logic of predictions and hypotheses; • Robustness of proposed survey or experimental design and resulting data in the context of stated predictions, hypotheses and research question • Reflection on strengths and weaknesses of your survey/experimental design; and • Your ability to work in a team. |

Assessment Task 2: Data Analysis Script 1

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| Goal: | In this Task, you will demonstrate your ability to import, manipulate and store data in R, to use these data to construct, fit, assess and interpret basic statistical models, and to present associated R scripts in a form that describes all of these steps and that also presents the results appropriately. This Task will comprise both formative and summative elements. |
| Product: | Working individually, but with the opportunity to collaborate, you will provide a single, fully annotated R script that indicates how you have imported, manipulated and analysed data, and how you stored and outputs. |
| Format: | From the list of problems provided, select ONE, and prepare an annotated R script of 1000 words \pm 15%, which you will compile into an MS Word file for submission. |
| Criteria | You will be assessed on: <ul style="list-style-type: none"> • Clarity and completeness of scripting; • Appropriateness of data manipulation and analysis; • Quality of resulting outputs; and • Appropriateness and accuracy of rationale/explanation and interpretation of results. |

Assessment Task 3: Data Analysis Script 2

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| Goal: | This final assignment will provide you with the opportunity to demonstrate the full range of skills you have developed during the course. This Task will comprise mainly summative elements. |
| Product: | Working individually, you will provide a single, fully annotated file of R script that indicates how you have imported, manipulated and analysed data, and how you stored outputs. |
| Format: | From the list of problems provided, select ONE, and prepare an annotated R script of 3000 words \pm 15%, which you will compile into an MS Word file for submission. |
| Criteria | You will be assessed on: <ul style="list-style-type: none"> • Precision and logic of predictions and associated hypotheses; • Quality of analyses, including their justification and correctness; • Depth of understanding of the analyses, and interpretation of the associated results; • Clarity and completeness of scripting; • Overall presentation of final script and associated outputs. |

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. A 12 unit course will have 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.

This Course will be delivered via technology-enabled learning and teaching. All lectures will remain in this mode for Semester 2 2020. When government guidelines allow, students that elected on-campus study via the class-selection process will be advised when on campus tutorials and practical sessions will resume.

| Location: Specific Campus(es) or online: | Directed study hours for location: |
|-------------------------------------------------|-------------------------------------------|
| USC Sunshine Coast | Lecture – 1 hour per week |
| USC Fraser Coast | Computer Lab – 3 hours per week |

7.2 Course content

| Week #/ Module # | What key concepts/content will I learn? |
|-----------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1 | Show me the evidence! A review of the philosophy of science as it applies to quantitative analysis in ecology An introduction to programming in R, Part I |
| 2 | A review of basic statistical concepts An introduction to programming in R, Part II |
| 3 | Experimental and survey design An introduction to programming in R, Graphics |
| 4 | Basic statistical tests Re-discovering the t-test |
| 5 | Normal responses: introducing the general linear model in the form of linear regression Modelling zooplankton biomass for an environmental impact assessment |
| 6 | Understanding general linear models with multiple predictors and interactions Extending the zooplankton biomass for an environmental impact assessment |
| 7 | Simplifying general linear models Simplifying the zooplankton biomass for an environmental impact assessment |

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| 8 | Consolidating concepts in general linear modelling: moving from the maximal model to the minimum adequate model Consolidating concepts in basic statistical modelling in R |
| 9 | Poisson responses: introducing the generalized linear model for counts Modelling species richness |
| 10 | Log-linear models: generalized linear models for cross-tabulated counts Modelling the effects of aphids on vulnerability of leaves to caterpillars |
| 11 | Proportions and binary responses: Binomial generalized linear models Modelling the consistency of climate-change responses in the global ocean |
| 12 | Basic pattern-recognition: Classification and regression trees Classifying Darwin's Finches |
| 13 | Final course revision Final workshop revision |

Please note that the course activities may be subject to variation.

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)

There is no prescribed textbook for this Course, but please note that you need to have regular access to the resources listed (in order of importance) below, which will be made available on short loan at the library:

| Author | Year | Title | Publisher |
|----------------------------|------|-----------------------------------------------------|----------------------------|
| Field A, Miles J & Field Z | 2012 | Discovering Statistics Using R | Sage |
| Michael J Crawley | 2012 | The R Book, 2 nd Edition | Wiley |
| Quinn GP & Keough MJ | 2002 | Experimental Design and Data Analysis for Biologist | Cambridge University Press |

8.2 Specific requirements

None, although a personal laptop computer would be useful.

9. Risk management

Health and safety risks for this course have been assessed as low.

It is your responsibility as a student to review course material, search online, discuss with lecturers and peers, and understand the health and safety risks associated with your specific course of study. It is also your responsibility to familiarise yourself with the University's general health and safety principles by reviewing the [online Health Safety and Wellbeing training module for students](#), and following the instructions of the University staff.

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:

- The final mark is in the percentage range 47% to 49.4%
- The course is graded using the Standard Grading scale
- 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, Student Central, Building A, 161 Old Maryborough Rd, Hervey Bay

- USC Moreton Bay - Service Centre, Building A – Ground Floor, 1 Moreton Bay Parade, Petrie
- **USC Caboolture** - Student Central, Level 1 Building J, Cnr Manley and Tallon Street, Caboolture

Tel: +61 7 5430 2890

Email: studentcentral@usc.edu.au