



## **CIEE Perth, Australia**

<b>Course title:</b>	Marine and Terrestrial Ecology Research Methods
<b>Course code:</b>	ECOL 3001 PEAU
<b>Programs offering course:</b>	Biology and Ecology Field Studies
<b>Language of instruction:</b>	English
<b>U.S. semester credits:</b>	4
<b>Contact hours:</b>	60
<b>Term:</b>	Spring 2020

### **Course Description**

Research Methods aims to identify and understand the methodologies used in research, to understand their strengths and limitations and to identify the necessary issues to be considered in ensuring data is collected and analysed reliably, efficiently and ethically. Scientific research is broadly based and utilises a range of methods. Students are introduced to a spectrum of research methods used in preparing for, doing and communicating the outcomes of research for both the terrestrial and marine environment. Areas covered include using the literature in devising and evaluating research, statistical analysis, library facilities and research ethics. Writing literature reviews, writing up methods and presenting research in public forums is discussed.

### **Learning Objectives**

By completing this course, students will:

1. Understand theoretical and practical aspects of science and research design, including the use of qualitative and quantitative approaches to research;
2. Interpret, critically evaluate and discuss previously published research;
3. Describe the characteristic features of common research methods and debate their relative merits;
4. Identify a research question (or project problem/objective) and justify the selection of an appropriate and ethically managed research method;
5. Demonstrate skills in the use of computers, databases, statistical and graphics packages for performing research and communicating the findings;
6. Demonstrate high quality oral communication skills in a professional environment.

### **Course Prerequisites**

There are no prerequisites required for this course.

### **Methods of Instruction**

This unit covers the following specific areas:

- Using the literature for devising and evaluating research
- Theoretical underpinning of research methodology and problem-solving
- Designing research project, collection of data
- Data analysis
- Critical thinking
- Oral communication skills
- Poster preparation and presentation



- Instruction on auxiliary methods used in conducting research, such as computer packages, the internet, and library facilities.

Students are required to attend all lectures and activities. Students are expected to arrive on time and participate in all class discussions, workshops, activities, and fieldtrips.

*Course schedule is subject to change due to study tours, excursions, and local holidays. Final schedules will be included in the final syllabus provided to students on site.*

### **Assessment and Final Grade**

1. Comprehensive Questions	20%
2. Oral Presentation	15%
3. Marine Field Methods Workshop (x2)	40%
4. Paper Discussions	15%
5. Participation	10%
TOTAL	100%

### **Course Requirements**

#### **Comprehensive Questions**

Research and answer four questions relating to the philosophy and logic of science, research design and statistical data analysis. This will aid you in learning to

- Research literature, synthesize and critique the literature
- Develop and demonstrate professional writing skills, including correct referencing skills

Answers to each question should be no more than 350 words excluding references, figures and tables. Use 12 point font, 1.5 line spacing and include page numbers. You should use as many primary source references as needed (ie peer-reviewed journal papers, book chapters) to critically answer each question.

#### **Oral Presentation**

Students will have **ten minutes** to present their work to the audience. The audience will then ask questions of the student arising from their oral presentation. You are expected to speak freely and not read from notes. Presentations will be on a selected research method. You will discuss where the research method has been used along with the pros and cons.

#### **Marine Field Methods Workshop (x2)**

To undertake science you need to use a range of skills, including research design, data analysis and communication. This is an opportunity for you to not only undertake research but also help to design a marine research project, set your hypothesis, gather the data, analyse the data and generate professional-level quality graphics and explanatory text.



With the data collected you will analyse it, and graph it. These outputs will then be integrated into a research paper with particular focus on hypothesis, methods and results.

From this assessment you will learn to

- To design a research project
- Develop hypothesis
- To undertake field research
- To learn how to connect hypotheses with data analysis
- To apply statistical techniques to actual data and obtain sensible results
- To generate effective, visual representations of data and analytical results
- To write succinct, professional quality methods, results, and captions

Each paper is meant to emulate the results of a professional, scientific paper. The paper should not exceed 1200 words (total). Use 12 point font and 1.5 line spacing for body text.

These assessments will be undertaken and submitted after the field trips and workshops.

### **Paper Discussions**

Becoming proficient in reading and comprehending the scientific literature is a critical skill. We will read a series of papers during this course and discuss them. You will lead the discussion once this course. Prior to the discussion you will need to select a paper relevant to Ningaloo Marine Park and draft a series of questions/topics to keep things going. Participation in discussions regardless of leading/not leading is expected.

Overall, there will be scheduled discussions that make up 15% of your marks in the unit. *Marks will be based on attendance and participation.*

From this assessment you will learn to

- Effectively read scientific papers (their structure, components, arguments, and limitations)
- Effectively communicate essential components of scientific students to others

### **Participation**

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### **Attendance**

## Weekly Schedule

### Week 1

Class 1.1 .

- Introduction to the Unit
- Scientific Paradigms
- (Guerra, Capitelli, and Longo, 2012)

Class 1.2 .

- Research Process
- Writing a Literature Review
- (Creswell, 2003)
- **Assessment Due:** Comprehensive questions

### Week 2

Class 2.1 .

- Research Methods in Marine Environment
- Scientific Inference and Critical Thinking
- (Nuzzo, 2014)
- **Assessment Due:** Paper Discussions (in class)

Class 2.2 .

- Designing Research
- (Chambliss, 2006)
- **Assessment Due:** Field Research Prac 1

### Week 3

Class 3.1 .

- Data Organisation and Analysis
- Presenting Results
- (Schwild and Keeley, 2012)

Class 3.2 .

- What makes a Good Poster?
- **Assessment Due:** Poster presentation; Field Research Prac 2

## Course Materials

### Readings

- Chambliss. (2006). "Causation and Experimental Design." *Sage Publishing*.  
[https://www.sagepub.com/sites/default/files/upm-binaries/23639\\_Chapter\\_5\\_Causation\\_and\\_Ex](https://www.sagepub.com/sites/default/files/upm-binaries/23639_Chapter_5_Causation_and_Ex)

- Creswell, J. (2003) *Research Design: Qualitative, Quantitative and Mixed Methods Approaches*. Sage Publications, London. Chapter 1 & 2.
- Guerra, Capitelli, and Longo (2012) The role of paradigms in science; a historical perspective. In L. L'Abate (ed.), *Paradigms in Theory Construction*, DOI 10.1007/978-1-4614-0914-4\_2
- Nuzzo, R. (2014) Statistical Errors. *Nature Vol: 506*: pp.15-152.
- Schwild, D. & Keeley, J. (2012) A Plant Distribution Shift: Temperature, drought or past disturbance? *PLoS ONE 7(2)*: e31173. doi:10.1371/journal.pone.0031173